INTER-AMERICAN TROPICAL TUNA COMMMISSION
COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL

QUARTERLY REPORT—INFORME TRIMESTRAL

October-December 2015—Octubre-Diciembre 2015

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 fourth quarter of 2015.

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 65th 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.

HONOR

The American Institute of Fishery Research Biologists (AIFRB) has selected the Inter-American Tropical Tuna Commission for its prestigious Outstanding Group Achievement Award. Dr. Richard Beamish, Chair of the AIFRB's Outstanding Achievement Award Committee, stated that the IATTC was selected from a list of nominations with outstanding records of contribution to fishery science or fishery resource policy. The criteria used to judge candidates include sustained contribution of significant publications, exceptional service to the fishery profession, outstanding teaching or training programs, and important discoveries or inventions.

The award was presented to Dr. Guillermo A. Compeán by Mr. Thomas Keegan, President of the AIFRB, at the AIFRB Southern California District's annual barbeque at the Cabrillo Marine Aquarium in San Pedro, California, USA, on 14 November 2015. Drs. Richard B. Deriso and William H. Bayliff and Mr. Kurt M. Schaefer were also in attendance.

The IATTC has also received the Carl R. Sullivan Conservation Award of the American Fisheries Society (AFS). It was presented to Dr. James Joseph, Director of the IATTC at the time, at the 125th annual meeting of the AFS at Tampa, Florida, USA, on 24 August 1994.

MEETINGS

The following meetings were held during the fourth quarter of 2015:

International Dolphin Conservation Program meetings

Dates	Location	Meeting	Number
19 October	La Jolla, USA	Permanent Working Group on Tuna Tracking	36
19 October	La Jolla, USA	Working Group to Promote and Publicize the AIDCP Dolphin Safe Tuna Certification System	23
19 October	La Jolla, USA	International Review Panel	58
20 October	La Jolla, USA	Meetings of Parties to the AIDCP	32

IATTC meeting

The second Technical Meeting on Dorado was held in Lima, Perú, on 27-29 October 2015. The IATTC was represented at the meeting by Guillermo Compeán, Alexandre Aires-da-Silva (chairman of the meeting), Carolina Minte-Vera, Marlon Román-Verdesoto, Salvador Siu, and Juan Valero (CAPAM). Ing. Guillermo Morán, Commissioner from Ecuador, also participated in the meeting.

The following presentations were made at the meeting:

Session 1. Inauguration and opening

Revisión de los aspectos biológicos y definición de los supuestos sobre la estructura del stock para el modelado de poblaciones, by IATTC staff

Session 2. Update on knowledge about the fisheries

Panorama General de las Investigaciones del Perico (*Coryphaena hippurus*) en Perú con Enfasis en el Periodo 2014–2015, by Miguel Ñiquen Carranza

Alimentación de Perico *Coryphaena hippurus* en el Perú. Interacción con la Anchoveta, by Ana Alegre Norza Sior

Caracterización Genética del Perico (*Coryphaena hippurus*) del Océano Pacífico Oriental, by R. Gozzer, X. Vélez-Zuazo, F. Menéndez, S. Amorós, W. Goyert, N. Bayona, and P. Díaz-Jaimes

Edad y Crecimiento de *Coryphaena hippurus* (Linnaeus) en la Zona Norte del Mar Peruano, Febrero 2010, by Carlos Goicochea

Proyecto de Mejoramiento Pesquero (FIP) de Perico en el Perú, by S. Amorós, W. Goyert, and R. Gozzer

La pesquería del Dorado de Altura (*Coryphaena hippurus*) en Chile, by Patricio Barría and Francisco Contreras

Posible correlación entre la variabilidad interanual de la CPUE del dorado y la temperatura superficial del mar (TSM), by Jimmy Martínez-Ortiz

La Pesquería del Dorado (*C. hippurus)* en el Pacifico Colombiano 2009-2015, by Luis A. Zapata Padilla and Rodrigo Baos Estupiñan

Distribución de Tallas de Captura en la Pesca de Dorado en Guatemala Estimaciones en Base a Pesos de Captura, by Manuel de Jesús Ixquiac Cabrera and Eduardo Vinicio Juárez Donis

Análisis de la Captura Incidental de Dorado durante en el OPO 1997-2006, by Sofía Ortega García, Raúl O. Martínez Rincón, Juan Guillermo Vaca Rodríguez, and Rubén Rodríguez Sánchez

Análisis Morfométrico de los Otolitos Sagita como Herramienta para la Discriminación de Stocks de Dorado (*Coryphaena hippurus*) en el Pacífico Mexicano, by Sofía Ortega-García, Ulianov Jakes-Cota, Rubén Rodríguez-Sánchez, and M.S. Zuñiga-Flores

Movimientos migratorios, distribución en profundidad y preferencias térmicas del dorado (*Coryphaena hippurus*) en el noroeste de Pacífico Mexicano, by Sofía Ortega-García, Christopher Perle, John O´Sullivan, and Rubén Rodríguez-Sánchez

Session 3. Review of biological aspects and defining stock structure assumptions for population modeling

Revisión de los Aspectos Biológicos y Definición de los Supuestos sobre la Estructura del Stock para el Modelado de Poblaciones, by IATTC staff

Aporte para la Discusión sobre Estructura Poblacional. Trabajo en Progreso con Datos de Panamá, by Centro Desarrollo y Pesca Sustentable [de Panamá]

Session 4. Potential stock assessment methodologies for dorado

Repaso General de Metodologías de Evaluación de Stocks, by IATTC staff

Una Visión a la Evaluación de Stocks del Perico/Dorado *Coryphaena hippurus*) a Partir de la Información de la Pesquería en Perú, by Edgar Josymar Torrejón-Magallanes and Ricardo Oliveros-Ramos

Estimador de Reducción Mensual (Tutorial paso a paso en Excel), by IATTC staff

Modelo *Stock Synthesis* estructurado por edad basado en tallas, by IATTC staff

Session 5. Discussion of a Management Strategy Evaluation (MSE) for dorado

Modelo *Stock Synthesis* y Evaluación de Estrategias Alternativas de Explotación, by IATTC staff

Other meetings

Dr. Richard B. Deriso participated in a meeting of the Scientific and Statistical Committee of the Western Pacific Fishery Management Council of the United States in Honolulu, Hawaii, USA, on 13-14 October 2015. His travel expenses were paid by the Western Pacific Fishery Management Council.

A technical workshop, "Data Conflict and Weighting, Likelihood Functions, and Process Error," sponsored by the Center for the Advancement of Population Assessment Methodology (CAPAM), was conducted in La Jolla, California, USA, on 19-23 October 2015.

The data weighting workshop is the third in a series organized by CAPAM as part of its Good Practices in Stock Assessment Modeling Program for improving fishery stock assessments. CAPAM is a collaborative effort between the Southwest Fisheries Science Center (SWFSC), the Inter-American Tropical Tuna Commission (IATTC), and Scripps Institution of Oceanography (SIO) for purposes of conducting both research and education activities to address modern stock assessment modeling issues. The workshop is sponsored by the U.S. National Oceanic and Atmospheric Administration, (NOAA), CAPAM, and the International Seafood Sustainability Foundation (ISSF).

The primary goal of the workshop is to provide advice and guidance on practices for using data in fishery assessments. The 5-day meeting included an applied modeling session, keynote and research presentations, and focused discussions. The major topics (and invited speakers) included:

- Data conflict and weighting – Chris Francis;
- Likelihood functions – Jim Thorson;
- Temporal variation – Anders Nielsen;
- Model misspecification – Kevin Piner;
- Wildlife population assessment methods – Panagiotis (Takis) Besbeas;
- Data conflict and weighting in stock assessments using the Stock Synthesis modeling framework (Ian Taylor) and related simulation methods/software (Cole Monnahan).

Mr. Marlon Román Verdesoto spent the period of 13-22 December 2015 in Kaohsiung, Chinese Taipei, where he participated in the International Workshop on Application of Electronic Monitoring Systems in Tuna Longline Fisheries, at which he gave a presentation entitled "The Inter-American Tropical Tuna Commission (IATTC): Overview of the Observed and Unobserved Data, and Some Aspects on the Potential Use of the Electronic Monitoring Systems (EMS) in the Tuna Purse-Seine Fishery." His travel expenses were paid by the International Seafood Sustainability Foundation.

