INTER-AMERICAN TROPICAL TUNA COMMMISSION
COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL

QUARTERLY REPORT—INFORME TRIMESTRAL

October-December 2011—Octubre-Diciembre 2011

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.

DIRECTOR

Dr. Guillermo A. Compeán

HEADQUARTERS AND MAIN LABORATORY—OFICINA Y LABORATORIO PRINCIPAL
8604 La Jolla Shores Drive
La Jolla, California 92037-1508, USA
www.iattc.org

COMMISSIONERS—COMISIONADOS

BELIZE—BELICE
James Azueta
Abilio Dominguez
Valerie Lanza
Wilfredi Pott

CANADA
Sylvie Lapointe
Larry Teague

CHINA

CHINESE TAIPEI—TAIPEI CHINO
Hong-Yen Huang
Chung-Hai Kwoh
Chi-Chao Liu

COLOMBIA
Paula Caballero
Juan Carlos Cadena
Carlos Robles
Xiomara Sanclemente

COSTA RICA
Bernal Alberto Chavarría Valverde
Asdrubal Vásquez Nuñez
Carlos Villalobos Solé

ECUADOR
Leonardo Maridueña
Erika Pazmiño B.
Iván Prieto B.
Luis Torres Navarrete

EL SALVADOR
Alejandro Flores Bonilla Salaverría
Manuel Calvo Benivides
Hugo Alexander Flores
María Christina Herrera Gómez

EUROPEAN UNION—UNIÓN EUROPEA
Roberto Cesari
Marco D'Ambrisio

FRANCE—FRANCIA
Marie-Sophie Dufau-Richet
Christiane Laurent-Monpetit
Jonathan Lemeunier
Michel Sallenave

GUATEMALA
Hugo Andrés Alsina Lagos
Bryslie Siomara Cifuentes Velasco
Estrella Lourdes Marroquin Guerra
Alfredo de Jesús Orellano Mejía

JAPAN—JAPÓN
Yutaka Aoki
Masahiro Ishikawa
Shingo Ota

KIRIBATI

MÉXICO
Marío Aguilar Sanchez
Miguel Ángel Cisneros Mata
Ramón Corral Ávila
Michel Dreyfus León

NICARAGUA
Steadman Fagoth Müller
Julio César Guevara
Danilo Rosales Pichardo
Armando Segura Espinoza

PANAMÁ
Orlando Bernal
María Patricia Díaz
José Antonio Isaza
Maricel Morales

PERÚ
Rocio Barrios
Gladys Cárdenas Quintana
Juan Carlos Suerio
María Elvira Veláquez

REPUBLIC OF KOREA—REPÚBLICA DE COREA
Il Jeong Jeong
Hyun Wook Kwon
Jeongseok Park

USA—EE.UU.
William Fox
Don Hansen
Rodney McInnis
Ed Stockwell

VANUATU
Christophe Emelee
Roy Mickey Joy
Dimitri Malvirlani
Laurent Parenté

VENEZUELA
Alvin Delgado
Pedro Guerra
Nancy Tablante

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 fourth quarter of 2011.

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." The Convention 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 61st 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

IATTC meetings

A workshop, "Using Oceanography for Fisheries Stock Assessment and Management 2011," was held in La Jolla, California, USA, on 11-14 October 2011. Representatives of the California Department of Fish and Game, Los Alamitos, California, USA; the Centro Interdisciplinario de Ciencias Marinas, La Paz, Mexico, the Fundación Pesca Limpia, Bogotá, Colombia; the Institute de Recherche pour le Developpement, Sète, France; the Instituto Español de Oceanografía, Santa Cruz de Tenerife, Spain; the National Aeronautics and Space Administration, Pasadena, California, U.S.A.; the National Institute of Water and Atmospheric Research, Wellington, New Zealand; the National Research Institute of Far Seas Fisheries, Shizuoka, Japan; Scripps Institution of Oceanography, La Jolla, California, USA; the Secretariat of the Pacific Community, Noumea, New Caledonia; Shanghai Ocean University, Shanghai, China; Starkist-

Ecuador, Guayaquil, Ecuador; the U.S. National Marine Fisheries Service, Beaufort, Honolulu, La Jolla, and Seattle, U.S.A.; the University of Miami, Miami, Florida, U.S.A.; the University of Southern California, Los Angeles, California, U.S.A., plus Drs. Guillermo A. Compeán, Richard B. Deriso, Alexandre Aires-da-Silva, Michael G. Hinton, Cleridy E. Lennert-Cody, Mark N. Maunder, and Robert J. Olson of the IATTC staff, participated in the workshop. The subjects of discussion included Predicting abundance and distribution, Standardizing CPUE [catch per unit of effort], Improving surveys, Correlating population and fishing processes, Integrating oceanographic data into stock assessment models, Management, Data, Mechanistic models, Ecosystem models, Performance of GLMs [general linear models], GAMs [general additive models], and regression trees for bycatch species with different distributional characteristics, and Spatial management. Presentations were made by Drs. Compeán, Deriso, Aires-da-Silva, Hinton, Lennert-Cody, Maunder, and Olson.

The following IATTC meetings were held in Del Mar, California, USA, in October 2011:

Date	Number	Meeting
20 October	29	Permanent Working Group on Tuna Tracking
20 October	16	Working Group to Promote and Publicize the AIDCP Dolphin Safe Tuna Certification System
20 October	50	International Review Panel
20 October	8	Scientific Advisory Board
21 October	24	Parties to the Agreement on the International Dolphin Conservation Program

Other meetings

A symposium entitled "Comparative Studies of the Reproductive Biology and Early Life History of Two Tuna Species for the Sustainable Use of these Resources" held in Panama, R.P., on 17 November 2011 is described in the section of this report entitled ***Early life history studies***.

Dr. Guillermo A. Compeán participated in a symposium entitled "Foro Económico de Pesca y Acuacultura" in Mexico City, on 24-25 November 2011, at which he presented a talk entitled "Un Enfoque Ecosistémico para Asegurar un Futuro en el Manejo de Pesquerías."

Dr. Michael D. Scott participated in the 19th Biennial Conference on the Biology of Marine Mammals, which was held in Tampa, Florida, USA, on 27 November-2 December 2011. Dr. Scott was a member of the Scientific Program Committee that helped organize the conference.

The Third Technical Meeting on Sharks, Workshop on Stock Assessment of Silky Shark in the Eastern Pacific Ocean, was held in La Jolla California, USA, on 7-9 December 2011. Representatives of the Universidad Católica de Chile, the Instituto Costarricense de Pesca y Acuicultura, the Subsecretaría de Recursos Pesqueros of Ecuador, the National Research Institute of Far Seas Fisheries of Japan, the Centro Regional de Investigaciòn Pesquera de Ensenada (Mexico), the Centro de Investigación Científica y de Educación Superior de Ensenada, the Universidad Autónoma de Sinaloa (Mexico), the Organización del Sector Pesquero y Acuícola del Istmo Centroamericano, the Secretariat of the Pacific Community, the U.S. National Marine

Fisheries Service, and Vanuatu Monitoring and Management Services participated in the meeting, as did Drs. Guillermo A. Compeán, Alexandre Aires-da-Silva, Richard B. Deriso, Martín A. Hall, Michael G. Hinton, Cleridy E. Lennert-Cody, Mark N. Maunder, Robert J. Olson, Jean-Francois Pulvenis de Séligny and Messrs. Ricardo Belmontes and Marlon Román of the IATTC staff. Presentations were made by Drs. Aires-da-Silva, Lennert-Cody, and Maunder.

Dr. Robert J. Olson participated in a principal investigators meeting of the Pelagic Fisheries Research Program (PFRP), Joint Institute of Marine and Atmospheric Research, University of Hawaii, on 15-16 December 2011 at the University of Hawaii. Dr. Olson was invited by the PFRP to participate in a panel discussion entitled "Ecosystem Models—Application to Fisheries."

RESEARCH

DATA COLLECTION AND DATABASE PROGRAM

The IATTC had field offices at Las Playas and Manta, Ecuador; Manzanillo and Mazatlan, Mexico; Panama, Republic of Panama; and Cumaná, Venezuela, during the fourth quarter of 2011. Personnel at those offices collected 256 length-frequency samples from 185 wells and abstracted logbook information for 167 trips of commercial fishing vessels during the quarter.

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), 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 landing, fishing vessel logbooks, scientific observers, and governmental agencies.

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

The lists of vessels authorized to fish for tunas in the EPO are given in the IATTC Regional Vessel Register. 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 2011 is about 212,300 m^3 (Table 1). The average weekly at-sea capacity for the fleet, for the weeks ending 9 October through 31 December, was about 99,300 m^3 (range: 42,300 to 161,200 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 (t) of tropical tunas from the EPO during the period of January-December 2011, and comparative statistics for 2006-2010, were:

Species	2011	2006-2010			Weekly average, 2011
		Average	Minimum	Maximum	
Yellowfin	208,800	203,900	180,300	235,100	4,000
Skipjack	272,700	235,700	170,700	297,500	5,200
Bigeye	44,100	55,000	48,000	60,000	800

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

No adjustments in the catch-per-unit-of-effort data are included for factors, such as type of set or vessel operating costs and market prices, which might identify whether a vessel was directing its effort toward a specific species.

The measures of catch rate used in analyses are based on 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 about 425 m^3, and only data for these vessels are included in these measures of catch rate. There are now far fewer pole-and-line vessels than in previous years, so the data for these vessels are combined without regard to carrying capacity.

