INTER-AMERICAN TROPICAL TUNA COMMMISSION
COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL

QUARTERLY REPORT—INFORME TRIMESTRAL

October-December 2006—Octubre-Diciembre 2006

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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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, and the Republic of Korea in 2005. 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 2006 the Parties to this agreement consisted of Costa Rica, Ecuador, El Salvador, the European Union, Guatemala, Honduras, Mexico, Nicaragua, Panama, Peru, the United States, Vanuatu, and Venezuela, and Bolivia and Colombia 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 by seven signatories that were Parties to the 1949 Convention on the date that the Antigua Convention was open for signature. It was ratified 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, and Nicaragua on 13 December 2006.

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 56th 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.

SPECIAL NOTICE

We are pleased to announce that Nicaragua ratified the IATTC's new convention ("the Antigua Convention") on 13 December 2006.

MEETINGS

The following IATTC and AIDCP meetings were held in La Jolla, California, during October 2006:

No.	Meeting	Date
22	Permanent Working Group on Tuna Tracking	24 October
8	Working Group to Publicize the Dolphin Safe Tuna Certification System	24 October
42	International Review Panel	25 October
16	Parties to the AIDCP	26 October
1	Working Group on Vessel Measurement	27-28 October

A Stock Synthesis II Tutorial, organized by Dr. Mark N. Maunder, was held in La Jolla on 16 October 2006. Dr. Maunder, Mr. Simon D. Hoyle, Secretariat of the Pacific Community, Noumea, New Caledonia, and Dr. Kevin R. Piner, U.S. National Marine Fisheries Service (NMFS), La Jolla, served as instructors. The participants included Drs. Richard B. Deriso and Michael G. Hinton and Messrs. Mauricio Orozco-Zöller, Marlon Román-Verdesoto, and Kurt M. Schaefer of the IATTC staff and representatives of the Department of Fisheries and Oceans of Canada, the Institut de Recherche pour le Développement of France, the National Research Institute of Far Seas Fisheries of Japan, the Instituto Nacional de la Pesca of Mexico, the Programa Nacional de Aprovechamiento del Atún y de Protección de Delfines of Mexico, the Organización de Productores Asociados de Grandes Atuneros Congeladores of Spain, the Programa Nacional de Observadores de Túnidos, Océano Pacífico, of Spain, the U.S. NMFS, and the University of Southern California.

A Management Strategy Workshop, also organized by Dr. Maunder, was held in La Jolla on 17-20 October 2006. Dr. Maunder served as chairman for the meeting, and he, Dr. Cleridy E. Lennert-Cody, and Mr. Schaefer made presentations. The participants included Drs. Robin Allen, Deriso, and Hinton and Messrs. Orozco-Zöller, Román-Verdesoto, and Patrick K. Tomlinson of the IATTC staff and representatives of the Department of Fisheries and Oceans of Canada, the Institut de Recherche pour le Développement of France, the International Pacific Halibut Commission, the National Research Institute of Far Seas Fisheries of Japan, the Instituto Nacional de la Pesca of Mexico, the Programa Nacional de Aprovechamiento del Atún y de Protección de Delfines of Mexico, the Secretariat of the Pacific Community, the Organización de Productores Asociados de Grandes Atuneros Congeladores of Spain, the Programa Nacional de Observadores de Túnidos, Océano Pacífico of Spain, the U.S. NMFS, the University of Southern California, and the Western and Central Pacific Fisheries Commission.

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, on 3-5 October 2006. His travel expenses were paid by the Western Pacific Fishery Management Council.

Mr. Vernon P. Scholey participated in the III Congreso Colombiano de Acuicultura in Santa Marta, Colombia, on 4-6 October 2006. He made a presentation at the Congreso entitled "Investigación de la Biología Reproductora y el Ciclo Vital Temprano del Atún Aleta Amarilla, *Thunnus albacares*, en Cautiverio," co-authored with Dr. Daniel Margulies and Ms. Jeanne B. Wexler. Mr. Scholey's expenses were paid by the Universidad de Magdalena.

A meeting entitled Workshop on Regional Economic Cooperation in the Pacific Fishery for Tropical Tunas was held at the University of California at San Diego on 10-12 October 2006. Dr. Robin Allen served as chairman, and Dr. Martín A. Hall and Mr. Brian S. Hallman also participated in the meeting. Among the 14 papers presented at the meeting were:

Regional Vessel Registries and Limited Access Programs by Brian Hallman, Scott Barrett, Ray Clarke, James Joseph, Victor Restrepo, and Dale Squires;
Incentives to Address Bycatch Issues by Heidi Gjertsen, Martín Hall, and Dale Squires;
Capacity Management in the Eastern Pacific Ocean by Pablo Arenas.

Dr. Richard B. Deriso participated in a workshop on FADIO (Fish Aggregating Devices as Instrumented Observatories of pelagic ecosystems) in Monaco on 25 October 2006. The European Union, which sponsored the workshop, paid most of his travel expenses.

Dr. Daniel Margulies presented a seminar entitled, "Research on the Reproductive Biology and Early Life History of Tropical Tunas at the IATTC's Achotines Laboratory, Republic of Panama," at the Hubbs Sea World Research Institute (HSWRI) in San Diego on 25 October 2006. The audience consisted of HSWRI staff members and graduate students. Dr. Margulies also discussed potential topics for joint studies of yellowfin tuna with HSWRI staff members.

Ms. Jeanne B. Wexler was an invited speaker at the fifth International Symposium on the Ecology and Aquaculture of Bluefin Tuna, which took place in Amami Oshima, Japan, during 11-12 November 2006. The symposium was organized to discuss aquaculture, ecology, and economics of bluefin tuna, with emphasis on aquaculture and propagation. Her talk was entitled "Development of a Yellowfin Tuna Broodstock and Early Life History Studies at the Achotines Laboratory in the Republic of Panama." Ms. Wexler's travel expenses were paid by Kinki University.

Dr. Robert J. Olson was co-convener of a workshop entitled "The Role of Squid in Pelagic Marine Ecosystems," which took place at the University of Hawaii at Manoa on 16-17 November 2006. The workshop was jointly sponsored by GLOBEC-CLIOTOP and the PFRP. CLIOTOP (Climate Impacts on Oceanic Top Predators) is a new regional program of the international research program GLOBEC (Global Ocean Ecosystem Dynamics). PFRP is the Pelagic Fisheries Research Program of the University of Hawaii, which is supported by the U.S National Oceanic and Atmospheric Administration. The purposes of the workshop were (1) to consider the role of squid in pelagic ecosystems that support tunas and other upper-level predators; (2) to consider how climate change might affect squid populations and the ecosystem; (3) to consider the recent range expansions of jumbo or Humboldt squid, *Dosidicus gigas*, in the Pacific Ocean, especially in terms of its effects on the ecosystems; and (4) to identify research needs for large pelagic squid to meet the goals of CLIOTOP. Dr. Olson gave the workshop introduction presentation entitled "Why Are Cephalopods Important to Tuna Fisheries Ecologists?" and he co-authored another presentation entitled "Cephalopod Prey of the Apex Predator Guild in the Epipelagic Eastern Pacific Ocean." The proceedings of the workshop will be published in the GLOBEC Report series. Dr. Olson's travel expenses were paid by the PFRP.

Prior to the above meeting, on 14-15 November, Dr. Olson participated in a meeting of PFRP principal investigators, and after the meeting, on 20-21 November, he met with other scientists involved in the PFRP isotope project.

Mr. Vernon P. Scholey participated in a Scientific Steering Committee meeting of the Universidad Marítima de Panamá on 16 November 2006.

Mr. Brian S. Hallman attended the annual meeting of the International Commission for the Conservation of Atlantic Tunas (ICCAT), held in Dubrovnik, Croatia, on 17-26 November 2006. He left that meeting early, however, to participate in an Illegal, Unreported and Unregulated monitoring network workshop in London on 22 November 2006.

Mr. Kurt M. Schaefer was an invited participant at the IX Foro Nacional Sobre el Atún, held at the Centro Interdisciplinario de Ciencias Marinas (CICIMAR) campus in La Paz, Baja California Sur, Mexico, on 22-24 November 2006, where he presented a talk entitled "Movements, Behavior, and Habitat Utilization of Yellowfin Tuna in the Northeastern Pacific Ocean, Ascertained from Archival Tag Data."

Dr. Michael G. Hinton represented the IATTC staff at a joint intersessional workshop of the Marlin (MARWG) and Swordfish (SWOWG) Working Groups of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC), which took place in Shimizu, Japan, on 8-15 November 2006. The goals of the MARWG intercessional workshop were to (1) update and complete compilation of fishery statistics, (2) review and agree on a stock structure scenario, and (3) agree on standardization approaches for catch-per-unit-of-effort (CPUE) time series in preparation for future use in fully-integrated models to assess the status of striped marlin in the North Pacific Ocean. The goals for the SWOWG intercessional workshop were to (1) review and prepare catch-effort and size data tables and (2) review approaches to standardizing CPUE data in preparation for future input to assess the status of North Pacific swordfish.

Dr. Hinton also participated as a member of the U.S. Argo Science and Implementation Panel meeting held in Miami, Florida, USA, on 29-30 November 2006. The Panel reviewed and made recommendations on the status of program implementation and real-time and delayed-mode quality control processing, incorporating Argo data into global-scale historical ocean profile data bases.

Dr. Mark N. Maunder participated, as an invited expert, in a meeting of the Scientific Committee of the International Whaling Commission in Tokyo, Japan, on 30 November-12 December 2006. The Scientific Committee is beginning to use stock assessment methods similar to those used by the IATTC staff.

Dr. Robin Allen attended, as an observer, the third meeting of the Western and Central Pacific Fisheries Commission in Apia, Samoa, on 11-15 December 2006.

Mr. Ernesto Altamirano Nieto participated in a workshop entitled Taller Internacional de la Administración y la Industria Atunera, held in Cartagena, Colombia, on 13-15 December 2006. The Instituto Colombiano de Desarrollo Rural (INCODER) paid for Mr. Altamirano's expenses to attend this workshop.

Dr. Mark N. Maunder participated in a workshop sponsored by the Scientific and Statistical Committee of the Pacific Fishery Management Council to evaluate aspects of the Council's groundfish harvest policies and assessment methodologies. The workshop was held at the Southwest Fisheries Science Center in La Jolla, California, on 18-20 December 2006.

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 abstracted logbook information from 218 trips of commercial fishing vessels and collected 526 length-frequency samples from 271 wells during the fourth quarter of 2006.

Also during the fourth quarter members of the field office staffs placed IATTC observers on 81 fishing trips by vessels that participate in the AIDCP On-Board Observer Program. In addition, 127 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 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 vessels that fished in the eastern Pacific Ocean (east of 150°W; EPO) during 2006 is about 225,600 cubic meters (m^3) (Table 1). The changes to the IATTC's fleet list during the fourth quarter of 2006 are given in Table 2. The weekly average at-sea capacity for the fleet, for the weekly periods ending 8 October through 31 December, was about 116,900 m^3 (range: 60,400 to 181,500 m^3). The EPO was closed to purse-seine fishing for tunas for two periods during 2006, which explains the low capacity-at-sea averages.

