INTER-AMERICAN TROPICAL TUNA COMMMISSION
COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL

QUARTERLY REPORT—INFORME TRIMESTRAL

July-September 2009—Julio-Septiembre 2009

COMMISSIONERS—COMISIONADOS

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The

QUARTERLY REPORT

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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

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de la

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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.

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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 Parties 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, France on 20 July 2007, Japan on 11 July 2008, and Costa Rica on 27 May 2009. Of these, Costa Rica, El Salvador, France, Japan, Mexico, Nicaragua, and Panama were Parties to the 1949 Convention on the date that the Antigua Convention was open for signature, so it will enter into force on 27 August 2010.

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 57th year. The results of the IATTC staff's research are published in the IATTC's Bulletin and Stock Assessment Report series in English and Spanish, its two official languages, in its Special Report and Data Report series, and in books, outside scientific journals, and trade journals. Summaries of each year's activities are reported upon in the IATTC's Annual Reports and Fishery Status Reports, also in the two languages.

MEETINGS

Dr. Guillermo A. Compeán and Mr. Brian S. Hallman participated in the second Joint Meeting of Tuna Regional Fishery Management Organizations (RFMOs), held in San Sebastian, Spain, on 29 June-3 July 2009. The participants agreed on a program of joint work by the five tuna RFMOs to be carried out during 2010.

Dr. Mark N. Maunder participated in a "Workshop on Spatial Structure and Dynamics of Walleye Pollock in the Bering Sea" in Seattle, Washington, USA, on 7-10 July 2009, at which he made the following presentation: "Spatial Analysis of Tuna in the Pacific Ocean," by Mark

Maunder, Alexandre Aires-da-Silva, Simon J. Hoyle, Kevin Piner, and Jesus Jurado-Molina. Dr. Maunder's travel expenses were paid by the organizers of the workshop.

Mr. Kurt M. Schaefer participated, as one of three reviewers, in a meeting at which the New Zealand Gamefish Tagging Program was discussed. The meeting took place in Auckland, New Zealand, on 20-21 July 2009. The purpose of the meeting was to review, discuss, and prepare a report on all aspects of the Program, including overall objectives, species included, methodologies, usefulness, and potential applications of the results to management. Mr. Schaefer and the other two reviewers gave presentations at the beginning of the meeting to provide an international perspective on other tagging projects directed at large pelagic fishes. Mr. Schaefer's travel expenses were paid by the Ministry of Fisheries of New Zealand.

Dr. Richard B. Deriso participated in a meeting of the Scientific and Statistical Committee of the Western Pacific Fishery Management Council of the United States in Honolulu, Hawaii, USA, on 20-22 July 2009. His travel expenses were paid by the Western Pacific Fishery Management Council.

Mr. Ernesto Altamirano Nieto participated in the Sixth International Fisheries Observer and Monitoring Conference, which took place in Portland, Maine, USA, on 20-24 July 2009.

Mr. Ricardo Belmontes Acosta participated in a workshop on the relationships of the Central American nations to the IATTC, which was held in Antigua, Guatemala, on 28-29 July 2009. He described the changes that will take place with the entry into force of the Antigua Convention on 27 August 2010, and answered questions regarding those changes.

Mr. Belmontes Acosta participated in a workshop on fisheries subsidies, sponsored by the World Wildlife Fund, the Programa de las Naciones Unidas para el Medio Ambiente, the Comisión Permanente del Pacífico Sur, and the government of Ecuador, held in Guayaquil, Ecuador, on 30 July 2009. The status of the negotiations regarding fisheries subsidies within the framework of the World Trade Organization was discussed, and the common interests of Latin American nations in these negotiations were identified at the workshop.

Dr. Mark N. Maunder participated in a workshop, "Estimating Natural Mortality in Stock Assessment Applications," in Seattle, Washington, USA, on 11-13 August 2009, at which he gave the following presentations:

"Estimating natural mortality within a stock assessment model: an evaluation using simulation analysis based on twelve stock assessments," by Mark N. Maunder, Hui-Hua Lee, Kevin R. Piner, and Richard D. Methot;

"Proposed formulation for age-specific patterns in natural mortality," by Mark N. Maunder.

His travel expenses were paid by the organizers of the workshop.

Mr. Kurt M. Schaefer participated at the fifth Scientific Committee meeting of the Western and Central Pacific Fisheries Commission in Port Vila, Vanuatu, during the period of 10-21 August 2009, at which he presented an overview of the tuna fisheries of the eastern Pacific Ocean (EPO) through the 2008 fishing year and summaries of the most recent stock assessments by the IATTC staff for yellowfin, skipjack, and bigeye. He also participated in the Third Pacific Tuna Tagging Programme (PTTP) Steering Committee meeting, at which he described recent tuna tagging experiments in the EPO, with emphasis on archival tag data for bigeye and yellowfin.

Dr. Robert J. Olson participated in a workshop and conference entitled "Ecopath 25 Years" in Vancouver, B.C, Canada, on 26 August-1 September 2009. Ecopath with Ecosim is a widely-used computer package for ecosystem modeling, and is recognized by the U.S. National Oceanic and Atmospheric Administration (NOAA) as one of its "most momentous breakthrough achievements." Specifically, a web site devoted to the achievements of NOAA during the last 200 years states that "ECOPATH modeling … revolutionized scientists' ability to accurately identify ecological relationships to understand complex marine ecosystems."

Dr. Mark N. Maunder participated in a Workshop on Ecosystem-Based Stock Assessment of Marine Turtles at Scripps Institution of Oceanography, La Jolla, California, USA, on 1-2 September 2009, at which he gave a presentation entitled "Including Ecosystem Considerations in Fisheries Stock Assessment."

Dr. Maunder participated in a meeting of a U.S. National Research Council (NRC) committee on a Review of Sea Turtle Population Assessment Methods in Washington, D.C., USA, on 8 September 2009, at which he gave a presentation entitled "Modeling Protected Species: Making the Most of the Available Data." His travel expenses were paid by the NRC.

Dr. Guillermo A. Compeán participated in the "IV Worldwide Conference of Tuna" in Vigo, Spain, on 14-15 September 2009. He was one of four speakers at a session entitled "Worldwide Tuna Fishing: Supplying to the Industry. Current Situation and Future Perspectives of the Resources and Prices."

Dr. Robert J. Olson and Ms. Leanne M. Duffy participated in a workshop entitled "Feeding in Tunas–a Global Comparison" on 28 September-2 October 2009, at the Institut de Recherché pour le Développement (IRD) in Sète, France. The workshop was jointly sponsored by GLOBEC-CLIOTOP and the home organizations of each participant. CLIOTOP (Climate Impacts on Oceanic Top Predators) is a regional program of the international research program GLOBEC (Global Ocean Ecosystem Dynamics). The purposes of the workshop were (1) to compile diet and stable isotope data into a composite data base for global analysis, (2) to use regression tree techniques to analyze broad-scale spatial, physical, and biological covariates with the diet data, and (3) to determine if latitude can be used as a proxy for climate change in eliciting food-web responses in pelagic fishes. Presentations were given by both Dr. Olson and Ms. Duffy.

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 third quarter of 2009.

Personnel at these offices collected 336 length-frequency samples from 182 wells and abstracted logbook information for 127 trips of commercial fishing vessels during the third quarter of 2009.

Also during the third quarter members of the field office staffs placed IATTC observers on 94 fishing trips by vessels that participate in the AIDCP On-Board Observer Program. In addition, 111 IATTC observers completed trips during the quarter, and were debriefed by field office personnel.

Fisheries statistics

The data on the catches of tunas in the eastern Pacific Ocean (EPO) collected by the IATTC staff are virtually complete, the principal exceptions being some of the catches by artisanal and recreational fisheries, and the catches, if any, by longline vessels fishing illegally in the EPO. The information reported herein is for the portion of the EPO east of 150°W between 50ºN and 50°S, unless noted otherwise. The catches are reported in metric tons (t), vessel capacities in cubic meters (m^3) of well volume, 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 end of a fishing trip. Thus, the estimates for the most recent periods (week or quarter) are the most preliminary, while those made a year later are much more accurate and precise. Statistics are developed using data from many sources, including landings, vessel logbooks, and observer records, collected either by IATTC staff or by governmental agencies and then made available to the IATTC staff.