The estimated nominal catches per day of fishing for yellowfin, skipjack, and bigeye in the EPO during the third quarter of 2011 and comparative statistics for 2006-2010 were:

Region	Species	Gear	2011	2006-2010		
				Average	Minimum	Maximum
N of 5° N	Yellowfin	PS	13.0	10.5	8.4	13.5
S of 5° N	Yellowfin	PS	3.9	2.4	2.0	2.8
N of 5° N	Skipjack	PS	1.9	2.3	0.8	3.4
S of 5° N	Skipjack	PS	11.6	8.1	5.8	10.4
EPO	Bigeye	PS	1.7	2.2	1.8	2.8
EPO	Yellowfin	LP	2.8	2.2	1.7	2.8
EPO	Skipjack	LP	0.04	0.5	0.1	0.8

Catch statistics for the longline fishery

The catches of bigeye by longline gear in the EPO are reported by flag states whose annual catches have exceeded 500 t (C-09-01-Tuna-conservation-2009-2011.pdf). Preliminary estimates of the catches reported for January-December 2011, 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.

The methods for sampling and estimation of the catches of tunas are described in the IATTC Annual Report for 2000, IATTC Stock Assessment Reports 2, 4, 10, 11, 12, and 13 and the Appendix of IATTC Special Report 18. 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 during the same calendar month, in the same type of set (floating-object, unassociated school, or dolphin), and in the same sampling area. These data are then categorized by fishery (Figure 1).

Data for fish caught during the third quarter of 2006-2011 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 third quarter of 2011, and the second shows data for the combined strata for the third quarter of each year of the 2006-2011 period. Samples from 220 wells were taken during the third quarter of 2011.

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 220 wells sampled that contained fish caught during the third quarter of 2011, 152 contained yellowfin. The estimated size compositions of these fish are shown in Figure 2a. The majority of the yellowfin catch during the third quarter was taken by sets on dolphins in the Northern and Inshore areas, and in the Northern unassociated fishery. Smaller amounts of yellowfin were taken in the Southern dolphin fishing area, and in the floating object fishery.

The estimated size compositions of the yellowfin caught by all fisheries combined during the third quarters of 2006-2011 are shown in Figure 2b. The average weight of yellowfin caught during the third quarter of 2011 (10.1 kg) was slightly more than that of 2010 (10.0 kg), and considerably less than that of 2009 (13.4 kg).

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 220 wells sampled that contained fish caught during the third quarter of 2011,113 contained skipjack. The estimated size compositions of these fish are shown in Figure 3a. Large amounts of skipjack in the 30- to 50-cm range were caught in the Northern, Equatorial, and Southern floating-object fisheries during the third quarter. Larger skipjack in the 50- to 60-cm range were taken in the Southern unassociated fishery.

The estimated size compositions of the skipjack caught by all fisheries combined during the third quarter of 2006-2011 are shown in Figure 3b. The average weight of skipjack caught during the third quarter of 2011 (2,5 kg) was greater than those of 2009 (1.6 kg) and 2010 (2.3 kg).

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 220 wells sampled that contained fish caught during the third quarter of 2011, 36 contained bigeye. The estimated size compositions of these fish are shown in Figure 4a. The majority of the bigeye catches during the third quarter came from the Northern, Equatorial, and Southern floating-object fisheries.

The estimated size compositions of the bigeye caught by all fisheries combined during the third quarter of 2006-2011 are shown in Figure 4b. The average weight of bigeye caught during the third quarter of 2011 (5.5 kg) was greater than those of 2009 (4.6 kg) and 2010 (4.9 kg).

The estimated retained purse-seine catch of bigeye less than 60 cm in length during the third quarter of 2011 was 4,621 metric tons (t), or about 34 percent of the estimated total retained purse-seine catch of bigeye during that period. The corresponding amounts for 2006-2010 ranged from 2,617 to 10,221 t, or 16 to 47 percent. These values may differ slightly from those given in previous Quarterly Reports due to changes in the estimation procedure.

Pacific bluefin are caught by purse-seine and recreational gear off California and Baja California from about 23°N to 35°N, with most of the catch being taken during May through October. During 2011, bluefin were caught between 26°N and 32°N from June through September. In the past, commercial and recreational catches have been reported separately. The inability to collect sufficient numbers of samples during 2004 through 2011, however, has made it infeasible to estimate the catches and size compositions separately. Therefore, the commercial and recreational catches of bluefin have been combined for each year of that period. The estimated size compositions for 2006-2011 are shown in Figure 5.

BIOLOGY AND ECOSYSTEM PROGRAM

Tuna tagging

Two IATTC scientists spent the period of 1 November-16 December 2011, on the chartered Hawaii-based commercial fishing vessel, *Ao Shibi Go*, conducting tagging operations in the equatorial central Pacific Ocean. The total numbers of fish tagged and released during this cruise were as follows: 4,210 bigeye; 247 yellowfin; 53 skipjack. Archival tags, with light sensors for geolocation estimation, were implanted into the peritoneal cavities of 91 bigeye, 86 yellowfin, and 30 skipjack. This tagging cruise was a collaborative effort between the Oceanic Fisheries Programme of the Secretariat of the Pacific Community and the IATTC, within the framework of the Pacific Tuna Tagging Project.

Early life history studies

Yellowfin broodstock

The yellowfin broodstock in Tank 1 (1,362,000 L) at the Achotines Laboratory spawned daily during the quarter. Spawning occurred between 9:45 p.m. and 11:00 p.m. The numbers of eggs collected after each spawning event ranged from about 46,000 to 454,000. The water temperatures in the tank during the quarter ranged from 27.1° to 28.8°C.

At the end of the quarter there were two 59-kg yellowfin, seven 41- to 50-kg yellowfin, and three 23- to 24-kg yellowfin in Tank 1, and one 9-kg yellowfin in the 170,000-L reserve broodstock tank (Tank 2).

Rearing of yellowfin eggs, larvae, and juveniles

During the quarter, estimates of 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.

Effects of ocean acidification on yellowfin eggs and larvae

In mid-2010, the Early Life History Group and colleagues at the Secretariat of the Pacific Community (SPC), Noumea, New Caledonia, were awarded a grant through the Pelagic Fisheries Research Program (PFRP), Joint Institute for Marine and Atmospheric Research, University of Hawaii at Manoa, to conduct a study of the potential impacts of ocean acidification on the early life stages of tropical tunas.

During the quarter, two experiments designed to examine the effects of a range of pH levels on the survival, development, and growth of eggs and larvae of yellowfin tuna were conducted at the Achotines Laboratory. In October, IATTC scientists were joined by project collaborators Drs. Don Bromhead and Simon Nichol of the SPC, Dr. Jane Williamson and Mr. Peter Schlegel of Macquarie University, Sydney, Australia, and Dr. Jon Havenhand of the University of Gothenburg, Tjamo, Sweden, to conduct the first experiment. Yellowfin eggs and larvae during the first 6 days of feeding were reared in each of five pH levels within the range of 8.1 to 6.5. (The ambient pH at the time that the first experiments were conducted was about 8.1.) Each pH treatment was tested in triplicate tanks. The experiment was repeated in November by IATTC scientists and local Achotines Laboratory staff members. Preliminary results from these two experiments suggest that survival after the first week of feeding is a decreasing function of pH, with 100-percent mortality occurring somewhere between pH levels of 6.9 and 6.5. Analysis of the data is still in progress. The final results will be used by the SPC staff to model and evaluate the potential impact of ocean acidification on the distribution and abundance of yellowfin tuna in the Pacific Ocean.

Comparative studies of yellowfin and Pacific bluefin larvae

As reported in the IATTC Quarterly Report for January-March 2011, a joint 5-year Kinki University-IATTC-ARAP (Autoridad de los Recursos Acuáticos de Panamá) research project is being supported in Panama by the Japan International Cooperation Agency (JICA). 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, 12 Kinki University faculty members, graduate students, and post-doctoral fellows and 10 ARAP scientists and technicians joined members of the Early Life History Group at the Achotines Laboratory during November and December to conduct joint experimental studies on yellowfin tuna.

Two of these trials were growth trials in which yellowfin larvae were reared in replicate tanks at two different food levels: a low level of 170 rotifers/L and a moderately low level of 318 rotifers/L. These trials complete a series of experiments designed to examine the growth potential of yellowfin larvae under a range of food conditions (170 to 3750 rotifers/L) during the first 10 days of feeding (13 days after hatching). The trials will be repeated with Pacific bluefin larvae in Oshima, Japan, in 2012.

Additionally, a separate trial was conducted in which yellowfin larvae were reared in replicate tanks under two different restrictive feeding scenarios. The addition of food on the first day of feeding was restricted to100 rotifers/L for either one or two days before the amounts of rotifers were increased to 3,000/L. These experimental conditions, which can be considered delayed optimal feeding conditions, will also be repeated with Pacific bluefin larvae in the future.

SATREPS Symposium

A SATREPS symposium entitled “Comparative Studies of the Reproductive Biology and Early Life History of Two Tuna Species (Yellowfin Tuna and Pacific Bluefin Tuna) for the Sustainable Use of these Resources” was held on 17 November 2011 in Panama City, Republic of Panama. The Symposium was attended by the Minis. Emilio Kieswetter, Agricultural Development Minister of Panama; Amb. Ikou Mizuki, Japanese Ambassador to Panama; Prof. Shigeru Miyashita, Director of the Fisheries Laboratory of Kinki University; Ing. Giovanni Lauri, ARAP administrator; Dr. Guillermo Compeán, Dr. Daniel Margulies, Mr. Vernon P. Scholey, Ms. Jeanne B. Wexler, and Ms. Maria C. Santiago of the IATTC staff; SATREPS project scientists; and various national and international journalists. Dr. Compeán presented the opening remarks, Mr. Scholey gave an overview of the Achotines Laboratory and its staff, and Dr. Margulies presented a summary of the Achotines research program. Also, Minis. Kieswetter, Amb. Mizuki, Prof. Miyashita, Ing. Lauri, and several other members of the faculty of Kinki University spoke about various aspects of the project. On 18 November 2011 the symposium attendees visited the Achotines Laboratory and received a tour of the project facilities and research activities for SATREPS.