Catch and catch-per-unit-of-effort statistics

Catch statistics

The estimated total retained catches of tunas in the EPO during 1 January-31 December 2006, and the corresponding periods of 2001-2005, in metric tons (t), were:

Species	2006	2001-2005			Weekly average, 2006
		Average	Minimum	Maximum	
Yellowfin	180,300	207,600	271,000	413,900	2,300
Skipjack	293,400	201,900	141,300	267,000	6,100
Bigeye	61,000	45,200	34,400	52,600	1,200

Summaries of the preliminary estimated retained catches, 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 such purse seiners 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 carrying capacity. 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 three quarters of 2006 and the corresponding periods of 2001-2005, in metric tons, were:

Species	Region	2006	2001-2005		
			Average	Minimum	Maximum
Yellowfin	N of 5°N	8.7	17.6	10.8	24.3
	S of 5°N	2.3	5.8	4.5	8.5
Skipjack	N of 5°N	3.3	2.6	1.3	4.4
	S of 5°N	9.0	7.9	6.0	10.2
Bigeye	EPO	1.8	2.2	2.0	2.9

There was a small amount of effort by pole-and-line vessels during the first three quarters of 2006, but no logbook data were obtained from these vessels, so estimates of their CPUEs cannot be calculated.

Catch statistics for the longline fishery

Preliminary estimates of the catches of bigeye by longline gear in the EPO during 2006 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, in its Annual Reports for 1954-2002, in its Fishery Status Reports 1-4 (covering the years 2002-2005), and in its Stock Assessment Reports.

Length-frequency samples of yellowfin, skipjack, bigeye, Pacific bluefin, and, occasionally, black skipjack from the catches of purse-seine, pole-and-line, and recreational vessels in the EPO are collected by IATTC personnel at ports of landing in Ecuador, Mexico, Panama, the USA, and Venezuela. The catches of yellowfin and skipjack were first sampled in 1954, bluefin in 1973, and bigeye in 1975. Sampling has continued to the present.

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

Data for fish caught during the third quarter of each year of the 2001-2006 period are presented in this report. Two sets of length-frequency histograms are presented for each species; the first shows the data by strata (gear type, set type, and area) for the third quarter of 2006, and the second shows data for the combined strata for the third quarter of each year of the 2001-2006 period. Samples from 191 wells were taken during the third quarter of 2006.

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 191 wells sampled that contained fish caught during the third quarter of 2006, 113 contained yellowfin. The estimated size compositions of these fish are shown in Figure 2a. The majority of the yellowfin catch during the third quarter was taken by sets on unassociated schools in the Northern area and on schools associated with dolphins in the Northern and Coastal areas. There were small amounts of yellowfin taken in floating-object sets in four areas and in dolphin sets in the Southern area.

The estimated size compositions of the yellowfin caught by all fisheries combined during the third quarter of 2001-2006 are shown in Figure 2b. The average weights of the yellowfin caught during the third quarter of 2006 were greater than those of 2005, but less than those of 2001, 2002, 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 191 wells sampled that contained fish caught during the third quarter of 2006, 160 contained skipjack. The estimated size compositions of these fish are shown in Figure 3a. Large amounts of skipjack were caught in the Northern and Equatorial floating object fisheries. Also, significant amounts of skipjack were taken in the floating-object fishery of the Southern area and in the unassociated fisheries areas in the Northern and Southern areas. Small amounts of skipjack were taken in the inshore floating-object fishery and in schools associated with dolphins.

The estimated size compositions of the skipjack caught by all fisheries combined during the third quarter of 2001-2006 are shown in Figure 3b. The average weight of the skipjack caught during the third quarter of 2006 was less than those of all years of the 2001-2005 period.

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 191 wells sampled that contained fish caught during the third quarter of 2006, 68 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 all but the Inshore area, where only a small amount was taken. A small amount of bigeye was caught in the unassociated fishery.

The estimated size compositions of the bigeye caught by all fisheries combined during the third quarter of 2001-2006 are shown in Figure 4b. The average weight of bigeye caught during the third quarter of 2006 was considerably less than those any of the previous years of the 2001-2005 period.

The estimated retained catch of bigeye less than 60 cm in length during the first three quarters of 2006 was 27,562 metric tons (t), or about 49 percent of the estimated total catch of bigeye by purse seiners during those three quarters. The corresponding amounts for the first three quarters of 2001-2005 ranged from 3,521 to 14,546 t. or 4 to 43 percent.

Pacific bluefin are caught by purse-seine and recreational gear off California and Baja California from about 23°N to 35°N, with most of the catch being taken during May through October. During 2006 bluefin were caught between 26°N and 31°N from March through August. The majority of the catches of bluefin by both commercial and recreational vessels were taken during June, July, and August. In the past commercial and recreational catches have been reported separately. The inability to collect sufficient numbers of samples during 2004, 2005, and 2006, however, has made it infeasible to estimate the catches and size compositions separately. Therefore, the commercial and recreational catches of bluefin were combined for each year of the 2001-2006 period. The estimated size compositions are shown in Figure 5.

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 (which initiated its national observer program, the Programa Nacional de Observadores de Nicaragua, during this quarter), Panama, and Venezuela. (The Nicaraguan program, the Programa Nacional de Observadores de Nicaragua, is administered by the Fundación Internacional de Pesca (FIPESCA), which also administers the Panamanian national program.) 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 2006 the observer programs of Colombia, the European Union, Mexico, 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. The observer program of Nicaragua, which began this quarter, sampled only one trip.

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 137 fishing trips aboard purse seiners covered by that program during the fourth quarter of 2006. Preliminary coverage data for these vessels during the quarter are shown in Table 8.

Training

There were no IATTC observer training courses during the quarter.

RESEARCH

Tuna tagging

Tagging of bigeye, skipjack, and yellowfin tuna in the equatorial eastern Pacific Ocean

The IATTC staff has conducted tuna tagging cruises in the equatorial eastern Pacific Ocean (EPO) aboard the chartered pole-and-line tuna fishing vessel *Her Grace* during March to May of 2000, 2002, 2003, 2004, 2005, and 2006. The objective was to obtain a comprehensive understanding of the biology of bigeye tuna and to obtain estimates of their movement, growth, mortality, and gear interaction parameters for inclusion in stock assessments for this species. This was to be accomplished by (1) tagging large numbers of small bigeye tuna (<100 cm in length), using plastic dart tags (henceforth referred to as "conventional tags"), and releasing them in the area where purse-seine vessels catch bigeye associated with fish-aggregating devices (FADs) and (2) implanting archival (electronic data storage) tags in the peritoneal cavities of bigeye tunas and releasing them in that area. In addition, limited numbers of skipjack and yellowfin tunas, encountered during the tagging operations, were tagged, also with conventional tags.

The numbers of releases and returns of fish with conventional tags are shown in Table 9a. The lengths of the fish at release and the times at liberty were as follows:

Species	Length at release in centimeters		Days at liberty	
	Range	Mean	Range	Mean
Bigeye	33-147	78	2-1,213	165
Skipjack	36-78	62	6-1,261	59
Yellowfin	30-130	53	5-917	103

The percentages of tags returned from skipjack and yellowfin tunas are quite similar to one another, but substantially less than those for bigeye tuna.

The numbers of releases and returns of fish with archival tags are shown in Table 9b. The lengths of the fish at release and the times at liberty were as follows

Species	Length at release in centimeters		Days at liberty	
	Range	Mean	Range	Mean
Bigeye	49-136	90	8-1,810	165
Skipjack	44-73	56	25-218	115
Yellowfin	51-73	55	13-136	47

Again, the percentages of tags returned from skipjack and yellowfin tunas are similar to one another, but substantially less than those for bigeye tuna.

The times at liberty for the fish with conventional and archival tags combined are shown in Figure 6.

The linear displacements of the tagged fish, determined from release and recapture positions, are shown in Figure 7. The overall distributions of the recaptures for the three species, tagged in similar locations, illustrate similar latitudinal and longitudinal ranges of dispersion (Figure 8). After 30 days at liberty, 95 percent of the recaptured bigeye were within 1,003 nm of their release positions. The greatest linear displacement for a bigeye was 3,830 nm. It was recaptured by a longline vessel at about 11ºN-158ºW after 696 days at liberty. After 30 days at liberty, 95 percent of the recaptured skipjack were within 1,350 nm of their release positions, and 93 percent were recaptured within 1,000 nm of those positions. The greatest linear displacement for a skipjack was 3,049 nm. It was recaptured by a purse-seine vessel during a set on a floating object at about 4ºN-145ºW after 167 days at liberty. After 30 days at liberty, 95 percent of the recaptured yellowfin were within 1,094 nm of their release positions, and 93 percent were recaptured within 1,000 nm of those positions. The greatest linear displacement for a yellowfin was 2,902 nm. It was recaptured by a purse-seine vessel during a set on a floating object at about 3ºS-144ºW after 102 days at liberty.

A total of 3,319 daily position estimates were obtained for 26 of the bigeye tuna tagged and released between 2002 and 2005 that were at liberty for more than 150 days. Daily longitude estimates were derived with software for processing light level data recorded by the tags, and the latitudes at which the sea-surface temperatures (SSTs) recorded by the tags best matched remotely-sensed SSTs along the meridian were selected as the corresponding estimates. The 95-percent utilization distribution of the daily position estimates is about 1,700,000 km^2 and the probable core area, 50-percent utilization distribution, is only about 8 percent of that (Figure 9). The results from analyses of these archival tag data, along with those of the conventional tag data, indicate regional fidelity for bigeye within this region.

Tagging of yellowfin tuna with archival tags in the EPO

The IATTC has conducted yellowfin tuna-tagging cruises off Baja California, Mexico, during October or November of 2002 through 2006, on regularly-scheduled 10-day fishing trips aboard the *Royal Star*, a San Diego-based long-range sport-fishing vessel. This yellowfin tuna archival tagging project is a component of the Tagging of Pacific Pelagics (TOPP) program, which is one of several programs supported by the Census of Marine Life (COML). The TOPP program uses electronic tagging to study the movements of several large open-ocean animals, including yellowfin, bluefin, and albacore tunas, and the oceanographic factors influencing their behavior. In addition, the TOPP program provided partial funding for the tagging of yellowfin in the equatorial EPO in 2006. Data for all releases of yellowfin tagged with archival tags in the EPO are shown in Table 10. The releases in the equatorial EPO in 2003 and at the Revillagigedo Islands in 2006 (described below) were not sponsored by the TOPP program.

The release locations off Baja California were from the ridge northwest of Magdalena Bay in all years, at Guadalupe Island in 2003, at Alijos Rocks in 2003-2006 (all Southern Baja California), and off Northern Baja California in 2004-2006. Many recapture positions are off southern Baja California, but there were considerable numbers of recaptures in the vicinity of each of the release locations, several near the Tres Marías Islands, in the Gulf of Tehuantepec, and in the tropical EPO between 5º and 10ºN (Figure 10, lower panel).

The times at liberty for these yellowfin ranged from 0.5 to 1,161 days, with a mean duration of 156 days. A total of 8,823 daily position estimates, with the latitudes corrected with SST-matching software, were obtained for 34 of the fish tagged and released between 2002 and 2005 that were at liberty for more than 150 days. The 95-percent utilization distribution of the daily position estimates is about 700,000 km^2 and the probable core area—50-percent utilization distribution—is only about 13 percent of that area (Figure 11). The results from analyses of these data, primarily for fish residing in waters off Baja California, indicate strong regional fidelity within this region.

