INTER-AMERICAN TROPICAL TUNA COMMMISSION
COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL

QUARTERLY REPORT—INFORME TRIMESTRAL

October-December 2010—Octubre-Diciembre 2010

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. At the end of the fourth quarter of 2010, 20 nations and economic entities were members of the IATTC.

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 60th 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. Richard B. Deriso participated in a meeting of the Scientific and Statistical Committee of the Western Pacific Fishery Management Council of the United States in Honolulu, Hawaii, USA, on 6-8 October 2010. His travel expenses were paid by the Western Pacific Fishery Management Council.

Drs. Mark N. Maunder and Alexandre Aires-da-Silva participated in an intercessional workshop of the Albacore Working Group of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean in La Jolla, California, USA, on 12-19 October 2010. The purpose of this workshop was to evaluate and prepare the available data for a stock assessment of North Pacific albacore that will take place in March 2011.

Dr. Martín A. Hall participated in a workshop entitled "Selective Fishing and Balanced Exploitation in Relation to Fisheries and Ecosystem Sustainability," organized by the Fisheries Expert Group of the International Union for Conservation of Nature-Center for Ecosystem Management and the European Board of Conservation and Development in Nagoya, Japan, on 14-16 October 2010.

Dr. Martín A. Hall spent the period of 17-18 October 2010, in Yokohama, Japan, where he and Dr. Kusuke Yokota discussed the latter's participation in the upcoming Circle Hook Symposium. Dr. Hall is a member of the steering committee of that symposium, which will take place in Miami, Florida, USA, in May 2011. He also met with Drs. Takafumi Arimoto, Daisuke Shiode, and Tadashi Tokai at the Tokyo University of Marine Science and Technology.

Mr. Kurt M. Schaefer participated, as an invited speaker, in the International Symposium on Tuna and Billfish Tagging in Taitung, Chinese Taipei, on 7-12 November 2010. The title of his presentation, coauthored with Mr. Daniel W. Fuller, was "A Ten-Year Perspective on Archival Tagging Experiments with Tropical Tunas in the Eastern Pacific Ocean." His travel expenses were paid by the Fisheries Research Institute, Council of Agriculture, Executive Yuan, Chinese Taipei.

Mr. Alejandro Pérez participated in a meeting, "Technical Consultation to Identify a Structure and Strategy for the Development and Implementation of the Global Record of Fishing Vessels, Refrigerated Transport Vessels and Supply Vessels" at the headquarters of the Food and Agriculture Organization (FAO) of the United Nations in Rome, Italy, on 8-12 November 2010. The purpose of the meeting was to provide recommendations to be further analyzed at an FAO Committee of Fisheries meeting to be held in Rome in January 2011.

Dr. Guillermo A. Compeán participated in the International Conference on Environment and Resources of the South Pacific, which took place in Viña del Mar, Chile, on 22-26 November 2010. The conference was sponsored by the School of Marine Sciences of the Pontificia Universidad Católica de Valparaiso, Chile, as part of the celebrations of the Bicentennial of the Republic of Chile. He gave a talk entitled "Status of Tuna Populations in the Eastern Pacific" at the conference.

Dr. Guillermo A. Compeán participated in the Seventh Regular Session of the Western and Central Pacific Fisheries Commission in Honolulu, Hawaii, on 6-10 December 2010.

Dr. Robert J. Olson participated in the annual principal investigators' workshop of the Pelagic Fisheries Research Program (PFRP), Joint Institute of Marine and Atmospheric Research, University of Hawaii, on 15-16 December 2010. He was invited to give the keynote address at the workshop; this was entitled "Food Web Implications for Pelagic Top Predators: from Guts and Isotopes to Models." Dr. Olson's travel expenses were paid by PFRP. Prior to the PFRP workshop, Dr. Olson met with colleagues at the University of Hawaii to plan a sampling program for a new project funded by the Comparative Analysis of Marine Ecosystem Organization (CAMEO) program, which is implemented as a partnership between the U.S. National Marine Fisheries Service and the U.S. National Science Foundation, Division of Ocean Sciences.

RESEARCH

DATA COLLECTION AND DATABASE PROGRAM

The IATTC had field offices at Las Playas and Manta, Ecuador; Manzanillo and Mazatlan, Mexico; Panama, Republic of Panama; and Cumaná, Venezuela, during the fourth quarter of 2010. Personnel at those offices collected 229 length-frequency samples from 151 wells and abstracted logbook information for 174 trips of commercial fishing vessels during the fourth quarter of 2010.

Reported fisheries statistics

The information reported herein are for the eastern Pacific Ocean (EPO: the region east of 150ºW, south of 50ºN, and north of 50°S), unless noted otherwise. The catches are reported in metric tons (t), vessel capacities in cubic meters (m^3), and effort in days fishing. Estimates of fisheries statistics with varying degrees of accuracy and precision are available. The most accurate and precise are those made after all available information has been entered into the data base, processed, and verified. While it may require a year or more to obtain some final information, much of the catch information is processed and available within two to three months of the return of a vessel from a fishing trip. Thus the estimates for the current week are the most preliminary, while those made a year later are much more accurate and precise. The statistics are developed using data from many sources, including reports of landing, fishing vessel logbooks, scientific observers, and governmental agencies.

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

The lists of vessels authorized to fish for tunas in the EPO are given in the IATTC Regional Vessel Register. The estimated total carrying capacity of the purse-seine and pole-and-line vessels that have or are expected to fish in the EPO during 2010 is about 209,600 m^3 (Table 1). The average weekly at-sea capacity for the fleet, for the weeks ending 4 October through 31 December, was about 110,000 m^3 (range: 39,000 to 170,500 m^3).

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

Catch statistics

The estimated total retained catches (t) of tropical tunas from the EPO during the period of January-December 2010, and comparative statistics for 2005-2009, were:

Species	2010	2005-2009			Weekly average, 2010
		Average	Minimum	Maximum	
Yellowfin	228,700	212,800	180,300	273,500	4,400
Skipjack	170,700	254,400	194,600	297,500	3,300
Bigeye	48,000	55,100	48,900	59,900	900

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

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

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

The measures of catch rate used in analyses are based on fishing trips landing predominantly yellowfin, skipjack, bigeye, and bluefin tuna. The great majority of the purse-seine catches of yellowfin, skipjack, and bigeye are made by vessels with fish-carrying capacities greater than about 425 m^3, and only data for these vessels are included in these measures of catch rate. There are now far fewer pole-and-line vessels than in previous years, so the data for these vessels are combined without regard to carrying capacity.

The estimated nominal catches per day of fishing for yellowfin, skipjack, and bigeye in the EPO during the third quarter of 2010 and comparative statistics for 2005-2009 were:

Region	Species	Gear	2010	2005-2009		
				Average	Minimum	Maximum
N of 5° N	Yellowfin	PS	13.9	10.3	8.4	13.6
S of 5° N			2.6	2.8	2.0	4.7
N of 5° N	Skipjack	PS	1.0	3.0	0.8	4.4
S of 5° N			7.6	8.7	5.8	10.4
EPO	Bigeye	PS	1.7	2.1	1.7	2.8
EPO	Yellowfin	LP	2.4	2.2	1.7	2.8
EPO	Skipjack	LP	0.1	0.8	0.5	1.5

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 (http://iattc.org/PDFFiles2/C-09-01-Tuna-conservation-2009-2011.pdf). Preliminary estimates of the catches reported for January-December 2010, are shown in Table 3.

Size compositions of the surface catches of tunas

Length-frequency samples are the basic source of data used for estimating the size and age compositions of the various species of fish in the landings. This information is necessary to obtain age-structured estimates of the population. Samples of yellowfin, skipjack, bigeye, Pacific bluefin, and, occasionally, black skipjack from the catches of purse-seine, pole-and-line, and recreational vessels in the EPO are collected by IATTC personnel at ports of landing in Ecuador, Mexico, Panama, the USA, and Venezuela. The catches of yellowfin and skipjack were first sampled in 1954, bluefin in 1973, and bigeye in 1975.

The methods for sampling and estimation of the catches of tunas are described in the IATTC Annual Report for 2000, IATTC Stock Assessment Report 4, and the Appendix of IATTC Special Report 18. Briefly, the fish in a well of a purse-seine or pole-and-line vessel are selected for sampling only if all the fish in the well were caught during the same calendar month, in the same type of set (floating-object, unassociated school, or dolphin), and in the same sampling area. These data are then categorized by fishery (Figure 1).

Data for fish caught during thethird quarter of 2005-2010 are presented in this report. Two sets of length-frequency histograms are presented for each species; the first shows the data by stratum (gear type, set type, and area) for the third quarter of 2010, and the second shows data for the combined strata for the third quarter of each year of the 2005-2010 period. Samples from 192 wells were taken during the third quarter of 2010.

