INTER-AMERICAN TROPICAL TUNA COMMMISSION
COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL

QUARTERLY REPORT—INFORME TRIMESTRAL

April-June 2008—Abril-Junio 2008

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

April-June 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

Abril-Junio 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 meetings

The ninth IATTC Stock Assessment Review Meeting was held in La Jolla, California, USA, on 12-16 May 2008. Dr. Guillermo A. Compeán presided at the meeting, Dr. Robert J. Olson served as one of the two rapporteurs, and presentations were made by Drs. Compeán, Olson, Richard B. Deriso, Martín A. Hall, and Mark N. Maunder, and Messrs. Alexandre Aires-da-Silva, Edward H. Everett, and Kurt M. Schaefer.

The following meetings of the IATTC and the IDCP and their working groups were held in Panama, R.P., in June 2008:

Inter-American Tropical Tuna Commission		
Meeting		**Dates**
9	Permanent Working Group on Compliance	19 June 2008
3	WCPFC-IATTC Consultative Meeting	27 June 2008
78	Inter-American Tropical Tuna Commission	23-27 June 2008

International Dolphin Conservation Program		
Meeting		**Dates**
25	Permanent Working Group on Tuna Tracking	16 June 2008
11	Working Group to Promote and Publicize the AIDCP Dolphin Safe Tuna Certification System	16 June 2008
45	International Review Panel	17 June 2008
19	Parties to the AIDCP	18 June 2008

IATTC and IDCP		
Meeting		**Date**
7	Joint Working Group on Fishing by Non-Parties	20 June 2008

Other meetings

Dr. Michael G. Hinton participated in the Second Session of the FIRMS [Fishery Resources Monitoring System] Technical Working Group in Rome, Italy, on 1-4 April 2008. He served as co-chairman, along with Pilar Pallares of the International Commission for the Conservation of Atlantic Tunas and David Ramm of the Commission for the Conservation of Antarctic Marine Living Resources. At this meeting the participants reviewed and finalized the steps necessary to initiate publication of Fisheries Fact Sheets on the FIGIS [Fisheries Global Information System] web site, received an introduction and training on new tools for posting and updating information on FIGIS web pages, and made recommendations to be considered by the larger group of partners at the FIRMS Steering Committee meeting, to be held in July 2008.

Dr. Martín A. Hall spent the period of 6-7 April 2008, in Manta, Ecuador, where he participated in a captain's seminar and a meeting entitled "Discussion of Options for Experiments on the Selectivity of Tuna Purse-Seine Nets."

Dr. Martín A. Hall spent the period of 9-10 April 2008, in Maracaibo, Venezuela, where he participated in a workshop entitled "Experimental Design for the Mitigation of Bycatches of Sea Turtles," organized by the Instituto Venezolano de Investigaciones Cientificas, at which he gave the following presentations:

"Interactions of Longline Fisheries with Sea Turtles";

"Strategies for Mitigating Bycatches of Sea Turtles: the IATTC's Experiences";

"Seminar: Fisheries Bycatch: Examples and Mitigation Strategies";

"Two Cases of Bycatch Mitigation: Dolphins in the Tuna Purse-Seine Fishery and Sea Turtles in the Artisanal Longline Fishery";

"Experimental Design Applied to Bycatch Mitigation."

Mr. Vernon P. Scholey participated in the first 2008 meeting of the Board of Directors of the Secretaría Nacional de Ciencia, Tecnología e Innovación (SENACYT) of Panama in Panama, R.P., on 10 April 2008.

Dr. Martín A. Hall gave a demonstration on the organization and execution of a workshop for artisanal fishermen at Isla Zapata, Venezuela, on 11 April 2008.

Ms. Nora Roa-Wade participated in a meeting of the International Fisheries Commissions Pension Society in Washington, D.C., USA, on 16-18 April 2008.

Dr. Guillermo A. Compeán participated in the "Sustainable Tuna Roundtable" in Brussels, Belgium, on 21 April 2008. The Sustainable Tuna Roundtable "brings key industry interests together to discuss tuna fishery sustainability issues and supplier and retailer sourcing policies. Two main meeting purposes are to (i) improve communication between the tuna fishing industry, retail industry and buyers to increase the factual basis of fishery sustainability assessments and seafood sourcing policies, and ultimately improve the sustainability of practices by the tuna fishing industries; and (ii) discuss options for the assessment and certification of tuna fisheries against standards for ecological sustainability, social responsibility and food safety, and identify next steps to achieve a single set of standards. [The] participants [included representatives of] the tuna fishing industry, retail/foodservice industries, buyers, and inter-governmental organizations, including regional fisheries management organizations and other regional fishery bodies."

Dr. Guillermo A. Compeán participated in most of the "World Symposium for the Study into the Stock Fluctuation of Northern Bluefin Tunas (*Thunnus thynnus* and *Thunnus orientalis*) including Historic Periods" in Santander, Spain, on 21-28 April 2008, where he made the following presentation: "An Historical Overview of the Bluefin Fishery in the Eastern Pacific Ocean" by A. Aires-Da-Silva, G. Compeán, and M. Dreyfus.

Dr. Guillermo A. Compeán participated in a meeting of the Comisión Nacional de Acuacultura y Pesca (CONAPESCA) of Mexico in Mazatlan, Mexico, on 29 April-3 May 2008, where he gave a presentation entitled "The Status of the Tuna Stocks." This presentation was made in response to a request by Mexican authorities who were preparing to participate in the 78th meeting of the IATTC, which was to take place in Panama, R.P., on 23-27 June 2008.

Many members of the IATTC staff attended all or parts of the 59th Tuna Conference in Lake Arrowhead, California, on 19-22 May 2008. Dr. Guillermo A. Compeán was one of four participants in a special session entitled "Challenges to Management in the 21st Century," at which he gave a talk entitled "Challenges to Developing International Consensus." Dr. William H. Bayliff was moderator of a session on "Management" and Mr. Kurt M. Schaefer was moderator of a session on "Biology." Talks were given by Dr. Robert J. Olson, Messrs. Daniel W. Fuller, Marlon H. Román Verdesoto, and Kurt M. Schaefer, and Ms. Maria C. Santiago. In addition, research in which Drs. Olson, Cleridy E. Lennert-Cody, and Daniel Margulies, Messrs. Fuller, Schaefer, and Vernon P. Scholey, and Ms. Jeanne B. Wexler had participated was presented by other speakers. Also, Ms. Leanne M. Duffy presented a poster prepared by her and Dr. Olson.

Mr. Alexandre Aires-da-Silva participated in a meeting of the Bluefin Working Group of the International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean in Shimizu, Japan, on 18 May-6 June 2008.

Mr. Vernon P. Scholey participated in the workshop "Developing a Sustainable Aquaculture Industry in the Azores," held in Horta, Portugal, on 2-5 June 2008. He presented a paper, co-authored with Dr. Daniel Margulies and Mss. Jeanne B. Wexler, and Maria C. Santiago, entitled "Review of Tuna Research at the Inter-American Tropical Tuna Commission Achotines Laboratory." Mr. Scholey's travel expenses were paid by the workshop organizers (United States Department of Agriculture, the European Union, and the Regional Government of the Azores).

Dr. Guillermo A. Compeán participated in the 19th Conferencia de Ministros de OLDEPESCA (Organización Latinoamericana de Desarrollo Pesquero) in Lima, Peru, on 4-6 June 2008, at which he gave a presentation entitled "El Trabajo de la CIAT en Latinoamérica."

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 10-12 June 2008. His travel expenses were paid by the Western Pacific Fishery Management Council.

Dr. Michael G. Hinton participated in a meeting of the Billfish Working Group of the International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean in Abashiri, Japan, on 11-19 June 2008.

DATA COLLECTION

The IATTC has field offices at Las Playas and Manta, Ecuador; Manzanillo and Mazatlan, Mexico; Panama, Republic of Panama; Mayaguez, Puerto Rico, USA; and Cumaná, Venezuela.

Personnel at these offices collected 350 length-frequency samples from 208 wells and abstracted logbook information for 267 trips of commercial fishing vessels during the second quarter of 2008.

Also during the second quarter members of the field office staffs placed IATTC observers on 133 fishing trips by vessels that participate in the AIDCP On-Board Observer Program. In addition, 130 IATTC observers completed trips during the quarter, and were debriefed by field office personnel.

Surface fleet and surface catch and catch-per-unit-of-effort statistics

Statistical data for purse-seine and pole-and-line vessels are continuously being collected by personnel at the IATTC's field stations 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 228,800 cubic meters (m^3) (Table 1). The weekly average at-sea capacity for the fleet, for the weekly periods ending 31 March through 29 June, was about 149,000 m^3 (range: 138,000 to 162,400 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 and catch-per-unit-of-effort statistics for the purse-seine and pole-and-line fisheries

Catch statistics

The estimated total retained catches of tunas in the EPO during the 1 January-29 June 2008 period, in metric tons (t), were:

Species	**2008**	**2003-2007**			**Weekly average, 2008**
		Average	**Minimum**	**Maximum**	
Yellowfin	110,500	158,700	105,900	229,300	4,200
Skipjack	179,200	121,500	96,500	144,900	6,900
Bigeye	37,700	22,800	13,000	30,500	1,400

Preliminary estimates of the retained catches, by species and by flag of vessel, are shown in Table 3.

Catch-per-unit-of-effort statistics based on vessel logbook abstracts

The logbook data used in the analyses have been obtained with the cooperation of vessel owners and captains. The catch and effort measures used by the IATTC staff are based on fishing trips landing predominantly yellowfin, skipjack, bigeye, and bluefin tuna. The great majority of the purse-seine catches of yellowfin, skipjack, and bigeye are made by vessels with carrying capacities greater than 363 t, and only data for purse seiners with carrying capacities greater than 363 t are included herein for comparisons among years. There are now far fewer pole-and-line vessels than in previous years, so the data for these vessels are combined without regard to size classes. There are no adjustments included for other factors, such as type of set or vessel operating costs and market prices, which might identify whether a vessel was directing its effort toward a specific species.

Preliminary estimates of the catches per unit of effort (CPUEs), expressed as catches per day's fishing by purse seiners, of yellowfin (Table 4), skipjack (Table 5), and bigeye (Table 6) in the EPO during the first quarter of 2008 and the corresponding periods of 2003-2007, in metric tons, were:

Species	Region	2008	2003-2007		
			Average	Minimum	Maximum
Yellowfin	N of 5°N	10.5	13.4	9.1	23.0
	S of 5°N	4.6	5.6	2.8	9.1
Skipjack	N of 5°N	2.5	2.0	1.1	3.6
	S of 5°N	16.1	9.1	13.4	13.4
Bigeye	EPO	2.1	1.6	1.4	1.9

Catch statistics for the longline fishery

The catches of bigeye by longline gear in the EPO during the first and second quarters of 2008 are shown in Table 7. 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, its Annual Reports for 1954-2002, its Fishery Status Reports 1-5, and its Stock Assessment Reports 1-8.

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 1).

Data for fish caught during the first quarter of 2003-2008 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 first quarter of 2008, and the second shows the combined data for the first quarter of each year of the 2003-2008 period. Samples from 275 wells were taken during the first quarter of 2008. There were no reported catches made by pole-and-line vessels during the first quarter of 2008.

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 275 wells sampled during the first quarter of 2008, 137 contained yellowfin. The estimated size compositions of these fish are shown in Figure 2a. The majority of the yellowfin catch was taken by sets on schools associated with dolphins in the Northern, Inshore, and Southern areas. Smaller amounts of yellowfin were taken on unassociated schools in the North and South, and on schools associated with floating objects in the Equatorial and Inshore areas. There were also small amounts of yellowfin taken on floating-object sets in the Northern and Southern areas.

The estimated size compositions of the yellowfin caught by all fisheries combined during the first quarter of 2003-2008 are shown in Figure 2b. The average weights of the fish caught during the first quarter of 2008 were less than those caught during 2007, greater than those caught during 2005 and 2006, but considerably less than those caught during 2003 and 2004.

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 275 wells sampled during the first quarter of 2008, 216 contained skipjack. The estimated size compositions of these fish are shown in Figure 3a. A large portion of the skipjack caught during the first quarter was taken in the Southern unassociated fishery. There were also significant catches of skipjack in the Equatorial, Inshore, and Southern floating-object fisheries. Small amounts of skipjack were taken in the Northern unassociated and floating-object fisheries, and in schools associated with dolphins.

The estimated size compositions of the skipjack caught by all fisheries combined during the first quarter of 2003-2008 are shown in Figure 3b. The average weights of skipjack caught during the first quarter of 2008 were equal to those caught in 2006, but less than those caught during that period of 2003-2005 and 2007. Most of the skipjack caught in the first quarter of 2008 were between 40 and 50 cm in length.

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 275 wells sampled during the first quarter of 2008, 39 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 Equatorial and Southern areas, with smaller catches in the Northern, and Inshore floating-object fisheries. A small amount of bigeye was caught in the unassociated fishery. There were no recorded catches of bigeye in sets on fish associated with dolphins.