Tagging of yellowfin and wahoo in the Revillagigedo Islands Marine Reserve, Mexico

The IATTC, in collaboration with the Instituto Nacional de Pesca of Mexico, conducted a tag-and-release project for yellowfin and wahoo (*Acanthocybium solandri*) within the Revillagigedo Islands Marine Reserve, Mexico, in February 2006, utilizing the long-range sport-fishing vessel *Royal Star*. A special permit was provided by the Comisión Nacional de Acuacultura y Pesca of Mexico for the vessel, with a group of sport fishermen aboard, to conduct fishing and tagging activities for those species within the reserve. Each participating fishermen was required to purchase an archival tag, in addition to payment of the regular fare to the vessel. The objectives of the project were to tag and release yellowfin and wahoo with conventional tags, and also yellowfin with implanted archival tags, to obtain information on their movements and behavior, including habitat utilization, for those species within the Revillagigedo Islands Marine Reserve and in areas to which they might move.

During this trip 292 yellowfin and 309 wahoo were tagged with conventional tags and released in the Revillagigedo Islands Marine Reserve. The weights for 194 of the larger yellowfin were estimated to range from 7 to 114 kg, with an average weight of 30 kg. Another 89 of the yellowfin were measured aboard the vessel, using a calibrated cradle or calipers. These ranged from 52 to 184 cm in length, with an average length of 92 cm. In addition, geolocating archival tags were implanted in 38 yellowfin, ranging in length from 79 to 140 cm, with an average length of 109 cm. The weights for 272 of the wahoo were estimated to range from 4 to 25 kg, with an average weight of 11 kg. As of 31 December 2006, 27 (9.2 percent) of the 292 yellowfin with conventional tags, 6 (15.8 percent) of the 38 yellowfin with archival tags, and 4 (1.3 percent) of the 309 wahoo had been recaptured and their tags returned. Thirteen of the 27 recaptured yellowfin with conventional tags, three of the six recaptured yellowfin with archival tags, and two of the four recaptured wahoo were at liberty for more than 30 days.

One yellowfin, 110 cm in length, released with an archival tag at Clarion Island in mid-February, was at liberty for 154 days. The fish stayed in the proximity of Clarion Island for about 3 months, after which it began to move to the west. After reaching 119°W longitude, it turned to the east in early July, reaching Clarion Island after about 2 weeks. It then turned north, and a short time later it was recaptured by a purse-seine vessel in a set made on fish associated with dolphins. Another yellowfin, 129 cm in length, also released with an archival tag at Clarion Island in mid-February, was at liberty for 88 days. The fish remained in the vicinity of the Clarion Island until early April, at which time it moved a short distance to the south. It remained approximately 100 to 150 nautical miles to the south of Clarion Island for about 3 weeks, and then began to move to the northeast, where it was ultimately recaptured in mid-May by a purse-seine vessel in a set made on unassociated tunas.

Length frequencies of yellowfin tuna caught by small vessels

Overview

A preliminary analysis of yellowfin length-frequency data for the 2002-2006 period was performed to explore the feasibility of using this type of data to identify "small" vessels (vessels with fish-carrying capacities less than or equal to 363 metric tons (t)) that may have been setting on tunas associated with dolphins. Length-frequency data of "large" vessels (vessels with fish-carrying capacities greater than 363 t) were used to build a classification algorithm for predicting the purse-seine set type for a length-frequency sample: dolphin-associated yellowfin ("dolphin sets") *versus* yellowfin not associated with dolphins ("other sets"). This two-class classification algorithm was then used to screen the length-frequency samples of small vessels, assuming that the fishing dynamics of large and small vessels are similar.

Data

Two sources of data were used in this analysis. The first was yellowfin length-frequency samples and accompanying information collected as part the IATTC's regular sampling program for all vessels. The second was yellowfin length-frequency samples and accompanying information collected as part of the NOAA-funded additional sampling program for small vessels, which began in January 2006. For both data sources, each sample represents length information on a collection of fish taken from a particular well of a vessel, plus additional information on the location, date, and type of set in which the fish that went into the well were caught. Data for the 2002-2006 period were used in this analysis. Prior to analysis, the lengths were converted to ages (in months), assuming that there were 14 cohorts represented in each sample.

Method of analysis

The analysis of the yellowfin age data involved three steps. The first step was to build a classification algorithm to predict the sample set type, using the data for large vessels. (Samples obtained from small vessels could not be used to build the classification algorithm because no fish that were sampled were reported to have been caught in dolphin sets.) This was done with the algorithmic technique "random forests," which is an extension of classical classification and regression trees that generates predictions based on a large collection of trees (a "forest") instead of a single tree. The variables used to predict the sample set type were: the proportion of fish in each of eight age intervals, and the year, month, and area in which the fish in the sample were caught. The second step was to predict the set type (dolphin or non-dolphin) for the data for small vessels, and compute "residuals" from these predictions. For each sample, the residual is simply the negative of the proportion of trees in the random forest predicting the sample to be from dolphin sets. The final step is to determine if "unusual" residuals were concentrated within certain vessels, a possible indication of fishing on tunas associated with dolphins. Residuals were considered unusual when most of the trees in the random forest classified the sample as coming from dolphin sets, but the reported set type was non-dolphin. For each small vessel, the probability of obtaining as many or more unusual residuals, out of the number of samples available for that vessel, was computed, using a binomial distribution. These probabilities are referred to as "per-vessel" probabilities.

Results

Classification errors for predicting the sample set type of large vessels are shown in Table 11. The greater the proportion of older fish in a sample, the more likely it was to be classified as being from one or more dolphin sets (Figure 12). A summary of the per-vessel probabilities of small vessels is shown in Figure 13. It is clear from Figure 13 that for those small vessels represented in the data of this analysis, many have few or no unusual residuals (per-vessel probabilities near or at 1.0), while a few small vessels have a relatively greater number of unusual residuals (per-vessel probabilities near 0.0). The samples of those small vessels with the smallest per-vessel probabilities would be considered the most unusual, and worthy of further analysis.

Summary and future considerations

In summary, it has been demonstrated that yellowfin length-frequency data are useful for building a classification algorithm for the set type associated with samples from large vessels. Assuming that the fishing dynamics of large vessels are similar to those of small vessels, this analysis has demonstrated an approach for identifying unusual length-frequency data of small vessels that could then be subject to further analysis. Because the wells of individual vessels may contain catches from single sets or multiple sets, the results of an analysis such as this cannot be used to estimate the percentage of small vessel *sets* with unusual data.

There are two points that will be considered in future analyses. First, a comparable classification algorithm will be built on the raw length-frequency data, once a method has been developed to obtain approximate random samples of lengths from size-sorted samples. Based on preliminary results of length-based and age-based classification algorithms built on non-size-sorted samples, the overall properties of the classification algorithms and the behavior of the residuals are anticipated to be very similar between the two approaches. However, the results may differ for some specific vessels. Second, the percent species composition in the well (*e.g.* yellowfin, other tunas) will be used as a predictor in the classification algorithm. The percentage of yellowfin in the well was not used in this preliminary analysis because composition data from the additional sampling program were not available at the time that this report was prepared.

Early life history studies

Yellowfin broodstock

The yellowfin broodstock in Tank 1 (1,362,000 L) at the Achotines Laboratory spawned daily during the quarter, except during the periods of 12-25 October, 13-27 November, 14-19 December, and 22-25 December. Spawning occurred between 09:30 p.m. and 11:40 p.m. The numbers of eggs collected after each spawning event ranged from about 3,000 to 998,000. The water temperatures in the tank ranged from 28.1° to 29.7°C during the quarter.

Two males (34 and 51 kg) and one fish of unknown sex and size died during the quarter. The two males died from striking the tank wall, and the other fish died from entering one of the outflow pipes of the tank. At the end of December there were 16 fish, ranging in weight from approximately 43 to 59 kg, 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 December, five fish from those groups remained in Tank 1.

On 27 September, prototype archival tags were implanted into eight (5- to 8-kg) yellowfin tuna in Tank 2 (170,000 L) to test tag performance after one and two months in captivity. The tags were recovered during October and November and sent to the manufacturer for analyses. During December Tank 2 was restocked with 12 2- to 5-kg yellowfin tuna.

Rearing of yellowfin eggs, larvae, and juveniles

During the quarter the following parameters were recorded for most spawning events: times of spawning, egg diameter, duration of egg stage, hatching rate, lengths of hatched larvae, and duration of yolk-sac stage. The weights of the eggs, yolk-sac larvae, and first-feeding larvae, and the lengths and selected morphometrics of these, were measured periodically.

Studies of snappers

The work on spotted rose snappers (*Lutjanus guttatus*) is carried out by the Dirección General de Recursos Marinos y Costeros (DGRMC) de Panamá.

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 continued to spawn twice weekly during the quarter.

The second group consists of 25 individuals from a group bred at the Laboratory from eggs obtained from spawning in 1998. These fish spawned intermittently during the quarter, but less frequently than the group of older snappers.

At the end of the quarter there were 1,700 juvenile snappers that were raised from eggs fertilized in October. The juveniles will be used in experiments during the first quarter of 2007 to determine the appropriate densities for optimal survival during and after transport to off-site rearing locations in Panama. These transport trials will be conducted with funds obtained from the Secretaría Nacional de Ciencia y Tecnología (SENACYT) of Panama, following the memorandum of understanding involving the Ministerio de Desarrollo Agropecuario, the Autoridad Marítima de Panamá, the IATTC, and SENACYT.

Studies of copepod cultures

Mr. Santiago Cambefort and Achotines staff members continued to work with copepod (*Acartia* spp.) cultures at the Laboratory during the fourth quarter. Mr. Cambefort, a Panamanian citizen, studied at the Escuela Politécnica in Guayaquil, Ecuador, and is completing his thesis work on *Acartia* spp. at the Achotines Laboratory. Mass production of the copepod cultures will be useful to produce food for larval tunas during rearing trials and experiments.

Experiments were conducted during the quarter to determine the optimal diet and proportions of three species of microalgae for maximum production and survival of *Acartia* spp. Results from the experiments indicated that the dietary requirements for survival and production are stage-specific for *Acartia* spp. A diet of a mixture of *Chaetoceros gracilis, Isochrysis galbana* affinis, and *Tetraselmis tetrahele* in a proportion of 2:1:1, respectively (50,000 cells/ml total fed daily) resulted in significantly greater egg production and survival in adult copepods than did other diets tested. In another experiment, eggs of *Acartia* spp. were harvested and cultured with four different diets of microalgae. The nauplii grew more rapidly to the copepodite stage (within three days), and the survival was significantly greater, when fed a diet of only *Isochrysis galbana*. The survival and growth of the nauplii were reduced with the other diets, including a mixed diet of the three microalgae.

Visitors at the Achotines Laboratory

Mr. Santiago Cambefort, a student at the Escuela Politécnica in Guayaquil, Ecuador, continued to work with Mr. Luis Tejada and other Achotines Laboratory staff members during the quarter on experiments with copepod cultures. Mr. Cambefort left the Achotines Laboratory on 14 November 2006.

Dr. Catherina Caballero, a post-doctoral student at the Smithsonian Tropical Research Institute (STRI), spent the period of 27-28 October 2006, at the Achotines Laboratory, where she collected sponges to study the associated symbiotic fungi. She was accompanied by Mr. Edgardo Ochoa, the director of STRI's Scientific Diving Program, and three students.

