INTER-AMERICAN TROPICAL TUNA COMMMISSION
COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL

QUARTERLY REPORT—INFORME TRIMESTRAL

July-September 2012—Julio-Septiembre 2012

The Quarterly Report of the Inter-American Tropical Tuna Commission is an informal account of the current status of the tuna fisheries in the eastern Pacific Ocean in relation to the interests of the Commission, and of the research and the associated activities of the Commission's scientific staff. The research results presented should be regarded, in most instances, as preliminary and in the nature of progress reports.

El Informe Trimestral de la Comisión Interamericana del Atún Tropical es un relato informal de la situación actual de la pesca atunera en el Océano Pacífico oriental con relación a los intereses de la Comisión, y de la investigación científica y demás actividades del personal científico de la Comisión. Gran parte de los resultados de investigación presentados en este informe son preliminares y deben ser considerados como informes del avance de la investigación.

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INTRODUCTION

The Inter-American Tropical Tuna Commission (IATTC) operated from 1950 to 2010 under the authority and direction of a Convention signed by representatives of the governments of Costa Rica and the United States of America on 31 May 1949. The Convention was open to the adherence by other governments whose nationals participated in the fisheries for tropical tunas and tuna-like species in the eastern Pacific Ocean (EPO). The original convention was replaced by the "Antigua Convention" on 27 August 2010, 15 months after it had been ratified or acceded to by seven Parties that were Parties to the original Convention on the date that the Antigua Convention was open for signature. On that date, Belize, Canada, China, Chinese Taipei, and the European Union became members of the Commission, and Spain ceased to be a member. Spanish interests were henceforth handled by the European Union. Kiribati joined the IATTC in June 2011. There were 21 members of the IATTC at the end of the second quarter of 2012.

The Antigua Convention states that the "Scientific Staff shall operate under the supervision of the Director," that it will "conduct scientific research … approved by the Commission," and "provide the Commission, through the Director, with scientific advice and recommendations in support of the formulation of conservation and management measures and other relevant matters." It states that "the objective of this Convention is to ensure the long-term conservation and sustainable use of the "tunas and tuna-like species and other species of fish taken by vessels fishing for tunas and tuna-like species," but it also states that the Commission is to "adopt, as necessary, conservation and management measures and recommendations for species belonging to the same ecosystem and that are affected by fishing for, or dependent on or associated with, the fish stocks covered by this Convention, with a view to maintaining or restoring populations of such species above levels at which their reproduction may become seriously threatened."

The scientific program is now in its 62nd year. The results of the IATTC staff's research are published in the IATTC's Bulletin and Stock Assessment Report series in English and Spanish, its two official languages, in its Special Report and Data Report series, and in books, outside scientific journals, and trade journals. Summaries of each year's activities are reported upon in the IATTC's Annual Reports and Fishery Status Reports, also in the two languages.

MEETINGS

Dr. Mark N. Maunder conducted an AD Model Builder workshop in Finse, Norway, on 30 June-1 July 2012. His expenses were paid by the organizers of the workshop.

Dr. Maunder participated in the International Statistical Ecology Conference in Krokkleiva, Norway, on 3-6 July 2012. He chaired a special session, “The Development and Use of Statistical Methodology in Fisheries Research” and gave the introductory presentation, “The Contribution of Fisheries Stock Assessment to Statistical Ecology,” at that session. His expenses were paid by the organizers of the conference.

Dr. Guillermo Compeán and Mr. Jean-Francois Pulvenis participated in the 30th meeting of the FAO Committee on Fisheries, entitled “The State of World Fisheries and Aquaculture,” in Rome, Italy, on 9-13 July 2012.

Dr. Compeán, Mr. Pulvenis, Dr. Richard B. Deriso, Dr. Mark N. Maunder, and Mr. Kurt M. Schaefer participated in a workshop, “Understanding Purse Seine CPUE,” sponsored by the International Seafood Sustainability Foundation (ISSF) in Rome, Italy, on 16-19 July 2012. Dr. Maunder served as chairman of that workshop, and made the following presentations:

Current Use of Purse Seine CPUE in IATTC Tuna Assessments;

Measures of Effort and Covariates;

Alternative Methods for Analyzing CPUE; and

Identifying Purse-Seiner Cooperative Fishing from Vessel Movements.

The last presentation was made on behalf of Dr. Cleridy E. Lennert-Cody. Mr. Schaefer presented a talk, co-authored with Mr. Daniel W. Fuller, entitled “Behavior of Bigeye, Yellowfin, and Skipjack Tunas, and their Vulnerability to Capture by Purse-Seine Vessels, in the Eastern Pacific Ocean.”

Dr. Maunder and Mr. Schaefer also participated in a second ISSF workshop, “Review of Spatial Closures to Manage Tuna Fisheries,” in Rome, Italy, on 20-21 July 2012. Dr. Maunder gave a presentation entitled “Spatial Closures in the EPO,” and Mr. Schaefer presented a talk, co-authored with Mr. Fuller, entitled “Large Scale Horizontal Movements of Bluefin, Albacore, Skipjack, Bigeye, and Yellowfin Tunas in the Pacific Ocean.” Everyone’s travel expenses for the two ISSF conferences were paid by the ISSF.

Dr. Michael G. Hinton participated in a meeting of principal investigators of the Fishscape-Pham Project at the Gulf of Maine Research Institute in Portland, Maine, USA, on 2-6 July 2012. (Fishscape is a fully-integrated geospatial model of the international fishery targeting tropical tunas in the eastern Pacific Ocean. Fishscape will identify the major sources of stability and instability that lead to wide variation among otherwise similar systems across multiple disciplines. Using robust decision-making methods, Fishscape will explore through simulation a wide range of social and ecological factors to discover what makes the system resilient and what leads to instability. PHAM [Pelagic Habitat Analysis Module] is a set of software tools designed to assist fisheries managers and scientists to examine and predict the habitat for pelagic ocean biota using presence-absence or abundance data for the biota, combined with environmental data sets such as satellite imagery, bathymetry, survey cruises, and ocean circulation.) The participants reviewed progress to date and drafted time lines for work to be completed during the coming year. Dr. Hinton's travel expenses were paid by the U.S. National Science Foundation and the U.S. National Aeronautics and Space Administration.

Dr. Hinton participated in the Conferencia Cooperación Chile-Estados Unidos en Oceanografía at the Universidad de Concepción, Chile, on 6-10 August 2012. The conference was sponsored by the Comité Oceanográfico Nacional (CONA) of Chile and the Office of Global Science and Technology of the United States Office of Naval Research. Its objective was to identify and foster collaborations between Chilean and United States scientists on subjects ranging from geophysics to glaciology to pelagic ecology. Chile will soon launch the oceanographic and fisheries research vessel *Cabo de Hornos*, for which CONA and the Subsecretaría de Pesca (Subpesca) of Chile have yet to establish research priorities. Chile and the United States have a history of collaborative oceanographic and Antarctic research, and would like to optimize use of their research vessels through such collaborations. The participants toured the *Cabo de Hornos* so that they could better understand the research capabilities of the vessel. Prior to arriving in Concepción and joining the other participants, Dr. Hinton presented a talk on the use of satellite imagery and ocean sensing systems in fisheries at the Valparaíso offices of Subpesca, and he discussed opportunities for collaboration between Chile and the United States ocean and fisheries research with those unable to attend and participate in the conference. The participation of the 10 scientists from the United States (including Dr. Hinton) was funded by the U.S. National Science Foundation.

Mr. Kurt M. Schaefer participated in the Eighth Scientific Committee meeting of the Western and Central Pacific Fisheries Commission in Busan, Korea, during the period of 7-15 August 2012, at which he presented an overview of the tuna fisheries of the eastern Pacific Ocean (EPO) through 2011 and the current stock assessments by the IATTC staff for yellowfin, skipjack, and bigeye tuna. Mr. Schaefer also participated in the Sixth Steering Committee meeting for the Pacific Tuna Tagging Program, at which he presented an overview of recent tagging experiments in the EPO conducted by the IATTC staff. Most of the documents presented at the meeting can be seen at the following web site: www.wcpfc.int

Dr. Guillermo Compeán participated in a "Reunión del Comité de Dirección de SICA/OSPESCA [Sistema de la Integración Centroamericana/Organización del Sector Pesquero y Acuícola del Istmo Centroamericano], in Managua, Nicaragua, on 16-17 August 2012. A Memorandum of Understanding that cites Article XXIII of the Antigua Convention was signed at the meeting. The English version of Article XXIII reads as follows:

> 1. The Commission shall seek to adopt measures relating to technical assistance, technology transfer, training and other forms of cooperation, to assist developing countries that are members of the Commission to fulfill their obligations under this Convention, as well as to enhance their ability to develop fisheries under their respective national jurisdictions and to participate in high seas fisheries on a sustainable basis.
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> 2. The members of the Commission shall facilitate and promote such cooperation, especially financial and technical, and the transfer of technology, as may be necessary for the effective implementation of paragraph 1 of this Article.

Drs. Martin A. Hall, Mark N. Maunder, and Michael D. Scott participated in the annual Tuna-Dolphin Symposium of the Marine Conservation and Diversity course at Scripps Institution of Oceanography, La Jolla, California, USA, on 17 August 2012. Dr. Hall presented the following talks:

Management by the IATTC; and

Towards a New Paradigm: Ecosystem-Based Management.

Dr. Maunder presented a talk entitled

Dolphin Population Dynamics Modeling at the IATTC.

Drs. Hall and Maunder participated in a panel discussion entitled "The Future of the ETP" at the conclusion of the symposium.

Dr. Cleridy E. Lennert-Cody participated in the International Biometric Conference in Kobe, Japan, on 26-31 August 2012, where she chaired a session on novel statistical methodology and its application in marine ecology and fisheries research. She also gave a talk at the conference on a tree-based method for simultaneous analysis of frequency distributions and time series data. Her travel expenses were paid by research funds of Dr. Mihoko Minami of Keio University, Tokyo, Japan.

Dr. Guillermo Compeán participated in the XIX Congreso Nacional de Ciencia y Tecnología del Mar in Tuxpan, Mexico, on 28-30 August 2012, where he gave a presentation entitled "The Development of Tuna Fishing in Mexico." His participation was funded by the organizers of the meeting.