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

The IATTC Regional Vessel Register lists all vessels, other than artisanal and recreational fishing vessels, authorized to fish for tunas in the EPO. The estimated total carrying capacity of the purse-seine and pole-and-line vessels that have or are expected to fish in the EPO during 2009 is about 230,100 m^3 (Table 1). The average weekly at-sea capacity for the fleet, for the weeks ending 29 June through 27 September, was about 127,700 m^3 (range: 101,100 to 176,100 m^3).

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

Catch statistics

The estimated total retained catches, in metric tons, of tropical tunas from the EPO during the period of January-September 2009, and the equivalent statistics for 2004-2008, were:

Species	2009	2004-2008			Weekly average, 2009
		Average	Minimum	Maximum	
Yellowfin	187,200	179,200	142,400	233,600	4,900
Skipjack	169,600	185,500	132,200	234,600	4,500
Bigeye	42,600	38,100	30,300	48,000	1,100

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

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

The catch-per-unit-of-effort (CPUE) statistics in this report do not incorporate adjustments for factors, such as type of set, vessel operating costs, or market prices, which might identify whether a vessel was directing its effort toward a specific species.

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

The estimated nominal catches of yellowfin, skipjack, and bigeye per day of fishing, in metric tons, by purse-seine (PS) and pole-and-line (LP) gear in the EPO during the first two quarters of 2009 and comparative statistics for 2004-2008 were:

Region	Species	Gear	2009	2004-2008		
				Average	Minimum	Maximum
N of 5°N	yellowfin	PS	15.5	10.8	9.4	12.5
S of 5°N			2.9	4.1	2.2	7.2
N of 5°N	skipjack	PS	0.5	2.8	2.1	3.6
S of 5°N			9.3	8.8	6.4	11.6
EPO	bigeye	PS	1.7	2.0	1.5	3.1
EPO	yellowfin	LP	1.7	1.4	0.0	3.9
EPO	skipjack	LP	0.7	0.8	0.0	2.9

Catch statistics for the longline fishery

IATTC Resolution C-09-01 requires nations whose annual catches of bigeye by longline gear in the EPO exceed 500 metric tons to report their catches monthly. The catches reported for January-September 2009 are shown in Table 3.

Size compositions of the surface catches of tunas

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

The methods for sampling 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 1).

Data for fish caught during the second quarters of 2004-2009 are presented in this report. Two sets of length-frequency histograms are presented for each species; the first shows the data by stratum (gear type, set type, and area) for the second quarter of 2009, and the second shows data for the combined strata for the second quarter of each year of the 2004-2009 period. Samples from 243 wells were taken during the second quarter of 2009.

There are ten surface fisheries for yellowfin defined for stock assessments, four associated with floating objects, two unassociated school, three associated with dolphins, and one pole-and-line (Figure 1). The last fishery includes all 13 sampling areas. Of the 243 wells sampled that contained fish caught during the second quarter of 2009, 174 contained yellowfin. The estimated size compositions of these fish are shown in Figure 2a. The majority of the yellowfin catch during the second quarter was taken by sets on dolphins in the Northern and Inshore areas. There were also smaller amounts of large yellowfin (120-160 cm) taken in schools associated with dolphins in the Southern area. Smaller amounts of yellowfin were taken in floating-object sets, primarily in the Northern and Southern areas, and in sets on unassociated schools in the Northern and Southern areas.

The estimated size compositions of the yellowfin caught by all fisheries combined during the second quarters of 2004-2009 are shown in Figure 2b. The average weight of the yellowfin caught during the second quarter of 2009 (17.2 kg) was considerably greater than those of any of the previous five 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 1). The last two fisheries include all 13 sampling areas. Of the 243 wells sampled that contained fish caught during the second quarter of 2009, 133 contained skipjack. The estimated size compositions of these fish are shown in Figure 3a. Large amounts of skipjack in the 35- to 50-cm range were caught in the Southern unassociated fishery during the second quarter. Also, significant amounts of skipjack were taken in the floating-object fisheries in the Northern, Equatorial, Inshore, and Southern areas. The majority of the skipjack caught during the second quarter in the floating-object fishery in the Northern, Inshore and Southern areas ranged between about 30 and 50 cm in length. Larger skipjack in the 65- to 75-cm range were taken in the Equatorial floating-object fishery.

The estimated size compositions of the skipjack caught by all fisheries combined during the second quarters of 2004-2009 are shown in Figure 3b. The average weight for the second quarter of 2009 (1.8 kg) was less than those of four 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 1). The last three fisheries include all 13 sampling areas. Of the 243 wells sampled that contained fish caught during the second quarter of 2009, 71 contained bigeye. The estimated size compositions of these fish are shown in Figure 4a. The majority of the catch was taken in floating-object sets in the Northern, Equatorial, and Southern areas. Smaller amounts of larger bigeye (120-140 cm) were taken in the Inshore floating-object fishery.

The estimated size compositions of the bigeye caught by all fisheries combined during the second quarters of 2004-2009 are shown in Figure 4b. The average weight of bigeye during the second quarter of 2009 (6.4 kg) was considerably less than that of 2008, but greater than those of 2006 and 2007.

The estimated retained purse-seine catch of bigeye less than 60 cm in length during the first two quarters of 2009 was 10,316 metric tons (t), or about 27 percent of the estimated total retained purse-seine catch of bigeye during that period. The corresponding amounts for the first two quarters of 2000-2008 ranged from 6,374 to 20,323 t, or 16 to 47 percent. These values may differ slightly from those given in previous Quarterly Reports due to changes in the estimation procedure.

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 2009 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 161 fishing trips aboard purse seiners covered by that program during the third quarter of 2009. Preliminary coverage data for these vessels during the quarter are shown in Table 4.

Training

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

RESEARCH

Tuna tagging

Mr. Kurt M. Schaefer spent the period of 12-26 September 2009, at the Achotines Laboratory, where, with the assistance of Laboratory staff members, he tagged 20 yellowfin tuna, ranging in length from about 47 to 82 cm, with Lotek LTD 2310s archival tags. The objective was to expand the geographical distribution of deployments of archival tags in yellowfin tuna in the eastern Pacific Ocean (EPO). Deployments of archival tags by IATTC personnel on yellowfin tuna have taken place off northern and southern Baja California, Mexico, since 2002, at the Revillagigedo Islands from 2006 through 2009, in the equatorial EPO in 2006, and at Panama in 2007, 2008, and 2009.

Early life history studies

Yellowfin broodstock

The yellowfin broodstock in Tank 1 (1,362,000 L) at the Achotines Laboratory spawned daily during the quarter. Spawning occurred between 10:45 p.m. and 11:30 p.m. The numbers of eggs collected after each spawning event ranged from about 70,000 to 1,081,000. The water temperatures in the tank during the quarter ranged from 28.0° to 29.0°C.

There were two 54- to 55-kg yellowfin and seven 30- to 36-kg yellowfin in Tank 1 at the end of September.

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. Another 15 reserve-broodstock yellowfin held in Tank 2 were transferred to Tank 1 during late 2008; 5 of the October-stocked fish and 1 of the December-stocked fish were implanted with archival tags before they were moved to Tank 1. At the end of September, two of the January 2007 group and three of the October 2008 group, all bearing archival tags, 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.

The fish from several spawnings were used for rearing and experimental trials during the quarter. These trials are described below.

Experiments with yellowfin tuna larvae

Early life history group trials

During the quarter an experiment was conducted to investigate the effect of early piscivory on the growth of yellowfin tuna larvae. In the laboratory, yellowfin become piscivorous at around 6.5 mm SL (IATTC Special Report 16: 14. It has been theorized that the early onset of piscivory is beneficial to survival due to an increase in growth rate and therefore a reduction in susceptibility to predation. However, no laboratory experiments have been conducted with yellowfin at this stage to compare the growth rates of larvae fed a fish diet versus that of other food types.

Global Royal Fish trials

Plans for joint research by the IATTC and Global Royal Fish (GRF) are described in the IATTC Quarterly Report for January-March 2009. During the third quarter, GRF scientists initiated several trials with Achotines Laboratory staff members designed to increase the growth and survival of larval and juvenile yellowfin tuna. These trials will be continued through the fourth quarter of 2009.

Visitors at the Achotines Laboratory

Mr. Carlos Guevara and an assistant spent the morning of 14 July 2009 SCUBA diving in Achotines Bay, carrying out an annual update of the previous Smithsonian Tropical Research Institute survey of the Achotines Bay coral reef.