A 12-member mission, including Mr. Asdrubal Vásquez Núñez (IATTC Commissioner for Costa Rica) and Mr. Carlos Villalobos Solé (Executive President), from the Instituto Costarricense de Pesca y Acuicultura (INCOPESCA) visited the Achotines Laboratory on 10 December 2006. They were joined by Dr. Richard Pretto and Mr. George Novey, of the newly-formed Autoridad de los Recursos Acuáticos de Panamá (ARAP), and two Panamanian presidential advisors, who traveled to the Achotines Laboratory to meet with the INCOPESCA group.

Training

Ms. Aidamalia Vargas of the Achotines Laboratory staff and Mr. Amado Cano of the Dirección General de Recursos Marinos y Costeros de Panamá were selected by the Ministerio de Desarrollo Agropecuario (MIDA) of Panama to participate in intensive aquaculture training courses in Concepción, Coquimbo, and Puerto Montt, Chile. The training, which took place from 13 November to 7 December 2006, was sponsored by the Agencia de Cooperación Internacional de Chile, the Korea International Cooperation Agency, the Japan International Cooperation Agency, the Universidad Católica del Norte in Coquimbo, and the Universidad de Concepción. Their travel expenses were paid by the Chilean government.

Oceanography and meteorology

Surface winds blow almost constantly over northern South America, which causes 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 2005 the SSTs were nearly normal, although there were small areas of cool water, mostly near the coast, and small areas of warm water, mostly offshore, during nearly every month. During all three months of the first quarter of 2006 there was a narrow band of cool water that extended along the equator from as far east as about 90°W (in March) to as far west as about 180° (in February). In addition, there were large areas of warm water, mostly south of 20°S, during all three months. The narrow band of cool water that had occurred along the equator during the first quarter was not present during the second quarter. The large area of warm water that was present south of 20°S during March (IATTC Quarterly Report for January-March 2006: Figure 8) persisted in April, extending as far eastward as 100°W, but its area decreased considerably in May and it was absent in June. There were small areas of cool water off Baja California and northern Central America in April and May, but only the one off Baja California persisted in June (IATTC Quarterly Report for April-June 2006: Figure 5). During July there was a fairly extensive area of cool water off Mexico. During August there was a small area of warm water off northern Mexico and some small areas of warm water along the equator. In September there were three larger areas of warm water along the equator from the coast of

South America to west of 180° and a small area of warm water off Baja California (IATTC Quarterly Report for July-September 2006: Figure 5). The SSTs were more than 1°C above normal along the equator from near the coast to about 170°E throughout the fourth quarter. In addition, there were areas of warm water off northern and central Mexico and in a few other scattered areas during that quarter (Figure 14). The data in Table 12 are mixed, but overall they are indicative of a weak El Niño event. Most notably, the SST anomalies in Areas 1, 2, 3, and 4 were positive throughout the quarter (as was the case during the third quarter). Also, the thermocline at 0°-110°W was unusually deep (as was the case during September). No patterns are evident in the data for the SOIs, SOI*s, and NOI*s. According to the Climate Diagnostics Bulletin of the U.S. National Weather Service for December 2006, "El Niño conditions are likely to continue through March-May 2007."

GEAR PROGRAM

During the fourth quarter the IATTC staff participated in one dolphin safety-gear inspection aboard a Mexican-flag purse seiner.

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

The U.S. National Oceanic and Atmospheric Administration has awarded the IATTC a contract to place observers, on a voluntary basis, on sufficient numbers of trips of "Class-5" purse seiners (vessels with fish-carrying capacities of 272-363 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 fish-carrying 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 fish-carrying 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 fourth quarter. The numbers of trips completed and the numbers of samples taken were as follows:

Month	Trips completed	Samples taken	Fish sampled		
			Yellowfin	Skipjack	Bigeye
October	21	20	7,156	950	350
November	18	18	9,035	576	183
December	16	16	7,314	700	50
Total	55	54	23,505	2,226	583

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Allen, Robin. 2006. Las pesquerías de los atunes rabil, listado y patudo en el Océano Pacífico oriental. Industrias Pesqueras, 1905: 14-16.

Alvarado Bremer, Jaime R., Michael G. Hinton, and Thomas W. Greig. 2006. Evidence of spatial genetic heterogeneity in Pacific swordfish (*Xiphias gladius*) revealed by the analysis of *ldh*-A sequences. Bull. Mar. Sci., 79 (3): 493-503.

Maunder, Mark N., Michael G. Hinton, Keith A. Bigelow, and Adam D. Langley. 2006. Developing indices of abundance using habitat data in a statistical framework. Bull. Mar. Sci., 79 (3): 545–559.

Sibert, John, John Hampton, Pierre Kleiber, and Mark Maunder. 2006. Biomass, size, and trophic status of top predators in the Pacific Ocean. Science, 314 (5806): 1773-1776.

Maunder, Mark. 2006. [letter to the editor of the San Diego Union-Tribune concerning its article on the above paper by Sibert *et al*.]

INTER-AGENCY COOPERATION

On 3 October 2007 Dr. Robin Allen signed a memorandum of understanding with representatives of the Autoridad Marítima de Panamá and the Overseas Fishery Cooperation Foundation (OFCF) of Japan, establishing a cooperative project to mitigate the effect of the local longline fishery on sea turtles. Mr. Takahisa Mitsuhashi of the OFCF, who had previously been stationed at its Manta Office, will work at the IATTC's field office in Panama for the duration of the project.

From 9-13 October 2006 Mr. Vernon P. Scholey co-taught a course on marine fish culture at the Universidad de Magdalena branch mariculture facility in Taganga, Colombia, a fishing village a short distance from the main campus in Santa Marta. The course was attended by 52 graduate and undergraduate students (Ingenieria Pesquera-Acuicultura). Dr. Luis A. Pérez Carrasco, director of the aquaculture division of Acuinuga, a consulting group based in A Coruña, Spain, was the other course instructor. Mr. Scholey's expenses were paid by the Universidad de Magdalena.

Messrs. Kruger Loor Santana and David A. Bratten participated in the Stenella Abundance Research Project (STAR) conducted by the U.S. National Marine Fisheries Service. STAR is a multi-year cetacean and ecosystem study to assess the status of dolphin stocks affected by the yellowfin tuna purse-seine fishery in the eastern Pacific Ocean. Messrs. Loor and Bratten were independent observers aboard the National Oceanic and Atmospheric Administration (NOAA) research vessel *McArthur II*, Mr. Loor during the third leg of the trip (Manta, Ecuador, to Manzanillo, Mexico, 5 October-3 November 2006) and Mr. Bratten during the fourth leg (Manzanillo to San Diego, California, 9 November-7 December 2006). A second NOAA vessel, the *David Starr Jordan*, also participated in the project.

Dr. Cleridy E. Lennert-Cody began serving on the dissertation committee of a Ph.D. candidate at Scripps Institution of Oceanography in December 2006.

ADMINISTRATION

Dr. Takayuki Matsumoto of the National Research Institute of Far Seas Fisheries of Japan, who had been working with Dr. William H. Bayliff since 29 November 2005 on a report on the Japanese longline fishery for tunas and billfishes in the eastern Pacific Ocean during 1998-2003, returned to Japan on 22 November 2006.

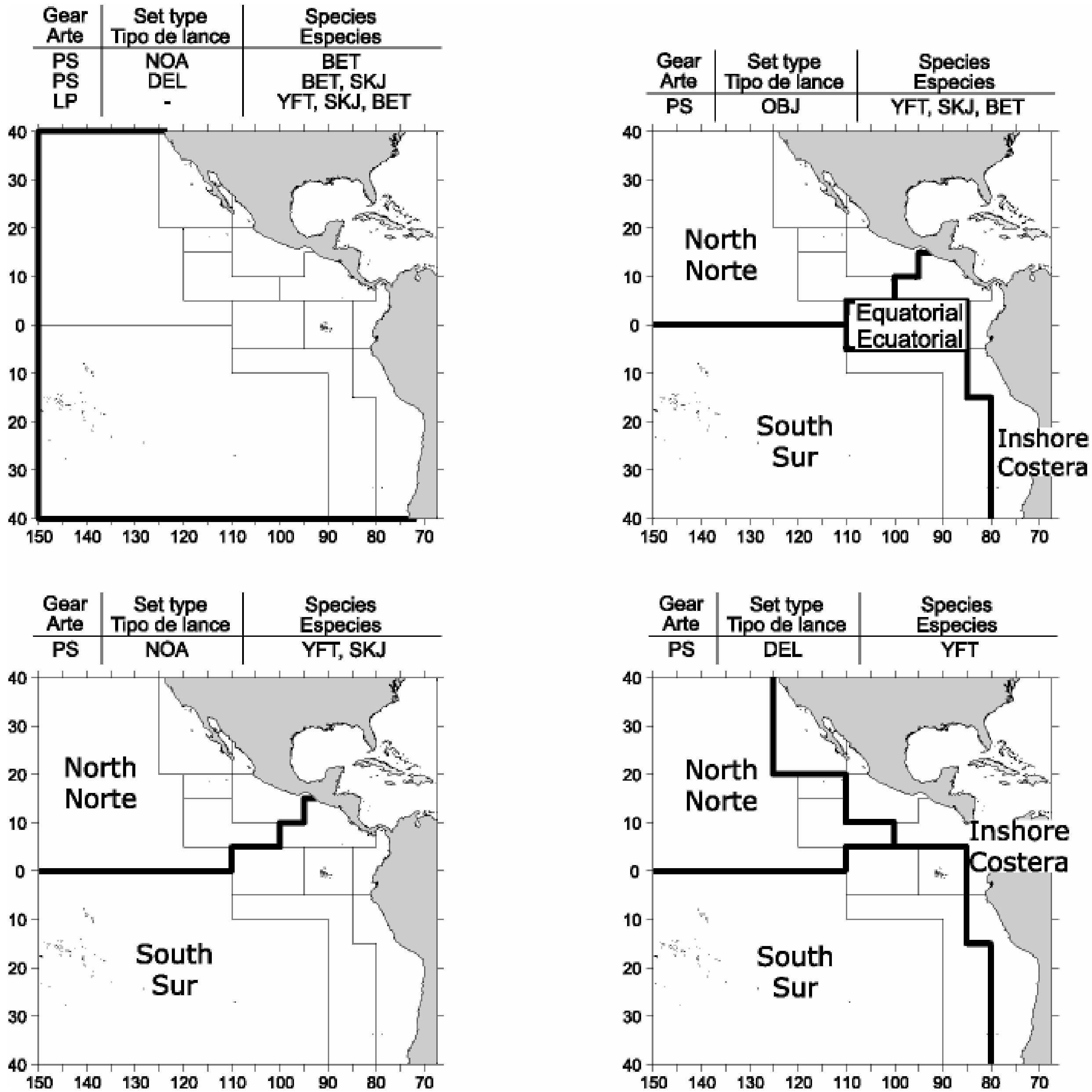

FIGURE 1. Spatial extents of the fisheries defined by the IATTC staff for stock assessment of yellowfin, skipjack, and bigeye in the EPO. The thin lines indicate the boundaries of the 13 length-frequency sampling areas, and the bold lines the boundaries of the fisheries. Gear: PS = purse seine, LP =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

