INTER-AMERICAN TROPICAL TUNA COMMMISSION
COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL

QUARTERLY REPORT—INFORME TRIMESTRAL

July-September 2014—Julio-Septiembre 2014

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
8901 La Jolla Shores Drive
La Jolla, California 92037-1509, USA
www.iattc.org

COMMISSIONERS—COMISIONADOS

BELIZE—BELICE
Valarie Lanza
Delice Pinkard
Robert Robinson

CANADA
Sylvie Lapointe
Larry Teague

CHINA

COLOMBIA
Paula Caballero
Carlos Robles
Elizabeth Taylor

COSTA RICA
Luis Felipe Arauz Cavallini
Gustavo Meneses Castro
Antonio Porras Porras
Asdrubal Vásquez Núñez

ECUADOR
Edwin Fernando Moncayo Calderero
Ramón Montaño Cruz
Guillermo Morán Velásquez
Luis Torres Navarrete

EL SALVADOR
Manuel Calvo Benivides
Hugo Alexander Flores
Ana Marlene Galdamez
Gustavo Antonio Portillo

EUROPEAN UNION—UNIÓN EUROPEA
Angela Martini
Luis Molledo

FRANCE—FRANCIA
Marie-Sophie Dufau-Richet
Christine Laurent Monpetit
Thomas Roche
Michel Sallenave

GUATEMALA
Bryslie Siomara Cifuentes Velasco
José Sebastian Marcucci Ruíz
Carlos Francisco Marín Arriola
William René Méndez

JAPAN—JAPÓN
Tatuso Hirayama
Takashi Koya
Jun Yamashita

KIRIBATI

MÉXICO
Marío Aguilar Sánchez
Michel Dreyfus León
Carlos Gabriel Enriquez Montes
Raúl Adán Romo Trujillo

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

PANAMÁ
Raul Delgado
María Patricia Díaz
Arnulfo Franco
Maricel Morales

PERÚ
José Allemant Sayán
Luis Roberto Arribasplata Campos
Gladys Cárdenas Quintana
Miguel Ñiquen Carranza

REPUBLIC OF KOREA—REPÚBLICA DE COREA
Jongwha Bang
Il Jeong Jeong
Jeongseok Park

CHINESE TAIPEI—TAIPEI CHINO
Hong-Yen Huang
Chung-Hai Kwoh
Ted Tien-Hsiang Tsai

USA—EE.UU.
William Fox
Don Hansen
Barry Thom
Edward Weissman

VANUATU
Christophe Emelee
Roy Mickey Joy
Dimitri Malvirlani
Laurent Parenté

VENEZUELA
Alvin Delgado
Tibisay Leon
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 third quarter of 2014.

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 64th 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 and International Dolphin Conservation Program (IDCP) meetings

The following IATTC and IDCP meetings were held in Lima, Peru, in July 2014:

Number	Meeting	Date(s)
34	Permanent Working Group on Tuna Tracking	7 July
20	Working Group to Promote and Publicize the AIDCP Dolphin Safe Tuna Certification System	7 July
55	International Review Panel	7 July
29	Meeting of the Parties [to the AIDCP]	8 July
5	Committee for the Review of Implementation of Measures Adopted by the Commission	9-10 July
2	Committee on Administration and Finance	11 July
15	Permanent Working Group on Fleet Capacity	12-13 July
87	Inter-American Tropical Tuna Commission	14-18 July

Proposals on the following subjects were circulated at the IATTC meeting: management of fishing capacity; conservation of Pacific bluefin tuna; North Pacific albacore tuna; Regional Vessel Register; illegal, unreported, and unregulated fishing activities in the eastern Pacific Ocean.

Also, statements from the following organizations were circulated at that meeting: International Seafood Sustainability Foundation; The Pew Charitable Trusts; MRAG Americas; World Wildlife Fund; American Albacore Fishing Association, American Fishermen's Research Foundation, Oregon Albacore Commission, and Western Fishboat Owners Association; Humane Society.

Bolivia, Honduras, Indonesia, and Liberia were approved as Cooperating Non-Members of the IATTC for the period of July 2014-June 2015.

Other meetings

Mr. Kurt M. Schaefer participated in the 10th Regular Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission (WCPFC) in Majuro, Republic of the Marshall Islands, on 6-14 August 2014. He gave a presentation during the meeting consisting of an overview of the eastern Pacific Ocean tuna fisheries through the 2013 and summaries of the most recent stock assessments by the IATTC staff for yellowfin, skipjack, and bigeye tunas. While at the meeting, Mr. Schaefer also participated in the Seventh Steering Committee meeting for the Pacific Tuna Tagging Programme, at which he presented an overview of the results of the bigeye tagging experiments undertaken in the equatorial central Pacific by the Oceanic Fisheries Programme of the Secretariat of the Pacific Community and the IATTC. Most all of the documents presented at the WCPFC meeting can be viewed on the following web site: https://wcpfc.int/meetings/10th-regular-session-scientific-committee

Dr. Michael D. Scott participated in a U.S. National Marine Fisheries Service Stock Delineation Guidelines Initiative workshop held in La Jolla, California, USA, on 19-21 August 2014. The purpose of the workshop was to develop guidelines for integrating multiple lines of evidence to differentiate marine mammal stocks.

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 compositions of the catch for the surface fisheries, is complicated. Observers accompany all trips of Class-6 purse seiners (vessels with fish-carrying capacities greater than 363 metric tons) that fish in the EPO. 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, as the calculations cannot be performed until after the end of the year.

IATTC personnel stationed at its field offices collected 371 length-frequency samples from 217 wells and abstracted logbook information for 306 trips of commercial fishing vessels during the third quarter of 2014.

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), the vessel capacities in cubic meters (m^3), and effort in days fishing. Estimates of fisheries statistics with varying degrees of accuracy and precision are available. The most accurate and precise are those made after all available information has been entered into the data base, processed, and verified. While it may require a year or more to obtain some final information, much of the catch information is processed and available within two to three months of the return of a vessel from a fishing trip. Thus the estimates for the current week are the most preliminary, while those made a year later are much more accurate and precise. The statistics are developed using data from many sources, including reports of landings, fishing vessel logbooks, scientific observers, and governmental agencies.

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

The IATTC Regional Vessel Register (http://www.iattc.org/VesselListsENG.htm) lists all vessels, other than artisanal and recreational fishing vessels, authorized to fish for tunas in the EPO. The estimated total carrying capacity of the purse-seine and pole-and-line vessels that have or are expected to fish in the EPO during 2014 is about 223,779 m^3 (Table 1). The average weekly at-sea capacity for the fleet, for the weeks ending 6 July through 28 September, was about 134,500 m^3 (range: 106,000 to 175,800 m^3).

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

Catch statistics

The estimated total retained catches, in metric tons, of tropical tunas from the EPO during the period of January-September 2014, and the equivalent statistics for 2009-2013, were:

Species	**2014**	**2009-2013**			**Weekly average,**
		Average	**Minimum**	**Maximum**	**2014**
Yellowfin	191,200	181,500	175,700	187,200	4,900
Skipjack	189,600	183,400	118,500	222,300	4,900
Bigeye	38,700	39,400	35,900	42,600	1,000

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

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

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

The measures of CPUE used in these analyses are based on data from fishing trips landing predominantly yellowfin, skipjack, bigeye, and bluefin tuna. The great majority of the purse-seine catches of yellowfin, skipjack, and bigeye are made by 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 their fish-carrying capacities.

The estimated nominal catches of yellowfin, skipjack, and bigeye per day of fishing, in metric tons, by purse-seine (PS) and pole-and-line (LP) gear in the EPO during the second quarter of 2014 and comparative statistics for 2009-2013 were:

Region	Species	Gear	2014	2009-2013		
				Average	Minimum	Maximum
N of 5°N	yellowfin	PS	19.4	14.4	13.5	15.5
S of 5°N			2.9	3.2	2.7	4.1
N of 5°N	skipjack	PS	1.7	1.6	0.7	2.7
S of 5°N			9.2	9.7	8.0	11.9
EPO	bigeye	PS	2.0	2.3	2.2	2.4
EPO	yellowfin	LP	0.0	4.6	0.5	10.1
EPO	skipjack	LP	0.0	1.9	0.3	4.5

Catch statistics for the longline fishery

IATTC Resolution C-09-01 requires nations whose annual catches of bigeye by longline gear in the EPO exceed 500 metric tons to report their catches at monthly intervals. The catches reported for January-September 2014 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 second quarters of 2009-2014 are presented in this report. Two sets of length-frequency histograms are presented for each species; the first shows the data by stratum (gear type, set type, and area) for the second quarter of 2014, and the second shows data for the combined strata for the second quarter of each year of the 2009-2014 period. Samples from 236 wells were taken during the second quarter of 2014.

