INTER-AMERICAN TROPICAL TUNA COMMMISSION
COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL

QUARTERLY REPORT—INFORME TRIMESTRAL

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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. There were 20 members of the IATTC at the end of the first quarter of 2011.

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 61st 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

Drs. Mark N. Maunder and Cleridy E. Lennert-Cody participated in a meeting of a working group, "Evaluating and Improving Open Source Software for Nonlinear Statistical Modeling in Ecology," at the National Center for Ecological Analysis and Synthesis at the University of California at Santa Barbara, on 10-14 January 2011. Dr. Maunder is chairman of the working group, and Dr. Lennert-Cody is one of its members. Their travel expenses were paid by the University of California.

A meeting of the Proyecto de Cooperación para la Reducción de la Captura Incidental de Tortugas Marinas en el Océano Pacífico Oriental, sponsored by the IATTC and the Overseas Fishery Cooperation Foundation (OFCF) of Japan, was held in La Jolla, California, USA, on 18-19 January 2011. The participants included Drs. Guillermo A. Compeán and Martín A. Hall of the IATTC, representatives of the governments of Colombia, Costa Rica, Ecuador, Peru, and the United States, and representatives of the Inter-American Convention for the Protection and Conservation of Sea Turtles, the Organización del Sector Pesquero y Acuícola de Centroamerica-El Sistema de la Integración Centroamericana (OSPESCA-SICA), the OFCF, and the World Wildlife Fund.

Dr. Michael G. Hinton participated in a meeting of the Billfish Working Group of the International Science Committee for Tuna and Tuna-Like Species in the North Pacific Ocean in Honolulu, Hawaii, USA, on 18-27 January 2011.

Dr. Guillermo A. Compeán and Mr. Brian S. Hallman participated in the 29th session of the FAO Committee on Fisheries in Rome on 31 January-4 February 2011. After that, they participated in the third meeting of the Regional Fishery Secretariat Network, which took place in Rome on 7-9 February 2011.

Dr. Guillermo A. Compeán participated in a workshop, sponsored by the International Seafood Sustainability Foundation, the Center for Environmental Economics at the University of California at San Diego, and the Institute on Global Cooperation and Conflict, on Allocation of Common Resources. The workshop took place at Yountville, California, USA, on 11-13 February 2011. He participated in a panel discussion entitled "International Allocation in Fisheries: Application and Experience," at which he gave a presentation entitled "The Implementation of Resolution C-02-03 on Fleet Capacity."

Dr. Michael D. Scott participated in a Guidelines for Assessing Marine Mammals Workshop, sponsored by the U.S. National Marine Fisheries Service (NMFS), in La Jolla, California, USA, on 15-18 February 2011. As its name suggests, its purpose was to discuss revised guidelines for U.S. management of marine mammals. Dr. Scott serves as chairman of the Pacific Scientific Review Group, an independent group that reviews marine mammal research and use of the management guidelines by the U.S. NMFS and the U.S. Fish and Wildlife Service.

Dr. Michael G. Hinton participated in a Red List Workshop of the International Union for the Conservation of Nature (IUCN) in Fort Lauderdale, Florida, on 15-18 February 2011. The purpose of the workshop was to integrate previous assessments of the threat status to 18 species of tunas and billfishes. The final results will be published in the IUCN Red List in late 2011, after peer review of the draft results.

A meeting at which an agreement to conduct comparative research on the early life history and reproductive biology of Pacific bluefin tuna and yellowfin tuna was signed is described in the section of this report entitled ***Early life history studies***.

Dr. Guillermo A. Compeán participated in a meeting of the Comisión Dictaminadora Externa y el Comité de Evaluación del Centro de Investigaciones Biológicas del Noroeste in La Paz, Mexico, on 1-2 March 2011.

Dr. Richard B. Deriso participated in a meeting of the Science Advisory Committee of the International Seafood Sustainability Foundation (ISSF) in Bellagio, Italy, on 8-19 March 2011. His travel expenses were paid by the ISSF.

Dr. Mark N. Maunder was an invited participant at an ISSF Stock Assessment Workshop, held in Rome, Italy, on 14-17 March 2011. His travel expenses were paid by the ISSF.

Dr. Maunder was an invited participant at the California Department of Fish and Game Marine Protected Areas and Fisheries Integration Workshop, held in San Diego, California, on 29-30 March 2011.

Dr. Robert J. Olson was an invited participant in an international workshop on the implementation of ecosystem approaches to fisheries management in the Pacific Ocean tuna fisheries. The workshop, which was hosted by the Secretariat of the Pacific Community (SPC), Noumea, New Caledonia, was held during 28 March-1 April 2011. Dr. Olson gave two presentations on work done at the Commission in collaboration with Ms. Leanne M. Duffy, scientists of the U.S. National Oceanic and Atmospheric Administration, and scientists of various other nations. One was entitled, "Metrics of Ecosystem Impact in the Purse-seine Fishery of the Eastern Pacific Ocean," and the other was entitled, "Decadal-scale Comparisons of Predation by Yellowfin Tuna in the Eastern Tropical Pacific Ocean." Dr. Olson's travel expenses were paid by the SPC.

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 first quarter of 2011. Personnel at these offices collected 227 length-frequency samples from 156 wells and abstracted logbook information for 220 trips of commercial fishing vessels during the first quarter of 2011.

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

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

The lists of vessels authorized to fish for tunas in the EPO are given in the IATTC Regional Vessel Register (http://www.iattc.org/VesselListsENG.htm). The estimated total carrying capacity of the purse-seine and pole-and-line vessels that have or are expected to fish in the EPO during 2011 is about 209,200 m^3 (Table 1). The average weekly at-sea capacity for the fleet, for the weeks ending 1 January through 3 April, was about 126,700 m^3 (range: 40,700 to 158,800 m^3).

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

Catch statistics

Estimated total retained catches (t) of tropical tunas from the EPO during the period of January-March 2011, and comparative statistics for 2006-2010, were:

Species	**2011**	**2006-2010**			**Weekly average, 2011**
		Average	**Minimum**	**Maximum**	
Yellowfin	63,600	58,200	52,600	66,900	4,900
Skipjack	64,100	67,500	50,800	93,100	4,900
Bigeye	8,500	12,400	9,300	15,500	700

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

Catch statistics for 2010

Estimates of the annual retained and discarded catches of the various species of tunas and other fishes by purse seiners and pole-and line vessels fishing at least part of the year in the EPO for yellowfin, skipjack, bigeye, or bluefin during 1981-2010 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 5 to 10 percent of the total catch of yellowfin is taken by longlines. Until recently, the great majority of the catch of bigeye had been harvested by the longline fishery.

There were no restrictions on fishing for tunas in the EPO during 1980-1997. However, there were restrictions on fishing for yellowfin in the Commission's Yellowfin Regulatory Area (CYRA) (IATTC Annual Report for 2001: Figure 1) from 26 November through 31 December

1998, from 14 October through 31 December 1999, from 1 through 31 December 2000, and from 27 October through 31 December 2001. Purse-seine fishing for tunas was prohibited in the EPO from 1 through 31 December 2002, and in a portion of the EPO from 1 through 31 December 2003. In 2004-2007, there were restrictions on purse-seine fishing for tunas for vessels of some countries from 1 August through 11 September, and from 20 November through 31 December for vessels of other countries. The members of the IATTC could not agree on regulations for 2008, but most of the countries adopted regulations similar to those that they had had during 2007. In addition, fishing for tunas associated with fish-aggregating devices (FADs) was prohibited in the EPO from 9 November through 31 December 1999 and from 15 September through 15 December 2000. Furthermore, regulations placed on purse-seine vessels directing their effort at tunas associated with dolphins have probably affected the way these vessels operate, especially since the late 1980s. There was a major El Niño event, which began in mid-1982 and persisted until late 1983. The catch rates in the EPO were low before and during this El Niño episode, which caused a shift of fishing effort from the eastern to the western Pacific, and the fishing effort remained relatively low during 1984-1986. During 1997-1998 another major El Niño event occurred in the EPO, but the effects of this on the vulnerability of the fish to capture were apparently less severe.

The retained catches, in metric tons, based on the current species composition project, described in the IATTC Annual Report for 2000 and in IATTC Stock Assessment Report 4, of yellowfin, skipjack, and bigeye in the EPO during 2010, and the 1995-2009 annual averages for those species, are as follows:

Species	**2010**	**Average**	**Minimum**	**Maximum**
			1995-2009	
Yellowfin	251,000	267,000	167,000	413,000
Skipjac	147,000	205,000	107,000	297,000
Bigeye	58,000	64,000	44,000	95,000

The 2010 catch of yellowfin was about 16 thousand metric tons (t) (6 percent) less than the average for 1995-2009. The 2010 skipjack catch was about 58 thousand t (28 percent) less than the average for 1995-2009. The 2010 bigeye catch was about 6 thousand t (9 percent) less than the average for 1995-2009.

The average annual distributions of the purse-seine catches of yellowfin, skipjack, and bigeye, by set type, in the EPO during 2005-2009, are shown in Figures 1a, 2a, and 3a, and preliminary estimates for 2010 are shown in Figures 1b, 2b, and 3b. The catches of yellowfin in 2010 showed an increase in catches on dolphins in the inshore areas off southern Mexico and Central America, and in the inshore areas off Baja California. The yellowfin catches in floating-object and unassociated school sets were somewhat smaller in the inshore areas south of 10°S. The catches of skipjack in 2010 were smaller in the areas north of 10°N, and in the inshore areas off Ecuador and Peru, compared to the average annual distributions for 2005-2009. Greater catches of skipjack were observed in floating-object sets in the offshore equatorial area from about 130°W to 150°W. The catches of bigeye in 2010 were very similar to the average annual distribution of the catches during 2005-2009, with slightly higher catches observed in the offshore equatorial area from about 140°W to 150°W. The catches of bigeye were lower in the equatorial area from about 90°W to 110°W.

Bigeye are not often caught 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 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 comprise most of the catches of fish made by tuna vessels in the EPO, bluefin, albacore, bonito, black skipjack, and other species contribute to the overall harvest in this area. The total retained catch of these other species in the EPO was about 6 thousand t in 2009 (Table 3), which is greater than the 1995-2009 annual average retained catch of about 5 thousand t (range: 1 t to 19 thousand t).

Preliminary estimates of the retained catches in the EPO in 2009 and 2010, 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 2010 were as follows:

Flag	**Retained catches**	
	Metric tons	**Percentages**
Ecuador	152,700	32
Mexico	121,600	26
Panama	60,800	13
Venezuela	37,400	8

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, 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 capacities.

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

Region	**Species**	**Gear**	**2010**	**2005-2009**		
				Average	**Minimum**	**Maximum**
N of 5° N	Yellowfin	PS	12.6	9.9	8.1	12.6
S of 5° N			2.3	2.9	2.0	5.7
N of 5° N	Skipjack	PS	1.3	2.7	1.1	3.7
S of 5° N			7.4	9.3	6.2	12.6
EPO	Bigeye	PS	1.8	2.4	2.0	2.8
EPO	Yellowfin	LP	2.4	1.9	1.6	2.1
EPO	Skipjack	LP	0.1	1.0	0.5	1.7

Catch statistics for the longline fishery

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). The catches that have been reported for January-December 2010 are shown in Table 5a, and preliminary estimates of those reported for the first quarter of 2011 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, 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 the catches of tunas are described in the IATTC Annual Report for 2000 and in IATTC Stock Assessment Report 4. 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 4).