There are ten surface fisheries for yellowfin defined for stock assessments: four associated with floating objects, two unassociated school, three associated with dolphins, and one pole-and-line (Figure 1). The last fishery includes all 13 sampling areas. Of the 192 wells sampled that contained fish caught during the third quarter of 2010, 134 contained yellowfin. The estimated size compositions of these fish are shown in Figure 2a. The majority of the yellowfin catch during the third quarter was taken by sets on dolphins in the Northern and Inshore areas, with smaller amounts taken in the Northern and Southern unassociated fisheries. Lesser amounts of yellowfin were captured in the floating-object fisheries.

The estimated size compositions of the yellowfin caught by all fisheries combined during the third quarters of 2005-2010 are shown in Figure 2b. The average weight of yellowfin caught during the third quarter of 2010 (11.7 kg) was less than that of 2009 (13.4 kg), but greater than those of 2005-2008.

There are eight fisheries for skipjack defined for stock assessments: four associated with floating objects, two unassociated school, one associated with dolphins, and one pole-and-line (Figure 1). The last two fisheries include all 13 sampling areas. Of the 192 wells sampled that contained fish caught during the third quarter of 2010, 65 contained skipjack. The estimated size compositions of these fish are shown in Figure 3a. Large amounts of skipjack in the 30- to 50-cm range were caught in the Northern and Southern floating-object fisheries during the third quarter. Larger skipjack in the 60- to 75-cm range were taken in the Northern, Ecuatorial, and Southern floating-object fisheries. Small amounts of skipjack were also taken in the Northern and Southern unassociated fisheries.

The estimated size compositions of the skipjack caught by all fisheries combined during the third quarter of 2005-2010 are shown in Figure 3b. The average weight of skipjack caught during the third quarter of 2010 (2,3 kg) was greater than that of 2009, but not much different from those of the other years. There are seven surface fisheries for bigeye defined for stock assessments: four associated with floating objects, one unassociated school, one associated with dolphins, and one pole-and-line (Figure 1). The last three fisheries include all 13 sampling areas. Of the 192 wells sampled that contained fish caught during the third quarter of 2010, 43 contained bigeye. The estimated size compositions of these fish are shown in Figure 4a. Virtually all of the catch was taken in floating-object sets in the Northern and Southern areas, with a large portion of this catch in the 40- to 100-cm size range.

The estimated size compositions of the bigeye caught by all fisheries combined during the third quarter of 2005-2010 are shown in Figure 4b. The average weight of bigeye caught during the third quarter of 2010 (4.8 kg) was less than that of 2008, but not much different from those of the other years.

The estimated retained purse-seine catch of bigeye less than 60 cm in length during the fourth quarter of 2010 was 4,530 metric tons (t), or about 33 percent of the estimated total retained purse-seine catch of bigeye during that period. The corresponding amounts for 2005-2009 ranged from 2,617 to 10,221 t, or 17 to 49 percent. These values may differ slightly from those given in previous Quarterly Reports due to changes in the estimation procedure.

Pacific bluefin are caught by purse-seine and recreational gear off California and Baja California from about 23°N to 35°N, with most of the catch being taken during May through October. During 2010, bluefin were caught between 26°N and 32°N from May through September. The majority of the catches of bluefin by both commercial and recreational vessels were taken during June through September. In the past, commercial and recreational catches have been reported separately. The inability to collect sufficient numbers of samples during 2004 through 2010, however, has made it infeasible to estimate the catches and size compositions separately. Therefore, the commercial and recreational catches of bluefin were combined for each year of that period. The estimated size compositions for 2005-2010 are shown in Figure 5.

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. Spawning occurred between 8:50 p.m. and 10:50 p.m. The numbers of eggs collected after each spawning event ranged from about 15,000 to 496,000. The water temperatures in the tank during the quarter ranged from 26.3° to 27.6°C.

There were four 51- to 54-kg yellowfin (one with an archival tag), and eight 18- to 33-kg yellowfin in Tank 1 at the end of December.

During late 2008, 6 of the 15 yellowfin (7 to 10 kg) held in Tank 2 (170,000 L) were implanted with prototype archival tags and transferred to Tank 1. At the end of the quarter, one of the October 2008 group, bearing an archival tag, remained in Tank 1.

At the end of the quarter there were eight yellowfin, weighing from 3 to 6 kg each, in 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, hatching rate, lengths of hatched larvae, and duration of yolk-sac stage. The weights of the eggs, yolk-sac larvae, and first-feeding larvae, and the lengths and selected morphometrics of these, were measured periodically.

The juvenile yellowfin tuna that remained from experiments conducted in the previous quarter (Quarterly Report for July-September 2010) were grown out through October 22 and sampled at weekly intervals for later analysis at Texas A&M University, College Station, Texas, USA, as part of joint studies on digestive enzyme development of larval and early-juvenile yellowfin.

Studies of snappers

The work on snappers (*Lutjanus* spp.) is carried out by the Autoridad de los Recursos Acuáticos de Panamá (ARAP).

During 1996-2009, the staff of ARAP had conducted full life cycle research on spotted rose snappers (*Lutjanus guttatus*) in captivity. During the second and third quarters of 2009, the broodstock fish died due to low water temperatures and feeding problems. The mortality coincided with ARAP's plans to commence spawning and rearing studies during 2010 with a new, more commercially-important species of snapper. Yellow snapper (*Lutjanus argentiventris*) was chosen as the new species of snapper for study. In addition, ARAP decided to rebuild its spotted rose snapper broodstock. The fish were acquired from local fishermen.

During the third quarter, collection of broodstock yellow snappers, as well as spotted rose snappers, continued in local waters. During August, there were 62 spotted rose snappers and 19 yellow snappers being held in broodstock tanks at the Laboratory. However, by the end of September only nine spotted rose snappers remained following exposure to a biotoxin associated with a dinoflagellate bloom. The staff of ARAP plans to continue collection of spotted rose snappers during the first quarter of 2011.

Oceanography and meteorology

Easterly surface winds blow almost constantly over northern South America, which cause upwelling of cool, nutrient-rich subsurface water along the equator east of 160ºW, in the coastal regions off South America, and in offshore areas off Mexico and Central America. El Niño events are characterized by weaker-than-normal easterly surface winds, which cause above-normal sea-surface temperatures (SSTs) and sea levels and deeper-than-normal thermoclines over much of the tropical eastern Pacific Ocean (EPO). In addition, the Southern Oscillation Indices (SOIs) are negative during El Niño episodes. (The SOI is the difference between the anomalies of sea-level atmospheric pressure at Tahiti, French Polynesia, and Darwin, Australia. It is a measure of the strength of the easterly surface winds, especially in the tropical Pacific in the Southern Hemisphere.) Anti-El Niño events, which are the opposite of El Niño events, are characterized by stronger-than-normal easterly surface winds, below-normal SSTs and sea levels, shallower-than-normal thermoclines, and positive SOIs. Two additional indices, the NOI* (Progress Ocean., 53 (2-4): 115-139) and the SOI*, have recently been devised. The NOI* is the difference between the anomalies of sea-level atmospheric pressure at the North Pacific High (35°N-130°W) and Darwin, Australia, and the SOI* is the difference between the anomalies of sea-level atmospheric pressure at the South Pacific High (30°S-95°W) and Darwin. Ordinarily, the NOI* and SOI* values are both negative during El Niño events and positive during anti-El Niño events.

Weak El Niño conditions were in effect in the EPO during the last seven months of 2009. The SSTs were all normal or above normal during the third and fourth quarters of that year (IATTC Quarterly Report for October-December 2009: Figure 6; Table 5). The band of warm water that had existed along the equator since June 2009 persisted throughout the first quarter of 2010 (IATTC Quarterly Report for January-March 2010: Figure 5). An area of cool water that had formed offshore off Peru in late 2009 reached its maximum area in January 2010, and then it diminished in February and March. The conditions were quite different in April 2010, with cool water along the equator from about 120°W to about 160°E and a large area of cool water centered at about 15°N-125°W. Most of the cool water dissipated during May, but in June it reappeared as a narrow band of cool water extending along the equator from about 90°W to about 150°W (IATTC Quarterly Report for April-June 2010: Figure 5). The cooling increased during the third quarter, and by September the band of cool water along the equator extended to beyond 180°. Also, there were sizeable areas of cool water off northern and central Mexico and off Peru, particularly during September. The size if the area of cool water increased during the fourth quarter, reaching a maximum for the year in December (Figure 6). The SSTs were mostly above average from January through April, about average during May, and below average, with only one exception, during June through December (Table 4). The thermoclines along the equator at 110°W and 150°W during May through September were relatively shallow, and the sea levels at Callao, Peru, during the second, third, and fourth quarters were below average, both indicating anti-El Niño conditions. Also, the NOI*s and SOI*s during the third and fourth quarters were mostly positive, indicating anti-El Niño conditions. The value of 8.65 for the SOI* index in July 2010 is the second only to that of 8.66 for May 1956; the series includes data for 1948 through 2010. According to the Climate Diagnostics Bulletin of the U.S. National Weather Service for December 2010, anti-El Niño conditions are “expected to continue well into the Northern Hemisphere spring [of] 2011.”