Dr. Michael D. Scott participated in the 21st Biennial Conferenced on Marine Mammalogy, sponsored by the International Society for Marine Mammalogy, in San Francisco, California, USA, on 13-18 December 2015. Videos of the talks are posted on the web site of the International Society for Marine Mammalogy, https://www.marinemammalscience.org/.

There were only a few talks that directly mentioned the tuna-dolphin issue. Interestingly, there was little awareness of the tuna-dolphin issue among the younger participants at the meeting.

The Society's first-ever Conservation Award was given to Mexico for its recent ban on gillnet fishing within the range of the endangered vaquita, *Phocoena sinus*.

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 catches of 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. 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 of 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.

IATTC personnel stationed at its field offices collected 441 length-frequency samples from 254 wells and abstracted logbook information for 308 trips of commercial fishing vessels during the fourth quarter of 2015.

Reported fisheries statistics

The information reported herein is 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 scientific observers, fishing vessel logbooks, reports of landing, and data compiled by 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 (http://www.iattc.org/VesselListsENG.htm). The estimated total fish-carrying capacity of the purse-seine and pole-and-line vessels that have or were expected to fish in the EPO during 2015 was about 251,800 m^3 (Table 1). The average weekly at-sea capacity for the fleet, for the weeks ending 4 October through 31 December, was about 126,900 m^3 (range: 52,400 to 198,900 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-December 2015, and comparative statistics for 2010-2014, were:

Species	2015	2010-2014			Weekly average, 2015
		Average	Minimum	Maximum	
Yellowfin	246,100	220,100	203,500	237,700	4,700
Skipjack	327,000	247,500	170,700	272,700	6,300
Bigeye	61,300	49,200	44,100	52,800	1,200

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 (CPUE) 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 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 Class-6 vessels (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 carrying capacity.

The estimated nominal catches per day of fishing for 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 third quarter of 2015 and comparative statistics for 2010-2014 were:

Region	Species	Gear	2015	2010-2014		
				Average	Minimum	Maximum
N of 5° N	Yellowfin	PS	13.4	13.7	12.5	15.3
S of 5° N	Yellowfin	PS	3.2	3.0	2.5	3.6
N of 5° N	Skipjack	PS	1.4	2.2	1.5	2.9
S of 5° N	Skipjack	PS	11.5	9.8	7.7	11.7
EPO	Bigeye	PS	2.9	2.4	2.2	2.6
EPO	Yellowfin	LP	0	6.0	0	9.6
EPO	Skipjack	LP	0	0.8	0	1.7

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 metric tons (C-13-01-Tuna-conservation-in-the-EPO-2014-2016.pdf). Preliminary estimates of the catches reported for January-December 2015 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 and pole-and-line vessels in the EPO are collected by IATTC personnel at ports of landing in Ecuador, Mexico, Panama, 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 third quarter of 2010-2015 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 2015, and the second shows data for the combined strata for the third quarter of each year of the 2010-2015 period. Samples from 219 wells were taken during the third quarter of 2015.

There are ten surface fisheries for yellowfin defined for stock assessments: four associated with floating objects, two with unassociated tuna schools, three associated with dolphins, and one pole-and-line (Figure 1). The last fishery includes all 13 sampling areas. Of the 219 wells sampled that contained fish caught during the third quarter of 2015, 173 contained yellowfin. The estimated size compositions of these fish are shown in Figure 2a. During the third quarter most of the larger sized (>100 cm) yellowfin was taken in sets on dolphins in the Northern and Inshore fisheries, with smaller amounts in the Southern unassociated and Southern dolphin fisheries. Smaller yellowfin <50 cm were taken in the Equatorial and Inshore floating-object fisheries.

The estimated size compositions of the yellowfin caught by all fisheries combined during the third quarters of 2010-2015 are shown in Figure 2b. The average weight of yellowfin caught during the third quarter of 2015 (7.1 kg) was less than that of any of the previous 5 years, which ranged from 7.3 to 10.3 kg.

There are eight fisheries for skipjack defined for stock assessments: four associated with floating objects, two with unassociated tuna schools, one associated with dolphins, and one pole-and-line (Figure 1). Each of the last two fisheries includes all 13 sampling areas. Of the 219 wells sampled that contained fish caught during the third quarter of 2015, 145 contained skipjack. The estimated size compositions of these fish are shown in Figure 3a. Most of the smaller skipjack in the 35- to 50- cm range was caught in the Northern, Equatorial, and Southern floating-object fisheries, with lesser amounts of smaller skipjack caught in the Inshore floating-object fishery and the Northern and Southern unassociated fisheries. The largest skipjack, averaging 4.5 kg, were found in the Southern unassociated fishery.

The estimated size compositions of the skipjack caught by all fisheries combined during the third quarters of 2010-2015 are shown in Figure 3b. The average weight of skipjack caught during the third quarter of 2015 (1.7 kg) was less than that of any of the previous 5 years, which ranged from 1.8 to 2.6 kg.

There are seven surface fisheries for bigeye defined for stock assessments: four associated with floating objects, one with unassociated tuna schools, one associated with dolphins, and one pole-and-line (Figure 1). Each of the last three fisheries includes all 13 sampling areas. Of the 219 wells sampled that contained fish caught during the third quarter of 2015, 59 contained bigeye. The estimated size compositions of these fish are shown in Figure 4a. Almost all of the third quarter bigeye were caught in the Northern, Equatorial, and Southern floating-object fisheries. The majority of bigeye in each of these areas was in the 40 to 70 cm range.

The estimated size compositions of the bigeye caught by all fisheries combined during the third quarter of 2010-2015 are shown in Figure 4b. The average weight of bigeye caught during the third quarter of 2015 (4.1 kg) was similar to those of the previous 2 years, and less than the 2010-2012 averages, which ranged from 5.0 to 5.6 kg. Most of the 2015 bigeye were in the 40 to 70 cm range.

The estimated retained purse-seine catch of bigeye less than 60 cm in length during the third quarter of 2015 was 7,600 metric tons (t), or about 55 percent of the estimated total retained purse-seine catch of bigeye during that period. The corresponding amounts for 2010-2014 ranged from 3,900 to 5,600 t, or 34 to 37 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 during the first month of the quarter except for 10-20 October and 30-31 October, and did not recommence spawning for the remainder of the quarter. Spawning occurred between 11:15 p.m. and 00:15 a.m. The number of eggs collected ranged from 10,000 to 297,000 per day. The water temperatures in the tank ranged from 28.2 to 29.5°C.

At the end of the quarter there were eight 47- to 52-kg, five 20- to 37-kg, and seven 11- to 14-kg yellowfin in Tank 1. There was one 7-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, and hatching rate. The lengths of hatched larvae, duration of yolk-sac stage, 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 Kindai (formerly Kinki) University (KU)-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 IATTC 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. The research on Pacific bluefin, which is conducted at the Fisheries Laboratories of KU in Wakayama Prefecture, Japan, is being supported by the Japan Science and Technology Agency (JST). The project will come to a close in March 2016. The final evaluation of the SATREPS project was carried out from 7 to 23 November 2015, by a team of internal and external evaluators. The project was given a "high" evaluation rating for meeting or exceeding all of its original research objectives.

The final SATREPS International Symposium was held in Panama City on 16 November 2015, at which the research results from the 5-year comparative study were presented and discussed. Presentations were given by Dr. Daniel Margulies, Mr. Vernon P. Scholey, Ms. Jeanne W. Wexler, and Ms. Maria S. Stein, and by Japanese and Panamanian scientists involved in the project.

The final SATREPS Joint Coordinating Committee (JCC) meeting was held in Panama City on 23 November 2015. Dr. Daniel Margulies represented the IATTC at the meeting, at which the results of the final project evaluation were presented and discussed. Recommendations were developed to support a few small-scale, continuity research experiments during 2016, and to develop a joint research proposal by August 2016 outlining a new SATREPS research project (funded by JICA) to begin in early 2017.

