INTER-AMERICAN TROPICAL TUNA COMMMISSION
COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL

QUARTERLY REPORT—INFORME TRIMESTRAL

January-March 2016—Enero-Marzo 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 first quarter of 2016.

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 “Encuentro con el Sector Pesquero y Acuícola,” which took place in Mazatlán, Mexico, on 12 January 2016. The significance of this meeting was the commitment of the government of Mexico and the Mexican fishing industry to continue with their efforts for maintenance of responsible, productive, and sustainable fisheries and aquaculture.

Dr. Compeán participated in the Bluefin Futures Symposium, which was held in Monterey, California, USA, on 18-20 January 2016. The purpose of the meeting was to share scientific knowledge and perspectives on the status of Atlantic, Pacific, and Southern bluefin tuna and their future.

Dr. Compeán participated in The 1st Americas Tuna Conference, which took place in Panama, R.P., on 28-29 January 2016. It addressed the current and emerging issues confronting the global tuna industry. Dr. Compeán gave a presentation at the meeting entitled “How Healthy Are the EPO and Atlantic Stocks—Where Is it Taking Us?”

Dr. Compeán participated, as a Member of the Third Meeting of the Evaluation Committee and Fisheries Management Program of the Ulloa Gulf, Baja California Sur, in Ensenada, Mexico, on 26 February 2016. The purpose of the meeting was to perform a follow up to the development projects on the west coast of Baja California Sur related to the program called “Programa Integral de Ordenamiento Pesquero del Golfo de Ulloa: Observadores a Bordo (ATB) y Sistemas de Videograbación.”

Dr. Compeán participated in a meeting of the Centro de Investigaciones Biológicas del Noroeste, S.C. (CIBNOR) in La Paz, Mexico, on 1 March 2016. He fulfilled his functions as a member of the “Comisión Dictaminadora Externa (CDE)” at the meeting.

Dr. Compeán met with Dr. Guido Marinone, Director of the Centro de Investigación Científica y de Educación Superior de Ensenada **(**CICESE) in Ensenada, Mexico, on 17 March 2016, where they discussed issues concerning the fishing industry in Mexico.

Dr. Martín A. Hall participated in a Stakeholder Council meeting and Developing World Working Group of the Marine Stewardship Council in Madrid, Spain, on 10-13 January 2016. His travel expenses were paid by the Marine Stewardship Council.

Dr. Hall spent the period of 14-16 January 2016 in Sète, France, where he participated in a doctoral thesis examination of Ms. Liliana Roa Pascuali at the Université de Montpellier, Sète, France, as a member of her thesis committee. His travel expenses were paid by the Institut de Recherche pour le Développement of France.

Dr. Hall spent the period of 21-24 January 2016 at the Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER) in Nantes, France, where he presented a seminar entitled “Bycatches: Change, Evolution and Revolution, with an Emphasis on the Bycatch Battles in the Tuna Purse Seine Fisheries*”*

Dr. Hall and Mr. Kurt M. Schaefer participated in a Bycatch Steering Committee meeting of the International Seafood Sustainability Foundation (ISSF) in Madrid, Spain, on 27-29 January 2016. Their travel expenses were covered by ISSF.

Mr. Marlon Román spent the period of 16-20 January 2016 in Panama, where he met with Mr. Vernon P. Scholey and other members of the Achotines Laboratory staff with regard to the project "IATTC-Testing of Non-Entangling and Biodegradable Fish Aggregating Devices (FADs)." His travel expenses were covered by project funds.

Dr. Daniel Margulies, Mr. Vernon P. Scholey, and Ms. Jeanne B. Wexler participated in the World Aquaculture Society Conference in Las Vegas, Nevada, U.S.A., on 22-26 February 2016, where they gave the following presentations at the "Tuna and Seriola" session, chaired by Drs. Daniel Benetti and Alejandro Buentello. The names of the persons presenting the papers are in boldface,

"Laboratory Research on Early Life Stages of Yellowfin Tuna *Thunnus albacares* with an Emphasis on Juvenile Rearing Studies" by **Daniel Margulies**, Jeanne Wexler, Maria Stein, Vernon Scholey, Tomoki Honryo, Michio Kurata, Yang-Su Kim, Taro Matsumoto, Amal Biswas, Amado Cano, Yasuo Agawa, and Yoshifumi Sawada;

"Spawning History of Broodstock Yellowfin Tuna *Thunnus albacares* and Improved Methodology for their Capture and Maintenance" by **Vernon Scholey**, Daniel Margulies, Jeanne Wexler, Maria Stein, Shukei Masuma, and Yoshifumi Sawada;

Comparative Growth and Survival Studies of Yellowfin *Thunnus albacares* and Pacific Bluefin *Thunnus orientalis* Tuna Larvae, by **Jeanne Wexler**, Daniel Margulies, Maria Stein, Yang-Su Kim, Tsukasa Sasaki, Tomoki Honryo, Vernon Scholey, Angel Guillen, Yasuo Agawa, and Yoshifumi Sawada.

The paper presented by Ms. Wexler was nominated as one of the top presentations at the conference, and, as a result, she was encouraged by Dr. Carole Engle, Executive Editor of the Journal of the World Aquaculture Society, to submit a manuscript on this work to that journal.

Dr. Mark N. Maunder participated in a meeting of the Pacific Bluefin Tuna Working Group of the International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean in La Jolla, California, USA, on 29 February-11 March 2016.

RESEARCH

DATA COLLECTION AND DATABASE PROGRAM

There are two major fisheries for tunas in the eastern Pacific Ocean (EPO; the region bounded by the coastline of the Americas, 50°N, 150ºW, and 50°S), the commercial surface fishery and the industrial 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 industrial 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, and the data that they collect include the locations and dates of each set, the type of each set (dolphin, floating object, or unassociated), the approximate total weights of each species caught in each set, and the wells in which the fish caught in each set were 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 compositions 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 4).

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 194 length-frequency samples from 122 wells and abstracted logbook information for 213 trips of commercial fishing vessels during the first quarter of 2016.

Reported fisheries statistics

Information reported herein is for the EPO, unless noted otherwise. Catch is reported in metric tons (t), vessel capacity in cubic meters (m^3), and effort in days of 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 after 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.

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

The lists of vessels authorized to fish for tunas in the EPO are given in the IATTC Regional Vessel Register. The estimated total carrying capacity of the purse-seine and pole-and-line vessels that have or are expected to fish in the EPO during 2016 is about 255,972 m^3 (Table 1). The average weekly at-sea capacity for the fleet, for the weeks ending 1 January through 3 April, was about 170,700 m^3 (range: 58,300 to 207,200 m^3).

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

Catch statistics

The estimated total retained catches (t) of tropical tunas from the EPO during the period of January-March 2016, and comparative statistics for 2011-2015, were:

Species	2016	2011-2015			Weekly average, 2016
		Average	Minimum	Maximum	
Yellowfin	55,000	59,600	51,800	63,600	4,200
Skipjack	91,400	73,000	58,100	92,800	7,000
Bigeye	9,400	10,100	8,200	12,400	700

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

Catch statistics for 2015

Estimates of the annual retained and discarded EPO catches of the various species of tunas and other fishes by purse seiners and pole-and-line vessels from 1986-2015 are shown in Table 3. The retained catch data for skipjack and bluefin are essentially complete except for insignificant catches made by the longline, recreational (for skipjack), and artisanal fisheries. The catch data for yellowfin and bigeye do not include catches by longline vessels, as the data for these fisheries are received much later than those for the surface fisheries. About 3 to 12 percent of the total catch of yellowfin is taken by longliners. Until about the mid-1990s, the great majority of the catch of bigeye had been harvested by the longline fishery.

The regulations for surface fishing in 2015 applied only to Class-4, -5, and -6 purse seiners (vessels with fishing-carrying capacities greater than 181 metric tons). All such vessels registered in a nation or other fishing entities were required to cease fishing during one of the following periods:

Period 1	Period 2
29 July 2015-28 September 2015	18 November 2015-18 January 2016

(The owner of each vessel was entitled to select the period during which that vessel would refrain from fishing.) Notwithstanding the above, any Class-4 vessel (vessel with a fish-carrying capacity of 182-272 metric tons), provided it had an observer aboard, could make one trip of not more than 30 days during the closed period that its owner had selected. Also, the area bounded by 4°N, 3°S, 96°W, and 110°W was closed to fishing by purse-seine vessels from 29 September through 29 October 2015. In addition, the following limits on the catches of bigeye tuna were imposed on longline vessels of four Far East nations: China, 2,507 metric tons (t); Japan, 32,372 t; Republic of Korea, 11,947 t; Chinese Taipei, 7,555 t.

Preliminary estimates of the retained catches, in metric tons, of yellowfin, skipjack, and bigeye in the EPO during 2015, and final estimates of the 2000-2014 annual averages of those species, based on the methods described at the beginning of this section, are as follows:

Species	**2015**	**Average**	**Minimum**	**Maximum**
			2000-2014	
Yellowfin	245,000	257,000	167,000	413,000
Skipjack	329,000	234,000	144,000	297,000
Bigeye	63,000	66,000	49,000	95,000

The 2015 catch of yellowfin was about 12 thousand t (5 percent) less than the average for 2000-2014. The 2015 skipjack catch was about 96 thousand t (41 percent) greater than the average for 2000-2014 The 2015 bigeye catch was about 3 thousand t (4 percent) less than the average for 2000-2014.

The average annual distributions of the purse-seine catches of yellowfin, skipjack, and bigeye, by set type, in the EPO during 2010-2014 are shown in Figures 1a, 2a, and 3a, and preliminary estimates for 2015 are shown in Figures 1b, 2b, and 3b.

The majority of the yellowfin catch in 2015 was taken north of the 5°N latitude in sets associated with dolphins, and in the area between the Galapagos Islands and the coast of the Americas in all three types of sets. Though yellowfin in unassociated schools is typically found closer to shore, moderate catches were made far offshore around the 135°W longitude south of the equator. As in previous years, most of the yellowfin south of the 5°N latitude was caught in sets on floating objects.

Most of the skipjack catches in 2015 occurred south of 5°N latitude, in sets on floating objects and inshore sets on unassociated schools. The area off the coast of Peru produced the greatest 2015 skipjack catches, which were greater than those of previous years. A greater-than-normal offshore catch of skipjack was made around 135°W longitude south of the equator in sets on unassociated schools of tuna.

Bigeye are not often caught by surface gear north of about 7°N, and the catches of bigeye have decreased in the inshore areas off South America for several years. With the development of the fishery for tunas associated with fish-aggregating devices (FADs), the relative importance of the inshore areas has decreased, while that of the offshore areas has increased. Most of the bigeye catches are taken in sets on FADs between 5°N and 5°S.

While yellowfin, skipjack, and bigeye tunas comprise the most significant portion of the retained catches of the purse-seine and pole-and-line fleets in the EPO, other tunas and tuna-like species, such as black skipjack, bonito, wahoo, and frigate and bullet tunas, contribute to the overall harvest in this area. The total retained catch of those other species by these fisheries was about 4.7 thousand t in 2015, which is less than the 2000-2014 annual average retained catch of about 6.8 thousand t (range: 500 to 19 thousand t).

Preliminary estimates of the retained catches in the EPO in 2015, by flag, and by country, are given in Table 4.

Preliminary estimates of the most significant (equal to or greater than about 5 percent of the total) retained catches, of all species combined, during 2015 were as follows:

Flag	**Retained catches**	
	Metric tons	**Percentage**
Ecuador	304,100	47
Mexico	136,300	21
Panama	68,100	11
Colombia	36,200	6
Venezuela	35,200	6

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

There are no adjustments included for factors, such as type of set or vessel operating costs and market prices that might identify whether a vessel was directing its effort toward a specific species.