BYCATCH AND AIDCP PROGRAM

Data collection

The IATTC had field offices at Las Playas and Manta, Ecuador; Manzanillo and Mazatlan, Mexico; Panama, Republic of Panama; and Cumaná, Venezuela, during the fourth quarter of 2010. Members of the field office staffs placed IATTC observers on 75 fishing trips (including one aboard a Class-4 vessel) during the quarter. In addition, 113 IATTC observers completed trips (including three aboard Class-4 vessels) during the quarter, and were debriefed by field office personnel.

Observer program

Coverage

The Agreement on the International Dolphin Conservation Program (AIDCP) requires 100-percent coverage by observers on trips by purse seiners with carrying capacities greater than 363 metric tons that fish for tunas in the eastern Pacific Ocean (EPO). This mandate is carried out by the AIDCP On-Board Observer Program, made up of the IATTC's international observer program and the observer programs of Colombia, Ecuador, the European Union, Mexico, Nicaragua, Panama, and Venezuela. The observers are biologists trained to collect a variety of data on the mortalities of dolphins associated with the fishery, sightings of dolphin herds, catches of tunas and bycatches of fish and other animals, oceanographic and meteorological data, and other information used by the IATTC staff to assess the conditions of the various stocks of dolphins, study the causes of dolphin mortality, and assess the effect of the fishery on tunas and other components of the ecosystem. The observers also collect data relevant to compliance with the provisions of the AIDCP, and data required for the tuna-tracking system established under the AIDCP, which tracks the "dolphin-safe" status of tuna caught in each set from the time it is captured until it is unloaded (and, after that, until it is canned and labeled).

In 2010 the observer programs of Colombia, the European Union, Mexico, Nicaragua, Panama, and Venezuela are to sample half, and that of Ecuador approximately one-third, of the trips by vessels of their respective fleets, while IATTC observers are to sample the remainder of those trips. Except as described in the next paragraph, the IATTC is to cover all trips by vessels registered in other nations that are required to carry observers.

At the fifth meeting of the Parties to the AIDCP in June 2001, observers from the international observer program of the South Pacific Forum Fisheries Agency (FFA) were approved to collect pertinent information for the On-Board Observer Program, pursuant to Annex II (9) of the AIDCP in cases for which the Director determines that the use of an observer from the AIDCP On-Board Observer Program is not practical.

Observers from the On-Board Observer Program departed on 120 fishing trips (including three by Class-4 vessels) during the fourth quarter of 2010. Preliminary coverage data for these vessels during the quarter are shown in Table 5.

Training

IATTC staff members conducted one observer training course in Manta, Ecuador, during the period of September 18-30, 2010, for 14 trainees, 11 of whom were from Ecuador's national program (Programa Nacional de Observadores Pesqueros de Ecuador) and 3 from the IATTC international program.

GEAR PROJECT

During the fourth quarter IATTC staff members did not participate in any dolphin safety-gear inspections or safety-panel alignment procedures aboard purse-seiners.

INTER-AGENCY COOPERATION

Dr. Alexandre Aires-da-Silva gave a talk entitled "North Atlantic Blue Shark: a Review of Methods and Technology for Conservation" at the University of Washington in Seattle, Washington, USA, on 17 November 2010. The talk, which was based on Dr. Aires-da-Silva's Ph.D. dissertation submitted to the University of Washington, was given to the students in a class entitled "Conservation of Sharks: History and Future," taught by Professor Vincent F. Gallucci. Dr. Aires-da-Silva's expenses were paid by the University of Washington.

While in Chile to participate in a meeting described earlier in this report, Dr. Guillermo A. Compeán met with Lic. Pablo Galilea Carrillo, Undersecretary of Fisheries, Subsecretaría de Pesca of Chile.

Dr. Robert J. Olson presented a guest lecture at a Biological Oceanography class at Scripps Institution of Oceanography, La Jolla, California, USA, on 29 November 2010. The topic was the use of Productivity and Susceptibility Assessment to evaluate vulnerability to the purse-seine fishery in the eastern Pacific Ocean.

VISITING SCIENTIST

Mr. Chi-Chao Liu, Section Chief, Deep Sea Fisheries Division, Fisheries Agency of Taiwan, arrived at the IATTC headquarters in La Jolla, California, USA, on 1 November 2010. He was to spend about three months in La Jolla, where he would study the fisheries management program of the IATTC, with emphasis on research on tunas, billfishes, and dolphins, reduction of bycatches, collection and verification of data, the IATTC and national observer programs, and monitoring of compliance with regulations. He was also to spend some time studying the management programs of the U.S. National Marine Fisheries Service's Southwest Fisheries Science Center in La Jolla.

PUBLICATION

Schaefer, Kurt M., and Daniel W. Fuller. 2010. Vertical movements, behavior, and habitat of bigeye tuna (*Thunnus obesus*) in the equatorial eastern Pacific Ocean, ascertained from archival tag data. Mar. Biol., 157 (12): 2625-2642.

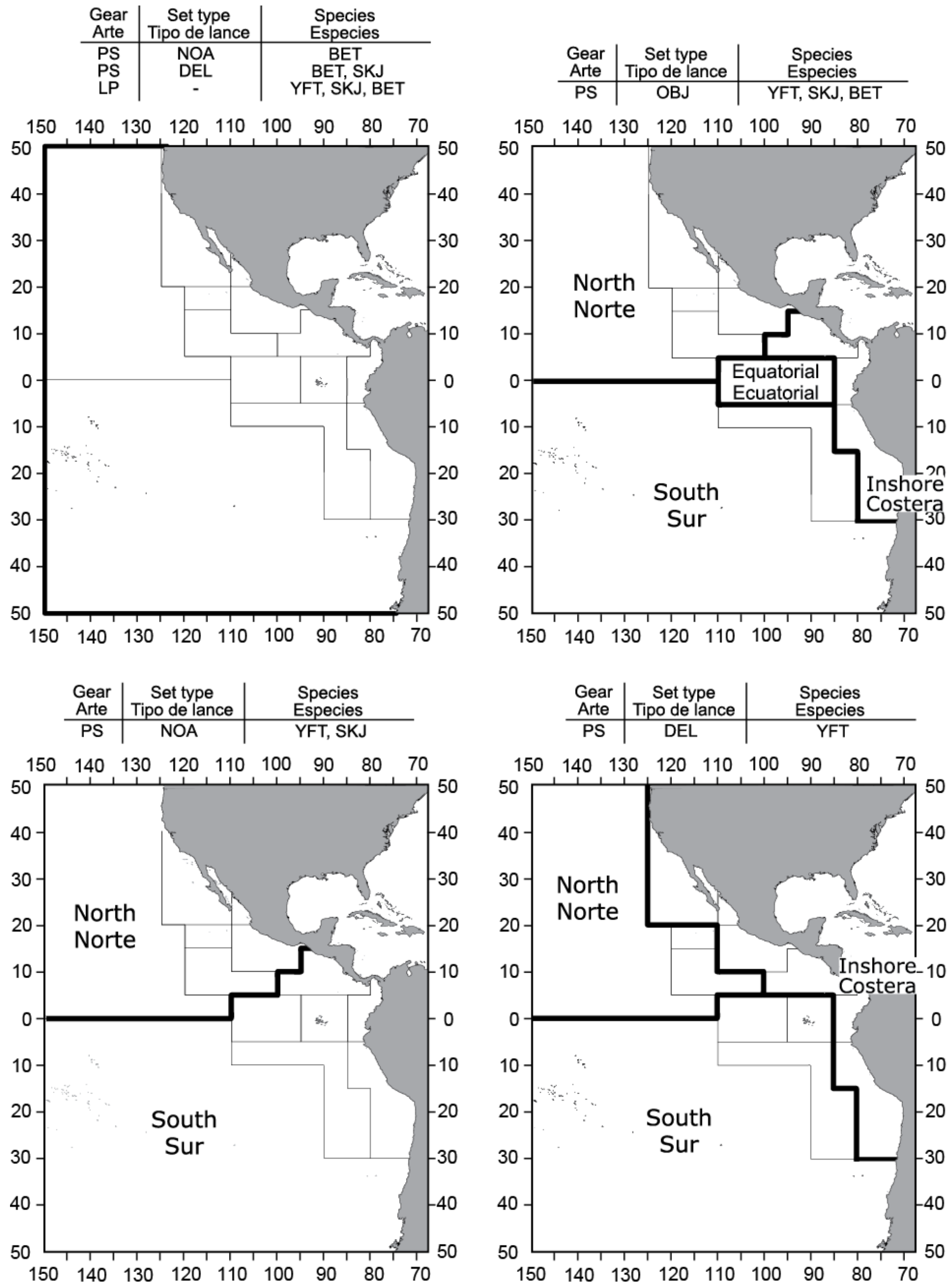

FIGURE 1. Spatial extents of the fisheries defined by the IATTC staff for stock assessment of yellowfin, skipjack, and bigeye in the EPO. The thin lines indicate the boundaries of the 13 length-frequency sampling areas, and the bold lines the boundaries of the fisheries. Gear: PS = purse seine, LP =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