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. During the second and third quarters of 2009, the broodstock fish died due to low water temperatures and feeding problems. The mortality coincided with ARAP’s plans to commence spawning and rearing studies during 2010 with a different, more commercially-important, species of snapper. Yellow snapper (*Lutjanus argentiventris*) was chosen as the new species of snapper for study. In addition, ARAP decided to rebuild its broodstock of spotted rose snappers. The fish were acquired from local fishermen. During August 2010 there were 62 spotted rose snappers and 19 yellow snappers being held in the broodstock tanks. Heavy mortalities of the red snappers, which may have been caused by a biotoxin associated with a dense phytoplankton bloom that may have leached through the seawater system filters, occurred during mid- to late September, and by the end of September 2010, only nine spotted rose snappers remained alive. The collection of more spotted rose snappers began in February 2011 and continued through September. At the end of the quarter, there were 10 spotted rose snappers being held in a broodstock tank at the Laboratory.

Visitors at the Achotines Laboratory

On 14 and 15 October 2011, the Achotines Laboratory was visited by Dr. Daniel Benetti, Director of the Aquaculture Program of the Rosenstiel School of Marine and AtmospHeric Science (RSMAS), University of Miami, and several executives of the Peruvian aquaculture company MARINAZUL, S.A. This visit was a follow-up to a request by the Peruvian Commissioner, Vice-Minister of Fisheries, for an exchange of information with the IATTC early life history group on its experiences in working with yellowfin tuna broodstock and larvae. The MARINAZUL group is investigating the feasibility of creating a tuna culture facility on the northern coast of Peru.

Faculty members and students of Pennsylvania State University (PSU), State College, Pennsylvania, USA, and the Universidad de Panamá Instituto de Geociencias completed the installation of a continuously-operating Global Positioning System (cGPS) receiver at the Achotines Laboratory during the quarter. On 10 November 2011, PSU faculty members and technicians added a complete meteorological station to the cGPS receiver. The meteorological module will transmit real-time weather data to be archived at PSU for use in analysis of field and experimental results at the Achotines Laboratory.

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.

There was a sizeable area of cool water in the eastern and central Pacific Ocean during the fourth quarter of 2010, which reached a maximum in December of that year (IATTC Quarterly Report for October-December 2010: Figure 6). The size of that area decreased during the first quarter of 2011 (IATTC Quarterly Report for January-March 2011: Figure 8), and during the second quarter some small areas of warm water appeared off northern South America (IATTC Quarterly Report for April-June 2011: Figure 5). The SSTs were below average, with only one exception, from July 2010 through March 2011, but the SST anomalies in Area 1 were above average during April, May, and June of 2011 (Table 4). The thermoclines along the equator were somewhat deeper during January-June 2011 than they had been during July-December 2010, indicating the weakening and subsequent disappearance of the anti-El Niño conditions of late 2010 and early 2011. During the third quarter, however, the warming trend came to an end, as small areas of cool water appeared in July and August, and then more cool water appeared in September, especially off southern Peru and northern Chile (IATTC Quarterly Report for July-September 2011: Figure 5). The cooling trend continued during the fourth quarter of 2011 (Figure 6), and by December 2011 there was a band of cool water along the equator from the coast of South America to west of 180°. There were no positive temperature anomalies in Areas 1-4 after July 2011 (Table 4). The SOIs were all positive from January through December 2011, but a few of the SOI*s and NOI*s during that period were negative. The NOI* value for December, 7.89, is exceeded by only one positive anomaly, 8.01 for January 2010. (The series extends from January 1948 to the present. The greatest positive and negative anomalies of both the NOI*s and SOI*s tend to occur during the Northern Hemisphere winter.) According to the Climate Diagnostics Bulletin of the U.S. National Weather Service for December 2011, "The latest observations, combined with model forecasts, suggest that [anti-El Niño conditions] will be of weak-to-moderate strength [during the northern winter of 2011-2012], and will continue thereafter as a weak event until it likely dissipates sometime between March and May [of 2012]."

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 Cumaná, Venezuela, during the fourth quarter of 2011. Members of the field office staffs placed IATTC observers on 77 fishing trips by vessels that participate in the AIDCP On-Board Observer Program during the quarter. In addition, 102 IATTC observers completed trips during the quarter, and were debriefed by field office personnel.

Observer program

Coverage

The Agreement on the International Dolphin Conservation Program (AIDCP) requires 100-percent coverage by observers on trips by purse seiners with carrying capacities greater than 363 metric tons that fish for tunas in the eastern Pacific Ocean (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 biologists 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 effect 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 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 2011 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 the international observer program of the South Pacific Forum Fisheries Agency (FFA) 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.

Observers from the On-Board Observer Program departed on 123 fishing trips aboard purse seiners covered by that program during the fourth quarter of 2011. Preliminary coverage data for these vessels during the quarter are shown in Table 5.

Training

There were no IATTC observer training courses conducted during the quarter.

GEAR PROJECT

An IATTC staff member participated in one dolphin safety-gear inspection and safety-panel alignment procedure aboard a purse-seiner during the fourth quarter of 2011.

INTER-AGENCY COOPERATION

Dr. Takaya Namba, Senior Researcher/Chief, Fisheries & Aquaculture International Co., Ltd., Tokyo, Japan, began a visit at IATTC headquarters in La Jolla, on 8 November 2011. Drs. Namba, representing the Overseas Fisheries Cooperation Foundation (OFCF) of Japan and Martín A. Hall are working on a cooperative project to enhance the capacity of the Central American countries for the resource management, especially for sharks taken by the artisanal fisheries.

One of the prime requirements for fisheries management is information on where and when the fish are caught. Drs. Namba and Hall are now investigating the possibility of equipping each fishing vessel with a digital camera with a global positioning system (GPS), which would be far cheaper, of course, than placing an observer on each vessel. The digital cameras can record the positions of the vessel at 1-minute intervals. When the photographs and data are downloaded to a computer, the location and time that any photograph was taken can be easily determined. In addition, it is hoped that in the process of installation and maintenance of the cameras, the ability of the Central American scientists to perform stock assessments will be enhanced. The program began with a trip to Costa Rica from 8 to 22 November 2011.

Mr. Kurt M. Schaefer participated as one of 12 judges for the International Smart Gear Competition of the World Wildlife Foundation (WWF) at its offices in Washington D.C., USA, on 11-12 October 2011. The WWF's International Smart Gear Competition brings together the fishing industry, research institutes, universities, and governments to inspire and reward practical, innovative fishing gear designs that reduce bycatches of sea turtles, birds, marine mammals, and non-target fish species in fishing gear. The 46 entries were reviewed and given scores by the panel of judges. Mr. Schaefer's travel expenses were paid by the WWF.

Mr. Raúl Octavio Martínez Rincón, a Ph.D. candidate at the Centro Interdisciplinario de Ciencias Marinas-Instituto Politécnico Nacional of Mexico, who had been working with Drs. Mark N. Maunder, Alexandre Aires-da-Silva, and Cleridy E. Lennert-Cody since 1 September 2011, returned to Mexico on 30 November 2011. Mr. Martínez's research is focused on spatial modeling of bycatches, and the purpose of his visit was to improve his skills with statistical methodologies to predict the spatial distributions of bycatches.

ADMINISTRATION

Ms. Cynthia Sacco, bilingual secretary for the IATTC since March 2007, resigned effective 31 December 2011, to return to Paraguay. Ms. Sacco was a hard worker, and performed her duties efficiently and cheerfully. Everyone will miss her, but we all wish her the best in her new life.

Ms. Denisse Bonares, formerly bilingual secretary for the Bycatch Program and the International Dolphin Conservation Program, has taken Ms. Sacco's place.

Ms. Zahir Dinublia, a graduate of Quincy College, Boston, Massachusetts, USA, was hired on November 1, 2011, to take Ms. Bonares' place.

Mr. Juan Gracia retired on 31 December 2011. Mr. Gracia had been stationed at the IATTC field office in Mayaguez, Puerto Rico, since June 1975, where his principal duties were sampling fish and collecting unloading data at the canneries in Puerto Rico. Later, when the canneries were shut down, he made frequent trips to Central America to visit the offices of government officials and people involved in the fishing industry in Costa Rica, El Salvador, Guatemala, and Nicaragua to obtain information on unloading weights, transshipments, *etc.* Also he made a 90-day tagging trip on the baitboat *Her Grace* in March-May 2000. Mr. Gracia performed his duties efficiently and cheerfully throughout his long period of employment with the IATTC. Everyone wishes him a long and happy period of retirement with his family and his many friends.

Mr. Patrick K. Tomlinson, an IATTC staff member since November 1971, officially retired on 31 December 2011. "IATTC staff member" is an inadequate description of Mr. Tomlinson. He is among the most accomplished fisheries scientists in the world in sampling, age and growth of fishes, yield-per-recruit modeling, cohort analysis, and production modeling.

- One of his early papers on sampling was:

  Tomlinson, Patrick K. 1971. Some sampling problems in fishery work. Biometrics, 27 (3): 631-641.

Biometrics is a prestigious journal that publishes papers on theoretical statistics, agriculture, medicine, entomology, *etc*., all of which are applicable to many fields of statistical analysis. His more recent papers on sampling include:

Tomlinson, Patrick K., Sachiko Tsuji, and Thomas P. Calkins. 1992. Length-frequency estimation for yellowfin tuna (*Thunnus albacares*) caught by commercial fishing gear in the eastern Pacific Ocean. Inter-Amer. Trop. Tuna Comm. Bull., 20 (6): 357-398.

Tomlinson, Patrick K. 2002. Progress on sampling the eastern Pacific Ocean catch for species composition and length-frequency distributions. IATTC Stock Assess. Rep., 2: 339-365.