Dr. Robert J. Olson participated in a meeting of the Working Party on Ecosystems and Bycatch of the Indian Ocean Tuna Commission (IOTC) in Cape Town, South Africa, on 17-19 September 2012. He was invited by the IOTC to assist with an Ecological Risk Assessment for pelagic sharks impacted by the Indian Ocean tuna fisheries. He also gave a presentation, co-authored with Ms. Leanne M. Duffy and Drs. Mark N. Maunder, Cleridy E. Lennert-Cody, Michael G. Hinton, Michael D. Scott, Alexandre Aires-da-Silva, and Richard B. Deriso, entitled "Use of Productivity and Susceptibility Indices to Evaluate Vulnerability in the Purse-Seine Fishery of the Eastern Pacific Ocean." Dr. Olson's travel expenses were paid by the IOTC.

Mr. Kurt M. Schaefer spent the period of 17-21 September 2012, at Shanghai Ocean University (SHOU), Shanghai, China. At the invitation of the Dean of the College of Marine Sciences, he gave the following presentations to professors and students at the university:

Life History Characteristics of Tropical Tunas and Appropriate Methodologies for their Estimation;

Recent Tuna Tagging Experiments in the EPO Using Plastic Dart Tags and Archival Tags; and

An Overview of the EPO Tuna Fisheries through the 2011 Fishing Year, along with the Stock Assessments by IATTC Staff for YFT, SKJ, and BET.

Mr. Schaefer also spent time discussing the potential for further collaborative research between the IATTC and SHOU with the dean and professors of the College of Marine Sciences. His travel expenses were paid by SHOU.

RESEARCH

DATA COLLECTION AND DATABASE PROGRAM

There are two major fisheries for tunas in the eastern Pacific Ocean (EPO; the region east of 150ºW, south of 50ºN, and north of 50°S), the commercial surface fishery and the longline fishery. The catches by the commercial surface fishery are taken almost entirely by purse-seine and pole-and-line vessels based in ports of Western Hemisphere nations. The longline catches are taken almost entirely by vessels registered and based in Far Eastern nations. The staff of the IATTC collects data on the catches by purse-seine and pole-and-line vessels and samples the catches of these vessels at unloading facilities in Las Playas and Manta, Ecuador; Manzanillo and Mazatlan, Mexico; Panama, Republic of Panama; and Cumaná, Venezuela, where it has field offices, and also, to a lesser extent, at other ports. The governments of the nations in which the catches of the longliners that fish in the EPO are registered compile the catch and size data for those vessels and make the data, in aggregated form, available to the IATTC staff. The rest of this section deals almost entirely with the surface fisheries.

Compilation of data on the amounts of catch, and on species and length composition of the catch for the surface fisheries is complicated. Observers accompany all trips of Class-6 purse seiners (vessels with fish-carrying capacities greater than 363 metric tons) that fish in the EPO, and the data that they collect include the locations and dates of each set, the type of each set (dolphin, floating object, or unassociated), the approximate total weights of each species caught in each set, and the wells in which the fish caught in each set are stored. Similar data are obtained from the logbooks of smaller purse seiners and of pole-and-line vessels, although these data may be less accurate or less precise than those collected by the observers. Then, when a vessel unloads its catch, the weight of the contents of each well is made available to the IATTC staff. These "reported catch statistics"—catch statistics obtained from every possible source, including observer records, fishing vessel logbooks, unloading records, and data compiled by governmental agencies—are compiled to provide an estimate of the total amount of tropical tunas (yellowfin, bigeye, and skipjack combined) caught annually by the surface fisheries. In addition, sample data on the species and length composition of the catch are also obtained when a vessel unloads. The methods for collection of these sample data are described in the IATTC Annual Report for 2000 and in IATTC Stock Assessment Reports 2, 4, 10, 11, 12, and 13. Briefly, the fish in a well of a purse-seine or pole-and-line vessel are selected for sampling only if all the fish in the well were caught in the same sampling area, during the same calendar month, and by the same type of gear (pole-and-line, or in the same type of set of a Class 1-5 or a Class-6 vessel). These data are then categorized by fishery (Figure 1).

The sample data on species and length composition of the catch are eventually combined with the reported catch statistics to make the "final" estimates of the catches by species and length- and weight-frequency distributions by species that appear in the IATTC's Stock Assessment Reports, Fishery Status Reports, and papers in outside journals, but this does not take place until two or more months after the end of the calendar year. (If additional information is acquired after the "final" estimates are calculated, that information is used to recalculate the estimates.) Most of the catch statistics that appear in the rest of this report are preliminary, as the calculations cannot be performed until after the end of the year.

IATTC personnel at stationed at its field offices collected 240 length-frequency samples from 161 wells and abstracted logbook information for 220 trips of commercial fishing vessels during the third quarter of 2012.

Reported fisheries statistics

The information reported herein are for the eastern Pacific Ocean (EPO: the region east of 150ºW, south of 50ºN, and north of 50°S), unless noted otherwise. The catches are reported in metric tons (t), the vessel capacities in cubic meters (m^3), and effort in days fishing. Estimates of fisheries statistics with varying degrees of accuracy and precision are available. The most accurate and precise are those made after all available information has been entered into the data base, processed, and verified. While it may require a year or more to obtain some final information, much of the catch information is processed and available within two to three months of the return of a vessel from a fishing trip. Thus the estimates for the current week are the most preliminary, while those made a year later are much more accurate and precise. The statistics are developed using data from many sources, including reports of landings, fishing vessel logbooks, scientific observers, and governmental agencies.

Fleet statistics for the purse-seine and pole-and-line fisheries

The IATTC Regional Vessel Register lists all vessels, other than artisanal and recreational fishing vessels, authorized to fish for tunas in the EPO. The estimated total carrying capacity of the purse-seine and pole-and-line vessels that have or are expected to fish in the EPO during 2012 is about 218,400 m^3 (Table 1). The average weekly at-sea capacity for the fleet, for the weeks ending 1 July through 30 September, was about 125,500 m^3 (range: 100,200 to 168,100 m^3).

Catch and catch-per-unit-of-effort statistics for the purse-seine and pole-and-line fisheries

Catch statistics

The estimated total retained catches, in metric tons, of tropical tunas from the EPO during the period of January-September 2012, and the equivalent statistics for 2007-2011, were:

Species	2012	2007-2011			Weekly average, 2012
		Average	Minimum	Maximum	
Yellowfin	175,700	169,600	142,400	187,200	4,500
Skipjack	196,100	176,200	118,500	234,600	5,000
Bigeye	40,900	40,400	35,900	48,000	1,100

Summaries of the estimated retained catches, by species and by flag of vessel, are shown in Table 2.

Catch-per-unit-of-effort statistics for purse-seine vessels

The catch-per-unit-of-effort (CPUE) statistics in this report do not incorporate adjustments for factors, such as type of set, vessel operating costs, or market prices, which might identify whether a vessel was directing its effort toward a specific species.

The measures of CPUE used in these analyses are based on data from fishing trips landing predominantly yellowfin, skipjack, bigeye, and bluefin tuna. The great majority of the purse-seine catches of yellowfin, skipjack, and bigeye are made by vessels with fish-carrying capacities greater than 363 metric tons, and only data for these vessels are included in these analyses. There are now far fewer pole-and-line vessels than in previous years, so the data for these vessels are combined without regard to their fish-carrying capacities.

The estimated nominal catches of yellowfin, skipjack, and bigeye per day of fishing, in metric tons, by purse-seine (PS) and pole-and-line (LP) gear in the EPO during the second quarter of 2012 and comparative statistics for 2007-2011 were:

Region	Species	Gear	2012	2007-2011		
				Average	Minimum	Maximum
N of 5°N	yellowfin	PS	14.4	12.9	9.6	14.9
S of 5°N	yellowfin	PS	4.3	3.1	2.6	4.0
N of 5°N	skipjack	PS	1.1	1.9	0.7	3.5
S of 5°N	skipjack	PS	9.4	9.7	6.8	12.7
EPO	bigeye	PS	2.7	2.4	1.9	3.4
EPO	yellowfin	LP	1.0	3.2	0.5	8.2
EPO	skipjack	LP	3.5	1.3	0.03	4.5

Catch statistics for the longline fishery

IATTC Resolution C-09-01 requires nations whose annual catches of bigeye by longline gear in the EPO exceed 500 metric tons to report their catches at monthly intervals. The catches reported for January-September 2012 are shown in Table 3.

Size compositions of the surface catches of tunas

Length-frequency samples are the basic source of data used for estimating the size and age compositions of the various species of fish in the landings. This information is necessary to obtain age-structured estimates of the population. Samples of yellowfin, skipjack, bigeye, Pacific bluefin, and, occasionally, black skipjack from the catches of purse-seine, pole-and-line, and recreational vessels in the EPO are collected by IATTC personnel at ports of landing in Ecuador, Mexico, Panama, the USA, and Venezuela. The catches of yellowfin and skipjack were first sampled in 1954, bluefin in 1973, and bigeye in 1975.

Data for fish caught during the second quarters of 2007-2012 are presented in this report. Two sets of length-frequency histograms are presented for each species; the first shows the data by stratum (gear type, set type, and area) for the second quarter of 2012, and the second shows data for the combined strata for the second quarter of each year of the 2007-2012 period. Samples from 300 wells were taken during the second quarter of 2012.

There are ten surface fisheries for yellowfin defined for stock assessments, four associated with floating objects, two unassociated school, three associated with dolphins, and one pole-and-line (Figure 1). The last fishery includes all 13 sampling areas. Of the 300 wells sampled that contained fish caught during the second quarter of 2012, 199 contained yellowfin. The estimated size compositions of these fish are shown in Figure 2a. The majority of the yellowfin catch during the second quarter was taken by sets on dolphins in the Northern Southern, and Inshore areas. Small amounts of yellowfin were taken in floating-object sets in the Northern, Equatorial, Inshore, and Southern areas, and in sets on unassociated schools in the Northern and Southern areas.

The estimated size compositions of the yellowfin caught by all fisheries combined during the second quarters of 2007-2012 are shown in Figure 2b. The average weight of the yellowfin caught during the second quarter of 2012 (19.0 kg) was greater than that of any of the previous five years.

There are eight fisheries for skipjack defined for stock assessments, four associated with floating objects, two unassociated school, one associated with dolphins, and one pole-and-line (Figure 1). The last two fisheries include all 13 sampling areas. Of the 300 wells sampled that contained fish caught during the second quarter of 2012, 143 contained skipjack. The estimated size compositions of these fish are shown in Figure 3a. Large amounts of skipjack in the 40- to 60-cm range were caught in the Equatorial, Inshore, and Southern floating-object fisheries and in the Southern unassociated fishery.