The measures of catch rate used in analyses are based on fishing trips landing predominantly yellowfin, skipjack, bigeye, and bluefin tuna. The great majority of the purse-seine catches of yellowfin, skipjack, and bigeye are made by Class-6 vessels (vessels with fish-carrying capacities greater than 363 metric tons), and only data for these vessels are included in these measures of catch rate. There are now far fewer pole-and-line vessels than in previous years, so the data for these vessels are combined without regard to fish-carrying capacity.

The estimated nominal catches per day of fishing for yellowfin, skipjack, and bigeye in the EPO during the fourth quarter of 2015 and comparable statistics for 2010-2014 are:

Region	**Species**	**Gear**	**2015**	**2010-2014**		
				Average	**Minimum**	**Maximum**
N of 5° N	Yellowfin	PS	12.8	13.3	11.7	14.7
S of 5° N	Yellowfin	PS	3.6	2.8	2.5	3.3
N of 5° N	Skipjack	PS	1.3	2.2	1.4	3.2
S of 5° N	Skipjack	PS	12.1	9.9	8.4	11.7
EPO	Bigeye	PS	2.8	2.4	2.2	2.6
EPO	Yellowfin	LP	0.0	6.6	4.5	9.5
EPO	Skipjack	LP	0.0	1.3	0.5	2.8

Catch statistics for the longline fishery

The catches of bigeye by longline gear in the EPO are reported by flag states whose annual catches have exceeded 500 t (Resolution C-13-01- Multiannual Program for the Conservation of Tuna in the Eastern Pacific Ocean during 2014-2016 Tuna-Conservation 2014-2016, adopyed at the 85th meeting of the IATTC in June 2013). The catches that have been reported for January-December 2015 are shown in Table 5a, and preliminary estimates of those reported for the first quarter of 2016 are shown in Table 5b.

Size compositions of the surface catches of tunas

Length-frequency samples are the basic source of data used for estimating the size and age compositions of the various species of fish in the landings. This information is necessary to obtain age-structured estimates of the population. Samples of yellowfin, skipjack, bigeye, Pacific bluefin, and, occasionally, black skipjack from the catches of purse-seine, pole-and-line, and recreational vessels in the EPO are collected by IATTC personnel at ports of landing in Ecuador, Mexico, Panama, 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 fourth quarter of 2010-2015 are presented in this report. Two sets of length-frequency histograms are presented for each species; the first shows the data by stratum (gear type, set type, and area) for the fourth quarter of 2015, and the second shows data for the combined strata for the fourth quarter of each year of the 2010-2015 period. Samples were obtained from 211 wells that contained fish caught during the fourth quarter of 2015.

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 4). The last fishery includes all 13 sampling areas. Of the 211 wells sampled that contained fish caught during the fourth quarter of 2015, 150 contained yellowfin. The estimated size compositions of these fish are shown in Figure 5a. The majority of the yellowfin catch is usually taken in sets on dolphins. However, during the fourth quarter there were also large catches of small yellowfin in the 40- to 55-cm range taken in the Equatorial floating-object area, and large yellowfin in the 115- to 150-cm range taken in the Southern unassociated area.

The estimated size compositions of the yellowfin caught by all fisheries combined during the fourth quarters of 2010-2015 are shown in Figure 5b. The average weight of the yellowfin caught during the fourth quarter of 2015 (5.4 kg) was half the average weight of any of the previous 3 years, due to an exceptionally large catch of small yellowfin in the Equatorial floating-object area. The size distribution of larger yellowfin was concentrated into a tighter range than in previous years, with the majority falling into the 120- to 140-cm range.

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 4). The last two fisheries include all 13 sampling areas. Of the 211 wells sampled that contained fish caught during the fourth quarter of 2015, 163 contained skipjack. The estimated size compositions of these fish are shown in Figure 6a. The Equatorial and Southern floating-object areas produced small size skipjack in the 35- to 55-cm range, and the Southern unassociated area produced the largest size skipjack in the 60- to 80-cm range. Lesser amounts of skipjack were also caught in the Northern and Inshore floating-object fisheries.

The estimated size compositions of the skipjack caught by all fisheries combined during the fourth quarters of 2010-2015 are shown in Figure 6b. The average weight of the skipjack caught during the fourth quarter of 2015 (2.4 kg) was less than the average weight of 2013 (3.0 kg), but the same as that of 2012 and 2014. The greatest average weight for the fourth quarters of 2010-2015 was 3.6 kg in 2011, and the least was 1.7 kg in 2010.

There are seven surface fisheries for bigeye defined for stock assessments: four associated with floating objects, one with unassociated schools, one associated with dolphins, and one pole-and-line (Figure 4). The last three fisheries include all 13 sampling areas. Of the 211 wells sampled that contained fish caught during the fourth quarter of 2015, 50 contained bigeye. The estimated size compositions of these fish are shown in Figure 7a. All of the catch was taken in floating-object sets, with over half in the Southern area and the rest in the Northern and Equatorial areas. The majority of the catch was in the 40- to 75-cm range, though larger bigeye in the 100- to 120-cm range were taken in the Southern floating-object area.

The estimated size compositions of the bigeye caught by all fisheries combined during the fourth quarter of 2010-2015 are shown in Figure 7b. The average weight of bigeye caught during the fourth quarter of 2015 (5.0 kg) was among the lowest for the 6 year period, well below the period high of 7.3 kg in 2011. The size distribution of bigeye was concentrated into a tighter range than in previous years, with the majority falling into the 40- to 75-cm range.

The estimated retained purse-seine catch of bigeye less than 60 cm in length during the fourth quarter of 2015 was 6,300 t, or about 34 percent of the estimated total retained purse-seine catch of bigeye during that period. The corresponding amounts for 2010-2014 ranged from 1,400 to 5,000 t, or 15 to 35 percent respectively. These values may differ slightly from those given in previous Quarterly Reports due to changes in the estimation procedure.

BIOLOGY AND ECOSYSTEM PROGRAM

Early life history studies

Yellowfin broodstock

The yellowfin broodstock in Tank 1 (1,362,000 L) at the Achotines Laboratory did not spawn during the first two months of the quarter, but resumed spawning beginning on 29 March. Spawning occurred between 7:15 p.m. and 10:00 p.m. The number of eggs collected ranged from 1,000 to 154,000 per day. During the quarter the water temperatures in the tank ranged from 21.9 to 29.0°C.

At the end of the quarter there were seven 50- to 54-kg, two 39-kg, and six 16- to 20-kg yellowfin in Tank 1. There was one 8-kg yellowfin in the 170,000-L reserve broodstock tank (Tank 2).

Rearing of yellowfin eggs, larvae, and juveniles

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

Comparative studies of yellowfin and Pacific bluefin larvae

A joint Kindai University (KU)-IATTC-ARAP [Autoridad de los Recursos Acuáticos de Panamá] 5-year research project is being supported in Panama by the Japan International Cooperation Agency (JICA) (see IATTC Quarterly Report for January-March 2011). This project, which is being conducted through the Science and Technology Research Partnership for Sustainable Development (SATREPS) program, involves comparative studies of the early life histories of Pacific bluefin and yellowfin. The research on Pacific bluefin, which is conducted at the Fisheries Laboratories of KU in Wakayama Prefecture, Japan, is being supported by the Japan Science and Technology Agency (JST). The project officially ended at the end of March 2016. The final evaluation of the SATREPS project was carried out from November 7 to November 23, 2015, by a team of internal and external evaluators. The project was given a "high" evaluation rating for meeting or exceeding all of its original research objectives.

During March 2016, KU, JICA, and ARAP faculty and staff members visited the Achotines Laboratory for a brief ceremony to hand over the equipment and materials purchased for the SATREPS project. For several days previous to this ceremony, KU, ARAP, and IATTC staff members discussed the framework of a new 5-year project to begin, tentatively, in 2017. A joint proposal outlining the new project will be submitted to JICA in October 2016.

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 March 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 continued spawning until early January 2016.

Meetings and workshops

Dr. Francesca Leasi, a Postdoctoral Buck Global Genome Initiative Fellow in the Department of Invertebrate Zoology at the Smithsonian Institution National Museum of Natural History, Washington, D.C., USA, held a Marine Invertebrate Workshop at the Achotines Laboratory from 22 February to 11 March 2016. Participants from seven countries, including the Republic of Panama, participated in the workshop.

Dr. Mark Ashton, Morris K. Jessup Professor of Silviculture and Forest Ecology, and Director of the School of Forests, at Yale University, New Haven, Connecticut, USA, conducted a field course on reforestation for graduate students at the Achotines Laboratory, from 20 to 25 March 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. 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.

During the third quarter of 2014, extensive areas of warm water were developing north of about 10°S (IATTC Quarterly Report for July-September 2014: Figure 5)—the early onset of the El Niño event that had been predicted by the U.S. National Weather Service (IATTC Quarterly Report for January-March 2014). During October, November, and December, however, the warm water was confined mostly to the area north of the equator and, in fact, a small area of cool water appeared well south of the equator and grew larger in November and December (IATTC Quarterly Report for October-December 2014: Figure 5). By January 2015 the area of warm water off Mexico had expanded to the southwest, combining with an area of warm water along the equator that persisted through June (IATTC Quarterly Report for April-June 2015: Figure 5). During the third quarter of 2015 the areas of warm water off Baja California and along the equator grew larger and warmer (IATTC Quarterly Report for July-September 2015: Figure 5). During the fourth quarter of 2015, the SSTs were above normal over much of the area north of 10°S, and off Peru, but nearly normal over most of the rest of the area south of the equator. The SSTs had been mostly below normal from October 2013 through March 2014, but during April 2015 through March 2016 they were all above normal (Table 6).

According to the Climate Diagnostics Bulletin of the U.S. National Weather Service for March 2016, "Nearly all models predict further weakening of El Niño, with a transition to ENSO-neutral likely during late [northern] spring or early summer 2016 … Then, the chance of [anti-El Niño] increases during the late summer or early fall. The official forecast is consistent with the model forecasts, also supported by a historical tendency for [anti-El Niño] to follow strong El Niño events. A transition to ENSO-neutral is likely during late Northern Hemisphere spring or early summer 2016, with an increasing chance of [anti-El Niño] during the second half of the year."

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, 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." 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 days duration during the specified closure periods, provided that such vessel carries an observer of the IDCP On-Board Observer Program.

The observers are biologists trained to collect a variety of data on the mortalities of dolphins associated with the fishery, sightings of dolphin herds, catches of tunas and bycatches of fish and other animals, oceanographic and meteorological data, and other information used by the IATTC staff to assess the conditions of the various stocks of dolphins, study the causes of dolphin mortality, and assess the effect of the fishery on tunas and other components of the ecosystem. The observers also collect data relevant to compliance with the provisions of the AIDCP and data required for the tuna-tracking system established under the AIDCP, which tracks the "dolphin-safe" status of tuna caught in each set from the time it is captured until it is unloaded (and, after that, until it is canned and labeled).

During the first 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 were to sample the remainder of those trips. Except as described in the next paragraph, the

IATTC was 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 first quarter of 2016 one party to both regional fisheries management organizations, and to the AIDCP, requested that cross-endorsed observers be allowed to be deployed on any trips of vessels planning to operate in both areas.