Tomlinson, Patrick K. 2004. Sampling the tuna catch of the eastern Pacific Ocean for species composition and length-frequency distributions. IATTC Stock Assess. Rep., 4: 311-333.

Lennert-Cody, Cleridy E., and Patrick K. Tomlinson. 2010. Evaluation of aspects of the current IATTC port-sampling design and estimation procedures for catches of tunas by purse seiners and pole-and-line vessels. IATTC Stock Assess. Rep., 10: 279-309.

Lennert-Cody, Cleridy E., Mihoko Minami, Patrick K. Tomlinson, and Mark N. Maunder. 2010. Exploratory analysis of spatial-temporal patterns in length-frequency data: an example of distributional regression trees. Fish. Res., 102 (3): 323-326.

Anonymous. 2011. The IATTC program for in-port sampling of tuna catches. IATTC Stock Assess. Rep., 11: 255-261.

In addition, he served as the principal mentor for Ms. Jenny M. Suter in the preparation of her M.S. thesis at San Diego State University, which was published as IATTC Special Report 18 in 2010.

- Among the papers that he has published on age and growth of fishes are:

  Tomlinson, Patrick K., and Norman J. Abramson. 1961. Fitting a von Bertalanffy growth curve by least squares including tables of polynomials. Calif. Dept. Fish Game, Fish Bull., 116: 69 pp.

  Josse, E., J.C. Le Guen, R. Kearney, A. Lewis, A. Smith, L. Marec, and P.K. Tomlinson. 1979. Growth of skipjack. South Pac. Comm., Occas. Pap., 11: 83 pp.

In addition, he has assisted all, or nearly all, of the IATTC staff members who have published papers on age and growth of various species of fishes since about 1971.

- The production modeling, yield-per-recruit modeling, and cohort analyses that he performed from about 1972 to 1998 were the basis for the IATTC staff's recommendations for management of yellowfin tuna during that period. Among the earlier papers that he has published on stock assessment are:

Tomlinson, Patrick K. 1968. Mortality, growth, and yield per recruit for Pismo clams. Calif. Fish Game, 54 (2): 100-107.

Tomlinson, Patrick K. 1970. A generalization of the Murphy catch equation. Jour. Fish. Res. Bd. Canada, 27 (4): 821-825.

Abramson, Norman J., and Patrick K. Tomlinson. 1972. An application of yield models to a California ocean shrimp population. Bull. U.S. Nat. Mar. Fish. Serv., 70 (3): 1021-1041.

The following paper is a refinement of Dr. Milner B. Schaefer's two famous papers, IATTC Bulletin, Vol. 1, No. 2, and Vol. 2, No. 6, on production modeling:

Pella, Jerome J., and Patrick K. Tomlinson. 1969. A generalized stock production model. Inter-Amer. Trop. Tuna Comm., Bull., 13 (3): 419-496.

That paper has been reprinted as a chapter in at least one book—an honor that is rarely accorded to any paper. Also, it has been cited more than 300 times by other authors.

Mr. Tomlinson has always been a modest person who never sought to direct attention toward himself or his work. He rarely participated in meetings, and the ones that he participated in were nearly always workshops with only a few participants. At those workshops, when it was appropriate, he calmly stated his opinions on the subject of discussion, and the other participants, some of whom had never heard of Mr. Tomlinson previous to the workshop, quickly recognized how astute Mr. Tomlinson was, and listened carefully to what he said.

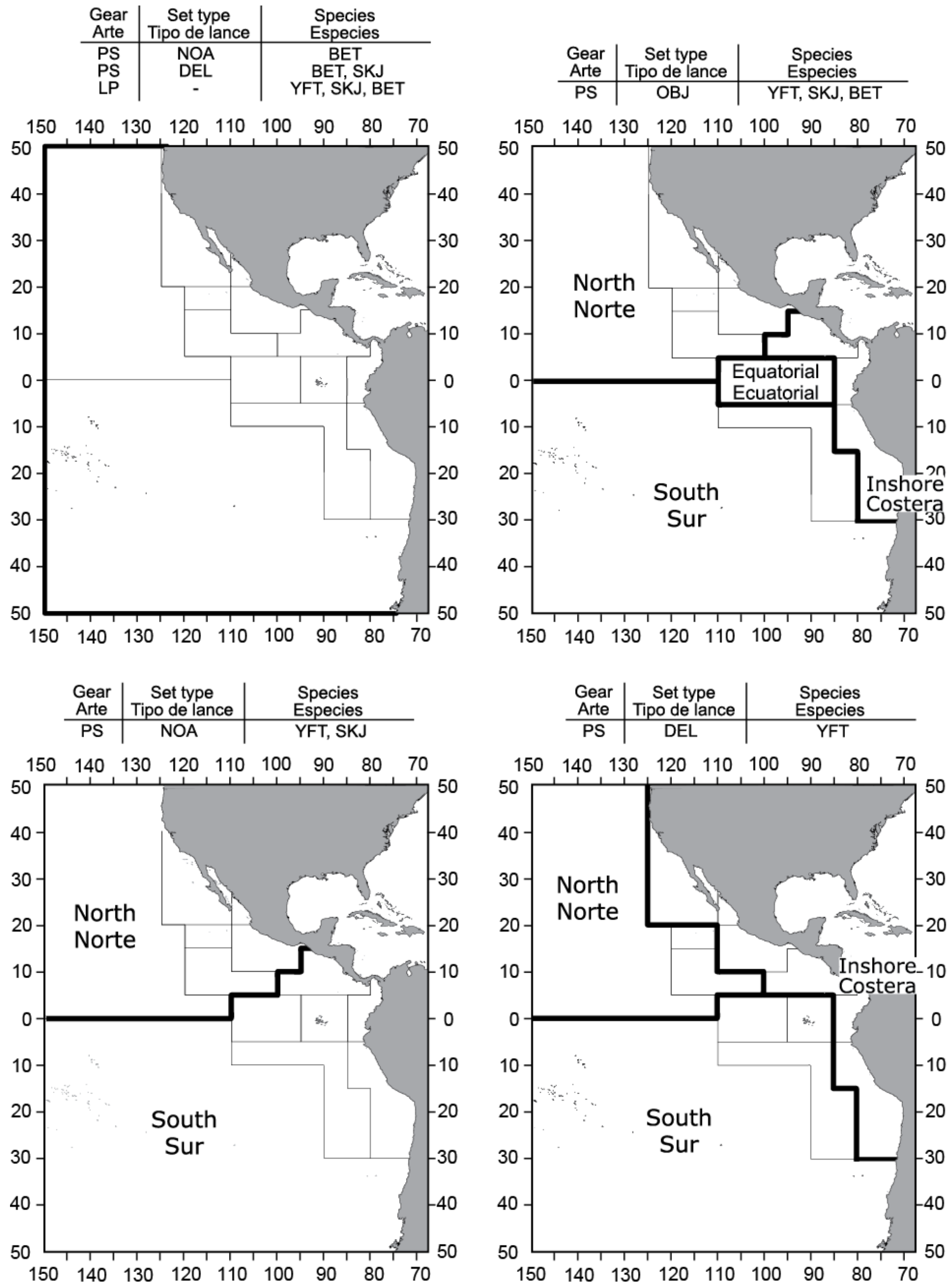

FIGURE 1. Spatial extents of the fisheries defined by the IATTC staff for stock assessment of yellowfin, skipjack, and bigeye in the EPO. The thin lines indicate the boundaries of the 13 length-frequency sampling areas, and the bold lines the boundaries of the fisheries. Gear: PS = purse seine, LP = 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.