Data for fish caught during the fourth quarters 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 fourth quarter of 2010, and the second shows data for the combined strata for the fourth quarter of each year of the 2005-2010 period. Samples from 143 wells were taken during the fourth 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 4). The last fishery includes all 13 sampling areas. Of the 143 wells sampled that contained fish caught during the fourth quarter of 2010, 118 contained yellowfin. The estimated size compositions of these fish are shown in Figure 5a. The majority of the yellowfin catch was taken by sets on dolphins in the Northern and Inshore areas; small amounts of yellowfin were also taken in floating-object sets and in the Northern and Southern unassociated set areas.

The estimated size compositions of the yellowfin caught by all fisheries combined during the fourth quarters of 2005-2010 are shown in Figure 5b. The average weight of the yellowfin caught during the fourth quarter of 2010 (5.9 kg) was considerably less than those of the previous two years.

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 4). The last two fisheries include all 13 sampling areas. Of the 143 wells sampled that contained fish caught during the fourth quarter of 2010, 73 contained skipjack. The estimated size compositions of these fish are shown in Figure 6a. Large amounts of skipjack in the 40- to 50-cm range were caught in the Northern, Equatorial, and Southern floating-object fisheries, and in the Southern unassociated school area. Larger skipjack in the 50- to 60-cm range were taken primarily in the Equatorial floating object fishery and in the Southern unassociated fishery.

The estimated size compositions of the skipjack caught by all fisheries combined during the fourth quarter of 2005-2010 are shown in Figure 6b. The average weight for the fourth quarter of 2010 (1.7 kg) was less than those of the previous five 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 4). The last three fisheries include all 13 sampling areas. Of the 143 wells sampled that contained fish caught during the fourth quarter of 2010, 32 contained bigeye. The estimated size compositions of these fish are shown in Figure 7a. The majority 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 80-cm size range. Smaller amounts of bigeye were taken in the Equatorial floating-object fishery.

The estimated size compositions of the bigeye caught by all fisheries combined during the fourth quarter of 2005-2010 are shown in Figure 7b. The average weight of bigeye during the fourth quarter of 2010 (5.0 kg) was less than that of 2009 (6.0 kg).

The estimated retained purse-seine catch of bigeye less than 60 cm in length during the fourth quarter of 2010 was 3,411 metric tons (t), or about 35 percent of the estimated total retained purse-seine catch of bigeye during that period. The corresponding amounts for 2003-2009 ranged from 3,855 to 5,907 t, or 22 to 40 percent. These values may differ slightly from those given in previous Quarterly Reports due to changes in the estimation procedure.

BIOLOGY AND ECOSYSTEM PROGRAM

Early life history studies

Yellowfin broodstock

The yellowfin broodstock in Tank 1 (1,362,000 L) at the Achotines Laboratory spawned daily during the quarter, except during 5-7 January, on 24 February, and during 4-7 and 23-26 March. Spawning occurred between 7:50 p.m. and 11:00 p.m. The numbers of eggs collected after each spawning event ranged from about 3,000 to 654,000. The water temperatures in the tank during the quarter ranged from 24.9° to 28.0°C.

At the end of the quarter there were four 54- to 56-kg yellowfin (one with an archival tag), and eight 24- to 39-kg yellowfin in Tank 1, and six 5- to 9-kg yellowfin in the 170,000-L reserve broodstock tank (Tank 2). .

During late 2008, 6 of the 15 yellowfin (7 to 10 kg) held in Tank 2 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.

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.

Collaborative research on yellowfin and bluefin

In January, representatives of Kinki University in Japan, the IATTC, and the Autoridad de los Recursos Acuáticos de Panama (ARAP) signed an agreement to conduct comparative research on the early life history and reproductive biology of Pacific bluefin tuna and yellowfin tuna. The joint research project, which will be conducted mostly at the Fisheries Laboratories of Kinki University in Wakayama Prefecture, Japan, and at the IATTC's Achotines Laboratory, will begin in early 2011 and continue for 5 years. It will be conducted by members of the faculty of Kinki University, the Early Life History Group of the IATTC, and staff scientists of ARAP. The studies will be the first in the world to investigate important comparative aspects of the reproductive biology, genetics, and early life histories of Pacific bluefin tuna and yellowfin tuna. The project will also support graduate research through Kinki University for selected staff members of the three participating groups. It will be implemented under the Science and Technology Research Partnership for Sustainable Development (SATREPS). The studies conducted in Japan will be supported by the Japan Science and Technology Agency (JST), and those undertaken in Panama will be supported by the Japan International Cooperation Agency (JICA).

The Early Life History Group and Hubbs Sea World Research Institute (HSWRI) of San Diego, California, USA, were awarded a grant in 2009 by the Saltonstall-Kennedy Program of the U.S. National Oceanic and Atmospheric Administration to conduct feasibility studies of the air shipment and subsequent rearing of yellowfin tuna eggs and larvae. During January 2011, Mr. Kevin Stuart, a HSWRI staff biologist, conducted multiple simulated shipments at the Achotines Laboratory and gained experience in culturing yellowfin larvae with the assistance of laboratory staff members. He returned to San Diego on 18 January 18 to receive yellowfin eggs and larvae shipped that day from the Achotines Laboratory. Three boxes, containing two bags each of eggs or larvae stocked in seawater, arrived at the HSWRI at about 11:00 p.m. that day. The initial survival of the eggs and larvae following air shipment ranged from 40 to100 percent. Parallel cultures of the same cohorts were carried out at the Achotines Laboratory to compare the growth and survival at the two facilities. On 1 February, another successful shipment of three boxes, containing two bags each of eggs or larvae stocked in seawater, arrived at the HSWRI about 24 hours after leaving the Achotines Laboratory. The initial survival of eggs was 87 percent, of yolk-sac larvae from 89 to 100 percent, and of 15-day-post-hatch larvae from 11 to 27 percent.

In mid-2010, the Early Life History Group and colleagues at the Secretariat of the Pacific Community (SPC), Noumea, New Caledonia, were awarded a grant through the Pelagic Fisheries Research Program (PFRP), Joint Institute for Marine and Atmospheric Research, University of Hawaii at Manoa, to conduct a study of the potential impacts of ocean acidification on the early life stages of tropical tunas. The study will involve experimental investigations, conducted at the Achotines Laboratory, of the effects of ocean acidification on the survival, development, and growth of egg and larvae of yellowfin tuna. The experimental results will be used by the SPC to model and evaluate the potential impact of ocean acidification on the distribution and abundance of yellowfin tuna in the Pacific Ocean. The project is a 2-year study that will be conducted during 2011-2012. During March 2011, final revisions to the experimental plan were completed and the initial procurement orders were made for the necessary laboratory equipment. The first experiments with yellowfin eggs and larvae will begin at the Achotines Laboratory in September 2011.

Studies of snappers

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

During 1996-2009, the ARAP staff had conducted full life cycle research on spotted rose snapper (*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 2010 there were 62 spotted rose snappers and 19 yellow snappers being held in broodstock tanks at the Laboratory. However, by the end of September 2010 only nine spotted rose snappers remained (see IATTC Quarterly Report for October-December 2010). Attempts to collect more spotted rose snappers began in February 2011, but none were caught.

Visitors at the Achotines Laboratory

Ms. Tanya Ribakoff, a graduate student at Auburn University, Auburn, Alabama, USA, arrived at the Achotines Laboratory on 4 January 2011. Ms. Ribakoff spent 3 months at the Achotines Laboratory to fulfill the internship requirement for her graduate degree. She paid her expenses while staying at the Laboratory.

Messrs. Alberto Garcia and Manuel Trute of the consulting group Arden & Price spent the period of 12-14 January 2011, at the Achotines Laboratory. Arden & Price is preparing a management plan for the Zona de Uso Especial Marítima being established by the Autoridad de los Recursos Acuáticos de Panamá (ARAP) in the southern Azuero Peninsula. Numerous Arden & Price specialists in different disciplines have visited the area to gather information for the management plan.

Ms. Lolly O'Brien, Undergraduate/Graduate Program Administrator at Princeton University, Princeton, New Jersey, USA, spent the period of 16-17 January 2011, at the Achotines Laboratory. Ms. O'Brien was familiarizing herself with locations used for Princeton University field trips and graduate student studies.

From 22 February through 1 March 2011, staff members of Kinki University (KU), Japan, visited Panama to meet with IATTC and ARAP staff members in order to coordinate various aspects of the collaborative research project on the early life history and reproductive biology of Pacific bluefin tuna and yellowfin tuna. The KU group was composed of three professors, Drs. Yoshifumi Sawada, Yasunori Ishibashi, and Kenji Takii, and a KU technical assistant, Mr. Tomoki Honryo. The KU group spent the period of 24-27 February 2011 at the Achotines Laboratory, and during the rest of their stay they visited ARAP facilities in Panama City and the interior of the country. Dr. Daniel Margulies traveled to Panama to participate in the meetings, at which he and Mr. Vernon P. Scholey represented the IATTC.

Dr. Stephen W. Pacala, Frederick D. Petrie Professor in the Department of Ecology and Evolutionary Biology at Princeton University, Princeton, New Jersey, USA, taught a portion of his "Biology of Coral Reefs" field course at the Achotines Laboratory. The 26-person group arrived at the Achotines Laboratory on 8 March 8 2011, and departed on 10 March 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.

There was a band of 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 in April 2010. 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 8). 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 of the area of cool water increased during the fourth quarter, reaching a maximum for the year in December (IATTC Quarterly Report for October-December 2010: Figure 5). The size of that area decreased during the first quarter of 2011 due to warming of the water between the coast and about 120°W (Figure 8). The SSTs were mostly above average in April 2010, about average during May, and below average, with only two exceptions, from June 2010 through March 2011 (Table 6). The thermoclines along the equator at 110°W and 150°W during May through September 2010 were relatively shallow, and the sea levels at Callao, Peru, during the second, third, and fourth quarters of 2010 were below average, both indicating anti-El Niño conditions. Also, the

NOI*s and SOI*s during the third and fourth quarters of 2010 and first quarter of 2011 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 the first quarter of 2011. According to the Climate Diagnostics Bulletin of the U.S. National Weather Service for March 2011, "Nearly all of the ENSO [El Niño-Southern Oscillation] models predict [anti-El Niño conditions] to continue weakening in the coming months, and the majority of models indicate a return to ENSO-neutral [conditions] by May-June-July …. While there is confidence in ENSO-neutral conditions by June 2011, the forecasts for the late [Northern Hemisphere] summer and beyond remain highly uncertain. At this time, all of the multi-model forecasts suggest ENSO-neutral conditions will persist from June through the rest of the year. However, the spread of individual model forecasts and overall model skill at these lead times leaves the door open for either El Niño or [anti-El Niño] conditions by the end of 2011."