Observers from the IDCP On-Board Observer Program departed on 283 fishing trips aboard purse seiners covered by that program during the first quarter of 2016. Preliminary coverage data for these vessels during the quarter are shown in Table 7. In addition, there was one trip of a vessel registered in a nation party to the AIDCP that does not regularly fish in the EPO, that was sighted fishing in the area of overlap between the IATTC and the WCPFC. Although there is an agreement between the two tuna management organizations, there is no formal agreement on the area of overlap with the AIDCP. This subject has been brought to the attention of the parties to the AIDCP and the IATTC.

Observer training

There were no observer training sessions conducted by the IATTC staff during the first quarter of 2016.

Gear project

During the first quarter of 2016 the IATTC staff carried out five dolphin safety-gear inspection and safety-panel alignment procedures for Class-6 vessels participating in the fisheries for tuna associated with dolphins. In addition, members of the staff of the national observer program of Mexico, trained by the IATTC staff, conducted eight more of these, for a total of thirteen for the quarter.

Training and certification of fishing captains and crew member

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 (1) attending 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 first quarter of 2016, the IATTC staff conducted two such seminars on the following dates and at the following locations:

Date	Location	Attendees
12 January	Manta, Ecuador	39
2 February	La Jolla, USA	1

PUBLICATIONS

Bayliff, William H. 2016. The fisheries for tunas in the eastern Pacific Ocean. *In* Benetti, Daniel D., Gavin J. Partridge, and Alejandro Buentello (editors), Advances in Tuna Aquaculture: from Hatchery to Market. Elsevier-Academic Press, Amsterdam: 21-42.

Carruthers,Thomas R., Laurence T. Kell, Doug D. S. Butterworth, Mark N. Maunder, Helena F. Geromont, Carl Walters, Murdoch K. McAllister, Richard Hillary, Polina Levontin, and Toshihide Kitakado. 2016. Performance review of simple management procedures. ICES Jour. Mar. Sci., 73 (2): 464-482.

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.

Lezama-Ochoa, Nerea, Hilario Murua, Guillem Chust, Emiel Van Loon, Jon Ruiz, Martin Hall, Pierre Chavance, Alicia Delgado De Molina, and Ernesto Villarino. 2016. Present and future potential habitat distribution of *Carcharhinus falciformis* and *Canthidermis maculata* by-catch species in the tropical tuna purse-seine fishery under climate change. Front. Mar. Sci., 30 March 2016.

Margulies, Daniel, Vernon P. Scholey, Jeanne B. Wexler, and Maria S. Stein. 2016. Research on the reproductive biology and early life history of yellowfin tuna *Thunnus albacares* in Panama. *In* Benetti, Daniel D., Gavin J. Partridge, and Alejandro Buentello (editors), Advances in Tuna Aquaculture: from Hatchery to Market. Elsevier-Academic Press, Amsterdam: 77-114.

VISITING STUDENTS

Mr. Christoffer Moesgaard Albertsen, a Ph.D. candidate at the National Institute of Aquatic Resources, Technical University of Denmark ("DTU Aqua") began a 6-month visit at the IATTC headquarters in La Jolla, California, USA, in early January 2016. His work is in applied statistics and fisheries, specifically with state-space models applied to two areas, tracking of marine animals and stock assessment models. He is working with Dr. Mark N. Maunder on a geostatistical model, using the R-package Template Model Builder (TMB), which was developed by Kasper Kristensen, also from DTU Aqua. He arrived in San Diego on January 4, 2016, and began work on January 6. He will continue his work at the IATTC until late June 2016.

Ms. Nerea Lezama-Ochoa, a Ph.D candidate at the Universidad del Pais Vasco, Vizcaya, Spain, began a stay of about one month at the La Jolla headquarters of the IATTC on 1 February 2016. She was working with Dr. Martín A. Hall on spatial and abundance patterns of Manta rays (*Manta* spp.) and Mobula rays. (*Mobula* spp.), which are taken as bycatches in the purse-seine fishery for tropical tunas in the EPO. Her last day at the IATTC was 26 February 2016.

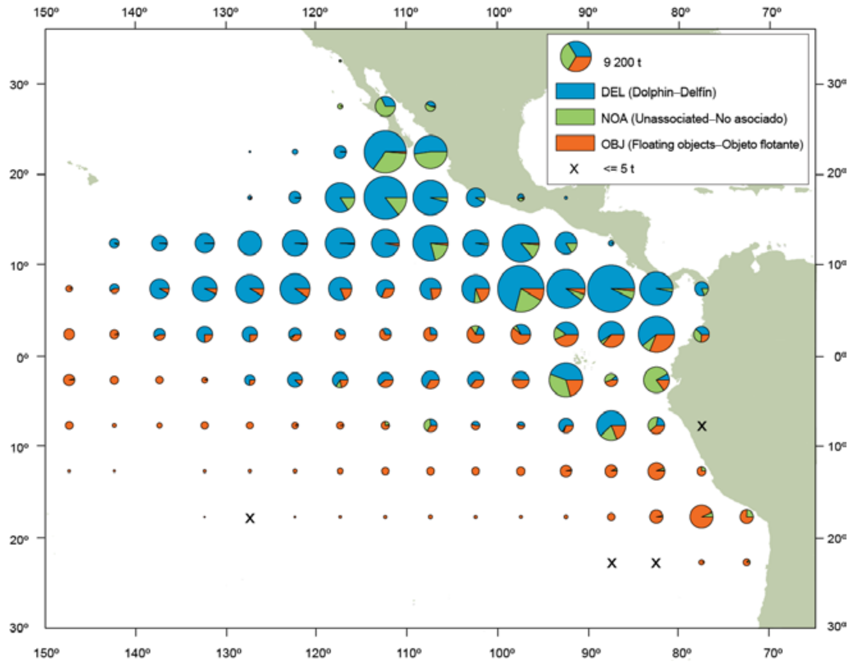

FIGURE 1a. Average annual distributions of the purse-seine catches of yellowfin, by set type, 2010-2014. The sizes of the circles are proportional to the amounts of yellowfin caught in those 5° by 5° areas.
FIGURA 1a. Distribución media anual de las capturas cerqueras de aleta amarilla, por tipo de lance, 2010-2014. El tamaño de cada círculo es proporcional a la cantidad de aleta amarilla capturado en la cuadrícula de 5° x 5° correspondiente.

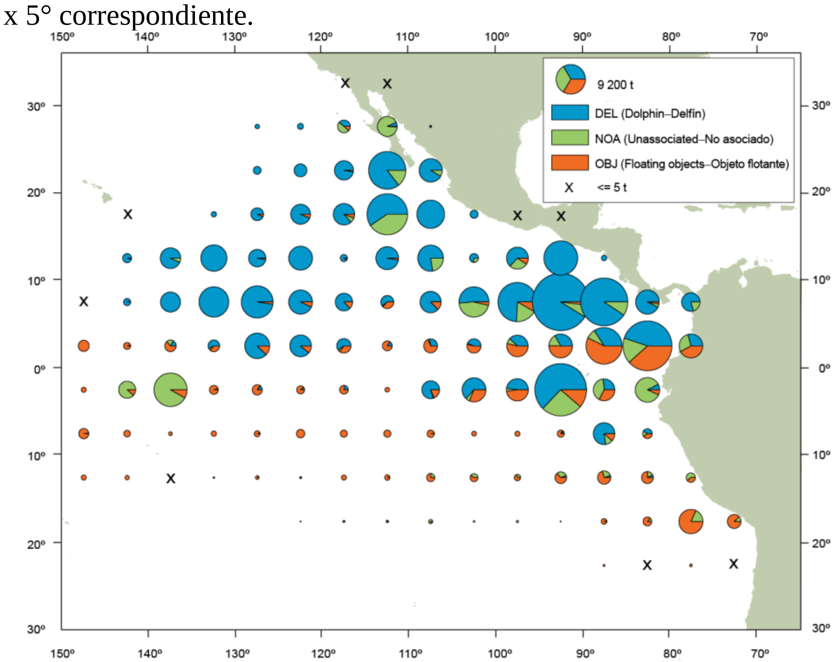

FIGURE 1b. Annual distributions of the purse-seine catches of yellowfin, by set type, 2015. The sizes of the circles are proportional to the amounts of yellowfin caught in those 5° by 5° areas.
FIGURA 1b. Distribución anual de las capturas cerqueras de aleta amarilla, por tipo de lance, 2015. El tamaño de cada círculo es proporcional a la cantidad de aleta amarilla capturado en la cuadrícula de 5° x 5° correspondiente.

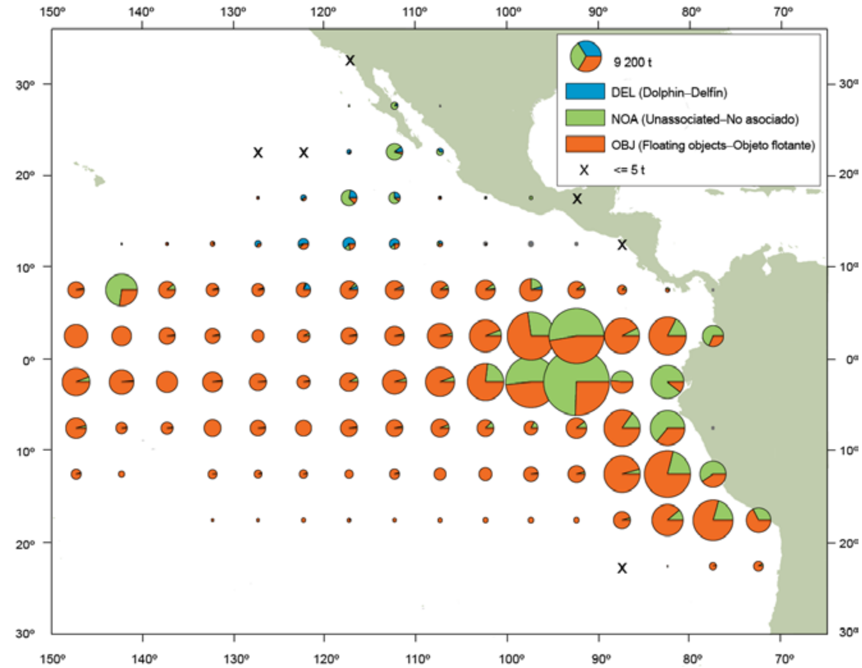

FIGURE 2a. Average annual distributions of the purse-seine catches of skipjack, by set type, 2010-2014. The sizes of the circles are proportional to the amounts of skipjack caught in those 5° by 5° areas.

FIGURA 2a. Distribución media anual de las capturas cerqueras de barrilete, por tipo de lance, 2010-2014. El tamaño de cada círculo es proporcional a la cantidad de barrilete capturado en la cuadrícula de 5° x 5° correspondiente.

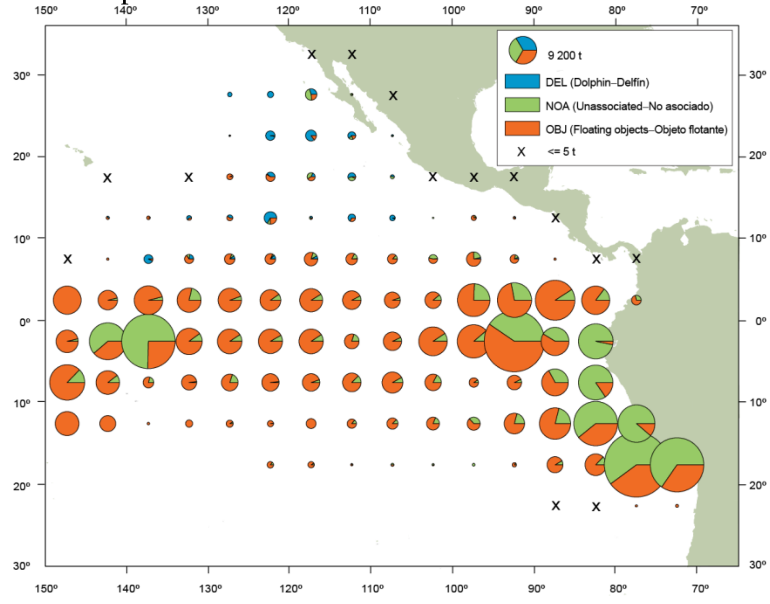

FIGURE 2b. Annual distributions of the purse-seine catches of skipjack, by set type, 2015. The sizes of the circles are proportional to the amounts of skipjack caught in those 5° by 5° areas.