Mr. Carlos Alberto Ravest Presa, a consultant to Global Royal Fish (GRF) from Chile, arrived at the Achotines Laboratory on 1 July 2009 to join Dr. Gidon Minkoff in research on culture of larval and juvenile yellowfin being conducted jointly by the IATTC early life history group and GRF. Mr. Brian Blanchard, a weaning consultant to GRF from Canada, spent the period of 12-29 July 2009 at the Achotines Laboratory, also working with Dr. Minkoff. Mr. Ory Moussaieff, Managing Director of GRF, spent the period of 12-29 July 2009 at the Achotines Laboratory. Dr. Minkoff and Mr. Ravest Presa, continued their research in August and September.

Dr. Harilaos Lessios, a Senior Scientist at the Smithsonian Tropical Research Institute (STRI), spent the period of 3-5 August 2009 at the Achotines Laboratory, where he conducted studies of sand dollars.

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.

The SSTs were near normal throughout the fourth quarter of 2008, with only a few scattered areas, mostly small, of warm or cool water (IATTC Quarterly Report for October-December 2008: Figure 6). A band of cool water formed along the equator from about 110°W to about 180° in January 2009. It weakened in February, but then became stronger in March, extending from the coast to about 140°W (IATTC Quarterly Report for January-March 2009: Figure 8). It can be seen in Table 5 that all of the SST values for the fourth and first quarters were below normal, that the SOI* and NOI* indices, with one exception, were well above normal during the fourth and first quarters, and that the thermocline was very shallow in the equatorial eastern Pacific Ocean from December through March, all of which are indicative of anti-El Niño conditions. (However, the SOI indices were close to normal from October through March, and the charts from which Figure 8 of the IATTC Quarterly Report for January-March 2009 was taken and the equivalent charts for October 2008 through February 2009 indicate, for the most part, near-normal conditions.) The SSTs were mostly above normal during the second quarter of 2009 and all above normal during the third quarter of 2009 (Figure 5; Table 5)555. According to the Climate Diagnostics Bulletin of the U.S. National Weather Service for September 2009, "El Niño is expected to strengthen and last through the Northern Hemisphere Winter [of] 2009-2010."

GEAR PROJECT

During the quarter, IATTC staff members participated in dolphin safety-gear inspections and safety-panel alignment procedures aboard two Mexican-flag purse seiners in Manzanillo, Mexico. Prior to both trial sets, IATTC staff members met with staff members of the Programa Nacional de Aprovechamiento del Atún y de Protección de Delfines (PNAAPD) of Mexico to discuss dolphin safety-gear requirements and dolphin-safety panel alignment procedures.

INTER-AGENCY COOPERATION

Dr. Marti McCracken of the U.S. National Marine Fisheries Service, Honolulu. Hawaii, USA, spent the period of 27 July-14 August 2009, at the IATTC headquarters in La Jolla, California, USA, where she worked with Dr. Cleridy Lennert-Cody on developing randomization methods for hook comparisons in longline fisheries.

Dr. Mihoko Minami of the Department of Mathematics, Keio University, Tokyo, Japan, spent the period of 31 July-11 August 2009, at the IATTC headquarters in La Jolla, where she worked with Dr. Cleridy Lennert-Cody on developing statistical methods for analysis of fisheries bycatch data.

PUBLICATIONS

IATTC

IATTC. 2009. Annual Report of the Inter-American Tropical Tuna Commission 2007: 110 pp.

Outside journals

Arrizabalaga, Haritz, Victor R. Restrepo, Mark N. Maunder, and Jacek Majkowski. 2009. Using stock assessment information to assess fishing capacity of tuna fisheries. ICES Jour. Mar. Sci., 66 (9): 1959-1966.

Montenegro, Carlos, Mark N. Maunder, and Maximiliano Zilleruelo. 2009. Improving management advice through spatially explicit models and sharing information. Fish. Res., 100 (3): 191-199.

Schaefer, Kurt M., Daniel W. Fuller, and Barbara A. Block. 2009. Vertical movements and habitat utilization of skipjack (*Katsuwonus pelamis*), yellowfin (*Thunnus albacares*), and bigeye (*Thunnus obesus*) tunas in the equatorial eastern Pacific Ocean, ascertained through archival tag data. *In* Nielsen, Jennifer L., Haritz Arrizabalaga, Nuno Fragoso, Alistair Hobday, Molly Lutcavage, and John Sibert (editors), 2009, Tagging and Tracking of Marine Animals with Electronic Devices. Springer: 121-144.

Watson, Jordan T., Timothy E. Essington, Cleridy E. Lennert-Cody, and Martín A. Hall. 2009. Trade-offs in the design of fishery closures: management of silky shark bycatch in the eastern Pacific Ocean tuna fishery. Conser. Biol., 23 (3): 626-635.

ADMINISTRATION

Following a 30-day trial period, Ms. Susana Cusatti, a graduate of the University of Panama, was hired on 10 July 2009 as a biologist at the IATTC's Achotines Laboratory in Achotines, Panama. She replaces Mr. Ricardo de Ycaza, who had resigned on 30 April 2009.

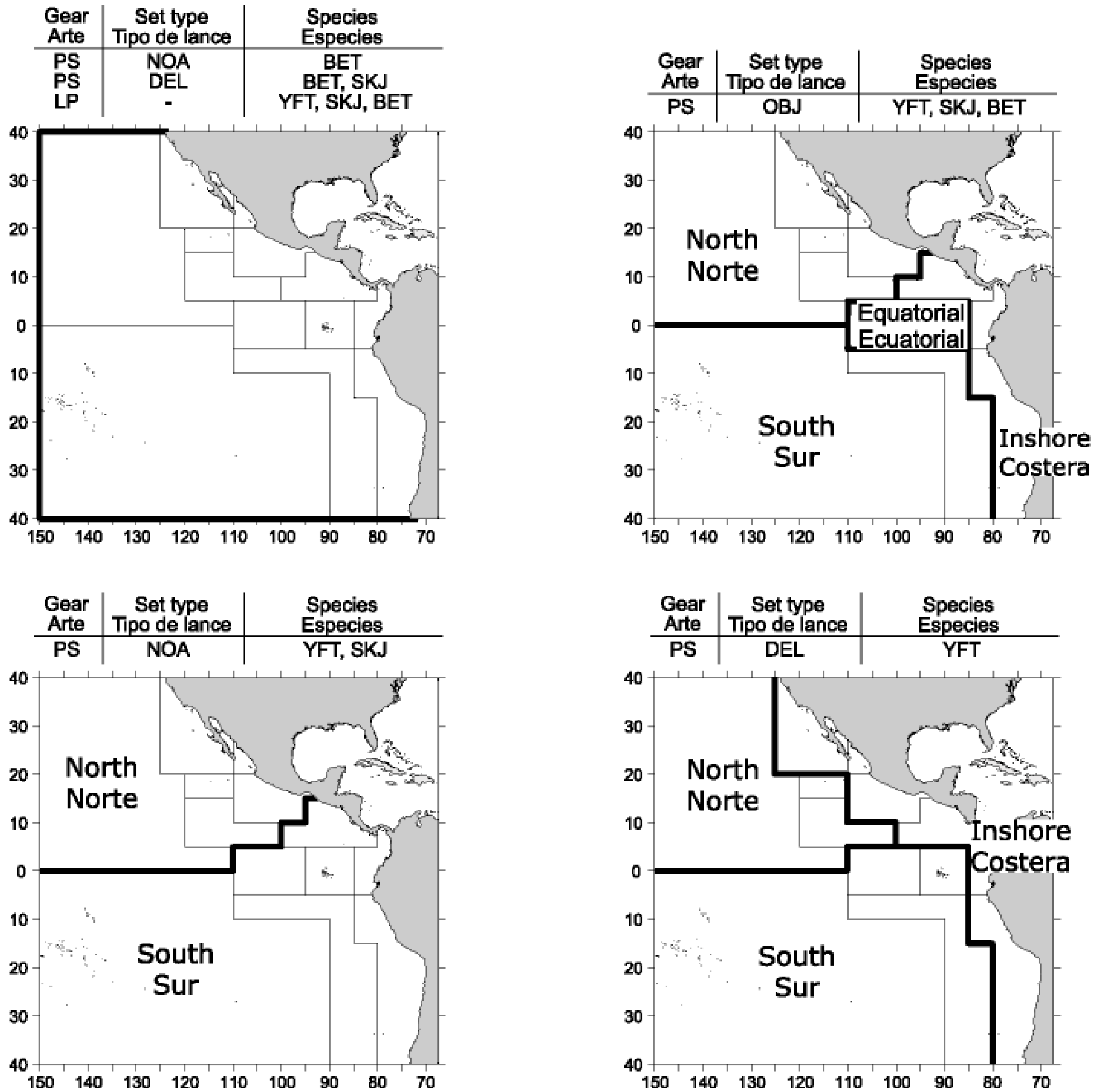

FIGURE 1. Spatial extents of the fisheries defined by the IATTC staff for stock assessment of yellowfin, skipjack, and bigeye in the EPO. The thin lines indicate the boundaries of the 13 length-frequency sampling areas, and the bold lines the boundaries of the fisheries. Gear: PS = purse seine, LP =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