BYCATCH PROGRAM 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 first quarter of 2010. Members of the field office staffs placed IATTC observers on 114 fishing trips by vessels that participate in the IDCP On-Board Observer Program during the quarter. In addition, 80 IATTC observers completed trips 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 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. 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 238 fishing trips aboard purse seiners covered by that program during the first quarter of 2011. Preliminary coverage data for these vessels during the quarter are shown in Table 7.

Training

There were no IATTC observer training courses conducted during the quarter.

GEAR PROJECT

IATTC staff members did not participate in any dolphin safety-gear inspections or safety-panel alignment procedures aboard purse seiners during the first quarter of 2011.

INTER-AGENCY COOPERATION

Dr. Cleridy E. Lennert-Cody gave a lecture, “An Introduction to Random Forests and Multivariate Regression Trees,” to Dr. Jay Barlow's class, “Computer Intensive Methods in Statistics,” at Scripps Institution of Oceanography, La Jolla, California, USA, on 15 February 2011.

Dr. Martín A. Hall spent the period of 20-27 February 2011 in Ecuador and Peru, where he and Dr. Takahisa Mituhasi of the Overseas Fishery Cooperation Foundation (OFCF) of Japan made several presentations on the work on sea turtles done by the IATTC and the OFCF to audiences in both countries. These included:

Characteristics and objectives of the project;

Results of experiments with circle hooks;

Results of experiments on reduction of entanglement of sea turtles;

Catalogue of hooks used in artisanal longline gear in the eastern Pacific Ocean;

Standard forms to improve the data collection systems for observers, for landings, and for description of gear;

Handling of hooked or entangled turtles: presentation of a new video (http://www.iattc.org/Downloads.htm);

Discussion of future steps to promote adoption: obstacles and solutions;

Feedback from participants.

The activities in Ecuador were coordinated by Mr. Jimmy Martínez Ortiz, a scientific advisor to the Subsecretaría de Recursos Pesqueros. The first activity, on 21 February, was a meeting with several Division Directors (Pesca, Pesca Artesanal, Sostenibilidad, Control, *etc*.) from the Subsecretaria. After that, fishers' workshops took place in Santa Marianita, Anconcito, and Santa Rosa de Salinas, which were attended by a total of about 150 fishers.

The activities in Peru were coordinated by Dr. Gladys Cárdenas Quintana of the Instituto del Mar del Perú (IMARPE). The first presentation, on 24 February, was at IMARPE in El Callao, and other workshops took place in Paita on 25 February for students at the center for fishers' training of the Fondo Nacional de Desarrollo Pesquero (FONDEPES), with support from Mr. Simon Chapilliquen, and in Pucusana on 26 February.

PUBLICATIONS

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Buentello, J. Alejandro, Camilo Pohlenz, Daniel Margulies, Vernon P. Scholey, Jeanne B. Wexler, Dariel Tovar-Ramírez, William H. Neill, Patricia Hinojosa-Baltazar, and Delbert M. Gatlin, III. 2011. A preliminary study of digestive enzyme activities and amino acid composition of early juvenile yellowfin tuna (*Thunnus albacares*). Aquaculture, 312 (1): 205-211.

Garcia, Serge M. (editor), Jeppe Kolding, Jake Rice, Marie-Joëlle Rochet, Shijie Zhou, Takafumi Arimoto, Jan Beyer, Lisa Borges, Alida Bundy, Daniel Dunn, Norman Graham, Martín Hall, Mikko Heino, Richard Law, Mitsutaku Makino, Adriaan D. Rijnsdorp, François Sinard, Anthony D.M. Smith, and Despina Symons. 2011. Selective fishing and balanced harvest in relation to fisheries and ecosystem sustainability (report of a scientific workshop organized by the ICUN-CEM [International Union for Conservation of Nature-Commission on Ecosystem Management] Fisheries Expert Group and the European Bureau for Conservation and Development in Nagoya, Japan, October 14-16, 2010): 33 pp.

Glaser, Sarah M., Hao Ye, Mark Maunder, Alec MacCall, Michael Fogarty, and George Sugihara. 2011. Detecting and forecasting complex nonlinear dynamics in spatially structured catch-per-unit-effort time series for North Pacific albacore (*Thunnus alalunga*). Canad. Jour. Fish. Aqua. Sci., 68 (3): 400-412.

Lee, Hui-Hua, Mark N. Maunder, Kevin R. Piner, and Richard D. Methot. 2011. Estimating natural mortality within a fisheries stock assessment model: an evaluation using simulation analysis based on twelve stock assessments. Fish. Res., 109 (1): 89-94.

Solana-Sansores, L. Rafael de J., y Guillermo Compeán-Jiménez. 2010. Efectos del cambio climático en la pesquería mexicana de atún del Pacífico. *In* Rivera-Arriaga, Evelia, Isaac Azuz Adeath, Guillermo Villalobos Zapata, y Leticia Alpuche Gual (editors), Cambio Climático en México: un Enfoque Costero y Marino. Gobierno del

Estado de Campeche-EPOMEX [Centro de Ecología Pesquerías y Oceanografía del Golfo de México]: 465-472.

Zink, Ian C., Daniel D. Benetti, Philippe A. Douillet, Daniel Margulies, and Vernon P. Scholey. 2011. Improvement of water chemistry with bacillus probiotics inclusion during simulated transport of yellowfin tuna yolk sac larvae. North Amer. Jour. Aquaculture, 73 (1): 42-48.

VISITING SCIENTIST

Mr. Chi-Chao Liu, Section Chief, Deep Sea Fisheries Division, Fisheries Agency of Taiwan, who had been visiting at the IATTC headquarters in La Jolla since 1 November 2010, returned to Chinese Taipei on 29 January 2011.

ADMINISTRATION

Mr. Brian S. Hallman, Deputy Director of the IATTC, resigned, effective 11 March 2011, to accept a position as Executive Director of the American Tunaboat Association, which has its headquarters in San Diego, California, USA. In Mr. Hallman's earlier employment with the U.S. Department of State, he was deeply involved in the negotiations for access for U.S. tuna boats to fishing grounds in the western Pacific Ocean, so he is well qualified for his new position. Mr. Hallman started working for the IATTC in October 1999, and he was promoted to Deputy Director in April 2008. He will be sorely missed, but everyone wishes him the best in his new position.

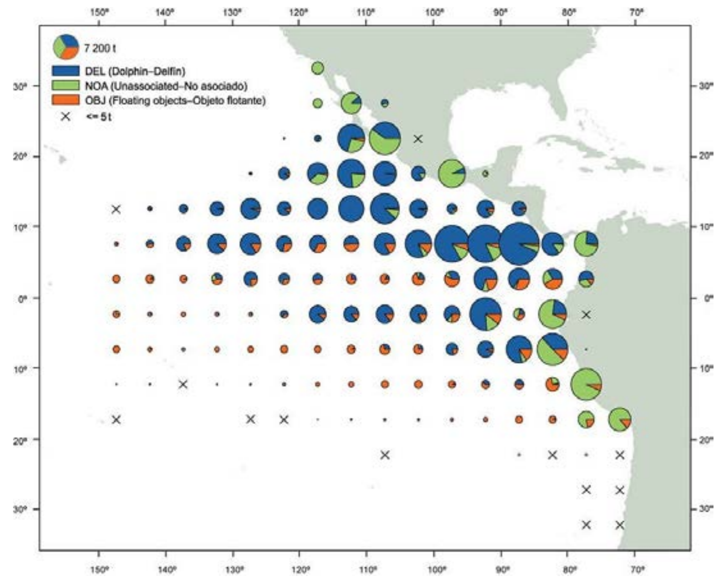

FIGURE 1a. Average annual distributions of the purse-seine catches of yellowfin, by set type, 2005-2009. The sizes of the circles are proportional to the amounts of yellowfin caught in those 5° by 5° areas.
FIGURA 1a. Distribución media anual de las capturas cerqueras de aleta amarilla, por tipo de lance, 2005-2009. El tamaño de cada círculo es proporcional a la cantidad de aleta amarilla capturado en la cuadrícula de 5° x 5° correspondiente.

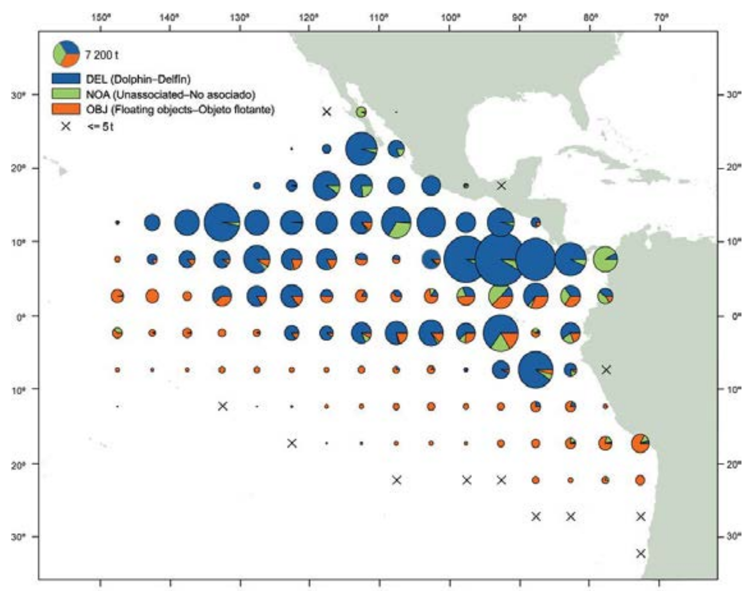

FIGURE 1b. Annual distributions of the purse-seine catches of yellowfin, by set type, 2010. The sizes of the circles are proportional to the amounts of yellowfin caught in those 5° by 5° areas.
FIGURA 1b. Distribución anual de las capturas cerqueras de aleta amarilla, por tipo de lance, 2010. El tamaño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

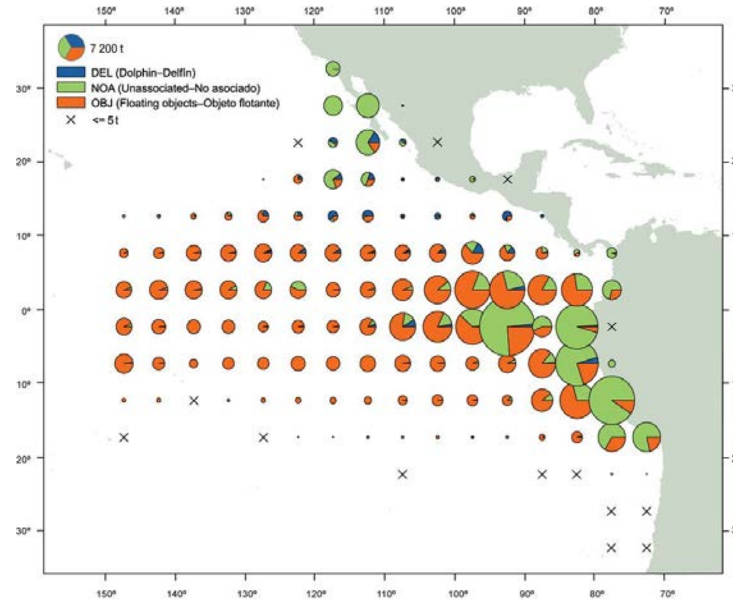

FIGURE 2a. Average annual distributions of the purse-seine catches of skipjack, by set type, 2005-2009. The sizes of the circles are proportional to the amounts of skipjack caught in those 5° by 5° areas.
FIGURA 2a. Distribución media anual de las capturas cerqueras de barrilete, por tipo de lance, 2005-2009. El tamaño de cada círculo es proporcional a la cantidad de barrilete capturado en la cuadrícula de 5° x 5° correspondiente.