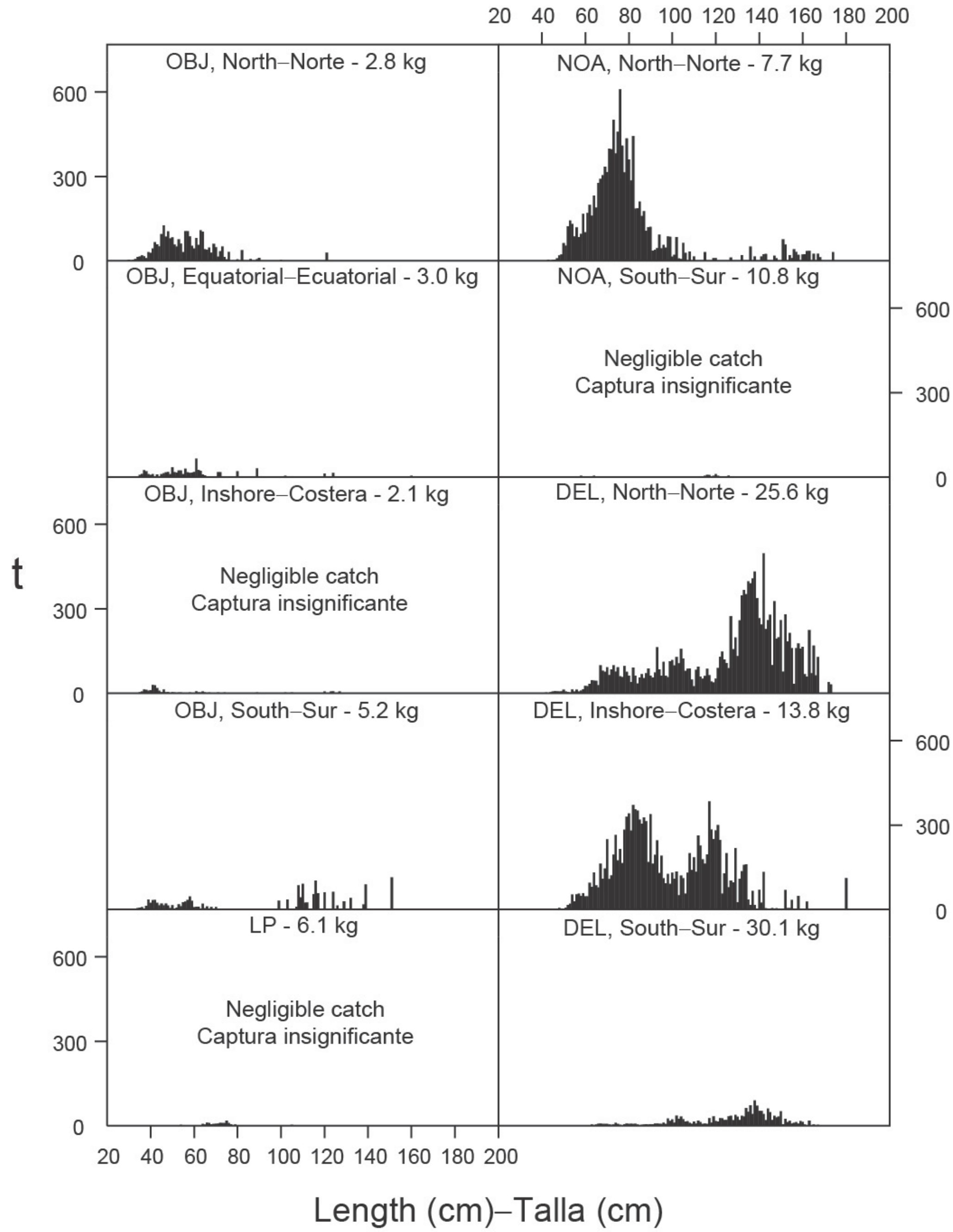

FIGURE 2a. Estimated size compositions of the yellowfin caught in each fishery of the EPO during the third quarter of 2011. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 2a. Composición por tallas estimada para el aleta amarilla capturado en cada pesquería del OPO durante el tercer trimestre de 2011. 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.

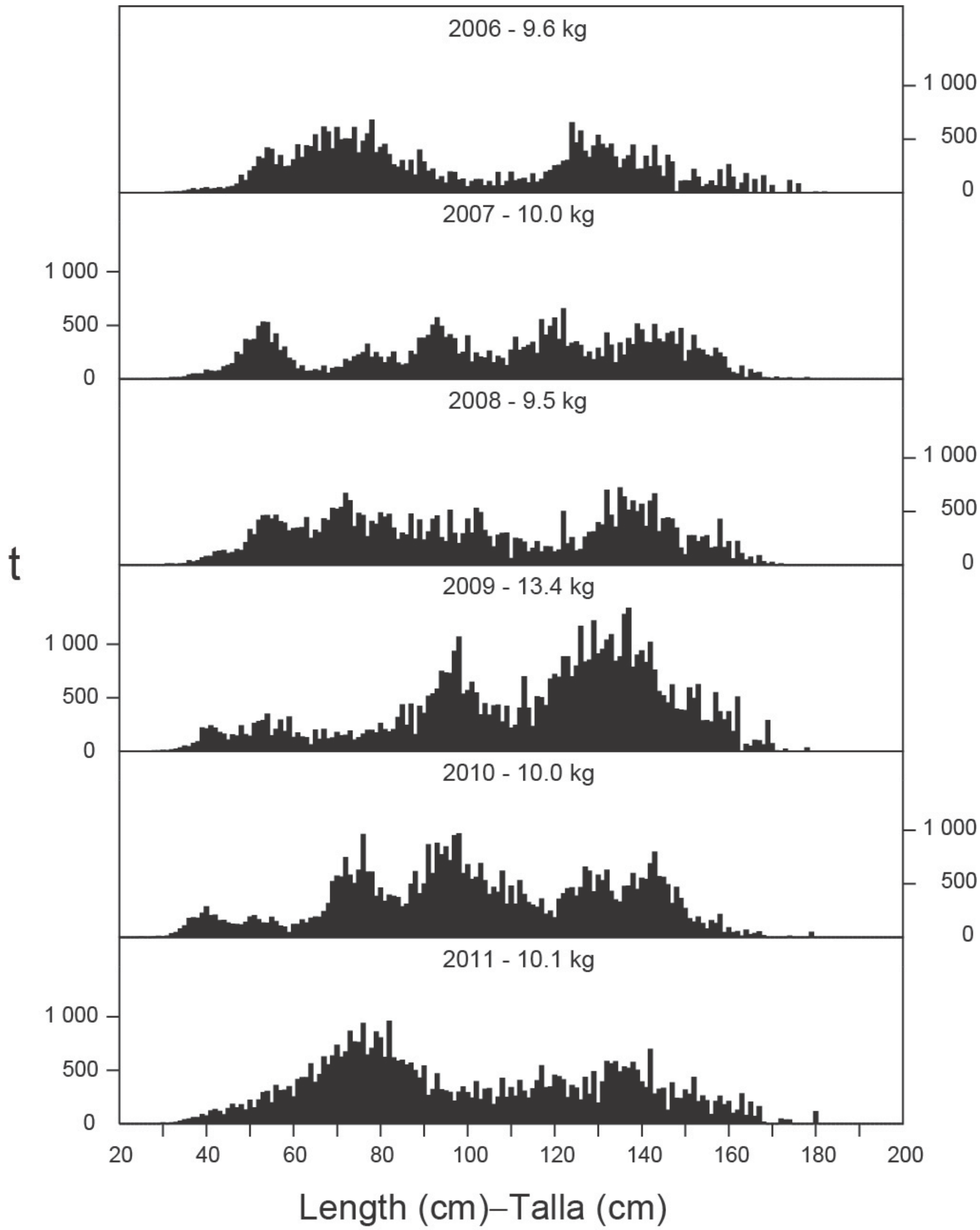

FIGURE 2b. Estimated size compositions of the yellowfin caught in the EPO during the third quarter of 2006-2011. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 2b. Composición por tallas estimada para el aleta amarilla capturado en el OPO en el tercer trimestre de 2006-2011. En cada recuadro se detalla el peso promedio de los peces en las muestras; t = toneladas métricas.

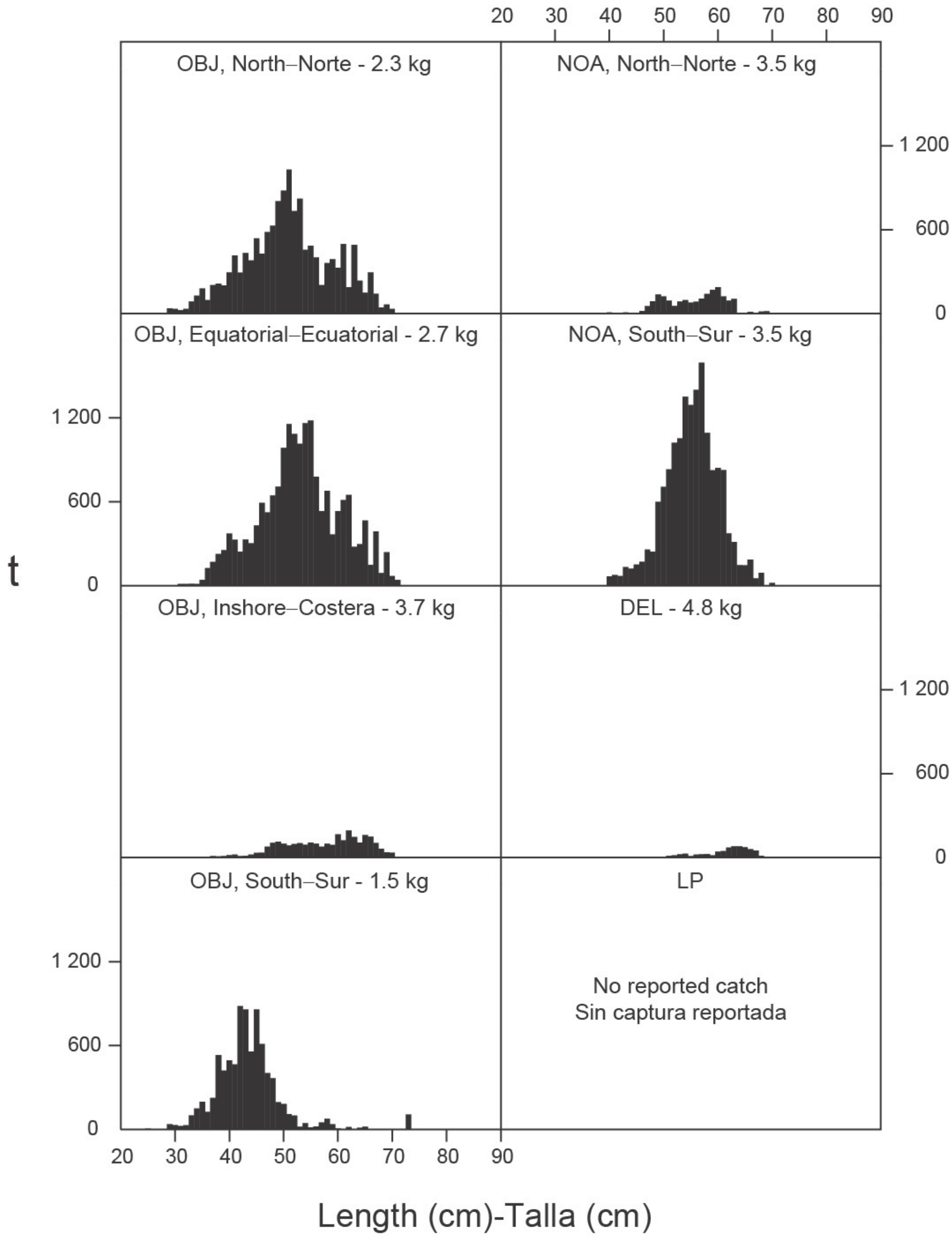

FIGURE 3a. Estimated size compositions of the skipjack caught in each fishery of the EPO during the third quarter of 2011. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 3a. Composición por tallas estimada para el barrilete capturado en cada pesquería del OPO durante el tercer trimestre de 2011. 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.