FIGURA 2b. Distribución anual de las capturas cerqueras de barrilete, por tipo de lance, 2015. El tamaño de cada círculo es proporcional a la cantidad de barrilete capturado en la cuadrícula de 5° x 5° correspondiente.

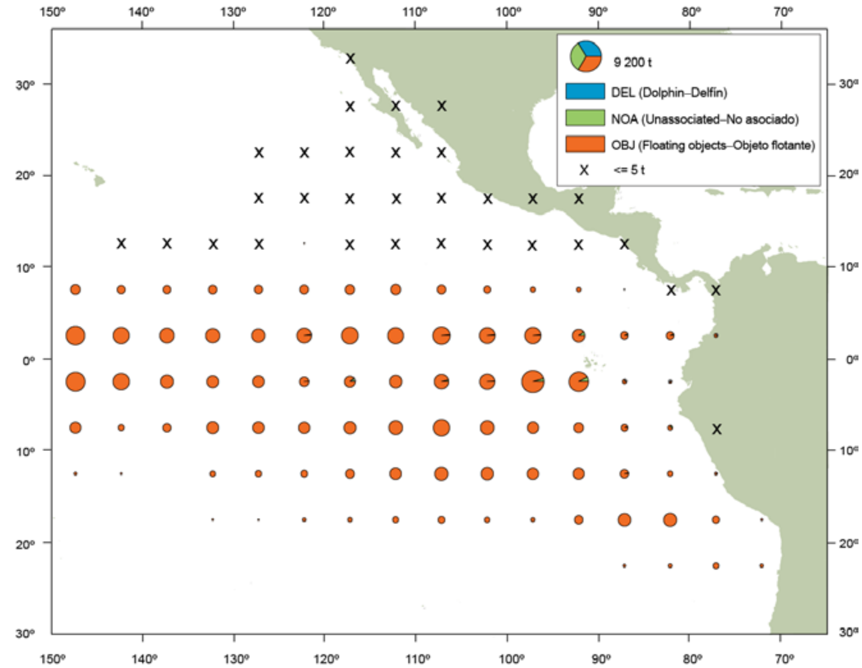

FIGURE 3a. Average annual distributions of the purse-seine catches of bigeye, by set type, 2010-2014. The sizes of the circles are proportional to the amounts of bigeye caught in those 5° by 5° areas.

FIGURA 3a. Distribución media anual de las capturas cerqueras de patudo, por tipo de lance, 2010-2014. El tamaño de cada círculo es proporcional a la cantidad de patudo capturado en la cuadrícula de 5° x 5° correspondiente.

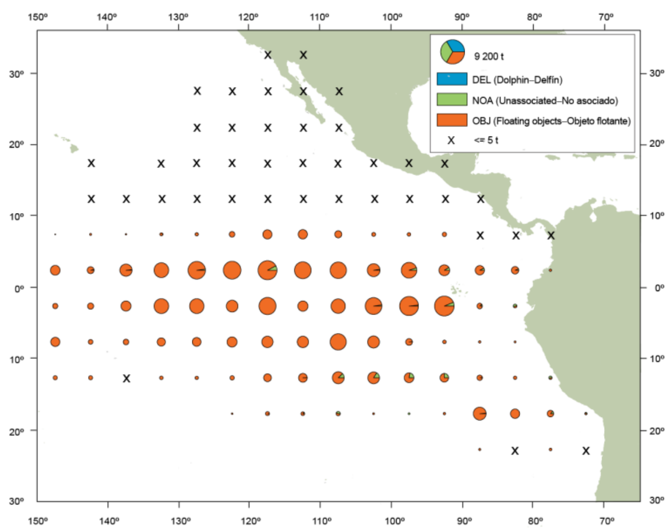

FIGURE 3b. Annual distributions of the purse-seine catches of bigeye, by set type, 2015. The sizes of the circles are proportional to the amounts of bigeye caught in those 5° by 5° areas.

FIGURA 3b. Distribución anual de las capturas cerqueras de patudo, por tipo de lance, 2015. El tamaño de cada círculo es proporcional a la cantidad de patudo capturado en la cuadrícula de 5° x 5° correspondiente.

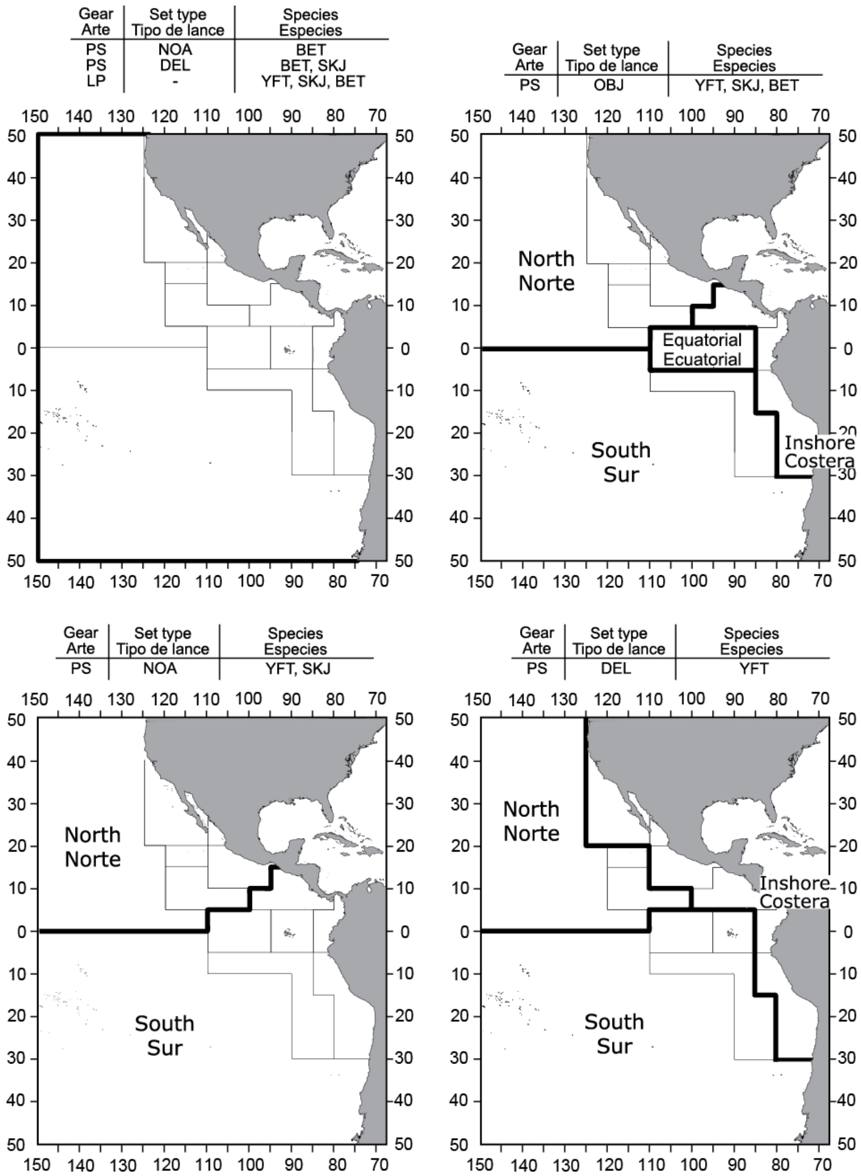

FIGURE 4. Spatial extents of the fisheries defined by the IATTC staff for stock assessment of yellowfin, skipjack, and bigeye in the EPO. The thin lines indicate the boundaries of the 13 length-frequency sampling areas, and the bold lines the boundaries of the fisheries. Gear: PS = purse seine, LP = pole and line; Set type: NOA = unassociated, DEL = dolphin, OBJ = floating object; Species: YFT = yellowfin, SKJ = skipjack, BET = bigeye.

FIGURA 4. 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.

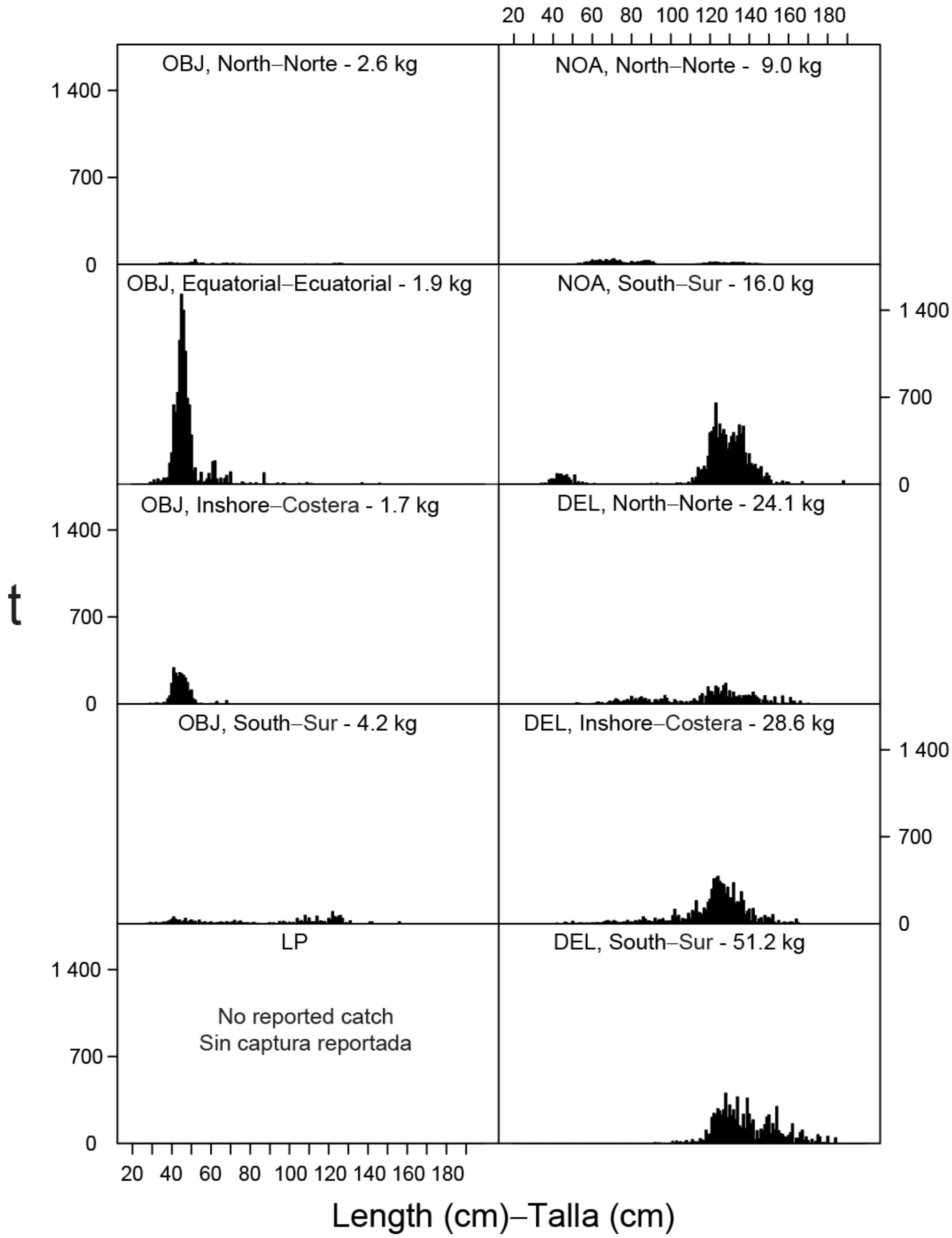

FIGURE 5a. Estimated size compositions of the yellowfin caught in each fishery of the EPO during the fourth quarter of 2015. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 5a. Composición por tallas estimada para el aleta amarilla capturado en cada pesquería del OPO durante el cuarto trimestre de 2015. En cada recuadro se detalla el peso promedio de los peces en las muestras. OBJ = objeto flotante; LP = caña; NOA = peces no asociados; DEL = delfín; t = toneladas métricas.