On 19-20 December 2015 the "International Symposium of SATREPS-Programs on Sustainable Aquatic Bioresources" was held at the Tokyo University of Marine Science and Technology in Tokyo, Japan. Dr. Daniel Margulies and Mr. Vernon P. Scholey were invited to make presentations at this symposium. Dr. Margulies's talk was entitled "Comparative Studies of the Reproductive Biology and Early Life History of Yellowfin Tuna (*Thunnus albacares*) and Pacific Bluefin Tuna (*Thunnus orientalis*): Applications to Tuna Resource Management and Aquaculture Development," with co-authors Vernon P. Scholey, Jeanne B. Wexler, Maria S. Stein, Susana Cusatti, Luis Tejada, Yang-Su Kim, Tomoki Honryo, Yasuo Agawa, Tsukasa Sasaki, Michio Kurata, Amal Biswas, and Yoshifumi Sawada. Mr. Scholey's talk was entitled "Spawning History and Improved Methodology for the Capture and Maintenance of Broodstock Yellowfin Tuna *Thunnus albacares* with a Summary of Improvements to the Research Capacity of the Achotines Laboratory from 2011 to Present," with co-authors Daniel Margulies, Jeanne B. Wexler, Maria S. Stein, Shukei Masuma, Yasuo Agawa, and Yoshifumi Sawada. He travel expenses of Dr. Margulies and Mr. Scholey were paid by SATREPS.

Other collaborative studies of yellowfin eggs and larvae

Cryoocyte, Inc., a research and technology company based in Boston, Massachusetts, USA, is collaborating with the Early Life History group on some pilot studies on the feasibility of cryopreservation techniques for yellowfin embryonic stages (see IATTC Quarterly Report for April-June 2014). The trials began in 2014 and have continued during 2015. Cryoocyte scientists returned to the Achotines Laboratoryand conducted experiments from 21 to 30 October, with plans to return in early 2016 for additional trials. Cryoocyte is providing the funding for the research trials.

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 had been unsuccessful in recent years. During the second quarter of 2013, a major fishing effort was undertaken, and more than 100 spotted rose snappers were collected in local waters. At the end of December 2015, a small group of fish continued to be held in the broodstock snapper tank. These fish began spawning during the third quarter of 2015 (see IATTC Quarterly Report for July-September 2015) and continued spawning during the quarter.

Tuna tagging

Messrs. Kurt M. Schaefer and Daniel W. Fuller spent the period of 6 October to 2 November 2015, aboard the commercial fishing vessel, *Gutsy Lady 4*, conducting tuna tagging operations in the equatorial central Pacific Ocean. The numbers of fish tagged and released during this cruise were as follows: bigeye, 366; yellowfin, 448; skipjack, 145. Archival tags, with light sensors for geolocation estimation, were implanted into the peritoneal cavities of 55 bigeye and 35 yellowfin. 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 of the Western and Central Pacific Fisheries Commission.

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). (The depth of the thermocline is a proxy for the depth of the upper edge of the oxygen-minimum zone, a thick layer of oxygen-poor water underlying the upper mixed layer. In locations where the thermocline is shallow, the habitat for tunas, especially yellowfin tuna, is vertically compressed near the surface of the ocean, where they are vulnerable to capture by surface gear.) 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 May and June 2014 there was a band of warm water along the equator that extended from the coast of South America to west of 180°, and the area of warm water off Mexico that had first made its appearance during the first quarter of 2014 (IATTC Quarterly Report for January-March 2014: Figure 8) was still in existence (IATTC Quarterly Report for April-June 2014, Figure 5). During May, June, and July of 2014 there was a band of cool water along 10°S that extended from the coast of South America to about 125°W. This band weakened during August and September (IATTC Quarterly Report for July-September 2014: Figure 5), but it persisted and strengthened during December (IATTC Quarterly Report for October-December 2014: Figure 5). Meanwhile, extensive areas of warm water were developing north of about 10°S (IATTC Quarterly Report for July-September 2014: Figure 5)—the early onset of the El Niño event that had been predicted by the U.S. National Weather Service (IATTC Quarterly Report for January-March 2014). During October, November, and December, however, the warm water was confined mostly to the area north of the equator and, in fact, a small area of cool water appeared well south of the equator and grew larger in November and December (IATTC Quarterly Report for October-December 2014: Figure 5). By January 2015 the area of warm water off Mexico had expanded to the southwest, combining with an area of warm water along the equator that persisted through June (IATTC Quarterly Report for April-June 2015: Figure 5). During the third quarter of 2015 the areas of warm water off Baja California and along the equator grew larger and warmer (IATTC Quarterly Report for July-September 2015: Figure 5). During the fourth quarter of 2015, the SSTs were above normal over much of the area north of 10°S, and off Peru, but nearly normal over most of the rest of the area south of the equator (Figure 5). The SSTs had been mostly below normal from October 2013 through March 2014, but during April 2014 through December 2015 they were virtually all above normal (Table 4).

According to the Climate Diagnostics Bulletin of the U.S. National Weather Service for December 2015, "Most models indicate that a strong El Niño will weaken with a transition to … neutral [conditions] during the late spring or early summer …. The forecasters are in agreement with the model consensus, though the exact timing of the transition is difficult to predict."

BYCATCH PROGRAM AND INTERNATIONAL DOLPHIN CONSERVATION PROGRAM

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 eastern Pacific Ocean (EPO). This mandate is carried out by the IDCP 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, Venezuela, and the Regional Observer Program (ROP) under the umbrella of the WCPFC, based on a Memorandum of Cooperation (MOC) signed by representatives of the IATTC and the WCPFC.

In addition, Resolution C-12-08 of the IATTC indicates that "Any vessel [regardless of size class] with one or more of its wells sealed to reduce its well volume recorded on the Regional Vessel Register shall be required to carry an observer from the International Dolphin Conservation Program (IDCP) on board." Furthermore, Resolution C-12-01 allows Class-4 purse-seine vessels (vessels with fish-carrying capacities of 182 to 272 metric tons) to make a single fishing trip of up to 30 days duration during the specified closure periods, provided that such vessel carries an observer of the IDCP On-Board Observer Program.

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 2015 the observer programs of Colombia, the European Union, Mexico, Nicaragua, Panama, and Venezuela were 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 IDCP 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 IDCP On-Board Observer Program is not practical. In 2011, the IATTC and the WCPFC agreed on the MOC described above. As part of the implementation of the MOC, representatives of the two organizations put together a series of procedures to follow for the observers of the ROP under the umbrella of the WCPFC for tuna purse seiners, while observing fishing activity in the IATTC convention area. Under that MOC, one Party to both regional fisheries management organizations, and to the AIDCP, requested that cross-endorsed observers be allowed to be deployed on four trips of vessels planning to operate in both areas during the fourth quarter of 2015. These requests were granted.

Observers from the IDCP On-Board Observer Program departed on 149 fishing trips aboard purse seiners covered by that program during the fourth quarter of 2015. Preliminary coverage data for these vessels during the quarter are shown in Table 5.

Training

During the fourth quarter of 2015, the IATTC staff conducted two observer training sessions. One was for 11 trainees, members of the ROPs of the WCPFC who were to participate in trips defined in the MOC as indicated above while observing fishing activity in the IATTC convention area. This session took place in Kiritimati (Christmas Island), Republic of Kiribati, during 20-25August 2015. The instructors were Mr. Ernesto Altamirano of the IATTC staff and Karl Staisch, the observer program coordinator for the WCPFC. All costs of this training, including travel and accommodations for Mr. Altamirano, were borne by the WCPFC.

A second tanning seminar for AIDCP-IATTC observers was held in Panama, Republic of Panama, for nine trainees, during 7-24 September 2015. The instructors were Messrs. Erick Largacha, the head of the IATTC office in Ecuador, and Ernesto Altamirano.

Gear project

The IATTC staff did not carry any dolphin safety-gear inspection and safety-panel alignment procedure during the fourth quarter of 2015.

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VISITING SCIENTIST

Dr. Jiang Feng Zhu of the College of Marine Sciences, Shanghai Ocean University, Shanghai, China, who had been working with Drs. Mark N. Maunder and Alexandre Aires-da-Silva on stock assessment methodology and applications at the IATTC headquarters in La Jolla since 5 January 2015 completed his work on 30 October 2015 and returned to China.

