INTER-AMERICAN TROPICAL TUNA COMMMISSION
COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL

QUARTERLY REPORT—INFORME TRIMESTRAL

January-March 2008—Enero-Marzo 2008

COMMISSIONERS—COMISIONADOS

COLOMBIA

COSTA RICA
Bernal Alberto Chavarría Valverde
Asdrubal Vásquez Nuñez
Carlos Villalobos Sole

ECUADOR
Jimmy Martínez Ortiz
Ramón Montaño Cruz
Guillermo Morán Velásquez
Luis Torres Navarrete

EL SALVADOR
Manuel Calvo Benivides
Manuel Ferín Oliva
Sonia Salaverría
José Emilio Suadi Hasbun

ESPAÑA—SPAIN
Rafael Centenera Ulecia
Fernando Curcio Ruigómez
Samuel J. Juárez Casado

FRANCE—FRANCIA
Patrick Brenner
Marie-Sophie Dufau-Richet
Delphine Leguerrier
Michel Sallenave

GUATEMALA
Fraterno Diaz Monge
Luis Alfonso Leal Monterroso

JAPAN—JAPÓN
Katsuma Hanafusa
Masahiro Ishikawa
Ryotaro Suzuki

MÉXICO
Mario Aguilar Sánchez
Miguel Angel Cisneros Mata
Ramón Corral Ávila
Michel Dreyfus León

NICARAGUA
Steadman Fagoth Müller
Manuel Pérez Moreno
Armando Segura Espinoza
Edward E. Weissman

PANAMÁ
María Patricia Díaz
Arnulfo Franco Rodríguez
Leika Martínez
George Novey

PERÚ
Gladys Cárdenas Quintana
Alfonso Miranda Eyzaguirre
Doris Sotomayor Yalan
Jorge Vértiz Calderón

REPUBLIC OF KOREA—REPÚBLICA DE COREA
In Cheol Rah
Jae-Hak Son
Kyu Jin Seok

USA—EE.UU.
Robert Fletcher
Rodney McInnis
Patrick Rose

VANUATU
Christophe Emelee
Roy Mickey Joy
Dmitri Malvirlani

VENEZUELA
Alvin Delgado
Gilberto Gimenez
Nancy Tablante

DIRECTOR

Dr. Guillermo A. Compeán

HEADQUARTERS AND MAIN LABORATORY—OFICINA Y LABORATORIO PRINCIPAL
8604 La Jolla Shores Drive
La Jolla, California 92037-1508, USA
www.iattc.org

The

QUARTERLY REPORT

January-March 2008

of the

INTER-AMERICAN TROPICAL TUNA COMMISSION

is an informal account, published in English and Spanish, 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

Enero-Marzo 2008

de la

COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL

es un relato informal, publicado en inglés y español, 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.

Editor—Redactor:
William H. Bayliff

INTRODUCTION

The Inter-American Tropical Tuna Commission (IATTC) operates under the authority and direction of a convention originally entered into by Costa Rica and the United States. The convention, which came into force in 1950, is open to adherence by other governments whose nationals fish for tropical tunas and tuna-like species in the eastern Pacific Ocean (EPO). Under this provision Panama adhered in 1953, Ecuador in 1961, Mexico in 1964, Canada in 1968, Japan in 1970, France and Nicaragua in 1973, Vanuatu in 1990, Venezuela in 1992, El Salvador in 1997, Guatemala in 2000, Peru in 2002, Spain in 2003, the Republic of Korea in 2005, and Colombia in 2007. Canada withdrew from the IATTC in 1984.

The IATTC's responsibilities are met with two programs, the Tuna-Billfish Program and the Tuna-Dolphin Program.

The principal responsibilities of the Tuna-Billfish Program specified in the IATTC's convention were (1) to study the biology of the tunas and related species of the eastern Pacific Ocean to estimate the effects that fishing and natural factors have on their abundance and (2) to recommend appropriate conservation measures so that the stocks of fish could be maintained at levels that would afford maximum sustainable catches. It was subsequently given the responsibility for collecting information on compliance with Commission resolutions.

The IATTC's responsibilities were broadened in 1976 to address the problems arising from the incidental mortality in purse seines of dolphins that associate with yellowfin tuna in the EPO. The Commission agreed that it "should strive to maintain a high level of tuna production and also to maintain [dolphin] stocks at or above levels that assure their survival in perpetuity, with every reasonable effort being made to avoid needless or careless killing of [dolphins]" (IATTC, 33rd meeting, minutes: page 9). The principal responsibilities of the IATTC's Tuna-Dolphin Program are (1) to monitor the abundance of dolphins and their mortality incidental to purse-seine fishing in the EPO, (2) to study the causes of mortality of dolphins during fishing operations and promote the use of fishing techniques and equipment that minimize these mortalities, (3) to study the effects of different modes of fishing on the various fish and other animals of the pelagic ecosystem, and (4) to provide a secretariat for the International Dolphin Conservation Program, described below.

On 17 June 1992, the Agreement for the Conservation of Dolphins ("the 1992 La Jolla Agreement"), which created the International Dolphin Conservation Program (IDCP), was adopted. The main objective of the Agreement was to reduce the mortality of dolphins in the purse-seine fishery without harming the tuna resources of the region and the fisheries that depend on them. This agreement introduced such novel and effective measures as Dolphin Mortality Limits (DMLs) for individual vessels and the International Review Panel to monitor the performance and compliance of the fishing fleet. On 21 May 1998, the Agreement on the International Dolphin Conservation Program (AIDCP), which built on and formalized the provisions of the 1992 La Jolla Agreement, was signed, and it entered into force on 15 February 1999. In 2007 the Parties to this agreement consisted of Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Peru, the United States, Vanuatu, and Venezuela, and Bolivia, Colombia, and the European Union were applying it provisionally. These were "committed to ensure the sustainability of tuna stocks in the eastern Pacific Ocean

and to progressively reduce the incidental mortalities of dolphins in the tuna fishery of the eastern Pacific Ocean to levels approaching zero; to avoid, reduce and minimize the incidental catch and the discard of juvenile tuna and the incidental catch of non-target species, taking into consideration the interrelationship among species in the ecosystem." This agreement established Stock Mortality Limits, which are similar to DMLs except that (1) they apply to all vessels combined, rather than to individual vessels, and (2) they apply to individual stocks of dolphins, rather than to all stocks of dolphins combined. The IATTC provides the Secretariat for the International Dolphin Conservation Program (IDCP) and its various working groups and panels and coordinates the On-Board Observer Program and the Tuna Tracking and Verification System (both described later in this report).

At its 70th meeting, on 24-27 June 2003, the Commission adopted the Resolution on the Adoption of the Convention for the Strengthening of the Inter-American Tropical Tuna Commission Established by the 1949 Convention between the United States of America and the Republic of Costa Rica ("the Antigua Convention"). This convention will replace the original one 15 months after it has been ratified or acceded to by seven signatories that were Parties to the 1949 Convention on the date that the Antigua Convention was open for signature. It has been ratified or acceded to by Mexico on 14 January 2005, El Salvador on 10 March 2005, the Republic of Korea on 13 December 2005, the European Union on 7 June 2006, Nicaragua on 13 December 2006, Belize on 12 June 2007, Panama on 10 July 2007, and France on 20 July 2007.

To carry out its responsibilities, the IATTC conducts a wide variety of investigations at sea, in ports where tunas are landed, and in its laboratories. The research is carried out by a permanent, internationally-recruited research and support staff appointed by the Director, who is directly responsible to the Commission.

The scientific program is now in its 58th year. The results of the IATTC staff's research are published in the IATTC's Bulletin and Stock Assessment Report series in English and Spanish, its two official languages, in its Special Report and Data Report series, and in books, outside scientific journals, and trade journals. Summaries of each year's activities are reported upon in the IATTC's Annual Reports and Fishery Status Reports, also in the two languages.

MEETINGS

IATTC meeting

The 77th meeting of the IATTC took place in La Jolla, California, USA, on 5-7 March 2008. The purpose of the meeting was to evaluate a proposal, put together by the IATTC staff, for the conservation of yellowfin and bigeye tuna in the eastern Pacific Ocean during 2008, 2009, and 2010. The proposal calls for (1) closure of the entire eastern Pacific Ocean to purse-seine fishing for tunas from 20 June through 11 September; (2) closure of an area bounded by 3°N and 5°S and by 94°W and 110°W to purse-seine fishing for tunas from 12 September through 31 December; (3) the following limits on the annual catches of bigeye by longline gear for four nations: China, 2,190 metric tons; Chinese Taipei, 6,601 metric tons; Japan, 28,283 metric tons; Republic of Korea, 10,438 metric tons; (4) limits on the annual catches of bigeye by longline gear for other nations to 83 percent of their bigeye catches during 2001 or 500 metric tons, whichever is greater. The minutes of this meeting are available on the IATTC web site.

Other meetings

Dr. Michael D. Scott chaired the annual meeting of the Pacific Scientific Review Group, a group that reviews and advises the U.S. National Marine Fisheries Service (NMFS) on research and management of populations of marine mammals in waters off the U.S west coast and Hawaii. The meeting, which was held in Monterey, California, USA, on 8-10 January 2008, was funded by the U.S. NMFS.

Dr. Michael G. Hinton participated in the eighth meeting of the Billfish Working Group of the International Scientific Committee of the Western and Central Pacific Fisheries Commission in Honolulu, Hawaii, USA, on 8-15 January 2008.

Dr. Mark N. Maunder participated in an organizational meeting of the AD Model Builder Foundation (described elsewhere in this report) at the National Center for Ecological Analysis and Synthesis in Santa Barbara, California, USA, on 23-24 January 2008, where he gave a presentation entitled "An Introduction to AD Model Builder." His expenses were paid by the grant from the Moore Foundation.

On 24 January 2008, Dr. Guillermo A. Compeán participated in a meeting in El Salvador sponsored by OSPESCA (Organización del Sector Pesquero y Acuícola del Istmo Centroamericano) entitled Reunión Preparatoria de la Agenda de Ministros: el Caso de las Medidas de Ordenación de Atún. He gave a talk entitled "Situación Actual de las Propuestas de Medidas de Conservación del Atún del Océano Pacífico Oriental" at that meeting.

A workshop entitled "Archival tag applications, capabilities, and techniques for implanting in large pelagics" was conducted at the Achotines Laboratory on 14-18 January 2008. The workshop was conducted by Kurt Schaefer, Dan Fuller, and Vernon Scholey of the IATTC staff and Padraic O'Flaherty of Lotek Wireless, St. Johns, Newfoundland, Canada. The workshop covered a broad range of topics, including current- and future-generation archival tags and their capabilities, methods for implanting archival tags, and data recovery, management, and analyses. During the workshop, archival tags were implanted into six captive yellowfin tuna, which were returned to Tank 2. The following people participated in the workshop: Francisco Abascal (Instituto Español de Oceanografía), Haritz Arrizabalaga (AZTI Tecnalia, Spain), Wei-Chuan Chiang (Fisheries Research Institute, Chinese Taipei), Carlos Guevara (Smithsonian Tropical Research Institute, Panama), and Simon Nicol (Secretariat of the Pacific Community, New Caledonia).

Dr. Guillermo A. Compeán participated in an *ad hoc* meeting of chairs of tuna RFMOs (Regional Fisheries Management Organizations) in San Francisco, California, USA, on 5-6 February 2008.

Drs. Guillermo A. Compeán and Martín A. Hall participated in a meeting of the Proyecto de Cooperación para la Reducción de Capturas Incidentales de Tortugas Marinas en Panamá in Panama, R.P., on 26-27 February 2008.

Dr. Mark N. Maunder and Mr. Alex Aires-da-Silva participated in an albacore stock assessment workshop convened by the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean in La Jolla, California, USA, on 28 February-6 March 2008. They collaborated with Dr. Paul Crone of the U.S. National Marine Fisheries Service on a

Stock Synthesis II assessment of North Pacific Albacore. Dr. Crone presented the results at the meeting. In addition, Dr. Maunder gave the following presentations:

Converting from a VPA [Virtual Population Analysis] to SS2 [Stock Synthesis II]: Things You Need to Know;

statVPA: Including Uncertainty in Catch-at-Age Data.

Mr. Brian S. Hallman represented the IATTC at the Seventh Round of Informal Consultations of States Party to the United Nations Fish Stocks Agreement, held in New York City. USA, on 11-12 March 2008. The participants reviewed the implementation of the Agreement to date, and discussed promotion of participation in the Agreement by countries not currently parties to it.

Mr. Ricardo Belmontes spent the period of 13-16 March 2008, in Panama, R.P., where he worked with Panamanian government officials on the arrangements for the IATTC and IDCP meetings that would take place there on 16-27 June 2008. In addition to the physical arrangements, he met with the Panamanian government authorities to discuss the main issues that will be on the agendas of the meetings.

Dr. Richard B. Deriso and Mr. Kurt M. Schaefer participated in a Steering Committee meeting for TOPP (Tagging of Pacific Pelagics) at the Hopkins Marine Station, Pacific Grove, California, USA, and the Monterey Bay Aquarium, Monterey, California, USA, on 27-28 March 2008. Mr. Schaefer gave a presentation at the meeting entitled "Vertical Movements and Habitat Utilization of Skipjack, Yellowfin, and Bigeye Tunas in the Equatorial Eastern Pacific Ocean, Ascertained through Archival Tag Data."