The estimated size compositions of the bigeye caught by all fisheries combined during the first quarter of 2003-2008 are shown in Figure 4b. The average weight of bigeye caught during the first quarter of 2008 was considerably greater than those of the five previous years.

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 230 fishing trips aboard purse seiners covered by that program during the second quarter of 2008. Preliminary coverage data for these vessels during the quarter are shown in Table 8. In addition to those trips, the Program has been placing observers aboard one vessel with a fish-carrying capacity of less than 364 metric tons since September 2007, 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. Four fishing trips by that vessel that began during the second quarter of 2008 were accompanied by observers.

Training

No observer training courses were conducted during the second quarter by either the IATTC program or any of the national programs.

RESEARCH

Tuna tagging

Mr. Kurt M. Schaefer spent the period of 1-14 April 2008 at the Achotines Laboratory in Panama, where, with the assistance of Achotines Laboratory staff members, he tagged 41 yellowfin tuna with archival tags near the Islas Los Frailes. The fish ranged in weight from about 3 to 7 kg. The objective was to expand the geographical distribution of deployments of archival tags on yellowfin tuna in the eastern Pacific Ocean (EPO). Other deployments by the IATTC staff have taken place off Baja California, Mexico, in 2002-2008, at the Revillagigedo Islands in 2006-2008, in the equatorial EPO in 2006, and near the Islas Los Frailes in 2007.

Messrs. Schaefer and Daniel W. Fuller spent the period of 16-27 April 2008 aboard the San Diego-based 28-m long-range sport-fishing vessel *Royal Star* on a fishing trip to the Revillagigedo Islands Marine Reserve, Mexico, where they tagged yellowfin tuna and wahoo. The tagging project is a collaborative effort involving the IATTC, the Instituto Nacional de Pesca of Mexico, and the owners of the *Royal Star*. The permit obtained from the government of

Mexico for this project provides a unique opportunity to conduct a comprehensive scientific evaluation of the movements and behavior of these two species within the Reserve and in the areas to which they might move. The cruise was highly successful, as 376 yellowfin were tagged with conventional dart tags or intramuscular tags, 23 yellowfin were tagged with archival tags, and 57 wahoo were tagged with 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.) The numbers of tagged fish released, by species, estimated weight, and tag type, were as follows:

Species	Number	Estimated weight		Tag type
		Pounds	Kilograms	
Yellowfin	145	<100	<45	dart or intramuscular
Yellowfin	147	100-150	45-68	dart or intramuscular
Yellowfin	67	150-200	68-91	dart or intramuscular
Yellowfin	17	>200	>91	dart or intramuscular
Yellowfin	23	10-50	5-23	archival
Wahoo	57	20-40	9-18	intramuscular

The largest tagged yellowfin weighed about 290 pounds (132 kg).

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 1-4 and 8-24 April. Spawning occurred between 8:15 p.m. and 10:35 p.m. The numbers of eggs collected after each spawning event ranged from about 7,000 to 2,135,000. The water temperatures in the tank during the quarter ranged from 23.7° to 28.6°C.

In April, 22 4- to 13-kg yellowfin, 6 of which had archival tags implanted in them, were transferred from the reserve broodstock tank (Tank 2; 170,000 L) to Tank 1, but all of them (17 females and 5 males) died within one month after transfer due to stress and inability to feed efficiently in the presence of the older, larger yellowfin that were already in the tank. Additionally, three females (61 to 72 kg) and two males (34 and 36 kg) died during the quarter in Tank 1. One of the females died by striking the tank wall, one had not been feeding due to mouth and eye damage, and one died of unknown causes. Both of the males, which had had archival tags implanted in them in January 2007, died of starvation due to impaired vision. At the end of June there were seven 36- to 61-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 June 2008 one fish from those groups remained in Tank 1. In late January 2007 10 yellowfin (4 to 10 kg) held in Tank 2 were implanted with prototype archival tags and transferred to Tank 1. At the end of this quarter, three of the January 2007 group remained in Tank 1.

Tank 2 held 11 yellowfin at the end of June. One of these fish had had an archival tag implanted in it in April 2008.

Skipjack

Over the past 20 years skipjack tuna have been caught only occasionally near the Achotines Laboratory. During May large schools of skipjack were observed within 8-12 miles of the Laboratory, and several were captured and transported to the holding tanks, but all but two of them died almost immediately, due to transfer stress or collisions with the walls of the tanks. After a short acclimation period the two survivors were transferred to Tank 2, but neither survived there for more than two weeks.

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.

Experiments with yellowfin tuna larvae

During the quarter, an experiment was conducted to examine the effect of a 4-fold difference in density on growth of larvae between 8 and 15 days after hatching. The age range used in this experiment will provide additional growth information for the transitional stage of development. Previous experiments had been conducted to estimate the density-dependent growth of larvae during the first two weeks of feeding (3-18 days after hatching), and the results indicated that the larvae grow more rapidly when they are maintained at lower densities. The results of the most recent experiment will be analyzed during the next quarter.

Also during the quarter, an experiment was conducted in collaboration with Clean Seas Tuna of Port Lincoln, Australia, to examine the effect of an extended light cycle (24 hours of light per day versus the normal 11 hours of light and 13 hours of darkness) on the survival, growth, and vertical distribution of yellowfin larvae after 5-6 days of feeding. (It is known that the larvae tend to sink toward the bottom of the tank during periods of darkness, and it was thought that their survival rate might be greater if they remained close to the surface. However, there is no way to measure the vertical distribution of the larvae.) There were no significant differences in survival or growth between the control and treatment groups in either of two replications of the experiment.

During the quarter, several cohorts of yellowfin larvae and juveniles were raised by the La Jolla and Achotines staffs from the egg stage through 1 to 6 weeks of feeding. They were used for the experiments mentioned above, for the IATTC-University of Miami workshop described in the section of this report entitled **INTER-AGENCY COOPERATION**, and for collaborative feeding trials with visiting members of the staff of Clean Seas Tuna. At the end of the quarter the remaining juveniles were approximately 5-6 cm in length.

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 began spawning in March, and continued to spawn, on average, two times weekly through the end of the second quarter.

The second group consists of 25 individuals from a group bred at the Laboratory from eggs obtained from spawning in 1998. They began spawning in March, and continued to spawn, on average, once weekly through the end of the second quarter.

Visitors at the Achotines Laboratory

Messrs. Ray Davis, Senior Vice President of Zoological Operations, and Chris Coco, Husbandry Manager, at the Georgia Aquarium in Atlanta, Georgia, USA, spent the period of 28-29 April 2008 at the Achotines Laboratory, where they discussed possible cooperation between the IATTC and the Georgia Aquarium with staff members at the Laboratory.

On 21 June 2008, the Achotines Laboratory received a visit from about 25 persons, including Dr. Guillermo Compeán, several IATTC Commissioners, and others participating in the 78th Annual Meeting of the IATTC in Panama, R.P. Dr. Daniel Margulies and Messrs. Vernon P. Scholey, Luís C. Tejada, and Amado Cano led tours of the Laboratory facilities and provided summaries of the research programs being conducted at the Laboratory. The transportation for the visit was coordinated by the Autoridad de los Recursos Acuáticos de Panamá and the Fundación Internacional de Pesca, Panamá.

Dolphin studies

Estimates of the mortality of dolphins due to fishing

The preliminary estimate of the incidental mortality of dolphins in the fishery in 2007 is 838 animals (Table 9), a 5.4-percent decrease relative to the 886 mortalities recorded in 2006. The mortalities for 1979-2007, by species and stock, are shown in Table 10, and the standard errors of these estimates are shown in Table 11. The estimates for 1979-1992 are based on a mortality-per-set ratio. The estimates for 1993-1994 are based on the sums of the IATTC species and stock tallies and the total dolphin mortalities recorded by the Mexican program, prorated to species and stock. The mortalities for 1995-2007 represent the sums of the observed species and stock tallies recorded by the IATTC and national programs. The mortalities for 2001-2003 have been adjusted for unobserved trips of vessels with carrying capacities greater than 363 metric tons. The sums of the estimated mortalities for the northeastern and western-southern stocks of offshore spotted dolphins are not necessarily equal to those for the previous stocks of northern and southern offshore dolphins because the estimates for the two stock groups are based on different areal strata, and the mortalities per set and the total numbers of sets vary spatially. The mortalities of the principal dolphin species affected by the fishery show declines (Figure 5) similar to that for the mortalities of all dolphins combined (Figure 6). Estimates of the abundances of the various stocks of dolphins and the relative mortalities (mortality/abundance) are also shown in Table 9. The stock with the highest level of relative mortality (0.03 percent) was the eastern spinner dolphin.

The trends in the numbers of sets on dolphin-associated fish ("dolphin sets"), mortality per set, and total mortality in recent years are shown in Figure 6.

Comparisons of some data for vessels with carrying capacities greater than 363 metric tons are shown below. (Smaller vessels rarely make sets on dolphin-associated tuna, and observers do not routinely accompany trips of such vessels.)

	2006	2007
Dolphin sets:		
Number of sets	8,923	8,871
Percentage of total sets that were dolphin sets	36	37
Catches of yellowfin in dolphin sets:		
Average catch, in metric tons	11.2	11.7
Percentage of total yellowfin catch taken in dolphin sets	59	56
Mortality of dolphins:		
Per dolphin set	0.10	0.09
Per metric ton of yellowfin caught in dolphin sets	0.0089	0.0081

Causes of the mortality of dolphins

The above figures are based on data from trips covered by observers from all components of the On-Board Observer Program. The comparisons in the next paragraph are based on the IATTC data bases for 1986-2007 only.

The decrease in the mortality per set is the result of actions by the fishermen to better manage the factors that bring about incidental mortalities of dolphins. Indicative of this effort is the number of sets in which no mortalities occurred, which has increased from 38 percent in 1986 to 94 percent in 2007, and the average number of animals left in the net after backdown, which has decreased from 6.0 in 1986 to less than 0.1 in 2007 (Table 12). The factors under the control of the fishermen that are likely to affect the mortality of dolphins per set include the occurrence of malfunctions, especially those that lead to net canopies and net collapses, and the time it takes to complete the backdown maneuver (Table 12). The percentage of sets with major mechanical malfunctions has decreased from an average of approximately 11 percent during the late 1980s to less than 6 percent during 2003-2007; during the same period the percentage of sets with net collapses decreased from about 30 percent to less than 5 percent and that of net canopies from about 20 percent to less than 5 percent. Although the chance of dolphin mortality increases with the duration of the backdown maneuver, the average backdown time has changed little since 1986. Also, the mortality of dolphins per set increases with the number of animals in the encircled herd, in part because the backdown maneuver takes longer to complete when larger herds are encircled. The fishermen could reduce the mortalities per set by encircling schools of fish associated with fewer dolphins.

Distribution of fishing effort

The spatial distributions of sets on tunas associated with dolphins in 2006 and 2007 by vessels carrying observers are shown in Figure 7. The patterns for the two years are largely similar.

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 March 2007 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. 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 2007: 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 had existed north and northwest of the Hawaiian Islands during the fourth quarter of 2007 persisted throughout the first and second quarters of 2008. Another area of warm water appeared south of 20°S between about 90° and 140°W in January 2008, and moved westward during the subsequent months. An area of warm water appeared off South America south of 20°S in February, increased in size in March (IATTC Quarterly Report for January-March 2008: Figure 8), and then decreased in size and eventually disappeared by June (IATTC Quarterly Report for:April-June 2007: Figure 8). 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 (IATTC Quarterly Report for January-March 2008: Figure 8). This area of cool water gradually dissipated during the second quarter of 2008, and was confined to waters north of 5°N by June (Figure 8). The small area of warm water that had appeared along the equator east of 100°W in March (IATTC Quarterly Report for January-March 2008: Figure 8) persisted throughout the second quarter (Figure 8). The data in Table 13 indicate that nearly normal conditions were in effect during the second quarter, with no SST anomalies exceeding -1.0 or +0.6. According to the Climate Diagnostics Bulletin of the U.S. National Weather Service for June 2008, "… neutral conditions are expected to continue into [the] Northern Hemisphere Fall [of] 2008."

GEAR PROGRAM

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

Two AIDCP seminars for fishermen were conducted by the IATTC staff during the second quarter, one in Manta, Ecuador, on April 7, 2008, for 16 attendees, and the other in La Unión, El Salvador, on June 1, 2008, for 1 attendee.

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 second quarter. The numbers of trips completed, numbers of samples taken, and numbers of fish sampled were as follows:

Month	Trips completed	Samples taken	Fish sampled		
			Yellowfin	Skipjack	Bigeye
April	27	18	4,876	1,600	200
May	19	18	4,837	1,154	527
June	26	23	7,766	1,650	550
Total	72	59	17,479	4,404	1,277

INTER-AGENCY COOPERATION

Dr. Robert J. Olson participated in the final examination of a doctoral candidate, M.C. Gladis López-Ibarra, of the Centro Interdisciplinario de Ciencias Marinas, La Paz, Mexico, on 6 June 2008. Her dissertation was entitled "Estructura Trófica de los Copépodos Pelágicos en el Océano Pacífico Oriental Tropical." Dr. Olson was a member of her doctoral committee.

