INTER-AMERICAN TROPICAL TUNA COMMMISSION
COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL

QUARTERLY REPORT—INFORME TRIMESTRAL

July-September 2016—Julio-Septiembre 2016

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 third 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 66th year. The results of the IATTC staff's research are published in the IATTC's Bulletin and Stock Assessment Report series in English and Spanish, its two official languages, in its Special Report and Data Report series, and in books, outside scientific journals, and trade journals. Summaries of each year's activities are reported upon in the IATTC's Annual Reports and Fishery Status Reports, also in the two languages.

MEETINGS

Dr. Guillermo A. Compeán participated in the Sixth Meeting of the Regional Fishery Body Secretariats' Network (RSN), which took place at the FAO headquarters in Rome on 9 and 15 July 2016. The meeting provided an opportunity for discussion of current global fisheries management and of aquaculture development issues.

A joint meeting of the secretariats of the regional fishery management organizations (RFMOs) was held after the RSN meeting. Dr. Guillermo A. Compeán was elected to serve as chairman of this meeting. The status of the Consolidated List of Authorized Vessels (CLAV) and the implementation of the Port State Measures Agreement were among the topics that were discussed.

Dr. Guillermo A. Compeán also participated in a meeting of the FAO Committee on Fisheries (COFI) at the FAO headquarters in Rome, on 11-15 July 2016. At that meeting the programs of work of FAO in the field of fisheries and aquaculture and their implementation were reviewed.

Mr. Kurt M. Schaefer participated in the 12th Scientific Committee meeting of the Western and Central Pacific Fisheries Commission in Kuta, Bali, Indonesia, on 3-11 August, 2016, at which he presented an overview of the eastern Pacific Ocean tuna fisheries through 2015 and accounts of the current stock assessments for yellowfin, skipjack, and bigeye tuna prepared by the IATTC staff. While at the meeting, Mr. Schaefer also participated in the Eighth Steering Committee meeting for the Pacific Tuna Tagging Programme. Most of the documents presented at the meeting, including a summary report, can be viewed at the following web site: https://www.wcpfc.int/meetings/sc12

Dr. Guillermo A. Compeán met with Ing. Guillermo Morán, Chair of the IATTC, at the IATTC's headquarters in La Jolla, California, USA, on 25 August 2016, in regard to the tuna conservation measures that were to be discussed during a resumption of the 90th meeting of the IATTC, which was to take place in La Jolla on 12-14 October 2016.

The Our Ocean Conference, hosted by the U.S. Secretary of State John Kerry, took place in Washington, D.C, USA, on 15-16 September 2016. It focused on important current ocean issues, including pollution, climate change, sustainable fisheries, and marine protected areas. The IATTC was represented at that meeting by Dr. Guillermo A. Compeán.

At the invitation of the government of Colombia, Dr. Guillermo A. Compeán participated in a meeting with representatives of the Colombian fisheries industry in Bogotá. Colombia, on 22-23 September 2016. The subject of the meeting was tuna conservation measures. Its purpose was to ensure that industry representatives understood the proposed recommendations of the IATTC staff.

At the invitation of the government of Mexico, Dr. Guillermo A. Compeán participated in a similar meeting with representatives of the Mexican fisheries industry in Mazatlán, Mexico, on 26 September 2016.

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 Mazatlán, 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. 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 474 length-frequency samples from 267 wells and abstracted logbook information for 308 trips of commercial fishing vessels during the third quarter of 2016.

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 2016 is about 264,859 m^3 (Table 1). The average weekly at-sea capacity for the fleet, for the weeks ending 10 July through 2 October, was about 154,000 m^3 (range: 129,400 to 191,300 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 2016, and the equivalent statistics for 2011-2015, were:

Species	2016	2011-2015			Weekly average, 2016
		Average	Minimum	Maximum	
Yellowfin	190,600	184,400	175,700	196,200	4,900
Skipjack	252,000	210,400	189,600	233,200	6,500
Bigeye	37,900	39,600	35,900	44,200	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 2016 and comparative statistics for 2011-2015 were:

Region	Species	Gear	2016	2011-2015		
				Average	Minimum	Maximum
N of 5°N	yellowfin	PS	12.7	15.4	14.1	17.4
S of 5°N			3.5	3.4	2.7	4.1
N of 5°N	skipjack	PS	1.4	1.9	1.1	2.9
S of 5°N			16.6	10.6	9.3	12.2
EPO	bigeye	PS	2.8	2.4	2.2	2.8
EPO	yellowfin	LP	0.0	4.1	0.0	11.2
EPO	skipjack	LP	0.0	1.0	0.0	4.4

Catch statistics for the longline fishery

IATTC Resolution C-13-01 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 2016 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 populations. 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 2011-2016 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 2016, and the second shows data for the combined strata for the second quarter of each year of the 2011-2016 period. Samples from 287 wells were taken during the second quarter of 2016.

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 287 wells sampled that contained fish caught during the second quarter of 2016, 220 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, which also produced the largest size tuna. Lesser amounts of large yellowfin with an average weight of 34.0 kg were caught in the Southern dolphin fishery. Smaller size yellowfin in the 35-60 cm range were taken in all four of the floating-object fisheries.

The estimated size compositions of the yellowfin caught by all fisheries combined during the second quarters of 2011-2016 are shown in Figure 2b. The average weight of the yellowfin caught during the second quarter of 2016 (9.8 kg) was lower than those of any of the previous 5 years. Most of the large yellowfin caught during 2016 was found in a range between 105-145 cm, whereas during the previous years the large yellowfin were distributed in a range between 75 and 155 cm.

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 287 wells sampled that contained fish caught during the second quarter of 2016, 177 contained skipjack. The estimated size compositions of these fish are shown in Figure 3a. Large amounts of skipjack in the 30- to 45-cm range were caught in the Northern and Southern floating-object fisheries. The larger skipjack in the 45-75 cm range were caught in the Southern unassociated fishery, and, to a lesser extent, in the Inshore floating-object fishery.

The estimated size compositions of the skipjack caught by all fisheries combined during the second quarters of 2011-2016 are shown in Figure 3b. For the third consecutive year the average weight for the second quarter of 2016 (1.4 kg) declined from the previous year, and was the lower that of any of the previous five years, which ranged from 1.6 to 2.6 kg. Most of the skipjack catch was between 30 and 50 cm.

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 287 wells sampled that contained fish caught during the second quarter of 2016, 73 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 in the Northern and Southern fisheries, with average weights of 3.5 and 4.1 kg, respectively.

The estimated size compositions of the bigeye caught by all fisheries combined during the second quarters of 2011-2016 are shown in Figure 4b. For the fifth consecutive year the average weight for the second quarter of 2016 declined from the previous year. The average weight ranged from a high of 9.4 kg in 2011 to the low of 4.0 kg in 2016. Most of the bigeye were less than 90 cm in length.

The estimated retained purse-seine catch of bigeye less than 60 cm in length during the first two quarters of 2016 was 7,620 metric tons (t), or about 46 percent of the estimated total retained purse-seine catch of bigeye during that period. The corresponding amounts for the first two quarters of 2011-2015 ranged from 4,260 to 9,967 t, or 20 to 53 percent of the estimated total retained purse-seine catch.

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, on 1, 13-23, and 25 July, 16-23 August, and 15-20 September. Spawning occurred between 11:15 p.m. and 00:15 a.m. The number of eggs collected ranged from 2,000 to 218,000 per day. During the quarter the water temperatures in the tank ranged from 27.9 to 28.9°C.