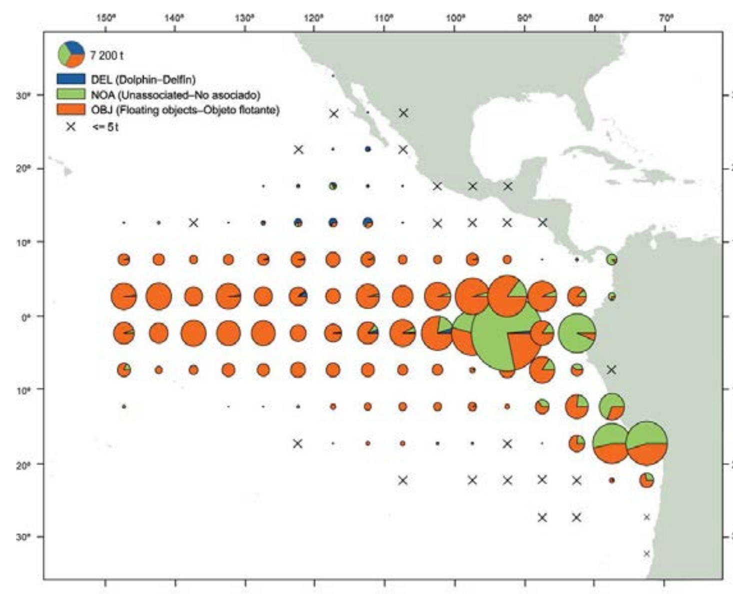

FIGURE 2b. Annual distributions of the purse-seine catches of skipjack, by set type, 2010. The sizes of the circles are proportional to the amounts of skipjack caught in those 5° by 5° areas.
FIGURA 2b. Distribución anual de las capturas cerqueras de barrilete, por tipo de lance, 2010. El tamaño de cada círculo es proporcional a la cantidad de barrilete capturado en la cuadrícula de 5° x 5° correspondiente.

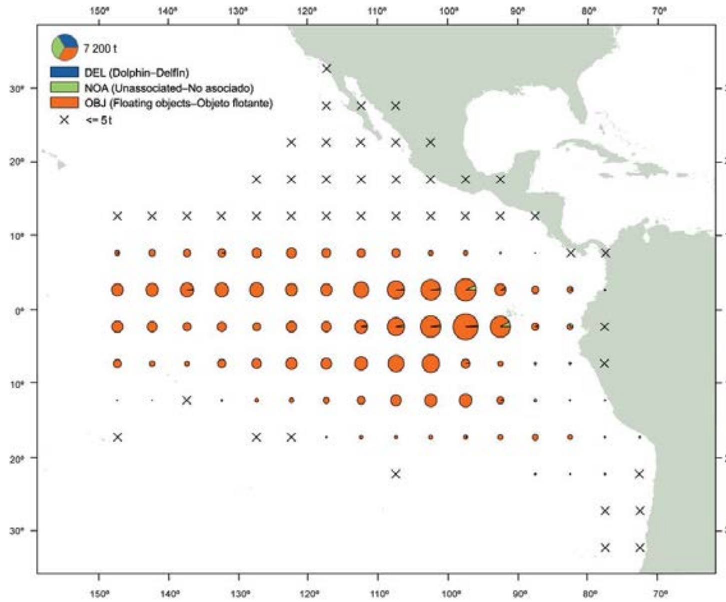

FIGURE 3a. Average annual distributions of the purse-seine catches of bigeye, by set type, 2005-2009. The sizes of the circles are proportional to the amounts of bigeye caught in those 5° by 5° areas.
FIGURA 3a. Distribución media anual de las capturas cerqueras de patudo, por tipo de lance, 2005-2009. El tamaño de cada círculo es proporcional a la cantidad de patudo capturado en la cuadrícula de 5° x 5° correspondiente.

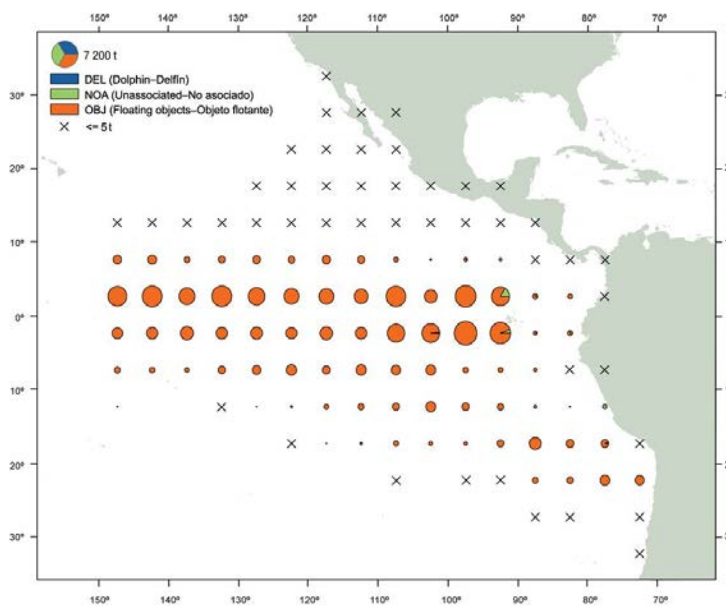

FIGURE 3b. Annual distributions of the purse-seine catches of bigeye, by set type, 2010. The sizes of the circles are proportional to the amounts of bigeye caught in those 5° by 5° areas.
FIGURA 3b. Distribución anual de las capturas cerqueras de patudo, por tipo de lance, 2010. El tamaño de cada círculo es proporcional a la cantidad de patudo capturado en la cuadrícula de 5° x 5° correspondiente.

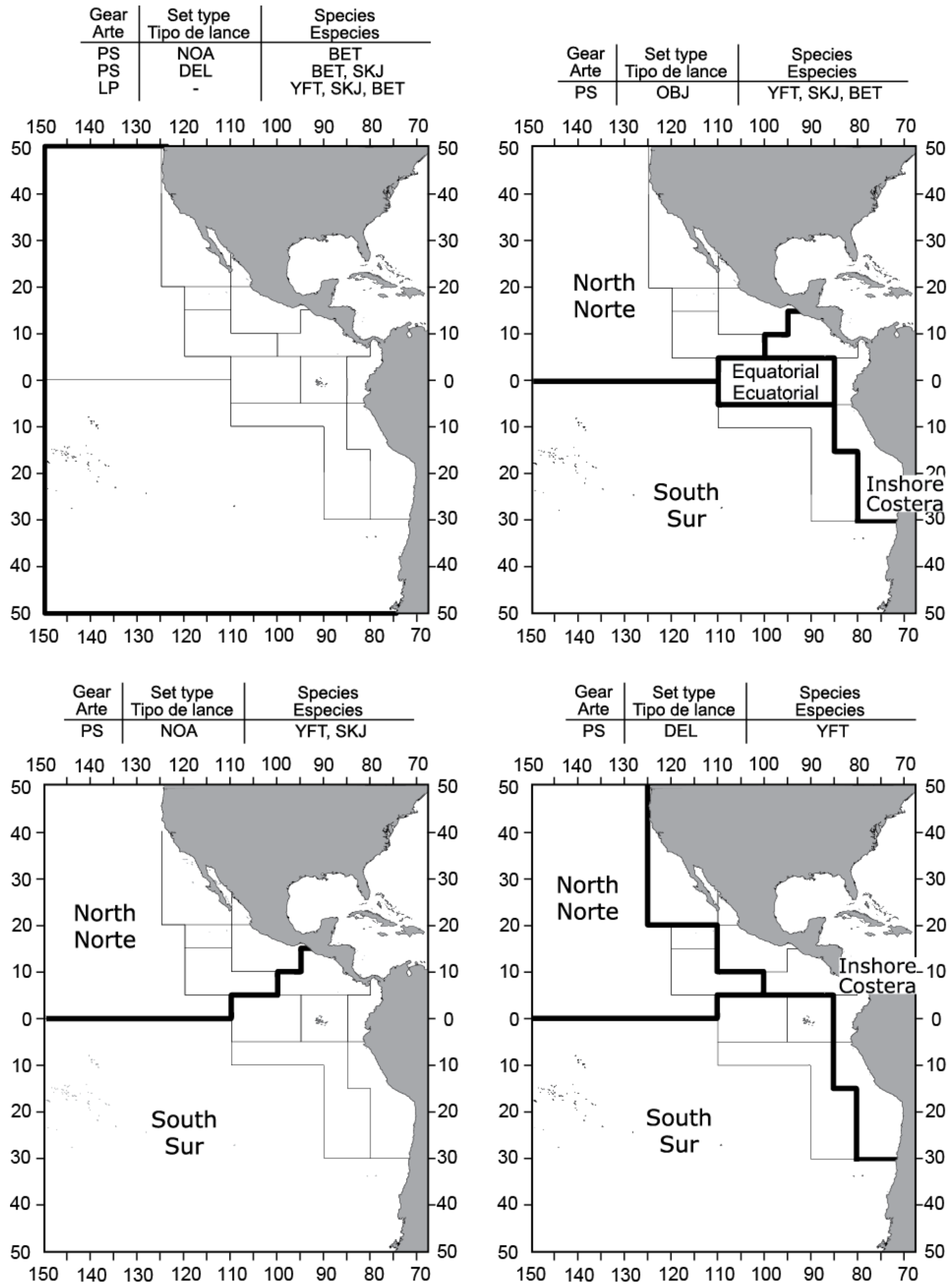

FIGURE 4. Spatial extents of the fisheries defined by the IATTC staff for stock assessment of yellowfin, skipjack, and bigeye in the EPO. The thin lines indicate the boundaries of the 13 length-frequency sampling areas, and the bold lines the boundaries of the fisheries. Gear: PS = purse seine, LP = 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.