DATA COLLECTION

The IATTC had field offices at Las Playas and Manta, Ecuador; Manzanillo and Mazatlan, Mexico; Panama, Republic of Panama; Mayaguez, Puerto Rico, USA; and Cumaná, Venezuela, during the first quarter of 2008.

Personnel at these offices collected 323 length-frequency samples from 209 wells and abstracted logbook information for 263 trips of commercial fishing vessels during the first quarter of 2008.

Also during the first quarter members of the field office staffs placed IATTC observers on 147 fishing trips by vessels that participate in the AIDCP On-Board Observer Program. In addition, 124 IATTC observers completed trips during the quarter, and were debriefed by field office personnel.

Surface fleet and surface catch statistics

Statistical data are continuously being collected by personnel at the IATTC's field offices and processed at its headquarters in La Jolla. As a result, estimates of fisheries statistics with varying degrees of accuracy and precision are available, the most accurate and precise being those made after all available information has been entered into the data base, processed, and verified. The estimates for the current quarter are the most preliminary, while those made six months to a year after monitoring of the fishery are much more accurate and precise. 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.

Fleet statistics

The estimated total carrying capacity of the purse-seine and pole-and-line vessels that are fishing, or are expected to fish, in the eastern Pacific Ocean (east of 150°W; EPO) during 2008 is about 227,000 cubic meters (m^3) (Table 1). The weekly average at-sea capacity for the fleet, for the weekly periods ending January 1 through March 30, was about 138,000 m^3. The changes of flags and vessel names and additions to and deletions from the IATTC's fleet list during that period are given in Table 2.

Catch statistics

Catch statistics for the first quarter of 2008

The estimated total retained catches of tunas in the EPO during the report period, in metric tons, were:

Species	2008	2003-2007			Weekly average, 2008
		Average	Minimum	Maximum	
Yellowfin	54,200	80,600	52,600	112,600	4,200
Skipjack	93,100	60,800	50,400	79,600	7,200
Bigeye	15,500	9,900	5,600	14,100	1,200

Summaries of the preliminary estimated retained catches, by flag of vessel, are shown in Table 3.

Catch statistics for 2007

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 1978-2007 are shown in Table 4. 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 13 October 14 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 2007, as in 2004 to 2006, 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. 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 program, described in the IATTC Annual Report for 2000 and in IATTC Stock Assessment Report 4, of yellowfin, skipjack, and bigeye in the EPO during 2007, the 1992-2006 annual averages for yellowfin and skipjack, and the 1994-2006 annual average for bigeye are as follows:

Species	2007	Average	Minimum	Maximum
			1992-2006	
Yellowfin	169,846	271,115	167,016	413,457
Skipjack	210,896	172,428	73,367	297,843
			1994-2006	
Bigeye	61,434	60,761	34,900	94,640

The 2007 catch of yellowfin was about 101 thousand metric tons (t) (37 percent) less than the average for 1992-2006. The 2007 skipjack catch was about 38 thousand t (22 percent) greater than the average for 1992-2006. The 2007 bigeye catch was about 1 thousand t (1 percent) greater than the average for 1994-2006.

The average annual distributions of the logged retained purse-seine catches of yellowfin, skipjack, and bigeye, by set type, in the EPO during the 1997-2006 period are shown in Figures 1a, 2a, and 3a, and the preliminary estimates for 2007 are shown in Figures 1b, 2b, and 3b. In comparison to 1997-2006, the catch of yellowfin in 2007, as in 2006, was significantly less than the average of the earlier period. The yellowfin catches from dolphin sets in the Northern areas off Mexico and Central America have been significantly lower during the past several years. The yellowfin catch off South America in 2007 was also less than the average of 1997-2006. The skipjack catch in 2007 was less than the average of 1997-2006. Significant catches of skipjack were made throughout the year from about 5°N to 15°S, with large catches recorded in the nearshore areas off South America. As had been the case during the 2004-2006 period, the catches of skipjack in the inshore areas off Mexico were greater, possibly due to changes in fishing strategy due to poor yellowfin fishing. The bigeye catch in 2007 was less than that of 2006, but greater than the average of 1997-2006. Bigeye are not often caught north of about 7°N. The catches of bigeye have decreased in the inshore areas off South America for many 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 from schools associated with 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 19 thousand t in 2007 (Table 4), which is considerably greater than the 1992-2006 annual average retained catch of about 3 thousand t (range: 500 t to 9 thousand t). The increase was due mainly to increased catches of bonito by

Mexican vessels (Table 5).

Preliminary estimates of the retained catches in the EPO in 2007, by flag, and the landings of EPO-caught fish, by country, are given in Table 5. The landings are fish unloaded during a calendar year, regardless of the year of catch. The country of landing is that in which the fish were unloaded from the fishing vessel or, in the case of transshipments, the country that received the transshipped fish.

Preliminary estimates of the most significant (equal to or greater than about 5 percent of the total) retained catches and landings, of all species combined, during 2007 were as follows:

Flag	Retained catches		Landings	
	Metric tons	Percentage	Metric tons	Percentage
Colombia	-	-	53,000	11
Ecuador	152,600	33	229,200	49
Mexico	108,700	23	102,300	22
Panama	61,200	13	-	-
Venezuela	46,600	10	-	-

It is important to note that when final information is available the landings currently assigned to the various countries may change due to exports from storage facilities to processors in other nations.

Catch statistics for the longline fishery

The catches of bigeye by longline gear in the EPO during 2007 and the first quarter of 2008 are shown in Tables 6a and 6b, respectively. Equivalent data are not available for the other species of tunas, or for billfishes.

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 for various purposes, including the integrated modeling that the staff has employed during the last several years. The results of such studies have been described in several IATTC Bulletins, in its Annual Reports for 1954-2002, and in its Stock Assessment Reports.

Length-frequency 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. Sampling has continued to the present.

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 quarter of 2002-2007 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 2007, and the second shows the combined data for the fourth quarter of each year of the 2002-2007 period. Samples from 163 wells were taken during the fourth quarter of 2007. No samples were taken from the negligible catches of yellowfin and skipjack taken by pole-and-line vessels during the fourth quarter. The estimates of the size distributions of these catches were obtained by using length-frequency data from fish caught in unassociated schools by purse seiners.

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 163 wells sampled, 130 contained yellowfin. The estimated size compositions of these fish during the fourth quarter of 2007 are shown in Figure 5a. Substantial amounts of yellowfin were caught in sets on fish associated with dolphins, sets on fish associated with floating objects, and sets on unassociated schools during the fourth quarter. Most of the yellowfin taken in floating-object sets were about 40 to 60 cm in length. Small amounts of smaller yellowfin were also captured in the Northern and Southern unassociated fishing areas and in the Inshore dolphin fishing area. Larger fish (>100 cm) were taken in the unassociated fishery in the South, and in the dolphin fisheries in the Northern and Inshore areas.

The estimated size compositions of the yellowfin caught by all fisheries combined during the fourth quarter of 2002-2007 are shown in Figure 5b. The average weights of the yellowfin caught during the fourth quarter of 2007 were slightly less than those of 2006, but considerably less than those of the fish caught during the 2002 to 2005 period. A mode of yellowfin between 40 and 50 cm in length appeared during the fourth quarter. This mode has been present during the fourth quarter of every year since 2000.

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 163 wells sampled, 129 contained skipjack. The estimated size compositions of these fish during the fourth quarter of 2007 are shown in Figure 6a. The catches of skipjack continued to be good in the floating-object fishery in the Equatorial region, and in the Southern unassociated area. Smaller amounts of skipjack were caught in the Northern, Inshore, and Southern floating-object fisheries, and in the Northern unassociated fishery. Small amounts of skipjack were taken in the dolphin fisheries.

The estimated size compositions of the skipjack caught by all fisheries combined during the fourth quarter of 2002-2007 are shown in Figure 6b. The majority of the skipjack caught during the fourth quarter ranged between about 40 and 50 cm. The average weight of the fish caught during 2007 was less than those of the fish caught during 2002-2006 period, and considerably less than those of 2003 and 2006.

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 163 wells sampled, 42 contained bigeye. The estimated size compositions of these fish during the fourth

quarter of 2007 are shown in Figure 7a. During the fourth quarter the bigeye catches were high in the Northern and Southern floating-object fisheries, and much less in the Equatorial floating-object fishery. Negligible amounts of bigeye were caught in the Inshore floating-object fishery and in unassociated sets. No catches of bigeye in dolphin sets or by pole-and-line vessels during the fourth quarter were recorded.

The estimated size compositions of the bigeye caught by all fisheries combined during the fourth quarter of 2002-2007 are shown in Figure 7b. The average weight of bigeye caught during the fourth quarter of 2007 was considerably less than those of the 2003 to 2006 period, but greater than those of 2002.

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 2008 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 243 fishing trips aboard purse seiners covered by that program during the first quarter of 2008. Preliminary coverage data for these vessels during the quarter are shown in Table 7. In addition to those trips, the Program has also been placing observers aboard a vessel of less than 364 metric tons carrying capacity during 2008, as required by AIDCP Resolution A-02-01, which was adopted at the

eighth meeting of the Parties to the AIDCP on 10 October 2002. Three fishing trips were begun by that vessel during the quarter, and an observer accompanied it on each trip.

Training

One IATTC observer training course was conducted during the quarter. It was held in Manta, Ecuador, on 11-28 February 2008, for 28 trainees, 18 of whom were Ecuadorian nationals and 10 of whom were Panamanian nationals.

RESEARCH

Tuna tagging

During the period of 19 to 28 January 2008, 11 yellowfin tuna were tagged and released with Lotek LTD 2310 geolocating archival tags off the IATTC Achotines Laboratory, Panama, in the vicinity of the Islas Los Frailes. The fish ranged in length from 54 to 72 cm, with an average of 65.4 cm. The purpose of this project is to expand the geographical distribution of deployments of archival tags in yellowfin tuna in the eastern Pacific Ocean (EPO). Deployments of archival tags on yellowfin by the IATTC staff since 2002 have taken place mostly off Baja California, Mexico, but also in the equatorial EPO west of Ecuador in 2006, near the Islas Los Frailes in 2007, and in the Revillagigedo Islands Marine Reserve in 2006, 2007, and 2008.

During the period of 10 to 27 February 2008, yellowfin and wahoo were tagged and released aboard the 28-m San Diego-based long-range sport-fishing vessel *Royal Star,* within the Revillagigedo Islands Marine Reserve, Mexico. The yellowfin were tagged with conventional dart tags, archival tags, or intramuscular tags, and the wahoo with dart or intramuscular tags. (Intramuscular tags are applied, with tagging poles, in the water, which reduces the stress to the fish, but makes it infeasible to measure them. They were used on nearly all of the wahoo.) This project, a collaborative effort between the IATTC, the Instituto Nacional de la Pesca of Mexico, and the owners of the *Royal Star*, provides a unique opportunity to conduct a scientific evaluation of the movements and behavior of yellowfin tuna and wahoo within the Reserve and in areas to which the fish might move, through no-retention tag-and-release fishing trips. The numbers of fish tagged and released were as follows:

Species	Number	Tag type
Yellowfin	419	dart
Yellowfin	48	intramuscular
Yellowfin	44	archival
Wahoo	127	dart (few) and intramuscular

Of the 467 yellowfin with dart or intramuscular tags, 373 weighed less than 100 pounds (<45 kg), 83 weighed between 100 and 200 pounds (45-91 kg), 9 weighed between 200 and 300 pounds (91-136 kg), and 2 weighed more than 300 pounds (>136 kg). The fish with archival tags ranged in length from 50 to 153 cm; 10 were released at Isla San Benedicto, 10 at Roca Partida, and 24 at Isla Clarión. The wahoo were mostly 20 to 40 pounds (9 to 18 kg) in weight.

AD Model Builder Foundation

Drs. Mark N. Maunder, John R. Sibert (professor at the University of Hawaii), and Anders Nielsen (post-doctoral student at the University of Hawaii), founders of the AD Model Builder Foundation, are Principal Investigators of a $986,664 grant obtained from the Gordon and Betty Moore Foundation. The grant will be used for the development and promotion of the AD Model Builder software created by Dr. David Fournier of Otter Research Ltd., Sidney, British Columbia, Canada. The project is carried out in collaboration with the U.S. National Center for Ecological Analysis and Synthesis and the U.S. National Marine Fisheries Service.

Early life history studies

Yellowfin broodstock

The yellowfin broodstock in Tank 1 (1,362,000 L) at the Achotines Laboratory spawned daily during the quarter except on 6, 11, 18, and 21 February and 29-31 March. Spawning occurred between 8:15 p.m. and 10:05 p.m. The numbers of eggs collected after each spawning event ranged from about 5,000 to 885,000. The water temperatures in the tank during the quarter ranged from 24.9° to 27.4°C.

At the end of March there were six 57- to 61-kg and six 29- to 38-kg yellowfin tuna in Tank 1.