At the end of the quarter there were two 55- to 57-kg and four 29- to 32-kg yellowfin in Tank 1. There were 23 3- to 6-kg yellowfin in the 170,000-L reserve broodstock tank (Tank 2). All healthy individuals from this group of fish will be transferred to Tank 1 in order to rebuild the broodstock during the fourth quarter of 2016.

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

Two experiments with Pacific bluefin (PBF) larvae were conducted at the Oshima Experimental Station, Kindai University, Wakayama Prefecture, Japan, during July: one experiment was designed to examine the feeding selection of larvae on larger (≥224 microns) prey sizes of rotifers, and the second experiment was designed to examine larval growth under a moderately high daily mean food level of 2900 rotifers/L. Growth, survival, and gut contents of the larvae from both trials are currently being analyzed. These trials are continuation experiments of comparative studies of PBF and YFT larvae from the recently-completed 5-year joint study of PBF and YFT conducted by the IATTC, Kindai University, and the Aquatic Resources Authority of Panama (ARAP). Discussions were also conducted with Kindai University faculty members to prepare a proposal to be submitted to the Japan International Cooperation Agency (JICA) for a new 5-year joint study of PBF and YFT in Japan and Panama.

Nutritional studies

During the quarter the IATTC worked with Texas A&M University (TAMU) adjunct professor Dr. Alejandro Buentello, Fish Nutritionist and Physiologist with Ichthus, Inc., and Dr. Juan Sierra of the University of Miami, to conduct a YFT nutrition trial using prepared diets. In preparation for these trials, the reserve broodstock tank, Tank 2, was stocked with 23 wild-caught YFT ranging in size from about 45 to 65 cm fork length. Several different prepared diets were tested for palatability and effects on growth in length and weight of the captive tuna. Ichthus, Inc. is providing the funding for this project. The trial was completed successfully at the end of the quarter, and final nutritional samples were obtained for analysis.

Tuna bycatch reduction technology studies

In a research project funded by the International Seafood Sustainability Foundation (ISSF), Dr. Gala Moreno of the ISSF and Dr. Guillermo Boyra and Xiker Salaberria of AZTI-Tecnalia, Derio, Basque Country, Spain, measured the acoustic properties (species-specific target strength related to length and behavior and species-specific-frequency response) of 45 to 71 cm yellowfin in the juvenile sea cage near the Achotines Laboratory for use as a possible bycatch mitigation measure for the drifting FAD (Fish Aggregating Device) fishery. The size class of 40-60 cm yellowfin is often associated with skipjack and bigeye tunas around drifting FADs. Each species has distinct acoustic properties, which can be detected remotely by echo-sounder buoys, so that areas of high presence of undesired sizes and tuna species at FADs could be avoided with development of this technology. The project was successfully completed at the end of July.

Also during the quarter, the IATTC bycatch research program conducted a feasibility study at the Achotines Laboratory with funding by the European Union, to design and deploy three anchored prototype FADs that were non-entangling and biodegradable. The FADs survived for up to 5 weeks offshore from the Laboratory. The design will be modified further to withstand strong ocean conditions for up to 4 months before being deployed in fishing areas.

Workshop

The IATTC and the University of Miami (Miami, Florida, USA) held their 14th workshop, "Physiology and Aquaculture of Pelagics, with Emphasis on Reproduction and Early Developmental Stages of Yellowfin Tuna," from 6 to 16 July 2016. The organizers were Dr. Daniel Margulies and Mr. Vernon P. Scholey of the IATTC staff and Dr. Daniel D. Benetti, Director of the Aquaculture Program of the Rosenstiel School of Marine and Atmospheric Science (RSMAS), University of Miami. Mr. Scholey and Dr. Benetti served as instructors. The participants included one of Dr. Benetti's graduate students and two aquaculture/biology professionals from Mexico and the USA. A fee for the participants and students covered the costs of putting on the workshop. 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 Open Blue cobia (*Rachycentron canadum*) culture laboratories and ocean cages on the Caribbean coast of Panama.

Other collaborations

During July, Cryoocyte, Inc., a research and technology company based in Boston, Massachusetts, USA, conducted further pilot studies at the Achotines Lanoratory to test the feasibility of cryopreservation techniques for YFT embryonic stages. Cryoocyte, Inc., is providing the funding for the trials.

Studies of snappers

The work on snappers (*Lutjanus* spp.) is carried out by the Autoridad de los Recursos Acuáticos de Panama (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 2016, a small group of fish continued to be held in the broodstock snapper tank. These fish began spawning during 2015 (see IATTC Quarterly Report for July-September 2015) and have continued spawning sporadically throughout the first three quarters of 2016.

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. An additional index, the Northern Oscillation Index (NOI*) (Progress Ocean., 53 (2-4): 115-139) has 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. The NOI* values are negative during El Niño events and positive during anti-El Niño events.

During the fourth quarter of 2015, the SSTs in the EPO were well above normal, with a broad band of water along the Equator with SSTs 2º and 3º above normal (IATTC Quarterly Report for October-December 2015: Figure 5). During the first quarter of 2016, there were no SSTs north of 25ºS that were more than 1º below normal, but there were extensive areas, especially between 10ºN and 10ºS with SSTs more than 2º above normal (Quarterly Report for January-March 2016: Figure 8). During the second quarter of 2016, the SSTs were much cooler, although there were scattered areas, both north and south of the Equator with SSTs more than 2º above normal (Quarterly Report for April-June 2016: Figure 5). However, there was a narrow band of cool water along the Equator with areas more than 2º below normal off Ecuador and west of 125ºW. During the third quarter of 2016, there were fewer areas with SSTs more than 2º above normal or more than 2º below normal. The latter occurred only along the Equator west of 125ºW. (Figure 5).

"According to the Climate Diagnostics Bulletin of the U.S. National Weather Service, "La Niña [anti-El Niño) is favored to develop (~70% chance) during the Northern Hemisphere fall 2016 and slightly favored to persist (~55% chance) during winter 2016-17."

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 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." Furthermore, Resolution C-13-01 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 day's 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).

During the third quarter of 2016 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 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. During the third quarter of 2016 one Party to both regional fisheries management organizations, and to the AIDCP, requested that six cross-endorsed observers be allowed to be deployed on trips of vessels of its flag, operating in both Convention areas. In addition, observers from the IDCP On-Board Observer Program departed on 203 fishing trips aboard purse seiners covered by that program during the third quarter of 2016, for a total of 209 sampled trips. Preliminary coverage data for these vessels during the quarter are shown in Table 5.

Observer training

There were no regular observer training sessions conducted by the IATTC staff during the third quarter of 2016. Nevertheless, at the request of the WCPFC, there was a training session for 20 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 Port Vila, Republic of Vanuatu, during 8-12 August 2016. The instructors were Messrs. Ernesto Altamirano of the IATTC staff and Mr. Karl Staisch, the observer program coordinator for the WCPFC. All costs of that training, including travel and accommodations for Mr. Altamirano. were borne by the WCPFC.

Gear project

During the third quarter of 2016 the IATTC staff did not carry out any dolphin safety-gear inspections or safety-panel alignment procedures for Class-6 purse seiners participating in the fisheries for tuna associated with dolphins. Nevertheless, members of the staff of the national observer program of Mexico, trained by the IATTC staff, conducted 12 of these inspections and alignments.