The estimated size compositions of the skipjack caught by all fisheries combined during the second quarters of 2007-2012 are shown in Figure 3b. The average weight for the second quarter of 2012 (2.3 kg) was equal to those of skipjack caught during the second quarter of 2011, less than that of 2007, and greater than those of 2008, 2009, and 2010.

There are seven surface fisheries for bigeye defined for stock assessments: four associated with floating objects, one unassociated school, one associated with dolphins, and one pole-and-line (Figure 1). The last three fisheries include all 13 sampling areas. Of the 300 wells sampled that contained fish caught during the second quarter of 2012, 68 contained bigeye. The estimated size compositions of these fish are shown in Figure 4a. The majority of the second-quarter bigeye catch was taken in floating-object sets in the Equatorial area. Smaller amounts of bigeye were taken in the Inshore and Southern floating-object fishery.

The estimated size compositions of the bigeye caught by all fisheries combined during the second quarters of 207-2012 are shown in Figure 4b. The average weight of bigeye caught during the second quarter of 2012 (7.1 kg) was less than those of 2008 and 2011, but greater than those of 2007, 2009, and 2010. The estimated retained purse-seine catch of bigeye less than 60 cm in length during the first two quarters of 2012 was 4,980 metric tons (t), or about 22 percent of the estimated total retained purse-seine catch of bigeye during that period. The corresponding amounts for the first two quarters of 2007-2011 ranged from 4,359 to 8,467 t, or 20 to 36 percent. These values may differ slightly from those given in previous Quarterly Reports due to changes in the estimation procedure.

BIOLOGY AND ECOSYSTEM PROGRAM

Early life history studies

Yellowfin broodstock

The yellowfin broodstock in Tank 1 (1,362,000 L) at the Achotines Laboratory spawned daily on July 1-4 and 6-7 and then ceased spawning until August 27 when the fish resumed daily spawning through the end of September, except on September 7. Spawning occurred between 11:00 p.m. and 00:20 a.m. The numbers of eggs collected after each spawning event ranged from about 28,000 to 774,000. The water temperatures in the tank during the quarter ranged from 28.2° to 29.3°C.

At the end of the quarter there were five 53- to 60-kg yellowfin, two 40- to 41-kg yellowfin, and five 14- to 20-kg yellowfin in Tank 1. There were five 4- to 6-kg yellowfin in the 170,000-L reserve broodstock tank (Tank 2).

Rearing of yellowfin eggs, larvae, and juveniles

During the quarter, the following parameters were recorded for most spawning events: times of spawning, egg diameter, duration of egg stage, hatching rate, lengths of hatched larvae, and duration of yolk-sac stage. The weights of the eggs, yolk-sac larvae, and first-feeding larvae, and the lengths and selected morphometrics of these, were measured periodically.

Comparative studies of yellowfin and Pacific bluefin larvae

A joint Kinki University-IATTC-ARAP [Autoridad de los Recursos Acuáticos de Panamá] 5-year research project is being supported in Panama by the Japan International Cooperation Agency (JICA) (see Quarterly Report for January-March 2011). This project, which is being conducted through the Science and Technology Research Partnership for Sustainable Development (SATREPS) Program, involves comparative studies of the early life histories of Pacific bluefin and yellowfin tuna.

As part of the SATREPS project, scientists of the IATTC's Early Life History Group spent the period of mid-July through the end of August at the Oshima Experimental Station of the Fisheries Laboratory, Kinki University, in Wakayama Prefecture, Japan. During their stay, they initiated several experiments with Kinki University faculty and staff members to investigate the rate of starvation and the growth potential of bluefin larvae under variable food conditions. The experiments were a continuation of comparative studies of bluefin and yellowfin early life histories being conducted under the SATREPS program. An additional experiment, supported by the Global Center of Excellence (GCOE) program, was conducted to investigate the effectiveness of two types of fatty acid enrichment products on the growth and survival of bluefin larvae.

In one experiment bluefin larvae were reared in replicated tanks with no food and at a controlled water temperature of approximately 27.5˚C. The larvae were sampled every 12 hours until nearly 100-prcent mortality was reached. The results indicate that first-feeding bluefin larvae can survive for almost 73 hours without food when reared at this water temperature. Histological samples will be analyzed in 2013 to examine the physiological effects of starvation. Additional starvation trials will be conducted with both bluefin and yellowfin larvae over a range of water temperatures. In another experiment, bluefin larvae were reared under low (170 rotifers/L), mid (505 rotifers/L) and high (3752 rotifer/L) food levels, and growth was estimated after 5 to 10 days of feeding. Preliminary comparative analyses of bluefin and yellowfin growth using the partial sample set for bluefin indicated no major differences in growth at medium to high food levels, with some indication that bluefin growth is more rapid than that of yellowfin at low-food levels. These trials will be expanded with the addition of two more food-levels during the next experimental season at the Kinki Laboratory in the summer of 2013. An additional experiment was conducted to compare the effectiveness of two types of fatty acid enrichment products used to enhance the effects of larval food organisms on the growth and survival of bluefin larvae. Two enrichment products were compared: an enrichment product normally used at the Achotines Laboratory to rear yellowfin larvae, and an enrichment product developed and routinely used by Kinki University to rear bluefin larvae. The results of the enrichment-comparison experiment indicated no statistical differences in growth or survival of bluefin larvae under either enrichment protocol. Both the growth and enrichment trials were similar to those conducted in July-August 2011 (see IATTC Quarterly Report for July-September 2011).

Dr. Yang-Su Kim, a Kinki University post-doctoral fellow, arrived at the Achotines Laboratory in September 2012 to initiate trials with yellowfin tuna larvae. Dr. Kim was joined near the end of October by other Kinki University professors, graduate students, and post-doctoral researchers, and also ARAP scientists and IATTC early life history staff members. This period of joint research activity at the Achotines Laboratory was scheduled to run from mid-September through mid-December of 2012.

On 27 September 2012, Dr. Yoshifumi Sawada of Kinki University visited the IATTC headquarters in La Jolla, where he met with Drs. Guillermo A. Compeán, Richard B. Deriso, and Daniel Margulies and Mss. Jeanne B. Wexler, and Maria S. Stein to discuss progress and research planning for the joint SATREPS project being conducted at the Achotines Laboratory and the Kinki University Fisheries Laboratory.

Collaborative work between the IATTC and Hubbs Sea World Research Institute

The joint IATTC-Hubbs Sea World Research Institute (HSWRI) project funded by California Sea Grant, "Development of Sustainable Tuna Aquaculture in the United States Using Yellowfin Tuna as a Model" was described in the IATTC Quarterly Report for April-June 2012. As part of this project, Mr. Kevin Stuart of HSWRI spent the period of 13-24 July 2012 at the Achotines Laboratory. During his stay he worked with Achotines Laboratory staff members on the research outlined for this project and prepared for the second of six planned shipments of yellowfin tuna larvae from the Achotines Laboratory to the HSWRI. Unfortunately, there was no spawning during his visit, so the shipment was rescheduled.

Workshop on physiology and aquaculture of pelagic fishes

The IATTC and the University of Miami (Miami, Florida, USA) held their tenth workshop, "Physiology and Aquaculture of Pelagics, with Emphasis on Reproduction and Early Developmental Stages of Yellowfin Tuna," from 9-21 July 2012. The organizers were Dr. Daniel Margulies and Mr. Vernon P. Scholey of the IATTC staff and Dr. Daniel D. Benetti, Director of the Aquaculture Program of the Rosenstiel School of Marine and Atmospheric Science (RSMAS), University of Miami. Mr. Scholey and Dr. Benetti served as instructors. The participants were Elizabeth Elkjer and Ian McComas of Blue Ocean Aquaculture, Hawaii, Robert Michael of the Challenger Institute of Technology, Australia, Edissa Palacios of MarinAzul, Peru, and Frederico Rotman of the Hubbs Sea World Research Institute, San Diego, California, USA. In addition, seven of Dr. Benetti's graduate students participated in the workshop. A fee for the participants and students covered the expenses of putting on the workshop. As part of the workshop, yellowfin larvae and juveniles were cultured from the larval stage through the fourth week of feeding. (Some larval cultures had been initiated prior to the beginning of the workshop.) The workshop group left the Achotines Laboratory on 19 July 2012 to visit the Ocean Blue cobia (*Rachycentron canadum*) culture laboratories and ocean cages on the Caribbean coast of Panama on 20-21 July 2012.

Studies of snappers

The work on snappers (*Lutjanus* spp.) is carried out by the Autoridad de los Recursos Acuáticos de Panamá (ARAP).

During 1996-2009, the ARAP staff had conducted full life cycle research on spotted rose snappers (*Lutjanus guttatus*) in captivity. Efforts to rebuild the broodstock population of this species, in order to continue research, has been unsuccessful in recent years, with only three fish remaining in the broodstock snapper tank at the end of the third quarter. ARAP plans to continue work with this species when it is able to establish a broodstock population.

Oceanography and meteorology

Easterly surface winds blow almost constantly over northern South America, which cause upwelling of cool, nutrient-rich subsurface water along the equator east of 160ºW, in the coastal regions off South America, and in offshore areas off Mexico and Central America. El Niño events are characterized by weaker-than-normal easterly surface winds, which cause above-normal sea-surface temperatures (SSTs) and sea levels and deeper-than-normal thermoclines over much of the tropical eastern Pacific Ocean (EPO). In addition, the Southern Oscillation Indices (SOIs) are negative during El Niño episodes. (The SOI is the difference between the anomalies of sea-level atmospheric pressure at Tahiti, French Polynesia, and Darwin, Australia. It is a measure of the strength of the easterly surface winds, especially in the tropical Pacific in the Southern Hemisphere.) Anti-El Niño events, which are the opposite of El Niño events, are characterized by stronger-than-normal easterly surface winds, below-normal SSTs and sea levels, shallower-than-normal thermoclines, and positive SOIs. Two additional indices, the NOI* (Progress Ocean., 53 (2-4): 115-139) and the SOI*, have recently been devised. The NOI* is the difference between the anomalies of sea-level atmospheric pressure at the North Pacific High (35°N-130°W) and Darwin, Australia, and the SOI* is the difference between the anomalies of sea-level atmospheric pressure at the South Pacific High (30°S-95°W) and Darwin. Ordinarily, the NOI* and SOI* values are both negative during El Niño events and positive during anti-El Niño events.]