From January 2003 through July 2005 archival tags had been implanted in yellowfin tuna (IATTC Quarterly Reports for January-March 2003, April-June 2004, October-December 2004, and July-September 2005), and at the end of March 2008 one fish from those groups remained in Tank 1. In late January 2007 10 yellowfin (4 to 10 kg) held in the 170,000-L reserve broodstock tank (Tank 2) were implanted with prototype archival tags and transferred to Tank 1. At the end of this quarter, five of the January 2007 group, bearing archival tags, remained in Tank 1.

Tank 2 held 14 yellowfin at the end of March, 5 of which had archival tags implanted in them. Tank 6 held 12 yellowfin at the end of the month. Most of the fish held in Tanks 2 and 6 will be transferred to Tank 1 in April to serve as additional broodstock.

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.

Studies of snappers

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

Two separate broodstocks of snappers are being kept in two 85,000-L tanks. The first consists of 15 individuals from the original broodstock caught in 1996. They spawned only twice this quarter, during March.

The second group consists of 25 individuals from a group bred at the Laboratory from eggs obtained from spawning in 1998. They did not spawn during this quarter.

Visitors at the Achotines Laboratory

Dr. Brian Wysor, Assistant Professor of Biology, Department of Biology and Marine Biology, Roger Williams University (RWU), Bristol, Rhode Island, USA, visited the Achotines Laboratory on 11-13 January 2008. Dr. Wysor is studying the marine flora of the Pacific and Atlantic coasts of Panama. He is interested in establishing field research sites and in possible use of the Achotines Laboratory for RWU field courses. Dr. Wysor was accompanied by RWU colleagues Drs. David Taylor and D. Wilson Freshwater, and graduate student Ms. Jessie Alden.

On 15 January 2008, Mr. Luis Tejada participated in the "Annual Presentation of Advances in Projects of Investigation" of the Secretaría Nacional de Ciencia y Tecnología de Panamá (SENACYT). Mr. Tejada presented progress reports on the algal project and the sailfish-wahoo project (see the IATTC Quarterly Report for January-March 2007) being carried out at the Achotines Laboratory with funding from SENACYT.

Mr. Vernon P. Scholey participated in the joint Environmental Leadership and Training Initiative (ELTI) and Native Species Reforestation Project (PRORENA) symposium "Conservando Biodiversidad a través de los Mercados de Carbono: Ciencia, Políticas y Mecanismos Prácticos" held at the Smithsonian Tropical Research Institute Tupper Conference Center in Panama, R.P., on 18 January 2008.

Mr. George Novey, Deputy Director of the Autoridad de Recursos Acuáticos de Panamá (ARAP), visited the Achotines Laboratory on 29 January 2008. He was accompanied by Dr. Daniel Benetti of the University of Miami, Miami, Florida, USA, and Messrs. Johann Scheidt and James Reilly of AquaSense Panama Ltd. The purpose of the visit was to discuss the possibility of ARAP providing eggs from the broodstock snappers that it maintains at the Achotines Laboratory to AquaSense for use in a trial mariculture project.

On 30 January 2008, Mr. Jim Parsons and Ms. Jackie Zimmerman of Troutlodge, Sumner, Washington, USA, visited the Achotines Laboratory to tour the facilities as a prelude to Ms. Zimmerman's participation in the annual IATTC-University of Miami workshop on rearing of pelagic fishes.

A group from the ARAP Integrated Coastal Management and Natural Resource Management division stayed at the Achotines Laboratory on 30-31 January 2008. Mr. Edwin Medina, Ms. Diana Arauz, and Mr. Elias Lopez were spending most of the week in the Azuero Peninsula area visiting fishermen and coastal residents who will be within the Marine Special Use Zone (ZUEM) to be established by ARAP in the southern Azuero region.

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 students then took a course on "Dry Tropical Forest Ecology," taught by Dr. Stephanie Bohlman of the Tropical Research Center, Smithsonian Institution. The 22-person group arrived on 15 February and departed on 23 February 2008.

Dr. Julio Vázquez Castro, Dean at the Faculty of Ocean Science at the Universidad Católica del Norte in Coquimbo, Chile, visited the Achotines Laboratory on 27 February 2008.

Acting as an evaluator for SENACYT, the objective of his visit was to assess progress on the two SENACYT-funded projects (described in the IATTC Quarterly Report for January-March 2007) being carried out at the Achotines Laboratory.

A delegation of four persons from the Overseas Fishery Cooperation Foundation (OFCF), Tokyo, Japan, visited the Achotines Laboratory on 28 February 2008. The delegation consisted of Messrs. Yasuhiro Horinouchi and Masayuki Waku of the OFCF headquarters in Tokyo, Dr. Takahisa Mitsuhashi, an OFCF turtle expert stationed in Panama, and their interpreter, Ms. Kumiko Cho.

Dr. Nancy Hechinger of the Interactive Telecommunications Program of New York University (NYU), USA, and 11 of her graduate students spent the period of 18-21 March 2008 at the Achotines Laboratory. During their stay they gathered information from the surrounding area for future programs in Panama. Focusing on the Azuero Peninsula, in partnership with the Azuero Foundation, they will be exploring and creating programs to foster improved information and education in the area of sustainable technologies for resource management. It is expected that four or five students will return in July or August to begin the initial programs that are now being developed at NYU.

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.

During January 2007 there was a narrow strip of warm water extending along the equator from the Galapagos Islands to about 130°W and an area of cool water off Mexico at about 20°N-125°W. In February the former was replaced by a narrow strip of cool water extending from about 120°W to about 135°W. The latter persisted in February. An area of warm water appeared off northern Chile at about 25°S-80°W during that month. In March a narrow band of cool water extended along the equator from the coast to about 110°W (IATTC Quarterly Report for January-March 2007: Figure 8). This band of cool water persisted during April, May, and

June, and it extended southward along the coast of South America, reaching 40°S in June. Small scattered areas of warm and cool water appeared offshore, particularly in May and June (IATTC Quarterly Report for April-June 2007: Figure 8). In July there was a narrow strip of cool water extending westward along the equator from the coast to about 135°W and southward along the coast of South America to about 50°S and a small area of cool water centered at about 20°N-135°W. In August the strip of cool water became wider, and the small area of cool water moved northwestward to about 40°N-140°W. In September the strip of cool water was not quite as wide as it had been in August, but it extended westward to about 160°W (IATTC Quarterly Report for July-September: Figure 5). The area of cool water along the equator and off the coast of northern South American persisted throughout the fourth quarter (IATTC Quarterly Report for October-December 2007: Figure 6). Also, a small area of cool water appeared off Baja California in October, and persisted throughout the fourth quarter. There were some areas of warm water west of 170°W and south of 15°S during October and November, but these had disappeared by December. An area of warm water that appeared north and northwest of the Hawaiian Islands during November 2007, and persisted throughout the first quarter of 2008. Another area of warm water appeared south of 20°S between about 90° and 140°W in January 2008. Warm water appeared off South America south of 20°S and also between about 150° and 170°W south of 20°S in February. In March, another area of warm water appeared off northern South America between about 10°N and 10°S, and the area of warm water south of 20°S west of about 140°W increased in size. Meanwhile, the area of cool water that had extended along the equator from the coast of South America to as far west as 180° during most of 2007 began to dissipate. However, the small area of cool water that was noted off Baja California in December expanded westward in January, connecting with the area of cool water along the equator, and that connection persisted in February and March (Figure 8). The data in Table 8 indicate that somewhat weaker anti-El Niño conditions were in effect during the first quarter. Only two SSTs, those for Area 1 during February and March, were above normal. The NOI* value for March, 8.12, is the greatest value on record, followed by values of 8.06 for January 2007 and 7.61 for February 1953. (The series of data for NOI* extends from January 1948 through March 2008.) Despite the appearance of warm water off South America during February and March, it is stated in the Climate Diagnostics Bulletin of the U.S. National Weather Service for March 2008 that, "based on current atmospheric and oceanic conditions and recent trends, [anti-El Niño conditions are] expected to continue for the next 3 months."

GEAR PROGRAM

During the first quarter an IATTC staff member participated in one dolphin safety-gear inspection and safety-panel alignment procedure aboard a Mexican-flag purse seiner.

COLLECTION OF AT-SEA AND SUPPLEMENTAL RETAINED CATCH DATA FOR SMALL PURSE SEINERS

The U.S. National Oceanic and Atmospheric Administration has awarded the IATTC a contract to place observers, on a voluntary basis, on sufficient numbers of trips of "Class-5" purse seiners (vessels with carrying capacities of 273-363 metric tons) based in ports on the Pacific Coast of Latin America to obtain data on "catch, bycatch, interaction with protected species, and gear" for 1,000 days at sea per year and to "sample 100 percent of the in-port unloadings of Class 4-5 purse seine vessels [vessels with well capacities of 182-363 metric

tons].” If that is not possible, observers can be placed on sufficient numbers of trips of Class-3 and/or -4 vessels (vessels with well capacities of 92-272 metric tons) to bring the total numbers of days at sea observed to 1,000.

No observers were placed on vessels during the first quarter of 2008. The numbers of trips completed and the numbers of samples taken were as follows:

Month	Trips completed	Samples taken	Fish sampled		
			Yellowfin	Skipjack	Bigeye
January	24	23	5,695	1,149	-
February	24	21	4,962	1,100	153
March	30	24	9,106	1,400	200
Total	78	68	19,763	3,649	353

PUBLICATION

Watters, George M., Robert J. Olson, John C. Field, and Timothy E. Essington. 2008. Range expansion of the Humboldt squid was not caused by tuna fishing. Proc. Nat. Acad. Sci. USA, 105 (3): E5.

(This is a letter to the editor of the Proceedings of the National Academy of Sciences of the United States offering a rebuttal to a paper [Zeidberg, Louis D., and Bruce H. Robison. 2007. Invasive range expansion by the Humboldt squid, *Dosidicus gigas*, in the eastern North Pacific. Proc. Nat. Acad. Sci. USA, 104 (31): 12948-12950] in which the authors attributed the range expansion of Humboldt squid to a trophic cascade caused by “recent drastic depletions” of tuna caused by overfishing.)

ADMINISTRATION

Mr. Erick Largacha was transferred from the IATTC’s La Jolla office to its field office in Manta, Ecuador, in early January. He was placed in charge of the Manta office on 1 February 2008.

After having been on maternity leave since 7 November 2007, Ms. Mónica Galván returned to full-time work at the La Jolla office on 25 February 2008.

Mr. Ricardo Belmontes, who has a degree in economics from the Universidad Autónoma Metropolitana of Mexico, began employment with the IATTC on 3 March 2008. Mr. Belmontes, who will assist Mr. Brian S. Hallman with fisheries policy matters, has considerable experience in that field, having participated as a Mexican delegate at IATTC and AIDCP meetings during the last 12 years. His last previous position was Director de Asuntos Pesqueros Internacionales for the Comisión Nacional de Acuacultura y Pesca of Mexico.

Mr. Alejandro Pérez Rodríguez, who began work as a “Fisheries Information Systems Specialist” in January 2007, returned to his native country of Spain on 25 March 2008. He will continue to work for the IATTC while in Spain.

Dr. Liming Song of Shanghai Fisheries University, Peoples Republic of China,

completed a 5-month stay at the IATTC headquarters in La Jolla on 21 March 2008. He was working with Drs. Michael G. Hinton and Mark N. Maunder on standardization models for longline catch rates, utilizing some of the detailed observations of gear and environment made in the Indian Ocean by Dr. Song's research group. Drs. Hinton and Maunder will continue to work with him on that project.

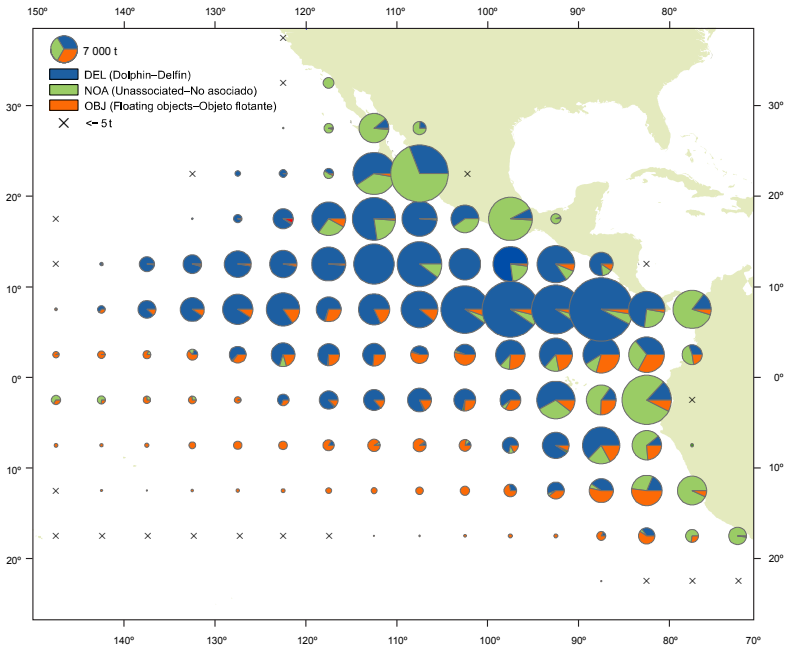

FIGURE 1a. Average annual distributions of the purse-seine catches of yellowfin, by set type, 1997-2006. The sizes of the circles are proportional to the amounts of yellowfin caught in those 5° by 5° areas.
FIGURA 1a. Distribución media anual de las capturas cerqueras de aleta amarilla, por tipo de lance, 1997-2006. El tamaño de cada círculo es proporcional a la cantidad de aleta amarilla capturado en la cuadrícula de 5° x 5° correspondiente.