Training and certification of fishing captains and crew members

The IATTC has conducted dolphin mortality reduction seminars for tuna fishermen since 1980. Article V of the AIDCP calls for the establishment, within the framework of the IATTC, of a system of technical training and certification of fishing captains. Under the system, the IATTC staff is responsible for maintaining a list of all captains qualified to fish for tunas associated with dolphins in the EPO. The names of the captains who meet the requirements are to be supplied to the International Review Panel for approval and circulation to the Parties to the AIDCP.

One of the requirements for new captains is to attend a training seminar organized by the IATTC staff or by the pertinent national program in coordination with the IATTC staff. The fishermen and others who attend the seminars are presented with certificates of attendance.

During the third quarter of 2016 Dr. Martín A. Hall and Mr. Erich Largacha conducted one such seminar, which took place in Manta, Ecuador, on 3 August 2016 for 39 attendees

INTER-AGENCY COOPERATION

The IATTC staff has cooperated extensively with other organizations all over the world since its inception. One example is briefly described in the following two paragraphs.

Artisinal fisheries are conducted in the Golfo de Ulloa, Baja California Sur, Mexico, with longline and gillnet gear deployed mostly from vessels based in two ports in Baja California Sur, Adolfo Lopez-Mateos and Punta Abreojos. The principal target species are sharks and other coastal fishes. A Mexican government agency, the Comisión Nacional de Acuacultura y Pesca (CONAPESCA), is responsible for the management of this fishery. It organized an observer program, the Sistemas y Servicios Ambientales (SISA, S.A.) to collect data on these fisheries. Mr. Marlon H. Román was invited to spend the period of 5-8 August 2016, at the two ports, where he participated in two workshops related to identification of loggerhead turtles (*Caretta caretta*) and observers' feedback on identification of these turtles.

Mr. Román's travel expenses were paid by the executors of the workshop.

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Humphries, Nicolas E., Kurt M. Schaefer, Daniel W. Fuller, Grace E M. Phillips, Catherine Wilding, and David W. Sims. 2016. Scale-dependent to scale-free daily behavioural switching and optimized searching in a marine predator. Animal Behaviour, 113: 189-201.

Olson, R.J., J.W. Young, F. Menard, M. Potier, V. Allain, N. Goñi, J.M. Logan, and F. Galván-Magaña. 2016. Bioenergetics, trophic ecology, and niche separation of tunas. Advances Mar. Biol., 74: 199-342.

Restrepo1, Victor, Laurent Dagorn, Gala Moreno, Fabien Forget, Kurt Schaefer, Igor Sancristobal, Jeff Muir, and David Itano. 2016. Compendium of ISSF at-sea bycatch mitigation research activities as of July 2016. ISSF Technical Report 2016-13, International Seafood Sustainability Foundation, McLean, Virginia, USA.: 70 pp.

Schaefer, Kurt M., and Daniel W. Fuller. 2016. Methodologies for investigating oceanadromous fish movements; archival and pop-up satellite archival tags. *In* Morais, Pedro, and Francoise Daverat (editors) An Introduction to Fish Migration. CRC Press, Boca Raton, London, and New York: 251-289.

Sun. Jenny, Michael G. Hinton, and D.G. Webster. 2016. Modeling the spatial dynamics of international tuna fleets. PLoS ONE 11(8): e0159626. doi:10.1371/journal.pone.0159626.

The paper by Olson *et al*. is particularly noteworthy, as the editors of Advances in Marine Biology are highly selective as to what they accept for publication. It is published only once a year, and in hardcover.

ADMINISTRATION

Mr. Andrés Romero Caicedo, a graduate of the Instituto Politécnico Nacional of Ecuador (Maestro en Ciencias en Manejo de Recursos Marinos), joined the La Jolla staff of the IATTC on 1 July 2016. He has replaced Mr. Lesly Rodríguz, who retired on 30 April 2016. He spent the first two weeks of July in Manta, Ecuador, where he became familiar with the work carried out at the IATTC field offices. He arrived in San Diego on 15 July 2016, and began work on 18 July 2016.

Mr. Bradley A. Wiley has been appointed to succeed Mr. Edward H. Everett as supervisor of the IATTC's field offices in Ecuador, Mexico, Panama, and Venezuela. His duties will include, but will not be limited to:

- Field office staff members' and observers' salary adjustments and contracts;
- Audit/review submitted expense reports for field offices and purchase requisitions;
- Conduct on-site audits of stations' activities and compliance every 12-18 months; monitor staff sampling techniques and performance; conduct refresher training, introducing new techniques and methods as required; keeping performance and techniques standardized across field offices as directed by science programs;
- Day-to-day field office communications, such as reviewing data handling procedures with data editors.

Dr. Shane Griffiths joined the IATTC staff's Biology and Ecosystem Program as a senior scientist, leading the ecosystem research program, on 12 September 2016. He is taking the place of Dr. Robert J. Olson. Dr. Griffiths has a Ph.D. degree in fish ecology from the University of Wollongong, Australia, and 14 years of experience working as a Principal Research Scientist for the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Australia. He has led numerous research projects investigating the trophic ecology, biology, movements, and population dynamics of tropical tunas, tuna-like species, billfishes, and sharks. He has extensive experience in ecological risk assessment, ecosystem modeling, and designing innovative survey tools for sampling recreational and artisanal fishermen.