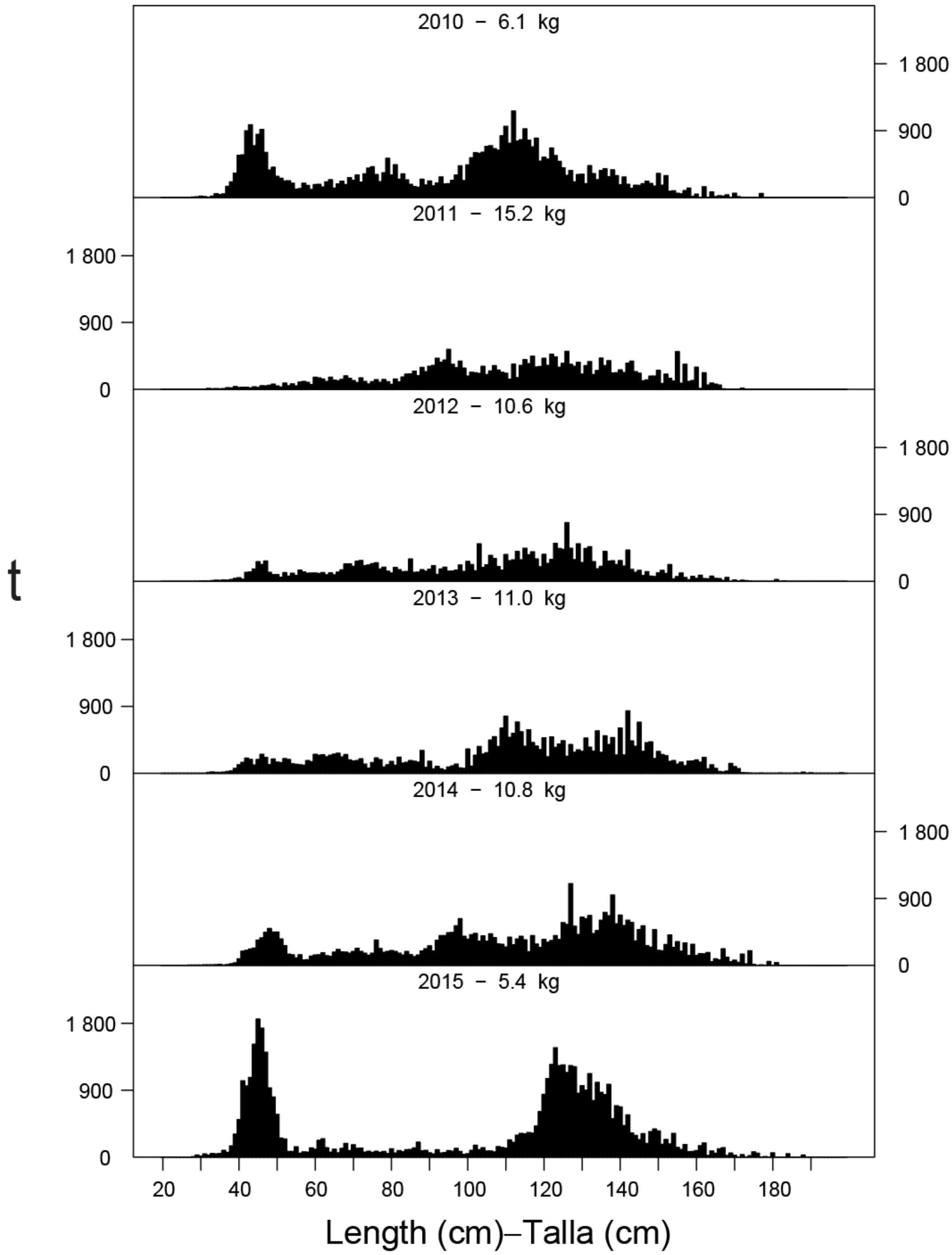

FIGURE 5b. Estimated size compositions of the yellowfin caught in the EPO during the fourth quarter of 2010-2015. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 5b. Composición por tallas estimada para el aleta amarilla capturado en el OPO en el cuarto trimestre de 2010-2015. En cada recuadro se detalla el peso promedio de los peces en las muestras; t = toneladas métricas.

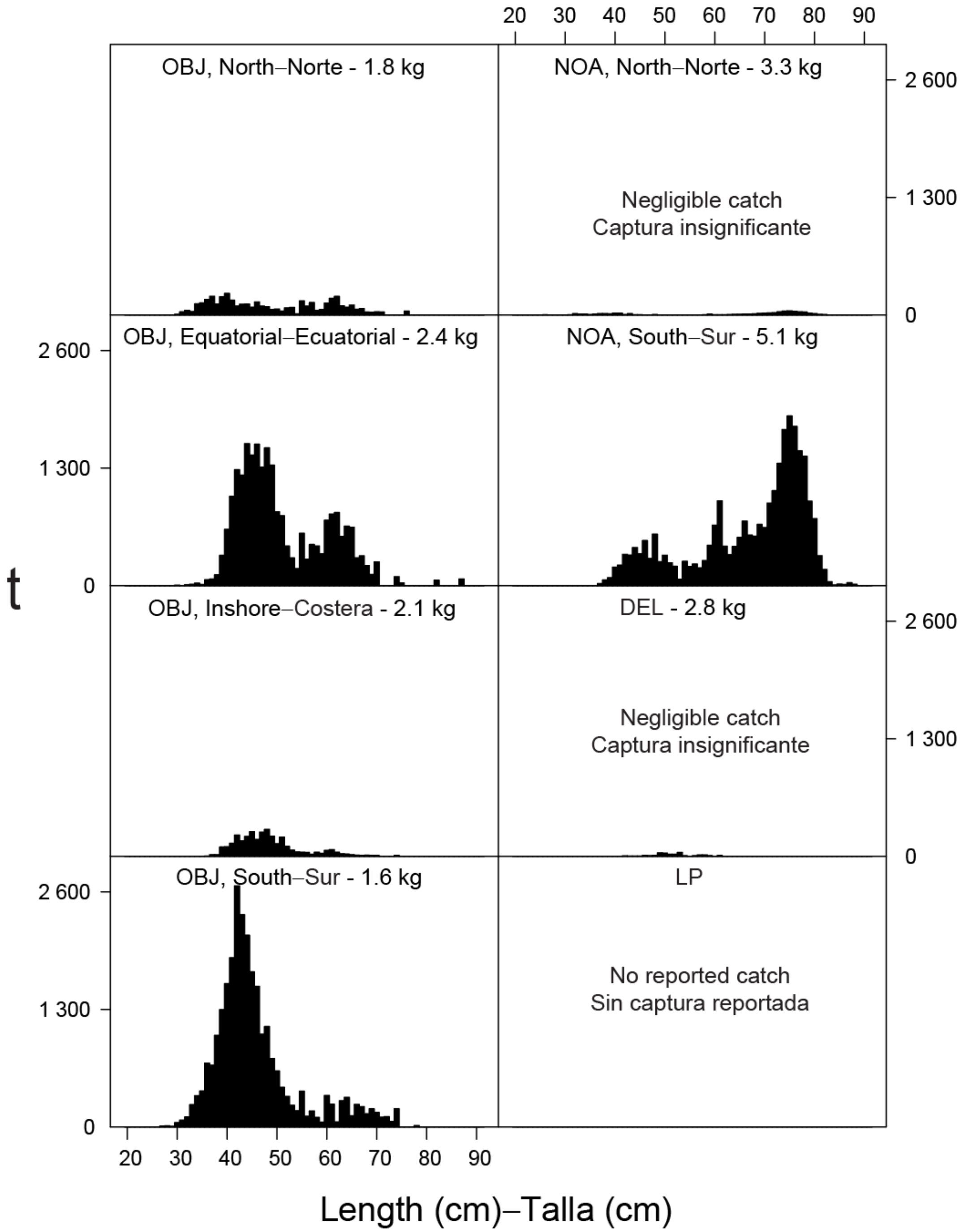

FIGURE 6a. Estimated size compositions of the skipjack caught in each fishery of the EPO during the fourth quarter of 2015. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 6a. Composición por tallas estimada para el barrilete capturado en cada pesquería del OPO durante el cuarto trimestre de 2015. En cada recuadro se detalla el peso promedio de los peces en las muestras. OBJ = objeto flotante; LP = caña; NOA = peces no asociados; DEL = delfín; t = toneladas métricas.