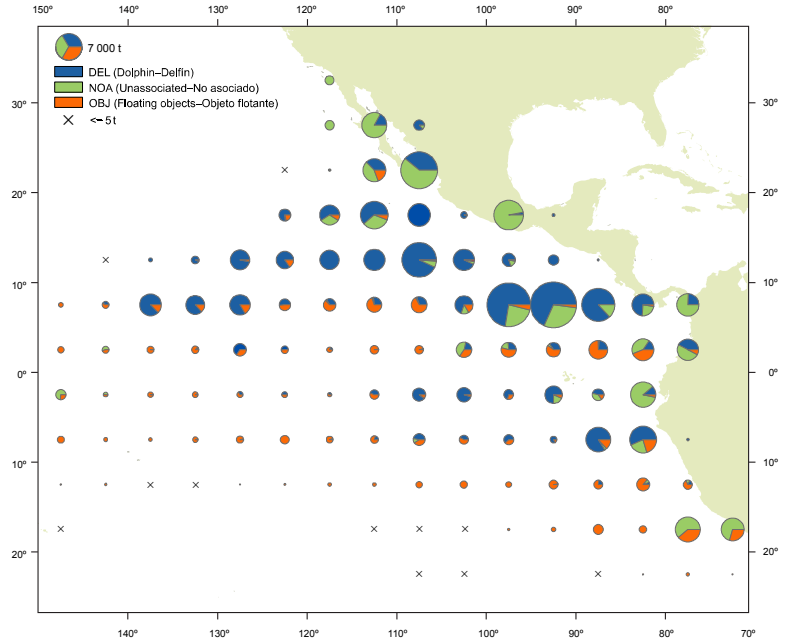

FIGURE 1b. Average annual distributions of the purse-seine catches of yellowfin, by set type, 2007. The sizes of the circles are proportional to the amounts of yellowfin caught in those 5° by 5° areas.
FIGURA 1b. Distribución media anual de las capturas cerqueras de aleta amarilla, por tipo de lance, 2007. El tamaño de cada círculo es proporcional a la cantidad de aleta amarilla capturado en la cuadrícula de 5° x 5° correspondiente.

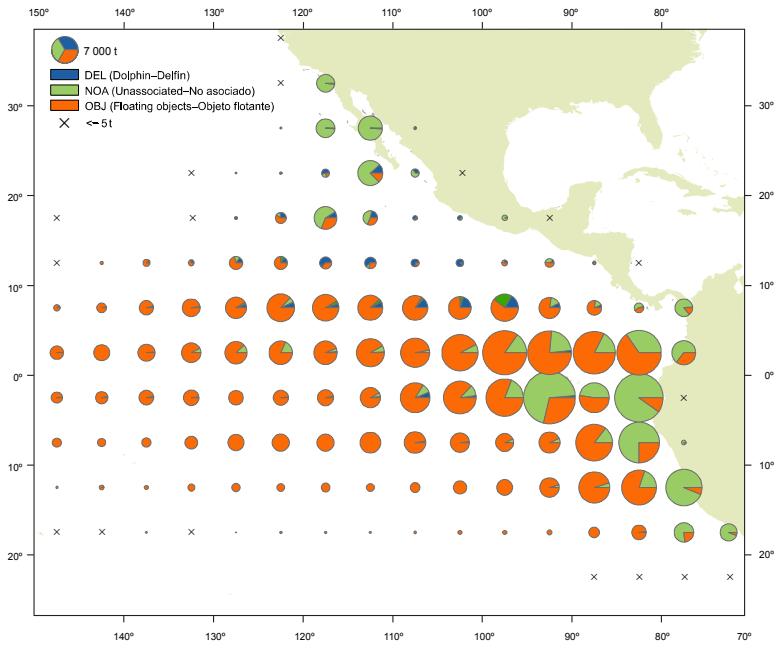

FIGURE 2a. Average annual distributions of the purse-seine catches of skipjack, by set type, 1997-2006. The sizes of the circles are proportional to the amounts of skipjack caught in those 5° by 5° areas.
FIGURA 2a. Distribución media anual de las capturas cerqueras de barrilete, por tipo de lance, 1997-2006. El tamaño de cada círculo es proporcional a la cantidad de barrilete capturado en la cuadrícula de 5° x 5° correspondiente.

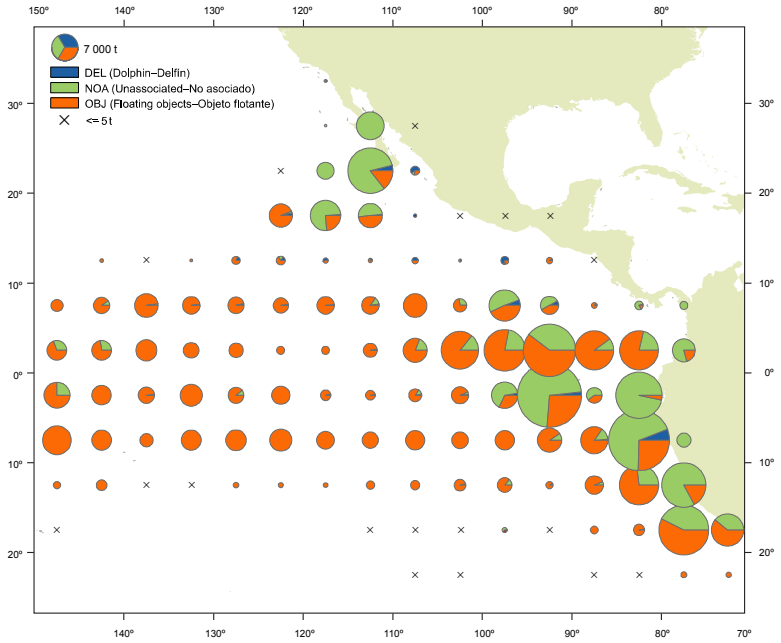

FIGURE 2b. Average annual distributions of the purse-seine catches of skipjack, by set type, 2007. The sizes of the circles are proportional to the amounts of skipjack caught in those 5° by 5° areas.
FIGURA 2b. Distribución media anual de las capturas cerqueras de barrilete, por tipo de lance, 2007. El tamaño de cada círculo es proporcional a la cantidad de barrilete capturado en la cuadrícula de 5° x 5° correspondiente.

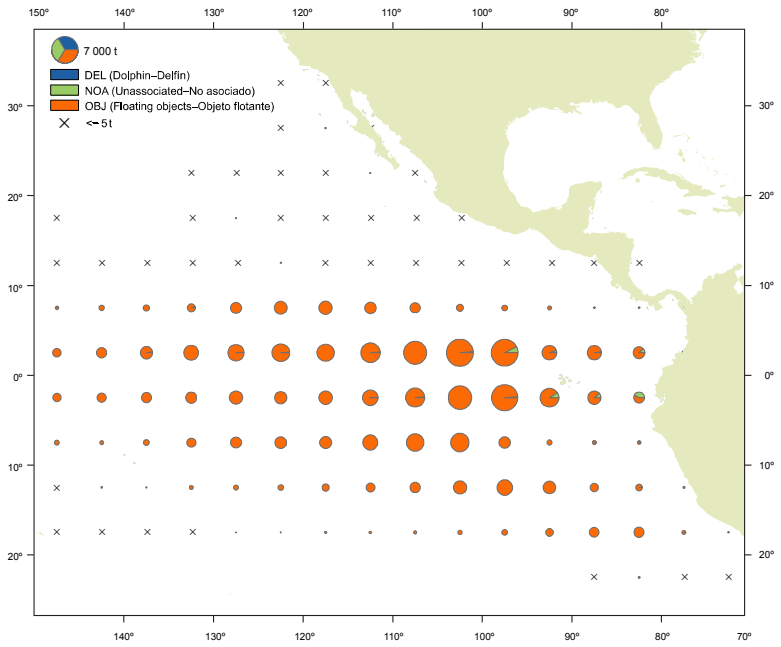

FIGURE 3a. Average annual distributions of the purse-seine catches of bigeye, by set type, 1997-2006. The sizes of the circles are proportional to the amounts of bigeye caught in those 5° by 5° areas.
FIGURA 3a. Distribución media anual de las capturas cerqueras de patudo, por tipo de lance, 1997-2006. El tamaño de cada círculo es proporcional a la cantidad de patudo capturado en la cuadrícula de 5° x 5° correspondiente.

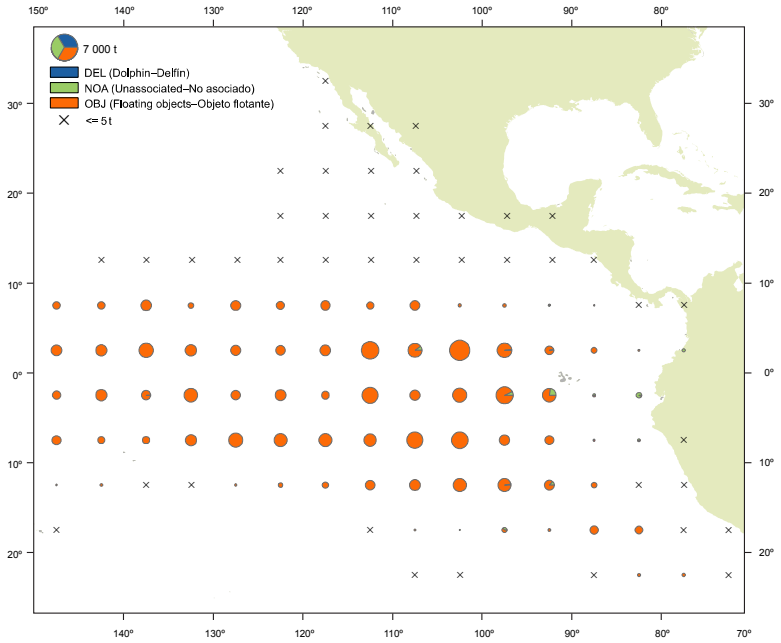

FIGURE 3b. Average annual distributions of the purse-seine catches of bigeye, by set type, 2007. The sizes of the circles are proportional to the amounts of bigeye caught in those 5° by 5° areas.
FIGURA 3b. Distribución media anual de las capturas cerqueras de patudo, por tipo de lance, 2007. El tamaño de cada círculo es proporcional a la cantidad de patudo capturado en la cuadrícula de 5° x 5° correspondiente.

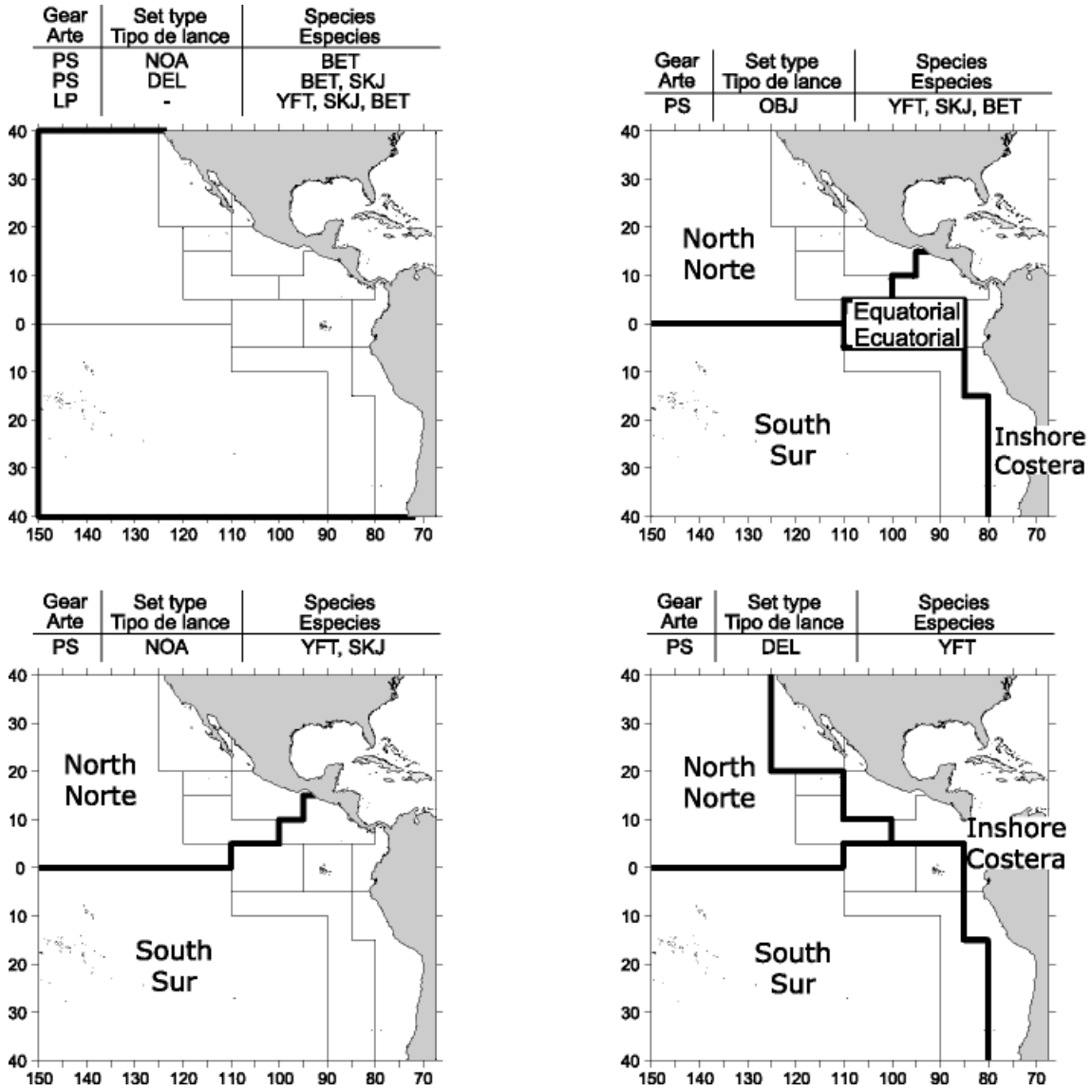

FIGURE 4. Spatial extents of the fisheries defined by the IATTC staff for stock assessment of yellowfin, skipjack, and bigeye in the EPO. The thin lines indicate the boundaries of the 13 length-frequency sampling areas, and the bold lines the boundaries of the fisheries. Gear: PS = purse seine, LP = 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, patudo, y aleta azul 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 = no asociado, DEL = delfín; OBJ = objeto flotante; Especies: YFT = aleta amarilla, SKJ = barrilete, BET = patudo.