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

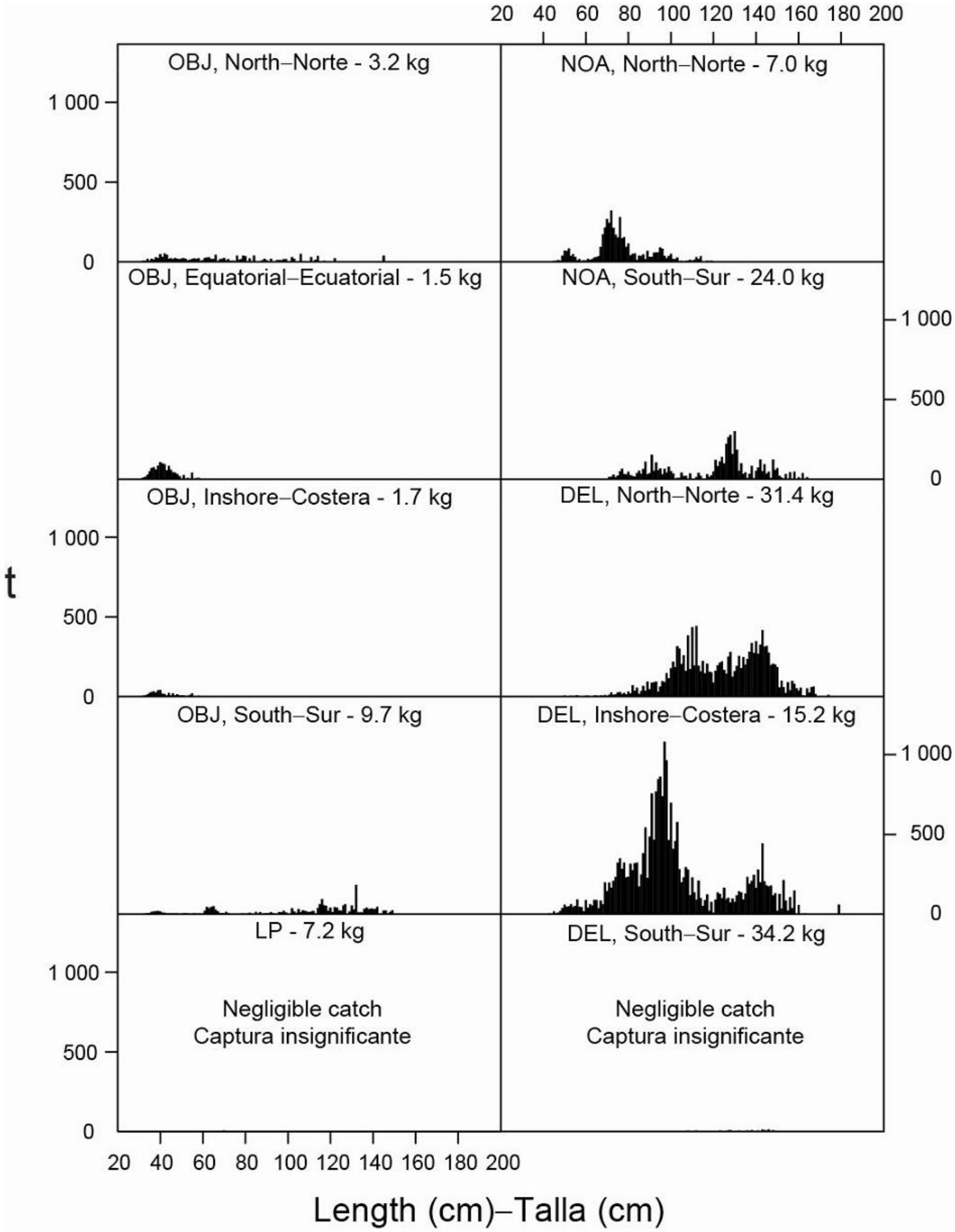

FIGURE 2a. Estimated size compositions of the yellowfin caught in each fishery of the EPO during the third quarter of 2010. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 2a. Composición por tallas estimada para el aleta amarilla capturado en cada pesquería del OPO durante el tercer trimestre de 2010. En cada recuadro se detalla el peso promedio de los peces en las muestras. OBJ = objeto flotante; LP = caña; NOA = peces no asociados; DEL = delfín; t = toneladas métricas.

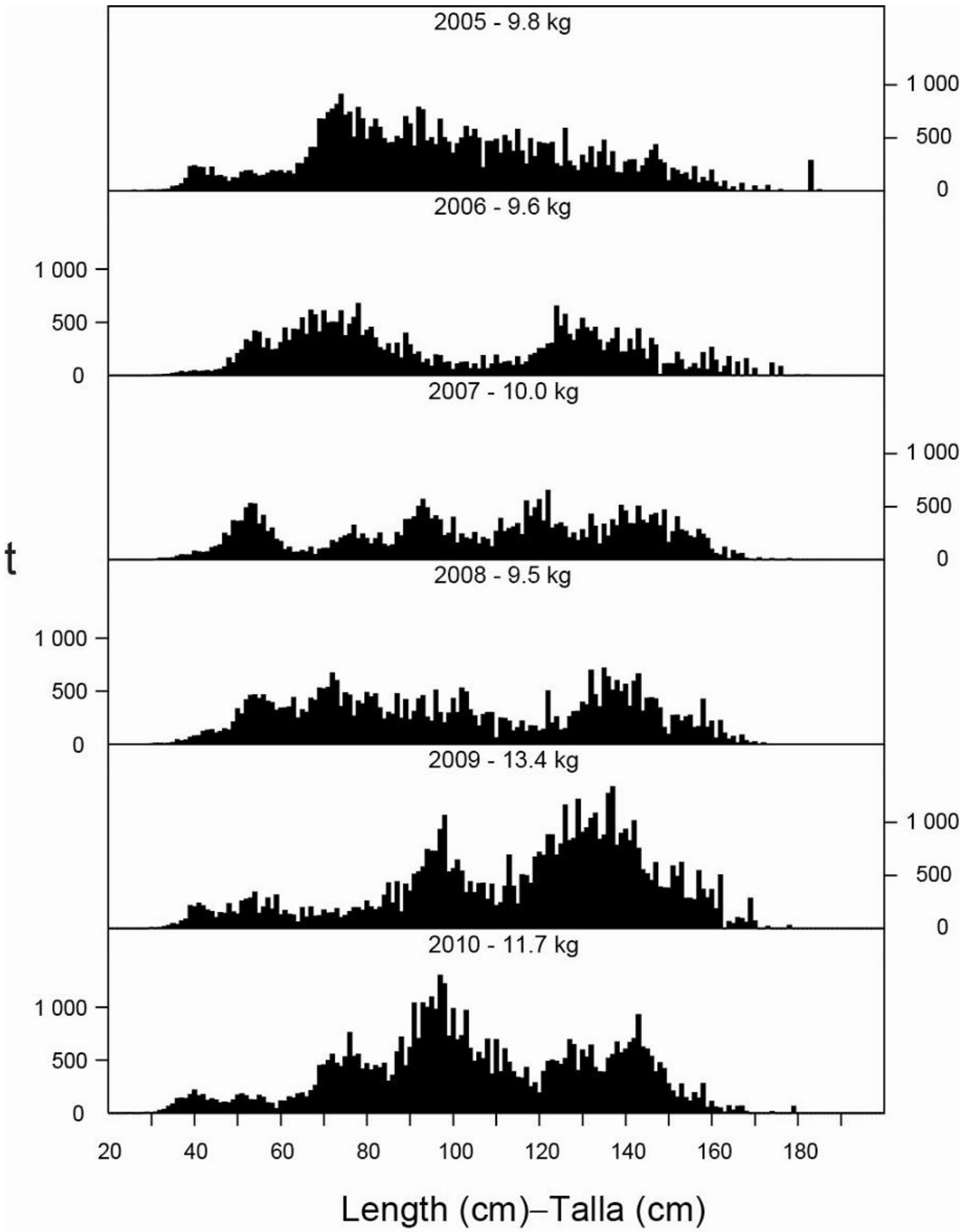

FIGURE 2b. Estimated size compositions of the yellowfin caught in the EPO during the third quarter of 2005-2010. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 2b. Composición por tallas estimada para el aleta amarilla capturado en el OPO en el tercer trimestre de 2005-2010. En cada recuadro se detalla el peso promedio de los peces en las muestras; t = toneladas métricas.