The University of Miami and the IATTC held their sixth workshop, "Physiology and Aquaculture of Pelagics, with Emphasis on Reproduction and Early Developmental Stages of Yellowfin Tuna," on 9-21 June 2008 at the Achotines Laboratory. The organizers and instructors were Dr. Daniel Margulies and Mr. Vernon P. Scholey of the IATTC staff and Dr. Daniel Benetti, Director of the Aquaculture Program of the Rosenstiel School of Marine and Atmospheric Science, University of Miami. The participants were Dr. Gavin Partridge of the Challenger TAFE Aquaculture Development Unit, Fremantle, Australia, Mr. Adrian McIntyre of Clean Seas Tuna, Port Lincoln, Australia, and Mr. Adam Daw and Ms. Sierra Tobaison of the Pacific Aquaculture and Coastal Resources Center at the University of Hawaii at Hilo. Ms. Marina Marinho Nunes and Mr. John Stieglitz, graduate students of Dr. Benetti at the University of Miami, also participated in the workshop. A fee for the participants covered the expenses of putting on the workshop. Mr. Amado Cano (Autoridad de los Recursos Acuáticos de Panamá), Ms. Jeanne B. Wexler, and several members of the IATTC staff at the Achotines Laboratory also gave presentations and participated in portions of the workshop.

PUBLICATIONS

Arenas, Pablo. 2007. Estimated target fleet capacity for the tuna fleet in the eastern Pacific Ocean, based on the stock assessments of target species. FAO Fish. Proc., 8: 39-50.

Bayliff, W. H., and J. Majkowski (editors). 2007. Methodological workshop on the management of tuna fishing capacity: stock status, data envelopment analysis, industry surveys and management options. FAO Fish. Proc., 8: x, 218 pp.

Joseph, James, Dale Squires, William Bayliff, and Theodore Groves. 2007. Requirements and alternatives for the limitation of fishing capacity in tuna purse-seine fleets. FAO Fish. Proc., 8: 153-191.

Lennert-Cody, Cleridy E., Jason J. Roberts, and Richard J. Stephenson. 2008. Effects of gear characteristics on the presence of bigeye tuna (*Thunnus obesus*) in the catches of the purse-seine fishery of the eastern Pacific Ocean. ICES Jour. Mar. Sci., 65 (6): 970-978.

Maury, Olivier, Patrick Lehodey, Alverto Garcia, Francis Marsac, Robert Olson, Jock Young, Raghu Murtugudde, and Kathleen Miller. 2008. The first CLIOTOP symposium: an overview. GLOBEC International Newsletter, 14 (1): 59-63.

ADMINISTRATION

Dr. Mihoko Minami of the Institute of Statistical Mathematics, Tokyo, Japan, began a 1-year visit to the IATTC headquarters in La Jolla in early April 2008. She is working primarily with Dr. Cleridy E. Lennert-Cody on several projects, including trend estimation for bycatch data with zero-inflated models and development of dimension reduction methods for high-dimensional non-normal data, such as catch-bycatch species and size data.

Ms. Leanne M. Duffy, a graduate of the University of California at San Diego, was employed as an assistant scientist on 16 April 2008. She had worked on a contract basis with Dr. Robert J. Olson on ecosystem studies since December 2006, and she will now continue the same work as an IATTC staff member.

Alexandre Aires-de-Silva was awarded his Ph.D. degree by the University of Washington, Seattle, Washington, USA, on 14 June 2008. In addition, he was awarded the Doctoral Faculty Merit Award for 2008 by the School of Aquatic and Fishery Sciences, University of Washington. Parts of his dissertation have been published as:

Aires-da-Silva, Alexandre M., and Vincent F. Gallucci. 2007. Demographic and risk analyses applied to management and conservation of the blue shark (*Prionace glauca*) in the North Atlantic Ocean. Marine and Freshwater Research, 58 (6): 570-580.

Aires-da-Silva A., R. L. Ferreira, and J. G. Pereira. 2008. Blue shark catch rate patterns from the Portuguese longline fishery in the Azores. *In* Camhi, Merry D., Ellen K. Pikitch, and Elizabeth A. Babcock (editors), Sharks of the Open Ocean. Blackwell Publishing, Oxford: 230-234.

Aires-da-Silva, A. M., J. J. Hoey, and V. F. Gallucci. 2008. A historical index of abundance for the blue shark (*Prionace glauca*) in the western North Atlantic. Fisheries Research, 92 (1): 41-52.

SPECIAL RECOGNITION

The International Fisheries Commissions Pension Society recognized Dr. Robin Allen's contributions to that endeavor with a crystal plaque with the following inscription:

For 11 years, he has been a source of wise counsel and practical guidance to the member commissions. His selfless service to the well-being of commission pensioners and his prudent oversight of their funds has earned him an exceptional gratitude.

He was not at that meeting, but Ms. Nora Roa-Wade accepted it on his behalf and brought it back to the IATTC headquarters in La Jolla. Fortuitously, Dr. Allen was at a meeting in La Jolla at the time.

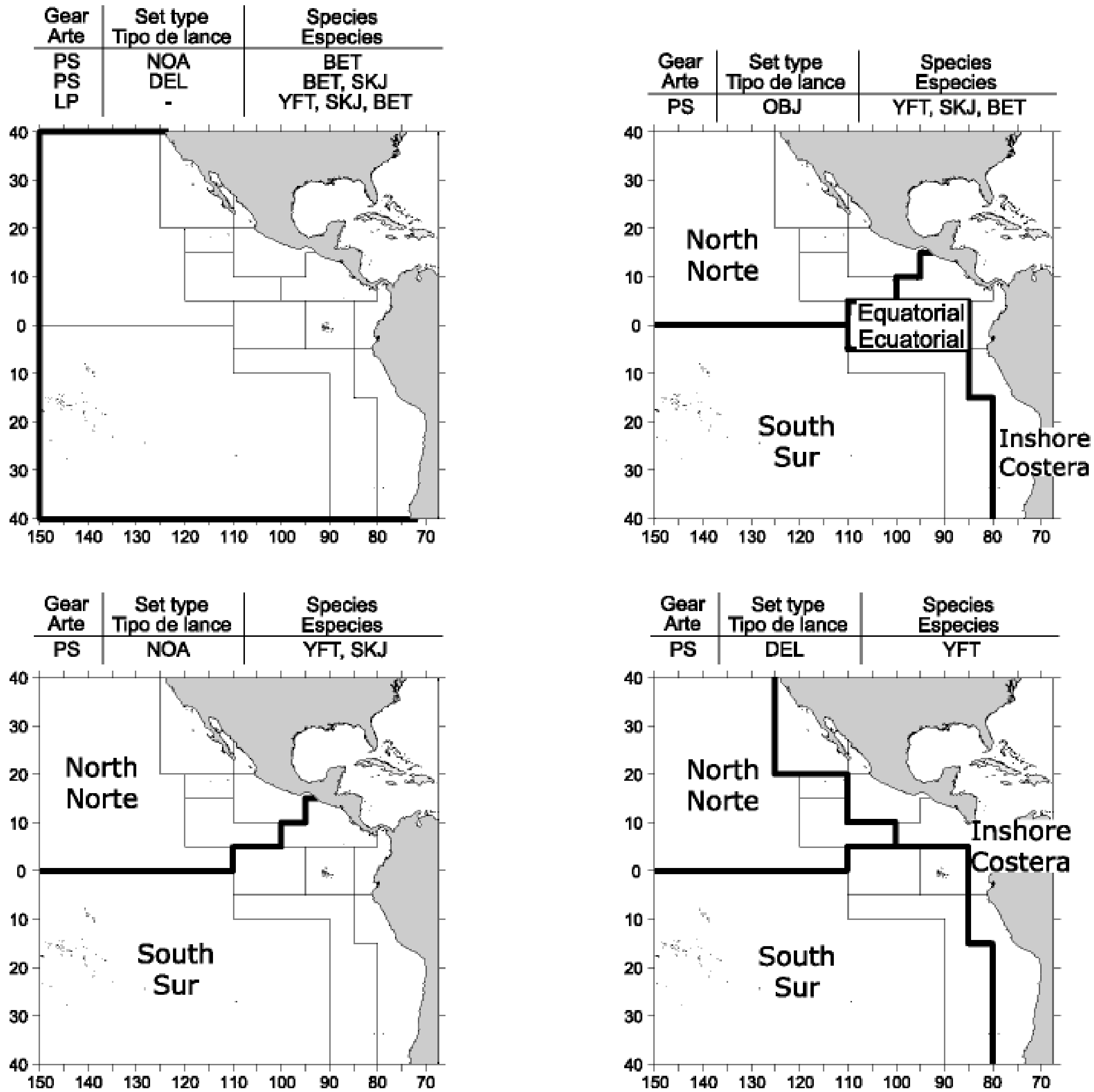

FIGURE 1. Spatial extents of the fisheries defined by the IATTC staff for stock assessment of yellowfin, skipjack, and bigeye in the EPO. The thin lines indicate the boundaries of the 13 length-frequency sampling areas, and the bold lines the boundaries of the fisheries. Gear: PS = purse seine, LP = 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, 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.

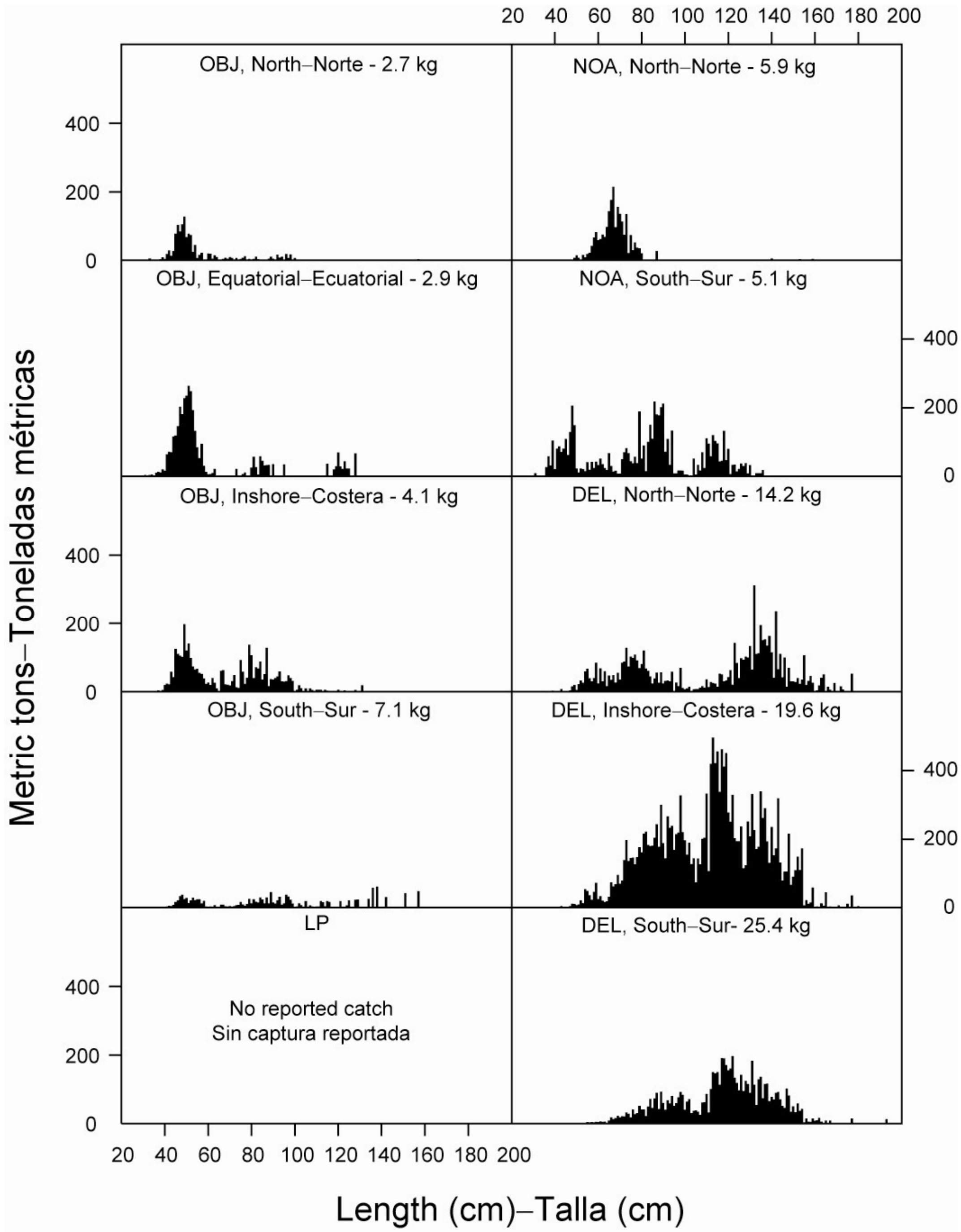

FIGURE 2a. Estimated size compositions of the yellowfin caught in each fishery of the EPO during the first quarter of 2008. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin.