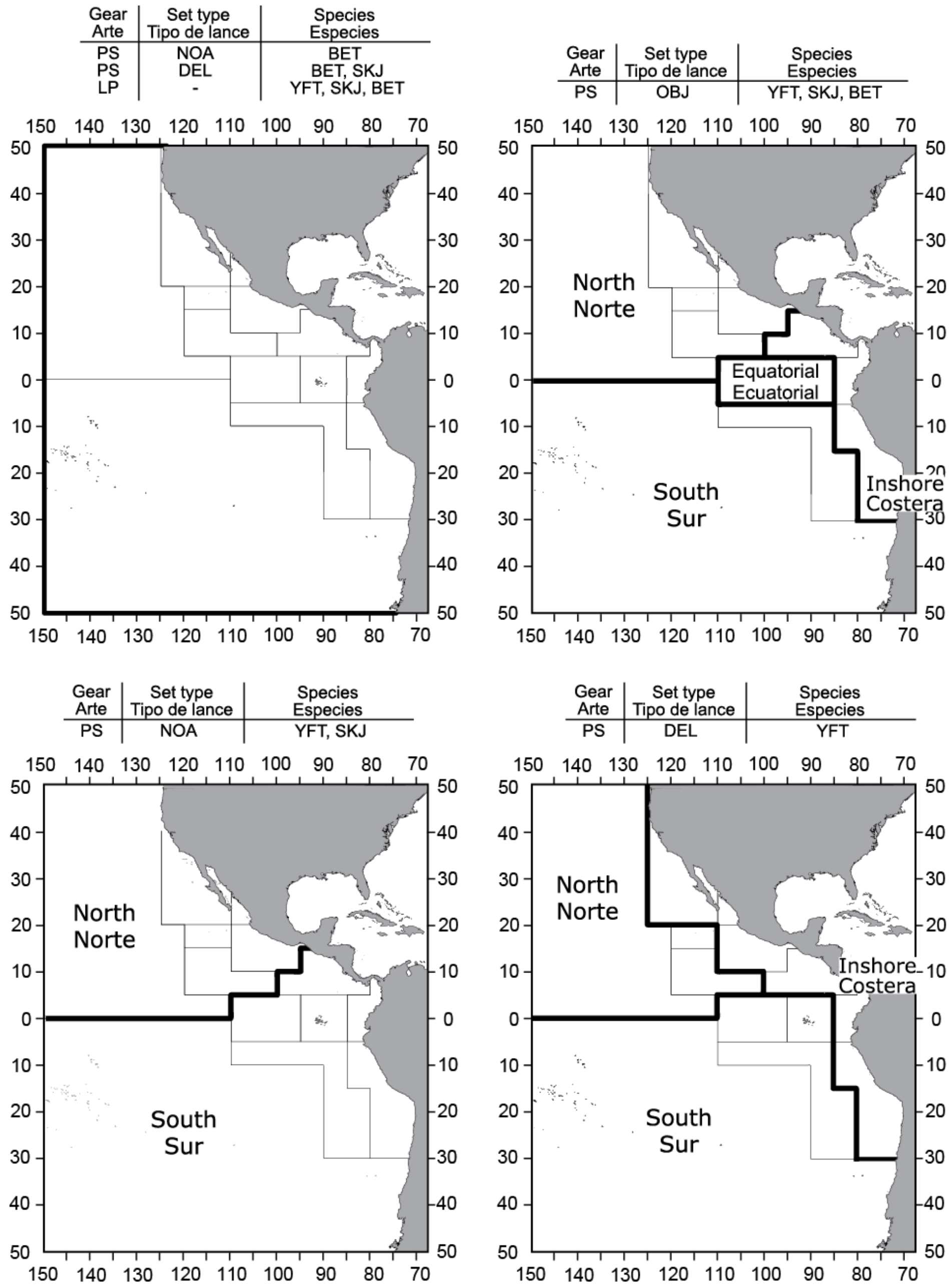

FIGURE 1. Spatial extents of the fisheries defined by the IATTC staff for stock assessment of yellowfin, skipjack, and bigeye in the EPO. The thin lines indicate the boundaries of the 13 length-frequency sampling areas, and the bold lines the boundaries of the fisheries. Gear: PS = purse seine, LP =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

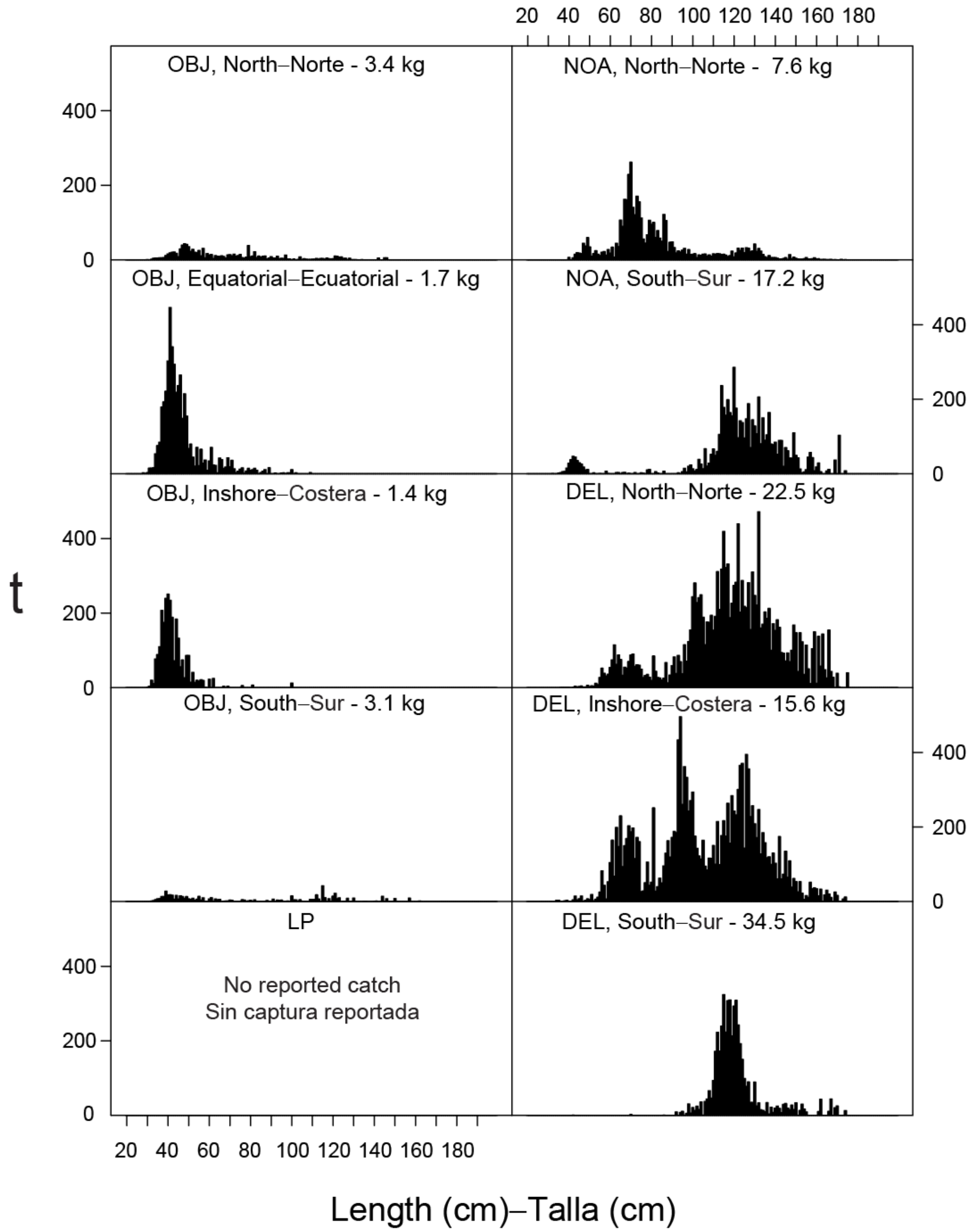

FIGURE 2a. Estimated size compositions of the yellowfin caught in each fishery of the EPO during the third quarter of 2015. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 2a. Composición por tallas estimada para el aleta amarilla capturado en cada pesquería del OPO durante el tercer trimestre de 2015. 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.