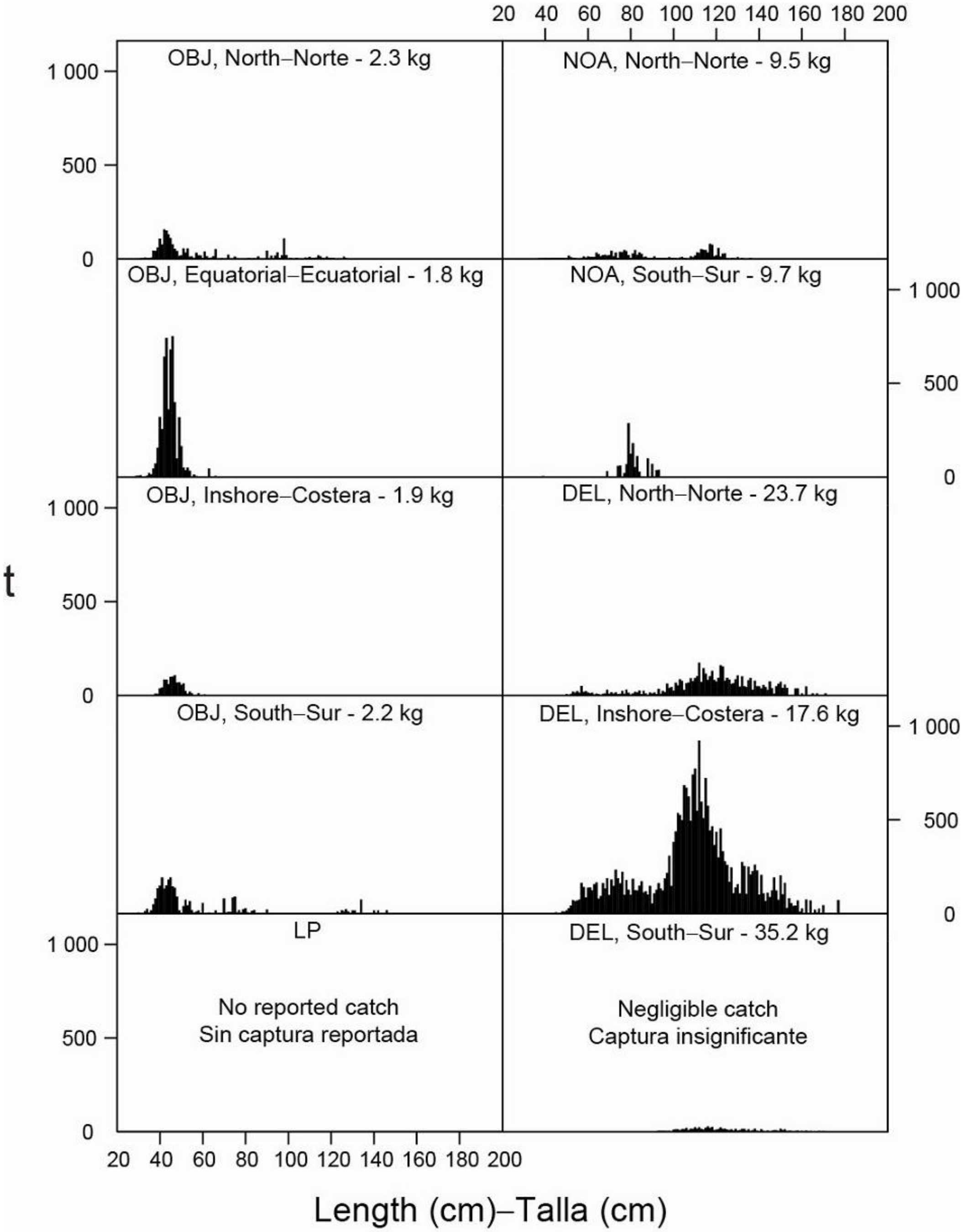

FIGURE 5a. Estimated size compositions of the yellowfin caught in each fishery of the EPO during the fourth quarter of 2010. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 5a. Composición por tallas estimada para el aleta amarilla capturado en cada pesquería del OPO durante el cuarto 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.

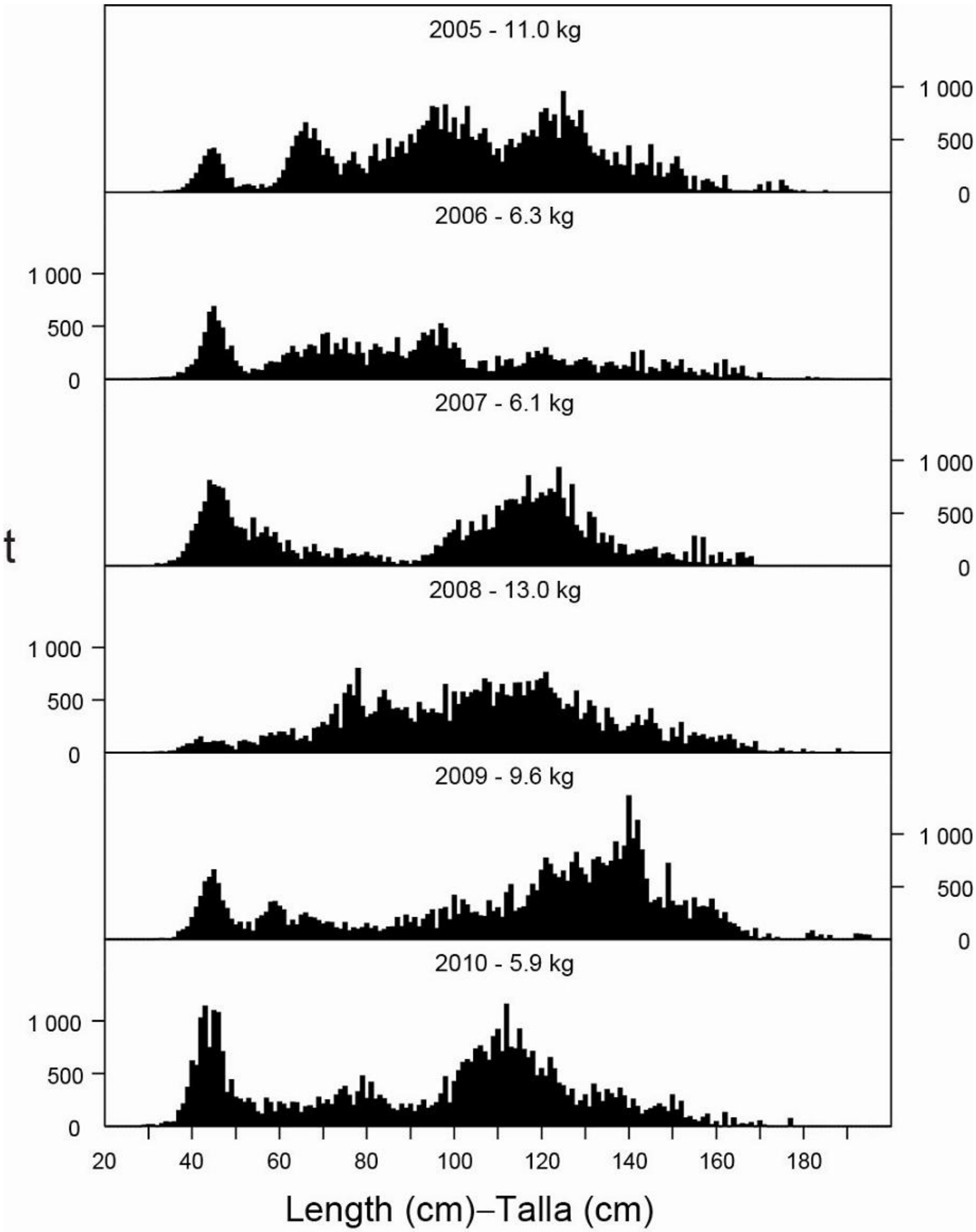

FIGURE 5b. Estimated size compositions of the yellowfin caught in the EPO during the fourth quarter of 2005-2010. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 5b. Composición por tallas estimada para el aleta amarilla capturado en el OPO en el cuarto trimestre de 2005-2010. En cada recuadro se detalla el peso promedio de los peces en las muestras; t = toneladas métricas.

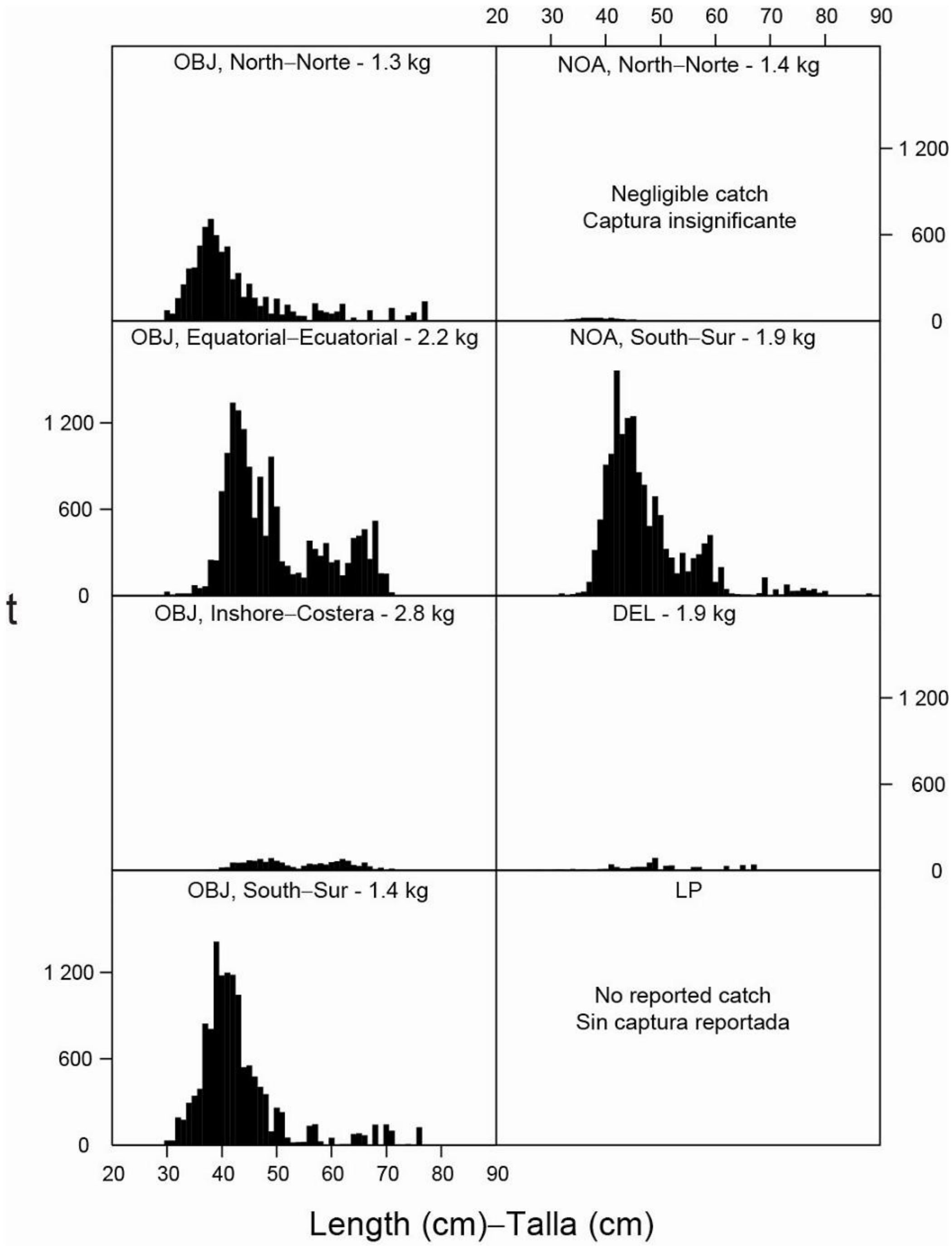

FIGURE 6a. Estimated size compositions of the skipjack caught in each fishery of the EPO during the fourth quarter of 2010. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 6a. Composición por tallas estimada para el barrilete capturado en cada pesquería del OPO durante el cuarto 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.