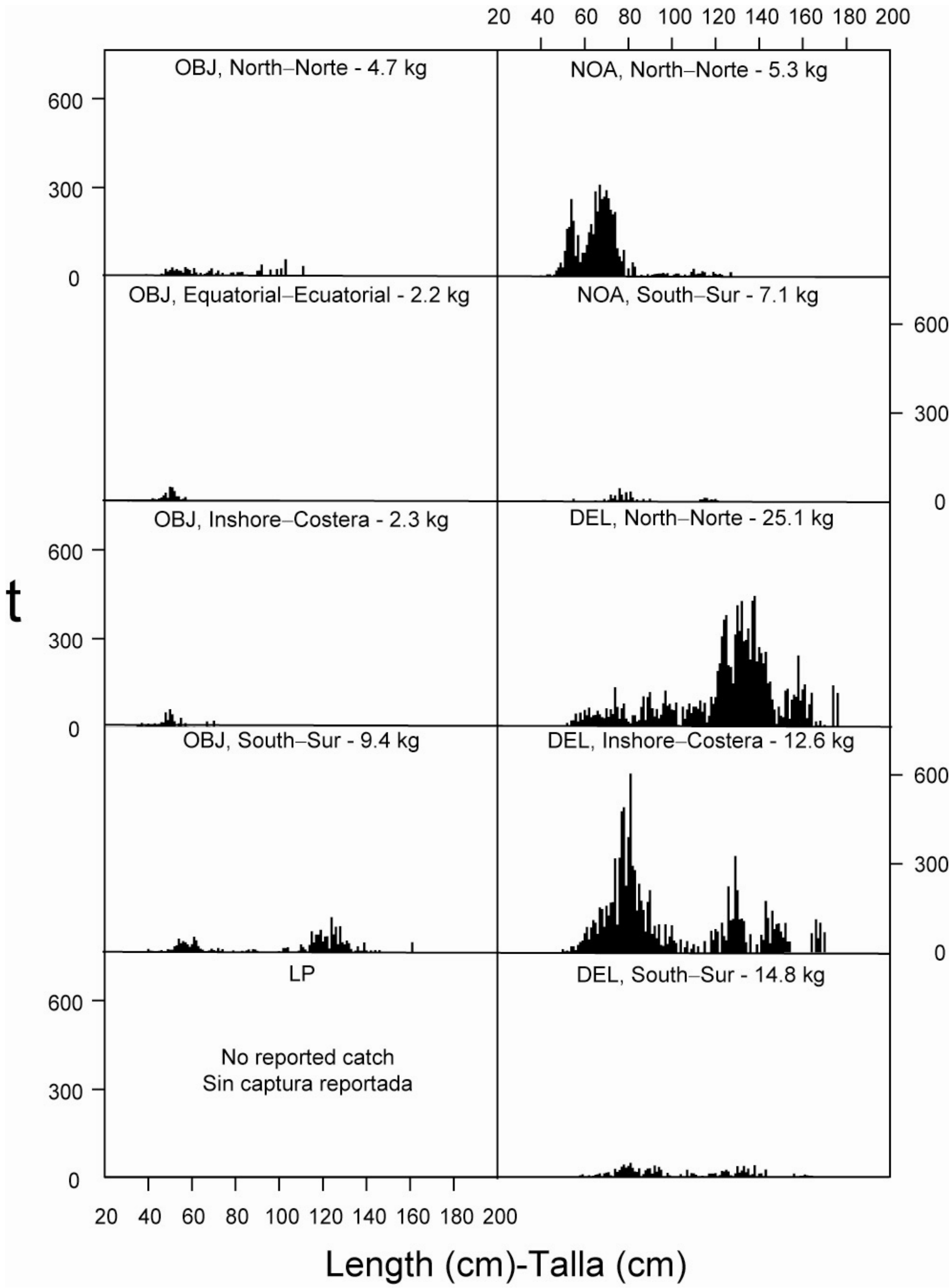

FIGURE 2a. Estimated size compositions of the yellowfin caught in each fishery of the EPO during the third quarter of 2006. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons; OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin.

FIGURA 2a. Composición por tallas estimada del aleta amarilla capturado en cada pesquería del OPO durante el tercero trimestre de 2006. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas; OBJ = objeto flotante; LP = caña; NOA = no asociado; DEL = delfín.

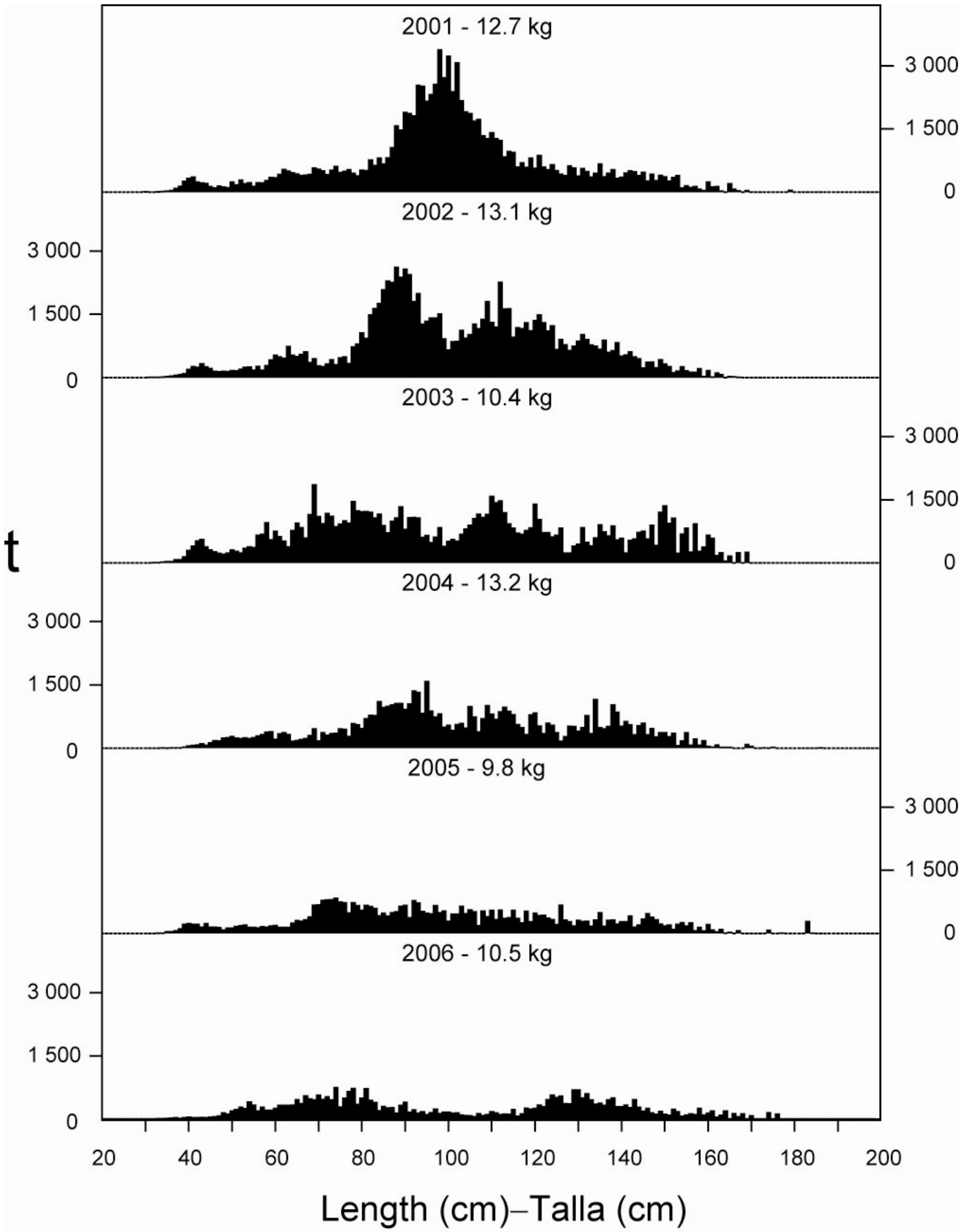

FIGURE 2b. Estimated size compositions of the yellowfin caught in the EPO during the third quarter of 2001-2006. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 2b. Composición por tallas estimada del aleta amarilla capturado en el OPO en el tercero trimestre durante 2001-2006. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas.

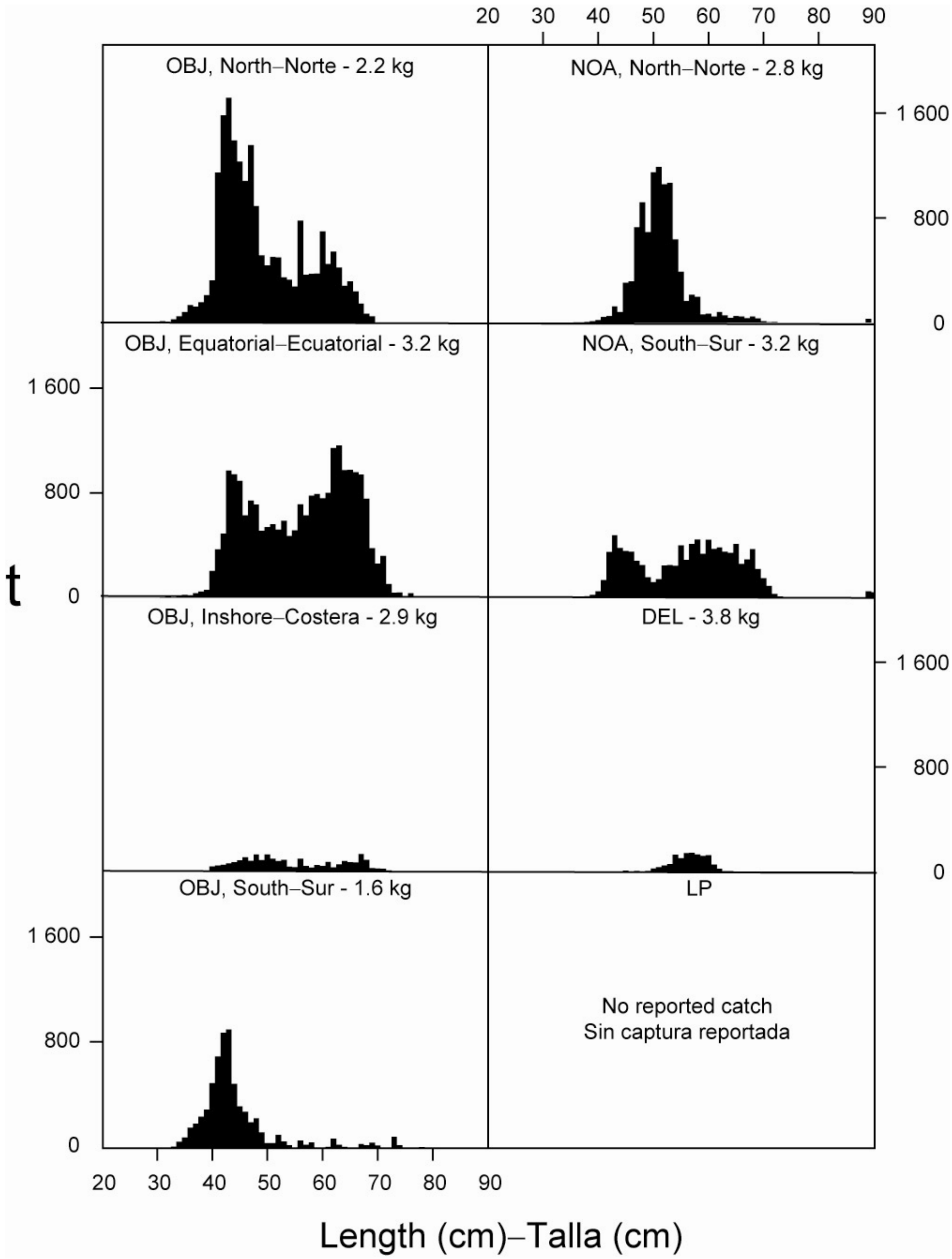

FIGURE 3a. Estimated size compositions of the skipjack caught in each fishery of the EPO during the third quarter of 2006. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons; OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin.