FIGURA 2a. Composición por tallas estimada para el aleta amarilla capturado en cada pesquería del OPO durante el primer trimestre de 2008. En cada recuadro se detalla el peso promedio de los peces en las muestras. OBJ = objeto flotante; LP = caña; NOA = unassociated; DEL = delfín.

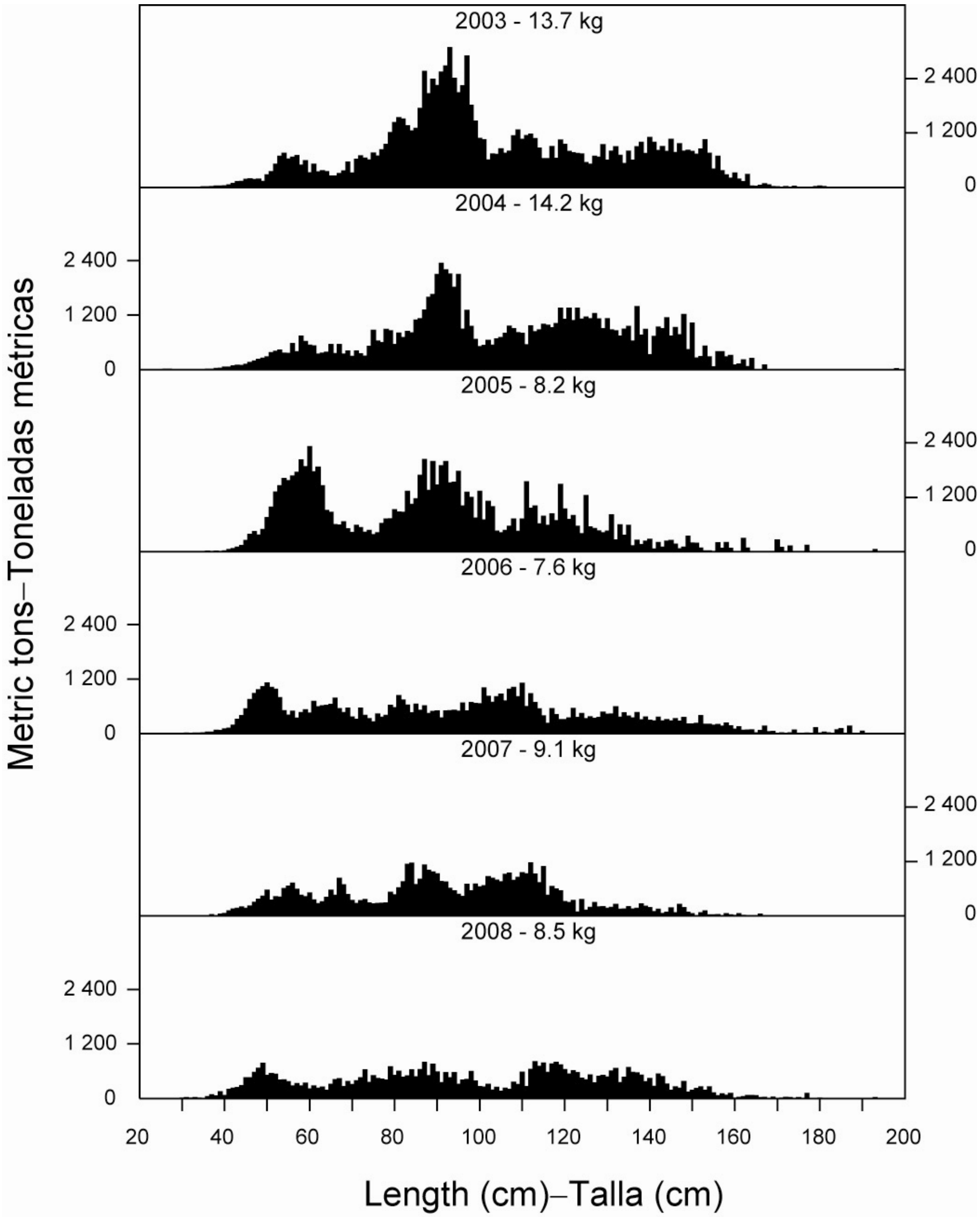

FIGURE 2b. Estimated size compositions of the yellowfin caught in the EPO during the first quarter of 2003-2008. The average weights of the fish in the samples are given at the tops of the panels.

FIGURA 2b. Composición por tallas estimada para el aleta amarilla capturado en el OPO en el primer trimestre de 2003-2008. En cada recuadro se detalla el peso promedio de los peces en las muestras.

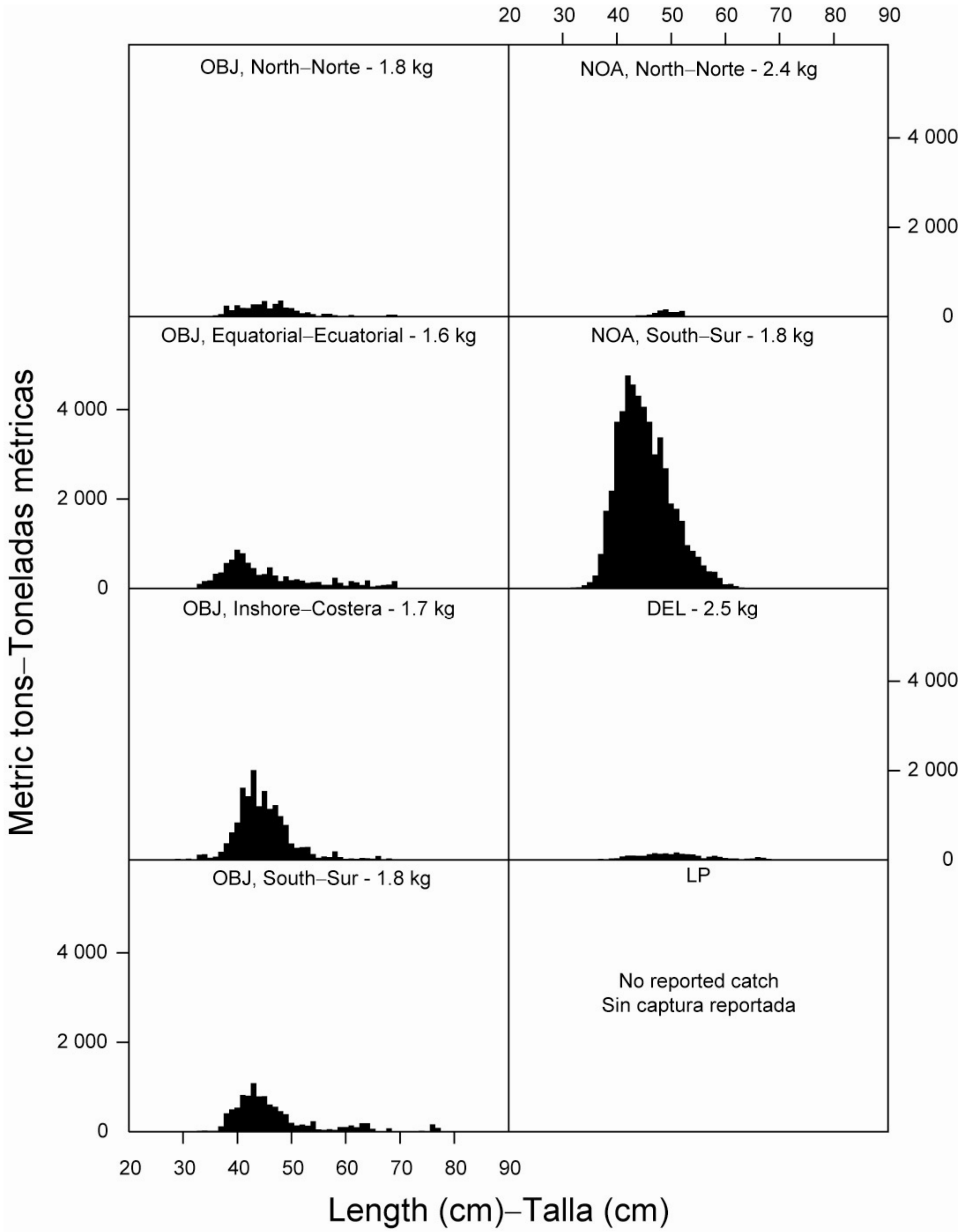

FIGURE 3a. Estimated size compositions of the skipjack caught in each fishery of the EPO during the first quarter of 2008. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin.

FIGURA 3a. Composición por tallas estimada para el barrilete capturado en cada pesquería del OPO durante el primer trimestre de 2008. En cada recuadro se detalla el peso promedio de los peces en las muestras. OBJ = objeto flotante; LP = caña; NOA = unassociated; DEL = delfín.

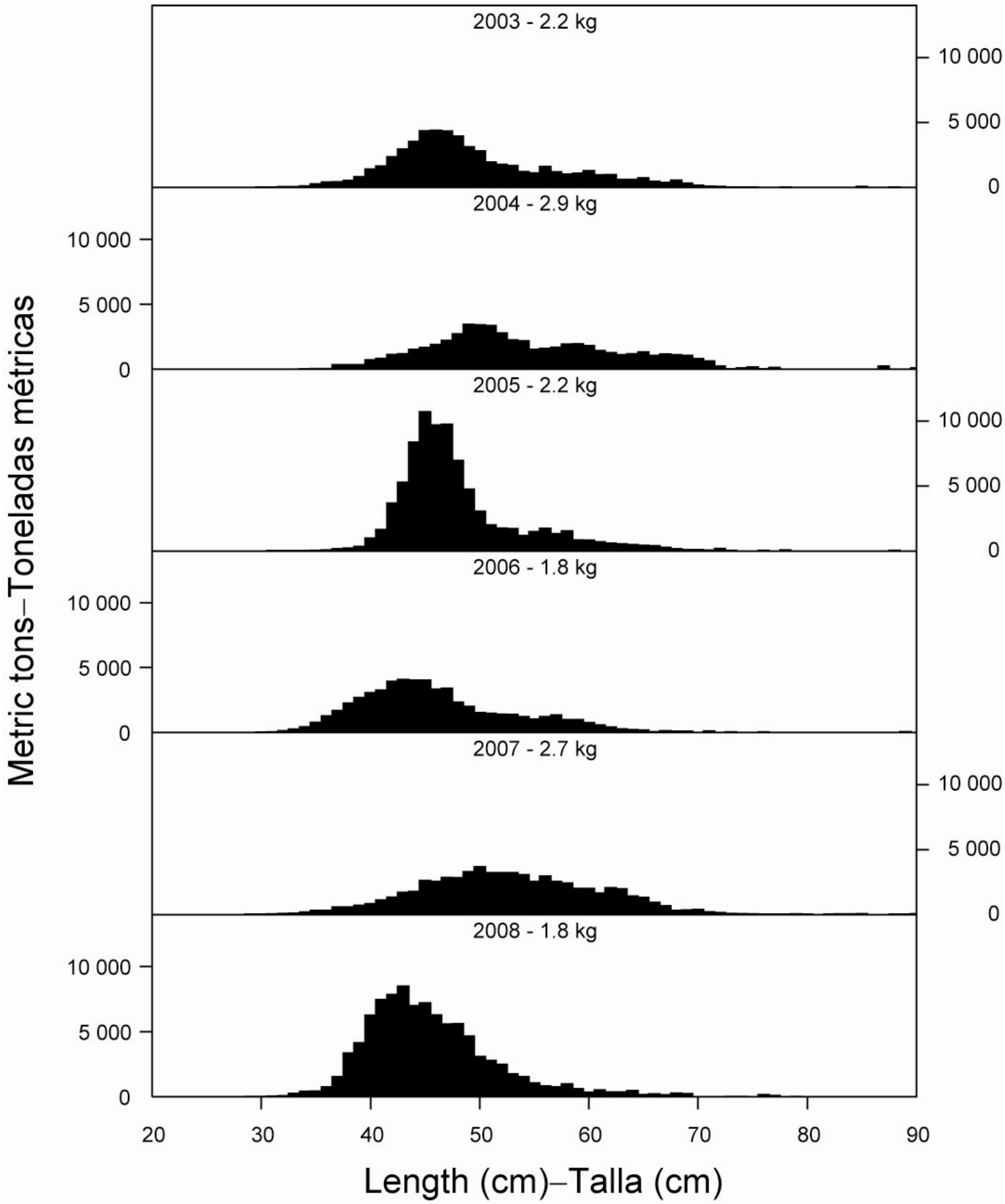

FIGURE 3b. Estimated size compositions of the skipjack caught in the EPO during the first quarter of 2003-2008. The average weights of the fish in the samples are given at the tops of the panels.

FIGURA 3b. Composición por tallas estimada para el barrilete capturado en el OPO en el cuarto trimestre de 2003-2008. En cada recuadro se detalla el peso promedio de los peces en las muestras.