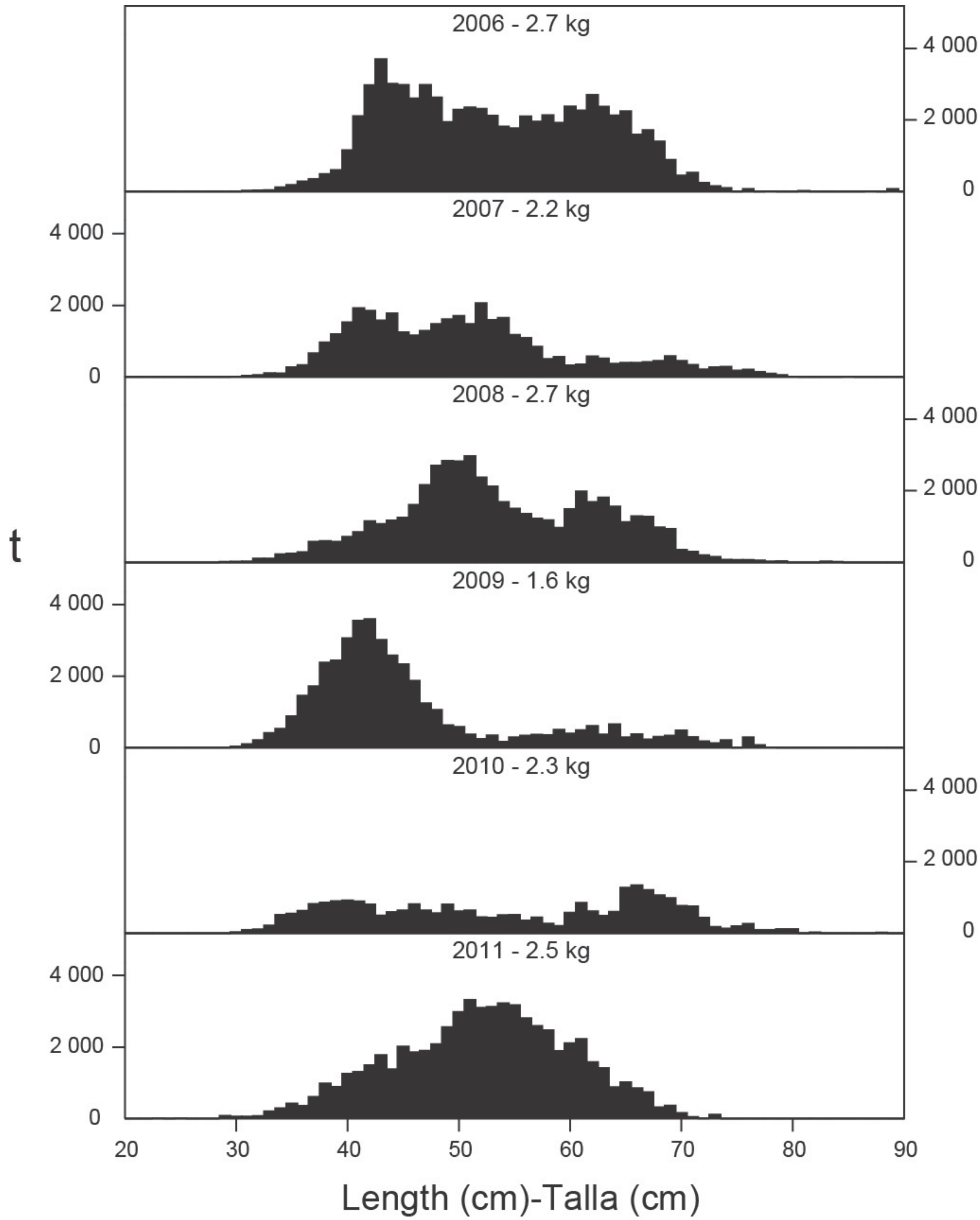

FIGURE 3b. Estimated size compositions of the skipjack caught in the EPO during the third quarter of 2006-2011. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.
FIGURA 3b. Composición por tallas estimada para el barrilete capturado en el OPO en el tercer trimestre de 2006-2011. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas.

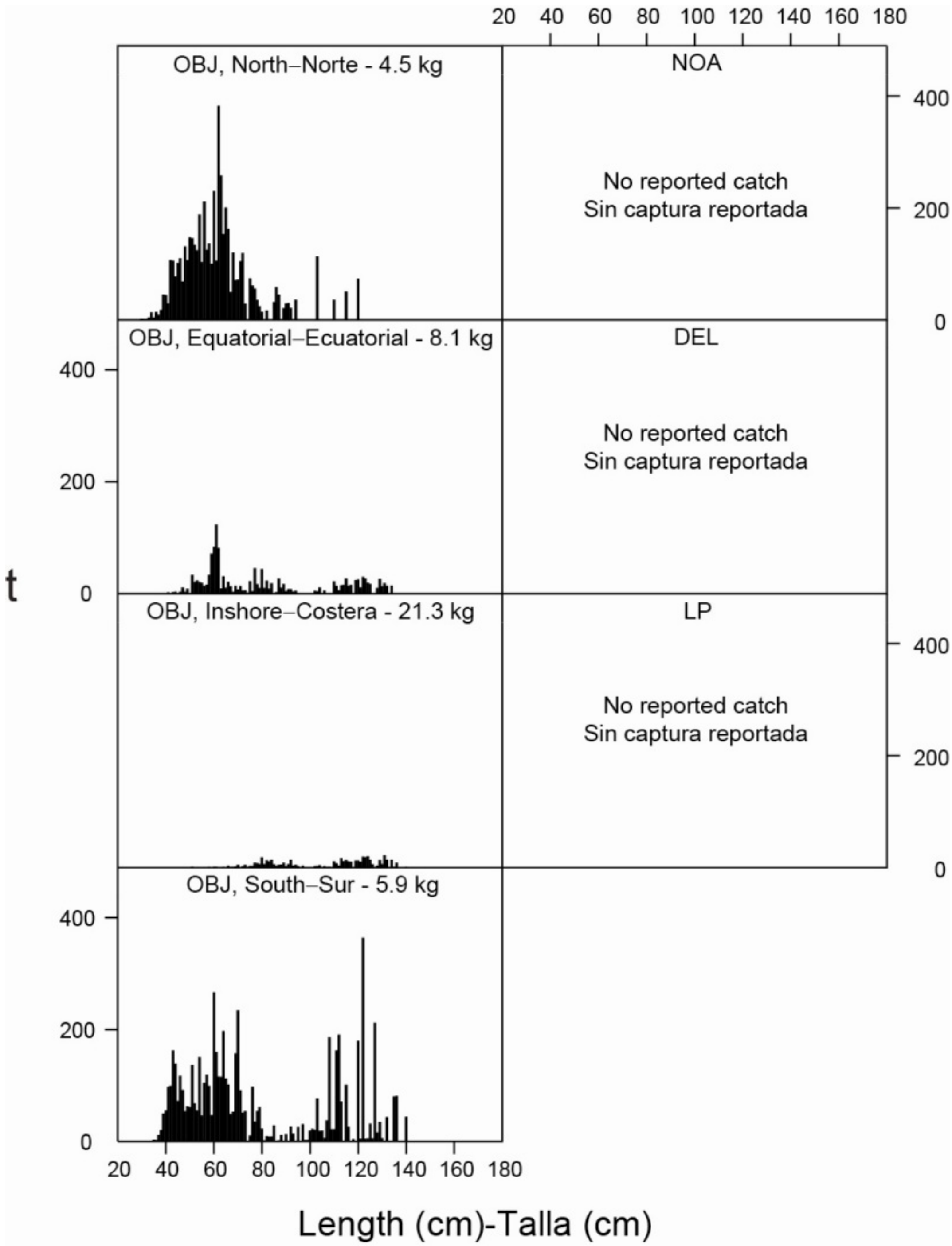

FIGURE 4a. Estimated size compositions of the bigeye caught in each fishery of the EPO during the third quarter of 2011. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 4a. Composición por tallas estimada para el patudo capturado en cada pesquería del OPO durante el tercer trimestre de 2011. 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.