There are ten surface fisheries for yellowfin defined for stock assessments, four associated with floating objects, two with unassociated schools, three associated with dolphins, and one pole-and-line (Figure 1). The last fishery includes all 13 sampling areas. Of the 236 wells sampled that contained fish caught during the second quarter of 2014, 196 contained yellowfin. The estimated size compositions of these fish are shown in Figure 2a. The majority of the yellowfin catch during the second quarter was taken by sets on dolphins in the Northern and Inshore areas. The Northern area sets produced the greatest size of yellowfin, with the majority in the 120-160 cm range and an average weight of 28.8 kg. Lesser amounts of smaller yellowfin were produced by sets on dolphin-associated fish in the Inshore area. Small amounts of yellowfin were taken in floating-object sets in the Northern area.

The estimated size compositions of the yellowfin caught by all fisheries combined during the second quarters of 2009-2014 are shown in Figure 2b. The average weight of the yellowfin caught during the second quarter of 2014 (10.6 kg) was about equal to those of 2010, 2011, and 2013, but much less those of 2009 and 2012, which averaged 18.0 and 17.4 kg, respectively.

There are eight fisheries for skipjack defined for stock assessments, four associated with floating objects, two with unassociated schools, one associated with dolphins, and one pole-and-line (Figure 1). The last two fisheries include all 13 sampling areas. Of the 236 wells sampled that contained fish caught during the second quarter of 2014, 115 contained skipjack. The estimated size compositions of these fish are shown in Figure 3a. Large amounts of skipjack in the 35- to 55-cm range were caught in all four of the floating-object fisheries. The Southern unassociated fishery also produced a large amount of skipjack, with the majority in the 60- to 70 cm range and an average weight of 2.8 kg.

The estimated size compositions of the skipjack caught by all fisheries combined during the second quarters of 2009-2014 are shown in Figure 3b. The average weight for the second quarter of 2014 (1.8 kg) was less than those of skipjack caught during the second quarter of the previous four years, which ranged from 2.1 to 2.6 kg.

There are seven surface fisheries for bigeye defined for stock assessments, four associated with floating objects, one on unassociated schools, one on fish associated with dolphins, and one pole-and-line fishery (Figure 1). The last three fisheries include all 13 sampling areas. Of the 236 wells sampled that contained fish caught during the second quarter of 2014, 55 contained bigeye. The estimated size compositions of these fish are shown in Figure 4a. Virtually all of the second-quarter bigeye catch was taken in floating-object sets, primarily in the Northern and Equatorial areas. The average weight of the fish caught in the Northern floating-object fishery (4.0 kg) was less than half that of the fish caught in the Equatorial area (9.2 kg).

The estimated size compositions of the bigeye caught by all fisheries combined during the second quarters of 2009-2014 are shown in Figure 4b. The average weight of bigeye caught during the second quarter of 2014 (5.7 kg) continued a declining trend from the high of 9.4 kg in 2011, 7.2 kg in 2012, and 6.2 kg in 2013.

The estimated retained purse-seine catch of bigeye less than 60 cm in length during the first two quarters of 2014 was 8,762 metric tons (t), or about 41 percent of the estimated total retained purse-seine catch of bigeye during that period. The corresponding amounts for the first two quarters of 2009-2013 ranged from 4,260 to 7,587 t, or 20 to 33 percent.

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 quarter except on 5 July, 8, 13, 18, 20, 22, 24-26, and 28-29 August, and 1, 3, and 7 September. Spawning occurred between 7:00 a.m. and 2:10 p.m. The number of eggs collected ranged from 5,000 to 663,000. The water temperatures in the tank ranged from 27.8° to 29.5°C.

At the end of the quarter there were two 47-kg yellowfin, seven 32- to 39-kg yellowfin, and seven 21- to 22-kg yellowfin in Tank 1. There were 19 2- to 6-kg yellowfin tuna 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 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).

As part of this project, multiple Kinki University scientists, including faculty members, research associates, and graduate students, arrived at the Achotines Laboratory in mid-April to initiate studies that continued through the end of July and resumed again in September. ARAP biologists joined the Kinki University scientists in working with the Achotines Laboratory staff on multiple trials and experiments.

As part of the SATREPS program, scientists of the IATTC's Early Life History Group and KU staff members completed an ongoing series of growth experiments with Pacific bluefin tuna larvae during July at the Oshima Experimental Station, Kinki University. Growth and survival were examined for larvae fed at a semi-high food level during the first 10 days of feeding. This experiment was conducted as part of a larger comparative study of the growth potential of yellowfin and Pacific bluefin larvae (first described in the IATTC Quarterly Report for April-June 2011).

During the second and third quarters of 2014, data from these studies were analyzed by IATTC scientists to compare the survival and growth potential of yellowfin and Pacific bluefin larvae after exposure to a gradient of relatively low and high mean daily food levels (170-, 318-, 505-, 2022-, and 3752 prey$\cdot L^{-1}$) during the first 10 days of feeding and after exposure to a two-day delay in feeding of optimal prey levels. Prey availability has a large influence on vital rates (*i.e*. growth and mortality) of tuna larvae, especially during the first week of feeding, when the larvae may encounter suboptimal feeding conditions. Preliminary results indicate that yellowfin larvae are less sensitive than bluefin larvae to suboptimal prey levels of uniformly small prey during the first week of feeding.

Experiments were also conducted in 2013 and 2014 to estimate starvation duration of bluefin and yellowfin larvae reared at water temperatures of 24°C, 26°C, 27°C, and 29°C. The experiments were conducted from the time of first feeding until the time when 100-percent mortality occurred. Starvation durations of both species were inversely related to increasing water temperatures. Bluefin larvae were able to survive longer than yellowfin larvae at all water temperatures tested.

The growth and survival characteristics of both species will be integrated into models that may be used to predict pre-recruit survival based on measureable physical and biological processes.

Collaborative work between the IATTC and Hubbs Sea World Research Institute

In late 2011, the Early Life History group and the Hubbs Sea World Research Institute (HSWRI) in San Diego, California, USA, began a project entitled "Development of Sustainable Tuna Aquaculture in the United States Using Yellowfin Tuna as a Model." The project, funded by California Sea Grant, was scheduled to be carried out from 2012 to 2014. In June and August 2014, HSWRI personnel conducted research trials on the project with Achotines Laboratory staff members. Air shipments of yellowfin larvae from the Achotines Laboratory to the HSWRI laboratory were successfully carried out, with good initial survivals of the larvae. From 6-14 September 2014, HSWRI personnel continued the research trials, and the fourth of six planned air shipments of yellowfin larvae arrived at HSWRI without incident; the initial survival of the larvae was the highest of any shipments to date.

Workshop on the physiology and aquaculture of pelagics

The IATTC and the University of Miami (Miami, Florida, USA) held their 12th workshop, "Physiology and Aquaculture of Pelagics, with Emphasis on Reproduction and Early Developmental Stages of Yellowfin Tuna," on 14-15 July 2014. Dr. Daniel Benetti, Director of the Aquaculture Program of the Rosenstiel School of Marine and Atmospheric Science (RSMAS), University of Miami, and IATTC staff scientists of the Early Life History Group served as organizers and instructors of the workshop. The participants included six graduate students and five aquaculture-biology professionals from the Bahamas, Colombia, France, and the USA. As part of the workshop, tuna larvae were cultured, and wild tuna were captured to augment the Achotines Laboratory broodstock population. After their stay at the Achotines Laboratory, the workshop group spent several days at the Ocean Blue cobia (*Rachycentron canadum*) culture laboratories and ocean cages on the Caribbean coast of Panama.

Studies of snappers

The work on snappers (*Lutjanus* spp.) is carried out by the 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 September 2014, a large group of fish continued to be held in the broodstock tank.

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 October 2013 there were areas of cool water near the coast off the Baja California peninsula and off South America from the Equator to about 35°S. In November most of this cool water had disappeared, except for two spots off South America between the Equator and 10°S. During December 2013 (IATTC Quarterly Report for October-December 2013: Figure 5) and January 2014, the SSTs were very close to normal throughout the entire tropical EPO. In February, however, a band of cool water, which extended along the equator from the coast of South America to about 145°W, appeared. Also some spots of warm appeared off Mexico and Central America. The band of cool water along the equator nearly disappeared in March, but there were spots of cool water along the coasts of Ecuador and Peru, and the spots of warm water off Mexico and Central America were more pronounced than they had been in February. By April the band of cool water along the equator had disappeared, but the spots of cool water along the coast of South America persisted. By May, however, the spots of cool water off South America had virtually disappeared. In May and June 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 was still in existence (IATTC Quarterly Report for April- June 2014, Figure 5).