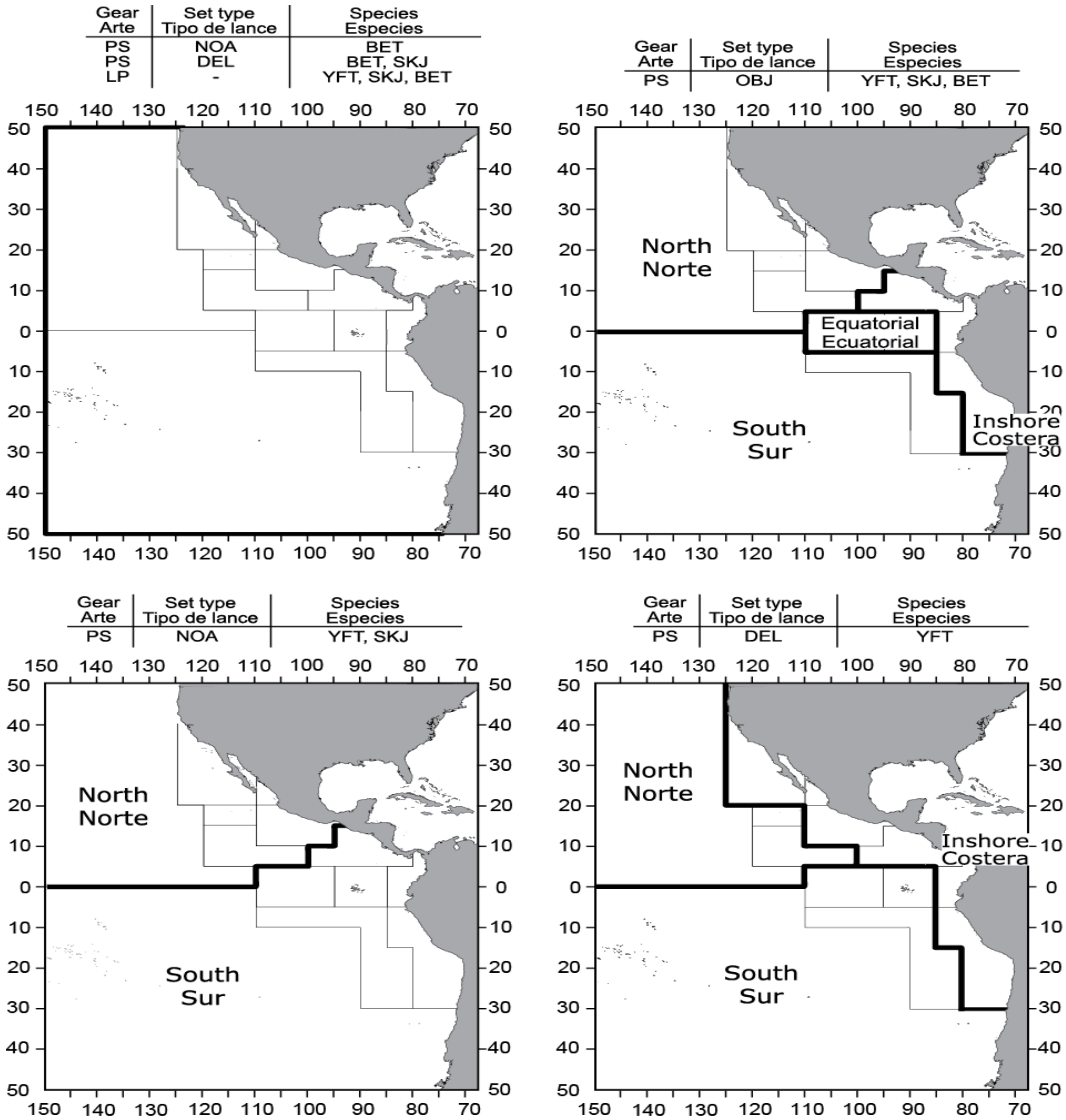

FIGURE 1. Spatial extents of the fisheries defined by the IATTC staff for stock assessment of yellowfin, skipjack, and bigeye in the EPO. The thin lines indicate the boundaries of the 13 length-frequency sampling areas, and the bold lines the boundaries of the fisheries. Gear: PS = purse seine, LP =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

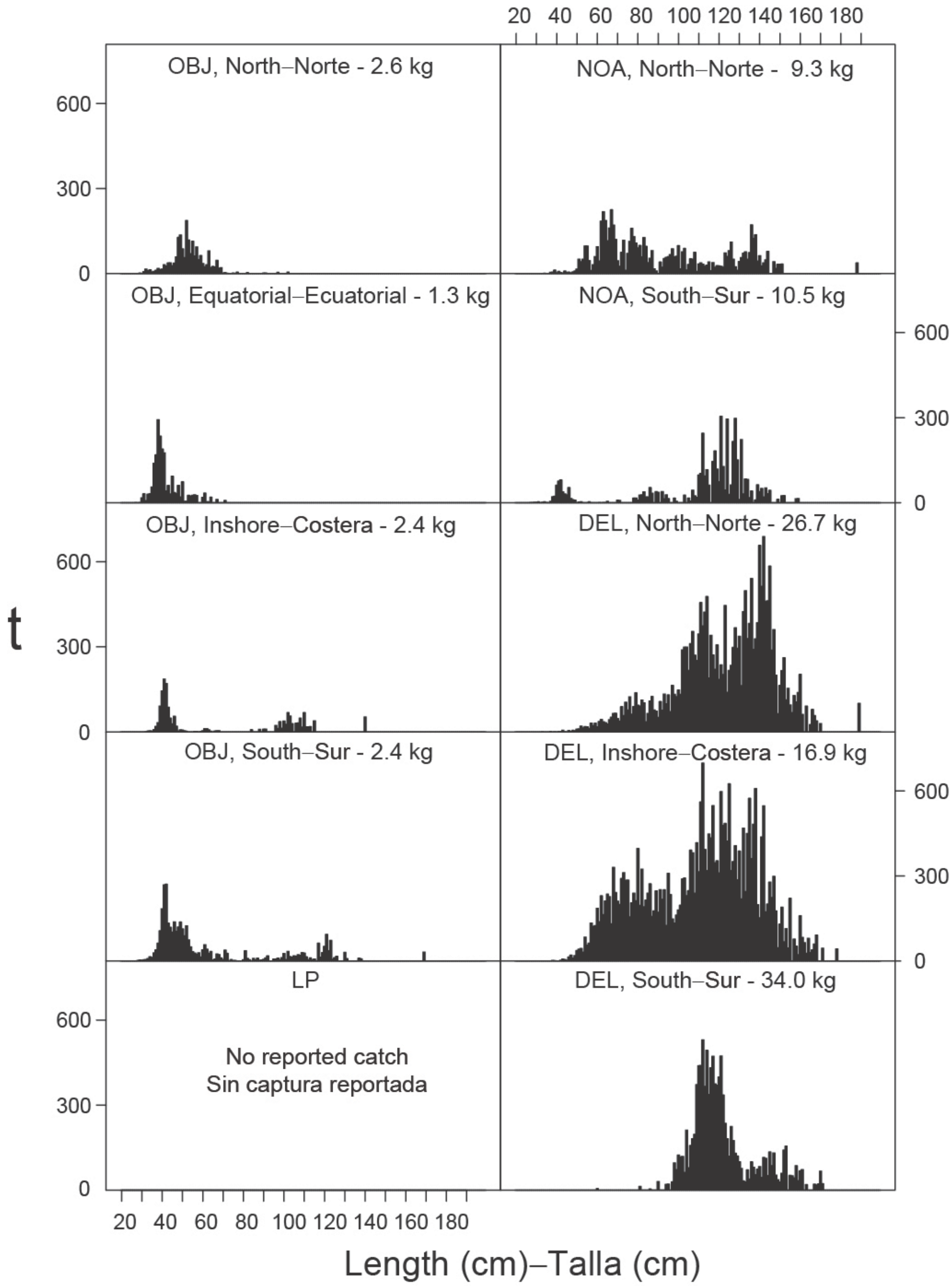

FIGURE 2a. Estimated size compositions of the yellowfin caught in each fishery of the EPO during the second quarter of 2016. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 2a. Composición por tallas estimada para el aleta amarilla capturado en cada pesquería del OPO durante el segundo trimestre de 2016. 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.