In December 2011 there was a band of cool water along the equator from the coast of South America to west of 180° and also a large area of cool water between about 110°W and

150°W and 10°S and 20°S (IATTC Quarterly Report for October-December 2011: Figure 6). These began to dissipate in January 2012, and in February and March an area of cool water extended from southern Baja California to the Equator at about 125°W, and then westward along the Equator to west of 180° (IATTC Quarterly Report for January-March 2012: Figure 8). This area of cool water moved northward during the ensuing months and persisted through September. A large area of warm water appeared off southern Peru and northern Chile in February 2012, and this persisted through July. In April a portion of this area of warm water extended westward along the Equator to about 115°W. This extension retracted in May, but then extended further to the west in June (IATTC Quarterly Report for April-June 2012: Figure 5). It began to weaken in August, and nearly disappeared in September. The transition from cooler-than-average conditions to warmer-than-average conditions is apparent in Table 4; during October 2011-January 2012 all of the SST anomalies were negative, whereas during July-September 2012 none of them were negative. According to the Climate Diagnostics Bulletin of the U.S. National Weather Service for September 2012, "Enhanced convection was seen across the western equatorial Pacific and near the Date Line …, which is consistent with weak El Niño conditions. Collectively, these oceanic and atmospheric anomalies reflect borderline ENSO [El Niño-Southern Oscillation]-neutral/weak El Niño conditions."

BYCATCH PROGRAM AND INTERNATIONAL DOLPHIN CONSERVATION PROGRAM

Data collection

The IATTC had field offices at Las Playas and Manta, Ecuador; Manzanillo and Mazatlan, Mexico; Panama, Republic of Panama; and Cumana, Venezuela, during the third quarter of 2012. Members of the field office staffs placed IATTC observers on 176 fishing trips by vessels that participate in the AIDCP On-Board Observer Program and fished in the eastern Pacific Ocean (EPO) during the quarter.

Observer program

Coverage

The Agreement on the International Dolphin Conservation Program (AIDCP) requires 100-percent coverage by observers on trips by Class-6 purse seiners (vessels with fish-carrying capacities greater than 363 metric tons) that fish for tunas in the EPO. This mandate is carried out by the AIDCP On-Board Observer Program, made up of the IATTC's international observer program and the observer programs of Colombia, Ecuador, the European Union, Mexico, Nicaragua, Panama, and Venezuela. The observers are professionals in biology or related fields trained to collect a variety of data on the mortalities of dolphins associated with the fishery, sightings of dolphin herds, catches of tunas and bycatches of fish and other animals, oceanographic and meteorological data, and other information used by the IATTC staff to assess the conditions of the various stocks of dolphins, study the causes of dolphin mortality, and assess the effects of the fishery on tunas and other components of the ecosystem. The observers also collect data relevant to compliance with the provisions of the AIDCP and IATTC resolutions and data required for the tuna-tracking system established under the AIDCP, which tracks the "dolphin-safe" status of tuna caught in each set from the time it is captured until it is unloaded (and, after that, until it is canned and labeled).

In 2012 the observer programs of Colombia, the European Union, Mexico, Nicaragua, Panama, and Venezuela are to sample half, and that of Ecuador approximately one-third, of the trips by vessels of their respective fleets, while IATTC observers are to sample the remainder of those trips. Except as described in the next paragraph, the IATTC is to cover all trips by vessels registered in other nations that are required to carry observers.

At the fifth meeting of the Parties to the AIDCP in June 2001, observers from other ocean areas were approved to collect pertinent information for the On-Board Observer Program, pursuant to Annex II (9) of the AIDCP in cases for which the Director determines that the use of an observer from the AIDCP On-Board Observer Program is not practical. In 2011, the IATTC and Western and Central Pacific Fisheries Commission (WCPFC) member nations agreed on a memorandum of cooperation (MOU) on the cross endorsement of observers aboard vessels operating in the convention areas of both organizations). As part of the implementation of the MOC, the secretariats of the two organizations put together a series of procedures for the observers of the Regional Observer Program (ROP) to follow under the umbrella of the WCPFC for tuna purse seiners, while observing fishing activity in the IATTC convention area.

Observers from the On-Board Observer Program departed on 176 fishing trips aboard purse seiners covered by that program during the third quarter of 2012. Preliminary coverage data for these vessels during the quarter are shown in Table 5.

Training

The IATTC staff, in coordination with the staff of the Regional Observer Program of the WCPFC, conducted a training seminar under the MOC for observers participating under the WCPFC in Tarawa, Kiribati, during the period of 17-22 August 2012.

The IATTC staff conducted an observer training seminar for 3 Panamanian and 16 Ecuadorian trainees, including 7 for the National Observer Program of Ecuador, in Manta, Ecuador, during the period of 3-19 September 2012.

GEAR PROJECT

Technicians of the Mexican National Program, following procedures provided by the IATTC staff, participated in safety-gear inspections or safety-panel alignments aboard three Mexican-flag purse seiners during the third quarter of 2012.

INTER-AGENCY COOPERATION

The Center for the Advancement of Population Assessment Methodology (CAPAM) was recently established as a collaborative effort of the U.S. National Marine Fisheries Service (La Jolla), the IATTC, and Scripps Institution of Oceanography (SIO), University of California, San Diego) for development of research and education frameworks to address modern stock assessment modeling issues. The CAPAM will focus on research related to quantitative methods used in stock assessment modeling efforts conducted worldwide. Specifically, emphasis will be on assumptions used in contemporary stock assessment models, *e.g*. selectivity/catchability, growth, natural mortality, stock-recruitment relationships, covariates, spatial structure, data/likelihood weighting, multi-species and ecosystem considerations, and diagnostics. The CAPAM infrastructure will consist of postdoctoral researchers, visiting scientists, on-site collaborators, and workshops. Pilot funding for CAPAM has been provided through competitive internal funding provided by the National Oceanic and Atmospheric Administration (NOAA)-National Marine Fisheries Service (NMFS). The structure for CAPAM was developed by Dr. Paul R. Crone of the NMFS and Dr. Mark N. Maunder of the IATTC, who obtained the pilot funding for the center. Ms. Jenny McDaniel of the NMFS joined the center to help with administrative duties. The center is linked with SIO through Dr. Brice X. Semmens, the new population dynamics professor at SIO. CAPAM is currently recruiting a postdoctoral researcher, and will conduct a workshop on "Selectivity: Theory, Estimation, and Application in Fishery Stock Assessment Models" in La Jolla, California, USA, on 12-14 March 2013.

PUBLICATIONS

Dagorn, Laurent, John D. Filmalter, Fabien Forget, Monin Justin Amandè, Martín A. Hall, Peter Williams, Hilario Murua, Javier Ariz, Pierre Chavance, and Nicolas Bez. 2012. Targeting bigger schools can reduce ecosystem impacts of fisheries. Canad. Jour. Fish. Aquatic Sci., 69 (9): 1463-1467.

Scott, Michael D., Susan J. Chivers, Robert J. Olson, Paul C. Fiedler, and Kim Holland. 2012. Pelagic predator associations: tuna and dolphins in the eastern tropical Pacific Ocean. Mar. Ecol. Prog. Ser., 458: 283-302.

Serafy Joseph E., Steven J. Cooke, Guillermo A. Diaz, John E. Graves, Martín Hall, Mahmood Shivji, and Yonat Swimmer. 2012. Circle hooks in commercial, recreational, and artisanal fisheries: research status and needs for improved conservation and management. Bull. Mar. Sci., 88 (3): 371-391.

ADMINISTRATION

Ms. Paola Gaeta, who was hired as a bilingual secretary on 26 March 2012, resigned on 10 July 2012. She was replaced on 24 July 2012 by Ms. Marisol Aguilar, a graduate of the Universidad Autónoma de Baja California in Tijuana, Baja California, Mexico.

Mr. Francisco Robayo's 1-year contract to serve as a "Tag Recovery Technician" at the IATTC's Manta office for the Secretariat of the Pacific Community has been extended for another year, until August 31, 2013.

ANNIVERSARY

The World Scientific Meeting on the Biology of Tunas and Related Species, sponsored by FAO, was held in La Jolla, California, USA, on 2-14 July 1962—50 years ago. The fact that the meeting was held in La Jolla, when the IATTC had been in existence for only 12 years, was a tribute to the accomplishments of Dr. Milner B. Schaefer, Director of the IATTC at the time, and the staff that he had assembled.

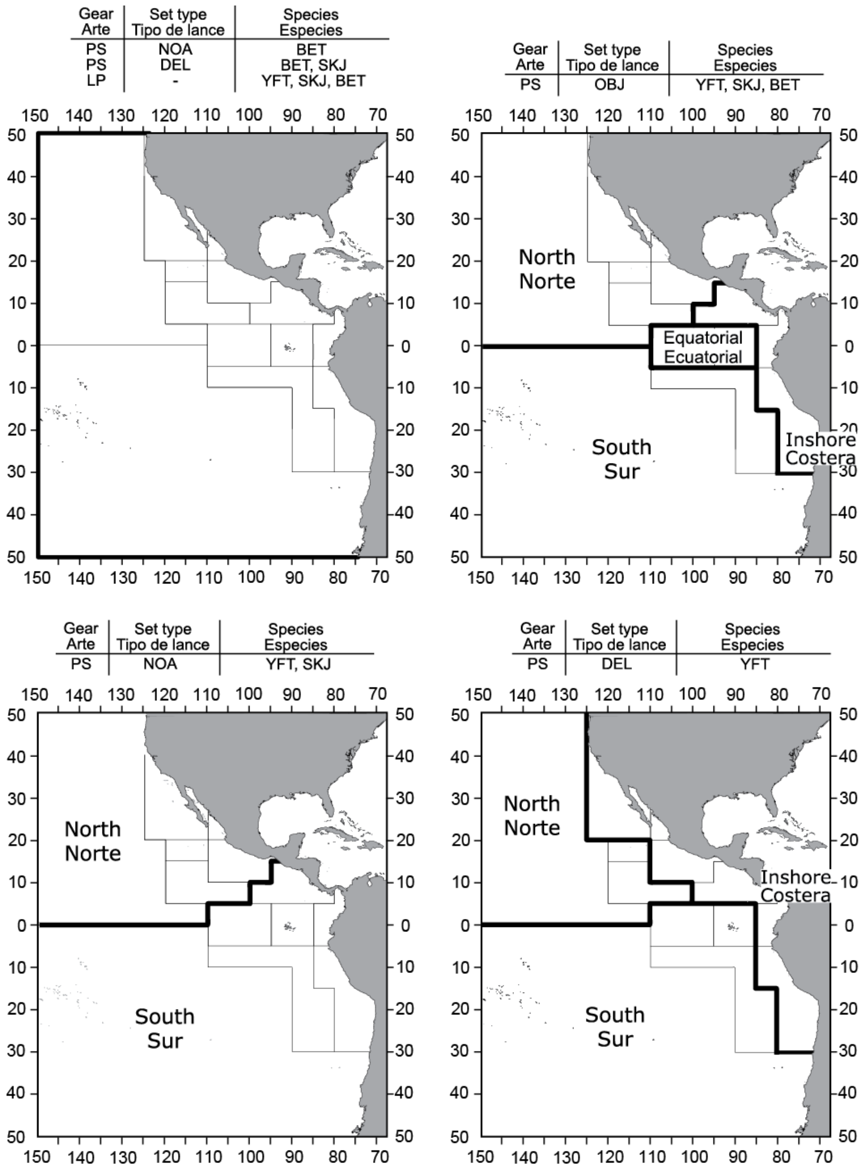

FIGURE 1. Spatial extents of the fisheries defined by the IATTC staff for stock assessment of yellowfin, skipjack, and bigeye in the EPO. The thin lines indicate the boundaries of the 13 length-frequency sampling areas, and the bold lines the boundaries of the fisheries. Gear: PS = purse seine, LP = pole and line; Set type: NOA = unassociated, DEL = dolphin, OBJ = floating object; Species: YFT = yellowfin, SKJ = skipjack, BET = bigeye.