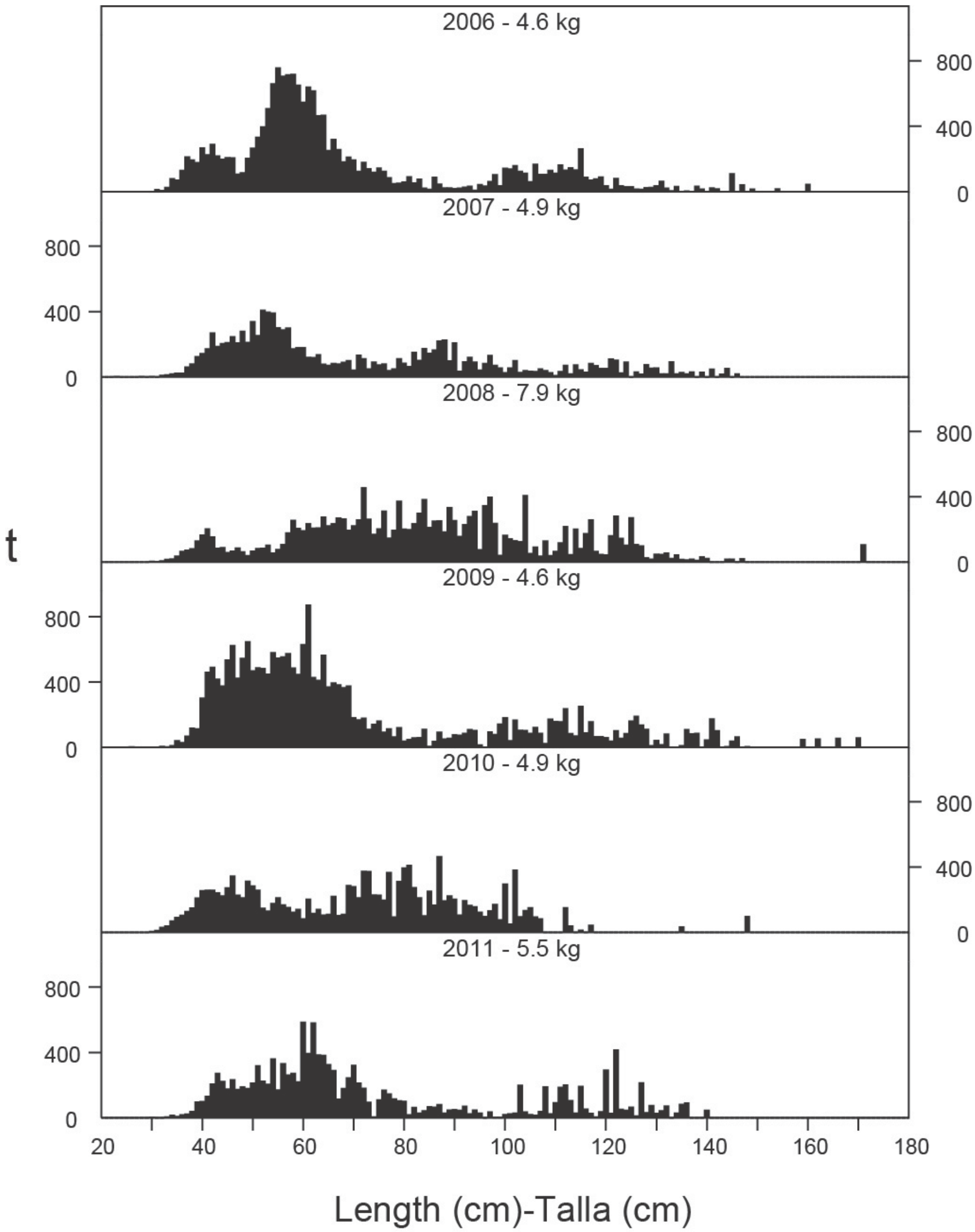

FIGURE 4b. Estimated size compositions of the bigeye caught in the EPO during the third quarter of 2006-2011. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 4b. Composición por tallas estimada para el patudo capturado en el OPO en el tercer trimestre de 2006-2011. En cada recuadro se detalla el peso promedio de los peces en las muestras; t = toneladas métricas.

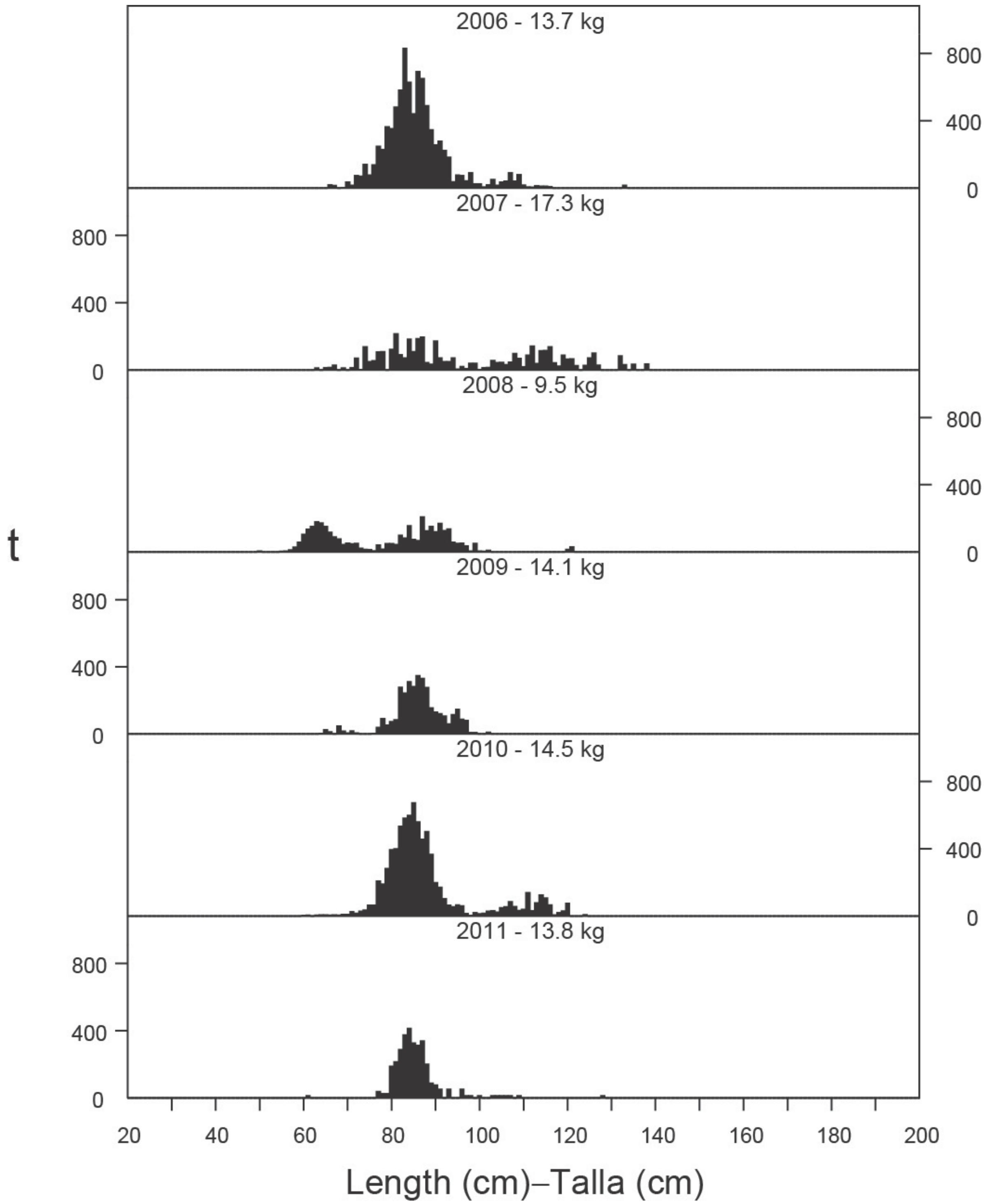

FIGURE 5. Estimated catches of Pacific bluefin by purse-seine and recreational gear in the EPO during 2006-2011. The values at the tops of the panels are the average weights. t = metric tons.

FIGURE 5. Captura estimada de aleta azul del Pacífico con arte de cerco y deportiva en el OPO durante 2006-2011. El valor en cada recuadro representa el peso promedio. t = toneladas métricas.