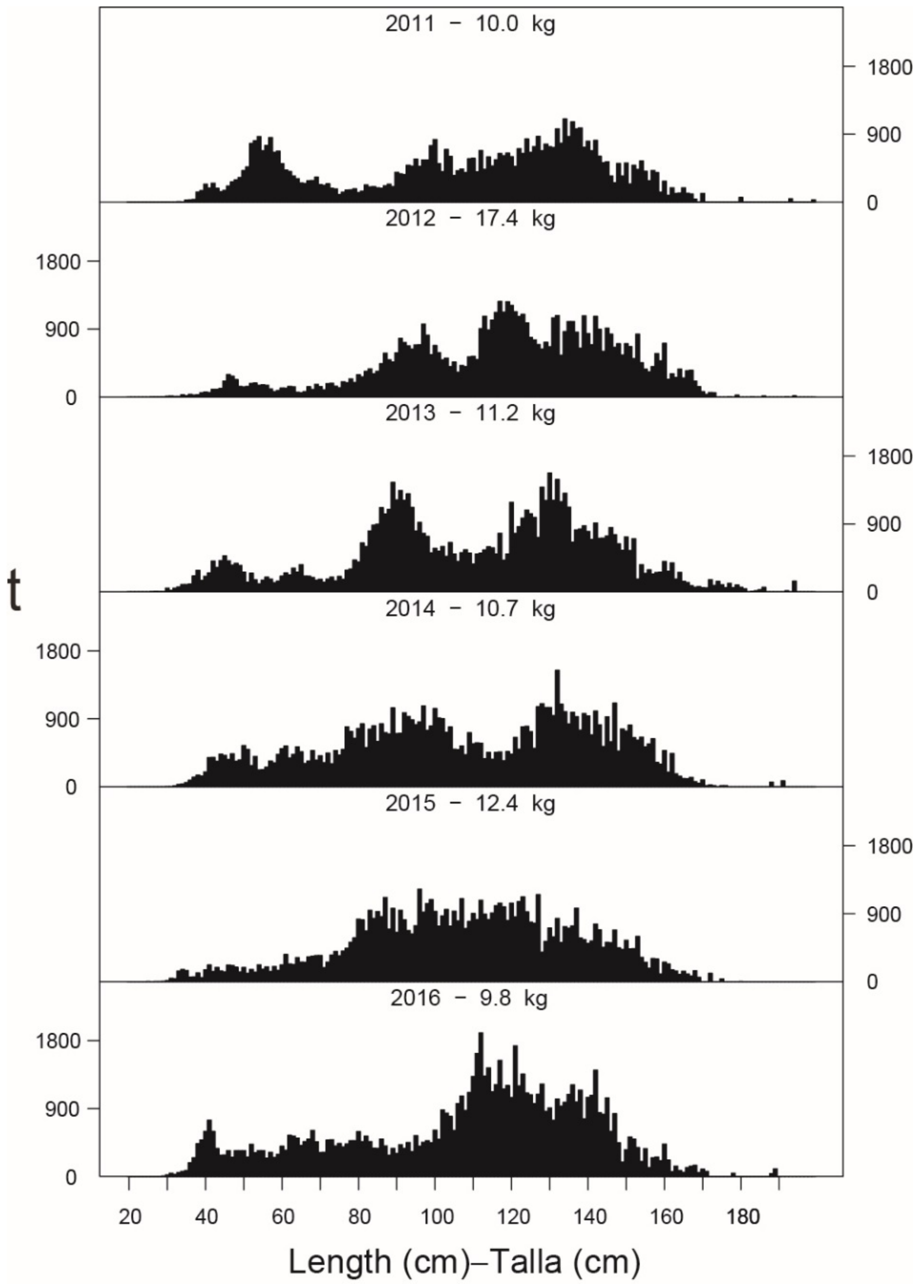

FIGURE 2b. Estimated size compositions of the yellowfin caught in the EPO during the second quarter of 2011-2016. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 2b. Composición por tallas estimada para el aleta amarilla capturado en el OPO en el segundo trimestre de 2011-2016. En cada recuadro se detalla el peso promedio de los peces en las muestras; t = toneladas métricas.

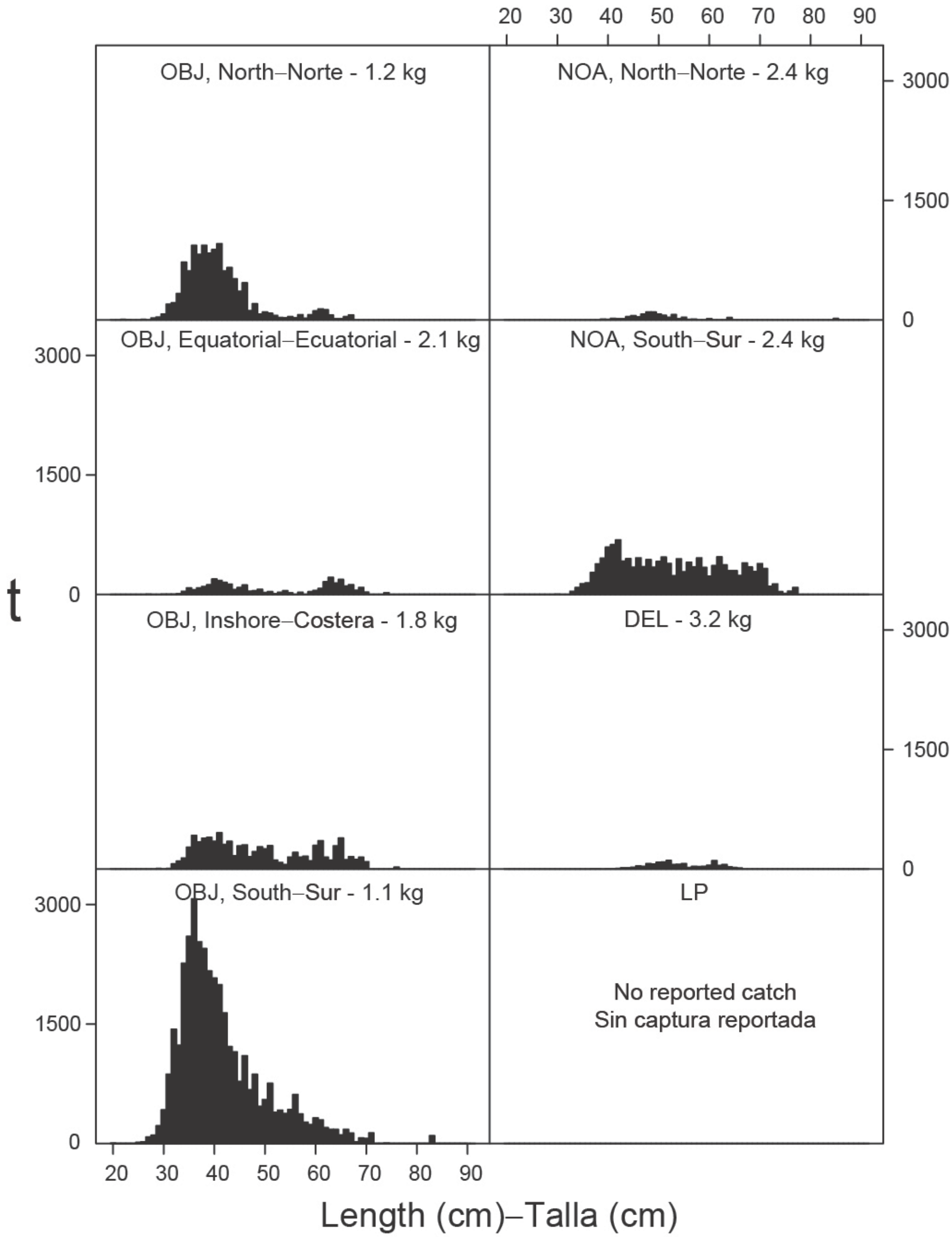

FIGURE 3a. Estimated size compositions of the skipjack caught in each fishery of the EPO during the second quarter of 2016. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 3a. Composición por tallas estimada para el barrilete capturado en cada pesquería del OPO durante el segundoo trimestre de 2016. 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.