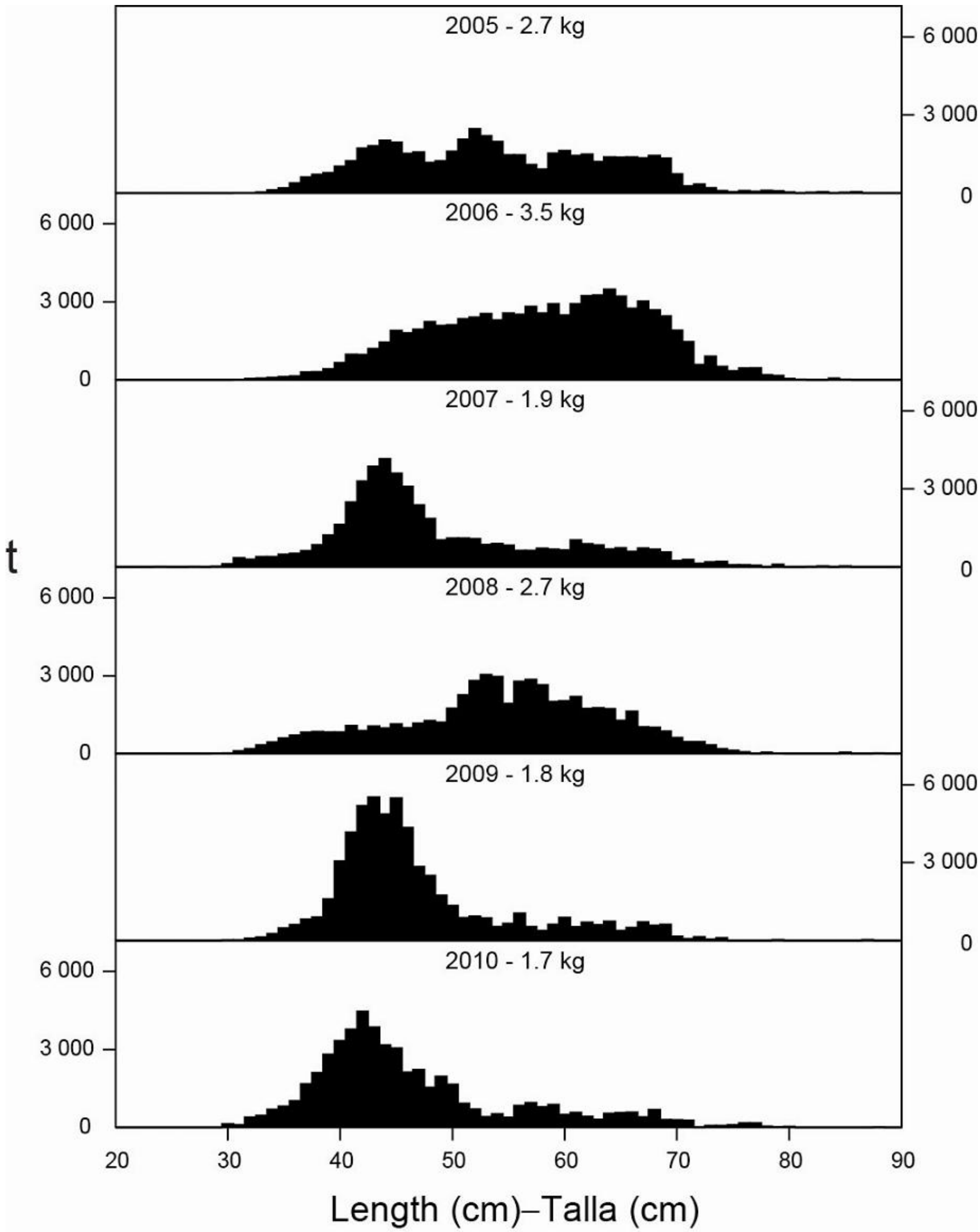

FIGURE 6b. Estimated size compositions of the skipjack caught in the EPO during the fourth quarter of 2005-2010. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 6b. Composición por tallas estimada para el barrilete capturado en el OPO en el cuarto trimestre de 2005-2010. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas.

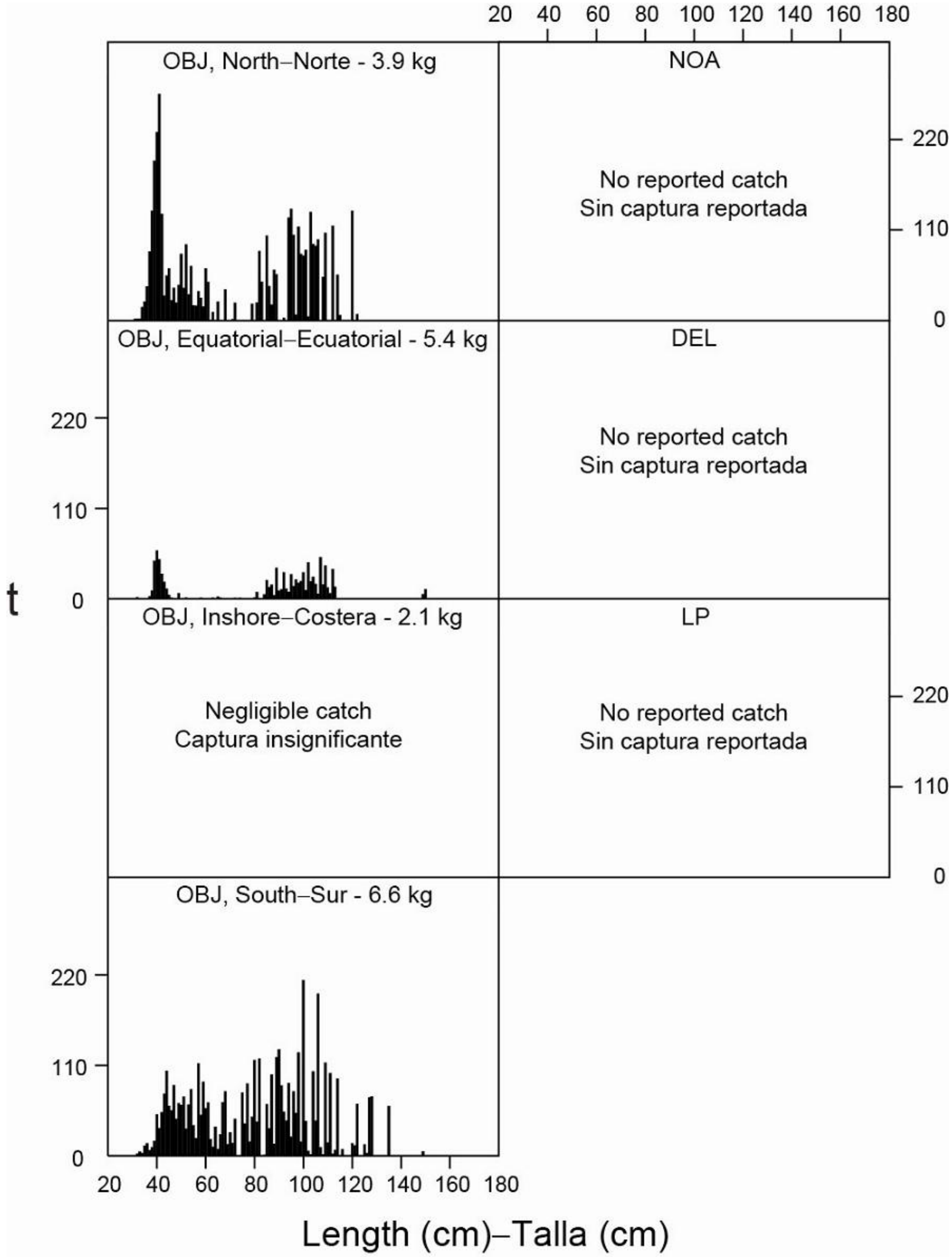

FIGURE 7a. Estimated size compositions of the bigeye caught in each fishery of the EPO during the fourth quarter of 2010. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 7a. Composición por tallas estimada para el patudo capturado en cada pesquería del OPO durante el cuarto 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.

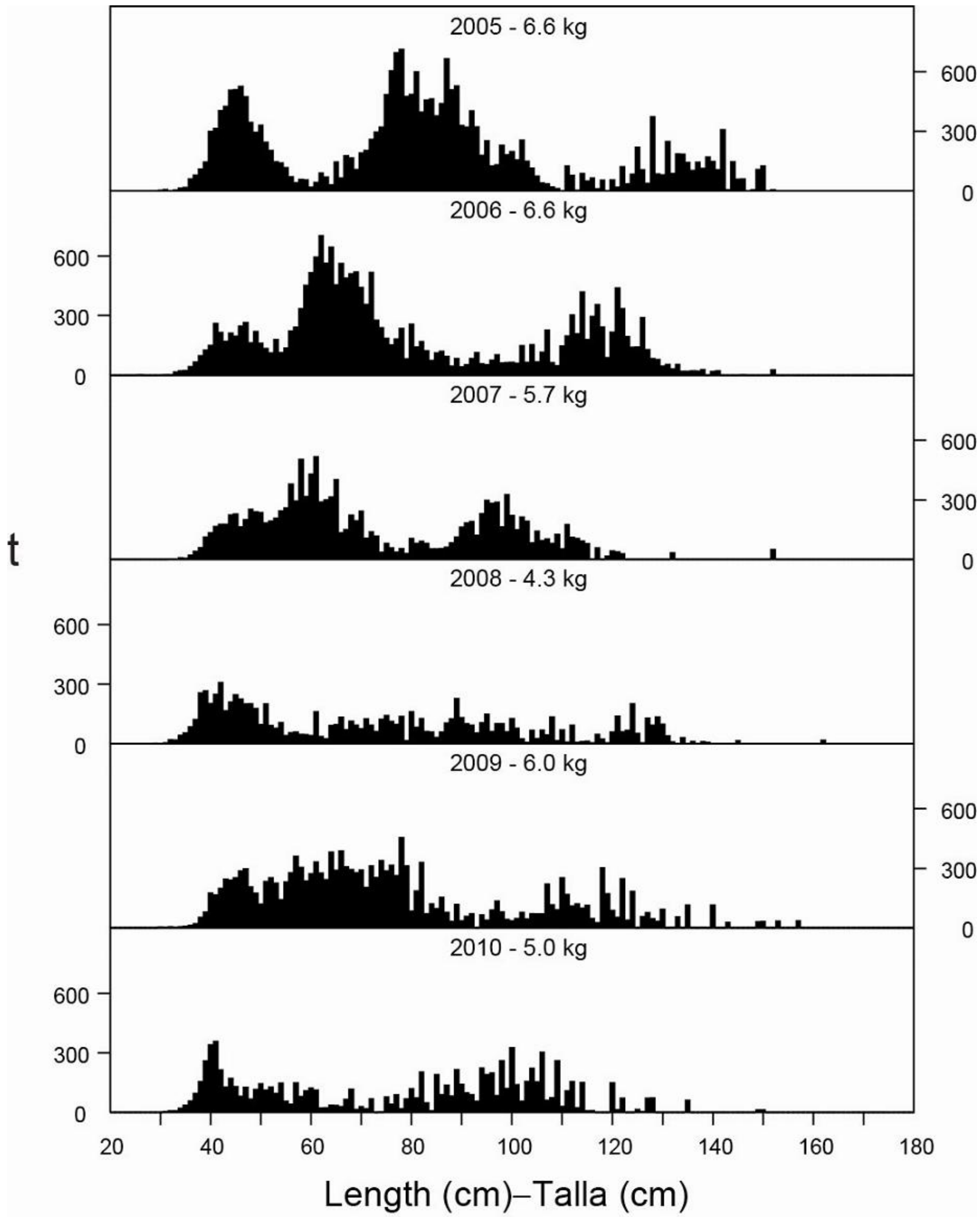

FIGURE 7b. Estimated size compositions of the bigeye caught in the EPO during the fourth quarter of 2005-2010. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.
FIGURA 7b. Composición por tallas estimada para el patudo capturado en el OPO en el cuarto trimestre de 2005-2010. En cada recuadro se detalla el peso promedio de los peces en las muestras; t = toneladas métricas.