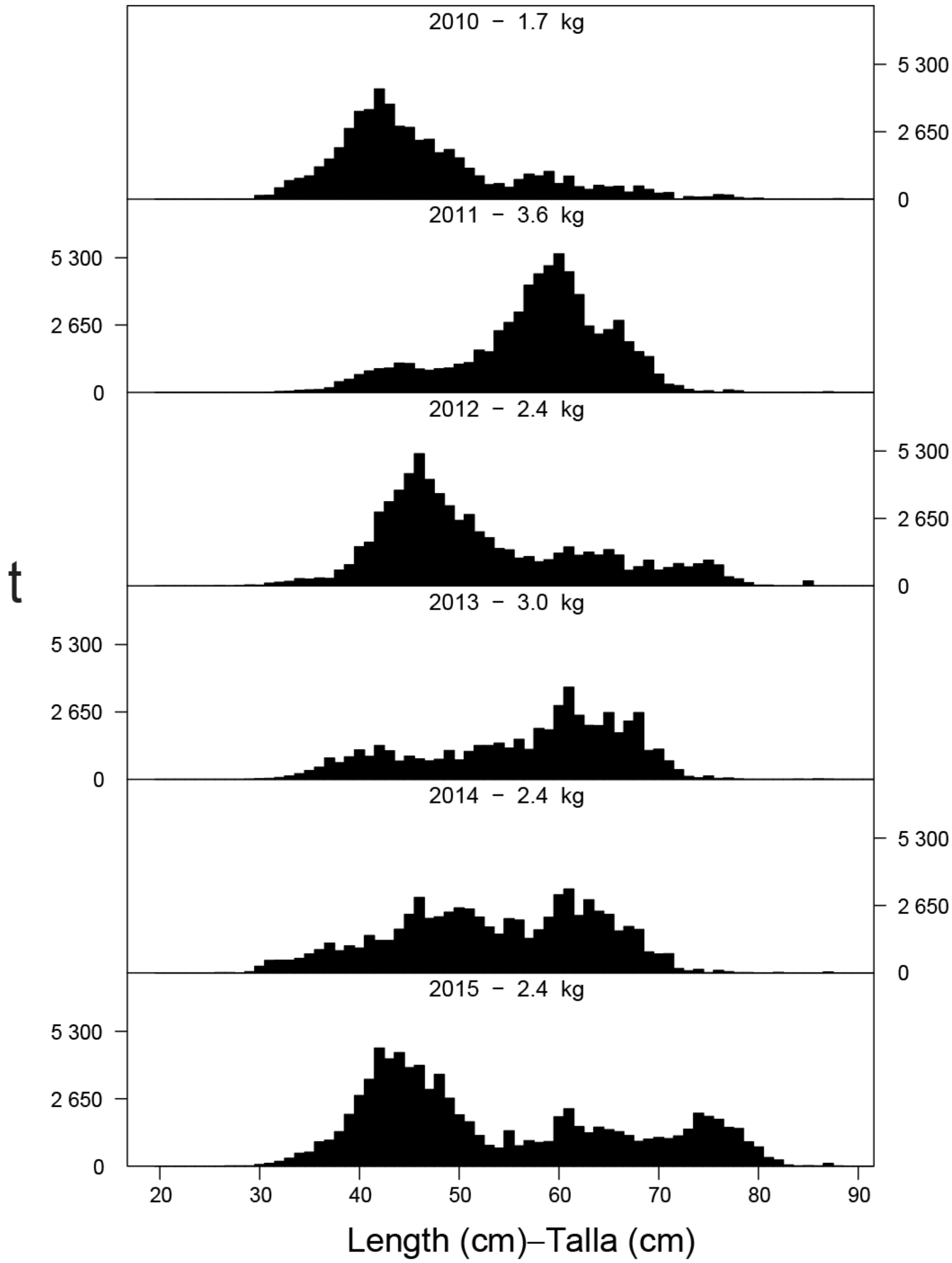

FIGURE 6b. Estimated size compositions of the skipjack caught in the EPO during the fourth quarter of 2010-2015. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 6b. Composición por tallas estimada para el barrilete capturado en el OPO en el cuarto trimestre de 2010-2015. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas.

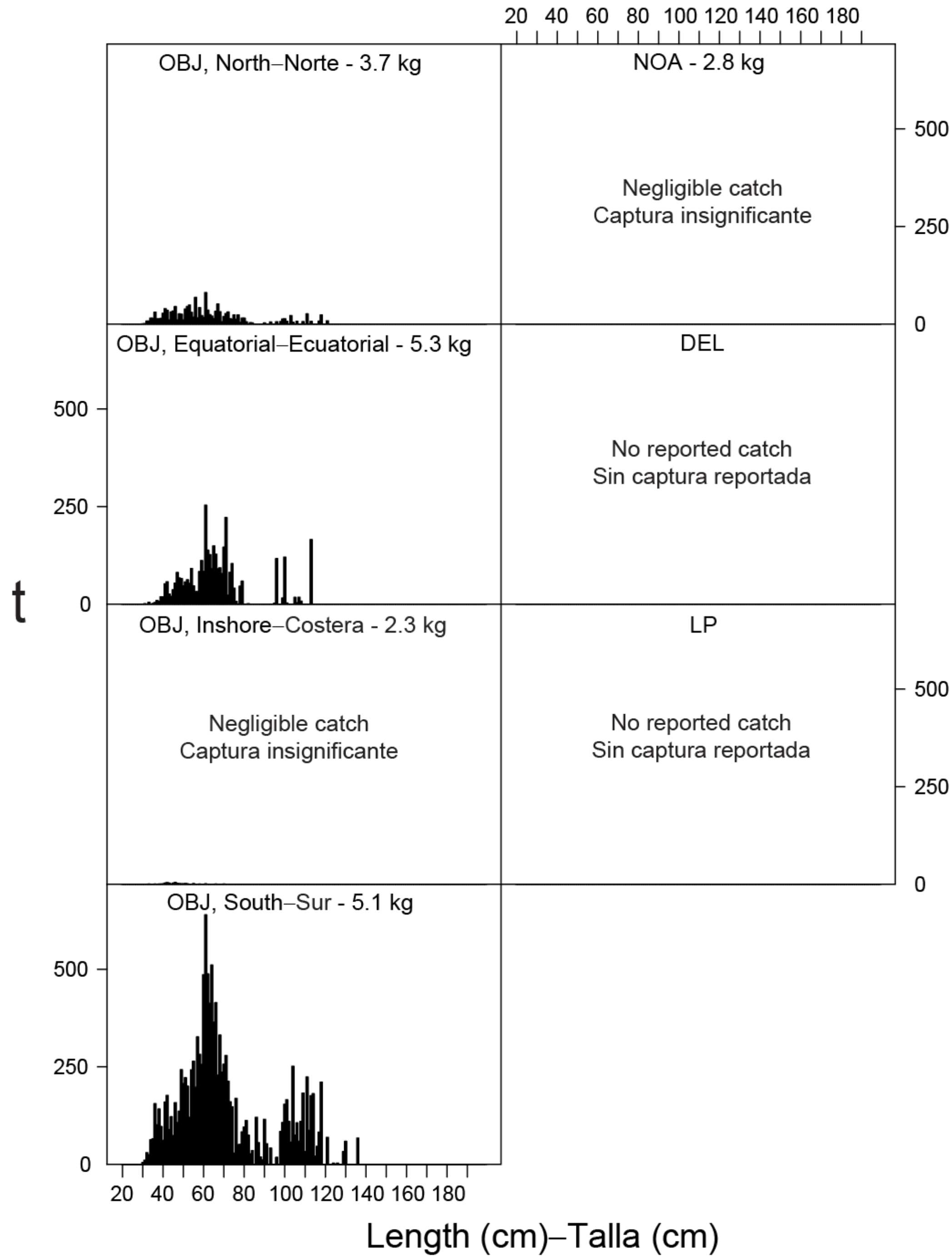

FIGURE 7a. Estimated size compositions of the bigeye caught in each fishery of the EPO during the fourth quarter of 2015. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 7a. Composición por tallas estimada para el patudo capturado en cada pesquería del OPO durante el cuarto trimestre de 2015. En cada recuadro se detalla el peso promedio de los peces en las muestras. OBJ = objeto flotante; LP = caña; NOA = peces no asociados; DEL = delfín; t = toneladas métricas.

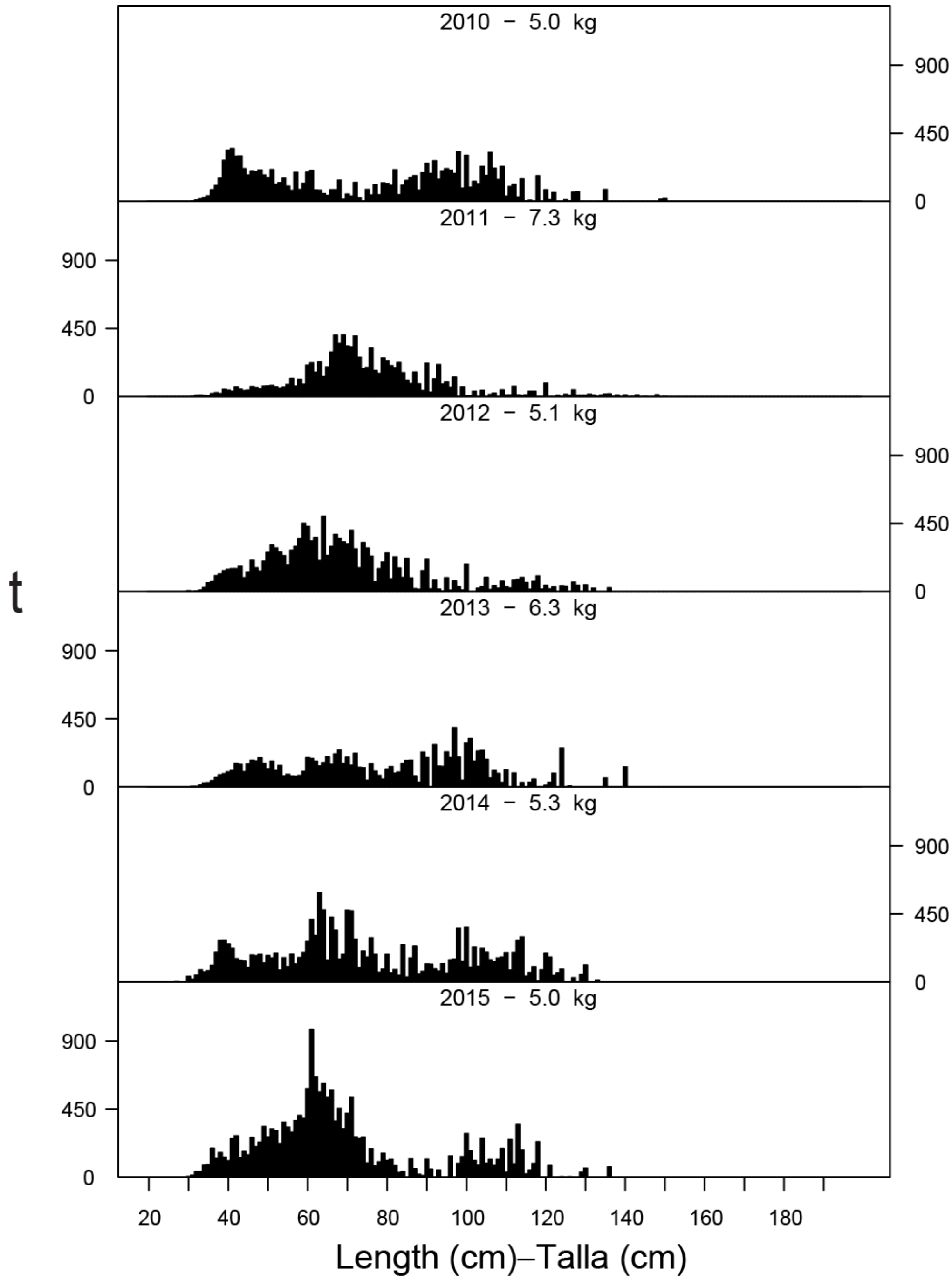

FIGURE 7b. Estimated size compositions of the bigeye caught in the EPO during the fourth quarter of 2010-2015. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 7b. Composición por tallas estimada para el patudo capturado en el OPO en el cuarto trimestre de 2010-2015. En cada recuadro se detalla el peso promedio de los peces en las muestras; t = toneladas métricas.