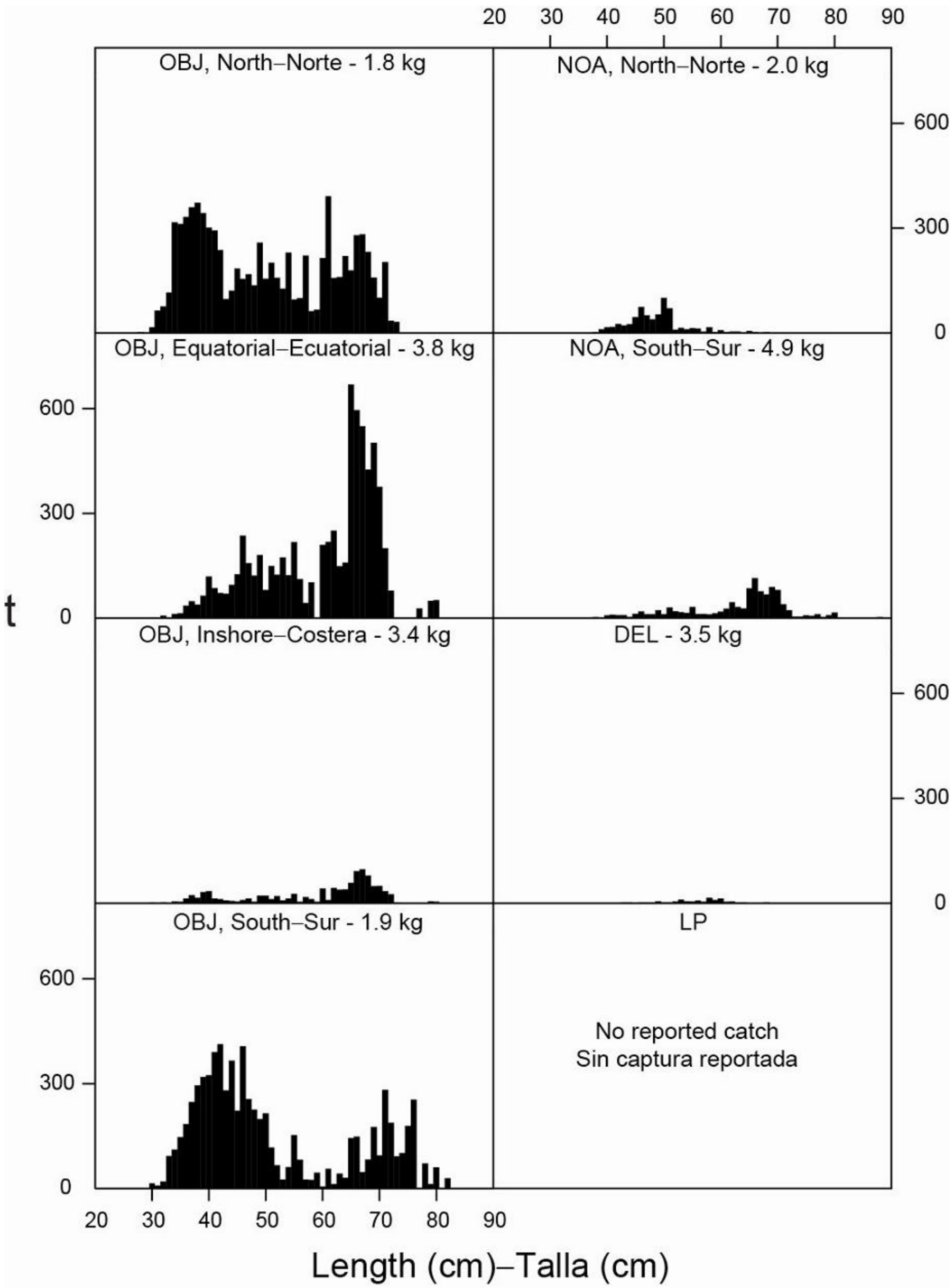

FIGURE 3a. Estimated size compositions of the skipjack caught in each fishery of the EPO during the third quarter of 2010. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 3a. Composición por tallas estimada para el barrilete capturado en cada pesquería del OPO durante el tercer trimestre de 2010. En cada recuadro se detalla el peso promedio de los peces en las muestras. OBJ = objeto flotante; LP = caña; NOA = peces no asociados; DEL = delfín; t = toneladas métricas.

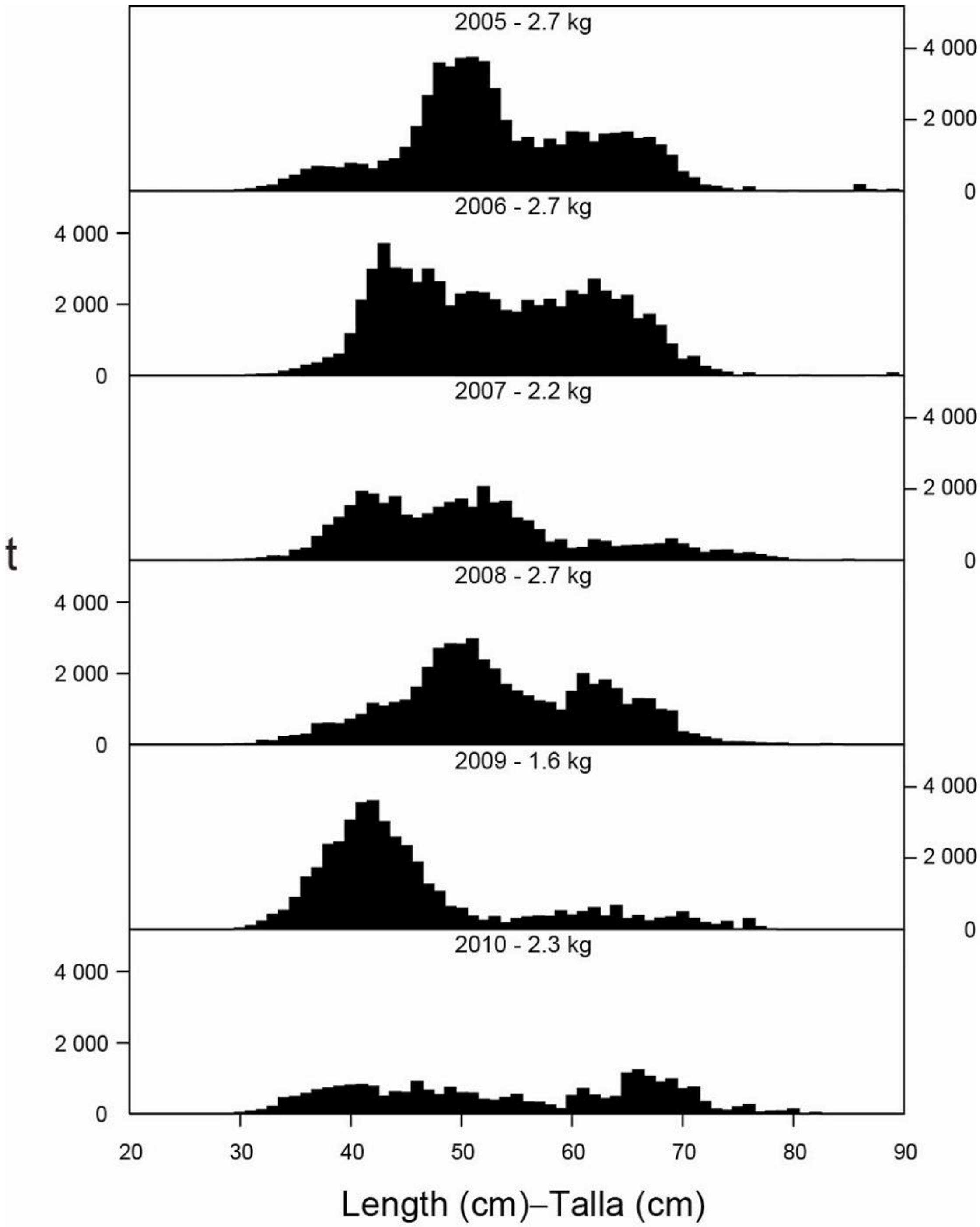

FIGURE 3b. Estimated size compositions of the skipjack caught in the EPO during the third quarter of 2005-2010. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 3b. Composición por tallas estimada para el barrilete capturado en el OPO en el tercer trimestre de 2005-2010. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas.