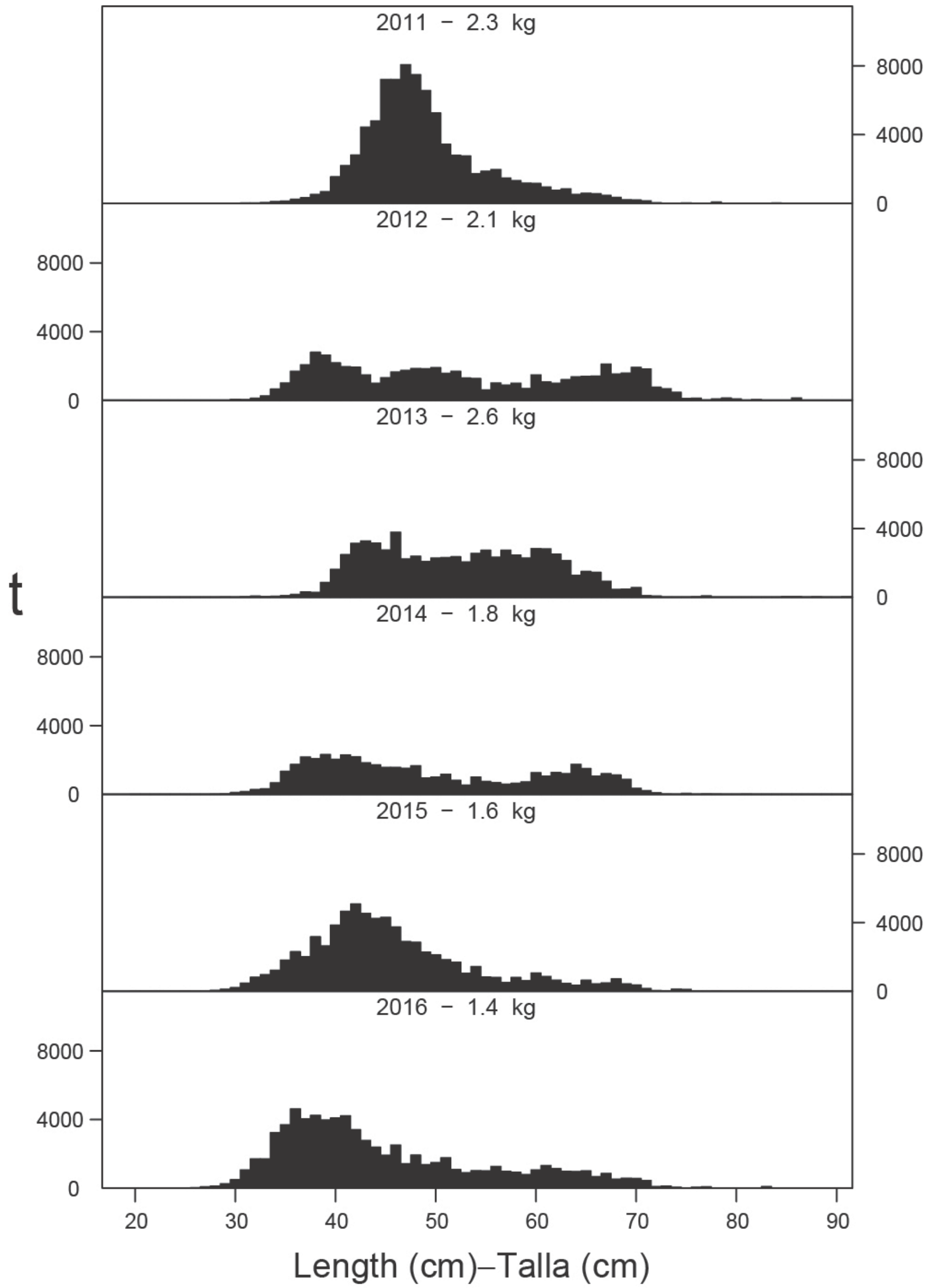

FIGURE 3b. Estimated size compositions of the skipjack caught in the EPO during the second quarter of 2011-2016. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.
FIGURA 3b. Composición por tallas estimada para el barrilete capturado en el OPO en el segundo trimestre de 2011-2016 En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas.

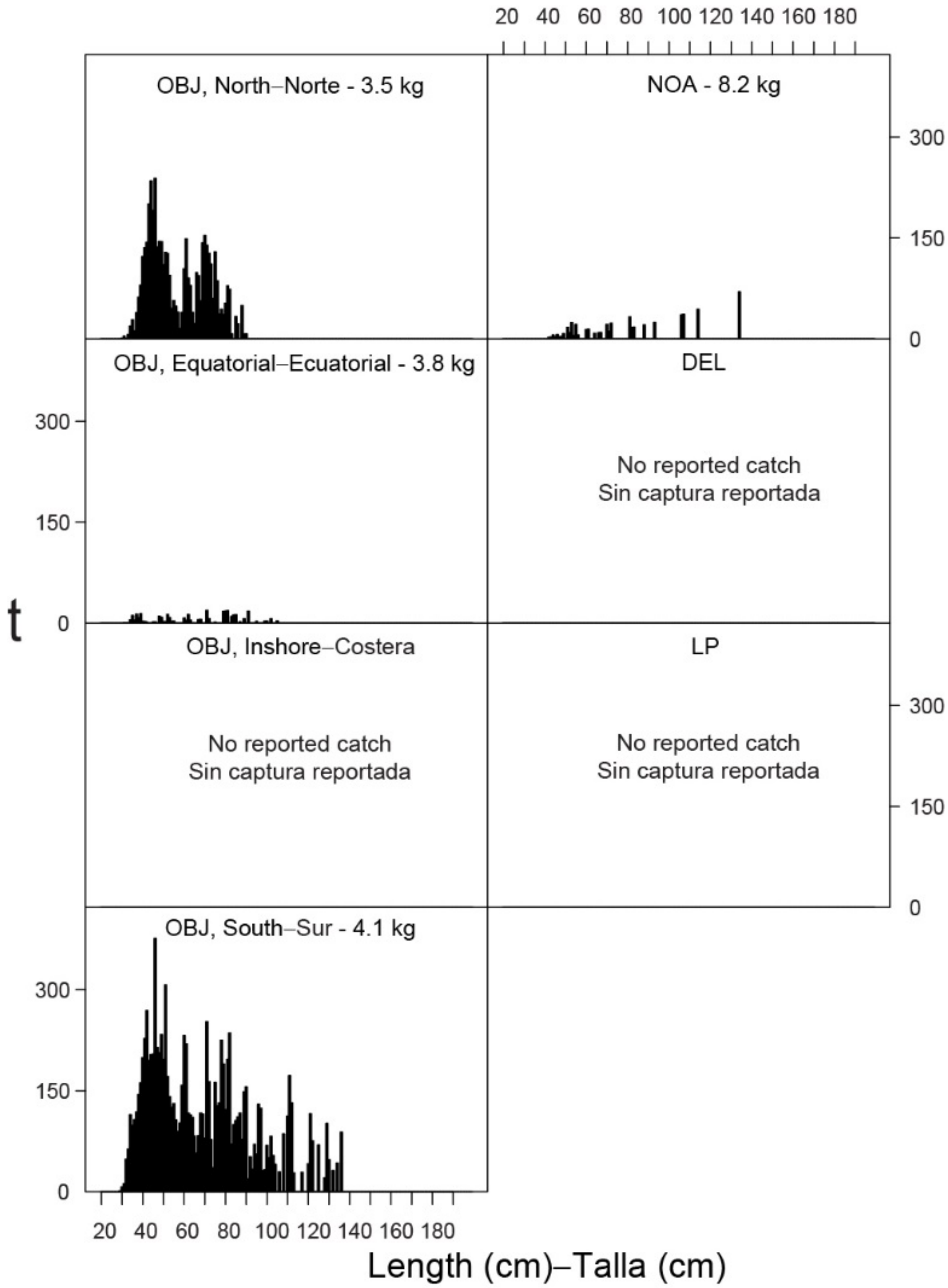

FIGURE 4a. Estimated size compositions of the bigeye caught in each fishery of the EPO during the second quarter of 2016. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 4a. Composición por tallas estimada para el patudo capturado en cada pesquería del OPO durante el segundo trimestre de 2016. 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.