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

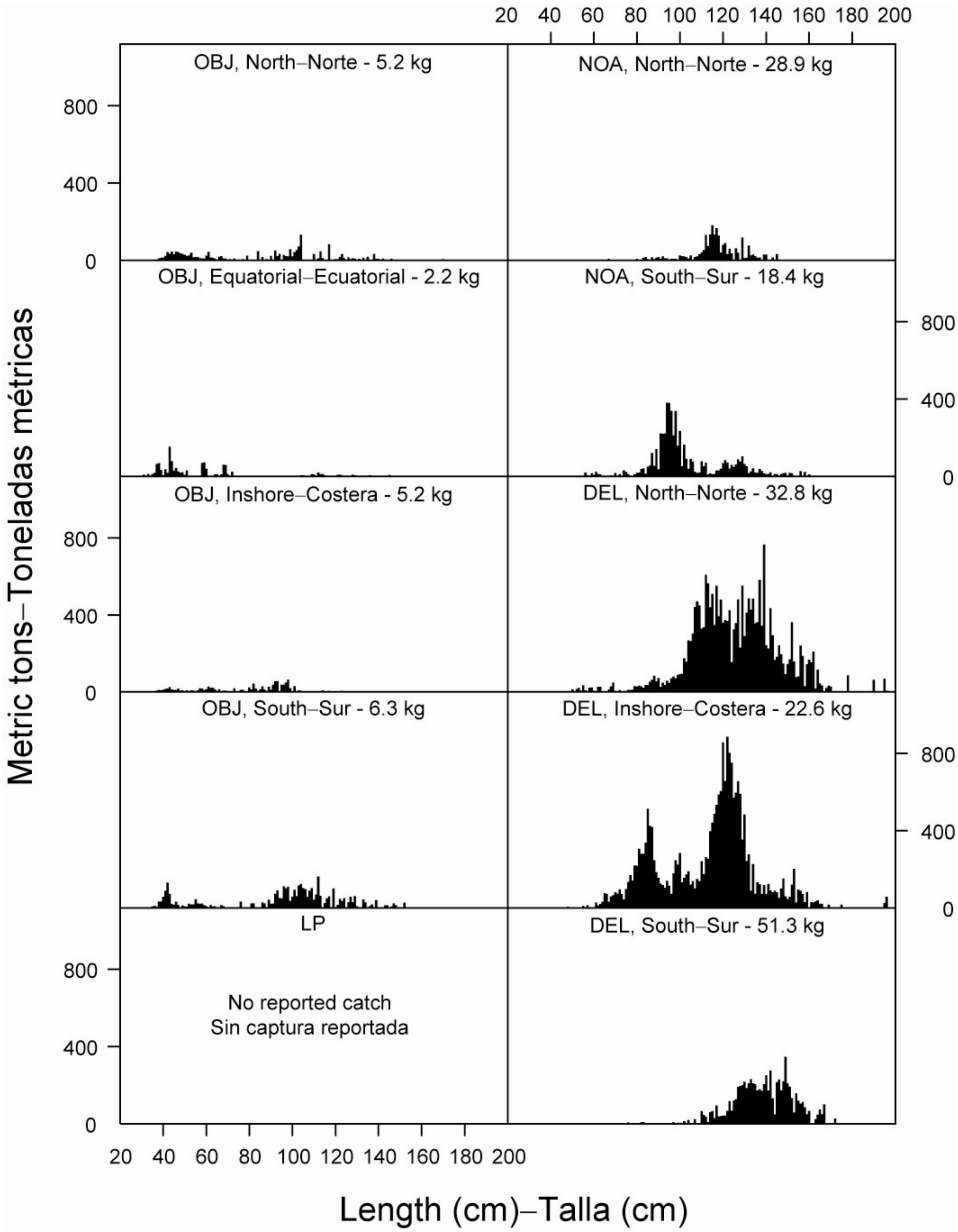

FIGURE 2a. Estimated size compositions of the yellowfin caught in each fishery of the EPO during the second quarter of 2009. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin.

FIGURA 2a. Composición por tallas estimada para el aleta amarilla capturado en cada pesquería del OPO durante el segundo trimestre de 2009. 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.

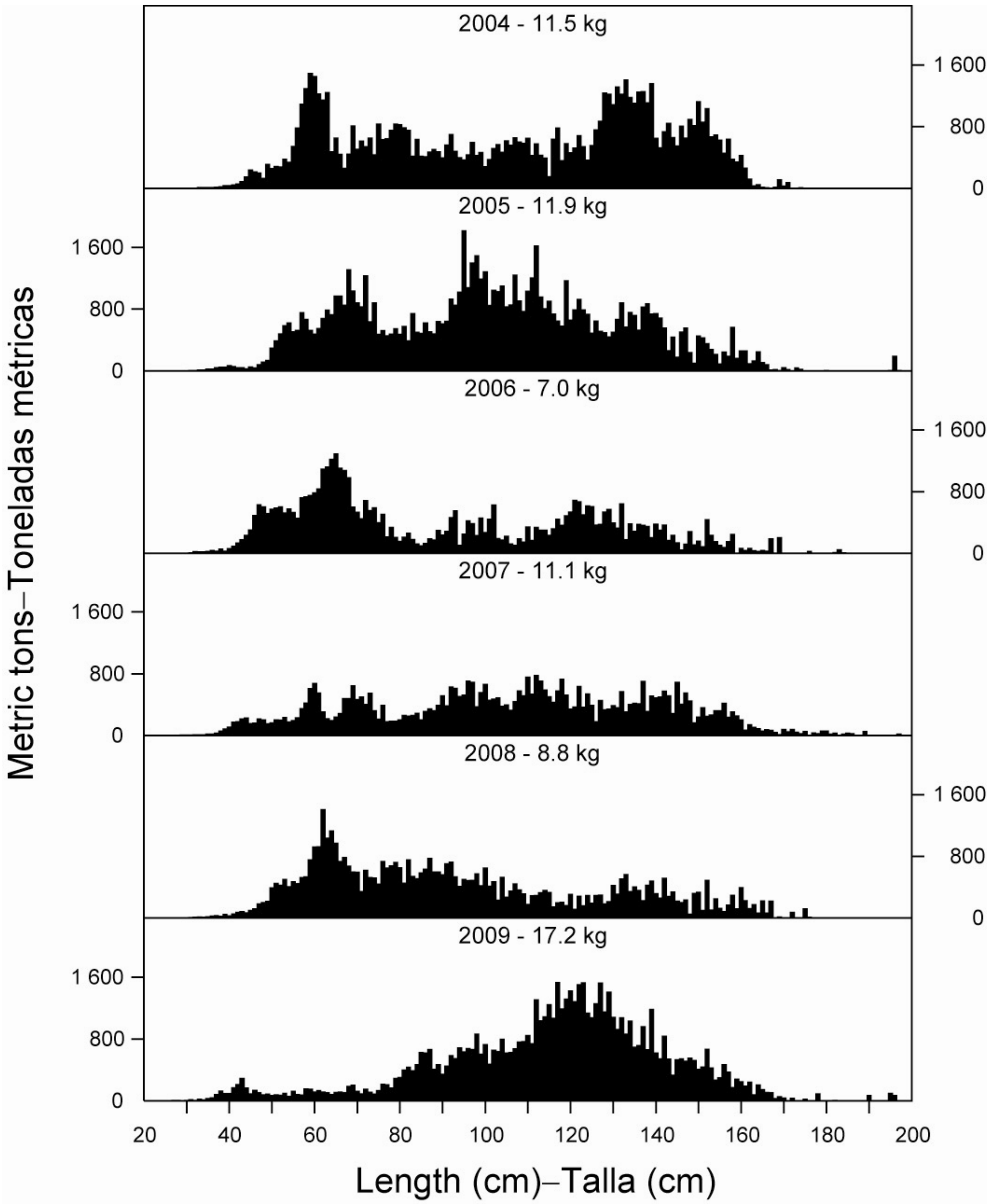

FIGURE 2b. Estimated size compositions of the yellowfin caught in the EPO during the second quarter of 2004-2009. The average weights of the fish in the samples are given at the tops of the panels.