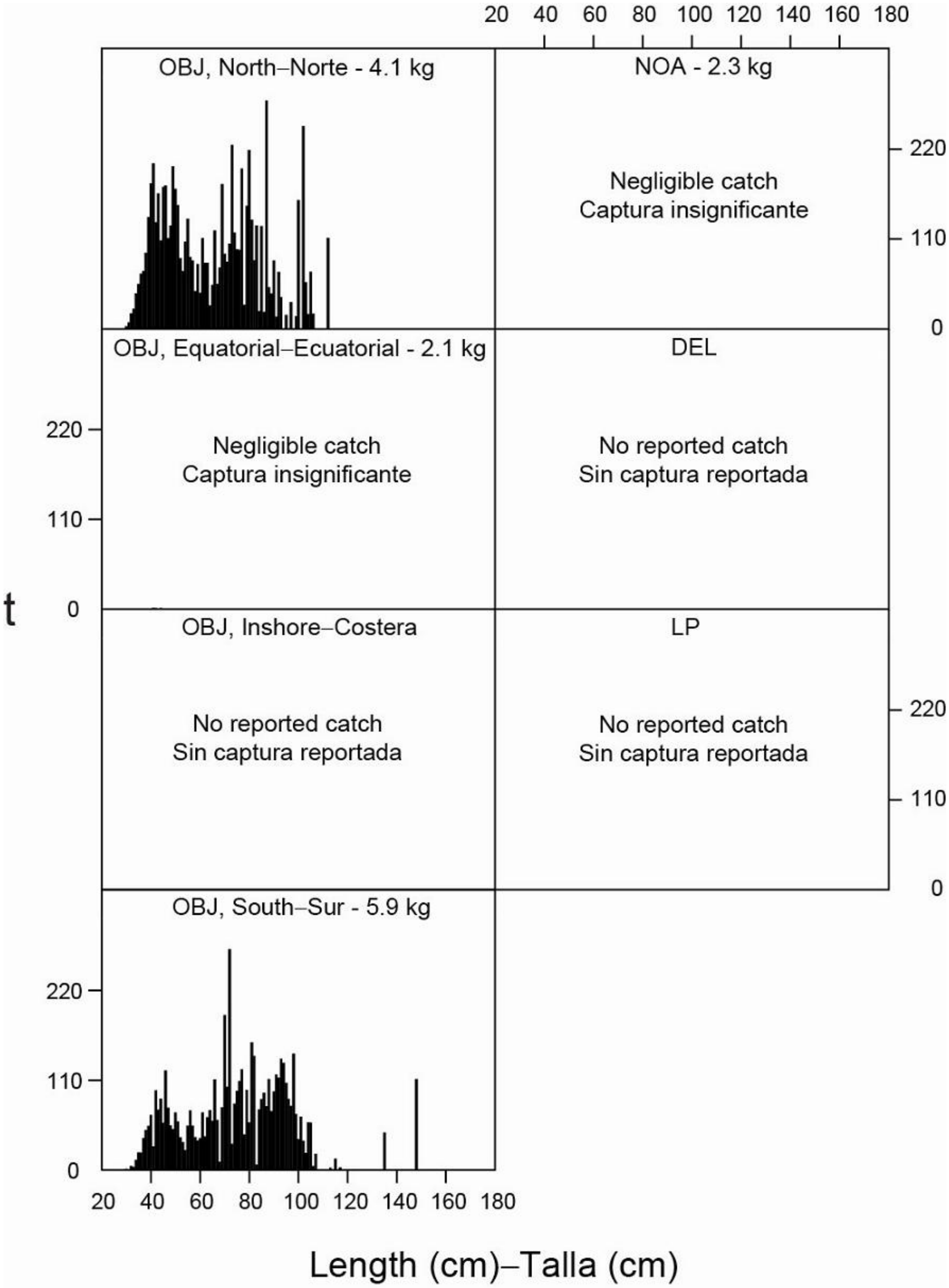

FIGURE 4a. Estimated size compositions of the bigeye caught in each fishery of the EPO during the third quarter of 2010. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 4a. Composición por tallas estimada para el patudo capturado en cada pesquería del OPO durante el tercer trimestre de 2010. En cada recuadro se detalla el peso promedio de los peces en las muestras. OBJ = objeto flotante; LP = caña; NOA = peces no asociados; DEL = delfín; t = toneladas métricas.

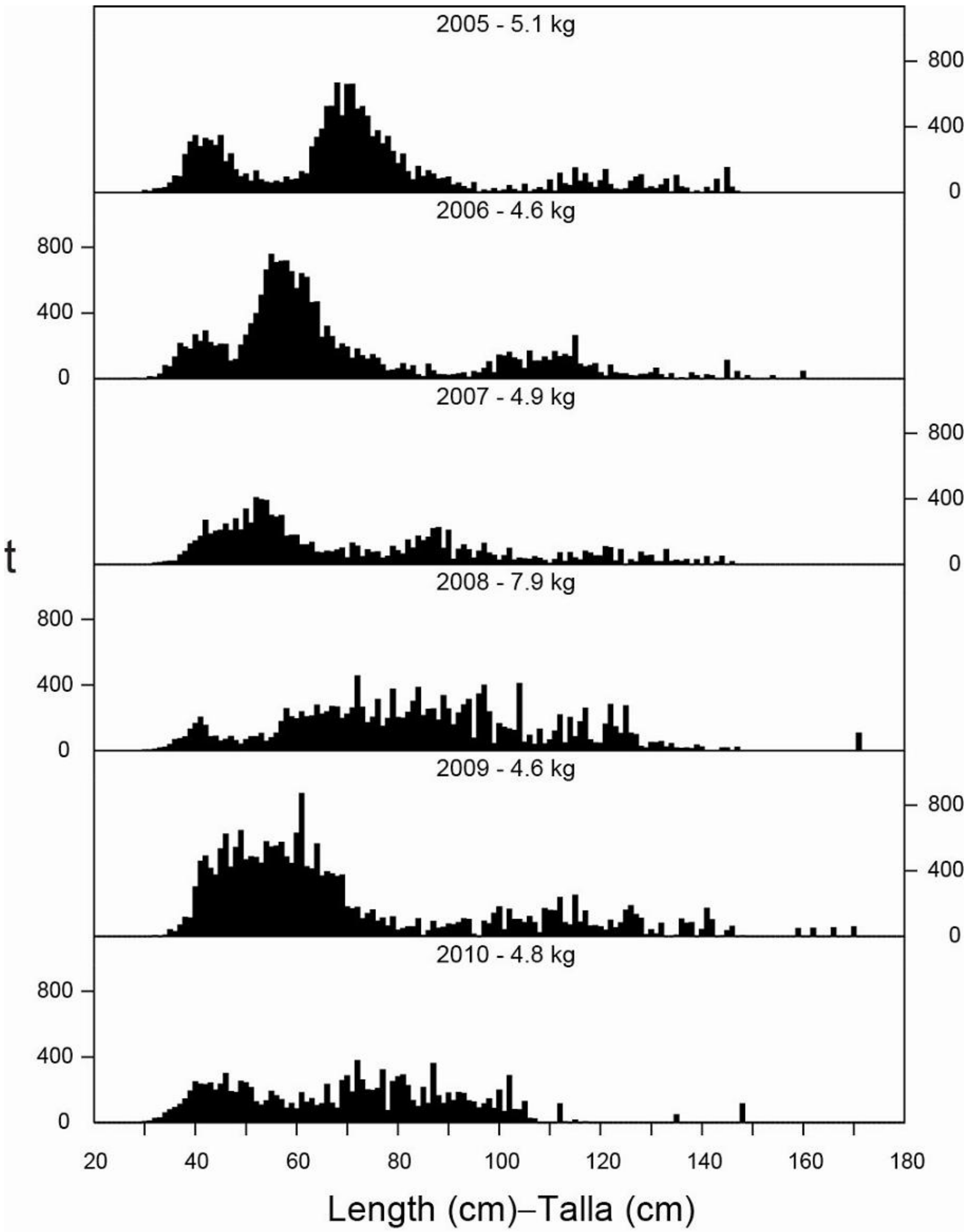

FIGURE 4b. Estimated size compositions of the bigeye caught in the EPO during the third quarter of 2005-2010. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 4b. Composición por tallas estimada para el patudo capturado en el OPO en el tercer trimestre de 2005-2010. En cada recuadro se detalla el peso promedio de los peces en las muestras; t = toneladas métricas.