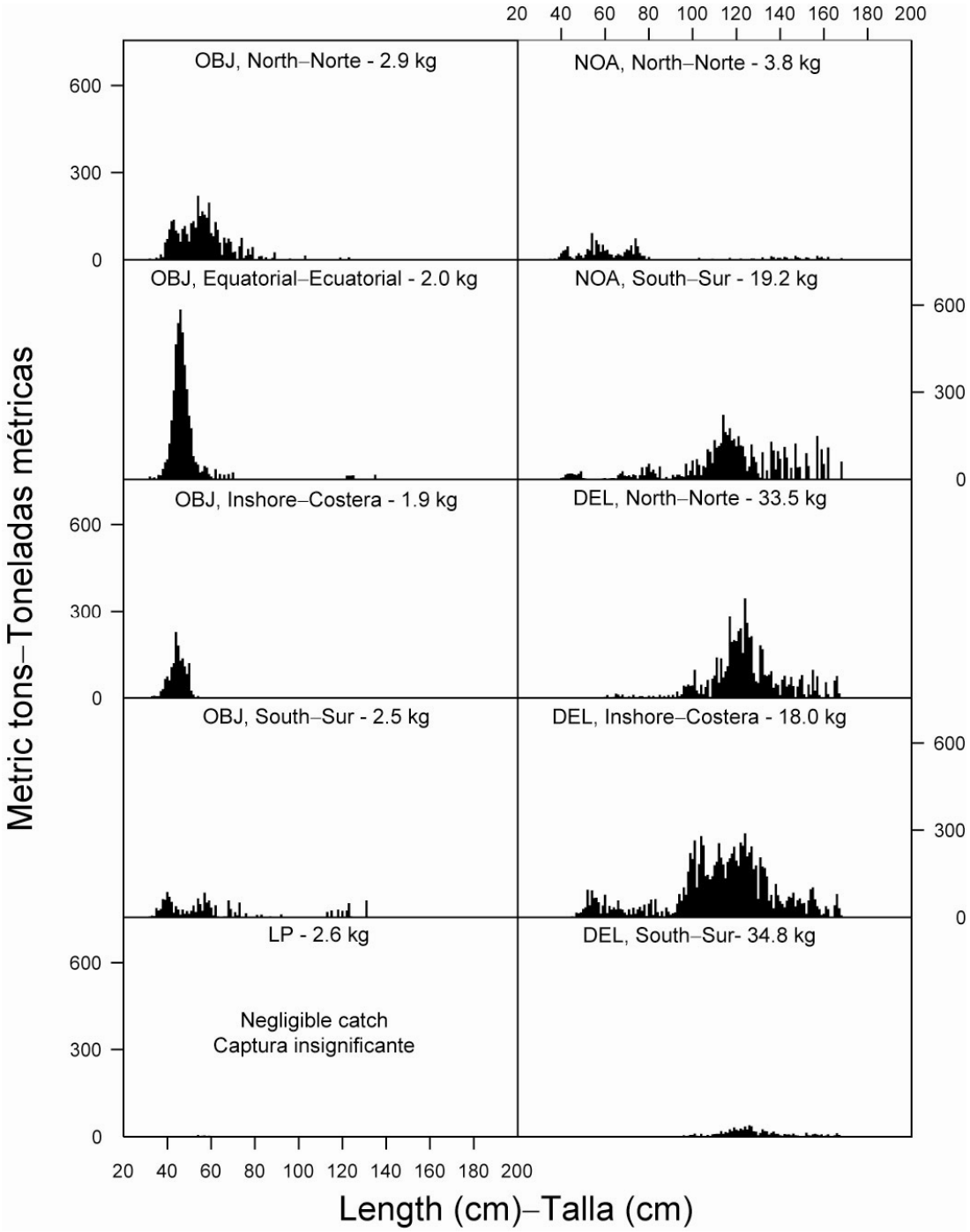

FIGURE 5a. Estimated size compositions of the yellowfin caught in each fishery of the EPO during the fourth quarter of 2007. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin.

FIGURA 5a. Composición por tallas estimada para el aleta amarilla capturado en cada pesquería del OPO durante el cuarto trimestre de 2007. En cada recuadro se detalla el peso promedio de los peces en las muestras. OBJ = objeto flotante; LP = caña; NOA = unassociated; DEL = delfín.

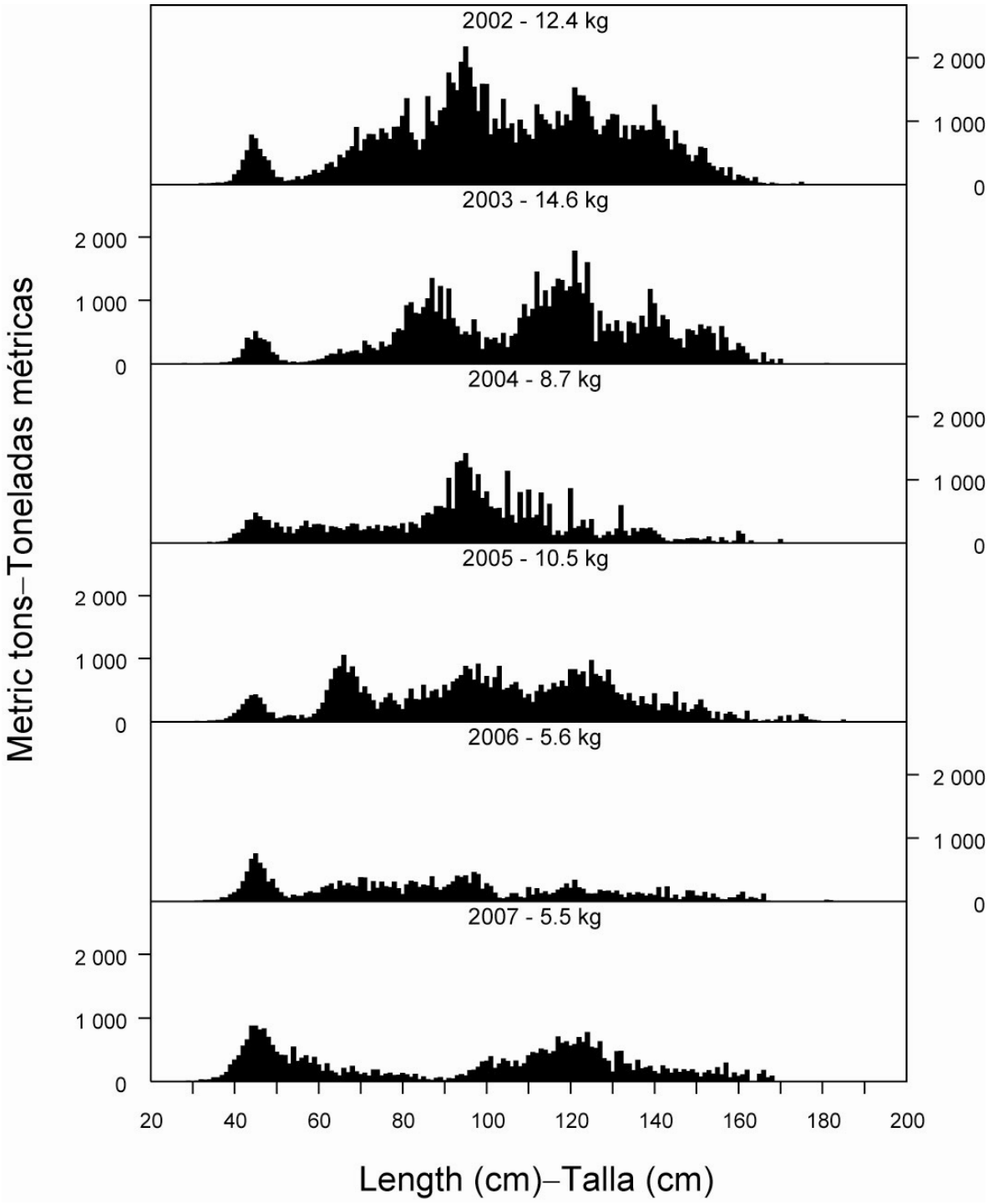

FIGURE 5b. Estimated size compositions of the yellowfin caught in the EPO during the fourth quarter of 2002-2007. The average weights of the fish in the samples are given at the tops of the panels.

FIGURA 5b. Composición por tallas estimada para el aleta amarilla capturado en el OPO en el cuarto trimestre de 2002-2007. En cada recuadro se detalla el peso promedio de los peces en las muestras.

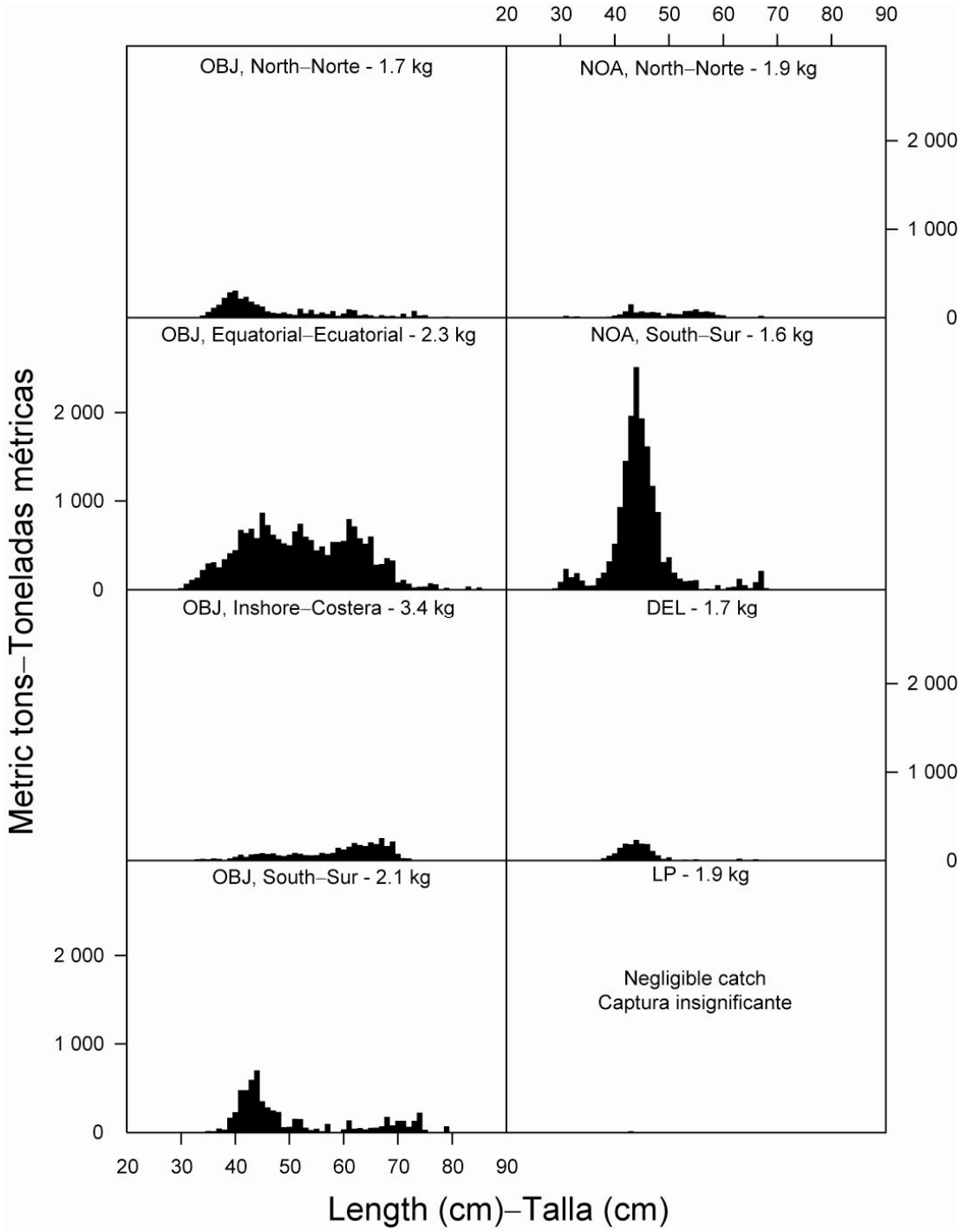

FIGURE 6a. Estimated size compositions of the skipjack caught in each fishery of the EPO during the fourth quarter of 2007. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin.