In May, June, and July 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. Meanwhile, extensive areas of warm water were developing north of about 10°S (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). The SSTs were mostly below normal from October 2013 through March 2014, but during April-September 2014 they were mostly above normal (Table 4).

According to the Climate Diagnostics Bulletin of the U.S. National Weather Service for September 2014, "Most models predict El Niño to develop during October-December 2014 and to continue into early 2015 … . The consensus of forecasters indicates a 2-in-3 chance of El Niño during the November 2014-January 2015 season. This El Niño will likely remain weak (3-month values of the Niño-3.4 index between 0.5°C and 0.9°C) throughout its duration. In summary, El Niño is favored to begin in the next 1-2 months and last into the Northern Hemisphere spring [of] 2015."

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 International Dolphin Conservation Program's (IDCP's) 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 and the Regional Observer Program (ROP) under the umbrella of the Western and Central Pacific Fisheries Commission (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." 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. Resolution A-02-01 also requires "purse-seine vessels of less than 363 metric tons carrying capacity … that have been identified by the IRP to have committed a possible infraction by intentionally setting on dolphins … to carry observers."

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 2014 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 IDCP's 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 for the observers of the ROP to follow 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 one trip of a vessel planning to operate in both areas during the third quarter of 2014. This request was granted.

Observers from the IDCP's On-Board Observer Program departed on 172 fishing trips aboard purse seiners covered by that program during the third quarter of 2014. Preliminary coverage data for these vessels during the quarter, plus data for one trip of an EPO-based vessel that operated in the EPO, but carried an ROP observer, are shown in Table 5. (If vessels based in ports in the western or central Pacific Ocean fish in the EPO, more rows, and possibly more columns, will be required in the tables equivalent to Table 5.)

In addition, there were eight trips of vessels smaller than Class 6 sampled under the provision of Resolutions C-12-01, C-12-08, and/or A-02-01, as stated above.

Training

There were no observer training sessions held during the third quarter of 2014.

Gear project

There were four dolphin safety-gear inspection and safety-panel alignment procedures carried out aboard Mexican-flag purse seiners during the third quarter of 2014. Three were performed by staff members of the Programa Nacional de Aprovechamiento del Atún y Protección de Delfines (PNAAPD) of Mexico and one by Mr. Marlon Román Verdesoto of the IATTC staff.

INTER -AGENCY COOPERATION

A Workshop on the Physiology and Aquaculture of Pelagics conducted jointly by Dr. Daniel Benetti, Director of the Aquaculture Program of the Rosenstiel School of Marine and Atmospheric Science, University of Miami, and staff scientists of the IATTC Early Life History Group is described in the subsection of this report entitled ***Early life history studies***.

Dr. Mihoko Minami of the Department of Mathematics, Keio University, Tokyo, Japan, spent the period of 4-7 August 2014 at the IATTC headquarters in La Jolla, California, USA, where she worked with Drs. Mark N. Maunder and Cleridy E. Lennert-Cody on evaluation of statistical methods for addressing the challenges posed by purse-seine observer data with respect to trend estimation for dolphin species, and on developing parametric hierarchical MIXTURE models for estimation of bluefin tuna catch AGE composition.

Mr. Fabio Fiorellato, a software engineer and fishery information systems developer at the Food and Agriculture Organization (FAO) of the United Nations, Rome, Italy, spent the period of 21 August-3 September 2014 at the IATTC headquarters in La Jolla. California, USA. During his stay, he collaborated with Mr. Nickolas W. Vogel, Ms. Joydelee C. Marrow, and Mr. Milton F. Lopez to implement an automated process to incorporate data from the IATTC vessel registry into the CLAV (Consolidated List of Authorized Vessels), a global data base that will store fishing vessel information from all of the five Tuna Regional Fisheries Management Organizations (TRFMOs) as part of the Global Environment Fund-funded Areas Beyond National Jurisdiction project.

The process implemented at the IATTC will automatically update the CLAV central data base (located at the headquarters of the Indian Ocean Tuna Commission (IOTC) with the most current vessel register data, and will regularly pass updates to the central data base with close-to-real-time frequency and almost no need for human intervention or support.

This same process has already been implemented at the IOTC, and will be deployed at the, Western and Central Pacific Fisheries Commission, the International Commission for the Conservation of Atlantic Tunas, and the Commission for the Conservation of Southern Bluefin Tuna during the next few months.

The CLAV system is capable of identifying data inconsistencies and duplications for vessels appearing in multiple registries; as a consequence, its users will have access to the combination of data from all of the five TRFMOs in a uniform way, thus being able to search and identify vessels shared by multiple organizations and display and evaluate their data in a broader, cross-organizational context.

This is an important step toward comprehensive monitoring of the fishing fleets in the oceans of the world, and will be a powerful tool for fisheries management and analysis, and identification and prevention of potential illegal, unreported, and unregulated fishing activities.

In a second phase the CLAV will evolve into an integrated system that will support data exchange, not only among the five TRFMOs, but also with other fishery-related organizations, including FAO.

In the final stage the TRFMOs vessel registry data, as they appear in the CLAV, could be seamlessly combined and complemented with data from other comprehensive vessel registries (*e.g.* the FAO Fishing Vessels Finder and the FAO Global Record of Fishing Vessels) to further increase their completeness and effectiveness.

The CLAV data base and its dissemination interface are in an advanced stage of development, and will be released to the public by the end of 2014.

Dr. Martín A. Hall participated in a fishing captain's workshop at the AZTI laboratory in Sukarrieta, Spain, on 18 September 2014, at which he and Dr. Jefferson Murua (AZTI-ISSF) spoke about mitigation of bycatches in purse seine fisheries.

Dr. Carolina Minte-Vera, assisted by Ms. Juliana Strieder Philippsen, a Ph.D. candidate at the State University of Maringá, Brazil, taught a course, "Introduction to the Assessment of Fisheries Resources" at the headquarters of Conservation International (CI)-Costa Rica branch, San José, Costa Rica, from 18 to 22 August 2014. Dr. Alexandre Aires-da-Silva helped Dr. Minte-Vera prepare the course. The course was hosted by Dr. Moisés Mug-Villanueva (Habitat Crítico Soluciones) and funded by CI-Costa Rica. The students included one Costa Rican commissioner to the IATTC, five scientists from the Instituto Costaricense de Pesca y Acuicultura (INCOPESCA), one student from the Centro de Investigación en Ciencias del Mar y Limnología (CIMAR), Universidad de Costa Rica, and two staff members of Conservation International.

Ms. Samantha Mercer, a senior in the Marine Sciences program at the University of San Diego, began working as an intern with Drs. Michael D. Scott of the IATTC staff and Elizabeth F. Edwards of the U.S. National Marine Fisheries Service on 19 September 2014. Ms. Mercer is compiling information from observer notes on dolphin behavior and swimming speeds during chases by purse-seine vessels. She will continue to do this work until at least May 2015.

PUBLICATIONS

Carvalho, Felipe, Robert Ahrens, Debra Murie, José M. Ponciano, Alexandre Aires-da-Silva, Mark N. Maunder, and Fabio Hazin. 2014. Incorporating specific change points in catchability in fisheries stock assessment models: an alternative approach applied to the blue shark (*Prionace glauca*) stock in the South Atlantic Ocean. Fish. Res., 154: 135-146.

Nomura, Shohei, Toru Kobayashi, Yasuo Agawa, Daniel Margulies, Vernon Scholey, Yoshifumi Sawada, and Naoki Yagishita. Genetic population structure of the Pacific bluefin tuna *Thunnus orientalis* and the yellowfin tuna *Thunnus albacares* in the North Pacific Ocean. 2014. Fish. Sci., DOI 10.1007/s12562-014-0789-8: 12 pp.

Schaefer, Kurt, Daniel Fuller, John Hampton, Sylvain Caillot, Bruno Leroy, and David Itano. 2015. Movements, dispersion, and mixing of bigeye tuna (*Thunnus obesus*) tagged and released in the equatorial Central Pacific Ocean, with conventional and archival tags. Fish. Res., 161: 336-355.

Young, J.W., R.J. Olson, F. Ménard, P.M. Kuhnert, L.M. Duffy, V. Allain, J.M. Logan, A. Lorrain, C.J. Somes, B. Graham, N. Goñi, H. Pethybridge, M. Simier, M. Potier, E. Romanov, D. Pagendam, C. Hannides, and C.A. Choy. 2014. Setting the stage for a global-scale trophic analysis of marine top predators: a multi-workshop review. Rev. Fish Biol. Fish. DOI 10.1007/s11160-014-9368-4.