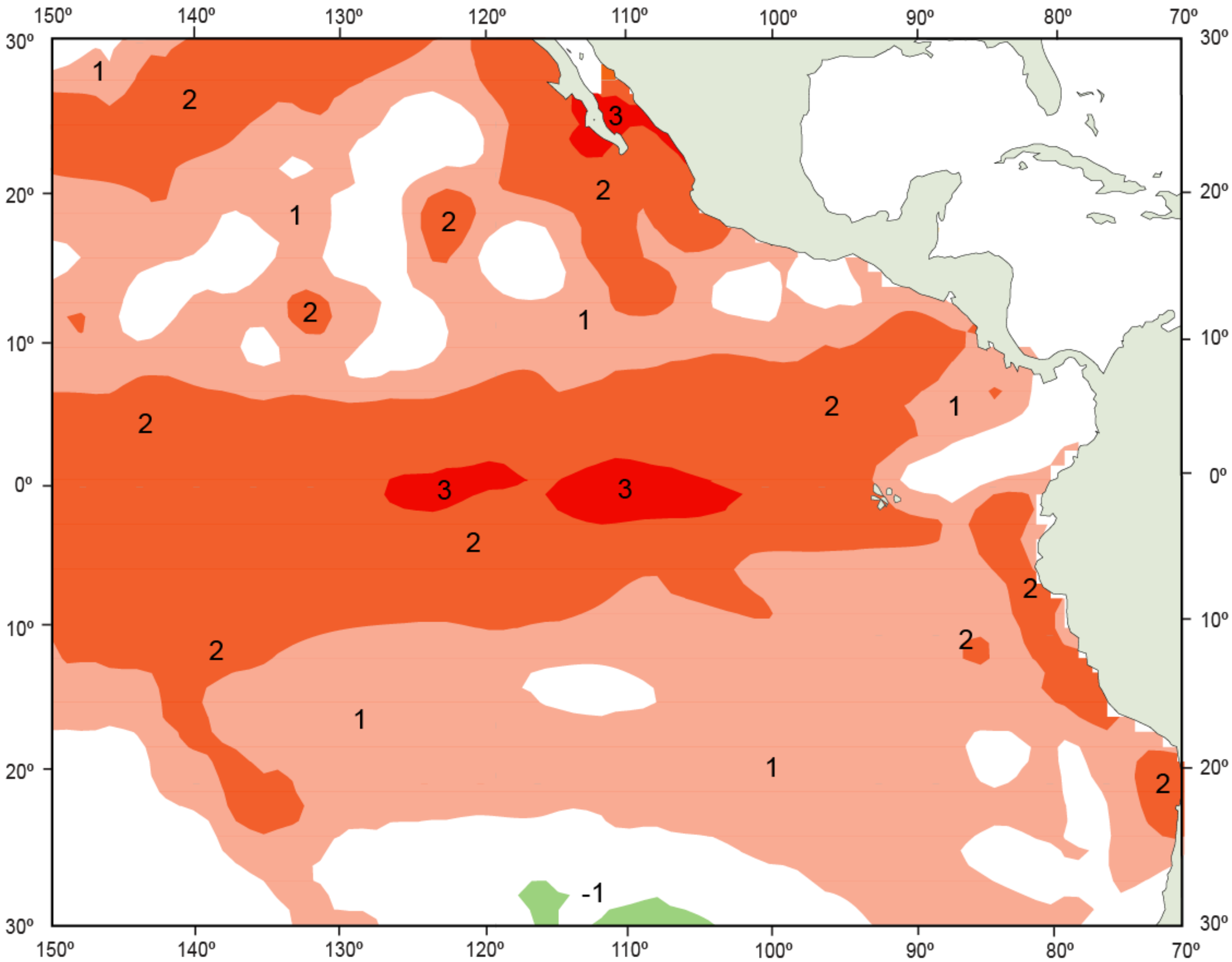

FIGURE 8. Sea-surface temperature (SST) anomalies (departures from long-term normals) for March 2016, based on data from fishing boats and other types of commercial vessels.
FIGURA 8. Anomalías (variaciones de los niveles normales a largo plazo) de la temperatura superficial del mar (TSM) en marzo de 2016, basadas en datos tomados por barcos pesqueros y otros buques comerciales.

TABLE 1. Estimates of the numbers and capacities (m^3) 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 (m^3) de los mismos por bandera, arte de pesca, y volumen de bodega. Se incluye cada buque en los totales de cada bandera bajo la cual pescó durante el año, pero solamente una vez en el total de la flota; por consiguiente, los totales de las flotas no son siempre iguales a las sumas de las banderas individuales. PS = cerquero; LP = cañero.

Flag	Gear	Well volume–Volumen de bodega				Capacity
Bandera	Arte	1-900	901-1700	>1700	Total	Capacidad
			Number—Número			
Colombia	PS	4	10	-	14	14,860
Ecuador	PS	74	25	13	112	91,651
UE(España)—EU(Spain)	PS	-	-	2	2	4,120
Guatemala	PS	-	1	-	1	1,475
México	PS	10	37	1	48	59,150
	LP	1	-	-	1	125
Nicaragua	PS	-	5	1	6	8,478
Panamá	PS	2	8	4	14	19,794
Perú	PS	6	-	-	6	2,818
El Salvador	PS	-	-	2	2	4,473
USA—EE.UU.	PS	9	6	8	23	25,936
Venezuela	PS	-	14	2	16	23,092
All flags—	PS	105	106	33	244	
Todas banderas	LP	1	-	-	1	
	PS + LP	106	106	33	245	
			Capacity—Capacidad			
All flags—	PS	47,453	141,200	67,194	255,847	
Todas banderas	LP	125	-	-	125	
	PS + LP	47,578	141,200	67,194	255,972	

TABLE 2. Preliminary estimates of the retained catches of tunas in the EPO, from 1 January through 3 April 2016, by species and vessel flag, in metric tons.
TABLA 2. Estimaciones preliminares de las capturas retenidas de atunes en el OPO del 1 de enero al 3 de abril 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	13,118	53,530	5,935	-	335	-	5	22	72,945	46.5
México	22,362	1,366	10	-	-	-	797	-	24,535	15.6
Panamá	5,713	9,311	904	-	-	-	-	-	15,928	10.2
United States - Estados Unidos	979	13,433	555	-	-	-	-	-	14,967	9.5
Venezuela	4,667	2,884	93	-	-	-	-	-	7,644	4.9
Other—Otros[2]	8,131	10,829	1,866	-	-	-	-	-	20,826	13.3
Total	54,970	91,353	9,363	-	335	-	802	22	156,845	

[1] Includes mackerel, other tunas, sharks, and miscellaneous fishes
[1] Incluye caballas, otros túnidos, tiburones, y peces diversos
[2] Includes Colombia, El Salvador, European Union (Spain), Guatemala, Nicaragua and Peru; this category is used to avoid revealing the operations of individual vessels or companies.
[2] Incluye Colombia, El Salvador, Guatemala, Nicaragua, Perú y Unión Europea (España); se usa esta categoría para no revelar información sobre faenas de buques o empresas individuales.

TABLE 3. Estimated retained and discarded EPO catches, in metric tons, by purse-seine and pole-and-line vessels. "TUN" includes some catches reported by species (figate or bullet tunas) along with the unidentified tunas. The data for 2014-2015 are preliminary. Discard data were first collected by observers in 1993.

TABLA 3. Estimaciones de capturas del OPO retenidas y descartadas, en toneladas métricas, de buques cerqueros y caneros. "TUN" incluye algunas capturas reportadas por especie (melvas o petos) junto con los atunes no identificados. Los datos de 2014-2015 son preliminares. Los observadores toman datos sobre descartes desde 1993.

Year	Yellowfin			Skipjack			Bigeye			Pacific bluefin		
	Retained	Discarded	Total	Retained	Discarded	Total	Retained	Discarded	Total	Retained	Discarded	Total
Año	Aleta amarilla			Barrilete			Patudo			Aleta azul del Pacífico		
	Retenido	Descartado	Total	Retenido	Descartado	Total	Retenido	Descartado	Total	Retenido	Descartado	Total
1986	263,049	-	263,049	67,555	-	67,555	2,686	-	2,686	5,040	-	5,040
1987	267,115	-	267,115	66,252	-	66,252	1,177	-	1,177	980	-	980
1988	281,016	-	281,016	91,438	-	91,438	1,540	-	1,540	1,379	-	1,379
1989	282,141	-	282,141	97,874	-	97,874	2,030	-	2,030	1,108	-	1,108
1990	265,929	-	265,929	75,192	-	75,192	5,921	-	5,921	1,491	-	1,491
1991	234,113	-	234,113	63,945	-	63,945	4,901	-	4,901	419	-	419
1992	231,910	-	231,910	86,240	-	86,240	7,179	-	7,179	1,928	-	1,928
1993	224,443	4,713	229,156	87,602	10,515	98,117	9,657	653	10,310	580	-	580
1994	212,033	4,525	216,558	73,366	10,491	83,857	34,899	2,266	37,165	969	-	969
1995	216,702	5,275	221,977	132,300	16,373	148,673	45,321	3,251	48,572	659	-	659
1996	242,369	6,312	248,681	106,528	24,494	131,022	61,311	5,689	67,000	8,333	-	8,333
1997	249,296	5,516	254,812	156,716	31,338	188,054	64,272	5,402	69,674	2,610	3	2,613
1998	259,044	4,697	263,741	142,315	22,643	164,958	44,129	2,822	46,951	1,772	-	1,772
1999	283,703	6,547	290,250	263,609	26,046	289,655	51,158	4,932	56,090	2,558	54	2,612
2000	255,694	6,207	261,901	205,878	24,468	230,346	95,282	5,417	100,699	3,773	-	3,773
2001	387,852	7,028	394,880	143,613	12,815	156,428	60,518	1,254	61,772	1,156	3	1,159
2002	413,236	4,140	417,376	154,162	12,506	166,668	57,421	949	58,370	1,761	1	1,762
2003	383,749	5,865	389,614	274,606	22,453	297,059	53,052	2,326	55,378	3,236	-	3,236
2004	274,441	3,000	277,441	198,352	17,078	215,430	65,471	1,574	67,045	8,880	19	8,899
2005	269,923	2,771	272,694	264,528	16,915	281,443	67,895	1,900	69,795	4,743	15	4,758
2006	167,317	1,534	168,851	296,703	11,177	307,880	83,838	1,680	85,518	9,928	-	9,928
2007	170,910	1,725	172,635	208,571	6,450	215,021	63,450	890	64,340	4,189	-	4,189
2008	185,871	696	186,567	297,102	8,249	305,351	75,028	2,086	77,114	4,407	14	4,421
2009	237,466	1,262	238,728	230,674	6,064	236,738	76,799	1,019	77,818	3,428	24	3,452
2010	251,469	1,031	252,500	147,239	2,769	150,008	57,752	564	58,316	7,746	-	7,746
2011	207,127	415	207,542	276,059	5,215	281,274	56,512	631	57,143	2,829	4	2,833
2012	198,417	451	198,868	266,518	3,511	270,029	66,020	473	66,493	6,705	-	6,705
2013	218,946	207	219,153	278,724	2,254	280,978	49,487	273	49,760	3,154	-	3,154
2014	233,973	517	234,490	261,578	2,596	264,174	60,453	83	60,536	5,263	66	5,329
2015	245,183	334	245,517	329,280	3,699	332,979	63,229	177	63,406	3,168	-	3,168

TABLE 3. (continued)
TABLA 3. (continuación)