FIGURA 2b. Composición por tallas estimada para el aleta amarilla capturado en el OPO en el segundo trimestre de 2004-2009. En cada recuadro se detalla el peso promedio de los peces en las muestras.

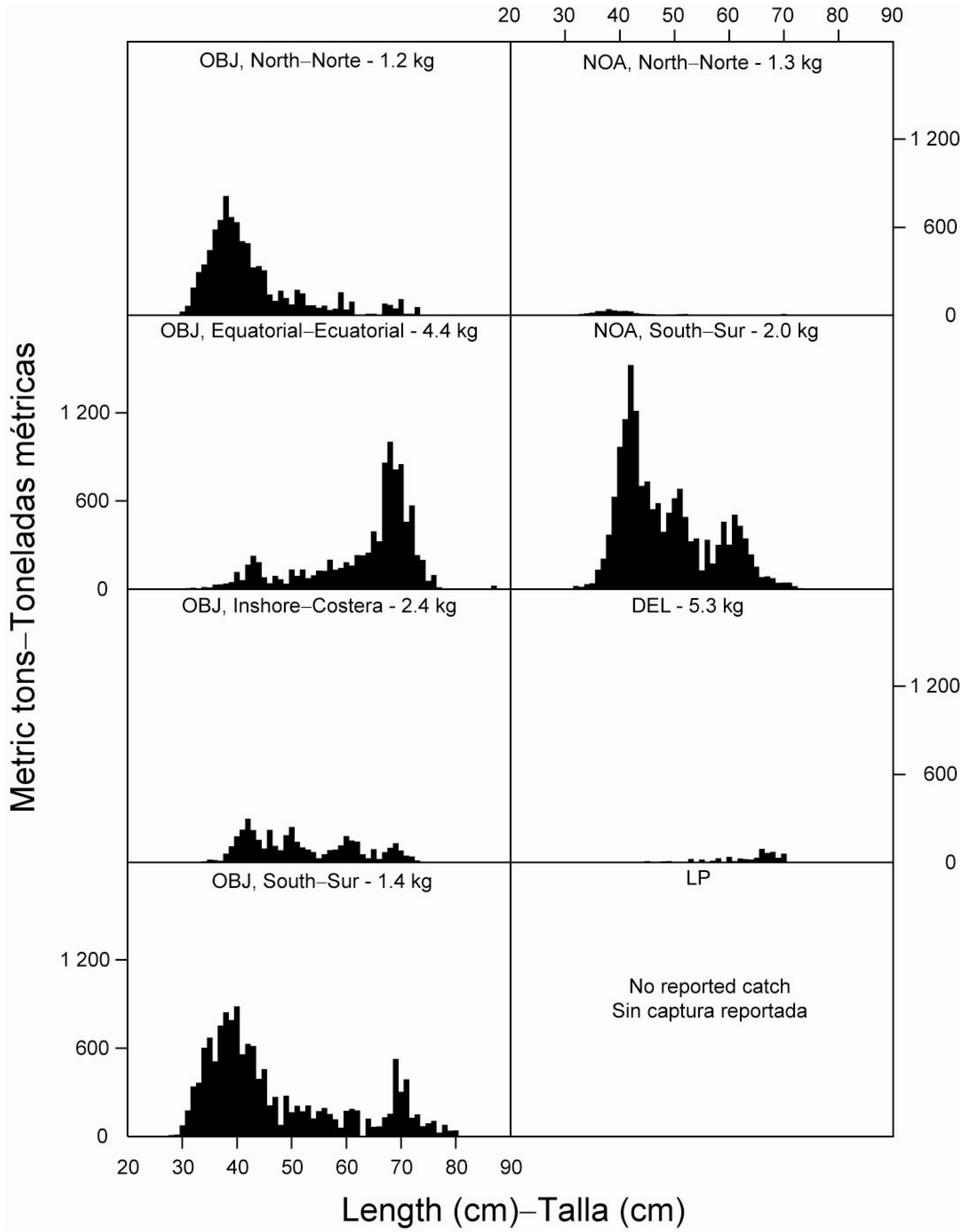

FIGURE 3a. Estimated size compositions of the skipjack caught in each fishery of the EPO during the second quarter of 2009. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin.

FIGURA 3a. Composición por tallas estimada para el barrilete capturado en cada pesquería del OPO durante el segundo trimestre de 2009. 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.

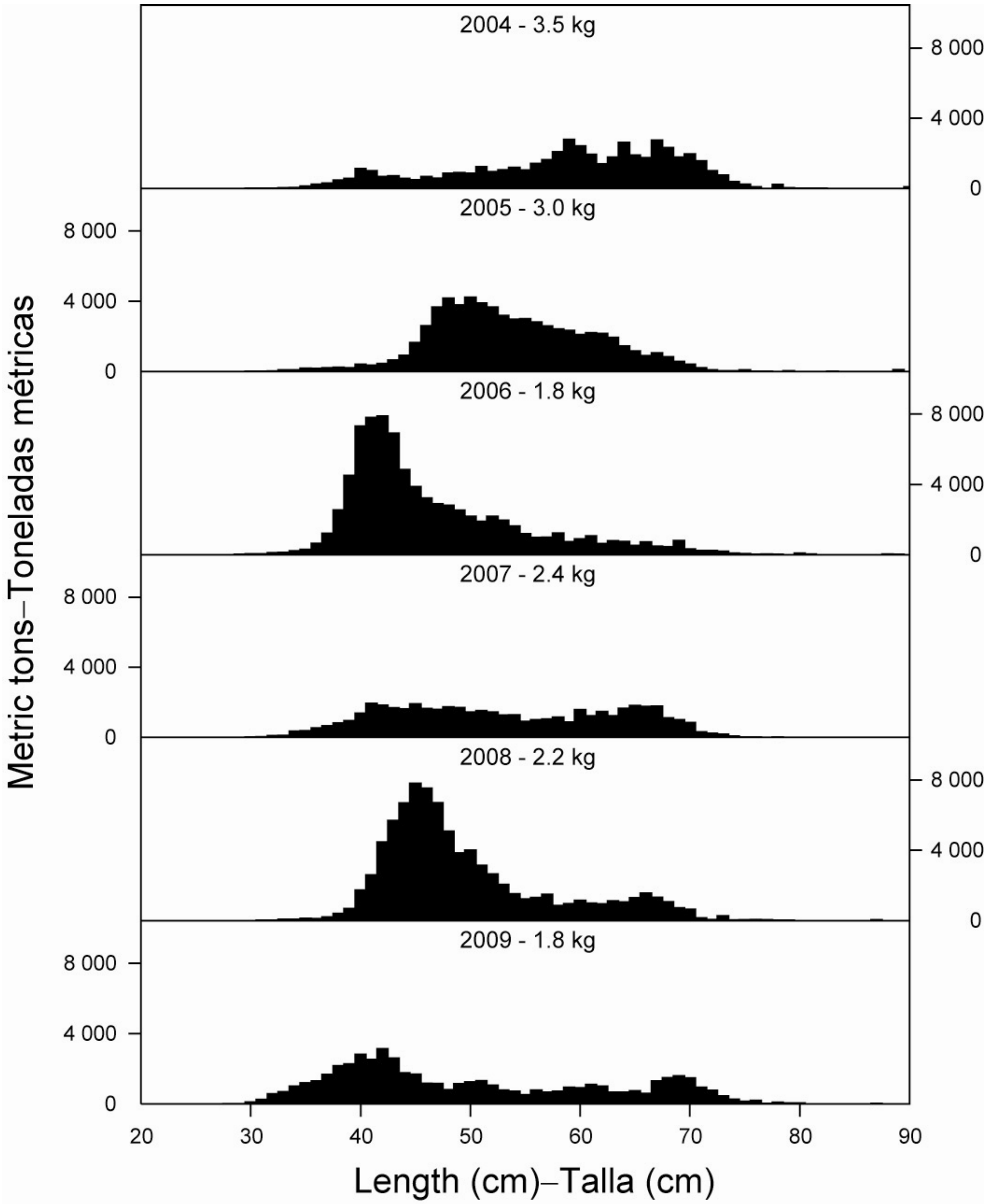

FIGURE 3b. Estimated size compositions of the skipjack caught in the EPO during the second quarter of 2004-2009. The average weights of the fish in the samples are given at the tops of the panels.