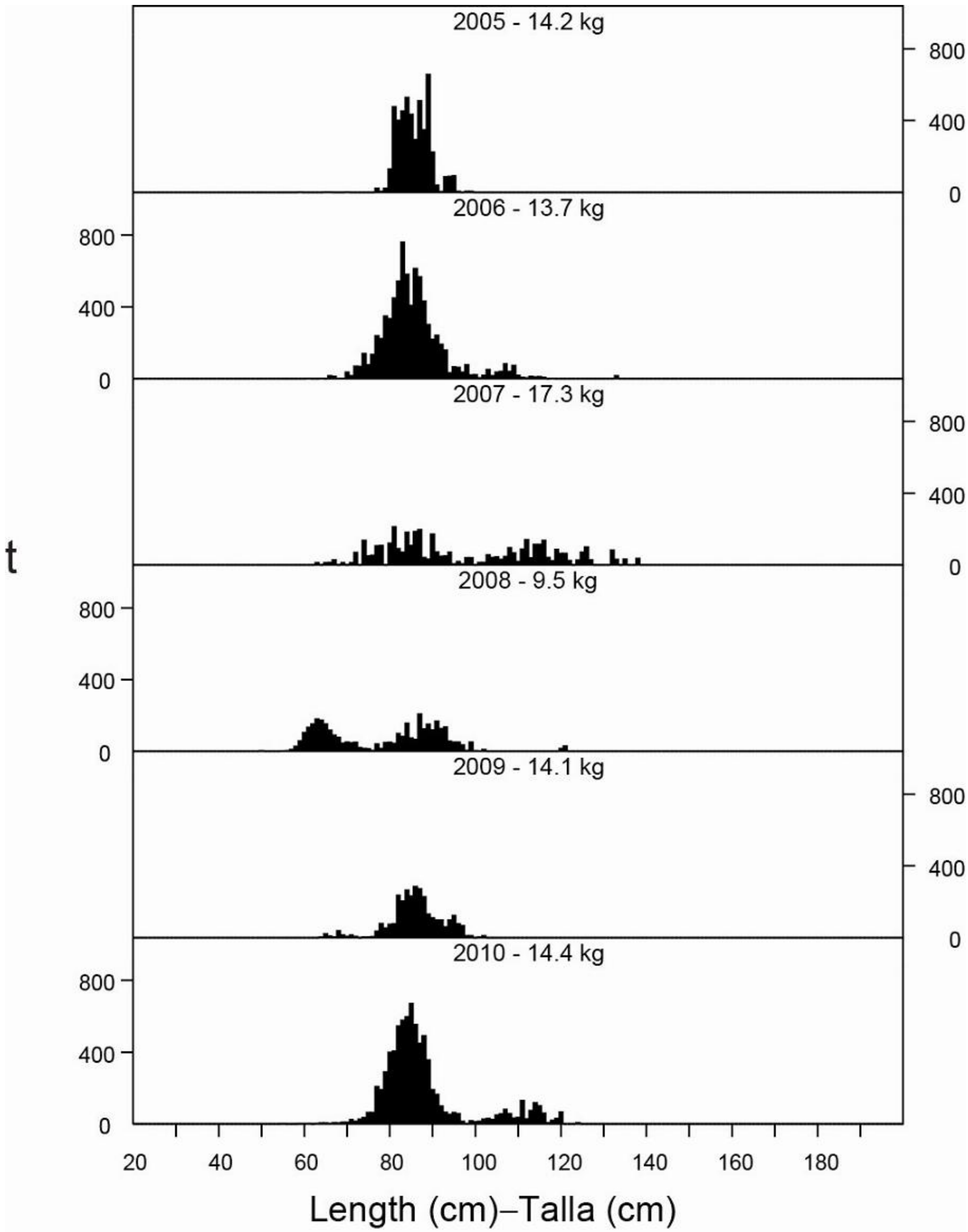

FIGURE 5. Estimated catches of Pacific bluefin by purse-seine and recreational gear in the EPO during 2005-2010. The values at the tops of the panels are the average weights. t = metric tons.

FIGURA 5. Captura estimada de aleta azul del Pacífico con arte de cerco y deportiva en el OPO durante 2005-2010. El valor en cada recuadro representa el peso promedio. t = toneladas métricas.

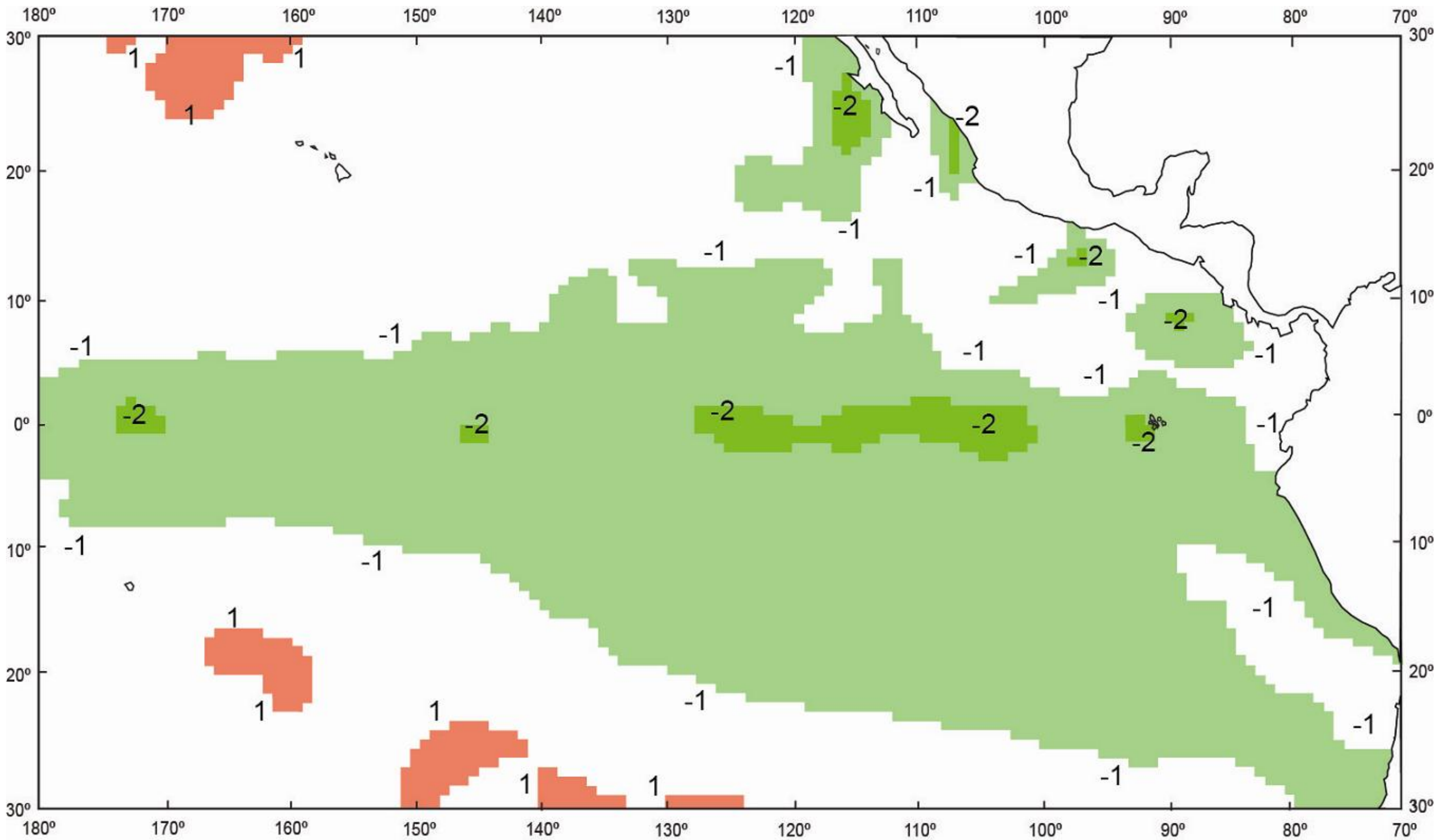

FIGURE 6. Sea-surface temperature (SST) anomalies (departures from long-term normals) for December 2010, based on data from fishing boats and other types of commercial vessels.
FIGURA 6. Anomalías (variaciones de los niveles normales a largo plazo) de la temperatura superficial del mar (TSM) en diciembre de 2010, 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 2010 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 2010, y de la capacidad de acarreo de los mismos, en metros cúbicos, por bandera, arte de pesca, y volumen de bodega. Se incluye cada buque en los totales de cada bandera bajo la cual pescó durante el año, pero solamente una vez en el total de la flota; por consiguiente, los totales de las flotas no son siempre iguales a las sumas de las banderas individuales. PS = cerquero; LP = cañero.

Flag	Gear	Well volume–Volumen de bodega				Capacity
Bandera	Arte	1-900	901-1700	>1700	Total	Capacidad
			Number—Número			
Bolivia	PS	1	-	-	1	222
Colombia	PS	3	10	-	13	14,590
Ecuador	PS	63	12	9	84	60,418
España—Spain	PS	-	-	4	4	10,116
Guatemala	PS	-	2	1	3	4,819
Honduras	PS	1	1	-	2	1,559
México	PS	9	29	1	39	45,224
	LP	3	-	-	3	255
Nicaragua	PS	-	5	-	5	6,353
Panamá	PS	3	17	4	24	32,599
Perú	PS	1	-	-	1	458
El Salvador	PS	-	1	3	4	7,415
Venezuela	PS	-	17	-	17	22,747
Vanuatu	PS	1	2	-	3	3,609
All flags—	PS	81	96	22	199	
Todas banderas	LP	3	-	-	3	
	PS + LP	84	96	22	202	
			Capacity—Capacidad			
All flags—	PS	37,282	125,354	46,697	209,333	
Todas banderas	LP	255	-	-	255	
	PS + LP	37,537	125,354	46,697	209,588	

TABLE 2. Estimates of the retained catches of tunas in the EPO from 1 January through 31 December 2010, by species and vessel flag, in metric tons.
TABLA 2. Estimaciones de las capturas retenidas de atunes en el OPO del 1 de enero al 31 de diciembre de 2010, 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	26,706	92,689	26,923	-	3	-	244	606	147,171	31.9
México	101,523	6,090	159	7,544	2,787	25	2,571	19	120,718	26.1
Nicaragua	10,444	4,427	1,568	-	-	-	70	1	16,510	3.6
Panamá	31,840	20,961	7,680	-	-	-	3	49	60,533	13.1
Venezuela	27,590	8,787	366	-	10	-	12	19	36,784	8.0
Other—Otros[2]	30,627	37,763	11,335	1	1	-	127	99	79,953	17.3
Total	228,730	170,717	48,031	7,545	2,801	25	3,027	793	461,669	

1 Includes other tunas, sharks, and miscellaneous fishes
1 Incluye otros túnidos, tiburones, y peces diversos
2 Includes Bolivia, Colombia, El Salvador, Guatemala, Honduras, Peru, Spain, and Vanuatu; this category is used to avoid revealing the operations of individual vessels or companies.
2 Incluye Bolivia, Colombia, El Salvador, España, Guatemala, Honduras, Perú, y Vanuatú; se usa esta categoría para no revelar información sobre faenas de buques o empresas individuales.