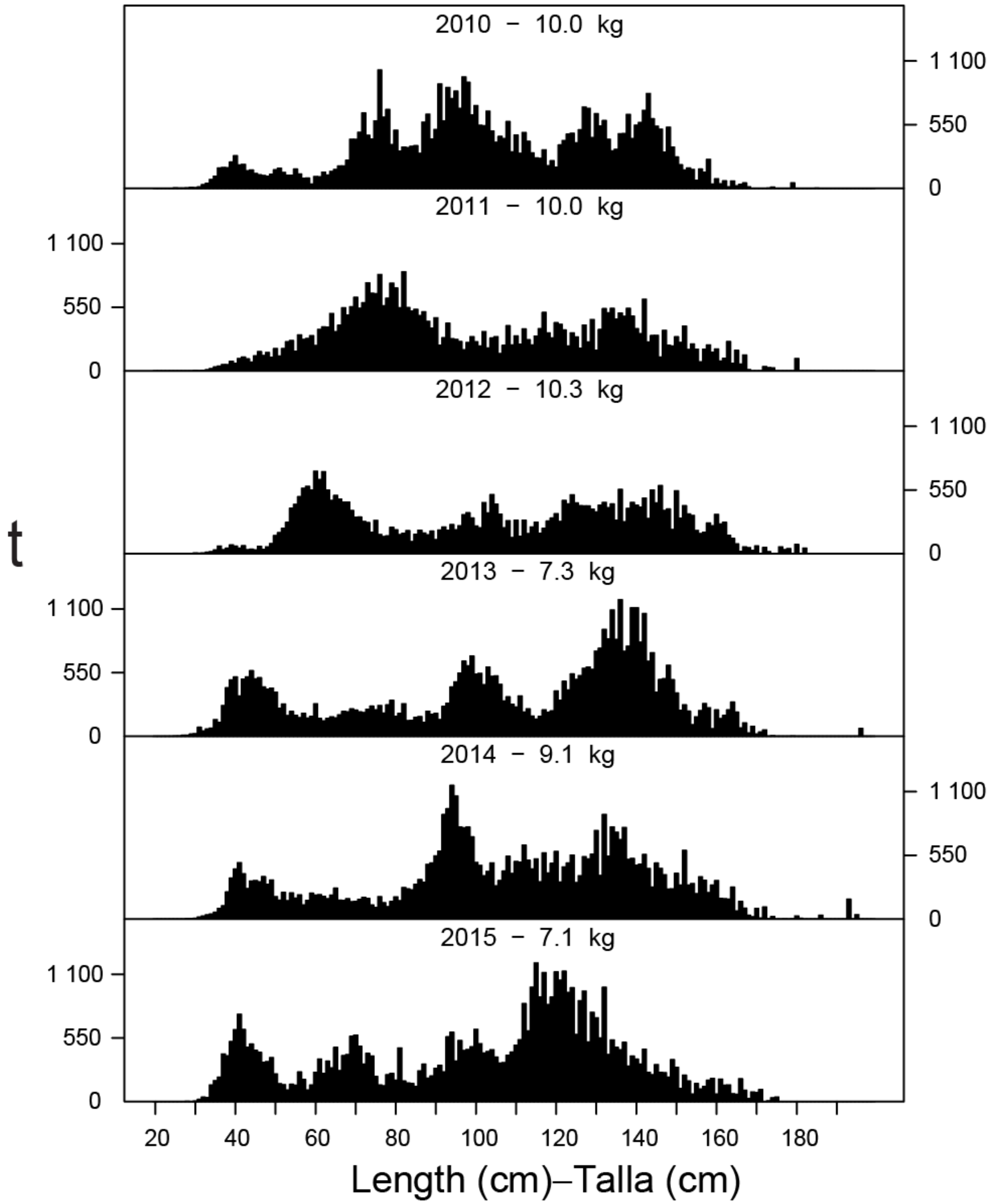

FIGURE 2b. Estimated size compositions of the yellowfin caught in the EPO during the third quarter of 2010-2015. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 2b. Composición por tallas estimada para el aleta amarilla capturado en el OPO en el tercer trimestre de 2010-2015. En cada recuadro se detalla el peso promedio de los peces en las muestras; t = toneladas métricas.

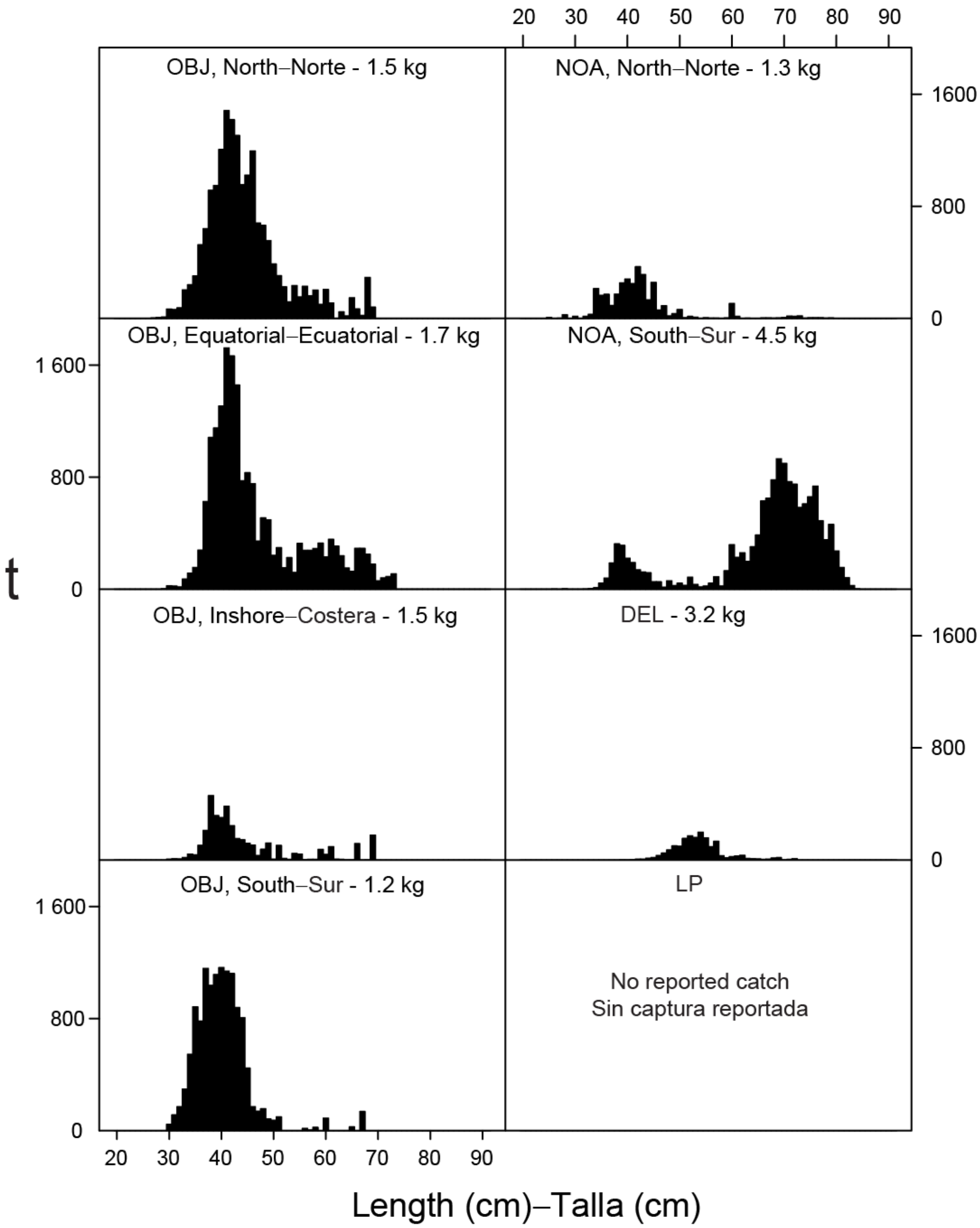

FIGURE 3a. Estimated size compositions of the skipjack caught in each fishery of the EPO during the third quarter of 2015. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 3a. Composición por tallas estimada para el barrilete capturado en cada pesquería del OPO durante el tercer trimestre de 2015. 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.