FIGURA 6a. Composición por tallas estimada para el barrilete capturado en cada pesquería del OPO durante el cuarto trimestre de 2007. En cada recuadro se detalla el peso promedio de los peces en las muestras. OBJ = objeto flotante; LP = caña; NOA = unassociated; DEL = delfín.

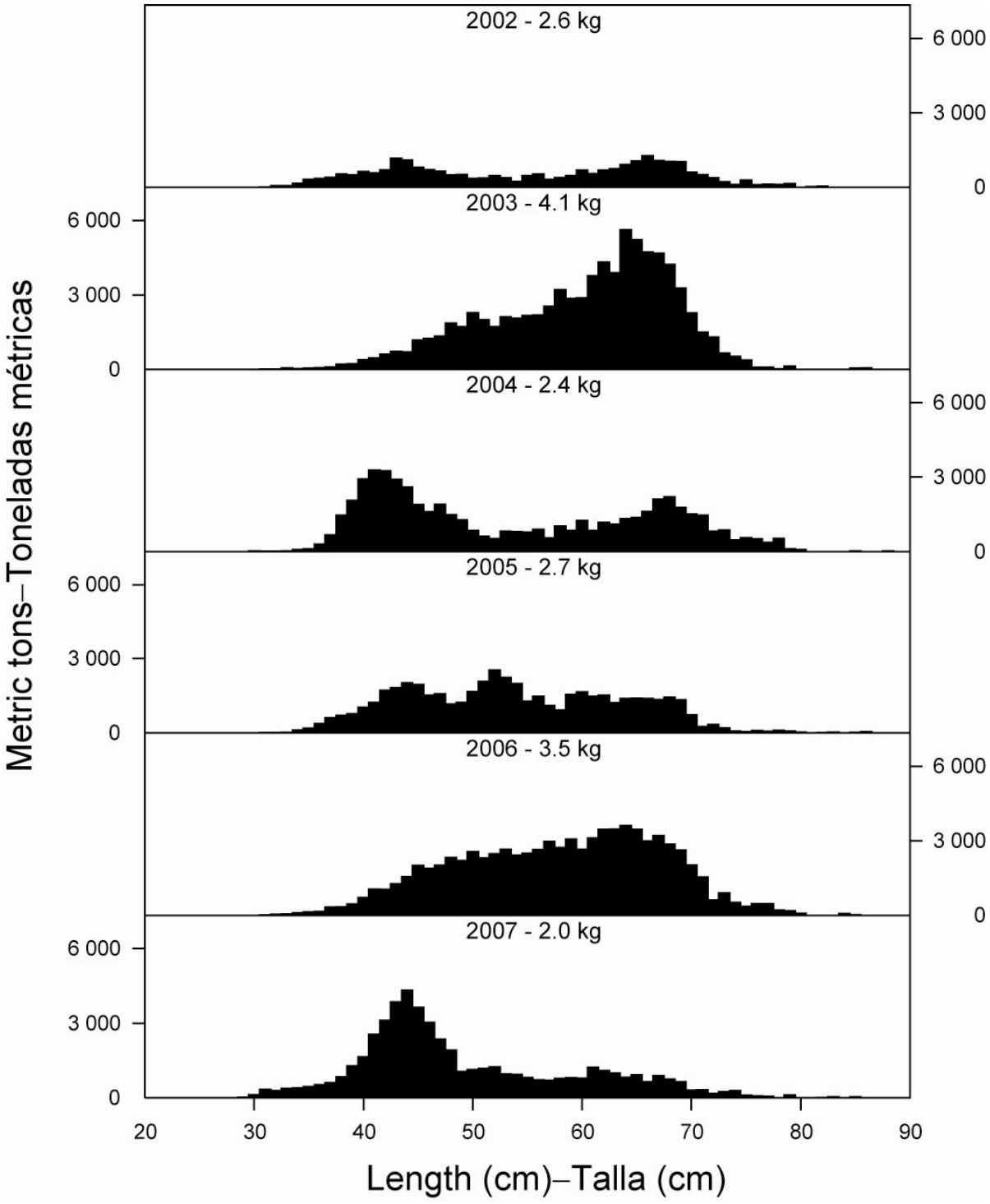

FIGURE 6b. Estimated size compositions of the skipjack caught in the EPO during the fourth quarter of 2002-2007. The average weights of the fish in the samples are given at the tops of the panels.

FIGURA 6b. Composición por tallas estimada para el barrilete capturado en el OPO en el cuarto trimestre de 2002-2007. En cada recuadro se detalla el peso promedio de los peces en las muestras.

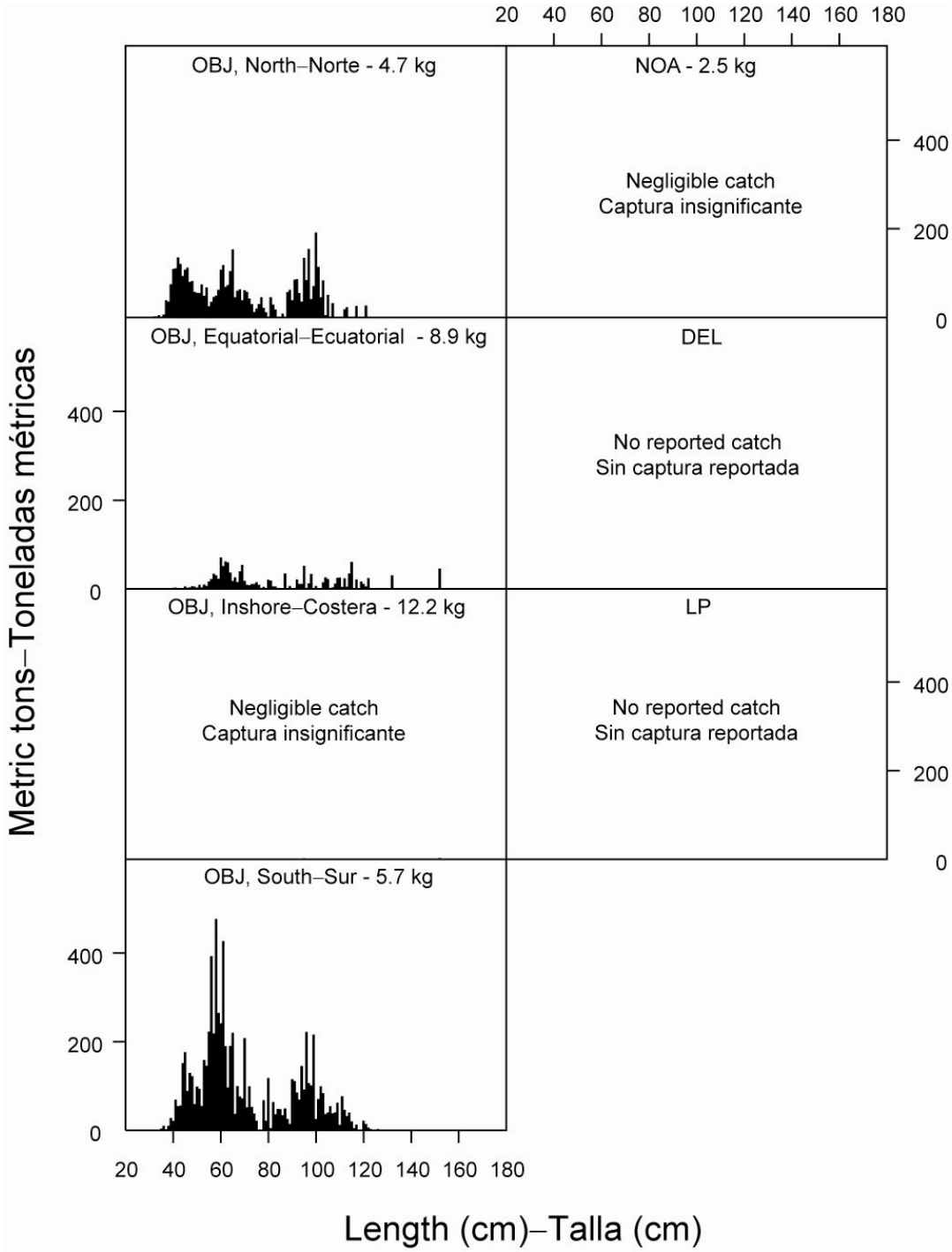

FIGURE 7a. Estimated size compositions of the bigeye caught in each fishery of the EPO during the fourth quarter of 2007. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin.

FIGURA 7a. Composición por tallas estimada para el patudo capturado en cada pesquería del OPO durante el cuarto trimestre de 2007. En cada recuadro se detalla el peso promedio de los peces en las muestras. OBJ = objeto flotante; LP = caña; NOA = unassociated; DEL = delfín.

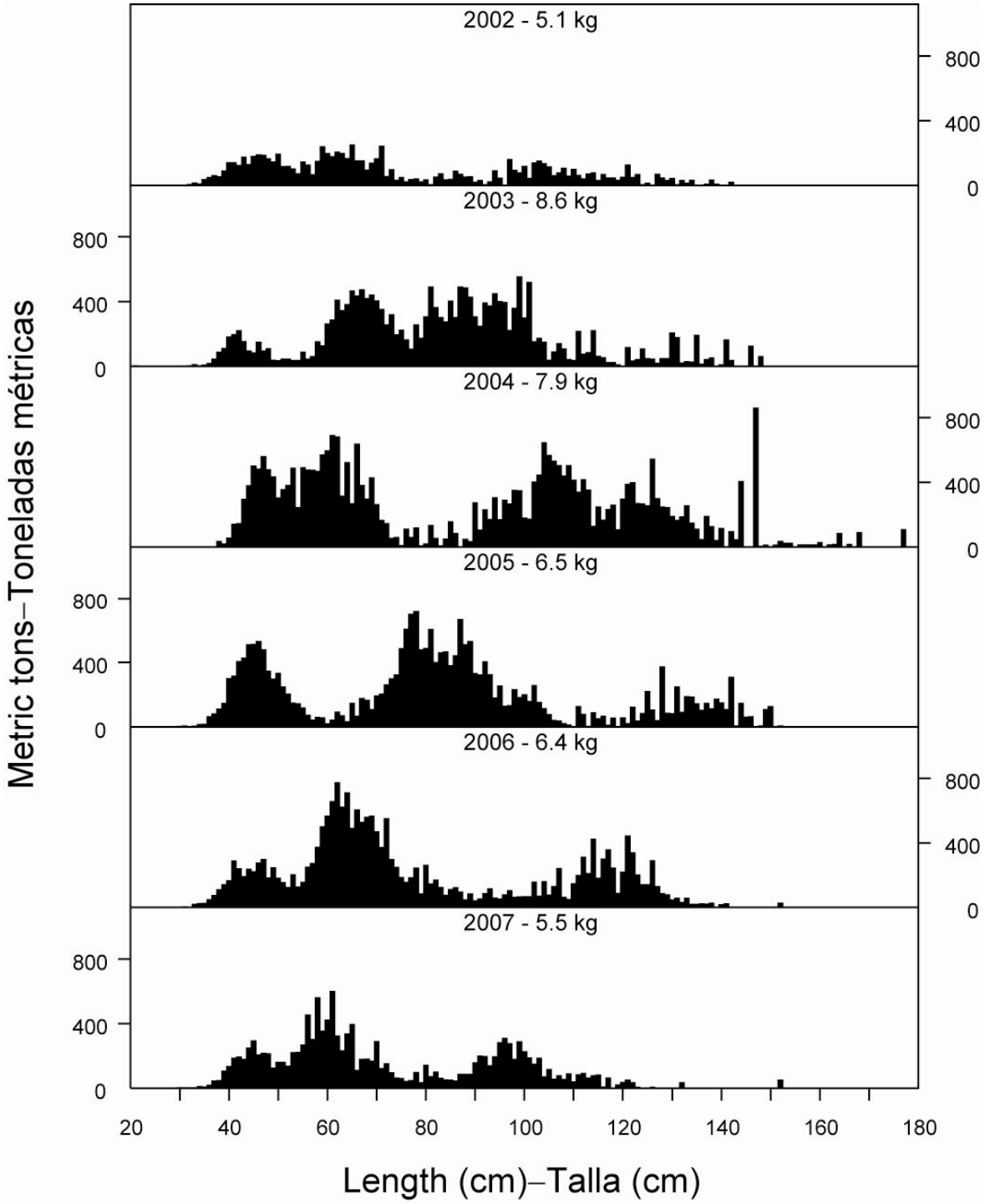

FIGURE 7b. Estimated size compositions of the bigeye caught in the EPO during the fourth quarter of 2002-2007. The average weights of the fish in the samples are given at the tops of the panels.