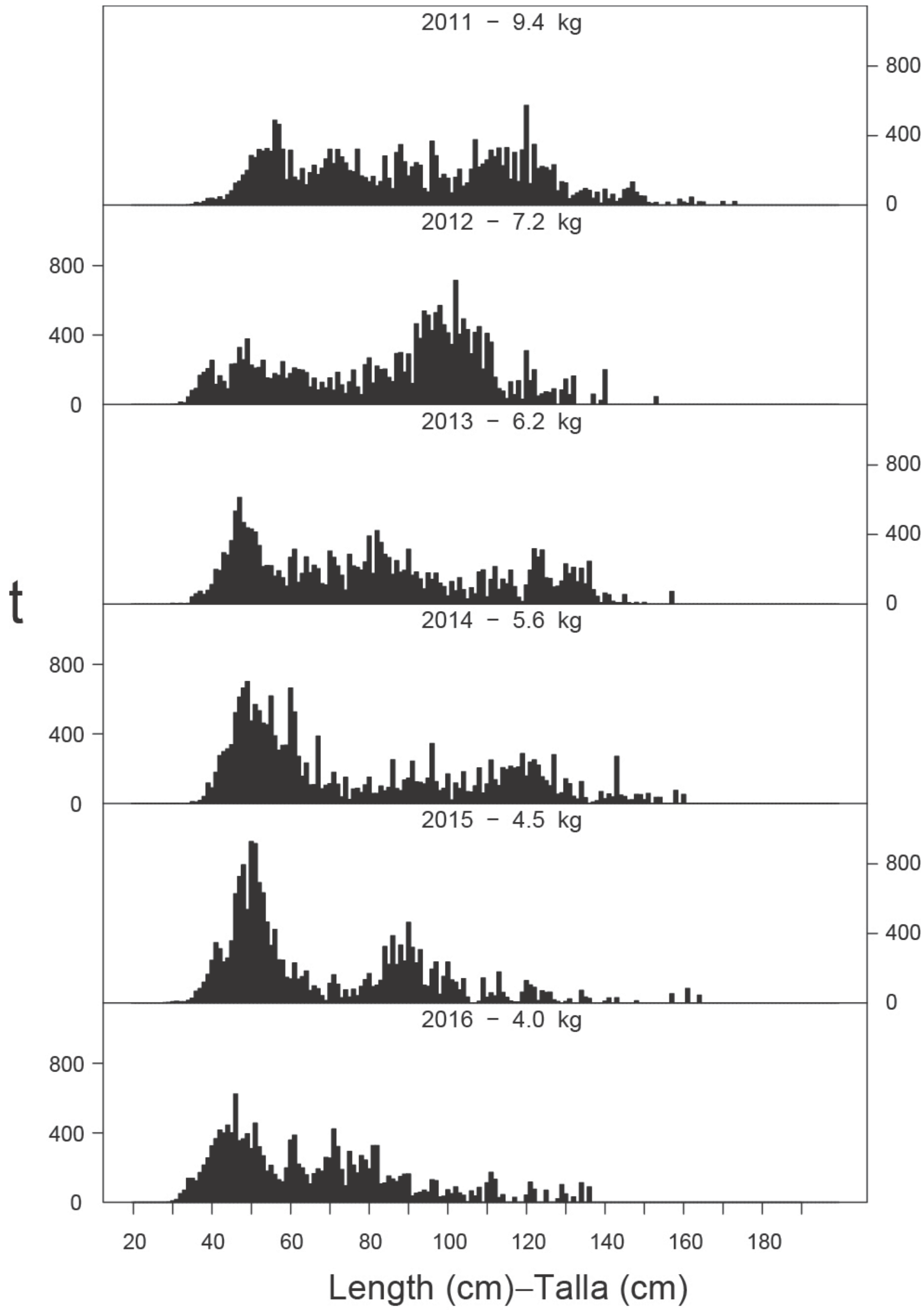

FIGURE 4b. Estimated size compositions of the bigeye caught in the EPO during the second quarter of 2011-2016. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 4b. Composición por tallas estimada para el patudo capturado en el OPO en el segundo trimestre de 2011-2016. En cada recuadro se detalla el peso promedio de los peces en las muestras; t = toneladas métricas.

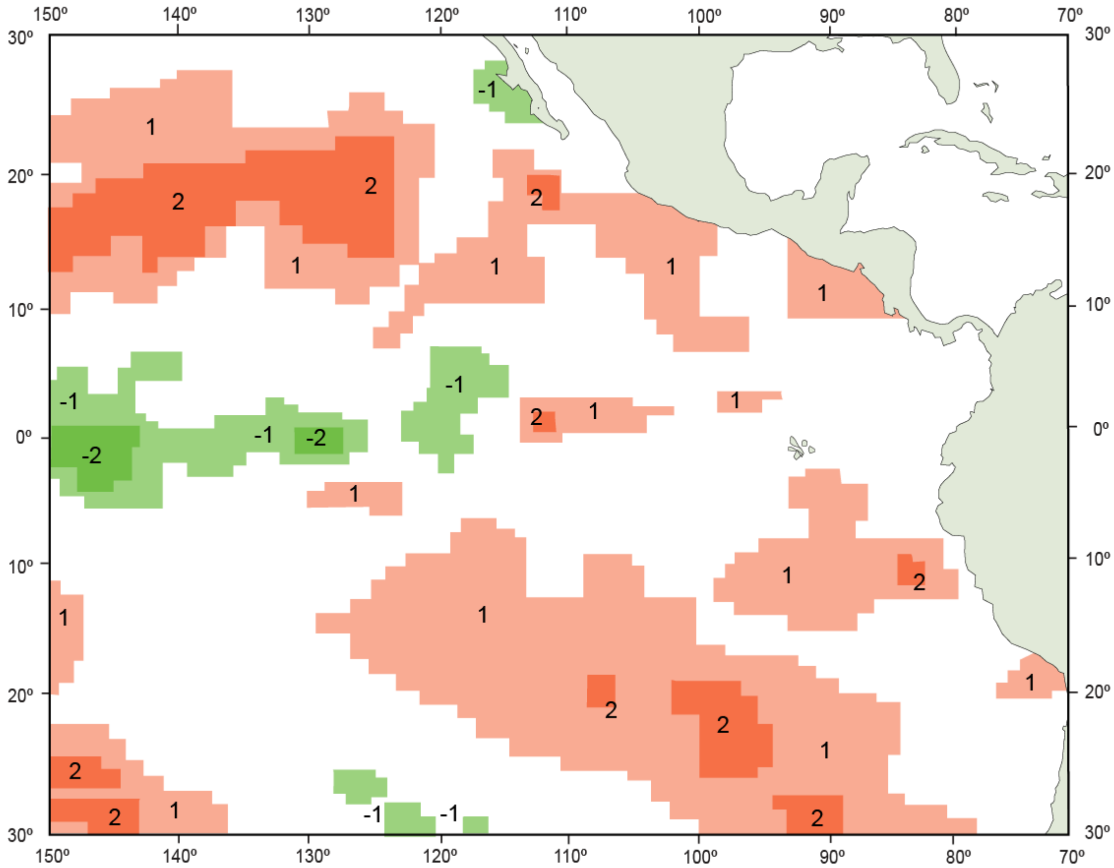

FIGURE 5. Sea-surface temperature (SST) anomalies (departures from long-term normals) for September 2016, based on data from fishing boats and other types of commercial vessels.
FIGURA 5. Anomalías (variaciones de los niveles normales a largo plazo) de la temperatura superficial del mar (TSM) en septiembre de 2016, 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 2016 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 2016, 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 Bandera	Gear Arte	Well volume–Volumen de bodega				Capacity Capacidad
		1-900	901-1700	>1700	Total	
		Number—Número				
Colombia	PS	4	10	-	14	14,860
Ecuador	PS	74	24	13	111	89,741
EU (España—Spain)	PS	-	-	2	2	4,120
Guatemala	PS	-	1	-	1	1,475
México	PS	10	38	1	49	60,146
	LP	1	-	-	1	125
Nicaragua	PS	-	5	1	6	8,478
Panamá	PS	2	9	4	15	21,174
Perú	PS	8	-	-	8	3,618
El Salvador	PS	-	-	2	2	4,473
USA—EE.UU	PS	9	8	10	27	33,557
Venezuela	PS	-	14	2	16	23,092
All flags—	PS	107	109	35	251	
Todas banderas	LP	1	-	-	1	
	PS + LP	108	109	35	252	
		Capacity—Capacidad				
All flags—	PS	48,502	145,508	70,724	264,734	
Todas banderas	LP	125	-	-	125	
	PS + LP	48,627	145,508	70,724	264,859	