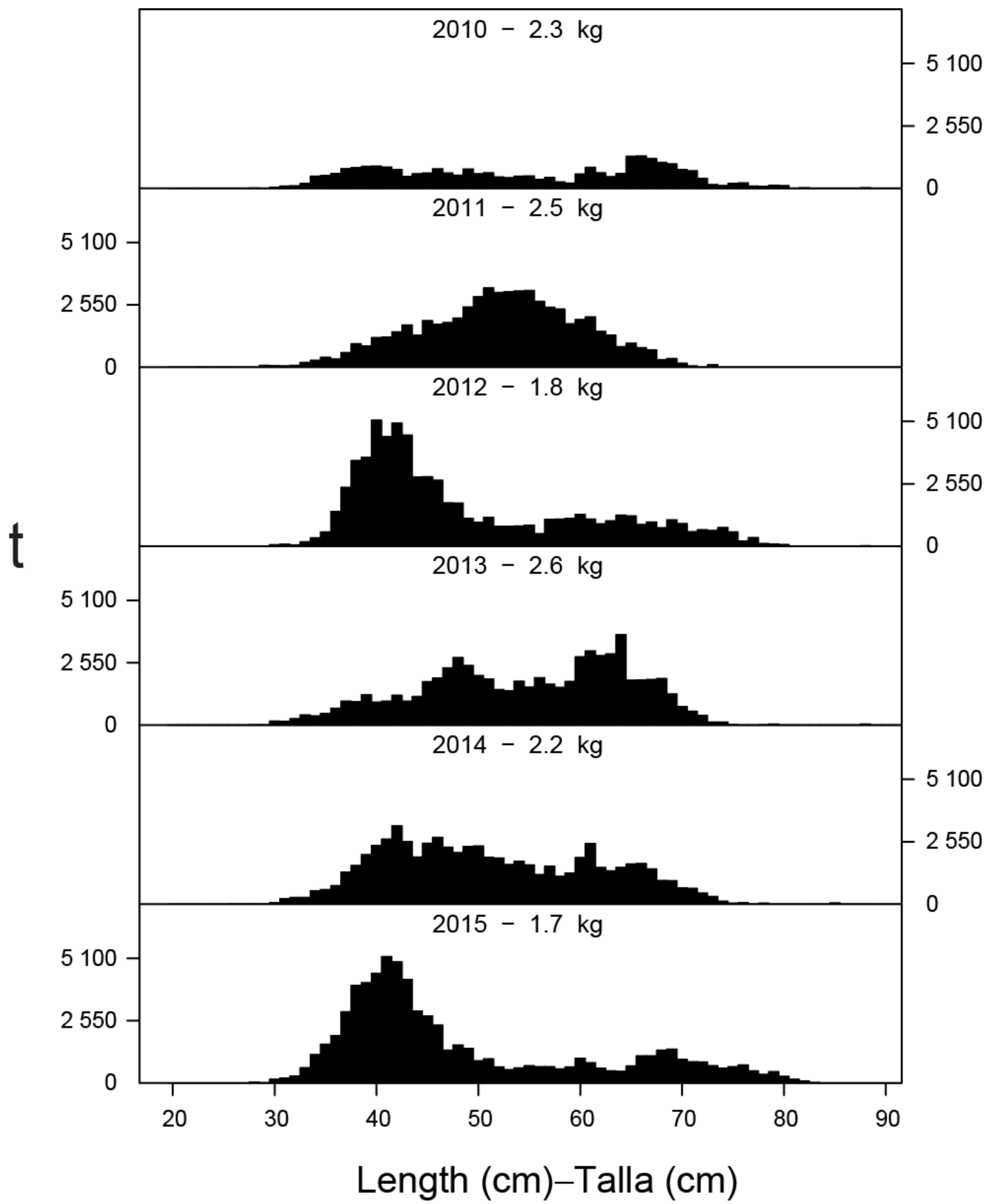

FIGURE 3b. Estimated size compositions of the skipjack caught in the EPO during the third quarter of 2010-2015. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 3b. Composición por tallas estimada para el barrilete capturado en el OPO en el tercer trimestre de 2010-2015. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas.

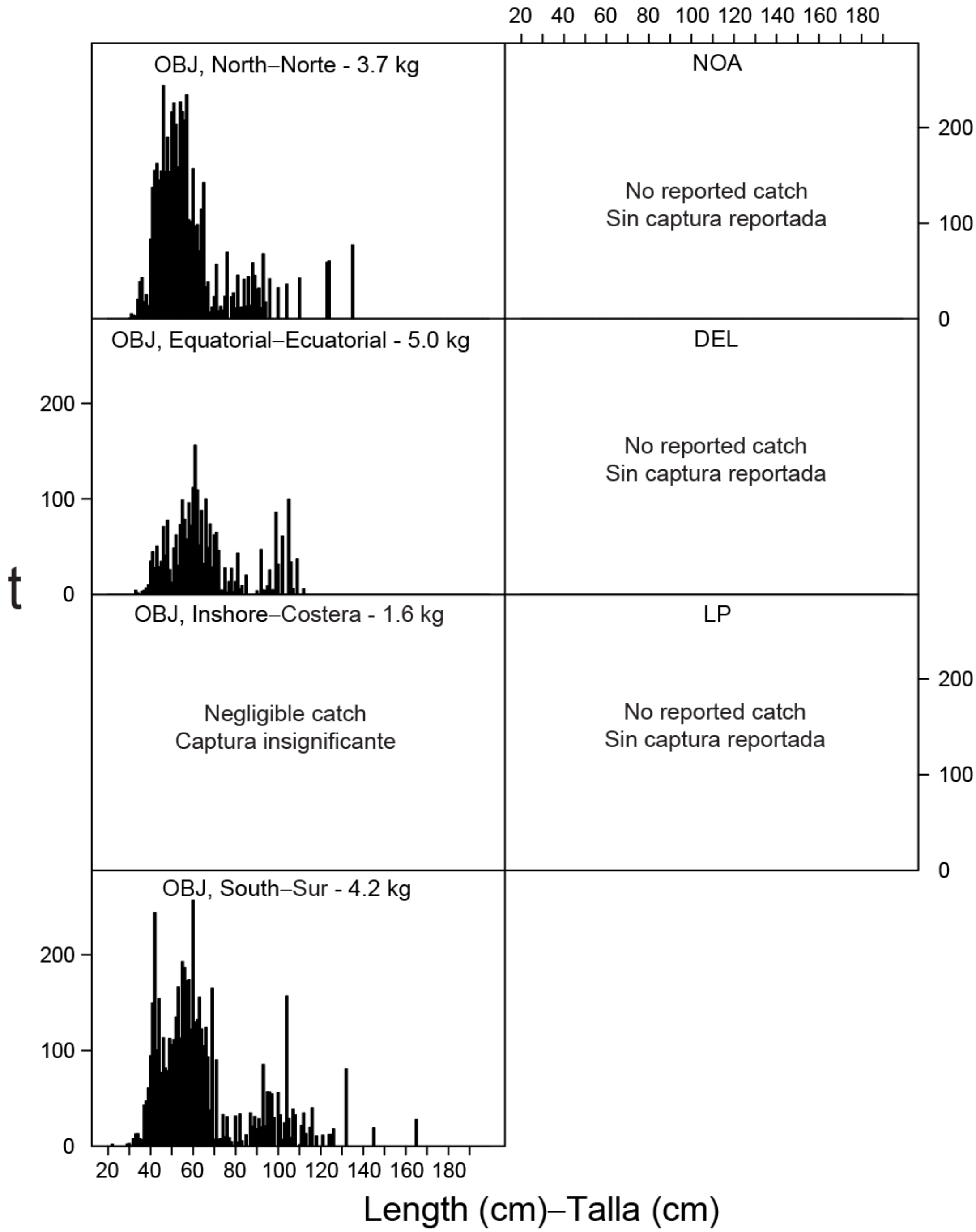

FIGURE 4a. Estimated size compositions of the bigeye caught in each fishery of the EPO during the third quarter of 2015. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 4a. Composición por tallas estimada para el patudo capturado en cada pesquería del OPO durante el tercer trimestre de 2015. 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.