FORREST R. MILLER, 1923-2014

Mr. Forrest R. Miller, an IATTC staff member from 1967 to 1990, passed away on 18 September 2014. Mr. Miller was an officer in the U.S. Air Force from 1944 until his retirement in 1966. While in the Air Force he devoted most of his time to meteorology. The Air Force sent him to the University of California at Los Angeles, from which he earned his B.S. and M.S. degrees, the latter under the late Dr. Jacob Bjerknes, at that time the world's leading authority on El Niño.

While working for the IATTC. Mr. Miller devoted much of his time to studying the El Niño phenomenon. During most of his period of employment he spoke about oceanographic conditions in the EPO at the IATTC meetings that were held in San Diego or La Jolla. Vessel owners and fishermen who attended those meetings paid close attention to what he said and asked him many questions. (In recent years anyone who has a computer can get almost any data that he wants from the internet, but that was not the case in those days. Furthermore, opinions expressed by Mr. Miller were more to be trusted than many opinions that can be found on the internet.) He was the author or co-author of one IATTC Bulletin, one IATTC Technical Report, two IATTC Data Reports, and 30 papers in outside journals.

Mr. Miller was a modest person, who performed his duties quietly and efficiently. Without calling attention to himself, he was a great asset to the IATTC's research program.

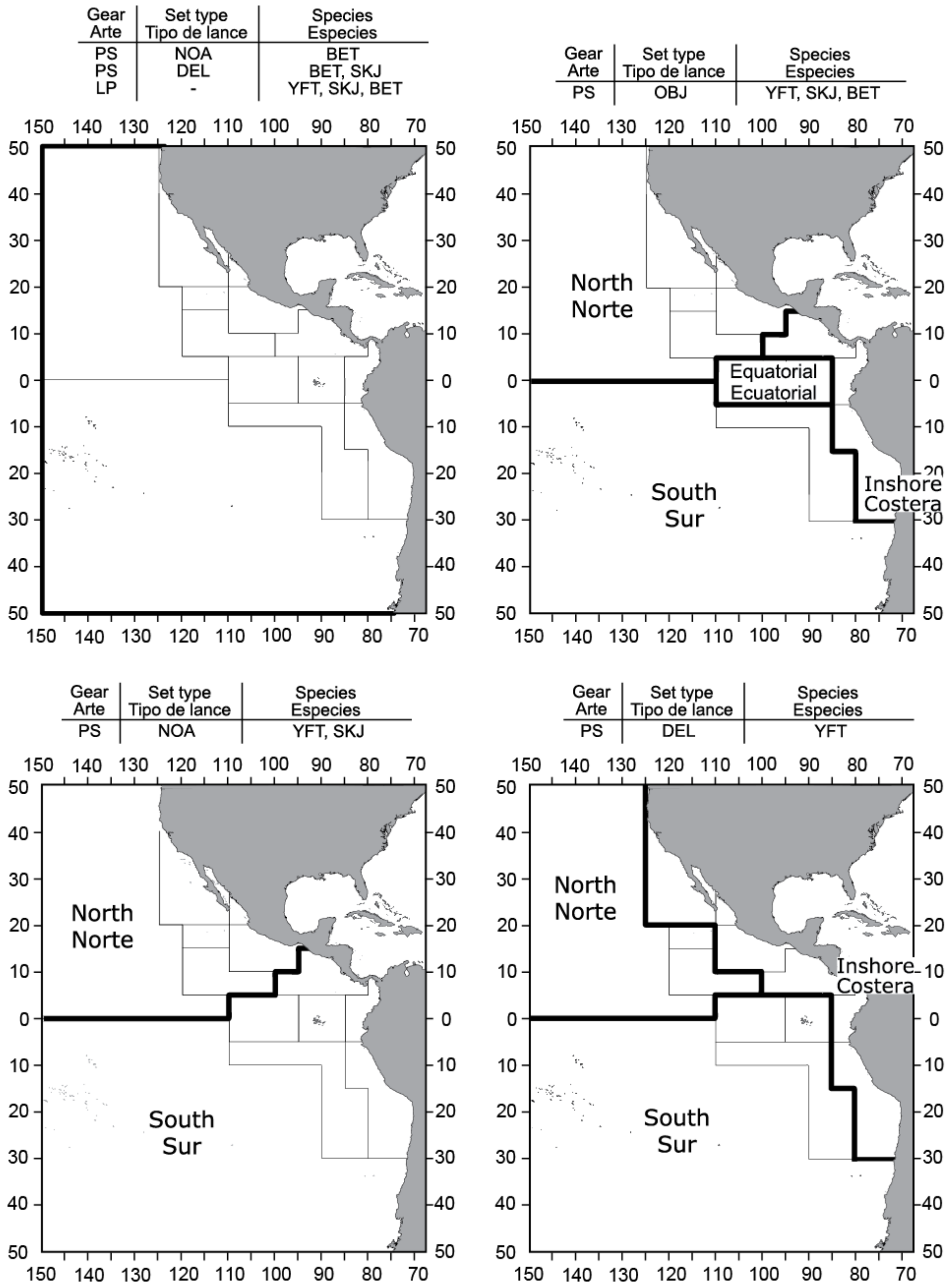

FIGURE 1. Spatial extents of the fisheries defined by the IATTC staff for stock assessment of yellowfin, skipjack, and bigeye in the EPO. The thin lines indicate the boundaries of the 13 length-frequency sampling areas, and the bold lines the boundaries of the fisheries. Gear: PS = purse seine, LP =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

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

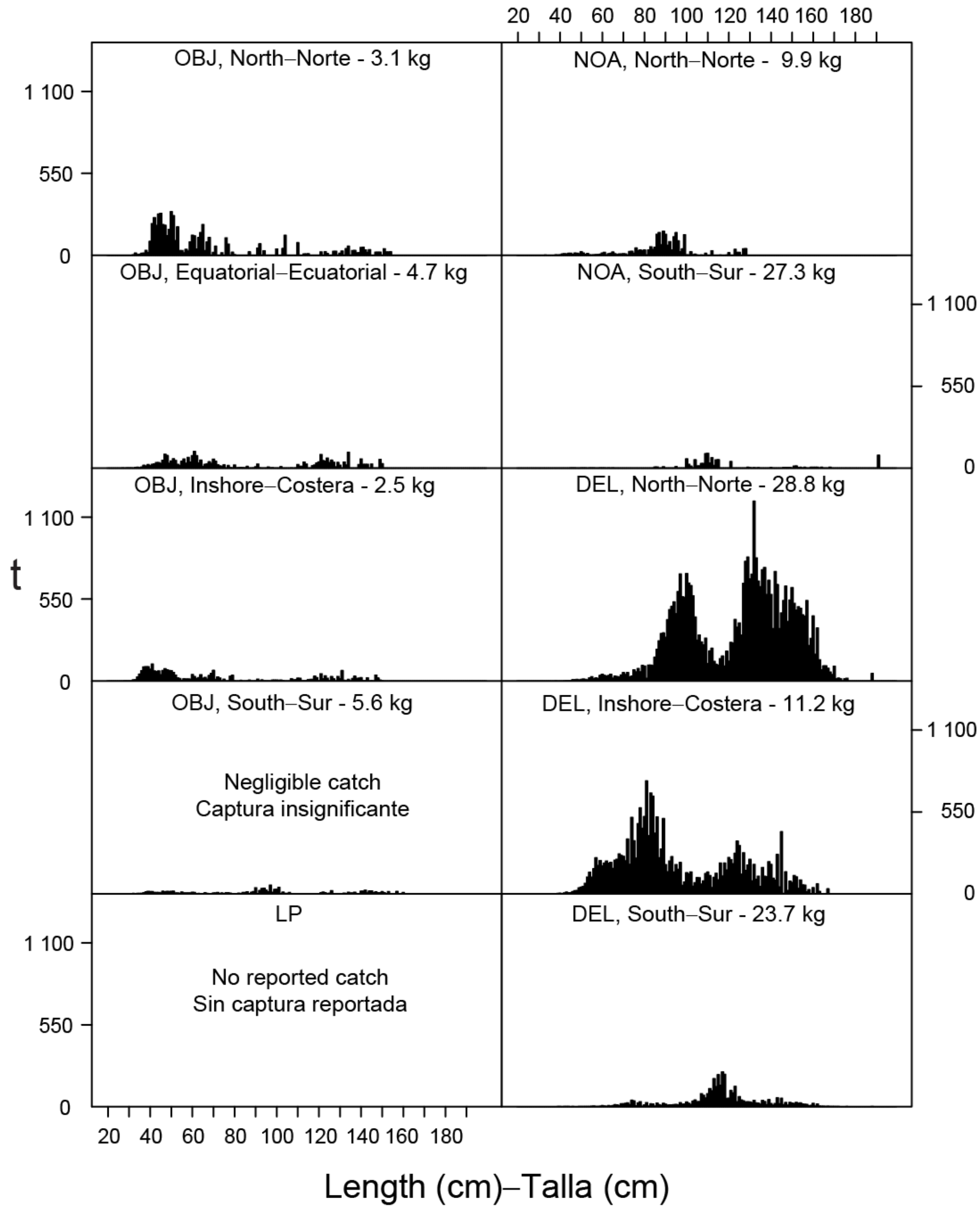

FIGURE 2a. Estimated size compositions of the yellowfin caught in each fishery of the EPO during the second quarter of 2014. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 2a. Composición por tallas estimada para el aleta amarilla capturado en cada pesquería del OPO durante el segundo trimestre de 2014. 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.