TABLE 3. Reported catches of bigeye tuna in the EPO during 2010 by longline vessels.
TABLA 3. Capturas reportadas de atún patudo en el OPO durante 2010 por buques palangreros.

Flag	Quarter				Month			Fourth quarter	Total
	1	2	3	1-3	10	11	12		
Bandera	**Trimestre**				**Mes**			**Cuarto trimestre**	**Total**
	1	**2**	**3**	**1-3**	**10**	**11**	**12**		
China	718	630	417	1,765					1,765
Japan—Japón	3,590	3,095	3,426	10,111	1,089			1,089	11,200
Republic of Korea—República de Corea									
Chinese Taipei—Taipei Chino	1,435	825	905	3,165	483			483	3,648
United States—EE.UU.									
Vanuatu	533	256	282	1,071	63	71	25	159	1,230
Total	6,276	4,806	5,030	16,112	1,635	71	25	1,731	17,843

TABLE 4. Oceanographic and meteorological data for the Pacific Ocean, January-December 2010. The values in parentheses are anomalies. SST = sea-surface temperature; SOI = Southern Oscillation Index; SOI* and NOI* are defined in the text.
TABLA 4. Datos oceanográficos y meteorológicos del Océano Pacífico, enero-diciembre 2010. Los valores en paréntesis son anomalías. TSM = temperatura superficie del mar; IOS = Índice de Oscilación del Sur; IOS* y ION* están definidas en el texto.

Month—Mes	**1**	**2**	**3**	**4**	**5**	**6**
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	24.7 (0.2)	26.0 (0.0)	26.2 (-0.2)	26.1 (0.6)	24.5 (0.1)	22.8 (-0.2)
Area 2 (5°N-5°S, 90°-150°W	26.6 (1.0)	27.1 (0.7)	27.7 (0.7)	28.7 (0.7)	27.1 (0.0)	25.9 (-0.5)
Area 3 (5°N-5°S, 120°-170°W)	28.1 (1.6)	27.9 (1.2)	28.3 (1.1)	28.4 (0.7)	27.7 (0.0)	27.1 (-0.4)
Area 4 (5°N-5°S, 150W°-160°E)	29.6 (1.4)	29.1 (1.1)	29.2 (1.1)	29.2 (0.8)	29.1 (0.4)	28.7 (0.1)
Talara, Perú	21.8 (1.8)	22.5 (1.1)	20.7 (-0.5)	18.2 (-1.8)	20.8 (1.5)	17.4 (-1.3)
Callao, Perú	19.5 (3.1)	18.7 (1.2)	18.7 (0.6)	16.6 (-1.0)	17.0 (-0.2)	16.2 (-0.4)
Thermocline depth—Profundidad de la termoclina, 0°, 80°W (m)	40	25	25	25	40	35
Thermocline depth—Profundidad de la termoclina, 0°, 110°W (m)	95	60	85	70	40	30
Thermocline depth—Profundidad de la termoclina, 0°, 150°W (m)	150	150	125	150	110	90
Thermocline depth—Profundidad de la termoclina, 0°, 180°W (m)	145	155	160	200	150	160
Sea level—Nivel del mar, Callao, Perú (cm)	113.3 (1.8)	107.1 (-7.1)	116.4 (1.7)	112.4 (-2.1)	108.4 (-4.9)	101.2 (-10.5)
SOI—IOS	-1.5	-2.1	-1.4	1.2	0.9	0.4
SOI*—IOS*	2.31	-1.43	-2.03	2.93	6.13	5.58
NOI*—ION*	-8.05	-6.33	-0.18	-1.75	3.50	2.77

Month—Mes	**7**	**8**	**9**	**10**	**11**	**12**
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	20.2 (-1.7)	19.3 (-1.5)	18.9 (-1.6)	19.1 (-1.9)	20.0 (-1.6)	21.4 (-1.5)
Area 2 (5°N-5°S, 90°-150°W	24.6 (-1.0)	23.9 (-1.1)	23.6 (-1.2)	23.3 (-1.6)	23.4 (-1.6)	23.5 (-1.6)
Area 3 (5°N-5°S, 120°-170°W)	26.1 (-0.9)	25.5 (-1.2)	25.1 (-1.6)	25.0 (-1.6)	25.1 (-1.5)	24.9 (-1.5)
Area 4 (5°N-5°S, 150W°-160°E)	28.1 (-0.5)	27.5 (-1.0)	27.1 (-1.4)	27.1 (-1.4)	27.1 (-1.3)	26.9 (-1.4)
Talara, Perú	16.9 (-0.8)	15.9 (-1.7)	15.1 (-2.8)	15.8 (-2.1)	15.9 (-2.2)	15.6 (-3.1)
Callao, Perú	15.0 (-1.2)	14.3 (-1.5)	14.2 (-1.2)	13.9 (-1.3)	13.7 (-2.0)	14.1 (-2.1)
Thermocline depth—Profundidad de la termoclina, 0°, 80°W (m)	30	35	40	40	40	35
Thermocline depth—Profundidad de la termoclina, 0°, 110°W (m)	20	20	15	25	15	10
Thermocline depth—Profundidad de la termoclina, 0°, 150°W (m)	100	100	120	115	120	125
Thermocline depth—Profundidad de la termoclina, 0°, 180°W (m)	170	150	150	185	160	170
Sea level—Nivel del mar, Callao, Perú (cm)	99.0 (-10.6)	94.6 (-12.7)	93.1 (-12.8)	96.5 (-9.3)	95.4 (-11.8)	100.2 (-8.3)
SOI—IOS	1.8	1.8	2.2	1.7	1.3	2.9
SOI*—IOS*	8.65	0.54	2.74	3.98	4.12	6.03
NOI*—ION*	-0.04	0.43	1.17	1.90	4.02	-2.89

TABLE 5. Preliminary data on the sampling coverage of trips by Class-6 vessels (vessels with fish-carrying capacities greater than 363 metric tons) by the observer programs of the IATTC, Colombia, Ecuador, the European Union, Mexico, Nicaragua, Panama, and Venezuela during the fourth quarter of 2010. The numbers in parentheses indicate cumulative totals for the year.
TABLA 5. Datos preliminares de la cobertura de muestreo de viajes de buques de Clase 6 (buques con capacidad de acarreo de peces mayor a 363 toneladas métricas) por los programas de observadores de la CIAT, Colombia, Ecuador, México, Nicaragua, Panamá, la Unión Europea, y Venezuela durante el cuarto trimestre de 2010. Los números entre paréntesis indican los totales acumulados para el año.

Flag	Trips		Observed by program						Percent observed	
			IATTC		National		Total			
Bandera	Viajes		Observado por programa						Porcentaje observado	
			CIAT		Nacional		Total			
Colombia	5	(41)	1	(20)	4	(21)	5	(41)	100.0	(100.0)
Ecuador	54	(242)	38	(163)	16	(79)	54	(242)	100.0	(100.0)
España—Spain	5	(24)	1	(10)	4	(14)	5	(24)	100.0	(100.0)
Guatemala	2	(11)	2	(11)			2	(11)	100.0	(100.0)
Honduras	1	(6)	1	(6)			1	(6)	100.0	(100.0)
México	14	(173)	8	(89)	6	(84)	14	(173)	100.0	(100.0)
Nicaragua	2	(22)	1	(11)	1	(11)	2	(22)	100.0	(100.0)
Panamá	16	(93)	6	(45)	10	(48)	16	(93)	100.0	(100.0)
El Salvador	7	(25)	7	(25)			7	(25)	100.0	(100.0)
Venezuela	12	(62)	8	(33)	4	(29)	12	(62)	100.0	(100.0)
Vanuatu	1	(12)	1	(12)			1	(12)	100.0	(100.0)
Total	119[2]	(711)[1]	74[2]	(425)[1]	45[2]	(286)[1]	119[2]	(711)[1]	100.0	(100.0)

[1] Includes 50 trips (29 by vessels with observers from the IATTC program and 21 by vessels with observers from the national programs) that began in late 2009 and ended in 2010

[1] Incluye 50 viajes (29 por observadores del programa del CIAT y 21 por observadores de los programas nacionales) iniciados a finales de 2009 y finalizados en 2010

[2] In addition, there were three trips on Class-4 vessels, one by an observer of the IATTC program and two by observers of national programs initiated during the fourth quarter.

[2] Ademas, se incluyen tres viajes en buques de Clase 4, una por un observador del programa de la CIAT y dos por observadores de los programas nacionales, iniciados durante el cuarto trimestre.