FIGURA 3a. Composición por tallas estimada del barrilete capturado en cada pesquería del OPO durante el tercero trimestre de 2006. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas; OBJ = objeto flotante; LP = caña; NOA = no asociado; DEL = delfín.

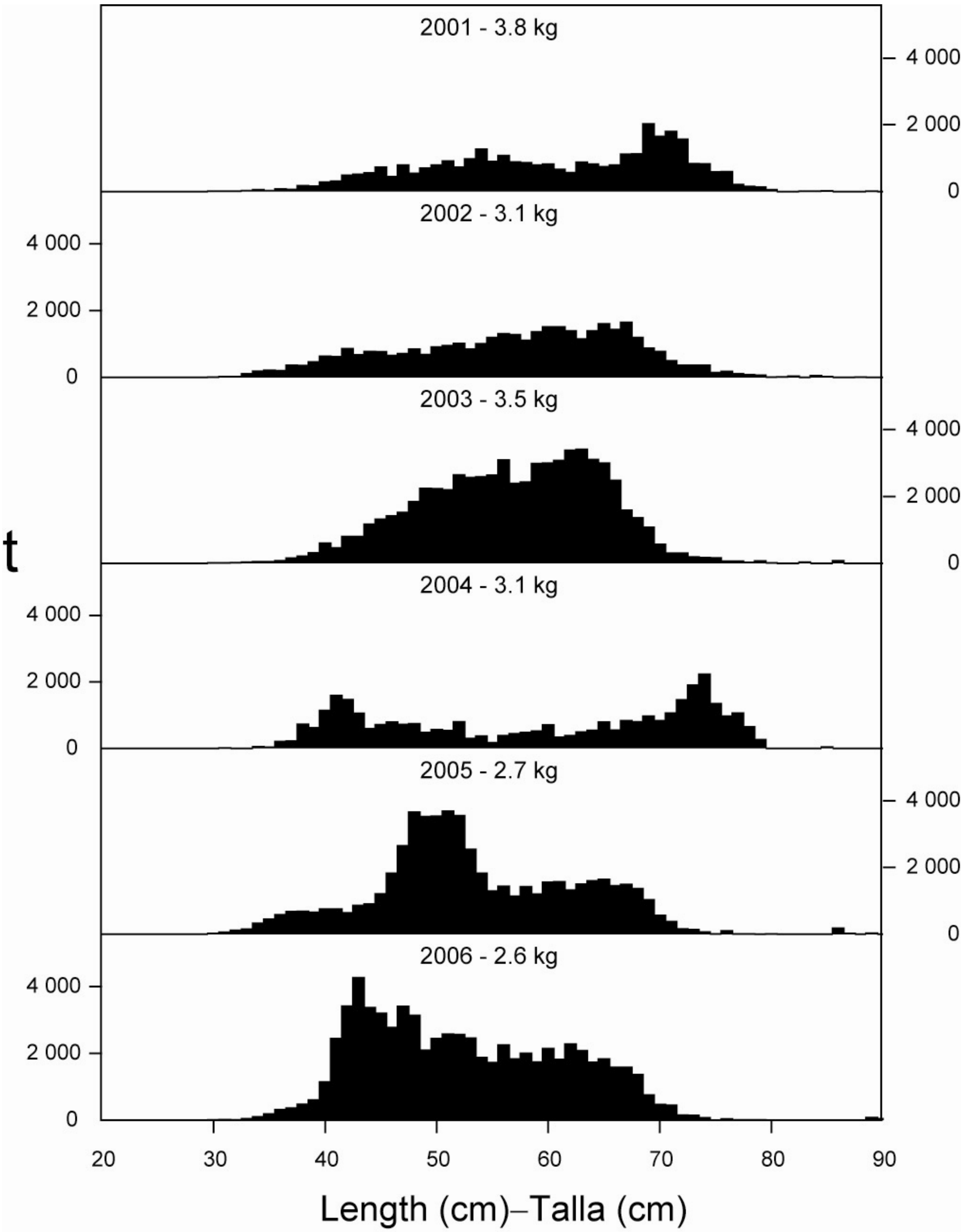

FIGURE 3b. Estimated size compositions of the skipjack caught in the EPO during the third quarter of 2001-2006. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 3b. Composición por tallas estimada del barrilete capturado en el OPO en el tercero trimestre durante 2001-2006. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas.

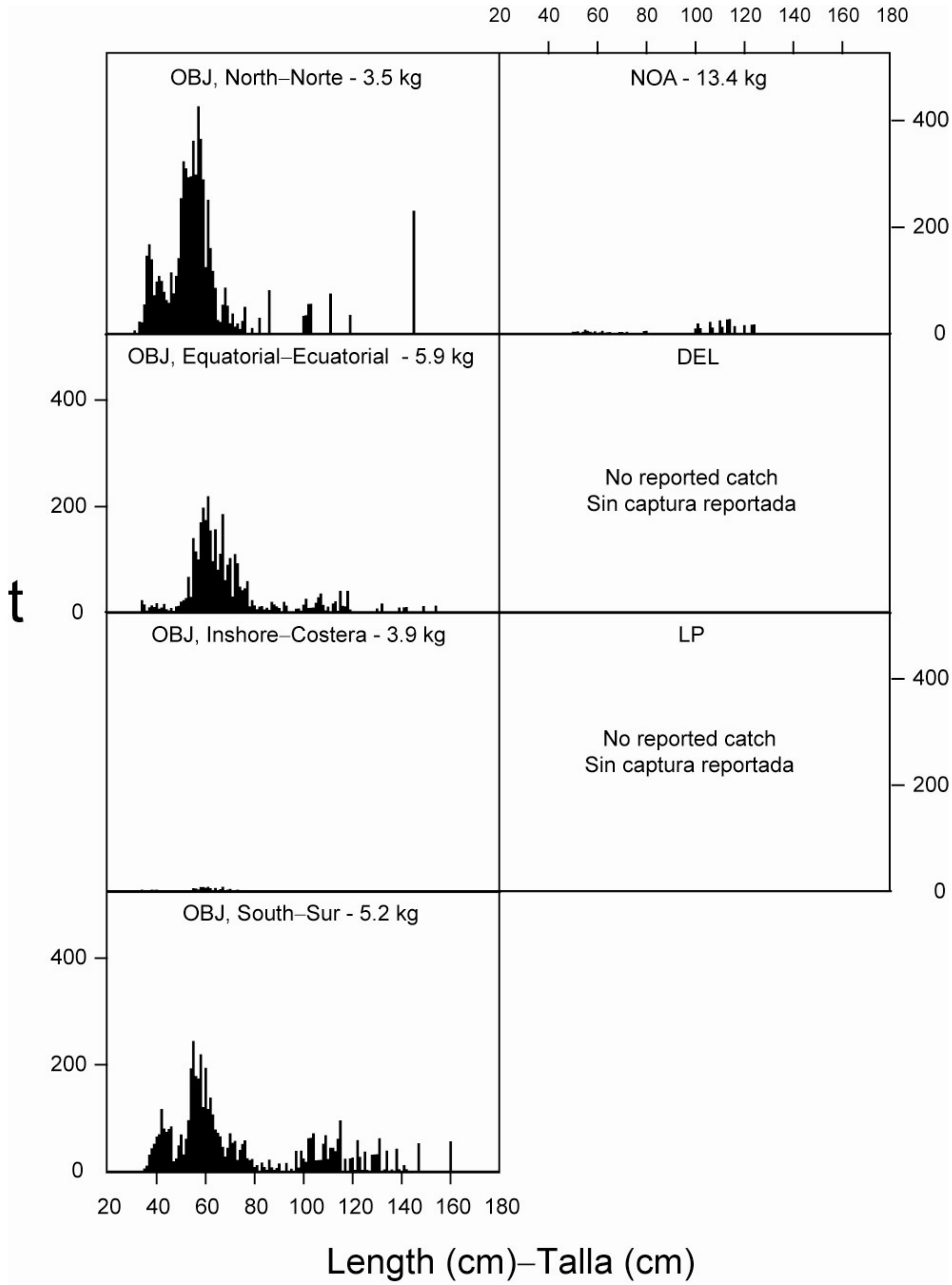

FIGURE 4a. Estimated size compositions of the bigeye caught in each fishery of the EPO during the third quarter of 2006. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons; OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin.

FIGURA 4a. Composición por tallas estimada del patudo capturado en cada pesquería del OPO durante el tercero trimestre de 2006. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas; OBJ = objeto flotante; LP = caña; NOA = no asociado; DEL = delfín.

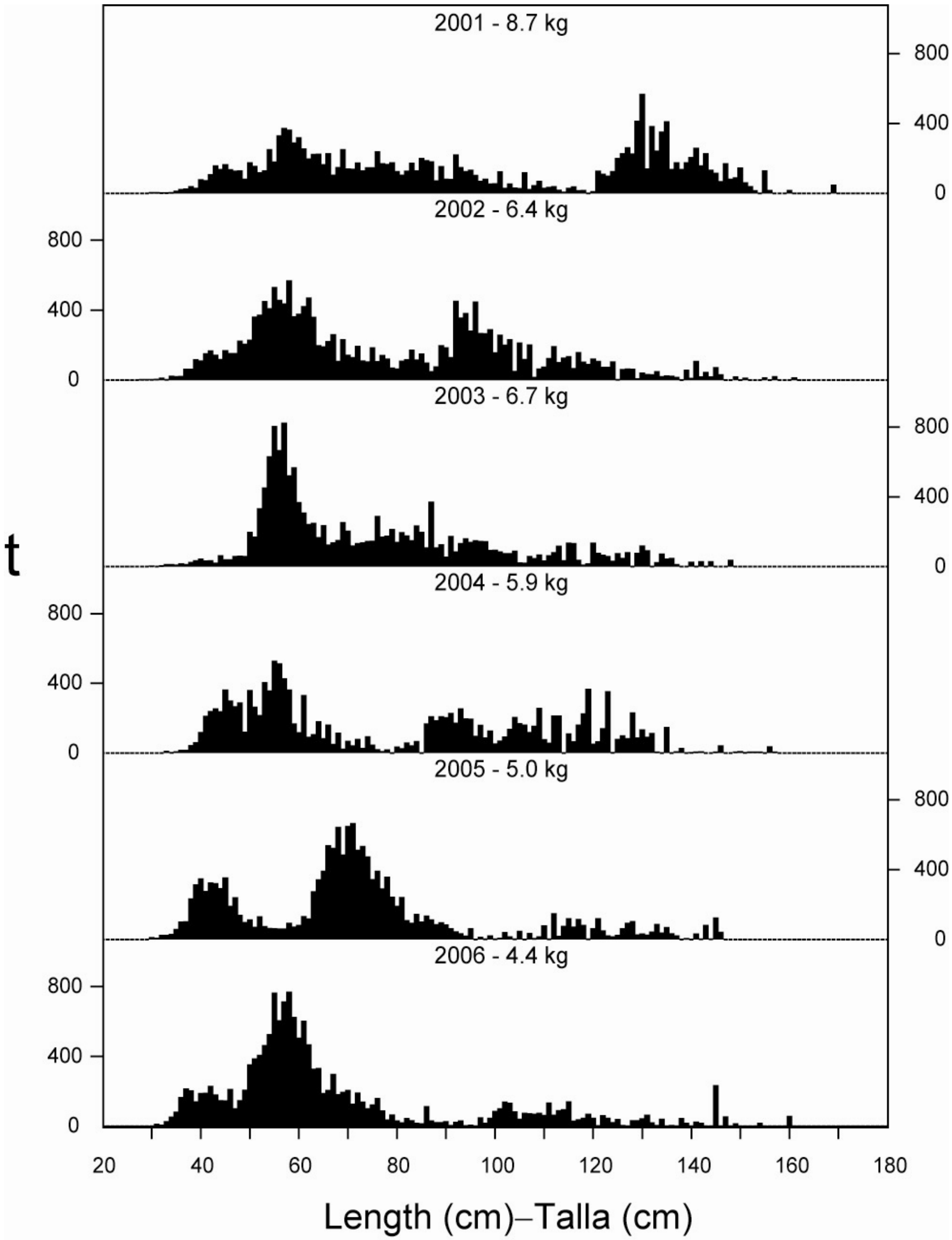

FIGURE 4b. Estimated size compositions of the bigeye caught in the EPO during the third quarter of 2001-2006. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 4b. Composición por tallas estimada del patudo capturado en el OPO en el tercero trimestre durante 2001-2006. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas.