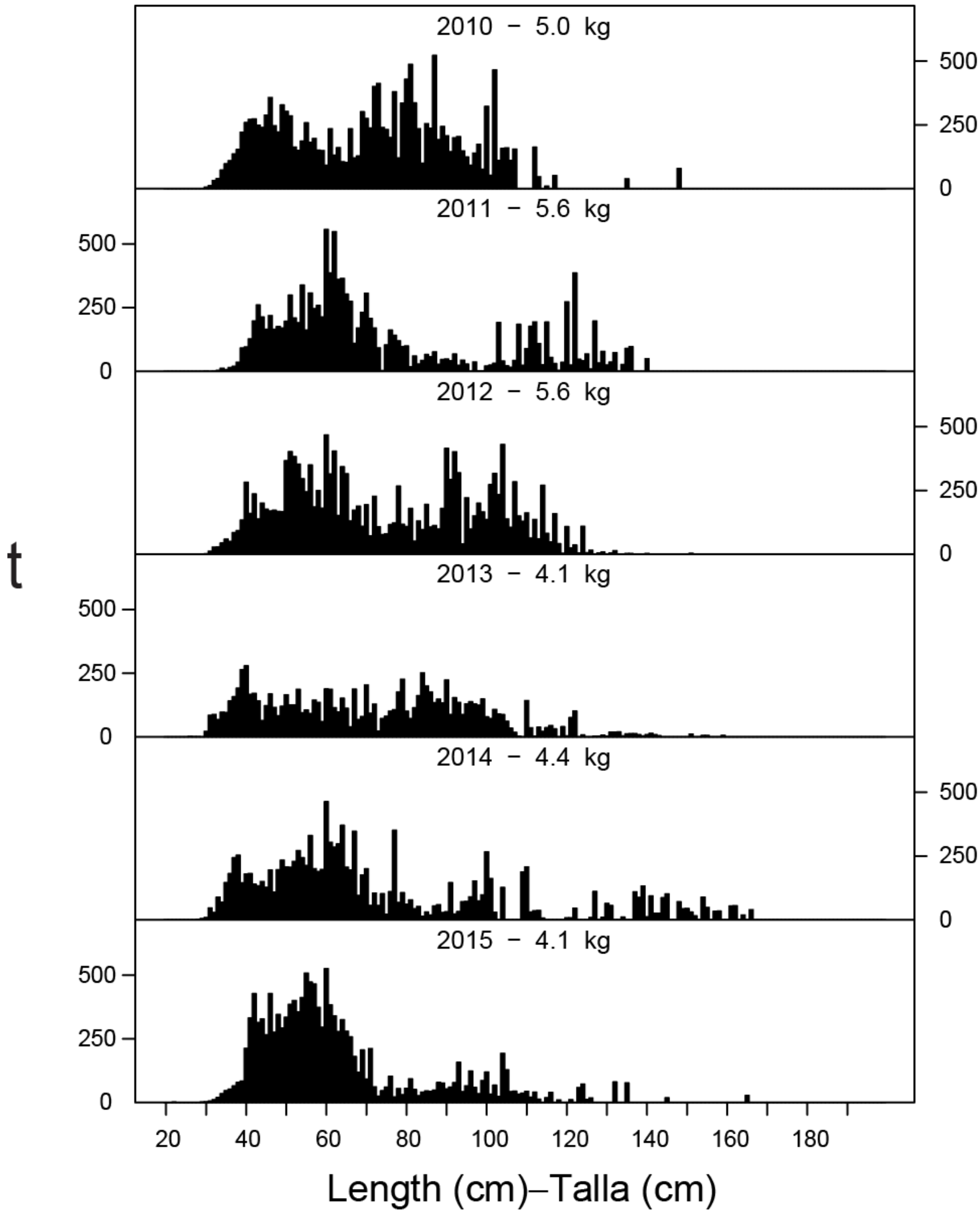

FIGURE 4b. Estimated size compositions of the bigeye caught in the EPO during the third quarter of 2010-2015. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 4b. Composición por tallas estimada para el patudo capturado en el OPO en el tercer trimestre de 2010-2015. En cada recuadro se detalla el peso promedio de los peces en las muestras; t = toneladas métricas.

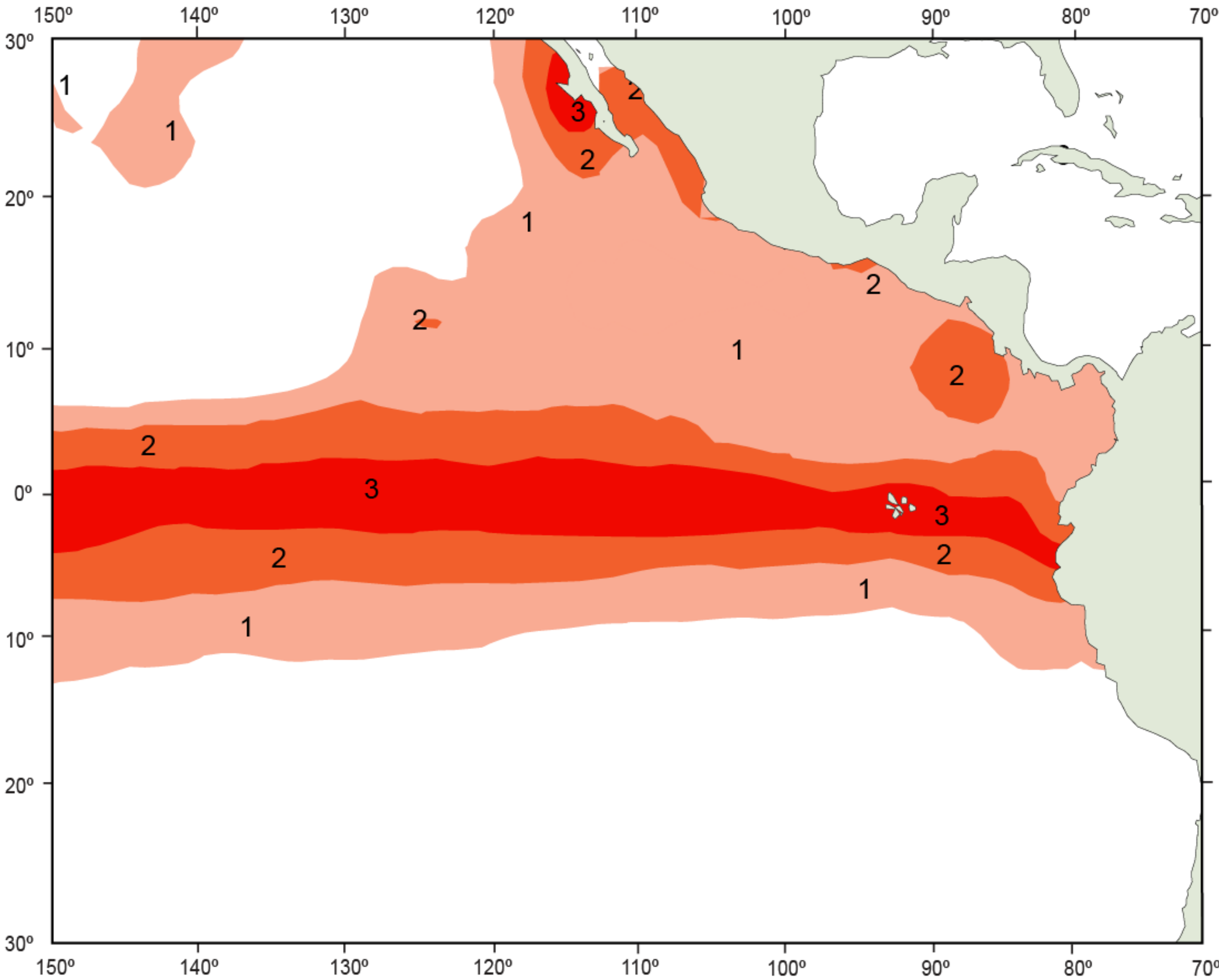

FIGURE 5. Sea-surface temperature (SST) anomalies (departures from long-term normals) for December 2015, based on data from fishing boats and other types of commercial vessels.
FIGURA 5. Anomalías (variaciones de los niveles normales a largo plazo) de la temperatura superficial del mar (TSM) en diciembre de 2015, 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 2015 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 2015 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	74	25	13	112	91,651
EU (España—Spain)	PS	-	-	4	4	10,116
Guatemala	PS	-	1	-	1	1,475
México	PS	10	36	1	47	57,502
	LP	1	-	-	1	125
Nicaragua	PS	-	5	1	6	8,478
Panamá	PS	2	8	4	14	19,794
Perú	PS	6	-	-	6	2,818
El Salvador	PS	-	-	2	2	4,473
USA—EE.UU.	PS	6	7	5	18	20,901
Venezuela	PS	-	13	1	14	19,592
All flags—	PS	102	105	31	238	
Todas banderas	LP	1	-	-	1	
	PS + LP	103	105	31	239	
			Capacity—Capacidad			
All flags—	PS	47,148	139,779	64,733	251,660	
Todas banderas	LP	125	-	-	125	
	PS + LP	47,273	139,779	64,733	251,785	