FIGURA 1. Extensión espacial de las pesquerías definidas por el personal de la CIAT para la evaluación de las poblaciones de atún aleta amarilla, barrilete, y patudo en el OPO. Las líneas delgadas indican los límites de las 13 zonas de muestreo de frecuencia de tallas, y las líneas gruesas los límites de las pesquerías. Artes: PS = red de cerco, LP = caña; Tipo de lance: NOA = peces no asociados, DEL = delfín; OBJ = objeto flotante; Especies: YFT = aleta amarilla, SKJ = barrilete, BET = patudo.

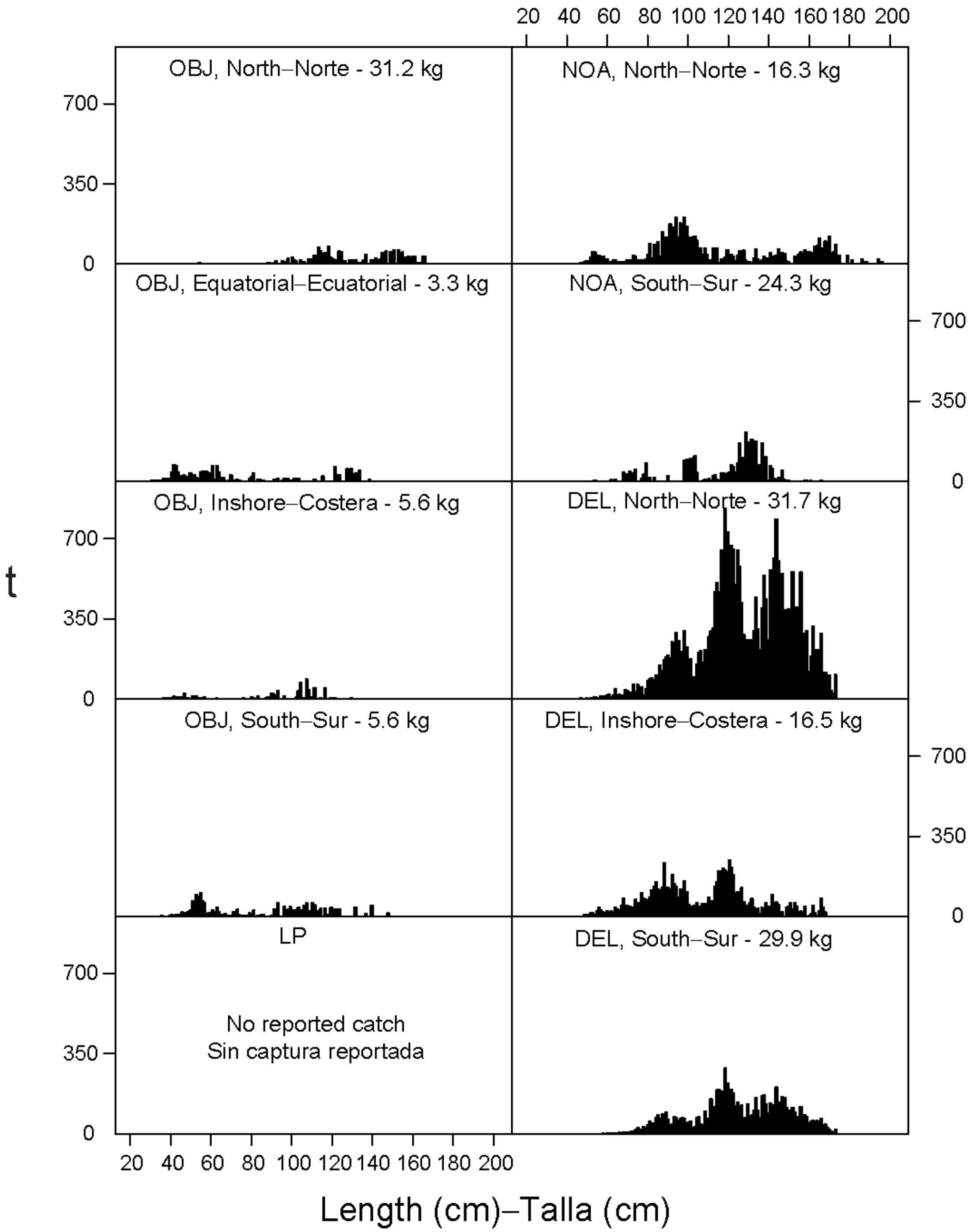

FIGURE 2a. Estimated size compositions of the yellowfin caught in each fishery of the EPO during the second quarter of 2012. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 2a. Composición por tallas estimada para el aleta amarilla capturado en cada pesquería del OPO durante el segundo trimestre de 2012. En cada recuadro se detalla el peso promedio de los peces en las muestras. OBJ = objeto flotante; LP = caña; NOA = peces no asociados; DEL = delfín; t = toneladas métricas.

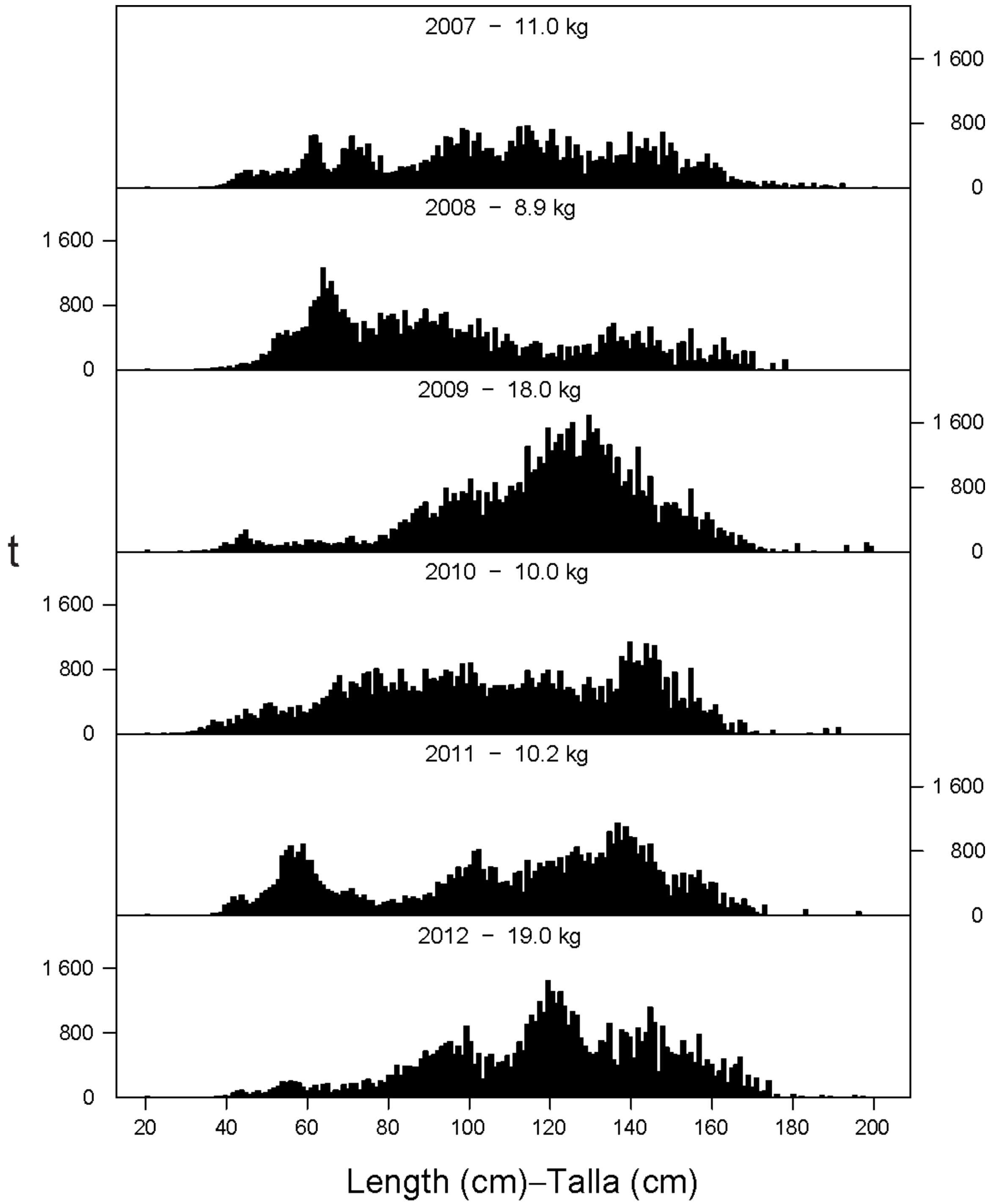

FIGURE 2b. Estimated size compositions of yellowfin tuna caught in the EPO during the second quarter of 2007-2012. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 2b. Composición por tallas estimada para el aleta amarilla capturado en el OPO en el segundo trimestre de 2007-2012. En cada recuadro se detalla el peso promedio de los peces en las muestras; t = toneladas métricas.