FIGURA 3b. Composición por tallas estimada para el barrilete capturado en el OPO en el cuarto trimestre de 2004-2009. En cada recuadro se detalla el peso promedio de los peces en las muestras.

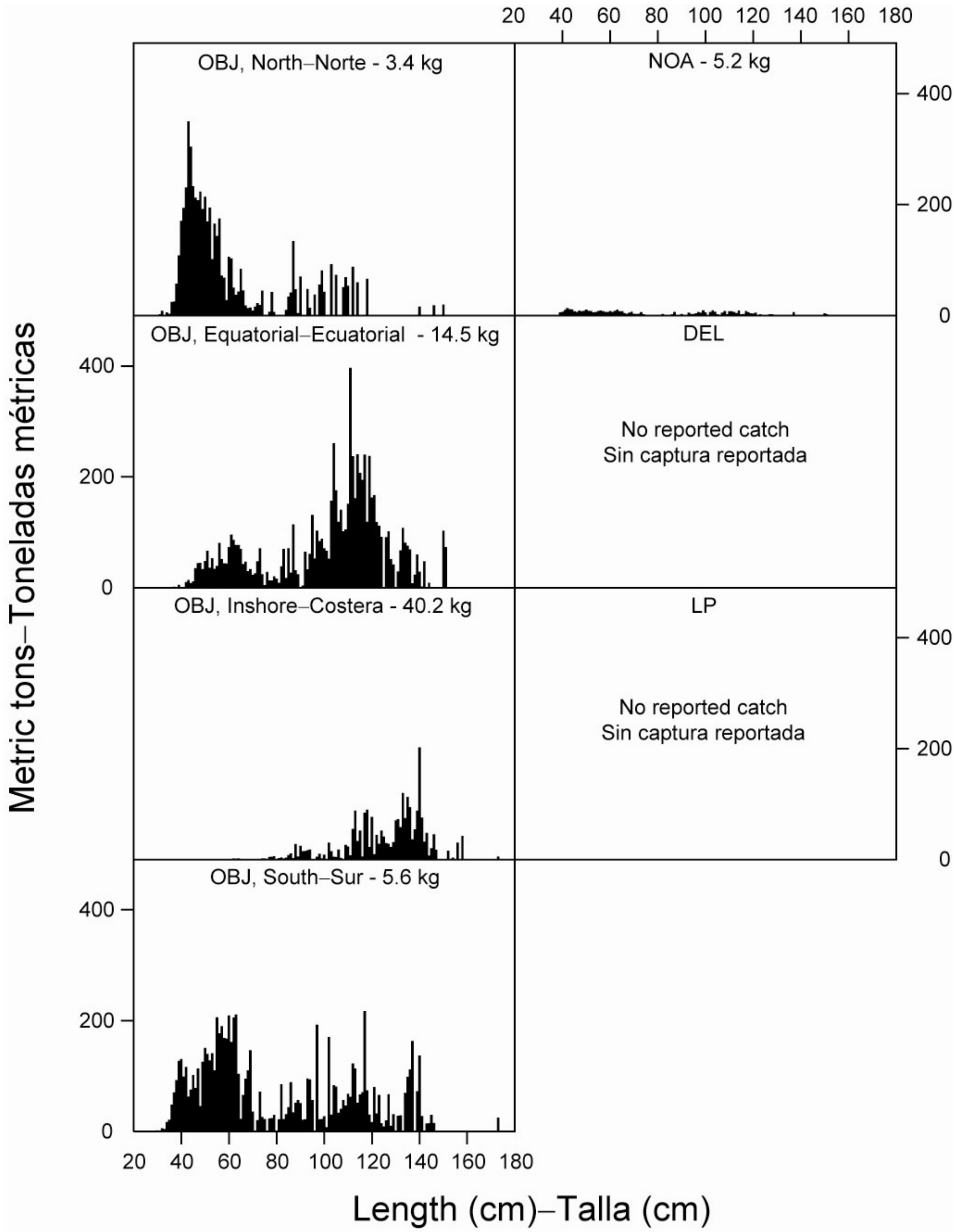

FIGURE 4a. Estimated size compositions of the bigeye caught in each fishery of the EPO during the second quarter of 2009. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin.

FIGURA 4a. Composición por tallas estimada para el patudo capturado en cada pesquería del OPO durante el segundo trimestre de 2009. 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.

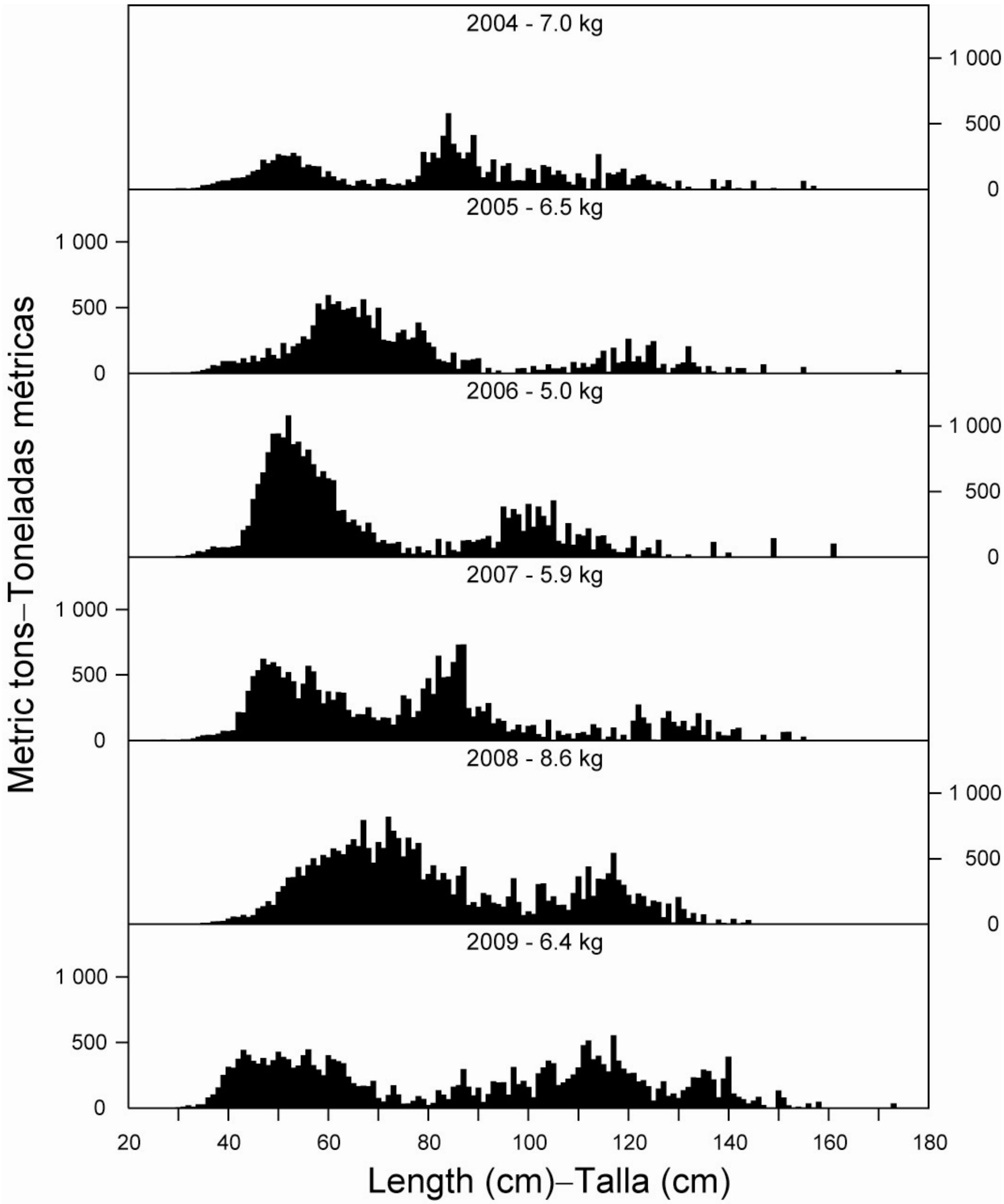

FIGURE 4b. Estimated size compositions of the bigeye caught in the EPO during the second quarter of 2004-2009. The average weights of the fish in the samples are given at the tops of the panels.