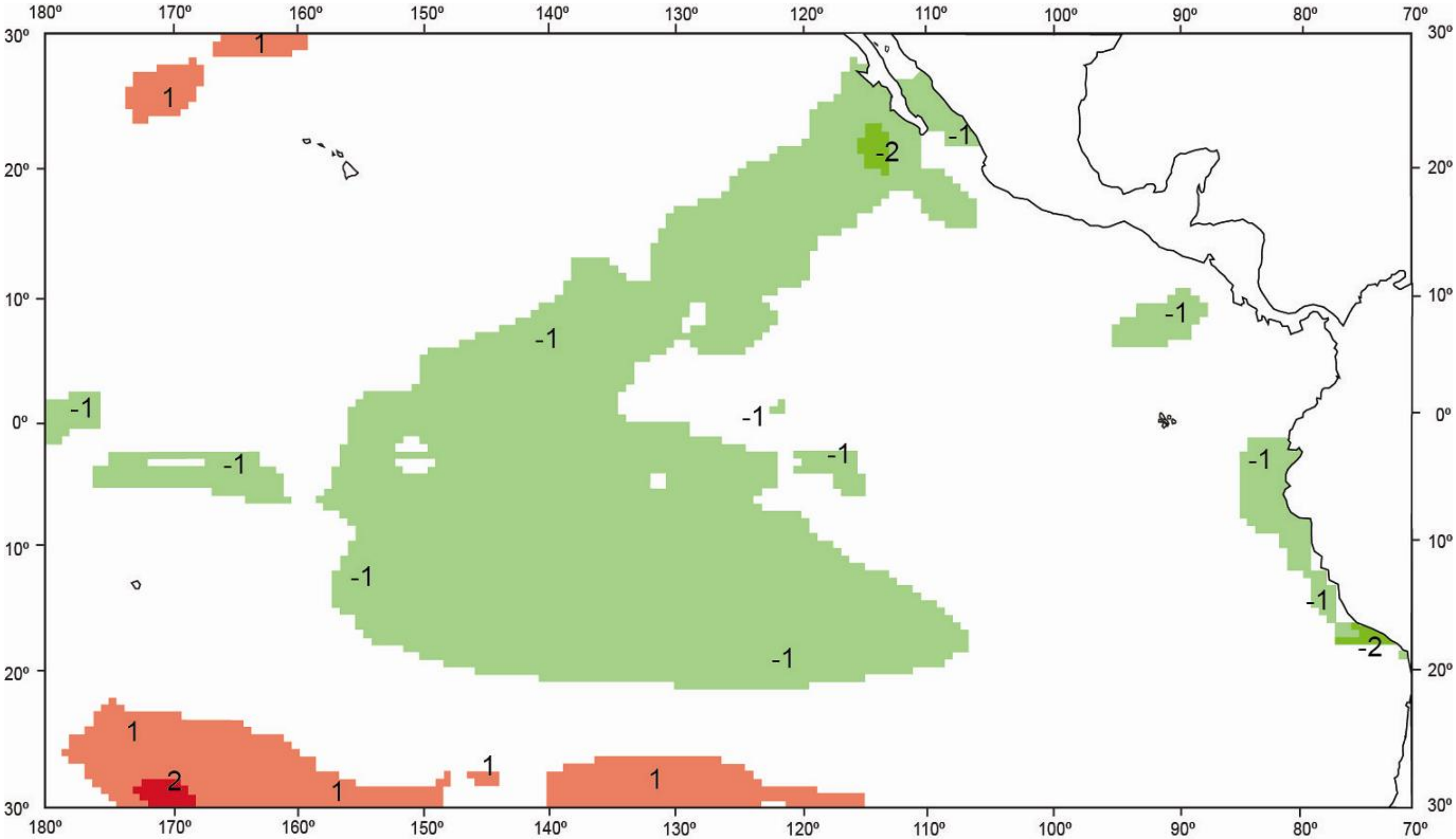

FIGURE 8. Sea-surface temperature (SST) anomalies (departures from long-term normals) for March 2011, based on data from fishing boats and other types of commercial vessels.
FIGURA 8. Anomalías (variaciones de los niveles normales a largo plazo) de la temperatura superficial del mar (TSM) en marzo de 2011, 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 2011 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 2011, 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				
Belize	PS	-	2	-	2	2,975
Bolivia	PS	1	-	-	1	222
Colombia	PS	3	10	-	13	14,590
Ecuador	PS	63	14	9	86	62,893
España—Spain	PS	-	-	4	4	10,116
Guatemala	PS	-	2	1	3	4,819
Honduras	PS	1	-	-	1	547
México	PS	9	30	1	40	46,342
	LP	3	-	-	3	255
Nicaragua	PS	-	6	-	6	7,934
Panamá	PS	2	12	4	18	24,701
El Salvador	PS	-	1	3	4	7,415
Venezuela	PS	-	17	-	17	22,747
Vanuatu	PS	1	2	-	3	3,609
All flags—	PS	80	96	22	198	
Todas banderas	LP	3	-	-	3	
	PS + LP	83	96	22	201	
		Capacity—Capacidad				
All flags—	PS	36,929	125,284	46,697	208,910	
Todas banderas	LP	255	-	-	255	
	PS + LP	37,184	125,284	46,697	209,165	

TABLE 2. Estimates of the retained catches of tunas in the EPO, from 1 January through 3 April 2011, 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 2011, 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	7,844	30,826	6,042	-	3	-	3	-	44,718	32.6
México	27,518	925	117	-	-	-	772	-	29,332	21.4
Panamá	7,625	8,411	930	-	-	-	-	-	16,966	12.4
Venezuela	6,140	10,613	5	-	-	-	35	7	16,800	12.3
Other—Otros[2]	14,506	13,373	1,387	-	-	-	-	-	29,266	21.3
Total	63,633	64,148	8,481	-	3	-	810	7	137,082	

[1] Includes other tunas, sharks, and miscellaneous fishes

[1] Incluye otros túnidos, tiburones, y peces diversos

[2] Includes Colombia, El Salvador, Guatemala, Honduras, Nicaragua, Spain, and Vanuatu; this category is used to avoid revealing the operations of individual vessels or companies.

[2] Incluye Colombia, El Salvador, España, Guatemala, Honduras, Nicaragua y Vanuatú; se usa esta categoría para no revelar información sobre faenas de buques o empresas individuales.

TABLE 3. Estimated retained and discarded catches, in metric tons, by purse-seine and pole-and-line vessels of the EPO tuna fleet. "Other" includes other tunas, sharks, and miscellaneous fishes. The data for 2009-2010 are preliminary. Discard data were first collected by observers in 1993.

TABLA 3. Estimaciones de capturas retenidas y descartadas, en toneladas métricas, de buques cerqueros y caneros de la flota atunera del OPO. "Otros" incluye otros atunes, tiburones, y peces diversos. Los datos de 2009-2010 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
1981	169,711	-	169,711	125,071	-	125,071	14,921	-	14,921	1,085	-	1,085
1982	116,293	-	116,293	104,259	-	104,259	6,981	-	6,981	3,145	-	3,145
1983	87,936	-	87,936	61,238	-	61,238	4,614	-	4,614	836	-	836
1984	138,776	-	138,776	62,743	-	62,743	8,863	-	8,863	839	-	839
1985	212,529	-	212,529	51,775	-	51,775	6,058	-	6,058	3,996	-	3,996
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	4,758	229,201	87,602	10,598	98,200	9,657	653	10,310	580	-	580
1994	212,033	4,527	216,560	73,366	10,501	83,867	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	24,503	131,031	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	2,609	3	2,612
1998	259,044	4,698	263,742	142,315	22,644	164,959	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	24,508	230,386	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	6	1,767
2003	383,749	5,950	389,699	274,606	22,453	297,059	53,052	2,326	55,378	3,236	-	3,236
2004	274,441	3,009	277,450	198,352	17,182	215,534	65,471	1,749	67,220	8,880	19	8,899
2005	269,923	2,929	272,852	264,528	17,228	281,756	67,895	1,952	69,847	4,743	15	4,758
2006	167,317	1,665	168,982	296,703	12,403	309,106	83,838	2,385	86,223	9,806	-	9,806
2007	170,910	1,946	172,856	208,571	7,159	215,730	63,450	1,039	64,489	4,189	-	4,189
2008	185,871	1,019	186,890	297,102	9,166	306,268	75,028	2,287	77,315	4,407	14	4,421
2009	237,466	1,482	238,948	230,674	6,903	237,577	76,799	1,104	77,903	3,398	24	3,422
2010	251,469	1,115	252,584	147,239	3,365	150,604	57,752	646	58,398	7,746	-	7,746