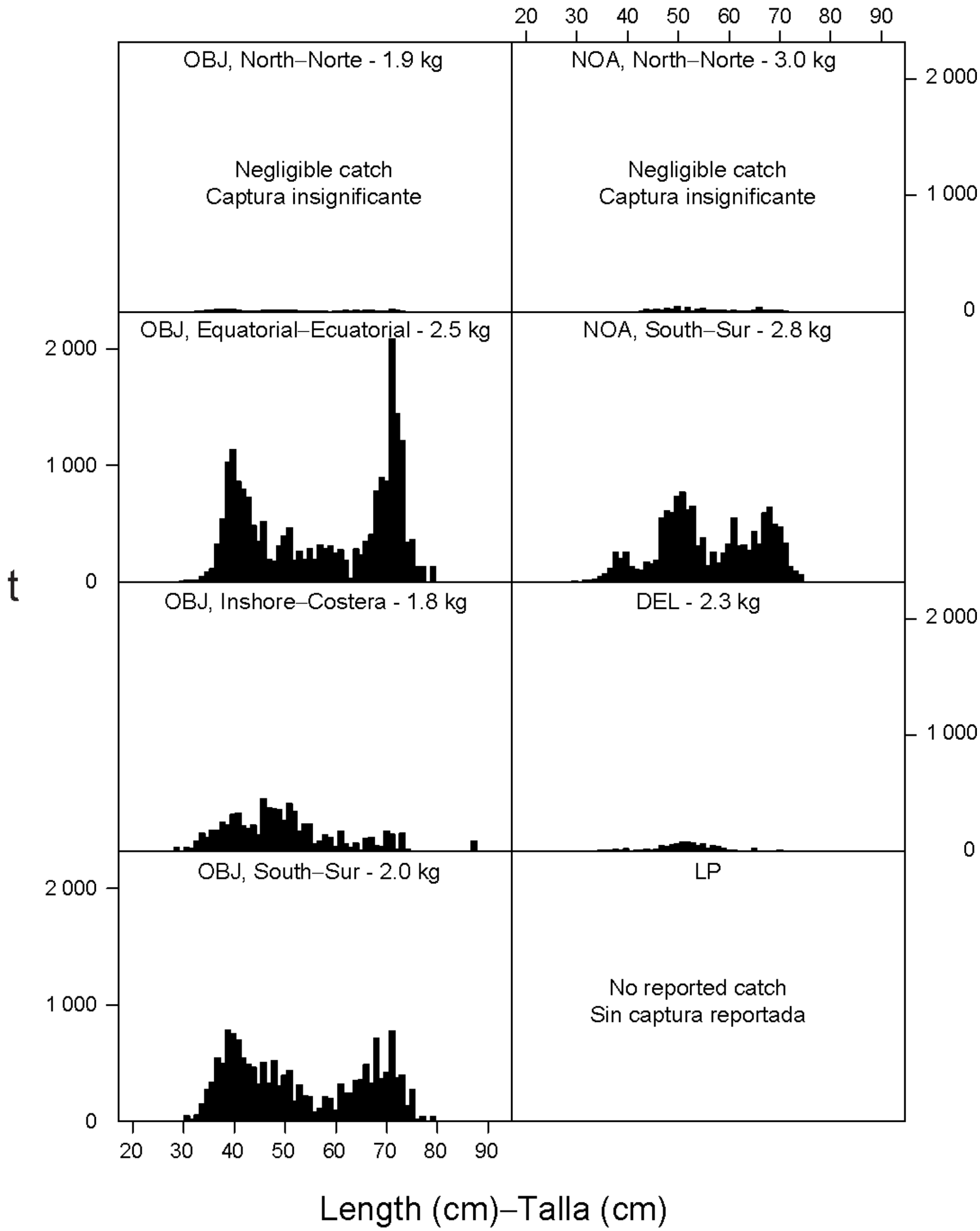

FIGURE 3a. Estimated size compositions of the skipjack caught in each fishery of the EPO during the second quarter of 2012. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 3a. Composición por tallas estimada para el barrilete capturado en cada pesquería del OPO durante el segundo trimestre de 2012. En cada recuadro se detalla el peso promedio de los peces en las muestras. OBJ = objeto flotante; LP = caña; NOA = peces no asociados; DEL = delfín; t = toneladas métricas.

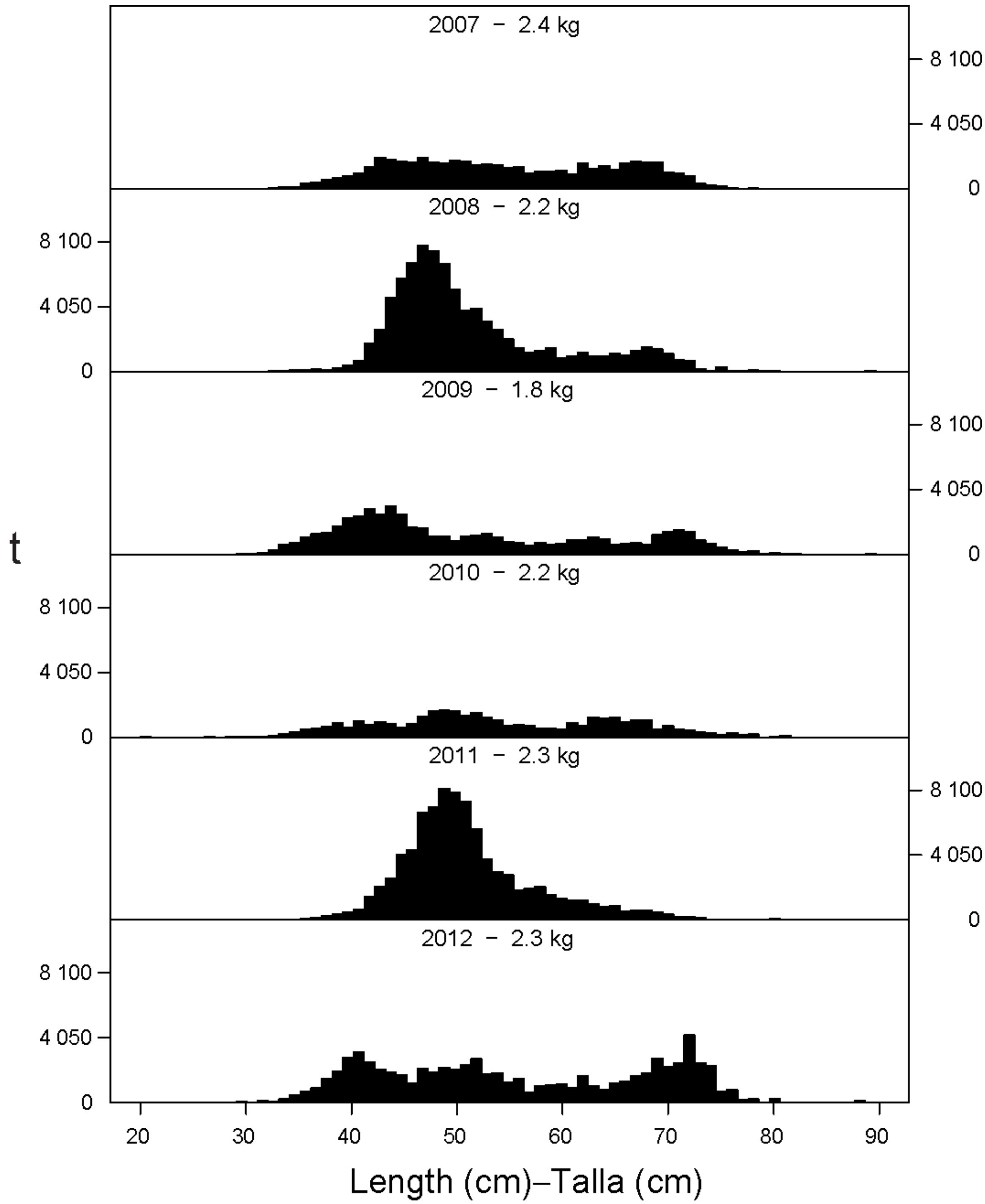

FIGURE 3b. Estimated size compositions of the skipjack caught in the EPO during the second quarter of 2007-2012. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 3b. Composición por tallas estimada para el barrilete capturado en el OPO en el segundo trimestre de 2007-2012. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas.