FIGURA 7b. Composición por tallas estimada para el patudo capturado en el OPO en el cuarto trimestre de 2002-2007. En cada recuadro se detalla el peso promedio de los peces en las muestras.

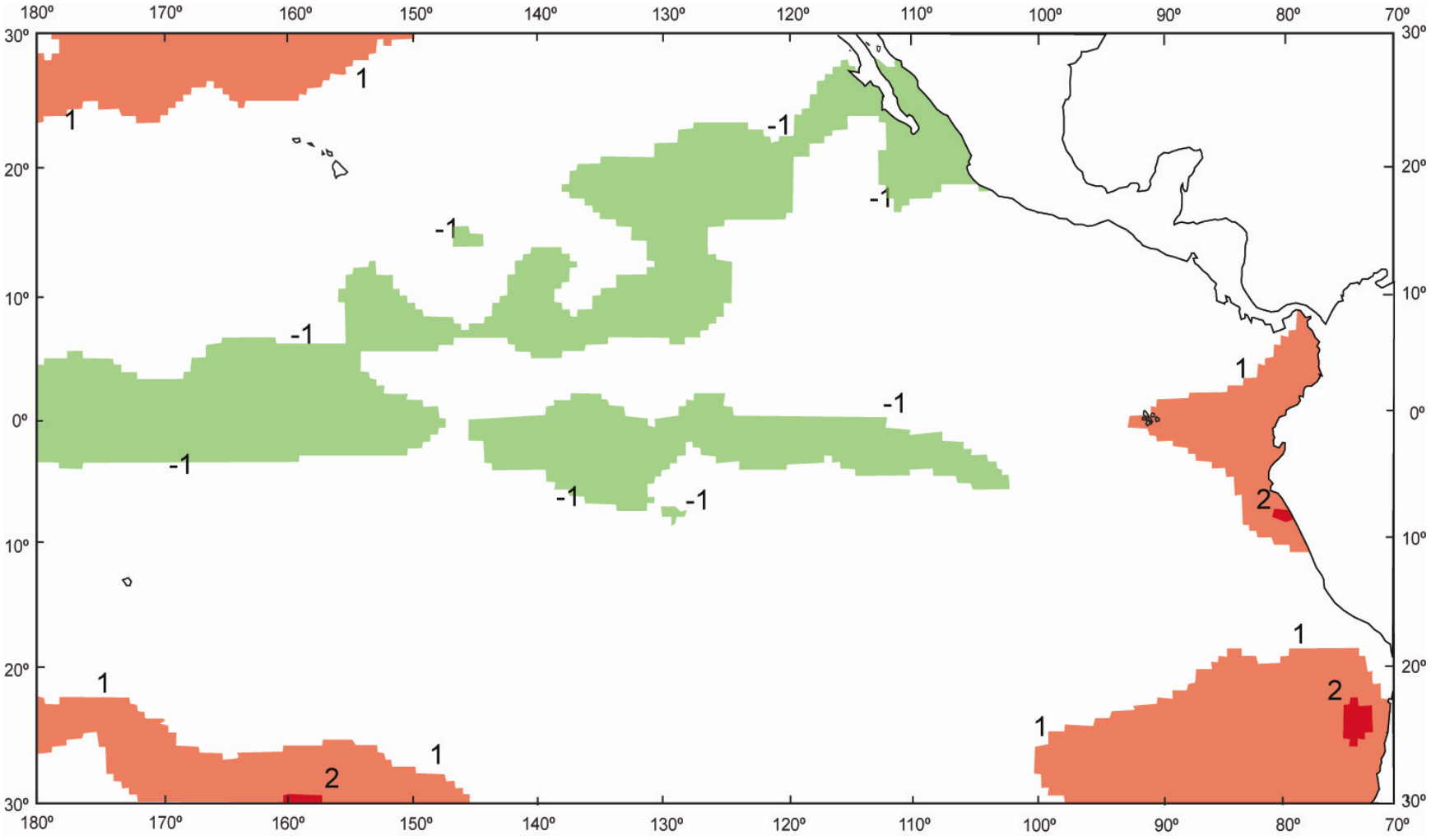

FIGURE 8. Sea-surface temperature (SST) anomalies (departures from long-term normals) for March 2008, based on data from fishing boats and other types of commercial vessels.
FIGURA 8. Anomalías (variaciones de los niveles normales a largo plazo) de la temperatura superficial del mar (TSM) en marzo de 2008, basadas en datos tomados por barcos pesqueros y otros buques comerciales.

TABLE 1. Preliminary estimates of the numbers and capacities, in cubic meters, of purse seiners and pole-and-line vessels operating in the EPO in 2008 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 preliminares del número de buques cerqueros y cañeros que pescan en el OPO en 2008, y de la capacidad de acarreo de los mismos, en metros cúbicos, por bandera, arte de pesca, y volumen de bodega. Se incluye cada buque en los totales de cada bandera bajo la cual pescó durante el año, pero solamente una vez en el total de la flota; por consiguiente, los totales de las flotas no son siempre iguales a las sumas de las banderas individuales. PS = cerquero; LP = cañero.

Flag Bandera	Gear Arte	Well volume–Volumen de bodega				Capacity Capacidad
		1-900	901-1700	>1700	Total	
			Number—Número			
Bolivia	PS	1	-	-	1	222
Colombia	PS	4	10	-	14	14,689
Ecuador	PS	57	15	9	81	59,132
España—Spain	PS	-	-	3	3	6,955
Guatemala	PS	-	1	-	1	1,475
Honduras	PS	2	1	-	3	1,700
México	PS	22	33	1	56	55,994
	LP	4	-	-	4	380
Nicaragua	PS	-	5	-	5	6,023
Panamá	PS	5	18	5	28	36,834
Perú	PS	1	-	-	1	542
El Salvador	PS	-	1	3	4	7,415
USA—EE.UU.	PS	1	-	-	1	170
Venezuela	PS	-	20	2	22	30,629
Vanuatu	PS	1	2	-	3	3,609
Unknown— Desconocida	PS	1	1	-	2	1,520
All flags— Todas banderas	PS	94	107	23	224	
	LP	4	-	-	4	
	PS + LP	98	107	23	228	
			Capacity—Capacidad			
All flags— Todas banderas	PS	41,037	136,887	48,735	226,659	
	LP	380	-	-	380	
	PS + LP	41,417	136,887	48,735	227,039	

TABLE 2. Changes in the IATTC fleet list recorded during the first quarter of 2008. PS = purse seine.
TABLA 2. Cambios en la flota observada por la CIAT registrados durante el primer trimestre de 2008. PS = cerquero.

Vessel name	Flag	Gear	Capacity (m^3)	Remarks	
Nombre del buque	**Bandera**	**Arte**	**Capacidad (m^3)**	**Comentarios**	
Vessels added to the fleet—Buques añadidos a la flota					
Re-entries—Reingresos					
				Now—Ahora	
Mazpesca 2	México	PS	1,181		
Aleta Azul	Venezuela	PS	1,298		
Taurus I	Venezuela	PS	1,380		
Changes of name or flag—Cambios de nombre o pabellon					
				Now—Ahora	
Mary Lynn	Colombia	PS	250		Ecuador
San Mateo	Ecuador	PS	1,033	*Reina Del Mar*	
Amalia Cristina	México	PS	1,311		Unknown—Desconocida
Atlantis IV	Nicaragua	PS	1,274	*Atlantis IV F*	
Acarigua F	Venezuela	PS	1,407	*Sea King F*	Panamá
Cuyuni	Vanuatu	PS	1,446	*Amalia*	
Vessels removed from fleet—Buques retirados de la flota					
Don Luis	Ecuador	PS	180	Sunk–Hundido	
Intrepido	Ecuador	PS	85	Sunk–Hundido	
Mazpesca	México	PS	493		
Cape Cod	USA—EE.UU.	PS	1,525		
Cape Finisterre	USA—EE.UU.	PS	1,593		
Raffaello	USA—EE.UU.	PS	1,084		

TABLE 3. Preliminary estimates of the retained catches of tunas in the EPO from 1 January through 30 March 2008, by species and vessel flag, in metric tons.
TABLA 3. Estimaciones preliminares de las capturas retenidas de atunes en el OPO del 1 de enero al 30 de abril 2008, 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	5,404	46,740	10,443	-	-	-	-	-	62,587	38.1
México	21,457	7,266	524	-	-	-	1,233	10	30,490	18.6
Panamá	9,856	10,356	2,496	-	-	-	-	-	22,708	13.8
Venezuela	5,170	12,539	254	-	8	-	-	-	17,971	11.0
Other—Otros[2]	12,313	16,199	1,812	-	-	-	-	-	30,324	18.5
Total	54,200	93,100	15,529	-	8	-	1,233	10	164,080	

[1] Includes other tunas, sharks, and miscellaneous fishes
[1] Incluye otros túnidos, tiburones, y peces diversos
[2] Includes Colombia, El Salvador, Guatemala, Honduras, Nicaragua, Peru, 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, Perú, y Vanuatú; se usa esta categoría para no revelar información sobre faenas de buques o empresas individuales.

TABLE 4. 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 2005-2007 are preliminary. Discard data were first collected by observers in 1993.

TABLA 4. 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 2005-2007 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
1978	162,687	-	162,687	178,341	-	178,341	18,539	-	18,539	5,393	-	5,393
1979	175,438	-	175,438	140,040	-	140,040	12,097	-	12,097	6,107	-	6,107
1980	144,522	-	144,522	136,138	-	136,138	21,939	-	21,939	2,909	-	2,909
1981	169,712	-	169,712	125,071	-	125,071	14,922	-	14,922	1,086	-	1,086
1982	116,292	-	116,292	104,258	-	104,258	6,981	-	6,981	3,145	-	3,145
1983	87,935	-	87,935	61,238	-	61,238	4,614	-	4,614	836	-	836
1984	138,776	-	138,776	62,743	-	62,743	8,862	-	8,862	839	-	839
1985	212,529	-	212,529	51,775	-	51,775	6,058	-	6,058	3,996	-	3,996
1986	263,049	-	263,049	67,556	-	67,556	2,685	-	2,685	5,040	-	5,040
1987	267,114	-	267,114	66,252	-	66,252	1,177	-	1,177	980	-	980
1988	281,016	-	281,016	91,438	-	91,438	1,540	-	1,540	1,380	-	1,380
1989	282,140	-	282,140	97,876	-	97,876	2,031	-	2,031	1,107	-	1,107
1990	265,926	-	265,926	75,194	-	75,194	5,920	-	5,920	1,491	-	1,491
1991	234,113	-	234,113	63,946	-	63,946	4,901	-	4,901	419	-	419
1992	231,910	-	231,910	86,239	-	86,239	7,179	-	7,179	1,928	-	1,928
1993	224,444	4,722	229,166	87,601	10,588	98,189	9,657	645	10,302	580	-	580
1994	212,034	4,691	216,725	73,367	10,472	83,839	34,900	2,261	37,161	969	-	969
1995	216,702	5,275	221,977	132,298	16,378	148,676	45,319	3,251	48,570	630	-	630
1996	242,367	6,314	248,681	106,531	24,837	131,368	61,312	5,689	67,001	8,223	-	8,223
1997	249,296	5,516	254,812	156,716	31,558	188,274	64,270	5,482	69,752	2,610	3	2,613
1998	259,043	4,718	263,761	142,315	22,856	165,171	44,128	2,853	46,981	1,772	-	1,772
1999	283,703	6,638	290,341	263,608	26,851	290,459	51,158	5,176	56,334	2,558	54	2,612
2000	257,662	6,796	264,458	204,538	26,415	230,953	94,640	5,649	100,289	3,773	-	3,773
2001	386,618	7,808	394,426	144,009	13,233	157,242	61,156	1,294	62,450	1,156	3	1,159
2002	413,457	4,019	417,476	153,919	12,625	166,544	57,440	937	58,377	1,761	6	1,767
2003	381,577	5,338	386,915	275,167	23,302	298,469	54,174	2,260	56,434	3,236	-	3,236
2004	271,481	2,967	274,448	199,192	17,555	216,747	67,592	1,588	69,180	8,880	19	8,899
2005	269,421	3,186	272,607	263,079	19,488	282,567	69,826	1,973	71,799	4,744	15	4,759
2006	167,016	1,522	168,538	297,843	12,696	310,539	83,978	1,886	85,864	9,806	-	9,806
2007	169,846	2,363	172,209	210,896	8,896	219,792	61,434	1,215	62,649	4,245	-	4,245