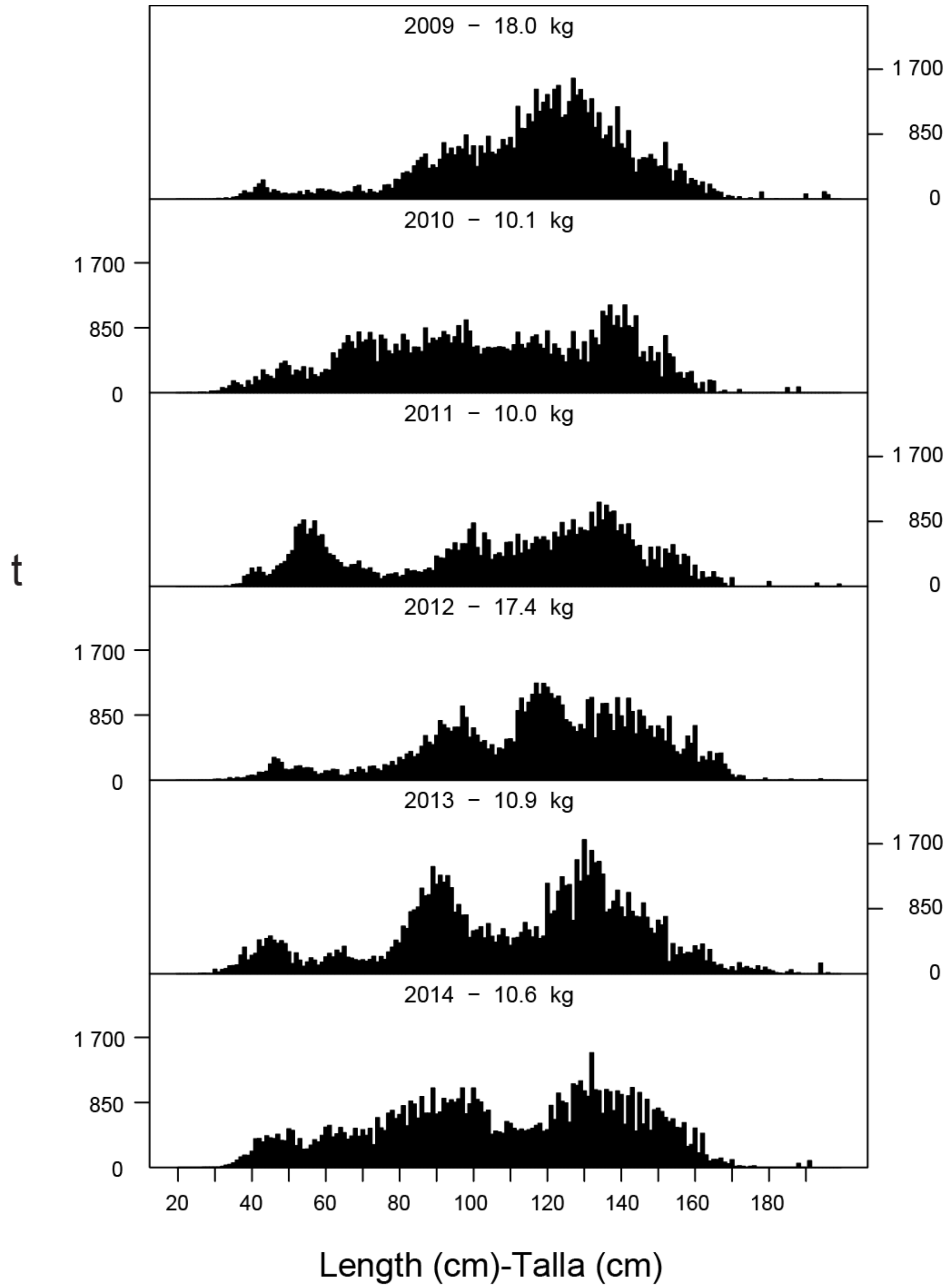

FIGURE 2b. Estimated size compositions of the yellowfin caught in the EPO during the second quarter of 2009-2014. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 2b. Composición por tallas estimada para el aleta amarilla capturado en el OPO en el segundo trimestre de 2009-2014. En cada recuadro se detalla el peso promedio de los peces en las muestras; t = toneladas métricas.

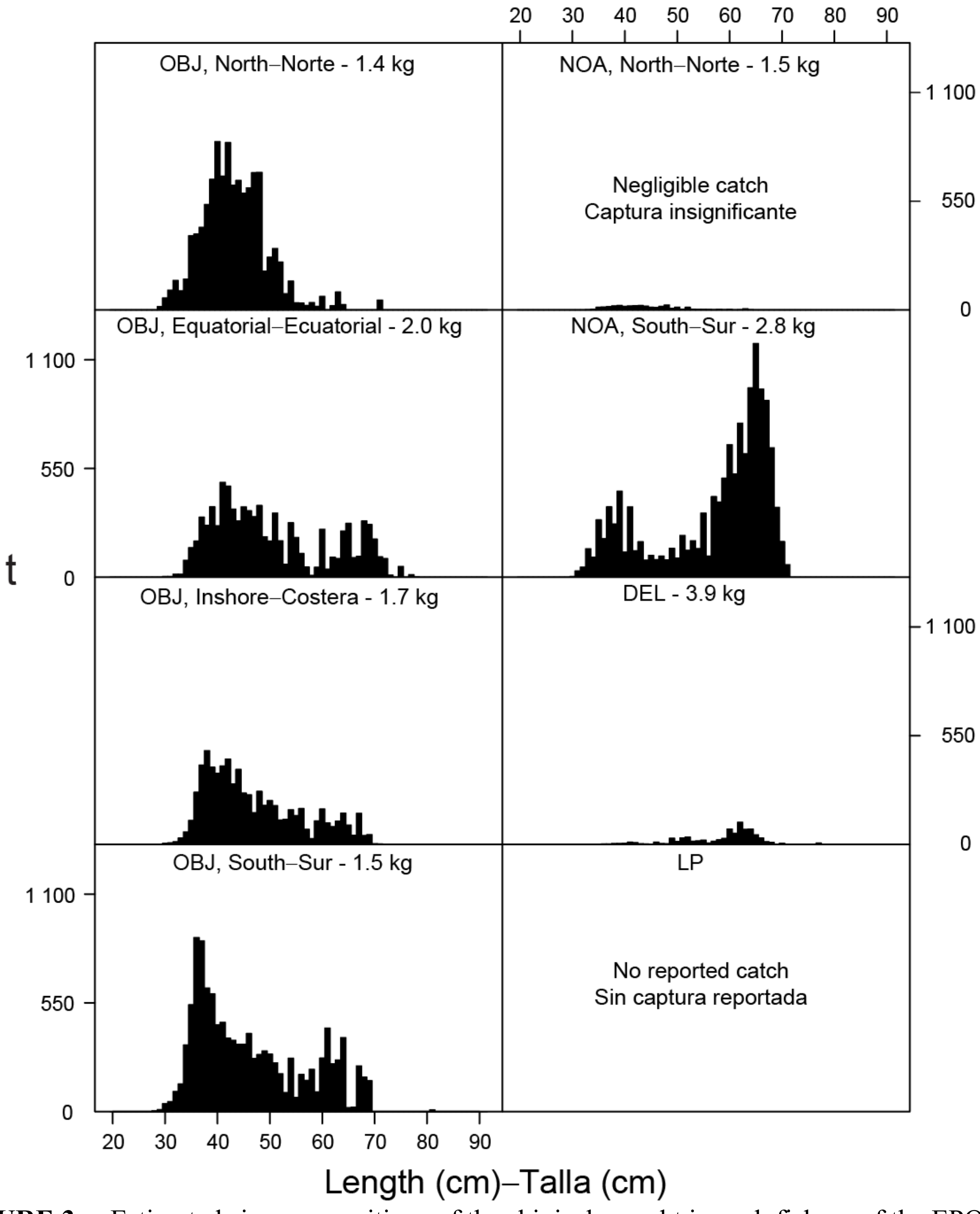

FIGURE 3a. Estimated size compositions of the skipjack caught in each fishery of the EPO during the second quarter of 2014. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 3a. Composición por tallas estimada para el barrilete capturado en cada pesquería del OPO durante el segundo trimestre de 2014. En cada recuadro se detalla el peso promedio de los peces en las muestras. OBJ = objeto flotante; LP = caña; NOA = peces no asociados; DEL = delfín; t = toneladas métricas.