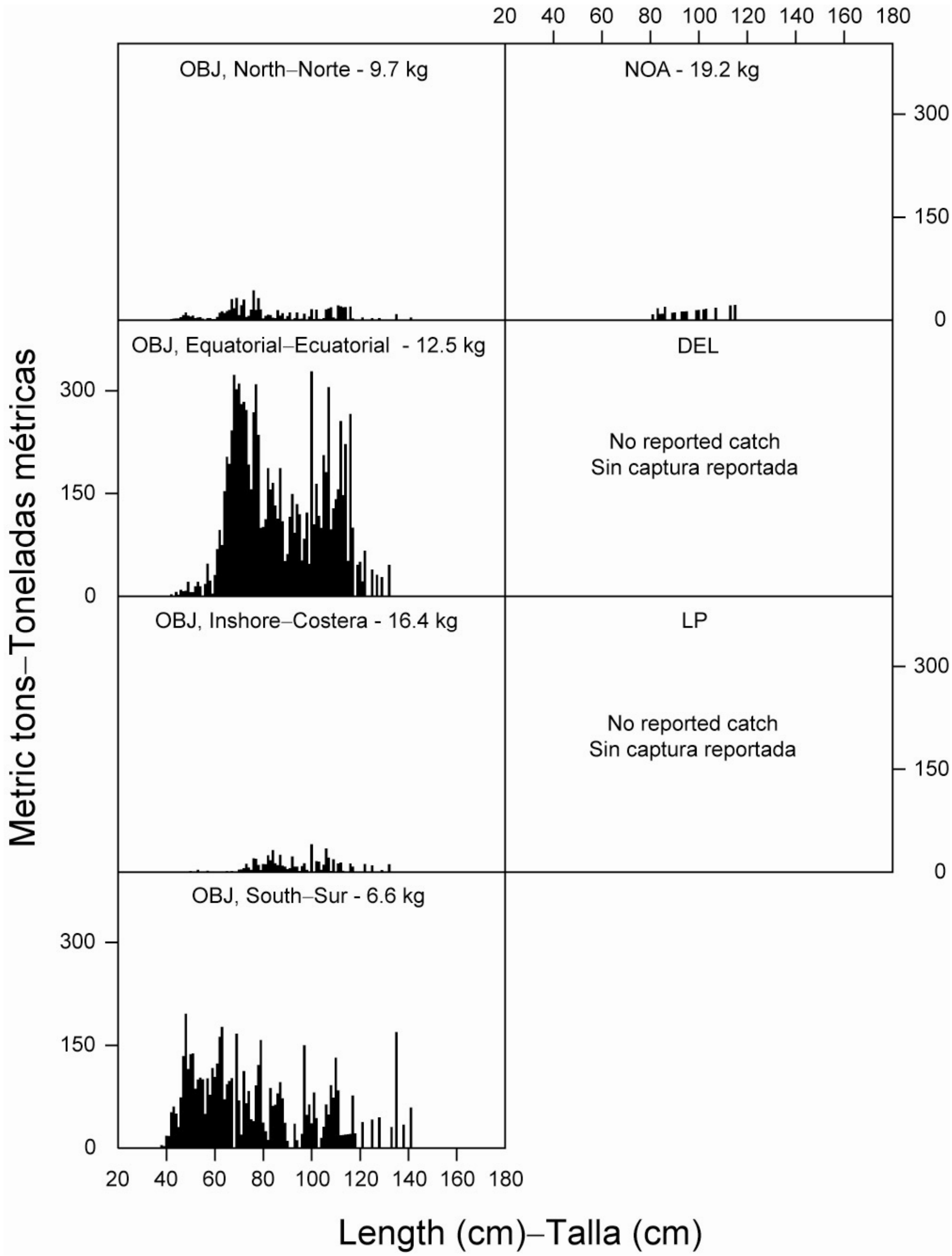

FIGURE 4a. Estimated size compositions of the bigeye caught in each fishery of the EPO during the first quarter of 2008. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin.

FIGURA 4a. Composición por tallas estimada para el patudo capturado en cada pesquería del OPO durante el primer trimestre de 2008. En cada recuadro se detalla el peso promedio de los peces en las muestras. OBJ = objeto flotante; LP = caña; NOA = unassociated; DEL = delfín.

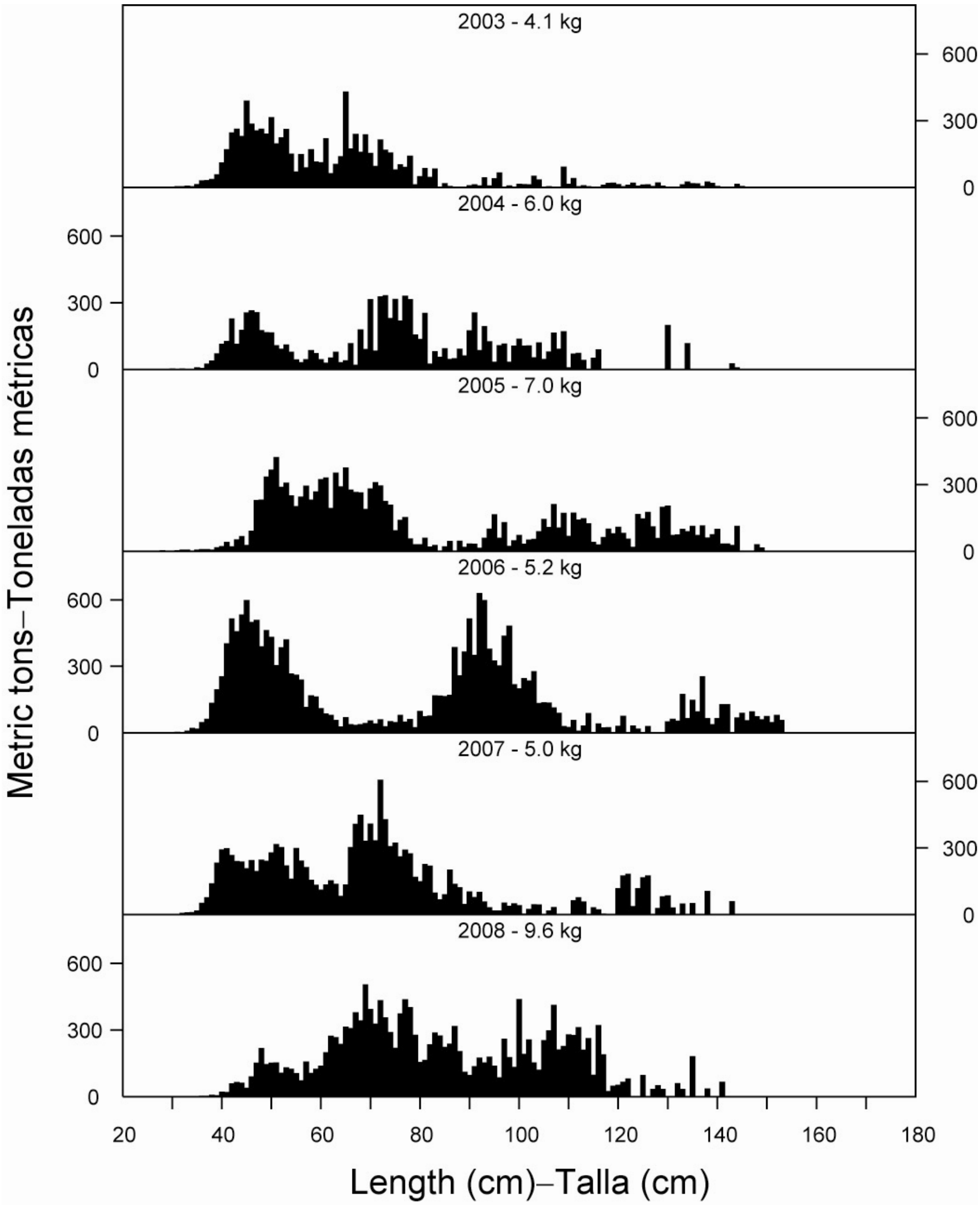

FIGURE 4b. Estimated size compositions of the bigeye caught in the EPO during the first quarter of 2003-2008. The average weights of the fish in the samples are given at the tops of the panels.

FIGURA 4b. Composición por tallas estimada para el patudo capturado en el OPO en el primer trimestre de 2003-2008. En cada recuadro se detalla el peso promedio de los peces en las muestras.

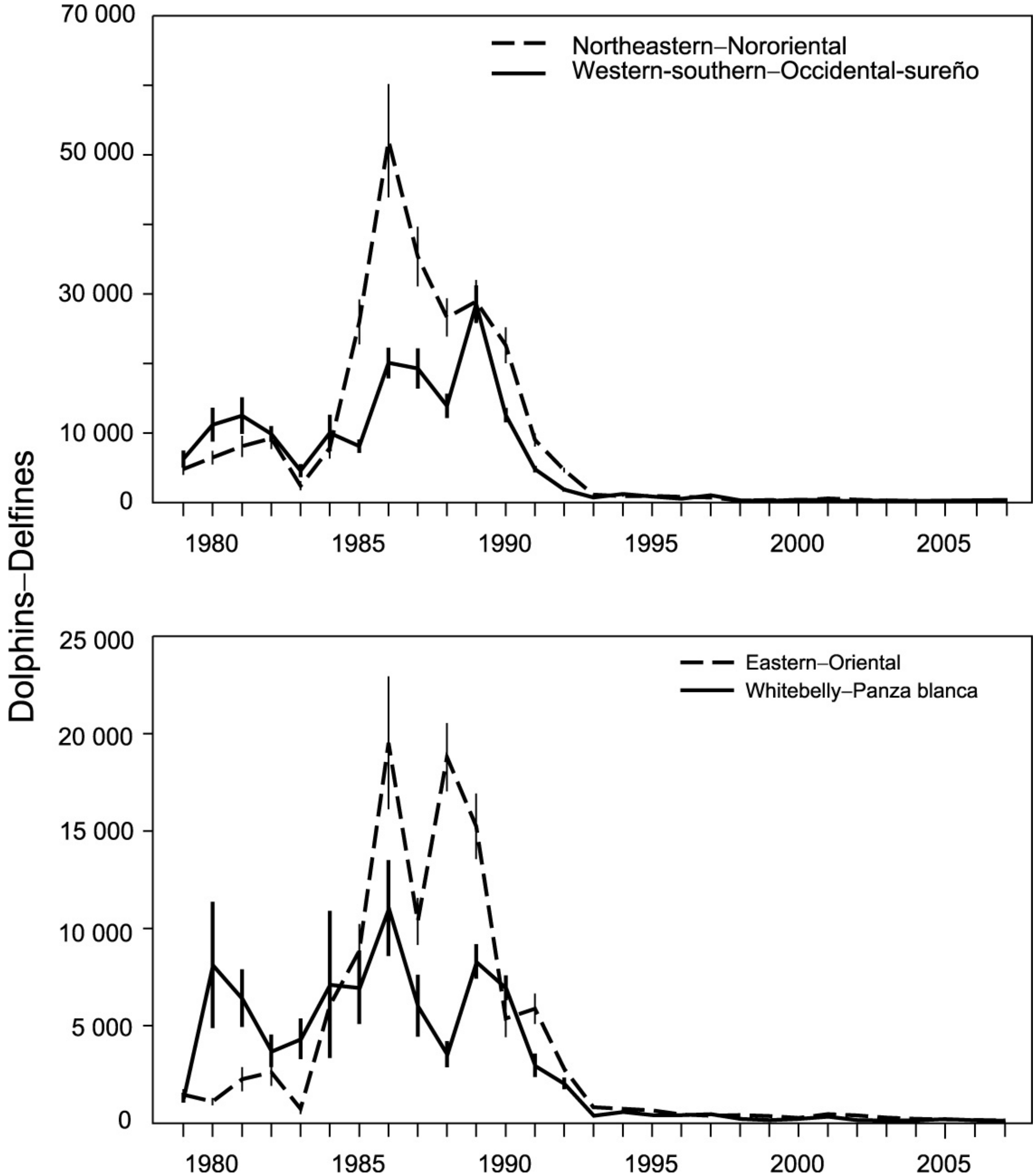

FIGURE 5. Estimated mortalities for the stocks of spotted (upper panel) and spinner (lower panel) dolphins in the eastern Pacific Ocean, 1979-2007. Each vertical line represents one positive and one negative standard error.

FIGURA 5. Mortalidad estimada de las poblaciones de delfines manchados (panel superior) y tornillo (panel inferior) en el Océano Pacífico oriental, 1979-2007. Cada línea vertical representa un error estándar positivo y un error estándar negativo.