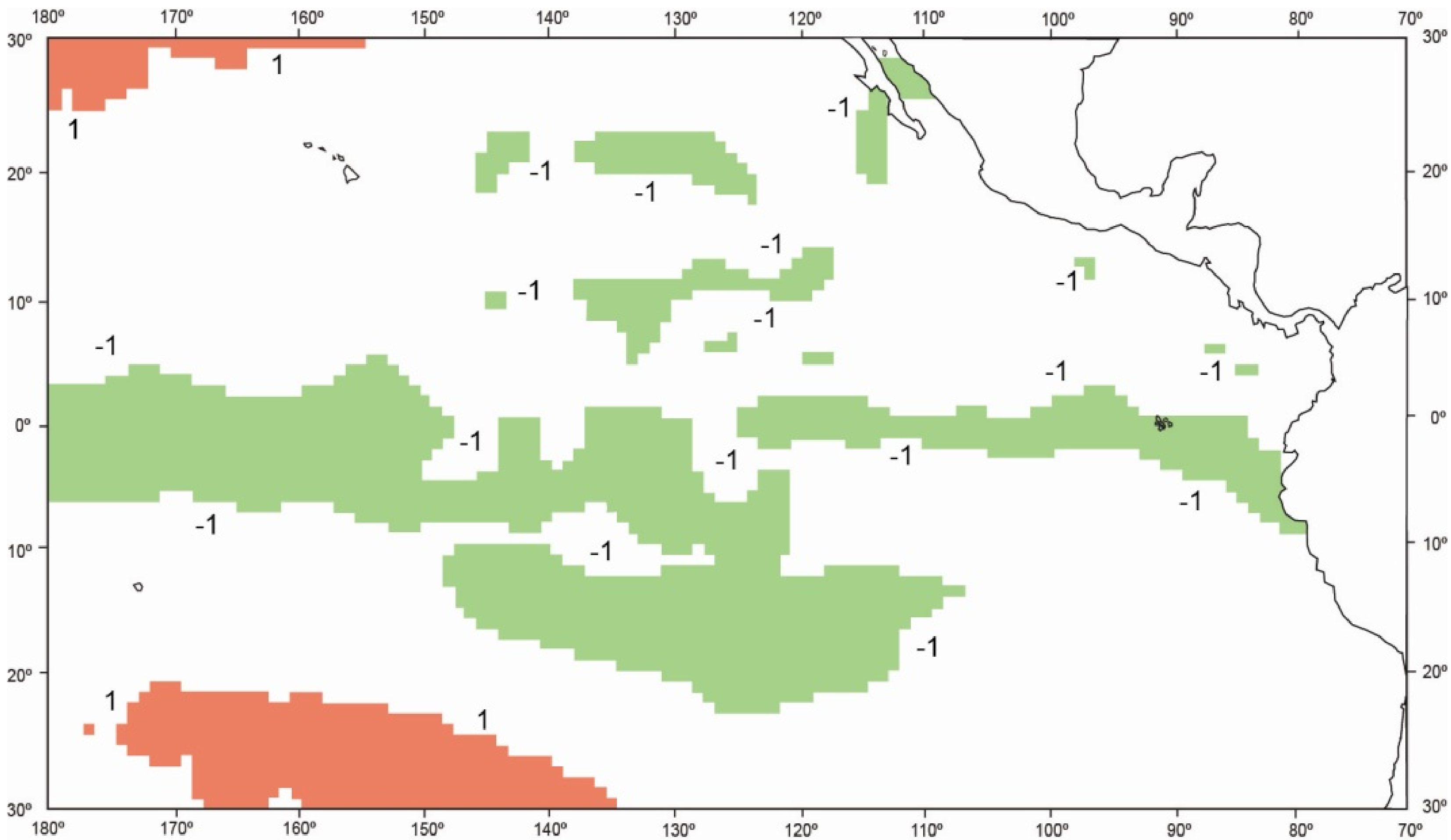

FIGURE 6. Sea-surface temperature (SST) anomalies (departures from long-term normals) for December 2011, based on data from fishing boats and other types of commercial vessels.
FIGURA 6. Anomalías (variaciones de los niveles normales a largo plazo) de la temperatura superficial del mar (TSM) en diciembre de 2011, 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 2011 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 2011, 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			
Bolivia	PS	1	-	-	1	222
Colombia	PS	4	10	-	14	14,860
Ecuador	PS	67	17	9	93	69,686
España—Spain	PS	-	-	4	4	10,116
Guatemala	PS	-	2	1	3	4,819
México	PS	9	31	1	41	47,274
	LP	2	-	-	2	143
Nicaragua	PS	-	6	1	7	9,685
Panamá	PS	2	12	4	18	24,953
El Salvador	PS	-	1	3	4	7,892
USA—EE.UU.	PS	-	3	-	3	4,046
Venezuela	PS	-	18	-	18	24,007
Vanuatu	PS	1	2	-	3	3,609
All flags—	PS	83	97	22	202	
Todas banderas	LP	2	-	-	2	
	PS + LP	85	97	22	204	
			Capacity—Capacidad			
All flags—	PS	39,195	126,298	46,697	212,190	
Todas banderas	LP	143	-	-	143	
	PS + LP	39,338	126,298	46,697	212,333	

TABLE 2. Estimates of the retained catches of tunas in the EPO from 1 January through 31 December 2011, 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 31 de diciembre de 2011, 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	18,744	22,848	2,207	-	-	10	-	-	43,809	8.1
Ecuador	30,065	145,217	25,097	2	3	-	88	377	200,849	37.2
México	100,554	11,233	347	2,820	8,214	-	2,075	76	125,319	23.2
Nicaragua	8,530	3,858	1,648	-	-	-	-	5	14,041	2.6
Panamá	20,149	30,842	5,919	-	-	-	-	256	57,166	10.6
Venezuela	19,628	26,168	240	-	-	-	40	153	46,229	8.6
Other—Otros[2]	11,112	32,547	8,632	-	-	-	69	124	52,484	9.7
Total	208,782	272,713	44,090	2,822	8,217	10	2,272	991	539,897	

1 Includes other tunas, sharks, and miscellaneous fishes

1 Incluye otros túnidos, tiburones, y peces diversos

2 Includes Bolivia, El Salvador, Guatemala, Honduras, Spain, United States, and Vanuatu; this category is used to avoid revealing the operations of individual vessels or companies.

2 Incluye Bolivia, El Salvador, España, Estados Unidos, Guatemala, Honduras, 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 2011 by longline vessels.
TABLA 3. Capturas reportadas de atún patudo en el OPO durante 2011 por buques palangreros.

Flag	Quarter				Month			Fourth quarter	Total
	1	2	3	1-3	10	11	12		
Bandera	**Trimestre**				**Mes**			**Cuarto trimestre**	**Total**
	1	**2**	**3**	**1-3**	**10**	**11**	**12**		
China	767	426		1,193					1,193
Japan—Japón	2,776	2,802	2,975	8,553	1,175	1,456	1,316	3,947	12,500
Republic of Korea—República de Corea	2,618	1,016	1,283	4,917	590	877	665	2,132	7,049
Chinese Taipei—Taipei Chino	723	395	1,089	2,207	569	587	701	1,857	4,064
United States—EE.UU.									
Vanuatu									
Total	6,884	4,639	5,347	16,870	2,334	2,920	2,682	7,936	24,806

TABLE 4. Oceanographic and meteorological data for the Pacific Ocean, January-December 2011. 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, enero-diciembre 2011. 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	**1**	**2**	**3**	**4**	**5**	**6**
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	23.9 (-0.7)	26.0 (0.1)	26.2 (-0.4)	25.8 (0.2)	25.0 (0.8)	23.8 (0.9)
Area 2 (5°N-5°S, 90°-150°W	24.2 (-1.4)	25.5 (-0.9)	26.4 (-0.8)	27.2 (-0.3)	27.0 (-0.1)	26.6 (0.1)
Area 3 (5°N-5°S, 120°-170°W)	24.9 (-1.7)	25.4 (-1.3)	26.2 (-1.0)	27.0 (-0.8)	27.4 (-0.5)	27.5 (-0.2)
Area 4 (5°N-5°S, 150W°-160°E)	26.7 (-1.6)	26.9 (-1.2)	27.4 (-0.8)	27.9 (-0.7)	28.3 (-0.5)	28.5 (-0.4)
Thermocline depth—Profundidad de la termoclina, 0°, 80°W (m)	30	20	10	15	25	25
Thermocline depth—Profundidad de la termoclina, 0°, 110°W (m)	25	50	75	40	55	40
Thermocline depth—Profundidad de la termoclina, 0°, 150°W (m)	120	160	140	140	125	115
Thermocline depth—Profundidad de la termoclina, 0°, 180°W (m)	190	200	200	180	185	180
SOI—IOS	2.3	2.7	2.5	1.9	0.4	0.2
SOI*—IOS*	3.85	2.00	3.50	4.09	1.27	3.29
NOI*—ION*	5.23	4.64	0.89	3.59	0.95	-0.36

Month—Mes	**7**	**8**	**9**	**10**	**11**	**12**
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	22.1 (0.5)	20.6 (0.0)	19.7 (-0.6)	20.2 (-0.6)	20.8 (-0.8)	21.8 (-1.1)
Area 2 (5°N-5°S, 90°-150°W	25.7 (0.1)	24.6 (-0.4)	24.2 (-0.6)	24.0 (-1.0)	23.9 (-1.1)	24.2 (-1.0)
Area 3 (5°N-5°S, 120°-170°W)	27.0 (-0.2)	26.2 (-0.6)	26.0 (-0.7)	25.7 (-1.0)	25.6 (-1.1)	25.5 (-1.0)
Area 4 (5°N-5°S, 150W°-160°E)	28.5 (-0.30)	28.3 (-0.4)	28.1 (-0.6)	27.9 (-0.7)	27.9 (-0.8)	27.4 (-1.1)
Thermocline depth—Profundidad de la termoclina, 0°, 80°W (m)	35	35	35	35	30	30
Thermocline depth—Profundidad de la termoclina, 0°, 110°W (m)	55	55	35	30	25	60
Thermocline depth—Profundidad de la termoclina, 0°, 150°W (m)	120	110	115	110	140	145
Thermocline depth—Profundidad de la termoclina, 0°, 180°W (m)	175	165	165	180	180	180
SOI—IOS	1.0	0.4	1.0	0.8	1.1	2.5
SOI*—IOS*	3.77	-0.11	0.14	3.17	0.20	3.74
NOI*—ION*	-0.39	0.47	0.29	1.41	1.72	7.89

TABLE 5. Preliminary data on the sampling coverage of trips by Class-6 vessels (vessels (vessels with fish-carrying capacities greater than 363 metric tons) by the observer programs of the IATTC, Colombia, Ecuador, the European Union, Mexico, Nicaragua, Panama, and Venezuela during the fourth quarter of 2011. The numbers in parentheses indicate cumulative totals for the year.
TABLA 5. Datos preliminares de la cobertura de muestreo de viajes de buques de clase 6 (buques con capacidad de acarea de peces mayor a 363 toneladas métricas) por los programas de observadores de la CIAT, Colombia, Ecuador, México, Nicaragua, Panamá, el Unión Europea, y Venezuela durante el cuarto trimestre de 2011. Los números en paréntesis indican 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	6	(47)	1	(22)	5	(25)	6	(47)	100.0	(100.0)
Ecuador	62	(290)	43	(193)	19	(97)	62	(290)	100.0	(100.0)
España—Spain	0	(14)	0	(6)	0	(8)	0	(14)	100.0	(100.0)
Guatemala	2	(14)	2	(14)	-	-	2	(14)	100.0	(100.0)
Honduras	0	(4)	0	(4)	-	-	0	(4)	100.0	(100.0)
México	17	(204)	7	(105)	10	(99)	17	(204)	100.0	(100.0)
Nicaragua	7	(23)	4	(12)	3	(11)	7	(23)	100.0	(100.0)
Panamá	15	(74)	8	(37)	7	(37)	15	(74)	100.0	(100.0)
Perú										
El Salvador	6	(25)	6	(25)			6	(25)	100.0	(100.0)
U.S.A.—EE.UU.	0	(6)		(5)	0 (1)		0	(6)		
Venezuela	8	(65)	6	(35)	2	(30)	8	(65)	100.0	(100.0)
Vanuatu	0	(11)	0	(11)			0	(11)	100.0	(100.0)
Total	123	(777)[1]	77	(469)	46	(308)	123	(777)[1]	100.0	(100.0)

[1] Includes 31 trips that began in 2010 and ended in 2011. In addition, there were three fishing trips of vessels less than 363 metric tons that were required to carry an observer during this quarter.
[1] Incluye 31 viajes iniciados en 2010 y terminados en 2011. Además, tres viajes de buques de capacidad menor a 363 toneladas métricas requirieron llevar observador durante este trimestre.