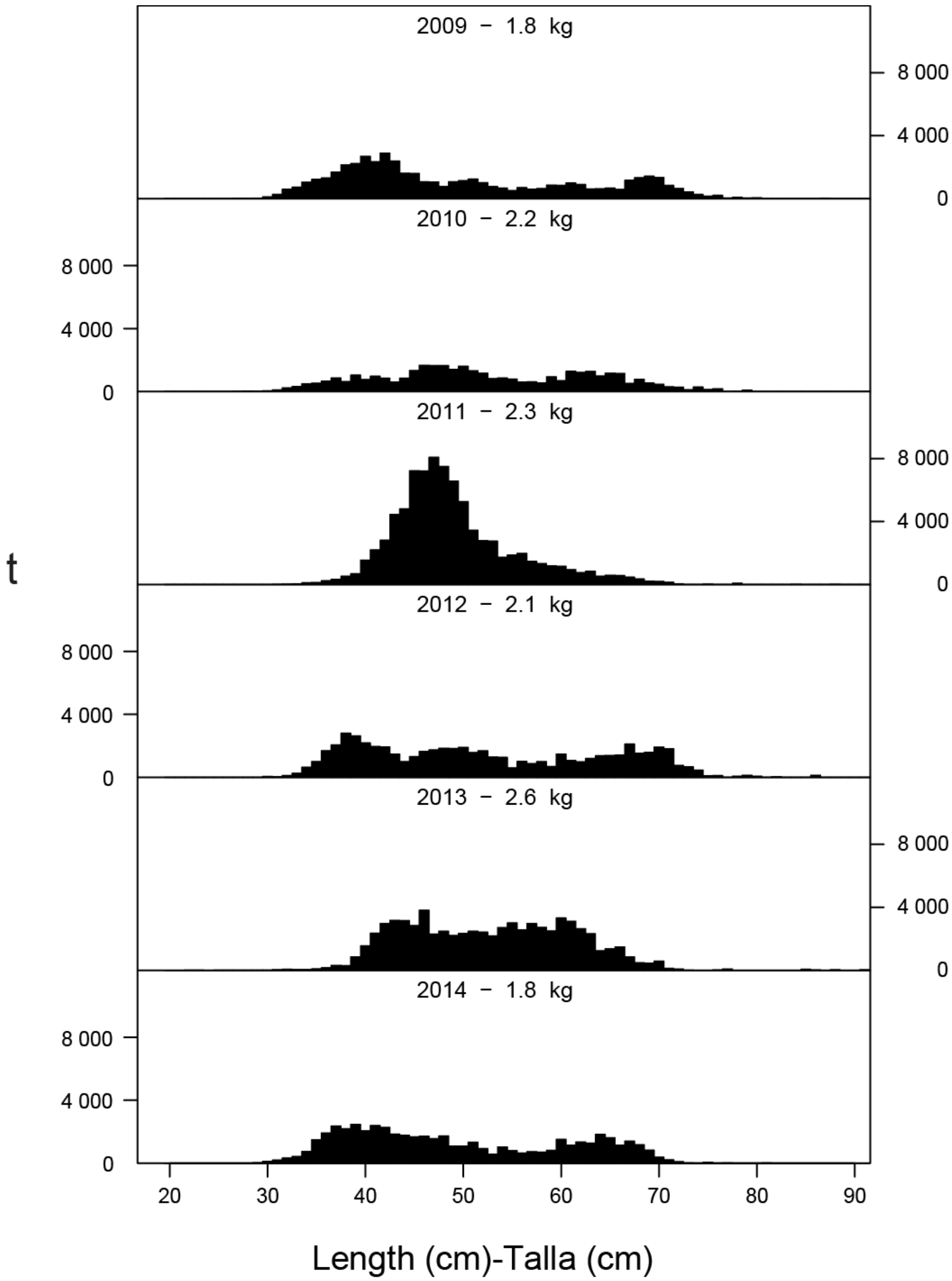

FIGURE 3b. Estimated size compositions of the skipjack caught in the EPO during the second quarter of 2009-2014. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.
FIGURA 3b. Composición por tallas estimada para el barrilete capturado en el OPO en el segundo trimestre de 2009-2014. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas.

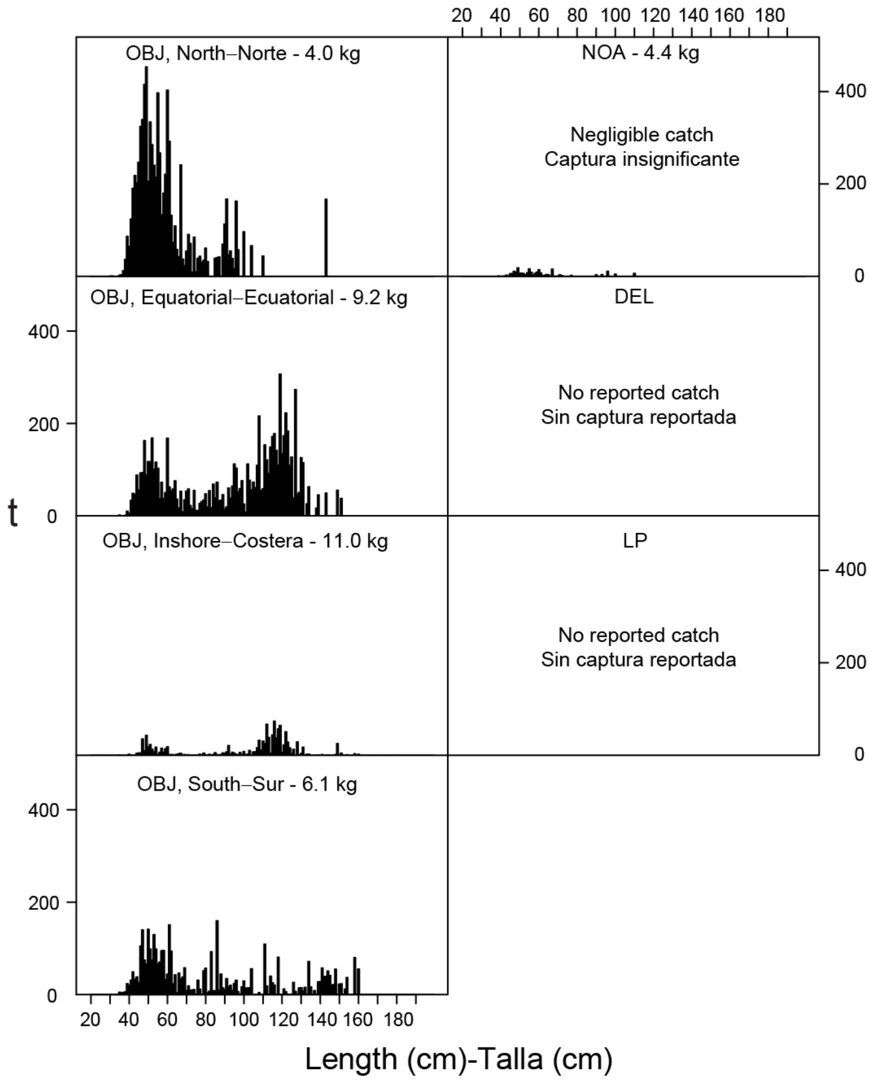

FIGURE 4a. Estimated size compositions of the bigeye caught in each fishery of the EPO during the second quarter of 2014. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 4a. Composición por tallas estimada para el patudo capturado en cada pesquería del OPO durante el segundo trimestre de 2014. En cada recuadro se detalla el peso promedio de los peces en las muestras. OBJ = objeto flotante; LP = caña; NOA = peces no asociados; DEL = delfín; t = toneladas métricas.