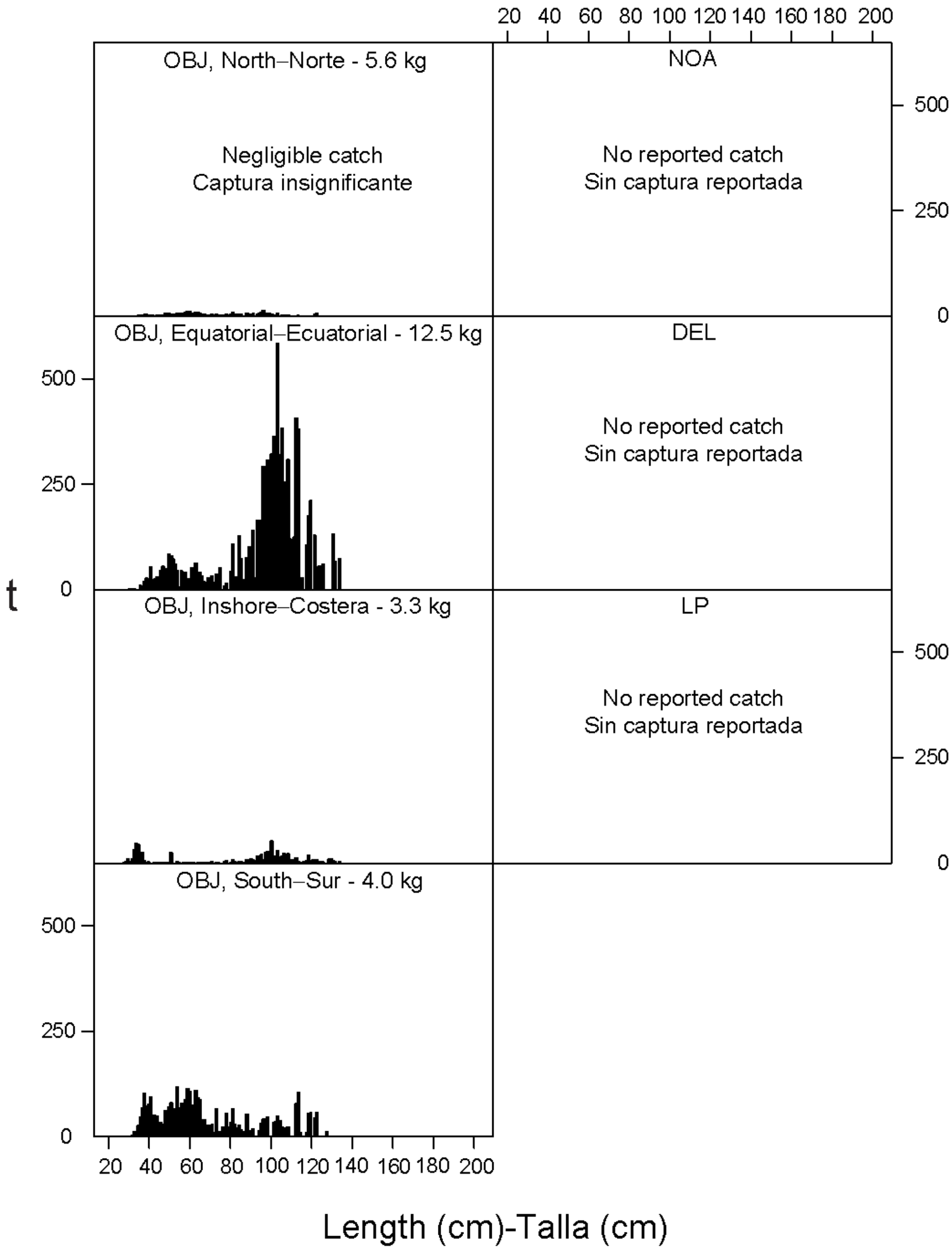

FIGURE 4a. Estimated size compositions of the bigeye caught in each fishery of the EPO during the second quarter of 2012. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 4a. Composición por tallas estimada para el patudo capturado en cada pesquería del OPO durante el segundo trimestre de 2012. En cada recuadro se detalla el peso promedio de los peces en las muestras. OBJ = objeto flotante; LP = caña; NOA = peces no asociados; DEL = delfín; t = toneladas métricas.

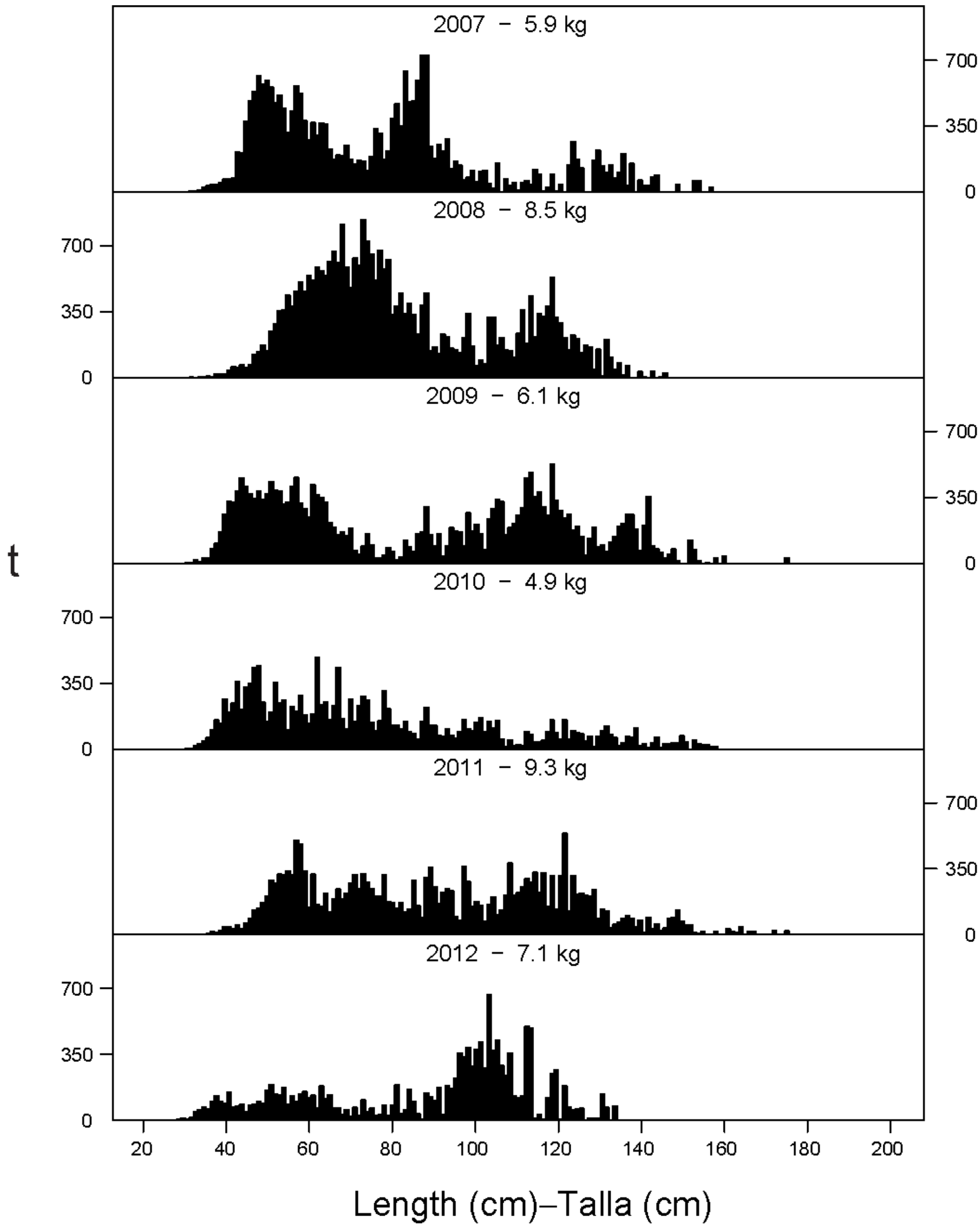

FIGURE 4b. Estimated size compositions of the bigeye caught in the EPO during the second quarter of 2007-2012. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 4b. Composición por tallas estimada para el patudo capturado en el OPO en el segundo trimestre de 2007-2012. En cada recuadro se detalla el peso promedio de los peces en las muestras; t = toneladas métricas.

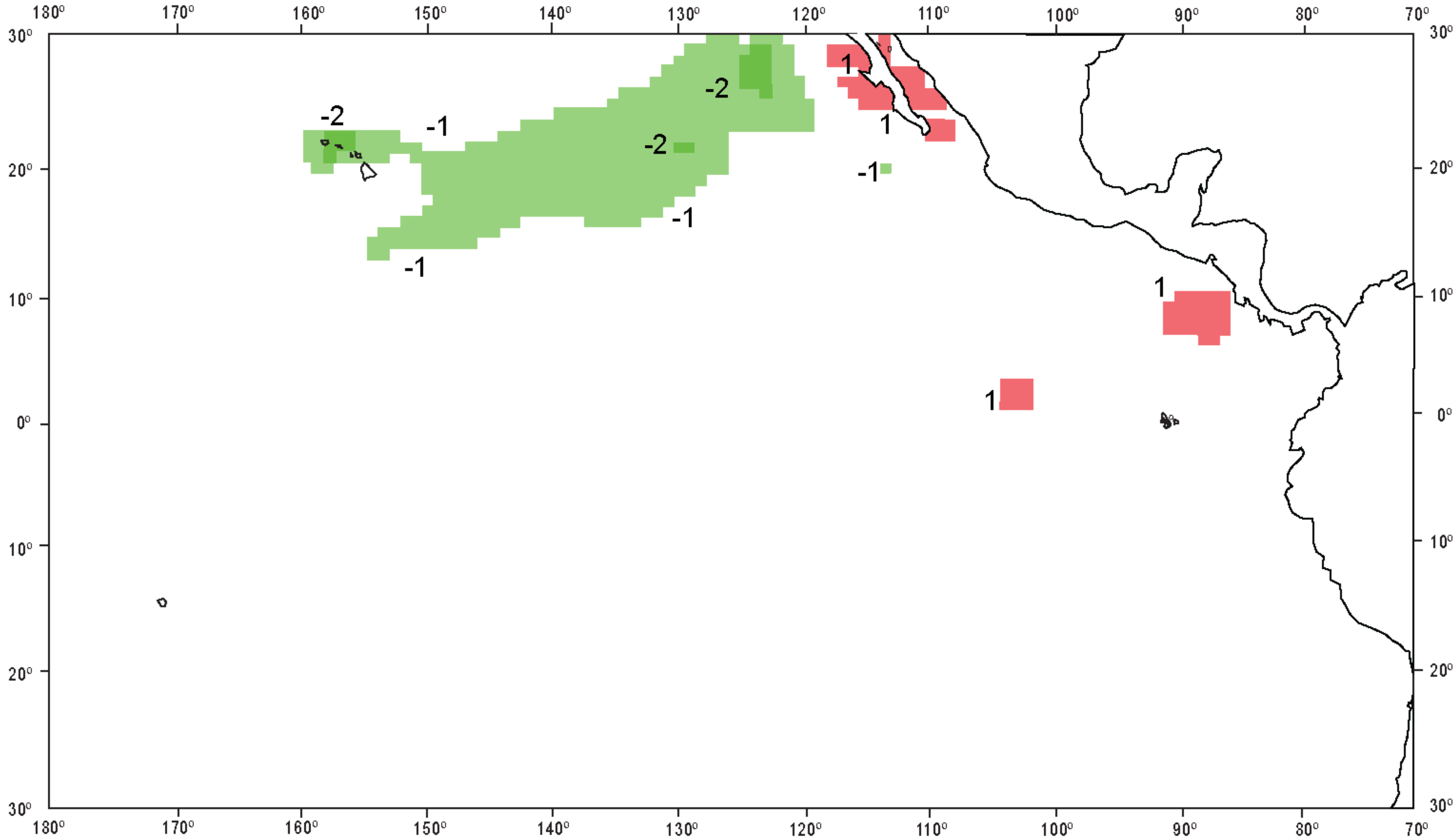

FIGURE 5. Sea-surface temperature (SST) anomalies (departures from long-term normals) for September 2012, based on data from fishing boats and other types of commercial vessels.
FIGURA 5. Anomalías (variaciones de los niveles normales a largo plazo) de la temperatura superficial del mar (TSM) en septiembre de 2012, basadas en datos tomados por barcos pesqueros y otros buques comerciales.