TABLE 2. Estimates of the retained catches of tunas in the EPO from 1 January through 31 December 2015, 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 2015, 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**
Ecuador	48,661	208,894	42,261	-	36	-	976	1,089	301,917	46.9
México	107,546	22,684	274	3,082	610	-	2,469	46	136,711	21.3
Nicaragua	6,828	1,770	1,025	-	-	-	-	-	9,623	1.5
Panamá	26,982	30,844	9,911	-	-	-	-	182	67,919	10.6
USA—EE.UU.	3,168	16,342	2,460	96	-	-	16	-	22,082	3.4
Venezuela	29,958	4,835	229	-	-	-	15	5	35,042	5.4
Other—Otros[2]	22,963	41,664	5,111	-	9	-	25	8	69,780	10.9
Total	246,106	327,033	61,271	3,178	655	-	3,501	1,330	643,074	

1 May include mackerel, other tunas, sharks, and miscellaneous fishes
1 Puede incluir caballas, otros túnidos, tiburones, y peces diversos
2 Includes Colombia, El Salvador, European Union (Spain), Guatemala and Peru; this category is used to avoid revealing the operations of individual vessels or companies.
2 Incluye Colombia, El Salvador, Guatemala, Perú y Unión Europea (España); 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 2015 by longline vessels.
TABLA 3. Capturas reportadas de atún patudo en el OPO durante 2015 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	1,349	2,077	2,370	5,796	662	-	-	662	6,458
Japan—Japón	3,820	2,548	2,630	8,998	1,309	1,573	-	2,882	11,880
Republic of Korea—República de Corea	2,351	2,240	2,144	6,735	1,040	1,112	-	2,152	8,887
Chinese Taipei—Taipei Chino	938	1,007	1,387	3,332	457	-	-	457	3,789
United States—Estados Unidos	-	-	-	-	-	-	-	-	666
Vanuatu	33	-	-	33	-	-	-	-	33
Total	8,491	7,872	8,531	24,894	3,468	2,685	-	6,153	31,713

TABLE 4. Oceanographic and meteorological data for the Pacific Ocean, January-December 2015. 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 2015. 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)	24.1 (-0.4)	25.6 (-0.6)	26.7 (0.1)	27.0 (1.4)	26.7 (2.4)	25.4 (2.5)
Area 2 (5°N-5°S, 90°-150°W	26.0 (0.4)	26.6 (0.2)	27.3 (0.2)	28.2 (0.7)	28.3 (1.2)	28.1 (1.2)
Area 3 (5°N-5°S, 120°-170°W)	27.1 (0.5)	27.3 (0.6)	27.8 (0.6)	28.6 (0.8)	28.9 (1.0)	29.0 (1.3)
Area 4 (5°N-5°S, 150W°-160°E)	29.2 (0.9)	29.1 (1.0)	29.3 (1.1)	29.7 (1.2)	29.9 (1.1)	29.9 (1.1)
Thermocline depth—Profundidad de la termoclina, 0°-80°W	20	20	10	45	85	45
Thermocline depth—Profundidad de la termoclina, 0°-110°W	50	50	50	100	95	100
Thermocline depth—Profundidad de la termoclina, 0°-150°W	150	150	145	150	150	140
Thermocline depth—Profundidad de la termoclina, 0°-180°	180	175	180	160	170	155
SOI—IOS	-0.8	0.2	-0.7	0.0	-0.7	-0.6
SOI*—IOS*	0,41	-0.58	-3.08	-2.55	-2.40	-1.42
NOI*—ION*	2.08	-1.67	0.93	0.63	-2.50	-1.47

TABLE 4. (continued)
TABLA 4. (continuación)

Month—Mes	**7**	**8**	**9**	**10**	**11**	**12**
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	24.5 (2.9)	22.9 (2.3)	22.9 (2.6)	23.3 (2.5)	23.7 (2.1)	25.0 (2.2)
Area 2 (5°N-5°S, 90°-150°W	27.8 (2.2)	27.3 (2.3)	27.5 (2.6)	27.6 (2.7)	27.9 (2.9)	28.0 (2.9)
Area 3 (5°N-5°S, 120°-170°W)	28.8 (1.6)	28.9 (2.1)	29.0 (2.3)	29.2 (2.5)	29.6 (3.0)	29.4 (2.8)
Area 4 (5°N-5°S, 150W°-160°E)	29.8 (1.0))	29.7 (1.0)	29.7 (1.0)	29.8 (1.1)	30.3 (1.7)	30.1 (1,6)
Thermocline depth—Profundidad de la termoclina, 0°-80°W	50	40	30	40	45	30
Thermocline depth—Profundidad de la termoclina, 0°-110°W	90	100	110	100	110	95
Thermocline depth—Profundidad de la termoclina, 0°-150°W	150	150	145	155	130	125
Thermocline depth—Profundidad de la termoclina, 0°-180°	160	160	160	120	105	95
SOI—IOS	-1.1	-1.4	-1.6	-1.7	-0.5	-0.6
SOI*—IOS*	-1.61	-5.46	-5.42	-4.87	1.49	-1.81
NOI*—ION*	-4.05	-3.22	-2.71	-4.08	2.09	1.55

TABLE 5. Preliminary data on the sampling coverage of trips of tuna purse seine vessels deployed by the observer programs of the IATTC, Colombia, Ecuador, the European Union, Mexico, Nicaragua, Panama, Venezuela, and under the MOC described above, departing during the fourth quarter of 2015. The numbers in parentheses indicate cumulative totals for the year.

TABLA 5. Datos preliminares de la cobertura de muestreo de viajes de buques atuneros de cerco asignados por los programas de observadores de la CIAT, Colombia, Ecuador, México, Nicaragua, Panamá, la Unión Europea, Venezuela y bajo el MDC descrito arriba, durante el cuarto trimestre de 2015. Los números entre paréntesis indican los totales acumulados para el año.

Flag	Trips		Class-6–Observed by program								Percentage observed	
			Clase-6–Observado por programa									
Bandera	Viajes		IATTC		National		WCPFC		Not obs.		Porcentaje observado	
			CIAT		Nacional				No obs.			
Colombia	10	(40)	8	(20)	2	(20)					100.0	(100)
Ecuador	78	(384)	49	(255)	29	(129)					100.0	(100)
El Salvador	4	(12)	4	(9)			0	(3)			100.0	(100)
EU (Spain)—UE (España)	3	(19)	2	(9)	1	(10)					100.0	(100)
Guatemala	1	(3)	1	(3)							100.0	(100)
México	14	(213)	5	(104)	9	(109)					100.0	(100)
Nicaragua	3	(15)	1	(6)	2	(9)					100.0	(100)
Panamá	17	(77)	10	(39)	7	(38)					100.0	(100)
Perú	3	(18)	3	(18)							100.0	(100)
U.S.A.—E.U.A.	10	(25)	6	(18)			4	(7)			100.0	(100)
Venezuela	6	(46)	3	(23)	3	(23)					100.0	(100)
Total	149	(852)	92	(504)	53	(338)	4	(10)	0	(1)	100.00	(100)
Class-4 – Clase 4												
Ecuador	9	(15)	9	(10)	0	(5)					-	-
Total	9	(15)	9	(10)	0	(5)					-	-
Class-5 - Clase 5												
Ecuador	0	(1)	0	(1)							-	-
Colombia	1	(2)	1	(1)	0	(1)					-	-
Total	1	(3)	1	(2)	0	(1)					-	-