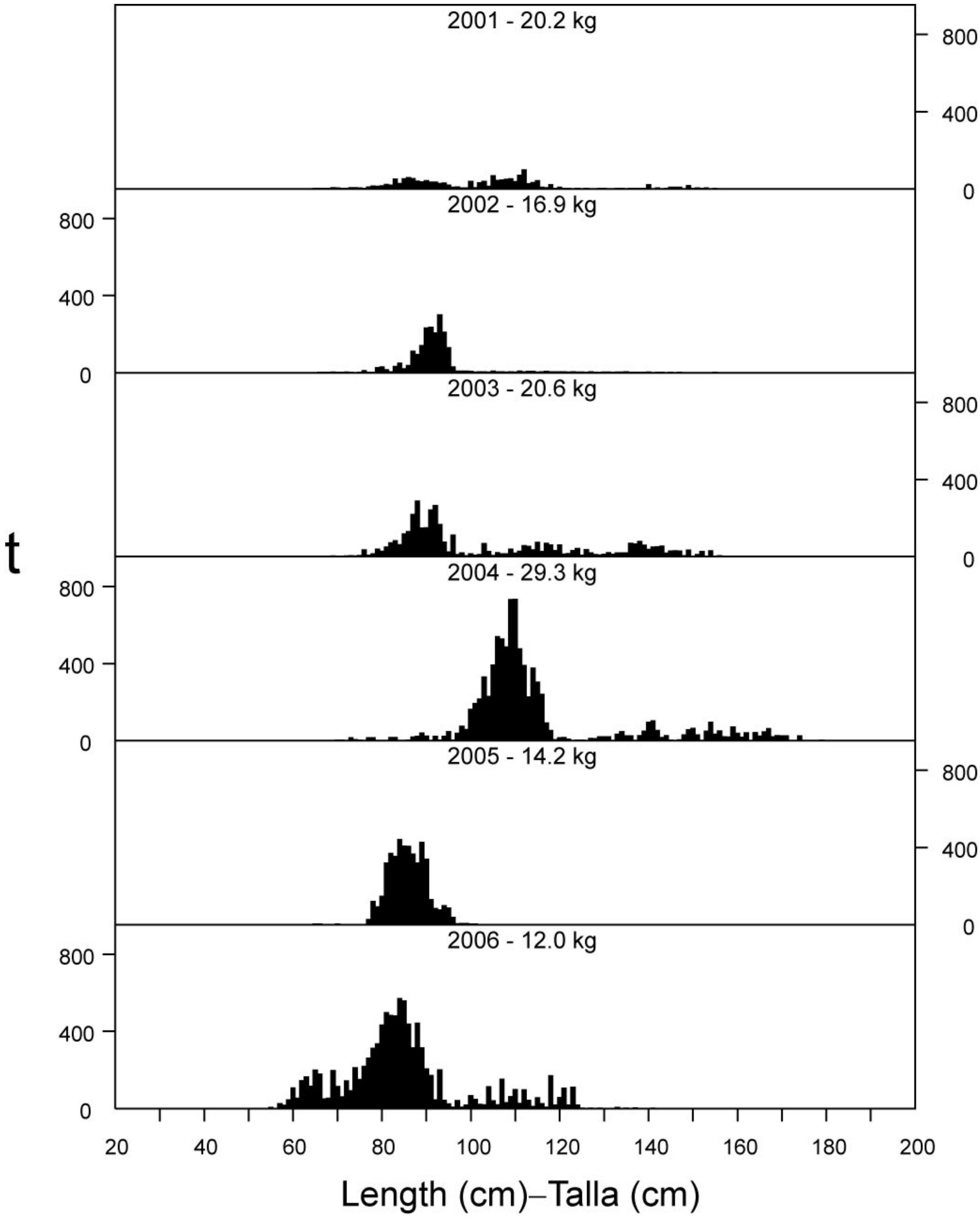

FIGURE 5. Estimated catches of Pacific bluefin by purse-seine and recreational gear in the EPO during 2001-2006. The values at the tops of the panels are the average weights. t = metric tons.

FIGURE 5. Captura estimada de aleta azul del Pacífico con arte de cerco y deportiva en el OPO durante2001-2006. El valor en cada recuadro representa el peso promedio. t = toneladas métricas.

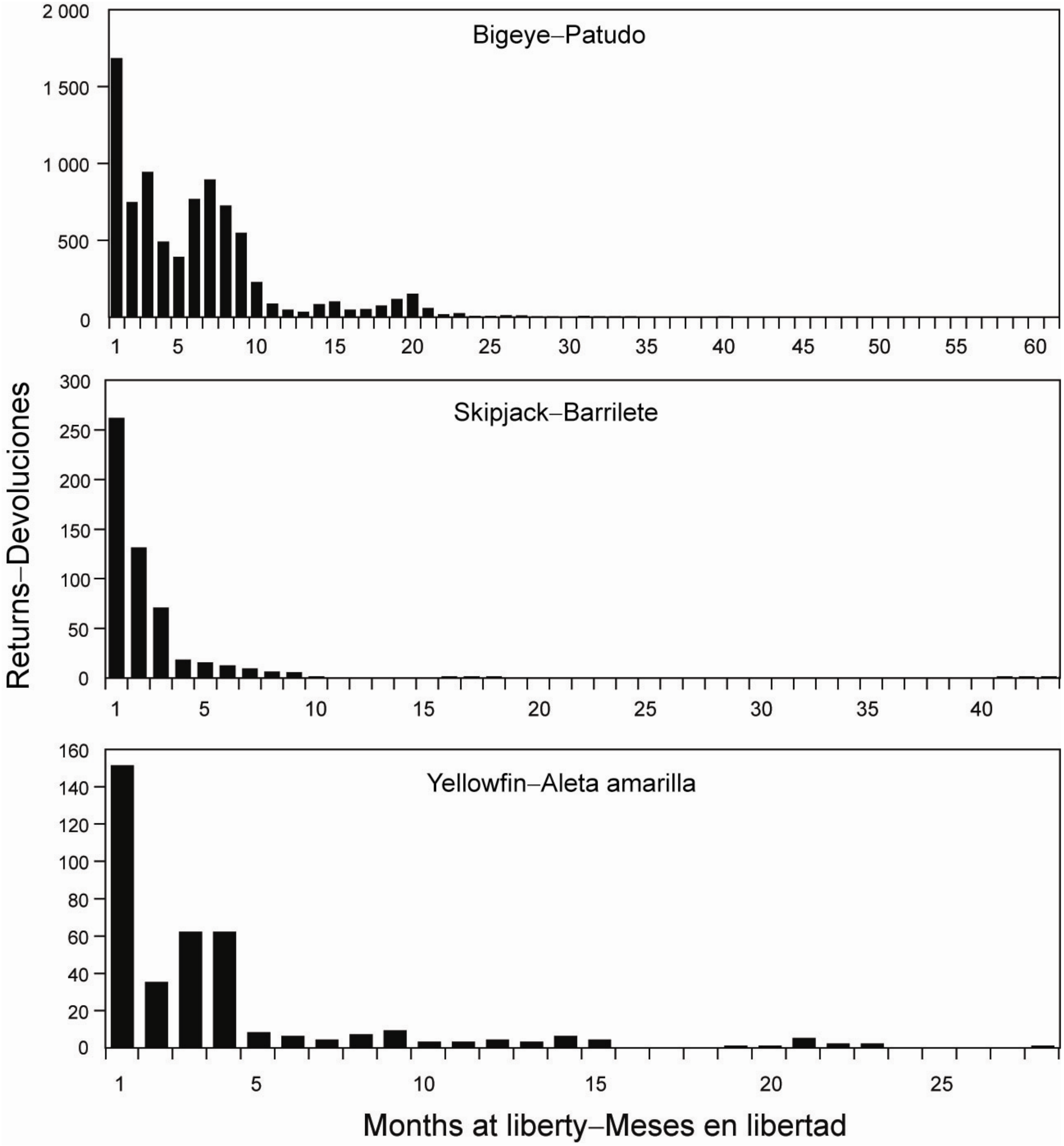

FIGURE 6. Numbers of returns of bigeye, skipjack, and yellowfin tagged with conventional or archival tags and released in the equatorial eastern Pacific Ocean, by months at liberty.
FIGURA 6. Número de devoluciones de atunes patudo, barrilete, y aleta amarilla marcados con marcas convencionales o archivadoras y liberados en el Océano Pacífico oriental ecuatorial, por meses en libertad.