TABLE 1. Estimates of the numbers and capacities, in cubic meters, of purse seiners and pole-and-line vessels operating in the EPO in 2012 by flag, gear, and well volume. Each vessel is included in the totals for each flag under which it fished during the year, but is included only once in the fleet total. Therefore the totals for the fleet may not equal the sums of the individual flag entries. PS = purse seine; LP = pole-and-line.

TABLA 1. Estimaciones del número de buques cerqueros y cañeros que pescan en el OPO en 2012, y de la capacidad de acarreo de los mismos, en metros cúbicos, por bandera, arte de pesca, y volumen de bodega. Se incluye cada buque en los totales de cada bandera bajo la cual pescó durante el año, pero solamente una vez en el total de la flota; por consiguiente, los totales de las flotas no son siempre iguales a las sumas de las banderas individuales. PS = cerquero; LP = cañero.

Flag	Gear	Well volume–Volumen de bodega				Capacity
Bandera	**Arte**	**1-900**	**901-1700**	**>1700**	**Total**	**Capacidad**
			Number—Número			
Colombia	PS	4	10	-	14	14,860
Ecuador	PS	73	19	11	103	79,222
EU (España—Spain)	PS	-	-	4	4	10,116
Guatemala	PS	-	1	1	2	3,575
México	PS	10	31	1	42	48,054
	LP	2	-	-	2	143
Nicaragua	PS	-	6	1	7	9,966
Panamá	PS	2	9	3	14	19,251
Perú	PS	1	-	-	1	299
El Salvador	PS	-	1	3	4	7,892
USA—EE.UU.	PS	-	2	-	2	2,855
Venezuela	PS	-	17	-	17	22,862
Vanuatu	PS	-	1	-	1	1,360
All flags—	PS	90	97	23	210	
Todas banderas	LP	2	-	-	2	
	PS + LP	92	97	23	212	
			Capacity—Capacidad			
All flags—	PS	42,089	126,268	49,855	218,212	
Todas banderas	LP	143	-	-	143	
	PS + LP	42,232	126,268	49,855	218,355	

TABLE 2. Estimates of the retained catches of tunas in the EPO from 1 January through 30 September 2012, by species and vessel flag, in metric tons.

TABLA 2. Estimaciones de las capturas retenidas de atunes en el OPO del 1 de enero al 30 de septiembre de 2012, por especie y bandera del buque, en toneladas métricas**.**

Flag	**Yellowfin**	**Skipjack**	**Bigeye**	**Pacific bluefin**	**Bonitos (*Sarda* spp.)**	**Albacore**	**Black skipjack**	**Other[1]**	**Total**	**Percentage of total**
Bandera	**Aleta amarilla**	**Barrilete**	**Patudo**	**Aleta azul del Pacífico**	**Bonitos (*Sarda* spp.)**	**Albacora**	**Barrilete negro**	**Otras[1]**	**Total**	**Porcentaje del total**
Colombia	19,688	11,246	1,060	-	-	-	-	-	31,994	7.4
Ecuador	23,521	113,590	28,874	-	3,805	-	231	569	170,590	39.6
México	83,683	11,448	170	6,607	3,957	-	2,666	41	108,572	25.2
Nicaragua	6,826	2,765	580	-	-	-	-	-	10,171	2.4
Panamá	15,382	18,752	3,789	-	25	-	1	83	38,032	8.8
Venezuela	19,901	15,383	693	-	-	-	7	35	36,019	8.4
Other—Otros[2]	6,688	22,889	5,779	-	2	-	-	1	35,359	8.2
Total	175,689	196,073	40,945	6,607	7,789	-	2,905	729	430,737	

[1] Includes other tunas, sharks, and miscellaneous fishes

[1] Incluye otros túnidos, tiburones, y peces diversos

[2] Includes El Salvador, European Union (Spain), Guatemala, United States, and Vanuatu; this category is used to avoid revealing the operations of individual vessels or companies.

[2] Incluye El Salvador, Estados Unidos, Guatemala, Unión Europea (España), y Vanuatú; se usa esta categoría para no revelar información sobre faenas de buques o empresas individuales.

TABLE 3. Reported catches of bigeye tuna in the EPO during 2012 by longline vessels.
TABLA 3. Capturas reportadas de atún patudo en el OPO durante 2012 por buques palangreros.

Country	First quarter	Second quarter	Third quarter				Total to date
			July	August	September	Total	
Pais	**Primer trimestre**	**Segundo trimestre**	**Tercer trimestre**				**Total al fecha**
			Julio	**Agosto**	**Septiembre**	**Total**	
China	1,621	372	-	-	-	-	1,993
Japan—Japón	3,584	2,728	1,112	-	-	1,112	7,424
Republic of Korea—República de Corea	1,557	498	261	319	-	580	2,635
Chinese Taipei—Taipei Chino	862	820	470	-	-	470	2,152
USA—EE.UU	-	-	-	-	-	-	-
Vanuatu	195	29	-	-	-	-	224
Total	7,819	4,447	1,843	319	-	2,162	14,428

TABLE 4. Oceanographic and meteorological data for the Pacific Ocean, October 2011-September 2012. The values in parentheses are anomalies. SST = sea-surface temperature; SOI = Southern Oscillation Index; SOI* and NOI* are defined in the text.
TABLA 4. Datos oceanográficos y meteorológicos del Océano Pacífico, octubre 2011-septiembre 2012. Los valores en paréntesis son anomalías. TSM = temperatura superficie del mar; IOS = Índice de Oscilación del Sur; IOS* y ION* están definidas en el texto.

Month—Mes	**10**	**11**	**12**	**1**	**2**	**3**
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	20.2 (-0.6)	20.8 (-0.8)	21.8 (-1.1)	23.7 (-0.8)	26.3 (0.2)	26.9 (0.3)
Area 2 (5°N-5°S, 90°-150°W	24.0 (-1.0)	23.9 (-1.1)	24.2 (-1.0)	24.8 (-0.8)	26.2 (-0.2)	26.9 (-0,2)
Area 3 (5°N-5°S, 120°-170°W)	25.7 (-1.0)	25.6 (-1.1)	25.5 (-1.0)	25.5 (-1.1)	26.0 (-0.7)	26.6 (-0.6)
Area 4 (5°N-5°S, 150W°-160°E)	27.9 (-0.7)	27.9 (-0.8)	27.4 (-1.1)	27.1 (-1.2)	27.2 (-0.9)	27.5 (-0.7)
Thermocline depth—Profundidad de la termoclina, 0°, 80°W	35	30	30	15	15	10
Thermocline depth—Profundidad de la termoclina, 0°,	30	25	60	50	45	60
Thermocline depth—Profundidad de la termoclina, 0°,	110	140	145	150	120	110
Thermocline depth—Profundidad de la termoclina, 0°, 180°W (m)	180	180	180	180	190	180
SOI—IOS	0.8	1.1	2.5	-1.1	0.5	0.7
SOI*—IOS*	3.17	0.20	3.74	-0.28	-1.61	0.80
NOI*—ION*	1.41	1.72	7.89	4.86	3.72	0.16

Month—Mes	**4**	**5**	**6**	**7**	**8**	**9**
9SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	26.9 (1.3)	25.5 (1.2)	24.5 (1.6	22.8 (1.2)	21.0 (0.4)	20.8 (0.5)
Area 2 (5°N-5°S, 90°-150°W	27.6 (0.1)	27.2 (0.2)	27.1 (0.7)	26.6 (1.0)	25.7 (0.7)	25.3 (0.4)
Area 3 (5°N-5°S, 120°-170°W)	27.4 (-0.4)	27.8 (-0.1)	28.0 (0.3)	27.8 (0.6)	27.6 (0.7)	27.2 (0.5)
Area 4 (5°N-5°S, 150W°-160°E)	28.2 (-0.3)	28.5 (-0.3)	28.7 (-0.1)	28.8 (0.0)	29.1 (0.4)	29.1 (0.4)
Thermocline depth—Profundidad de la termoclina, 0°, 80°W	10	15	35	25	30	40
Thermocline depth—Profundidad de la termoclina, 0°,	40	90	80	80	45	65
Thermocline depth—Profundidad de la termoclina, 0°,	130	130	125	140	140	140
Thermocline depth—Profundidad de la termoclina, 0°,	195	180	190	175	175	170
SOI—IOS	-0.3	0.0	-0.4	0.0	-0.2	0.2
SOI*—IOS*	2.98	-3.19	-1.36	5.60	2.99	2.28
NOI*—ION*	-1.34	2.67	0.17	1.87	-1.32	2.83

TABLE 5. Preliminary data on the sampling coverage of trips by Class-6 vessels (vessels with fish-carrying capacities greater than 363 metric tons) fishing in the EPO by the observer programs of the IATTC, Colombia, Ecuador, the European Union, Mexico, Nicaragua, Panama, and Venezuela departing during the third quarter of 2012. The numbers in parentheses indicate cumulative totals for the year.

TABLA 5. Datos preliminares de la cobertura de muestreo de viajes de buque de Clase 6 (buques con capacidad de acarreo mayor a 363 toneladas métricas) que pescaron en el OPO) por los programas de observadores de la CIAT, Colombia, Ecuador, México, Nicaragua, Panamá, la Unión Europea, y Venezuela durante el tercer trimestre de 2011. Los números entre paréntesis indican los totales acumulados para el año.

Flag	**Trips**		**Observed by program**						**Percent observed**	
			IATTC		**National**		**Total**			
Bandera	**Viajes**		**Observado por programa**						**Porcentaje observado**	
			CIAT		**Nacional**		**Total**			
Colombia	9	(36)	4	(17)	5	(19)	9	(36)	100.0	(100)
Ecuador	58	(243)	40	(157)	18	(86)	58	(243)	100.0	(100)
El Salvador	6	(13)	6	(13)			6	(13)	100.0	(100)
España—Spain	8	(16)	7	(8)	1	(8)	8	(16)	100.0	(100)
Guatemala	1	(6)	1	(6)			1	(6)	100.0	(100)
México	64	(189)	33	(100)	31	(89)	64	(189)	100.0	(100)
Nicaragua	3	(17)	2	(9)	1	(8)	3	(17)	100.0	(100)
Panamá	16	(51)	8	(26)	8	(25)	16	(51)	100.0	(100)
United States—EE.UU.	0	(2)	0	(2)			0	(2)	100.0	(100)
Vanuatu	1	(2)	1	(2)			1	(2)	100.0	(100)
Venezuela	10	(53)	3	(26)	7	(27)	10	(53)	100.0	(100)
Total	176	(628)	105	(366)	71	(262)	176	(628)	100.0	(100)