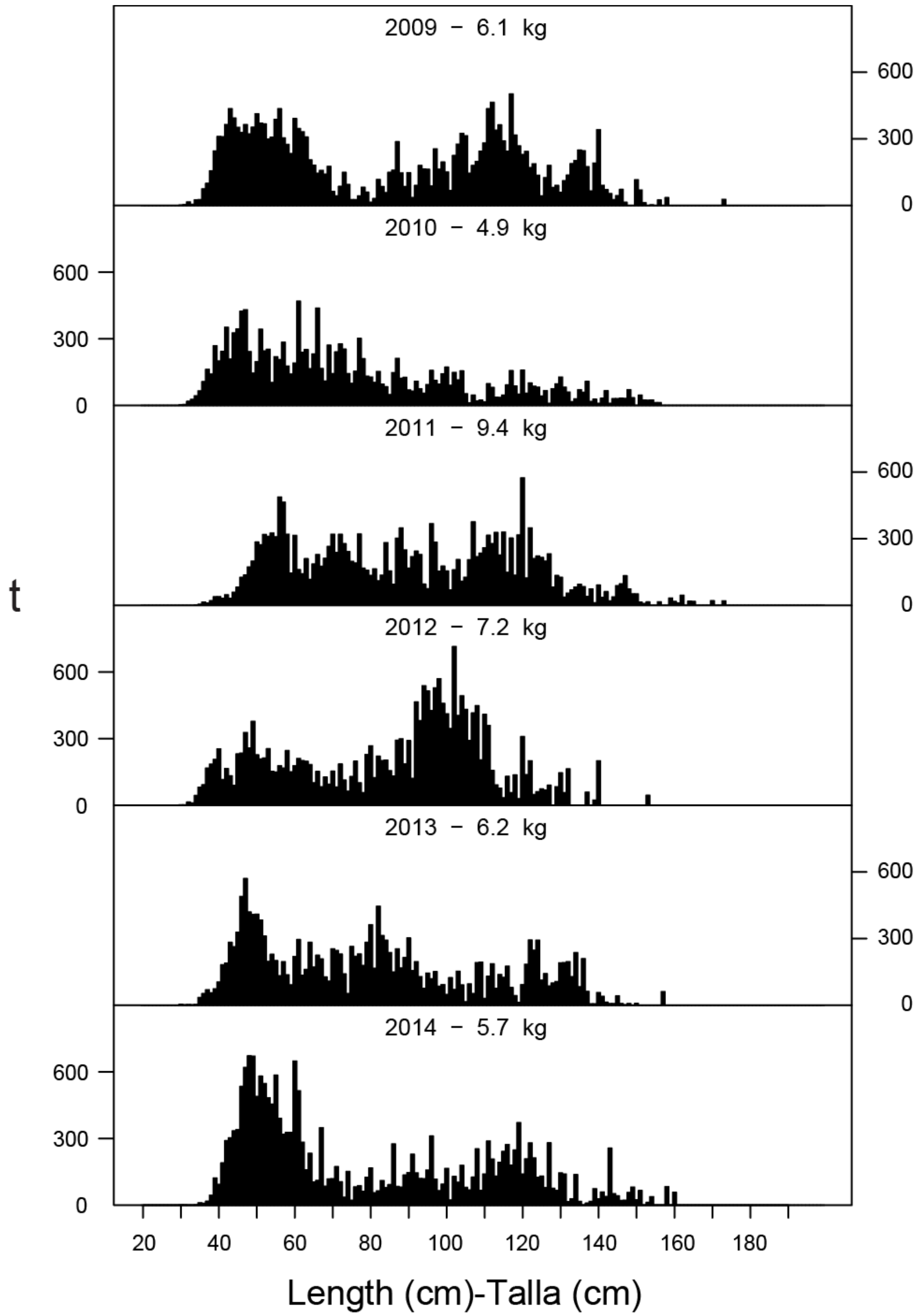

FIGURE 4b. Estimated size compositions of the bigeye caught in the EPO during the second quarter of 2009-2014. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 4b. Composición por tallas estimada para el patudo capturado en el OPO en el segundo trimestre de 2009-2014. En cada recuadro se detalla el peso promedio de los peces en las muestras; t = toneladas métricas.

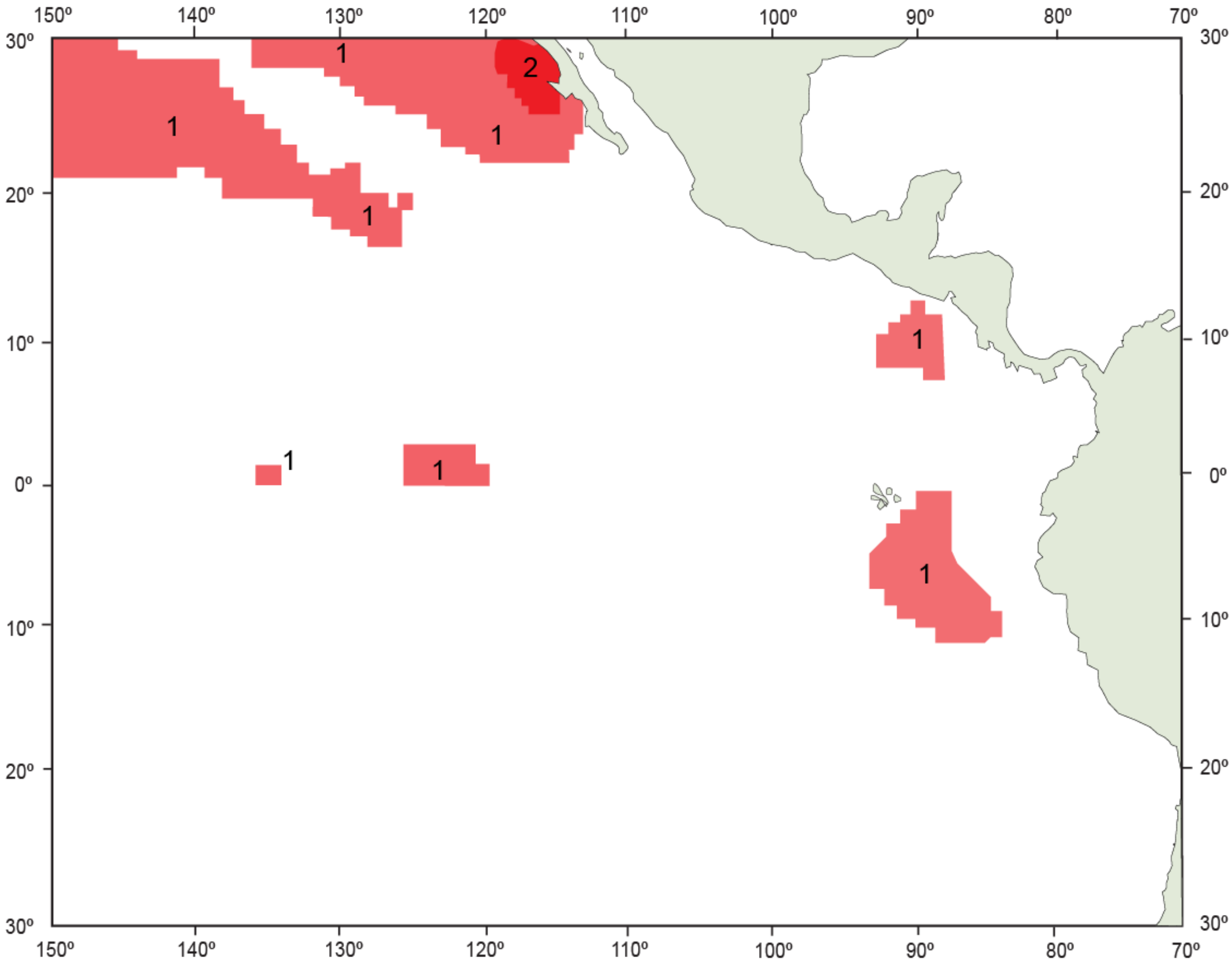

FIGURE 5. Sea-surface temperature (SST) anomalies (departures from long-term normals) for September 2014, based on data from fishing boats and other types of commercial vessels.
FIGURA 5. Anomalías (variaciones de los niveles normales a largo plazo) de la temperatura superficial del mar (TSM) en septiembre de 2014, 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 2014 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 2014, y de la capacidad de acarreo de los mismos, en metros cúbicos, por bandera, arte de pesca, y volumen de bodega. Se incluye cada buque en los totales de cada bandera bajo la cual pescó durante el año, pero solamente una vez en el total de la flota; por consiguiente, los totales de las flotas no son siempre iguales a las sumas de las banderas individuales. PS = cerquero; LP = cañero.