TABLE 2. Estimates of the retained catches of tunas in the EPO from 1 January through 2 October 2016, 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 2 de octubre de 2016, 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	42,701	140,753	22,962	-	2,751	-	1,404	1,168	211,739	42.9
México	79,032	10,393	156	2,904	375	-	3,489	5	96,354	19.5
Nicaragua	9,077	1,115	287	-	-	-	-	-	10,479	2.1
Panamá	18,521	22,534	5,499	-	30	-	19	31	46,634	9.5
United States—Estados Unidos	2,541	34,807	1,822	327	248	2	107	7	39,861	8.1
Venezuela	17,707	6,359	582	-	-	-	9	11	24,668	5.0
Other—Otros[2]	21,039	36,057	6,553	-	240	-	25	2	63,916	12.9
Total	190,618	252,018	37,861	3,231	3,644	2	5,053	1,224	493,651	

[1] May include other tunas, sharks, mackerel, and miscellaneous fishes
[1] Puede incluir otros túnidos, tiburones, caballas, 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 2016 by longline vessels.
TABLA 3. Capturas reportadas de atún patudo en el OPO durante 2016 por buques palangreros.

Country	First quarter	Second quarter	Third quarter				Total to date
			July	August	September	Total	
Pais	**Primer trimestre**	**Segundo trimestre**	**Tercer trimester**				**Total al fecha**
			Julio	**Agosto**	**Septiembre**	**Total**	
China	1,779	1,328	632	758	-	1,390	4,497
Japan—Japón	3,544	2,044	570	764	-	1,334	6,922
Republic of Korea—República de Corea	2,238	789	255	251	-	506	3,533
Chinese Taipei—Taipei Chino	1,311	711	425	-	-	425	2,447
USA—EE.UU	-	-	-	-	-	-	-
Vanuatu	-	-	-	-	-	-	-
Total	8,872	4,872	1,882	1,773	-	3,655	17,399

TABLE 4. Oceanographic and meteorological data for the Pacific Ocean, October 2015-September 2016. 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 2015-septiembre 2016. 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)	23.3 (2.5)	23.7 (2.1)	25.0 (2.2)	25.9 (1.4)	26.8 (0.7)	27.6 (0.9)
Area 2 (5°N-5°S, 90°-150°W	27.6 (2.7)	27.9 (2.9)	28.0 (2.9)	28.2 (2.6)	28.4 (2.0)	28.7 (1.6)
Area 3 (5°N-5°S, 120°-170°W)	29.2 (2.5)	29.6 (3.0)	29.4 (2.8)	29.2 (2.6)	29.1 (2.4)	28.9 (1.7)
Area 4 (5°N-5°S, 150W°-160°E)	29.8 (1.1)	30.3 (1.7)	30.1 (1,6)	29.7 (1.4)	29.6 (1.5)	29.5 (1.3)
Thermocline depth—Profundidad de la termoclina, 0°-80°W	40	45	30	40	30	25
Thermocline depth—Profundidad de la termoclina, 0°-110°W	100	110	95	95	85	40
Thermocline depth—Profundidad de la termoclina, 0°-150°W	155	130	125	150	120	105
Thermocline depth—Profundidad de la termoclina, 0°-180°	120	105	95	115	80	75
SOI—IOS	-1.7	-0.5	-0.6	-2.2	-2.0	-0.1
NOI*—ION*	-4.08	2.09	1.55	-6.94	0.82	-2.06

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)	25.8 (0.2)	24.6 (0.3)	23.2 (0.3)	21.8 (0.2)	2!.0 (0.4)	20.9 (0.5)
Area 2 (5°N-5°S, 90°-150°W	28.3 (0.8)	27.1 (0.0)	26.3 (-0.1)	25.1 (-0.5)	24.5 (-0.5)	24.7 (-0.2)
Area 3 (5°N-5°S, 120°-170°W)	28.9 (1.1)	28.2 (1.3)	27.5 (-0.1)	26.7 (-0.5)	26.3 (-0.5)	26.1 (-0.6)
Area 4 (5°N-5°S, 150W°-160°E)	29.4 (0.9)	29.4 (0,6)	29.4 (0.5)	29.1 (0.3)	28.7 (0.0)	28.5 (-0,2)
Thermocline depth—Profundidad de la termoclina, 0°-80°W	25	20	20	25	20	25
Thermocline depth—Profundidad de la termoclina, 0°-110°W	25	25	30	25	40	30
Thermocline depth—Profundidad de la termoclina, 0°-150°W	100	100	105	100	120	130
Thermocline depth—Profundidad de la termoclina, 0°-180°	130	140	150	150	155	150
SOI—IOS	-1.2	0.4	0.6	0.4	0.7	1.2
NOI*—ION*	-1.14	0,27	1.56	1.75	0.40	3.80

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 2016. 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 2016. Los números entre paréntesis indican los totales acumulados para el año.

Flag Bandera	Trips Viajes		Class-6–Observed by program Clase-6–Observado por programa								Percentage observed Porcentaje observado	
			IATTC-CIAT		National- Nacional		WCPFC		Not obs. No obs.			
Colombia	10	(32)	7	(17)	3	(15)					100.0	(100)
Ecuador	67	(286)	44	(188)	23	(98)					100.0	(100)
El Salvador	4	(10)	4	(10)							100.0	(100)
EU (Spain)—UE (España)	4	(10)	2	(5)	2	(5)					100.0	(100)
Guatemala	2	(4)	2	(4)							100.0	(100)
México	63	(200)	29	(96)	34	(104)					100.0	(100)
Nicaragua	6	(18)	4	(10)	2	(8)					100.0	(100)
Panamá	16	(56)	8	(28)	8	(28)					100.0	(100)
Perú	1	(19)	1	(19)							100.0	(100)
U.S.A.—E.U.A.	13	(47)	7	(34)			6	(11)	0	(2)	93.8	(94)
Venezuela	13	(38)	10	(22)	3	(16)					100.0	(100)
Total	199	(720)	118	(433)	75	(274)	6	(11)	0	(2)	100.0	(99.7)
Class – 4 – Clase												
Colombia	1	(1)	1	(1)	0	(0)					-	-
Ecuador	5	(5)	4	(4)	1	(1)					-	-
Total	6	(6)	5	(5)	1	(1)					-	-
Class – 5 – Clase												
Colombia	0	(3)	0	(1)	0	(2)					-	-
Perú	4	(4)		(4)							-	-
Total	4	(7)	0	(5)	0	(2)					-	-