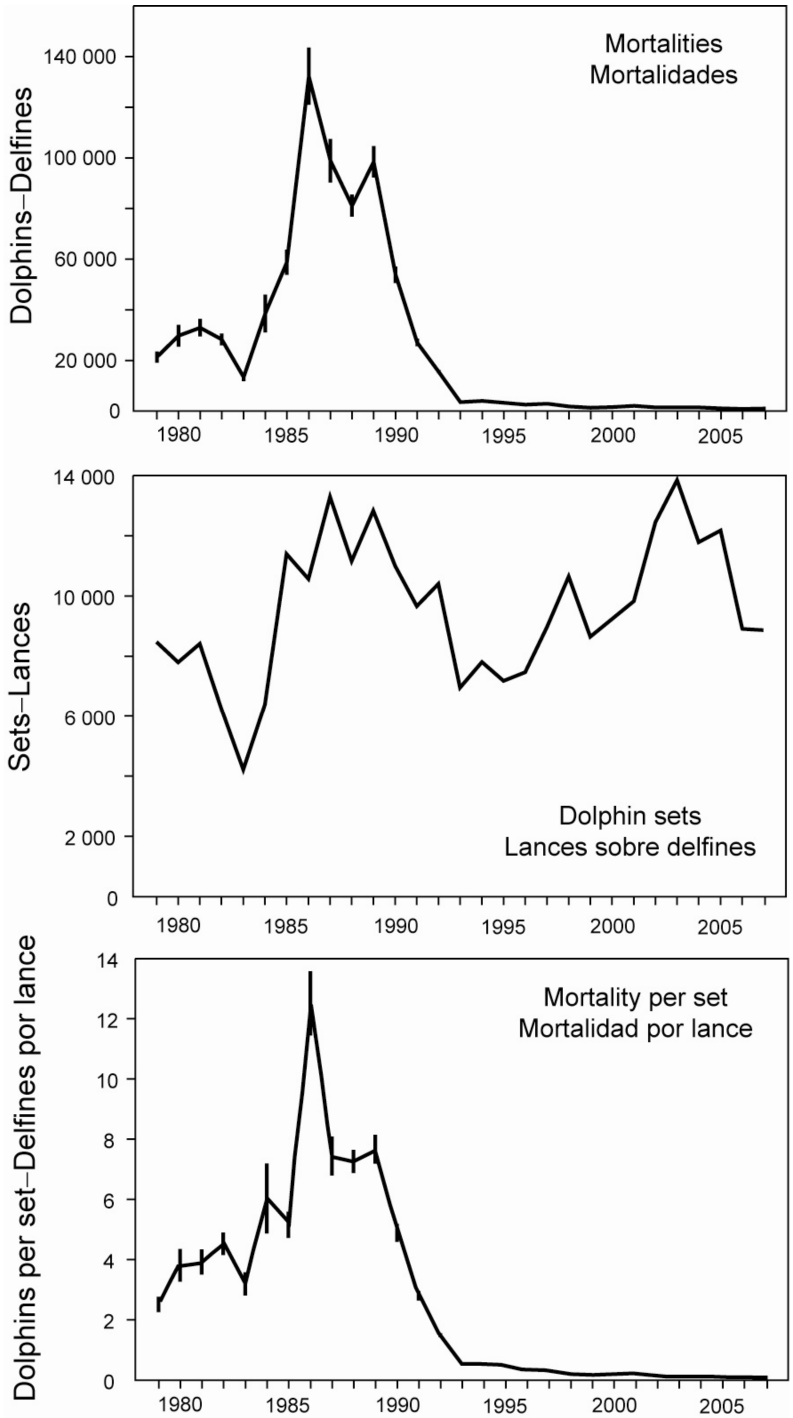

FIGURE 6. Total number of dolphin sets and average mortality per set (upper panel) and estimated total mortality (lower panel) for all dolphins in the EPO, 1979-2007. Each vertical line represents one positive and one negative standard error.

FIGURA 6. Número total de lances sobre delfines y mortalidad media por lance (panel superior) y mortalidad total estimada (panel inferior) para todas especies de delfines en el OPO, 1979-2007. Cada línea vertical representa un error estándar positivo y un error estándar negativo.

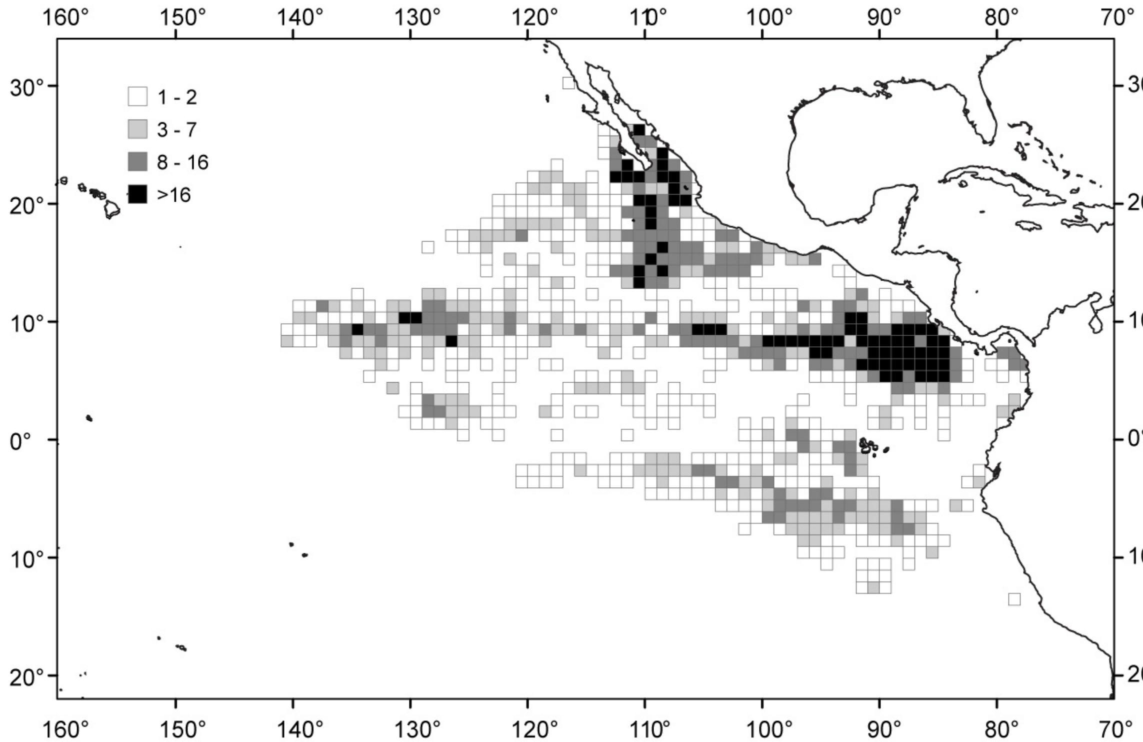

FIGURE 7a. Spatial distribution of sets on tuna associated with dolphins, 2006.
FIGURA 7a. Distribución espacial de los lances sobre atunes asociados con delfines, 2006.

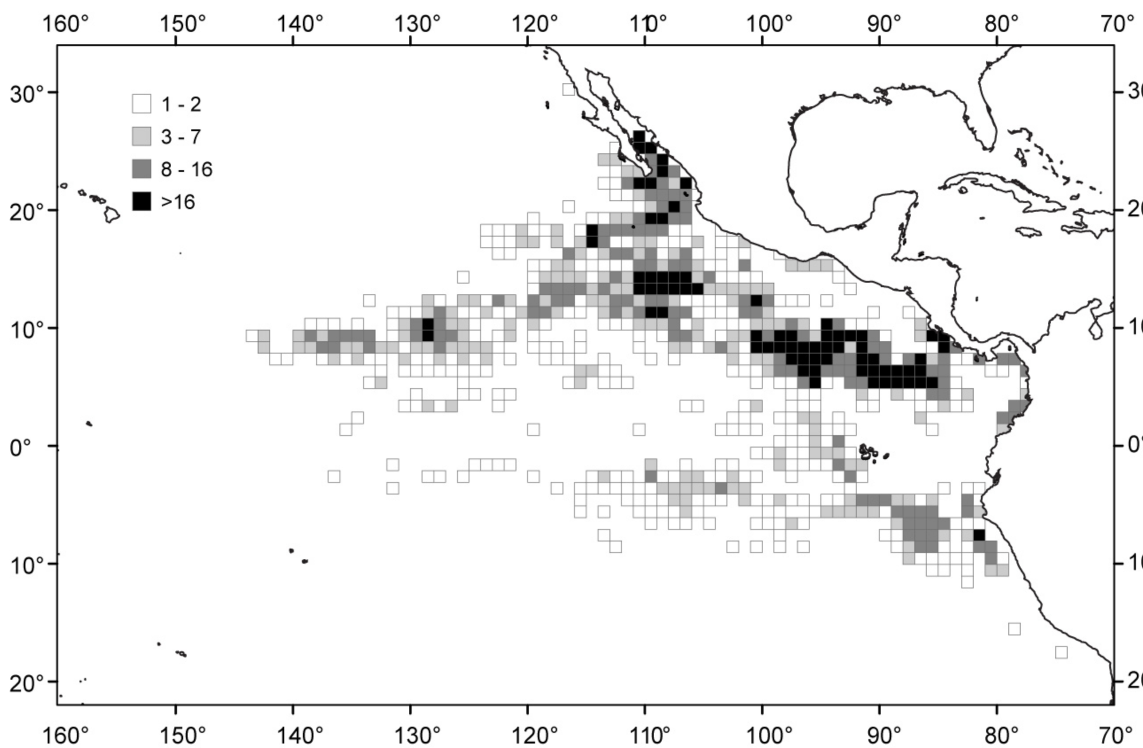

FIGURE 7b. Spatial distribution of sets on tuna associated with dolphins, 2007.
FIGURA 7b. Distribución espacial de los lances sobre atunes asociados con delfines, 2007.

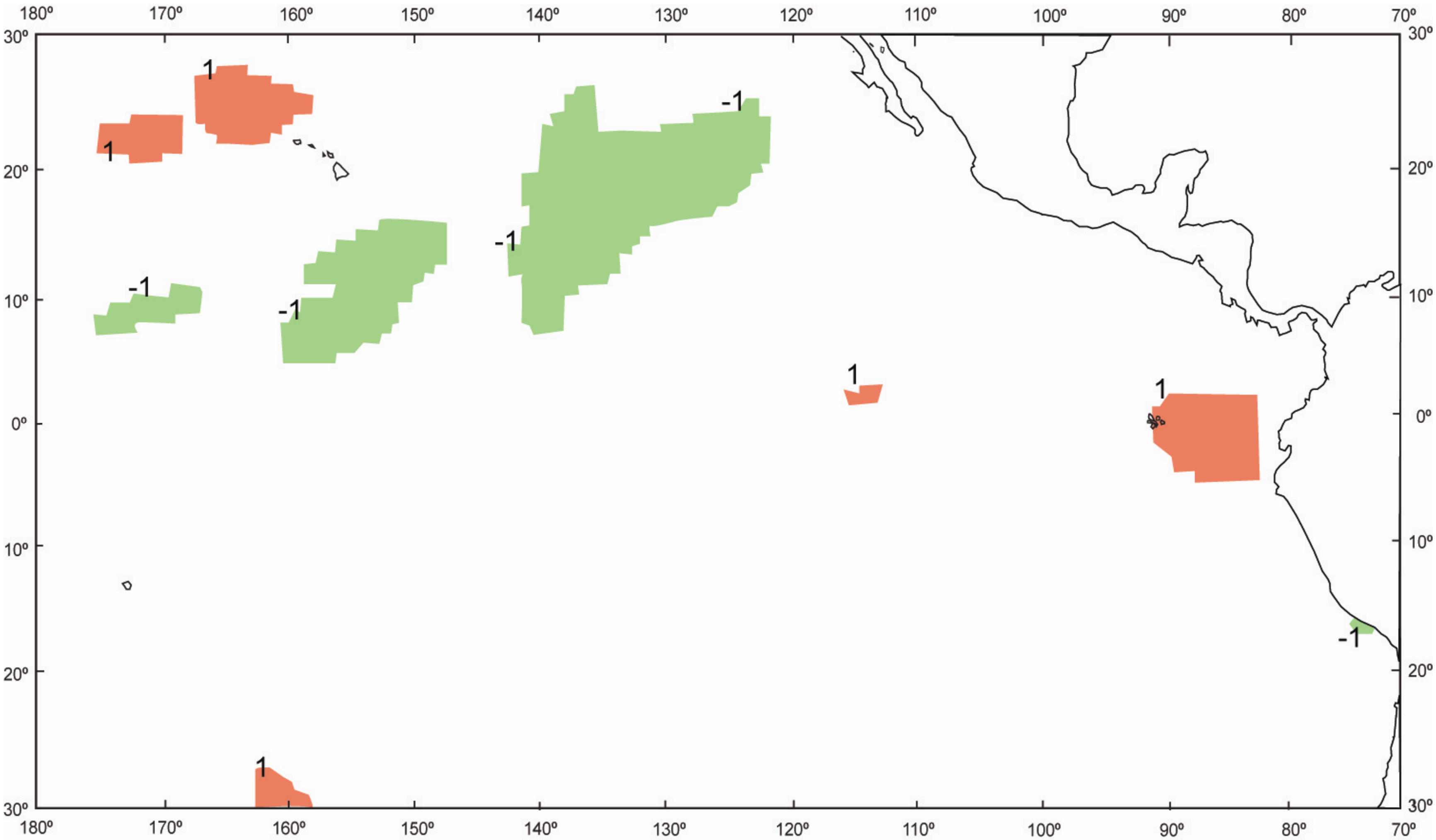

FIGURE 8. Sea-surface temperature (SST) anomalies (departures from long-term normals) for June 2008, based on data from fishing boats and other types of commercial vessels.