FIGURA 4b. Composición por tallas estimada para el patudo capturado en el OPO en el segundo trimestre de 2004-2009. En cada recuadro se detalla el peso promedio de los peces en las muestras.

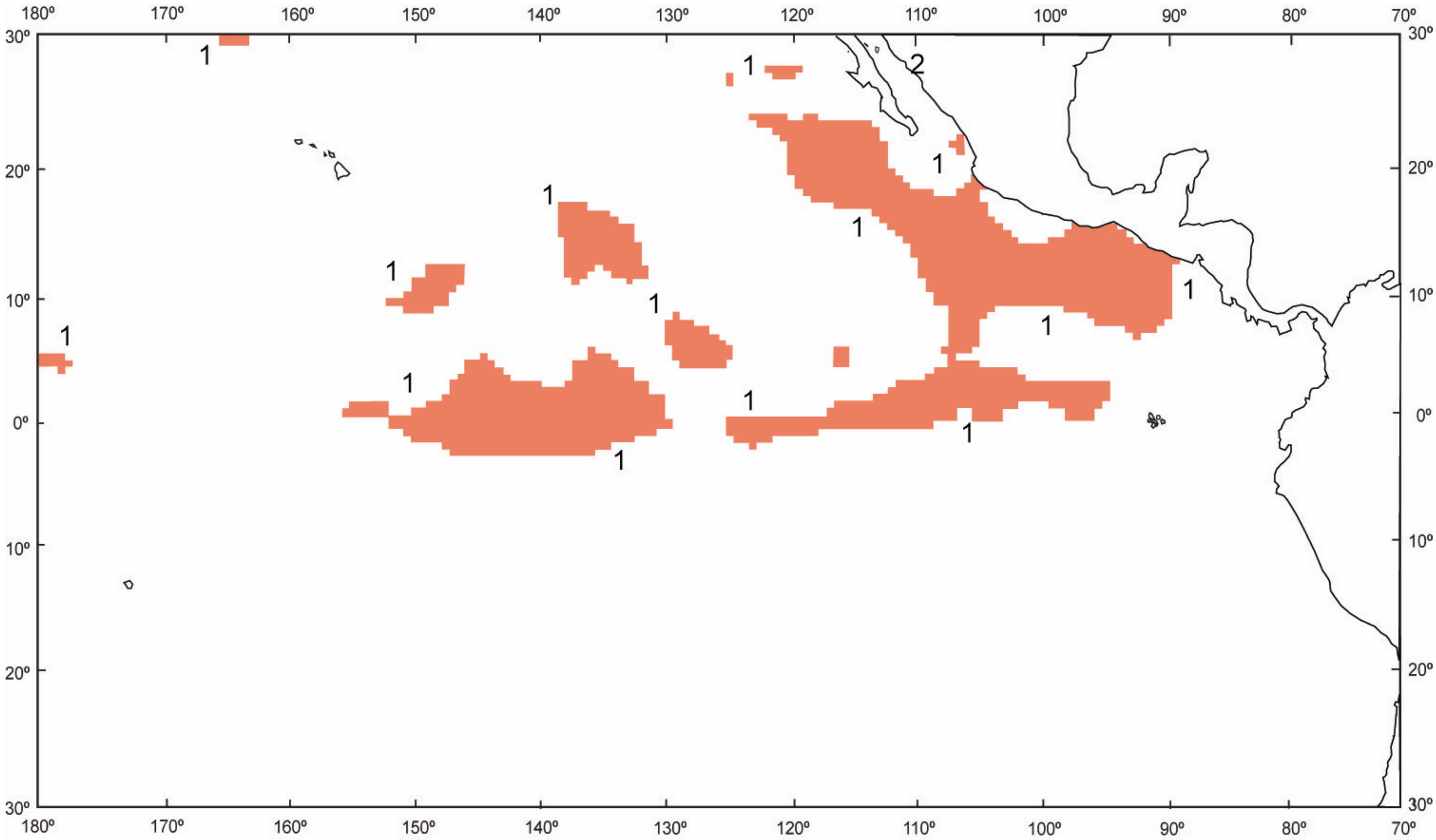

FIGURE 5. Sea-surface temperature (SST) anomalies (departures from long-term normals) for September 2009, based on data from fishing boats and other types of commercial vessels.
FIGURA 5. Anomalías (variaciones de los niveles normales a largo plazo) de la temperatura superficial del mar (TSM) en septiembre de 2009, basadas en datos tomados por barcos pesqueros y otros buques comerciales

TABLE 1. Estimates of the numbers and capacities, in cubic meters, of purse seiners and pole-and-line vessels operating in the EPO in 2009 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 2009, y de la capacidad de acarreo de los mismos, en metros cúbicos, por bandera, arte de pesca, y volumen de bodega. Se incluye cada buque en los totales de cada bandera bajo la cual pescó durante el año, pero solamente una vez en el total de la flota; por consiguiente, los totales de las flotas no son siempre iguales a las sumas de las banderas individuales. PS = cerquero; LP = cañero.

Flag	Gear	Well volume–Volumen de bodega				Capacity
Bandera	Arte	1-900	901-1700	>1700	Total	Capacidad
		Number—Número				
Bolivia	PS	1	-	-	1	222
Colombia	PS	4	10	-	14	14,860
Ecuador	PS	64	14	9	87	61,712
España—Spain	PS	-	-	4	4	10,116
Guatemala	PS	-	1	1	2	3,575
Honduras	PS	1	1	-	2	1,559
México	PS	16	32	1	49	51,968
	LP	4	-	-	4	380
Nicaragua	PS	-	5	-	5	6,353
Panamá	PS	5	17	3	25	31,811
Perú	PS	2	-	-	2	1,000
El Salvador	PS	-	1	3	4	7,415
USA—EE.UU.	PS	-	1	2	3	5,315
Venezuela	PS	-	20	2	22	30,629
Vanuatu	PS	1	2	-	3	3,609
All flags—	PS	93	104	25	222	
Todas banderas	LP	4	-	-	4	
	PS + LP	97	104	25	226	
		Capacity—Capacidad				
All flags—	PS	42,022	133,661	53,996	229,679	
Todas banderas	LP	380	-	-	380	
	PS + LP	42,402	133,661	53,996	230,059	

TABLE 2. Estimates of the retained catches of tunas in the EPO from 1 January through 27 September 2009, by species and vessel flag, in metric tons.
TABLA 2. Estimaciones de las capturas retenidas de atunes en el OPO del 1 de enero al 27 de septiembre de 2009, por especie y bandera del buque, en toneladas métricas**.**

Flag	**Yellowfin**	**Skipjack**	**Bigeye**	**Pacific bluefin**	**Bonitos (*Sarda* spp.)**	**Albacore**	**Black skipjack**	**Other[1]**	**Total**	**Percentage of total**
Bandera	**Aleta amarilla**	**Barrilete**	**Patudo**	**Aleta azul del Pacífico**	**Bonitos (*Sarda* spp.)**	**Albacora**	**Barrilete negro**	**Otras[1]**	**Total**	**Porcentaje del total**
Ecuador	13,324	86,491	23,179	-	-	3	37	512	123,546	29.9
México	86,154	8,050	1,344	2,520	6,879	2	3,712	26	108,687	26.3
Nicaragua	5,412	3,269	927	-	-	-	-	-	9,608	2.3
Panamá	25,070	19,123	5,957	-	-	-	34	98	50,282	12.2
Venezuela	23,625	14,431	1,438	-	-	-	6	58	39,558	9.6
Other—Otros[2]	33,613	38,195	9,801	-	-	-	-	51	81,660	19.7
Total	187,198	169,559	42,646	2,520	6,879	5	3,789	745	413,341	

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

TABLE 3. Reported catches of bigeye tuna in the EPO during 2009 by longline vessels.
TABLA 3. Capturas reportadas de atún patudo en el OPO durante 2009 por buques palangreros.