TABLE 4. (continued)
TABLA 4. (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
1978	1,734	-	1,734	4,836	-	4,836	2,170	-	2,170	809	-	809	374,509	-	374,509
1979	327	-	327	1,805	-	1,805	1,366	-	1,366	1,249	-	1,249	338,429	-	338,429
1980	601	-	601	6,125	-	6,125	3,681	-	3,681	1,108	-	1,108	317,023	-	317,023
1981	707	-	707	5,718	-	5,718	1,910	-	1,910	1,008	-	1,008	320,134	-	320,134
1982	553	-	553	2,121	-	2,121	1,338	-	1,338	783	-	783	235,471	-	235,471
1983	456	-	456	3,829	-	3,829	1,222	-	1,222	1,711	-	1,711	161,841	-	161,841
1984	5,351	-	5,351	3,514	-	3,514	663	-	663	986	-	986	221,734	-	221,734
1985	919	-	919	3,604	-	3,604	289	-	289	536	-	536	279,706	-	279,706
1986	133	-	133	490	-	490	568	-	568	1,143	-	1,143	340,664	-	340,664
1987	321	-	321	3,315	-	3,315	571	-	571	1,628	-	1,628	341,358	-	341,358
1988	288	-	288	9,550	-	9,550	956	-	956	1,295	-	1,295	387,463	-	387,463
1989	22	-	22	12,094	-	12,094	803	-	803	1,007	-	1,007	397,080	-	397,080
1990	209	-	209	13,856	-	13,856	787	-	787	930	-	930	364,313	-	364,313
1991	834	-	834	1,289	-	1,289	421	-	421	647	-	647	306,570	-	306,570
1992	255	-	255	978	-	978	104	-	104	763	-	763	329,356	-	329,356
1993	1	-	1	600	12	612	104	4,116	4,220	315	5,684	5,999	323,302	25,767	349,069
1994	85	-	85	8,692	147	8,839	188	834	1,022	419	4,951	5,370	330,654	23,356	354,010
1995	465	-	465	8,010	55	8,065	202	1,448	1,650	153	5,403	5,556	403,779	31,810	435,589
1996	83	-	83	655	1	656	704	2,304	3,008	219	5,655	5,874	420,094	44,800	464,894
1997	60	-	60	1,105	4	1,109	101	2,512	2,613	148	9,161	9,309	474,306	54,236	528,542
1998	123	-	123	1,337	4	1,341	529	1,876	2,405	158	6,857	7,015	449,405	39,164	488,569
1999	274	-	274	1,720	-	1,720	171	3,424	3,595	226	7,714	7,940	603,418	49,857	653,275
2000	157	-	157	636	-	636	294	1,877	2,171	360	5,439	5,799	562,060	46,176	608,236
2001	160	-	160	17	-	17	2,258	1,253	3,511	354	6,369	6,723	595,728	29,960	625,688
2002	412	-	412	-	-	-	1,467	2,207	3,674	621	5,892	6,513	629,077	25,686	654,763
2003	93	-	93	1	-	1	439	1,606	2,045	104	4,764	4,868	714,791	37,270	752,061
2004	231	-	231	16	35	51	883	392	1,275	381	4,731	5,112	548,656	27,287	575,943
2005	68	-	68	313	18	331	1,472	2,490	3,962	561	4,784	5,345	609,484	31,954	641,438
2006	131	-	131	3,519	84	3,603	1,999	1,759	3,758	881	5,891	6,772	565,173	23,838	589,011
2007	40	-	40	15,787	687	16,474	2,067	1,434	3,501	1,680	4,679	6,359	465,995	19,274	485,269

TABLE 5. Preliminary estimates of the retained catches and landings, in metric tons, of tunas and bonitos caught by purse-seine and pole-and-line in the EPO in 2007 by species and vessel flag (upper panel) and locations where processed (lower panel). The purse-seine and pole-and-line data for yellowfin, skipjack, and bigeye tunas have been adjusted to the species composition estimates and are preliminary.

TABLA 5. Estimaciones preliminares de las capturas retenidas y descargas de atunes y bonitos capturado por buques cerqueros, cañeros en el OPO en 2007, por especie y bandera del buque (panel superior) y localidad donde fue procesado (panel inferior), en toneladas métricas. Los datos de los atunes aleta amarilla, barrilete, y patudo de las pesquerías cerquera y cañera fueron ajustados a las estimaciones de composición por especie, y son preliminares.

Flag	Yellowfin	Skipjack	Bigeye	Pacific bluefin	Albacore	Black skipjack	Bonitos (*Sarda* spp.)	Miscel-laneous	Total	Percent of total
Bandera	**Aleta amarilla**	**Barrilete**	**Patudo**	**Aleta azul del Pacífico**	**Albacora**	**Barrilete negro**	**Bonitos (*Sarda* spp.)**	**Misce-láneo**	**Total**	**Porcentaje de total**
Retained catches—Capturas retenidas										
Ecuador	19,449	93,116	38,210	*	*	479	1,246	148	152,648	32.8
México	65,400	22,735	*	4,245	40	1,412	14,514	304	108,650	23.4
Nicaragua	5,228	3,040	527	*	*	0	*	*	8,795	1.9
Panamá	28,878	23,616	8,592	*	*	92	23	3	61,204	13.2
Venezuela	24,039	21,424	1,095	*	*	48	4	16	46,626	10.0
Other—Otras[1]	26,852	46,965	13,010	*	*	36	*	232	87,095	18.7
Total	169,846	210,896	61,434	4,245	40	2,067	15,787	703	465,018	
Landings—Descargas										
Colombia	30,412	19,212	3,390	*	*	*	*	*	53,014	11.3
Ecuador	38,178	136,424	52,399	*	*	595	1,439	151	229,186	48.9
México	59,292	22,291	377	4,242	39	1,382	14,343	304	102,270	21.8
Venezuela	9,615	10,552	460	*	*	22	4	5	20,658	4.4
Other—Otras[2]	35,165	22,416	5,760	3	*	42	*	232	63,618	13.6
Total	172,663	210,894	62,387	4,245	39	2,041	15,786	692	468,746	

[1]Includes Bolivia, Colombia, El Salvador, Guatemala, 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, y Vanuatú. Se usa esta categoría para no revelar información sobre las actividades de buques o empresas individuales.

[2] Includes Costa Rica, El Salvador, Guatemala, Peru, United States, and Unknown. This category is used to avoid revealing the operations of individual vessels or companies.

[2] Incluye Costa Rica, El Salvador, Estados Unidos, Guatemala, Perú, y Desconocido Se usa esta categoría para no revelar información sobre las actividades de buques o empresas individuales.

TABLE 6a. Catches of bigeye tuna, in metric tons, in the eastern Pacific Ocean during 2007 by longline vessels more than 24 meters in overall length.
TABLA 6a. Capturas de atún patudo, en toneladas métricas, en el Océano Pacífico oriental durante 2007 por buques palangreros de más de 24 metros en eslora total.

Flag	Quarter				Total
	1	2	3	4	
Bandera	**Trimestre**				**Total**
	1	**2**	**3**	**4**	
China	-	-	-	-	-
Japan—Japón	3,282	2,902	3,105	3,973	13,262
Republic of Korea—República de Corea*	1,826	1,963	941	881	5,611
Chinese Taipei—Taipei Chino	1,096	905	901	2,957	5,859
United States—Estados Unidos	106	10	203	11	330
Vanuatu	273	221	0	-	494
Total	6,583	6,001	5,150	7,822	25,556

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

TABLE 6b. Preliminary estimates of the catches of bigeye tuna, in metric tons, in the eastern Pacific Ocean during the first quarter of 2008 by longline vessels more than 24 meters in overall length.
TABLA 6b. Estimaciones preliminares de las capturas de atún patudo, en toneladas métricas, en el Océano Pacífico oriental durante el primer trimestre de 2008 por buques palangreros de más de 24 metros en eslora total.

Flag—Bandera	Month—Mes			
	1	2	3	Total
China	-	-	-	-
Japan—Japón	1,523	1,176	1,024	3,723
Republic of Korea—República de Corea	-	-	-	-
Chinese Taipei—Taipei Chino	291	139	-	-
United States— Estados Unidos	-	-	-	-
Vanuatu	-	-	-	-

TABLE 7. Preliminary data on the sampling coverage of trips by vessels with 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 2008.

TABLA 7. Datos preliminares de la cobertura de muestreo de viajes de buques con capacidad más que 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 2008.

Flag	Trips	Observed by program			Percent observed
		IATTC	National	Total	
Bandera	**Viajes**	**Observado por programa**			**Porcentaje observado**
		CIAT	**Nacional**	**Total**	
Colombia	20	9	11	20	100.0
Ecuador	111	74	37	111	100.0
España—Spain	7	2	5	7	100.0
Guatemala	2	2		2	100.0
Honduras	6	6		6	100.0
México	57	31	26	57	100.0
Nicaragua	5	3	2	5	100.0
Panamá	44	22	22	44	100.0
Perú	2	2		2	
El Salvador	11	11		11	100.0
Venezuela	25	14	11	25	100.0
Vanuatu	5	5		5	100.0
Total	295[1]	181	114	295[1]	100.0

[1] Includes 52 trips, 36 by vessels with observers from the IATTC program and 16 by vessels with observers from the national programs, that began in late 2007 and ended in 2008

[1] Incluye 52 viajes, 36 por buques con observadores del programa del CIAT y 16 por buques con observadores de los programas nacionales, iniciados a fines de 2007 y completados en 2008

TABLE 8. Oceanographic and meteorological data for the Pacific Ocean, April 2007-March 2008. The values in parentheses are anomalies. SST = sea-surface temperature; SOI = Southern Oscillation Index; SOI* and NOI* are defined in the text.
TABLA 8. Datos oceanográficos y meteorológicos del Océano Pacífico, abril 2007-marzo 2008. 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)	24.4 (-1.1)	22.8 (-1.6)	21.7 (-1.4)	20.3 (-1.6)	19.2 (-1.6)	18.6 (-1.9)
Area 2 (5°N-5°S, 90°-150°W	27.1 (-0.3)	26.4 (-0.7)	25.9 (-0.5)	24.8 (-0.8)	23.9 (-1.1)	23.6 (-1.3)
Area 3 (5°N-5°S, 120°-170°W)	27.8 (0.1)	27.6 (-0.2)	27.6 (0.1)	26.8 (-0.3)	26.2 (-0.5)	25.8 (-0.8)
Area 4 (5°N-5°S, 150W°-160°E)	28.7 (0.3)	28.9 (0.2)	29.0 (0.4)	28.8 (0.2)	28.6 (0.1)	28.1 (-0.4)
Thermocline depth—Profundidad de la termoclina, 0°, 80°W (m)	15	25	25	30	45	40
Thermocline depth—Profundidad de la termoclina, 0°, 110°W (m)	10	15	25	40	35	30
Thermocline depth—Profundidad de la termoclina, 0°, 150°W (m)	100	90	105	125	130	130
Thermocline depth—Profundidad de la termoclina, 0°, 180°W (m)	170	170	170	180	170	165
Sea level—Nivel del mar, Baltra, Ecuador (cm)	186.1 (3.4)	190.6 9.2	190.3 (9.4)	-	-	-
Sea level—Nivel del mar, Callao, Perú (cm)	102.8 (-11.7)	105.7 (-7.8)	99.7 (-12.3)	-	109.1 (1.5)	-
SOI—IOS	-0.4	-0.4	0.2	-0.5	0.1	0.2
SOI*—IOS*	1.24	5.50	2.69	4.36	7.92	4.12
NOI*—ION*	1.96	2.03	3.35	-1.61	-1.56	1.38

Month—Mes	10	11	12	1	2	3
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	18.8 (-2.1)	19.5 (-2.2)	20.8 (-2.0)	23.8 (-0.7)	26.3 (0.2)	27.3 (0.8)
Area 2 (5°N-5°S, 90°-150°W	23.4 (-1.5)	23.2 (-1.8)	23.6 (-1.5)	24.1 (-1.5)	25.0 (-1.4)	26.5 (-0.6)
Area 3 (5°N-5°S, 120°-170°W)	25.2 (-1.4)	25.1 (-1.3)	25.0 (-1.5)	24.7 (-1.8)	24.8 (-1.9)	26.0 (-1.1)
Area 4 (5°N-5°S, 150W°-160°E)	27.9 (-0.6)	27.4 (-0.9)	27.4 (-0.9)	26.6 (-1.5)	26.4 (-1.6)	26.8 (-1.3)
Thermocline depth—Profundidad de la termoclina, 0°, 80°W (m)	50	40	50	30	25	20
Thermocline depth—Profundidad de la termoclina, 0°, 110°W (m)	25	25	30	40	30	20
Thermocline depth—Profundidad de la termoclina, 0°, 150°W (m)	140	125	150	140	145	140
Thermocline depth—Profundidad de la termoclina, 0°, 180°W (m)	170	180	180	190	190	200
Sea level—Nivel del mar, Callao, Perú (cm)	-	-	96.3 (-12.3)	105.6 (-5.9)	103.7 (-10.2)	115.4 (0.7)
SOI—IOS	0.6	0.9	1.8	1.9	2.7	1.1
SOI*—IOS*	0.77	4.14	5.38	0.85	0.89	0.71
NOI*—ION*	2.13	3.97	7.03	1.34	5.69	8.12