Flag	Gear	Well volume–Volumen de bodega				Capacity
Bandera	Arte	1-900	901-1700	>1700	Total	Capacidad
			Number—Número			
Colombia	PS	4	10	-	14	14,860
Ecuador	PS	72	23	12	107	85,865
EU (España—Spain)	PS	-	-	4	4	10,116
Guatemala	PS	-	1	-	1	1,475
México	PS	10	33	1	44	52,558
	LP	3	-	-	3	268
Nicaragua	PS	-	6	1	7	9,966
Panamá	PS	2	8	3	13	18,039
Perú	PS	2	-	-	2	599
El Salvador	PS	-	1	3	4	7,892
USA—EE.UU	PS	-	1	-	1	1,251
Venezuela	PS	-	14	1	15	20,890
All flags—	PS	90	97	25	212	
Todas banderas	LP	3	-	-	3	
	PS + LP	93	97	25	215	
			Capacity—Capacidad			
All flags—	PS	42,996	127,407	53,108	223,511	
Todas banderas	LP	268	-	-	268	
	PS + LP	43,264	127,407	53,108	223,779	

TABLE 2. Estimates of the retained catches of tunas in the EPO from 1 January through 28 September 2014, 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 28 de septiembre de 2014, 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	13,665	16,415	1,320	-	-	-	-	-	31,400	7.3
Ecuador	26,944	125,553	26,194	-	1,857	-	389	965	181,902	42.1
México	103,239	6,868	17	4,862	1,003	-	3,002	79	119,070	27.5
Nicaragua	7,485	4,615	1,964	-	-	-	1	51	14,116	3.3
Panamá	15,182	15,942	5,192	-	2	-	5	253	36,576	8.5
Venezuela	19,803	8,342	339	-	-	-	6	-	28,490	6.6
Other—Otros[2]	4,913	11,869	3,651	404	-	-	-	-	20,837	4.7
Total	191,231	189,604	38,677	5,266	2,862	-	3,403	1,348	432,391	

[1] May include other tunas, sharks, mackerel, and miscellaneous fishes
[1] Puede incluir otros túnidos, tiburones, caballas, y peces diversos
[2] Includes El Salvador, European Union (Spain), Guatemala, and United States; this category is used to avoid revealing the operations of individual vessels or companies.
[2] Incluye El Salvador, Estados Unidos, Guatemala, 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 2014 by longline vessels.
TABLA 3. Capturas reportadas de atún patudo en el OPO durante 2014 por buques palangreros.

Country	First quarter	Second quarter	Third quarter				Total to date
			July	August	September	Total	
Pais	**Primer trimestre**	**Segundo trimestre**	**Tercer trimestre**				**Total al fecha**
			Julio	**Agosto**	**Septiembre**	**Total**	
China	786	1,021	184	-	-	184	1,991
Japan—Japón	3,619	2,230	871	948	829	2,648	8,497
Republic of Korea—República de Corea	1,666	1,045	189	285	1,154	1,628	4,339
Chinese Taipei—Taipei Chino	1,304	193	144	274	441	859	2,356
USA—EE.UU	-	-	-	-	-	-	476
Vanuatu	-	-	-	-	-	-	-
Total	7,375	4,489	1,388	1,507	2,424	5,319	17,659

TABLE 4. Oceanographic and meteorological data for the Pacific Ocean, October 2013-September 2014. The values in parentheses are anomalies. SST = sea-surface temperature; SOI = Southern Oscillation Index; SOI* and NOI* are defined in the text.
TABLA 4. Datos oceanográficos y meteorológicos del Océano Pacífico, octubre 2013-septiembre 2014. Los valores en paréntesis son anomalías. TSM = temperatura superficie del mar; IOS = Índice de Oscilación del Sur; IOS* y ION* están definidas en el texto.

Month—Mes	**10**	**11**	**12**	**1**	**2**	**3**
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	20.2 (-0.6)	21.1 (-0.5)	22.6 (-0.2)	24.8 (0.3)	25.4 (-0.8)	25.9 (-0.8)
Area 2 (5°N-5°S, 90°-150°W	24.7 (-0.2)	24.8 (-0.2)	25.1 (0.0)	25.3 (-0.4)	25.6 (-0.8)	26.9 (-0.2)
Area 3 (5°N-5°S, 120°-170°W)	26.4 (-0.3)	26.7 (0.0)	26.5 (0.0)	26.1 (-0.5)	26.2 (-0.6)	27.0 (-0.2)
Area 4 (5°N-5°S, 150W°-160°E)	28.7 (0.0)	28.9 (0.3)	28.6 (0.2)	28.1 (-0.2)	28.4 (0.3)	28.7 (0.5)
Thermocline depth—Profundidad de la termoclina, 0°-80°W	30	30	35	35	15	10
Thermocline depth—Profundidad de la termoclina, 0°-110°W	80	80	120	45	25	60
Thermocline depth—Profundidad de la termoclina, 0°-150°W	140	165	155	140	150	160
Thermocline depth—Profundidad de la termoclina, 0°-180°	180	180	170	185	180	180
SOI—IOS	-0.1	0.7	0.1	1.4	0.1	-0.9
SOI*—IOS*	-0.55	3.28	0.41	1.61	1.77	1.20
NOI*—ION*	0.93	0,14	4.97	3.98	-0.95	-0.60

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

Month—Mes	**4**	**5**	**6**	**7**	**8**	**9**
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	25.2 (-0.4)	25.6 (1.3)	24.6 (1.8)	23.0 (1.4)	21.9 (1.3)	21.3 (1.0)
Area 2 (5°N-5°S, 90°-150°W	27.7 (0.2)	27.7 (0.6)	27.4 (0.9)	26.3 (0.7)	25.5 (0.5)	25.3 (0,5)
Area 3 (5°N-5°S, 120°-170°W)	28.0 (0.2)	28.3 (0.5)	28.1 (0.5)	27.4 (0.2)	27.0 (0.2)	27.2 (0.5)
Area 4 (5°N-5°S, 150W°-160°E)	29.1 (0.6)	29.6 (0.8)	29.5 (0.6)	29.1 (0.3)	29.1 (0.5)	29.3 (0.7)
Thermocline depth—Profundidad de la termoclina, 0°-80°W	50	70	50	25	15	30
Thermocline depth—Profundidad de la termoclina, 0°-110°W	110	90	95	60	40	60
Thermocline depth—Profundidad de la termoclina, 0°-150°W	150	150	130	130	160	145
Thermocline depth—Profundidad de la termoclina, 0°-180°	170	170	160	160	175	175
SOI—IOS	0.8	0.5	0.2	-0.2	-0.7	-0.7
SOI*—IOS*	4.67	2.33	1.19	0.28	-6.64	0.64
NOI*—ION*	1.16	1.39	1.56	-0.95	-1.60	-3.84

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 third quarter of 2014. 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 tercer trimestre de 2014. Los números entre paréntesis indican los totales acumulados para el año.

Flag	Trips		Class 6—Observed by program						Percent observed	
			IATTC		National		WCPFC			
Bandera	Viajes		Clase 6—Observado por programa						Porcentaje observado	
			CIAT		Nacional		WCPFC			
Colombia	9	(34)	2	(17)	7	(17)			100.0	(100)
Ecuador	62	(251)	38	(162)	24	(86)	0	(3)	100.0	(100)
El Salvador	4	(15)	4	(12)			0	(3)	100.0	(100)
EU-UE (Spain)	7	(23)	5	(9)	2	(14)			100.0	(100)
EE.UU-USA	1	(2)					1	(2)	100.0	(100)
Guatemala	1	(4)	1	(4)					100.0	(100)
México	61	(183)	33	(91)	28	(92)			100.0	(100)
Nicaragua	5	(21)	3	(11)	2	(10)			100.0	(100)
Panamá	13	(51)	8	(28)	5	(23)			100.0	(100)
Venezuela	10	(39)	6	(20)	4	(19)			100.0	(100)
Total	173	(623)	100	(354)	72	(261)	1	(8)	100.0	(100)
			Classes 4 and 5—Clases 4 y 5							
Colombia	1	(1)	1	(1)					-[1]	-[1]
Ecuador	7	(7)	2	(2)	5	(5)			-[1]	-[1]
Total	181	631	103	357	77	266	1	(8)	100.0	100.0

[1] The AIDCP does not require vessels smaller than class-size 6 to be sampled at 100 percent.—El APICD no require que buques menores de clase 6 sean muestreados al 100%.