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

Year	Albacore			Bonitos (*Sarda* spp.)			Black skipjack			Other			Total		
	Retained	Discarded	Total	Retained	Discarded	Total	Retained	Discarded	Total	Retained	Discarded	Total	Retained	Discarded	Total
Año	Albacora			Bonitos (*Sarda* spp.)			Barrilete negro			Otros			Total		
	Retenido	Descartado	Total	Retenido	Descartado	Total	Retenido	Descartado	Total	Retenido	Descartado	Total	Retenido	Descartado	Total
1981	707	-	707	5,717	-	5,717	1,911	-	1,911	216	-	216	319,339	-	319,339
1982	553	-	553	2,122	-	2,122	1,338	-	1,338	47	-	47	234,738	-	234,738
1983	456	-	456	3,829	-	3,829	1,222	-	1,222	60	-	60	160,191	-	160,191
1984	5,351	-	5,351	3,514	-	3,514	662	-	662	6	-	6	220,754	-	220,754
1985	919	-	919	3,604	-	3,604	288	-	288	19	-	19	279,188	-	279,188
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	801	-	801	36	-	36	396,108	-	396,108
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	4,144	4,248	9	2,013	2,022	322,996	22,178	345,174
1994	85	-	85	8,693	147	8,840	188	854	1,042	9	497	506	330,242	18,792	349,034
1995	465	-	465	8,010	55	8,065	203	1,448	1,651	11	626	637	403,671	27,028	430,699
1996	83	-	83	654	1	655	704	2,304	3,008	37	1,028	1,065	420,019	39,837	459,856
1997	60	-	60	1,105	4	1,109	100	2,512	2,612	71	3,383	3,454	474,229	48,158	522,387
1998	123	-	123	1,337	4	1,341	528	1,876	2,404	13	1,233	1,246	449,261	33,277	482,538
1999	274	-	274	1,719	-	1,719	171	3,412	3,584	27	3,092	3,119	603,219	44,084	647,303
2000	157	-	157	636	-	636	293	1,995	2,288	190	1,410	1,600	561,903	39,537	601,440
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	21,747	650,782
2003	93	-	93	1	-	1	439	1,535	1,974	80	1,238	1,318	715,256	33,502	748,758
2004	231	-	231	16	35	51	884	387	1,271	256	973	1,229	548,531	23,354	571,885
2005	68	-	68	313	18	331	1,472	2,124	3,596	190	1,922	2,112	609,132	26,188	635,320
2006	110	-	110	3,519	80	3,599	1,999	1,977	3,976	49	1,910	1,959	563,341	20,420	583,761
2007	208	-	208	16,013	628	16,641	2,307	1,625	3,932	600	1,221	1,821	466,248	13,618	479,866
2008	1,099	-	1,099	7,883	37	7,920	3,624	2,251	5,875	137	1,381	1,518	575,151	16,155	591,306
2009	2,135	2	2,137	9,807	15	9,822	4,368	1,020	5,388	158	469	627	564,805	11,019	575,824
2010	25	-	25	2,814	25	2,839	3,191	1,087	4,278	125	747	872	470,361	6,985	477,346

TABLE 4. Preliminary estimates of the retained catches in metric tons, of tunas and bonitos caught by purse-seine, pole-and-line, and recreational vessels in the EPO in 2009 and 2010, 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, cañeros, y recreacionales en el OPO en 2009 y 2010, 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**	**Bluefin**	**Albacore**	**Black skipjack**	**Bonito (*Sarda* spp.)**	**Unidentified tun**	**Total**	**Percent**
	Aleta amarilla	**Barrilete**	**Patudo**	**Aleta azul**	**Albacora**	**Barrilete negro**	**Bonito (*Sarda* spp.)**	**Atunes no identificados**	**Total**	**Porcentaje**
2009	**Retained catches–Capturas retenidas**									
Ecuador	18,167	132,712	35,646	-	3	308	-	146	186,982	33.0
México	100,494	6,998	1,334	3,019	17	3,919	7,885	2	123,668	21.8
Nicaragua	6,686	5,119	2,241	-	-	-	-	-	14,046	2.5
Panamá	35,228	26,973	11,807	-	-	133	-	-	74,141	13.1
Venezuela	25,298	19,370	8,479	-	-	8	-	1	53,156	9.4
Other[1]	52,113	39,532	17,923	554	2,556	-	1,922	9	114,609	20.2
Total	237,986	230,704	77,430	3,573	2,576	4,368	9,807	158	566,602	
2010	**Retained catches–Capturas retenidas**									
Ecuador	34,764	82,280	34,902	-	-	413	3	108	152,470	32.4
México	105,428	3,057	11	7,745	25	2,569	2,811	3	121,649	25.8
Nicaragua	9,422	5,242	1,934	-	-	70	-	1	16,669	3.5
Panamá	34,538	19,213	7,089	-	-	3	-	-	60,843	12.9
Venezuela	21,245	11,818	4,361	-	-	9	-	-	37,433	8.0
Other[1]	46,274	25,630	9,457	112	-	127	-	13	81,613	17.3
Total	251,671	147,240	57,754	7,857	25	3,191	2,814	125	470,677	

[1] Includes Bolivia, Colombia, El Salvador, Guatemala, Honduras, Peru, Spain, United States, and Vanuatu This category is used to avoid revealing the operations of individual vessels or companies.

[1] Incluye Bolivia, Colombia, El Salvador, España, Estados Unidos, Guatemala, Honduras, Perú, y Vanuatú 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 2010 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 2009 por buques palangreros de más de 24 metros en eslora total.

Flag—Bandera	Quarter—Trimestre				Total
	1	2	3	4	
China	718	630	417	-	1,765
Japan—Japón	3,588	3,095	3,429	4,521	14,633
Republic of Korea—República de Corea*	1,318	1,867	2,107	3,835	9,127
Chinese Taipei—Taipei Chino	1,435	825	905	1,911	5,076
United States—Estados Unidos	-	-	-	-	-
Vanuatu	533	256	282	159	1,230
Total	7,592	6,673	7,140	10,426	31,831

* 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 2011 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 2011 por buques palangreros de más de 24 metros en eslora total.

Flag—Bandera	Month—Mes			Total
	1	2	3	
China	-	-	-	-
Japan—Japón	1,150	846	-	1,996
Republic of Korea—República de Corea*	1,108	967	-	2,075
Chinese Taipei—Taipei Chino	311	202	-	513
United States— Estados Unidos	-	-	-	-
Vanuatu	-	-	-	-

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

TABLE 6. Oceanographic and meteorological data for the Pacific Ocean, April 2010-March 2011. 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 2010-march 2011. 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)	26.1 (0.6)	24.5 (0.1)	22.8 (-0.2)	20.2 (-1.7)	19.3 (-1.5)	18.9 (-1.6)
Area 2 (5°N-5°S, 90°-150°W	28.7 (0.7)	27.1 (0.0)	25.9 (-0.5)	24.6 (-1.0)	23.9 (-1.1)	23.6 (-1.2)
Area 3 (5°N-5°S, 120°-170°W)	28.4 (0.7)	27.7 (0.0)	27.1 (-0.4)	26.1 (-0.9)	25.5 (-1.2)	25.1 (-1.6)
Area 4 (5°N-5°S, 150W°-160°E)	29.2 (0.8)	29.1 (0.4)	28.7 (0.1)	28.1 (-0.5)	27.5 (-1.0)	27.1 (-1.4)
Talara, Perú	18.2 (-1.8)	20.8 (1.5)	17.4 (-1.3)	16.9 (-0.8)	15.9 (-1.7)	15.1 (-2.8)
Callao, Perú	16.6 (-1.0)	17.0 (-0.2)	16.2 (-0.4)	15.0 (-1.2)	14.3 (-1.5)	14.2 (-1.2)
Thermocline depth—Profundidad de la termoclina, 0°, 80°W (m)	25	40	35	30	35	40
Thermocline depth—Profundidad de la termoclina, 0°, 110°W (m)	70	40	30	20	20	15
Thermocline depth—Profundidad de la termoclina, 0°, 150°W (m)	150	110	90	100	100	120
Thermocline depth—Profundidad de la termoclina, 0°, 180°W (m)	200	150	160	170	150	150
Sea level—Nivel del mar, Callao, Perú (cm)	112.4 (-2.1)	108.4 (-4.9)	101.2 (-10.5)	99.0 (-10.6)	94.6 (-12.7)	93.1 (-12.8)
SOI—IOS	1.2	0.9	0.4	1.8	1.8	2.2
SOI*—IOS*	2.93	6.13	5.58	8.65	0.54	2.74
NOI*—ION*	-1.75	3.50	2.77	-0.04	0.43	1.17

Month—Mes	**10**	**11**	**12**	**1**	**2**	**3**
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	19.1 (-1.9)	20.0 (-1.6)	21.4 (-1.5)	23.9 (-0.7)	26.0 (0.1)	26.2 (-0.4)
Area 2 (5°N-5°S, 90°-150°W	23.3 (-1.6)	23.4 (-1.6)	23.5 (-1.6)	24.2 (-1.4)	25.5 (-0.9)	26.4 (-0.8)
Area 3 (5°N-5°S, 120°-170°W)	25.0 (-1.6)	25.1 (-1.5)	24.9 (-1.5)	24.9 (-1.7)	25.4 (-1.3)	26.2 (-1.0)
Area 4 (5°N-5°S, 150W°-160°E)	27.1 (-1.4)	27.1 (-1.3)	26.9 (-1.4)	26.7 (-1.6)	26.9 (-1.2)	27.4 (-0.8)
Talara, Perú	15.8 (-2.1)	15.9 (-2.2)	15.6 (-3.1)	-	-	-
Callao, Perú	13.9 (-1.3)	13.7 (-2.0)	14.1 (-2.1)	-	-	-
Thermocline depth—Profundidad de la termoclina, 0°, 80°W (m)	40	40	35	30	20	10
Thermocline depth—Profundidad de la termoclina, 0°, 110°W (m)	25	15	10	25	50	75
Thermocline depth—Profundidad de la termoclina, 0°, 150°W (m)	115	120	125	120	160	140
Thermocline depth—Profundidad de la termoclina, 0°, 180°W (m)	185	160	170	190	200	200
Sea level—Nivel del mar, Callao, Perú (cm)	96.5 (-9.3)	95.4 (-11.8)	100.2 (-8.3)	-	-	-
SOI—IOS	1.7	1.3	2.9	2.3	2.7	2.5
SOI*—IOS*	3.98	4.12	6.03	3.85	2.00	3.50
NOI*—ION*	1.90	4.02	-2.89	5.23	4.64	0.89

TABLE 7. Preliminary data on the sampling coverage of trips by Class-6 vessels (vessels with fish-carrying capacities greater than 363 metric tons) by the IATTC program and the national programs of Colombia, Ecuador, the European Union, Mexico, Nicaragua, Panama, and Venezuela during the first quarter of 2011.

TABLA 7. 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 el programa de la CIAT y los programas nacionales de Colombia, Ecuador, México, Nicaragua, Panamá, el Unión Europea, y Venezuela durante el primero trimestre de 2011.

Flag	**Trips**	**Observed by program**			**Percent observed**
		IATTC	**National**	**Total**	
Bandera	**Viajes**	**Observado por programa**			**Porcentaje observado**
		CIAT	**Nacional**	**Total**	
Colombia	19	9	10	19	100.0
Ecuador	104	71	33[1]	104	100.0
España—Spain	6	2	4	6	100.0
Guatemala	5	5		5	100.0
Honduras	2	2		2	100.0
México	58	30	28	58	100.0
Nicaragua	7	5	2	7	100.0
Panamá	28	13	15	28	100.0
El Salvador	12	12		12	100.0
Venezuela	29	16	13	29	100.0
Vanuatu	5	5		5	100.0
Total[2]	275	170	105	275	100.0

[1] Includes one trip by a vessel that changed its registration from Panama to Ecuador during that trip. The observer on that trip was from the Programa Nacional de Observadores Panameños.

[1] Incluye un viaje por un buque que cambió su registración de Panamá a Ecuador durante el viaje. El observador en ese viaje era del Programa Nacional de Observadores Panameños.

[2] Includes 37 trips, 22 by vessels with observers from the IATTC program and 15 by vessels with observers from the national programs, that began in late 2010 and ended in 2011

[2] Incluye 37 viajes, 22 por buques con observadores del programa del CIAT y 15 por buques con observadores de los programas nacionales, iniciados a fines de 2010 y completados en 2011