Country	First quarter	Second quarter	Third quarter				Total to date
			July	August	September	Total	
Pais	**Primer trimestre**	**Segundo trimestre**	**Tercer trimestre**				**Total al fecha**
			Julio	**Agosto**	**Septiembre**	**Total**	
China	494	677	159	238	301	698	1,869
Japan—Japón	3,362	2,825	1,106	1,275	717	3,098	9,285
Republic of Korea—República de Corea	1,314	1,526	652	446	-	1,098	3,938
Chinese Taipei—Taipei Chino	461	625	-	-	-	-	1,086
USA—EE.UU	-	-	-	-	-	-	-
Vanuatu	-	-	-	-	-	-	-
Total	5,631	5,653	1,917	1,959	1,018	4,894	16,178

TABLE 4. Preliminary data on the sampling coverage of trips by vessels with capacities greater than 363 metric tons, plus one trip by a smaller vessel, by the observer programs of the IATTC, Colombia, Ecuador, the European Union, Mexico, Nicaragua, Panama, and Venezuela during the third quarter of 2009. The numbers in parentheses indicate cumulative totals for the year.

TABLA 4. Datos preliminares de la cobertura de muestreo de viajes de buques con capacidad más que 363 toneladas métricas, más un viaje de un buque de capacidad menor, por los programas de observadores de la CIAT, Colombia, Ecuador, México, Nicaragua, Panamá, la Unión Europea, y Venezuela durante el tercer trimestre de 2009. Los números en paréntesis indican totales acumulados para el año.

Flag	Trips		Observed by program						Percent observed	
			IATTC		National		Total			
Bandera	Viajes		Observado por programa						Porcentaje observado	
			CIAT		Nacional		Total			
Colombia	10	(34)	3	(17)	7	(17)	10	(34)	100.0	(100.0)
Ecuador	34	(166)	28	(113)	6	(53)	34	(166)[1]	100.0	(100.0)
España—Spain	7	(18)	3	(10)	4	(8)	7	(18)	100.0	(100.0)
Guatemala	1	(7)	1	(7)			1	(7)	100.0	(100.0)
Honduras	2	(10)	2	(10)			2	(10)	100.0	(100.0)
México	55	(168)	27	(87)	28	(81)	55	(168)	100.0	(100.0)
Nicaragua	4	(14)	2	(6)	2	(8)	4	(14)	100.0	(100.0)
Panamá	23	(75)	11	(41)	12	(34)	23	(75)	100.0	(100.0)
Perú	1	(3)	1	(3)			1	(3)	100.0	(100.0)
El Salvador	4	(17)	4	(17)			4	(17)	100.0	(100.0)
U.S.A.—EE.UU.	0	(6)	0	(5)		(1)[2]	0	(6)	100.0	(100.0)
Venezuela	13	(56)	7	(26)	6	(30)	13	(56)	100.0	(100.0)
Vanuatu	4	(11)	4	(11)			4	(11)	100.0	(100.0)
Total	158	(585)[3]	93	(353)	65	(232)	158	(585)[3]	100.0	(100.0)

1 Includes one fishing trip, with an observer, by a vessel with a fish-carrying capacity not greater than 363 metric tons during the closure period for the purse-seine fishery

1 Incluye un viaje de pesca por un buque de no más de 363 toneladas métricas de capacidad de acarreo, con observador, durante el período de veda de la pesquería de cerco con.

2 One trip by a U.S.-flag vessel was sampled by the national observer program of Panama (PRONAOP). The vessel was Panamanian flag until just prior to its departure, and the PRONAOP observer had already been assigned to it.

2 El Programa Nacional de Observadores Panameños (PRONAOP) muestreó un viaje de un buque de EE.UU. El buque tuvo bandera panameña hasta just antes de zarpar, y el observador del PRONAOP ya había sido asignado.

3 Includes 65 trips (40 with observers from the IATTC program and 25 with observers from the national programs) that began in late 2008 and ended in 2009

3 Incluye 65 viajes (40 con observadores del programa del CIAT y 25 con observadores de los programas nacionales) iniciados a fines de 2008 y terminados en 2009

TABLE 5. Oceanographic and meteorological data for the Pacific Ocean, October 2008-September 2009. The values in parentheses are anomalies. SST = sea-surface temperature; SOI = Southern Oscillation Index; SOI* and NOI* are defined in the text.
TABLA 5. Datos oceanográficos y meteorológicos del Océano Pacífico, octubre 2008-septiembre 2009. Los valores en paréntesis son anomalías. TSM = temperatura superficie del mar; IOS = Índice de Oscilación del Sur; IOS* y ION* están definidas en el texto.

Month—Mes	10	11	12	1	2	3
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	20.8 (-0.2)	21.5 (-0.2)	22.4 (-0.4)	24.3 (-0.2)	26.0 (-0.1)	26.4 (-0.1)
Area 2 (5°N-5°S, 90°-150°W	24.8 (-0.1)	24.8 (-0.2)	24.6 (-0.5)	25.0 (-0.6)	25.8 (-0.6)	26.4 (-0.6)
Area 3 (5°N-5°S, 120°-170°W)	26.3 (-0.3)	26.3 (-0.2)	25.7 (-0.7)	25.9 (-1.0)	26.0 (-0.7)	26.7 (-0.5)
Area 4 (5°N-5°S, 150W°-160°E)	28.3 (-0.1)	28.1 (-0.3)	27.7 (-0.6)	27.4 (-0.7)	27.4 (-0.7)	27.8 (-0.3)
Talara, Perú	17.8 (-0.1)	18.0 (-0.1)	17.6 (-1.1)	22.1 (0.8)	20.4 (0.6)	20.8 (2.0)
Callao, Perú	15.3 (0.1)	14.7 (-1.0)	14.2 (-2.0)	15.6 (-1.7)	16.9 (-0.7)	17.0 (0.3)
Thermocline depth—Profundidad de la termoclina, 0°, 80°W (m)	45	35	20	20	10	10
Thermocline depth—Profundidad de la termoclina, 0°, 110°W (m)	45	35	20	25	25	70
Thermocline depth—Profundidad de la termoclina, 0°, 150°W (m)	120	140	125	140	130	130
Thermocline depth—Profundidad de la termoclina, 0°, 180°W (m)	170	165	180	180	180	190
Sea level—Nivel del mar, Callao, Perú (cm)	104.7	101.8	97.8	107.7	110.2	113.7
SOI—IOS	1.3	1.5	1.5	1.2	0.8	-0.1
SOI*—IOS*	4.73	2.60	3.97	3.18	3.66	1.06
NOI*—ION*	2.20	2.52	4.22	6.76	-1.16	4.57

Month—Mes	4	5	6	7	8	9
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	26.0 (0.5)	24.9 (0.6)	23.7 (0.7)	23.7 (0.9)	21.6 (0.8)	20.8 (0.3)
Area 2 (5°N-5°S, 90°-150°W	27.4 (0.0)	27.4 (0.4)	27.1 (0.7)	26.6 (1.0)	25.9 (1.0)	25.7 (0.8)
Area 3 (5°N-5°S, 120°-170°W)	27.5 (-0.2)	28.0 (0.3)	28.1 (0.6)	28.0 (0.9)	27.5 (0.8)	27.5 (0.8)
Area 4 (5°N-5°S, 150W°-160°E)	28.4 (0.0)	29.0 (0.3)	29.2 (0.6)	29.2 (0.6)	29.2 (0.8)	29.3 (0.8)
Talara, Perú	18.2 (-1.8)	18.8 (-0.5)	19.5 (0.5)	20.0 (2.3)	18.3 (0.7)	17.3 (-0.6)
Callao, Perú	16.6 (-1.0)	16.8 (-0.5)	16.8 (0.2)	17.6 (1.4)	15.7 (-0.1)	15.5 (0.1)
Thermocline depth—Profundidad de la termoclina, 0°, 80°W (m)	10	10	30	20	25	25
Thermocline depth—Profundidad de la termoclina, 0°, 110°W (m)	60	90	90	70	40	90
Thermocline depth—Profundidad de la termoclina, 0°, 150°W (m)	150	160	150	140	155	130
Thermocline depth—Profundidad de la termoclina, 0°, 180°W (m)	210	190	160	180	175	180
Sea level—Nivel del mar, Callao, Perú (cm)	112.4	121.7	120.9	105.4	112.0	108.4
SOI—IOS	0.7	-0.4	-0.3	0.1	-0.7	0.3
SOI*—IOS*	137	1.81	-5.62	4.55	-2.58	4.92
NOI*—ION*	3.12	1.11	-2.38	0.20	-0.26	1.42