FIGURA 8. Anomalías (variaciones de los niveles normales a largo plazo) de la temperatura superficial del mar (TSM) en junio 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	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	5	10	-	15	15,110
Ecuador	PS	59	15	9	83	60,288
España—Spain	PS	-	-	3	3	6,955
Guatemala	PS	-	2	-	2	3,056
Honduras	PS	2	1	-	3	1,700
México	PS	22	33	1	56	56,009
	LP	4	-	-	4	380
Nicaragua	PS	-	5	-	5	6,023
Panamá	PS	5	18	5	28	36,966
Perú	PS	1	-	-	1	542
El Salvador	PS	-	1	3	4	7,415
USA—EE.UU.	PS	1	1	-	2	1,481
Venezuela	PS	-	20	2	22	30,629
Vanuatu	PS	1	2	-	3	3,609
Unknown—Desconocida	PS	1	-	-	1	209
All flags—	PS	97	107	23	227	
Todas banderas	LP	4	-	-	4	
	PS + LP	101	107	23	231	
		Capacity—Capacidad				
All flags—	PS	42,629	137,019	48,735	228,383	
Todas banderas	LP	380	-	-	380	
	PS + LP	43,009	137,019	48,735	228,763	

TABLE 2. Changes in the IATTC fleet list recorded during the second quarter of 2008. PS = purse seine; LP = pole-and-line.
TABLA 2. Cambios en la flota observada por la CIAT registrados durante el segundo trimestre de 2008. PS = cerquero; LP = cañero.

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					
New entry—1^er^ ingreso					
				Now—Ahora	
Dominador I	Colombia	PS	421		
Ignacio Mar I	Ecuador	PS	370		
Re-entries—Reingresos					
				Now—Ahora	
Mandy	Ecuador	PS	786	*Panchito L*	
Changes of name or flag—Cambios de nombre o pabellon					
				Now—Ahora	
Gold Coast	Colombia	PS	1,193	*Maria Isabel C*	
Pescatun	Panamá	PS	1,161	*Tunapesca*	
Vicente F	Panamá	PS	1,581		Guatemala
Amalia Cristina	Unknown	PS	1,311	*Cape San Lucas*	USA—EE.UU.

TABLE 3. Preliminary estimates of the retained catches of tunas in the EPO from 1 January through 29 June 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 29 de junio 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	14,157	88,680	24,932	-	-	-	1	180	127,950	38.6
México	46,237	14,233	755	1,626	10	1	2,496	27	65,385	19.7
Panamá	18,246	24,270	4,648	-	39	-	-	5	47,208	14.2
Venezuela	11,546	18,941	684	-	8	-	-	3	31,182	9.4
Other—Otros[2]	20,306	33,068	6,633	-	5	-	-	3	60,015	18.1
Total	110,492	179,192	37,652	1,626	62	1	2,497	218	331,740	

[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 Vanuatu; se usa esta categoría para no revelar Información sobre faenas de buques o empresas individuales

TABLE 4. Logged catches and catches per day's fishing[1] (CPDF) of yellowfin in the EPO, in metric tons, during the period of 1 January-31 March, based on fishing vessel logbook information. Because the catches in this table include only data that meet the requirements for calculation of the CPDFs, they are less than the total catches for the first quarters of 2003-2008.

TABLA 4. Captura registrada y captura por día de pesca[1] (CPDP) de aleta amarilla en el OPO, en toneladas métricas, durante el período de 1 de enero-31 de marzo, basado en información de los cuadernos de bitácora de buques pesqueros. Ya que las capturas en esta tabla incluyen solamente los datos que satisfacen los requisitos para el cálculo de la CPDP, son menos que las capturas totales del primer trimestre durante 2003-2008.

Area	Fishery statistic Estadística de pesca	Year-Año					
		2003	2004	2005	2006	2007	2008[2]
Purse seine—Red de cerco							
North of 5°N Al norte de 5°N	Catch—Captura	65,500	31,900	39,700	24,900	23,000	19,600
	CPDF—CPDP	23.0	12.0	13.9	9.1	9.1	10.5
South of 5°N Al sur de 5°N	Catch—Captura	19,500	42,400	24,200	11,200	8,700	6,800
	CPDF—CPDP	5.9	9.1	7.0	2.8	3.1	4.6
Total	Catch—Captura	85,000	74,300	63,900	36,100	31,700	26,400
	CPDF—CPDP	19.1	10.3	11.3	7.1	7.4	9.0
Annual total Total anual	Catch—Captura	275,200	193,200	162,000	106,300	93,000	
Pole and line—Cañero							
Total	Catch—Captura	<100	<100	200			
	CPDF—CPDP	.1	1.8	3.7			
Annual total	Catch—Captura	500	1,800	800	500	800	

1 Purse-seiners with carrying capacities greater than 363 t only; all pole-and-line vessels. The catch values are rounded to the nearest 100, and the CPDF values to the nearest 0.1.

1 Cerqueros con capacidad de acarreo más de 363 t únicamente; todos buques cañeros. Se redondean los valores de captura al 100 más cercano, y los de CPDP al 0.1 más cercano.

2 Preliminary

2 Preliminar

TABLE 5. Logged catches and catches per day's fishing[1] (CPDF) of skipjack in the EPO, in metric tons, during the period of 1 January-31 March, based on fishing vessel logbook information. Because the catches in this table include only data that meet the requirements for calculation of the CPDFs, they are less than the total catches for the first quarters of 2003-2008.

TABLA 5. Captura registrada y captura por día de pesca[1] (CPDP) de barrilete en el OPO, en toneladas métricas, durante el período de 1 de enero-31 de marzo, basado en información de los cuadernos de bitácora de buques pesqueros. Ya que las capturas en esta tabla incluyen solamente los datos que satisfacen los requisitos para el cálculo de la CPDP, son menos que las capturas totales del primer trimestre durante 2003-2008.

Area	**Fishery statistic Estadística de pesca**	**Year-Año**					
		2003	**2004**	**2005**	**2006**	**2007**	**2008[2]**
Purse seine—Red de cerco							
North of 5°N	Catch—Captura	5,800	4,100	10,300	3,100	4,400	4,700
Al norte de 5°N	CPDF—CPDP	2.0	1.5	3.6	1.1	1.7	2.5
South of 5°N	Catch—Captura	33,700	36,500	46,000	29,300	19,500	23,700
Al sur de 5°N	CPDF—CPDP	10.3	7.8	13.4	7.3	6.9	16.1
Total	Catch—Captura	39,500	40,600	56,300	32,400	23,900	28,400
	CPDF—CPDP	9.1	7.2	11.6	6.8	6.0	13.8
Annual total Total anual	Catch—Captura	155,000	132,500	148,600	146,700	76,700	
Pole and line—Cañero							
Total	Catch—Captura		<100	100			
	CPDF—CPDP		1.9	1.2			
Annual total	Catch—Captura	500	500	400	300	200	

1 Purse-seiners with carrying capacities greater than 363 t only; all pole-and-line vessels. The catch values are rounded to the nearest 100, and the CPDF values to the nearest 0.1.

1 Cerqueros con capacidad de acarreo más de 363 t únicamente; todos buques cañeros. Se redondean los valores de captura al 100 más cercano, y los de CPDP al 0.1 más cercano.

2 Preliminary

2 Preliminar

TABLE 6. Logged catches and catches per day's fishing[1] (CPDF) of bigeye in the EPO, in metric tons, during the period of 1 January-31 March, based on purse-seine vessel logbook information. Because the catches in this table include only data that meet the requirements for calculation of the CPDFs, they are less than the total catches for the first quarters of 2003-2008.
TABLA 6. Captura registrada y captura por día de pesca[1] (CPDP) de patudo en el OPO, en toneladas métricas, durante el período de 1 de enero-31 de marzo, basado en información de los cuadernos de bitácora de buques cerqueros. Ya que las capturas en esta tabla incluyen solamente los datos que satisfacen los requisitos para el cálculo de la CPDP, son menos que las capturas totales del primer trimestre durante 2003-2008.

Fishery statistic—Estadística de pesca	**Year—Año**					
	2003	**2004**	**2005**	**2006**	**2007**	**2008[2]**
Catch—Captura	5,800	7,200	6,100	8,200	4,300	3,100
CPDF—CPDP	1.6	1.5	1.4	1.9	1.4	2.1
Total annual catch—Captura total anual	33,100	43,100	28,500	34,100	20,700	

1 Vessels with carrying capacities greater than 363 t only. The catch values are rounded to the nearest 100, and the CPDF values to the nearest 0.1.
1 Buques con capacidad de acarreo más de 363 t únicamente. Se redondean los valores de captura al 100 más cercano, y los de CPDF al 0.1 más cercano.
2 Preliminary
2 Preliminar

TABLE 7. Catches of bigeye tuna in the eastern Pacific Ocean during 2008 by longline vessels.
TABLA 7. Captures de atún patudo en el Océano Pacífico oriental durante 2008 por buques palangreros.

	First quarter	**Month**			**Second quarter**	**Total to date**
		4	**5**	**6**		
	Primer trimestre	**Mes**			**Segundo trimestre**	**Total al fecha**
		4	**5**	**6**		
China	-	-	-	-	-	-
European Union—Unión Europea	-	-	-	-	-	-
Japan—Japón	3,272	1,044	932	899	2,875	6,147
Republic of Korea—República de Corea	1,826	-	-	-	-	1,826
Chinese Taipei—Taipei Chino	1,096	272	-	-	272	1,368
USA—EE.UU.	105	3	5	2	10	115
Vanuatu	187	18	35	-	53	240
Total	6,486	1,337	972	901	3,210	9,696

TABLE 8. Preliminary data on the sampling coverage of trips by vessels with capacities greater than 363 metric tons by the observer programs of the IATTC, Colombia, Ecuador, the European Union, Mexico, Nicaragua, Panama, and Venezuela during the second quarter of 2008. The numbers in parentheses indicate cumulative totals for the year.

TABLA 8. Datos preliminares de la cobertura de muestreo de viajes de buques con capacidad más que 363 toneladas métricas por los programas de observadores de la CIAT, Colombia, Ecuador, México, Nicaragua, Panamá, el Unión Europea, y Venezuela durante el segundo trimestre de 2008. 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	12	(32)	6	(15)	6	(17)	12	(32)	100.0	(100.0)
Ecuador	80	(191)	50	(124)	30	(67)	80	(191)	100.0	(100.0)
España—Spain	4	(11)	3	(5)	1	(6)	4	(11)	100.0	(100.0)
Guatemala	3	(5)	3	(5)			3	(5)	100.0	(100.0)
Honduras	4	(10)	4	(10)			4	(10)	100.0	(100.0)
México	53	(110)	19	(50)	34	(60)	53	(110)	100.0	(100.0)
Nicaragua	6	(11)	2	(5)	4	(6)	6	(11)	100.0	(100.0)
Panamá	30	(73)	17	(39)	13	(34)	30	(73)	100.0	(100.0)
Perú	3	(5)	3	(5)			3	(5)	100.0	(100.0)
El Salvador	6	(17)	6	(17)			6	(17)	100.0	(100.0)
U.S.A.—EE.UU.	1	(1)	1	(1)			1	(1)	100.0	(100.0)
Venezuela	22	(48)	10	(24)	12	(24)	22	(48)	100.0	(100.0)
Vanuatu	6	(11)	6	(11)			6	(11)	100.0	(100.0)
Total	230	(525)[1]	130	(311)	100	(214)	230	(525)[1]	100.0	(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 observadores del programa del CIAT y 16 por observadores de los programas nacionales) iniciados a fines de 2007 y completados en 2008

TABLE 9. Estimates of mortalities of dolphins in 2007, population abundance, and relative mortality, by stock. The data for 2007 are preliminary.

TABLA 9. Estimaciones de la mortalidad incidental de delfines en 2007, la abundancia de poblaciones, y la mortalidad relativa, por población. Los datos de 2007 son preliminares.