Year	Albacore			Bonitos (*Sarda* spp.)			Black skipjack			Unidentified tunas (TUN)			Total		
	Retained	Discarded	Total	Retained	Discarded	Total	Retained	Discarded	Total	Retained	Discarded	Total	Retained	Discarded	Total
Año	Albacora			Bonitos (*Sarda* spp.)			Barrilete negro			Atunes no identificados (TUN)			Total		
	Retenido	Descartado	Total	Retenido	Descartado	Total	Retenido	Descartado	Total	Retenido	Descartado	Total	Retenido	Descartado	Total
1986	133	-	133	490	-	490	569	-	569	181	-	181	339,703	-	339,703
1987	321	-	321	3,316	-	3,316	571	-	571	481	-	481	340,213	-	340,213
1988	288	-	288	9,550	-	9,550	956	-	956	79	-	79	386,246	-	386,246
1989	22	-	22	12,096	-	12,096	803	-	803	36	-	36	396,110	-	396,110
1990	209	-	209	13,856	-	13,856	787	-	787	200	-	200	363,585	-	363,585
1991	834	-	834	1,289	-	1,289	421	-	421	4	-	4	305,926	-	305,926
1992	255	-	255	977	-	977	105	-	105	24	-	24	328,618	-	328,618
1993	1	-	1	600	12	612	104	3,925	4,029	9	1,975	1,984	322,996	21,793	344,789
1994	85	-	85	8,693	147	8,840	188	857	1,045	9	498	507	330,242	18,784	349,026
1995	465	-	465	8,010	55	8,065	202	1,448	1,650	11	626	637	403,670	27,028	430,698
1996	83	-	83	654	1	655	704	2,304	3,008	37	1,028	1,065	420,019	39,828	459,847
1997	60	-	60	1,105	4	1,109	100	2,512	2,612	71	3,383	3,454	474,230	48,158	522,388
1998	123	-	123	1,337	4	1,341	528	1,876	2,404	13	1,233	1,246	449,261	33,275	482,536
1999	274	-	274	1,719	-	1,719	171	3,404	3,575	27	3,092	3,119	603,219	44,075	647,294
2000	157	-	157	636	-	636	294	1,995	2,289	190	1,410	1,600	561,904	39,497	601,401
2001	160	-	160	17	-	17	2,258	1,019	3,277	191	679	870	595,765	22,798	618,563
2002	412	-	412	-	-	-	1,467	2,283	3,750	576	1,863	2,439	629,035	21,742	650,777
2003	93	-	93	1	-	1	439	1,535	1,974	80	1,238	1,318	715,256	33,417	748,673
2004	231	-	231	16	35	51	884	387	1,271	256	973	1,229	548,531	23,066	571,597
2005	68	-	68	313	18	331	1,472	2,124	3,596	190	1,922	2,112	609,132	25,665	634,797
2006	110	-	110	3,519	80	3,599	1,999	1,972	3,971	50	1,910	1,960	563,464	18,353	581,817
2007	208	-	208	16,013	628	16,641	2,307	1,625	3,932	598	1,221	1,819	466,246	12,539	478,785
2008	1,099	-	1,099	7,883	37	7,920	3,624	2,251	5,875	137	1,380	1,517	575,151	14,713	589,864
2009	50	2	52	9,720	15	9,735	4,256	1,020	5,276	162	469	631	562,555	9,875	572,430
2010	25	-	25	2,824	19	2,843	3,425	1,079	4,504	136	709	845	470,616	6,171	476,787
2011	10	-	10	7,987	45	8,032	2,317	719	3,036	108	784	892	552,949	7,813	560,762
2012	-	-	-	8,191	156	8,347	4,504	440	4,944	41	354	395	550,396	5,385	555,781
2013	-	-	-	2,067	9	2,076	3,580	805	4,385	53	461	514	556,011	4,009	560,020
2014	-	-	-	2,821	38	2,859	4,153	486	4,639	113	328	441	568,354	4,114	572,468
2015	-	-	-	789	28	817	3,793	356	4,149	81	242	323	645,523	4,836	650,359

TABLE 4. Preliminary estimates of the retained catches in metric tons, of tunas and bonitos caught by purse-seine vessels in the EPO in 2014 and 2015, by species and vessel flag. The data for yellowfin, skipjack, and bigeye tunas have been adjusted to the species composition estimates, and are preliminary.

TABLA 4. Estimaciones preliminares de las capturas retenidas, en toneladas métricas, de atunes y bonitos por buques cerqueros en el OPO en 2014 y 2015, por especie y bandera del buque. Los datos de los atunes aleta amarilla, barrilete, y patudo fueron ajustados a las estimaciones de composición por especie, y son preliminares.

	Yellowfin	Skipjack	Bigeye	Pacific bluefin	Albacore	Black skipjack	Bonito	Unidentified tunas	Total	Percent
	Aleta amarilla	Barrilete	Patudo	Aleta azul	Albacora	Barrilete negro	Bonito	Atunes no identificados	Total	Porcentaje
2014	**Retained catches—Capturas retenidas**									
Colombia	17,203	22,740	2,453	-	-	10	-	-	42,406	7.4
Ecuador	37,640	172,510	38,749	-	-	707	1,855	65	251,526	44.2
EU (España)	763	5,599	2,790	-	-	-	-	-	9,152	1.6
México	120,986	8,777	40	4,862	-	3,428	964	48	139,105	24.5
Nicaragua	8,119	6,309	3,039	-	-	1	-	-	17,468	3.1
Panamá	19,375	21,816	8,107	-	-	5	2	-	49,305	8.7
United States - Estados Unidos	1,106	521	128	401	-	-	-	-	2,156	0.4
Venezuela	23,040	13,766	1,170	-	-	2	-	-	37,978	6.7
Other-Otra[1]	5,741	9,540	3,977	-	-	-	-	-	19,258	3.4
Total	233,973	261,578	60,453	5,263	-	4,153	2,821	113	568,354	
2015	**Retained catches–Capturas retenidas**									
Colombia	17,422	16,370	2,379	-	-	20	-	-	36,191	5.6
Ecuador	49,039	210,215	43,709	-	-	1,032	37	47	304,079	47.1
EU (España)	525	11,545	754	-	-	-	-	-	12,824	2.0
México	106,522	23,170	149	3,082	-	2,719	626	23	136,291	21.1
Nicaragua	6,788	1,439	962	-	-	1	-	-	9,190	1.4
Panamá	26,491	31,005	10,596	-	-	-	-	3	68,095	10.5
Perú	764	5,165	-	-	-	-	9	5	5,943	0.9
United States - Estados Unidos	3,151	16,867	2,308	86	-	-	117	-	22,529	3.5
Venezuela	30,266	4,777	126	-	-	15	-	3	35,187	5.5
Other-Otra[2]	4,215	8,727	2,246	-	-	6	-	-	15,194	2.4
Total	245,183	329,280	63,229	3,168	-	3,793	789	81	645,523	

[1] Includes El Salvador, Guatemala and Peru This category is used to avoid revealing the operations of individual vessels or companies.
[1] Incluye El Salvador, Guatemala y Perú Se usa esta categoría para no revelar información sobre las actividades de buques o empresas individuales.
[2] Includes El Salvador and Guatemala This category is used to avoid revealing the operations of individual vessels or companies.
[2] Incluye El Salvador y Guatemala Se usa esta categoría para no revelar información sobre las actividades de buques o empresas individuales.

TABLE 5a. Catches of bigeye tuna, in metric tons, in the eastern Pacific Ocean during 2015 by longline vessels more than 24 meters in overall length.
TABLA 5a. Capturas de atún patudo, en toneladas métricas, en el Océano Pacífico oriental durante 2015 por buques palangreros de más de 24 metros en eslora total.

Flag—Bandera	Quarter—Trimestre				Total
	1	2	3	4	
China	1,349	2,077	2,370	2,690	8,486
Japan—Japón	3,825	2,547	2,705	4,337	13,414
Republic of Korea—República de Corea*	2,351	2,240	2,144	3,372	10,107
Chinese Taipei—Taipei Chino	938	1,007	1,387	2,206	5,538
United States—Estados Unidos	-	-	-	-	666
Vanuatu	33	-	-	-	33
Total	8,496	7,871	8,606	12,605	38,244

* Round weight obtained by adjustment applied to processed weight—Peso entero obtenido mediante ajuste aplicado al peso procesado provisto

TABLE 5b. Preliminary estimates of the catches of bigeye tuna, in metric tons, in the eastern Pacific Ocean during the first quarter of 2016 by longline vessels more than 24 meters in overall length.
TABLA 5b. Estimaciones preliminares de las capturas de atún patudo, en toneladas métricas, en el Océano Pacífico oriental durante el primer trimestre de 2016 por buques palangreros de más de 24 metros en eslora total.

Flag—Bandera	Month—Mes			Total
	1	2	3	
China	-	-	-	-
Japan—Japón	1,444	1,116	-	2,560
Republic of Korea—República de Corea*	885	634	-	1,519
Chinese Taipei—Taipei Chino	488	500	-	988
United States— Estados Unidos	-	-	-	-
Vanuatu	-	-	-	-

* Round weight obtained by adjustment applied to processed weight—Peso entero obtenido mediante ajuste

TABLE 6. Oceanographic and meteorological data for the Pacific Ocean, April 2015-March 2016. The values in parentheses are anomalies. SST = sea-surface temperature; SOI = Southern Oscillation Index; SOI* and NOI* are defined in the text.
TABLA 6. Datos oceanográficos y meteorológicos del Océano Pacífico, abril 2015-marzo 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	**4**	**5**	**6**	**7**	**8**	**9**
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	27.0 (1.4)	26.7 (2.4)	25.4 (2.5)	24.5 (2.9)	22.9 (2.3)	22.9 (2.6)
Area 2 (5°N-5°S, 90°-150°W	28.2 (0.7)	28.3 (1.2)	28.1 (1.2)	27.8 (2.2)	27.3 (2.3)	27.5 (2.6)
Area 3 (5°N-5°S, 120°-170°W)	28.6 (0.8)	28.9 (1.0)	29.0 (1.3)	28.8 (1.6)	28.9 (2.1)	29.0 (2.3)
Area 4 (5°N-5°S, 150W°-160°E)	29.7 (1.2)	29.9 (1.1)	29.9 (1.1)	29.8 (1.0))	29.7 (1.0)	29.7 (1.0)
Thermocline depth—Profundidad de la termoclina, 0°-80°W	45	85	45	50	40	30
Thermocline depth—Profundidad de la termoclina, 0°-110°W	100	95	100	90	100	110
Thermocline depth—Profundidad de la termoclina, 0°-150°W	150	150	140	150	150	145
Thermocline depth—Profundidad de la termoclina, 0°-180°	160	170	155	160	160	160
SOI—IOS	0.0	-0.7	-0.6	-1.1	-1.4	-1.6
SOI*—IOS*	-2.55	-2.40	-1.42	-1.61	-5.46	-5.42
NOI*—ION*	0.63	-2.50	-1.47	-4.05	-3.22	-2.71

TABLE 6. (continued)
TABLA 6. (continuación)

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
SOI*—IOS*	-4.87	1.49	-1.81	-6.59	-2.30	-1.53
NOI*—ION*	-4.08	2.09	1.55	-6.94	0.82	-2.06

TABLE 7. 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, and Venezuela, departing during the first quarter of 2016. The numbers in parentheses indicate cumulative totals for the year.
TABLA 7. 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, y Venezuela, durante el primer trimestre de 2016. Los números entre paréntesis indican los totales acumulados para el año.

Flag	Trips		Class-6–Observed by program						Percentage observed	
Pabellón	Viajes		Clase-6–Observado por programa						Porcentaje observado	
			IATTC CIAT		National Nacional		Not obs. No obs.			
Colombia	11	(11)	5	(5)	6	(6)			100.0	(100)
Ecuador	116	(116)	79	(79)	37	(37)			100.0	(100)
El Salvador	4	(4)	4	(4)					100.0	(100)
EU (Spain)—UE (España)	3	(3)	2	(2)	1	(1)			100.0	(100)
Guatemala	1	(1)	1	(1)					100.0	(100)
México	77	(77)	34	(34)	43	(43)			100.0	(100)
Nicaragua	4	(4)	3	(3	1	(1)			100.0	(100)
Panamá	25	(25)	11	(11)	14	(14)			100.0	(100)
Perú	10	(10)	10	(10)					100.0	(100)
U.S.A.—E.U.A.	18	(18)	17	(17)			1	(1)	94.4	(94.4)
Venezuela	13	(13)	9	(9)	4	(4)			100.0	(100)
Total	282	(282)	175	(175)	106	(106)	1	(1)	99.6	(99.6)
				Class-5 - Clase						
Colombia	2	(2)	1	(1)	1	(1)			-	-
Total	2	(2)	1	(1)	1	(1)			-	-