Species and stock	**Incidental mortality**	**Population abundance**	**Relative mortality (percent)**
Especie y población	**Mortalidad incidental**	**Abundancia de la población**	**Mortalidad relativa (porcentaje)**
Offshore spotted dolphin—Delfín manchado de altamar[1]			
Northeastern—Nororiental	190	782,900	0.02
Western/southern—Occidental y sureño	112	892,600	0.01
Spinner dolphin—Delfín tornillo[1]			
Eastern—Oriental	174	592,200	0.03
Whitebelly—Panza blanca	113	617,100	0.02
Common dolphin—Delfín común[2]			
Northern—Norteño	57	449,462	0.01
Central	69	577,048	0.01
Southern—Sureño	93	1,525,207	<0.01
Other dolphins—Otros delfines[3,4]	30	2,802,300	<0.01
Total	838		

[1] logistic model for 1986-2003 (IATTC Special Report 14: Appendix 7)

[1] modelo logístico para 1986-2003 (Informe Especial de la CIAT 14: Anexo 7)

[2] weighted averages for 1998-2003 (IATTC Special Report 14: Appendix 5)

[2] promedios ponderados para 1998-2003 (Informe Especial de la CIAT 14: Anexo 5)

[3] pooled for 1986-1990 (Report of the International Whaling Commission, 43: 477-493)

[3] agrupados para 1986-1990 (Informe de la Comisión Ballenera Internacional, 43: 477-493)

[4] "Other dolphins" includes the following species and stocks, whose observed mortalities were as follows: Central American spinner dolphin (*Stenella longirostris centroamericana*), 14;striped dolphins (*Stenella coeruleoalba*), 6; coastal spotted dolphin (*Stenella attenuata*), 2; bottlenose dolphin (*Tursiops truncatus*), 1; Pacific whitesided dolphin (*Lagenorhynchus obliquidens*), 1; and unidentified dolphins, 6.

[4] "Otros delfines" incluye las siguientes especies y poblaciones, con las mortalidades observadas correspondientes: delfin tornillo centroamericano (*Stenella longirostris centroamericana*), 14;delfín listado (*Stenella coeruleoalba*), 6; delfin manchado costero (*Stenella attenuata*), 2; tonina (*Tursiops truncatus*), 1; delfín lagenorringo (*Lagenorhynchus obliquidens*), 1; y delfines no identificados, 6.

TABLE 10. Annual estimates of dolphin mortality, by species and stock, 1979-2007. The data for 2007 are preliminary. The sums of the estimated mortalities for the northeastern and western-southern stocks of offshore spotted dolphins do not necessarily equal those for the previous stocks of northern and southern offshore spotted dolphins because the estimates for the two stock groups are based on different areal strata, and the mortalities per set and the total numbers of sets vary spatially.
TABLA 10. Estimaciones anuales de la mortalidad de delfines, por especie y población, 1979-2007. Los datos de 2007 son preliminares. Las sumas de las mortalidades estimadas para las poblaciones nororiental y occidental y sureño del delfín manchado de altamar no equivalen necesariamente a las sumas de aquéllas para las antiguas poblaciones de delfín manchado de altamar norteño y sureño porque las estimaciones para los dos grupos de poblaciones se basan en estratos espaciales diferentes, y las mortalidades por lance y el número total de lances varían espacialmente.

Year	Offshore spotted[1]		Spinner		Common			Others	Total
	North-eastern	Western-southern	Eastern	White belly	Northern	Central	Southern		
Año	Manchado de altamar[1]		Tornillo		Común			Otros	Total
	Nor-oriental	Occidental y sureño	Oriental	Panza blanca	Norteño	Central	Sureño		
1979	4,828	6,254	1,460	1,312	4,161	2,342	94	880	21,331
1980	6,468	11,200	1,108	8,132	1,060	963	188	633	29,752
1981	8,096	12,512	2,261	6,412	2,629	372	348	367	32,997
1982	9,254	9,869	2,606	3,716	989	487	28	1,347	28,296
1983	2,430	4,587	745	4,337	845	191	0	353	13,488
1984	7,836	10,018	6,033	7,132	0	7,403	6	156	38,584
1985	25,975	8,089	8,853	6,979	0	6,839	304	1,777	58,816
1986	52,035	20,074	19,526	11,042	13,289	10,884	134	5,185	132,169
1987	35,366	19,298	10,358	6,026	8,216	9,659	6,759	3,200	98,882
1988	26,625	13,916	18,793	3,545	4,829	7,128	4,219	2,074	81,129
1989	28,898	28,530	15,245	8,302	1,066	12,711	576	3,123	98,451
1990	22,616	12,578	5,378	6,952	704	4,053	272	1,321	53,874
1991	9,005	4,821	5,879	2,974	161	3,182	115	990	27,127
1992	4,657	1,874	2,794	2,044	1,773	1,815	64	518	15,539
1993	1,139	757	821	412	81	230	0	161	3,601
1994	935	1,226	743	619	101	151	0	321	4,096
1995	952	859	654	445	9	192	0	163	3,274
1996	818	545	450	447	77	51	30	129	2,547
1997	721	1,044	391	498	9	114	58	170	3,005
1998	298	341	422	249	261	172	33	101	1,877
1999	358	253	363	192	85	34	1	62	1,348
2000	295	435	275	262	54	223	10	82	1,636
2001	592	311	469	372	94	203	46	44	2,131
2002	442	204	405	186	69	155	4	50	1,515
2003	290	341	289	171	133	140	99	39	1,502
2004	260	256	224	214	156	100	222	37	1,469
2005	273	100	275	108	114	57	154	70	1,151
2006	147	135	160	144	129	86	40	45	886
2007	192	112	174	113	57	69	93	28	838

[1] The estimates for offshore spotted dolphins include mortalities of coastal spotted dolphins.
[1] Las estimaciones de delfines manchados de altamar incluyen mortalidades de delfines manchados costeros.

TABLE 11. Standard errors of annual estimates of dolphin species and stock mortality for 1979-1994, and 2001-2003. There are no standard errors for 1995-2000, and 2004-2007, because the coverage was at or nearly at 100 percent during those years.

TABLA 11. Errores estándar de las estimaciones anuales de la mortalidad de delfines por especie y población para 1979-1994, y 2001-2003. No hay errores estándar para 1995-2000, y 2004-2007, porque la cobertura fue de 100%, o casi, en esos años.

Year	Offshore spotted		Spinner		Common			Other
	North-eastern	Western-southern	Eastern	Whitebelly	Northern	Central	Southern	
Año	Manchado de altamar		Tornillo		Común			Otros
	Nor-oriental	Occidental y sureño	Oriental	Panza blanca	Norteño	Central	Sureño	
1979	817	1,229	276	255	1,432	560	115	204
1980	962	2,430	187	3,239	438	567	140	217
1981	1,508	2,629	616	1,477	645	167	230	76
1982	1,529	1,146	692	831	495	168	16	512
1983	659	928	284	1,043	349	87	-	171
1984	1,493	2,614	2,421	3,773	-	5,093	3	72
1985	3,210	951	1,362	1,882	-	2,776	247	570
1986	8,134	2,187	3,404	2,454	5,107	3,062	111	1,722
1987	4,272	2,899	1,199	1,589	4,954	2,507	3,323	1,140
1988	2,744	1,741	1,749	668	1,020	1,224	1,354	399
1989	3,108	2,675	1,674	883	325	4,168	295	430
1990	2,575	1,015	949	640	192	1,223	95	405
1991	956	454	771	598	57	442	30	182
1992	321	288	168	297	329	157	8	95
1993	89	52	98	33	27	-	-	29
1994	69	55	84	41	35	8	-	20
2001	3	28	1	6	7	7	-	1
2002	1	2	1	1	1	1	1	1
2003	1	1	1	1	-	1	1	-

TABLE 12. Percentages of sets with no dolphin mortalities, with major gear malfunctions, with net collapses, with net canopies, average times of backdown (in minutes), and average number of live dolphins left in the net at the end of backdown.

TABLA 12. Porcentajes de lances sin mortalidad de delfines, con averías mayores, con colapso de la red, con abultamiento de la red, duración media del retroceso (en minutos), y número medio de delfines en la red después del retroceso.

Year Año	Sets with zero mortality (percent) Lances sin mortalidad (porcentaje)	Sets with major malfunctions (percent) Lances con averías mayores (porcentaje)	Sets with net collapse (percent) Lances con colapso de la red (porcentaje)	Sets with net canopy (percent) Lances con abultamiento de la red (porcentaje)	Average duration of backdown (minutes) Duración media del retroceso (minutos)	Average number of live dolphins left in net after backdown Número medio de delfines en la red después del retroceso
1986	38.1	9.5	29.0	22.2	15.3	6.0
1987	46.1	10.9	32.9	18.9	14.6	4.4
1988	45.1	11.6	31.6	22.7	14.3	5.5
1989	44.9	10.3	29.7	18.3	15.1	5.0
1990	54.2	9.8	30.1	16.7	14.3	2.4
1991	61.9	10.6	25.2	13.2	14.2	1.6
1992	73.4	8.9	22.0	7.3	13.0	1.3
1993	84.3	9.4	12.9	5.7	13.2	0.7
1994	83.4	8.2	10.9	6.5	15.1	0.3
1995	85.0	7.7	10.3	6.0	14.0	0.4
1996	87.6	7.1	7.3	4.9	13.6	0.2
1997	87.7	6.6	6.1	4.6	14.3	0.2
1998	90.3	6.3	4.9	3.7	13.2	0.2
1999	91.0	6.6	5.9	4.6	14.0	0.1
2000	90.8	5.6	4.3	5.0	14.9	0.2
2001	91.6	6.5	3.9	4.6	15.6	0.1
2002	93.6	6.0	3.1	3.3	15.0	0.1
2003	93.9	5.2	3.5	3.7	14.5	<0.1
2004	93.8	5.4	3.4	3.4	15.2	<0.1
2005	94.9	5.0	2.6	2.7	14.5	<0.1
2006	93.9	5.7	3.3	3.5	15.8	<0.1
2007	94.2	5.1	1.6	3.4	15.2	<0.1

TABLE 13. Oceanographic and meteorological data for the Pacific Ocean, July 2007-June 2008. The values in parentheses are anomalies. SST = sea-surface temperature; SOI = Southern Oscillation Index; SOI* and NOI* are defined in the text.
TABLA 13. Datos oceanográficos y meteorológicos del Océano Pacífico, julio 2007-junio 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	**7**	**8**	**9**	**10**	**11**	**12**
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	20.3 (-1.6)	19.2 (-1.6)	18.6 (-1.9)	18.8 (-2.1)	19.5 (-2.2)	20.8 (-2.0)
Area 2 (5°N-5°S, 90°-150°W	24.8 (-0.8)	23.9 (-1.1)	23.6 (-1.3)	23.4 (-1.5)	23.2 (-1.8)	23.6 (-1.5)
Area 3 (5°N-5°S, 120°-170°W)	26.8 (-0.3)	26.2 (-0.5)	25.8 (-0.8)	25.2 (-1.4)	25.1 (-1.5)	25.0 (-1.5)
Area 4 (5°N-5°S, 150W°-160°E)	28.8 (0.2)	28.6 (0.1)	28.1 (-0.4)	27.9 (-0.6)	27.4 (-0.9)	27.4 (-0.9)
Thermocline depth—Profundidad de la termoclina, 0°, 80°W (m)	30	45	40	50	40	50
Thermocline depth—Profundidad de la termoclina, 0°, 110°W (m)	40	35	30	25	25	30
Thermocline depth—Profundidad de la termoclina, 0°, 150°W (m)	125	130	130	140	125	150
Thermocline depth—Profundidad de la termoclina, 0°, 180°W (m)	180	170	165	170	180	180
Sea level—Nivel del mar, Callao, Perú (cm)	-	109.1 (1.5)	-	-	-	96.3 (-12.3)
SOI—IOS	-0.5	0.1	0.2	0.6	0.9	1.8
SOI*—IOS*	4.36	7.92	4.12	0.77	4.14	5.38
NOI*—ION*	-1.61	-1.56	1.38	2.13	3.97	7.03

Month—Mes	**1**	**2**	**3**	**4**	**5**	**6**
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	23.8 (-0.7)	26.3 (0.2)	27.3 (0.8)	25.9 (0.4)	24.4 (0.1)	23.7 (0.6)
Area 2 (5°N-5°S, 90°-150°W	24.1 (-1.5)	25.0 (-1.4)	26.5 (-0.6)	27.2 (-0.2)	27.1 (0.0)	26.6 (0.2)
Area 3 (5°N-5°S, 120°-170°W)	24.7 (-1.8)	24.8 (-1.9)	26.0 (-1.1)	26.8 (-0.9)	27.2 (-0.6)	27.2 (-0.3)
Area 4 (5°N-5°S, 150W°-160°E)	26.6 (-1.5)	26.4 (-1.6)	26.8 (-1.3)	27.4 (-1.0)	27.9 (-0.8)	28.1 (-0.6)
Thermocline depth—Profundidad de la termoclina, 0°, 80°W (m)	30	25	20	15	80	70
Thermocline depth—Profundidad de la termoclina, 0°, 110°W (m)	40	30	20	40	80	70
Thermocline depth—Profundidad de la termoclina, 0°, 150°W (m)	140	145	140	140	140	145
Thermocline depth—Profundidad de la termoclina, 0°, 180°W (m)	190	190	200	200	200	180
Sea level—Nivel del mar, Callao, Perú (cm)	105.6 (-5.9)	103.7 (-10.2)	115.4 (0.7)	112.4 (-2.1)	115.7 (2.2)	113.6 (1.6)
SOI—IOS	1.9	2.7	1.1	0.6	-0.3	0.3
SOI*—IOS*	0.85	0.89	0.71	0.21	-4.85	3.56
NOI*—ION*	1.34	5.69	8.12	4.41	0.57	1.47