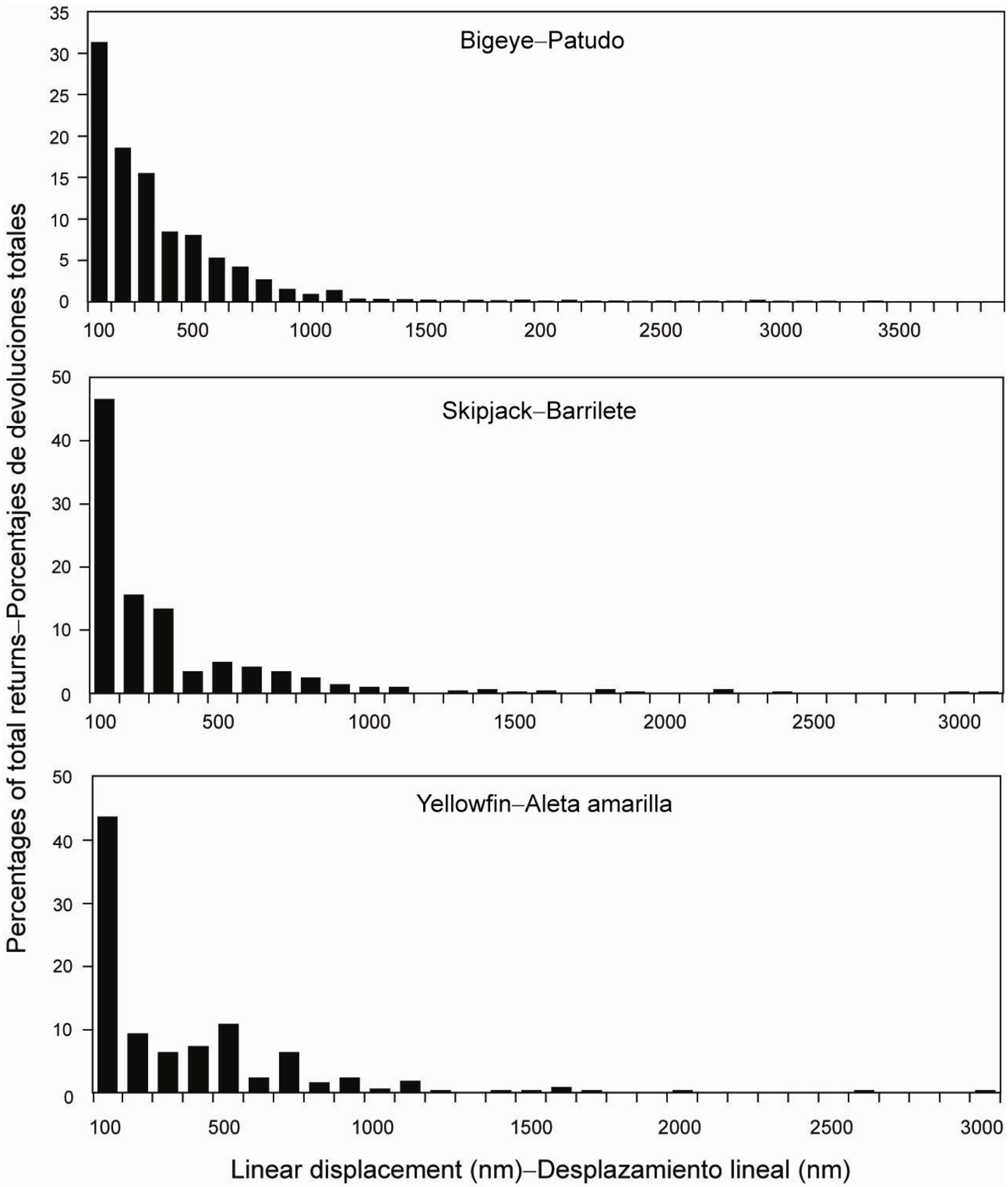

FIGURE 7. Linear displacements, expressed as percentages of total returns, for bigeye, skipjack, and yellowfin tagged with conventional or archival tags and released in the equatorial eastern Pacific Ocean.
FIGURA 7. Desplazamientos lineales, expresados como porcentajes de devoluciones totales, de atunes patudo, barrilete, y aleta amarilla marcados con marcas convencionales o archivadoras y liberados en el Océano Pacífico oriental ecuatorial.

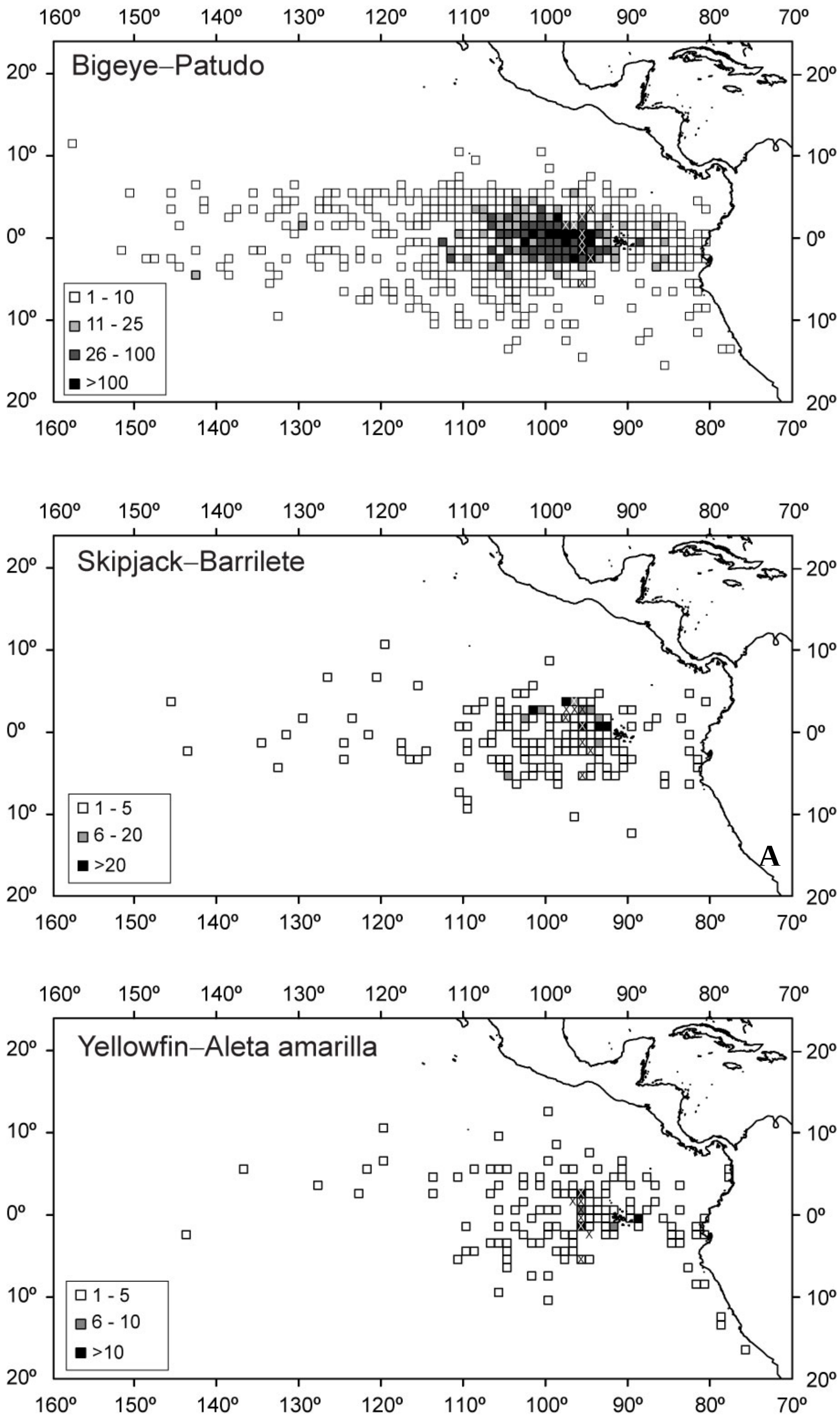

FIGURE 8. Locations of release (squares with x's) and recapture (squares with and without x's) of bigeye, skipjack, and yellowfin tagged with conventional or archival tags and released in the equatorial eastern Pacific Ocean.

FIGURA 8. Posiciones de liberación (cuadros con x) y recaptura (cuadros con y sin x) de atunes patudo, barrilete, y aleta amarilla marcados con marcas convencionales o archivadoras y liberados en el Océano Pacífico oriental ecuatorial.

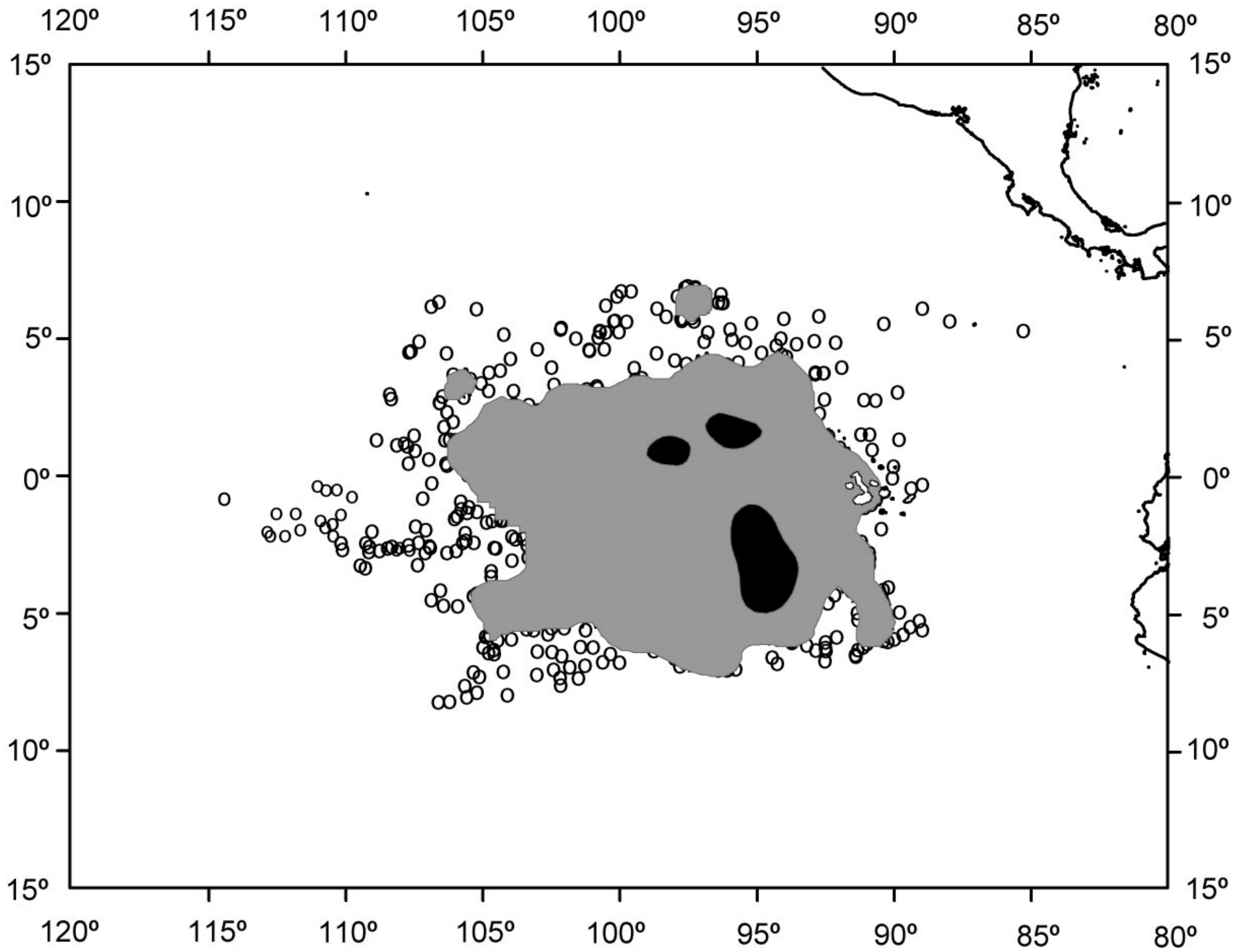

FIGURE 9. Utilization distributions (50 percent in black and 95 percent in gray), consisting of 3,319 geolocation estimates, for 26 bigeye released in the equatorial Pacific Ocean that were at liberty for more than 150 days. The circles are the geolocation estimates outside the 95-percent utilization distribution.

FIGURA 9. Distribuciones de utilización (50% en negro y 95% en gris), consistiendo en 3.319 estimaciones de geolocalización, de 26 patudos liberados en el Océano Pacífico ecuatorial que estuvieron en libertad más de 150 días. Los círculos son las estimaciones de geolocalización afuera de la distribución de utilización de 95%.

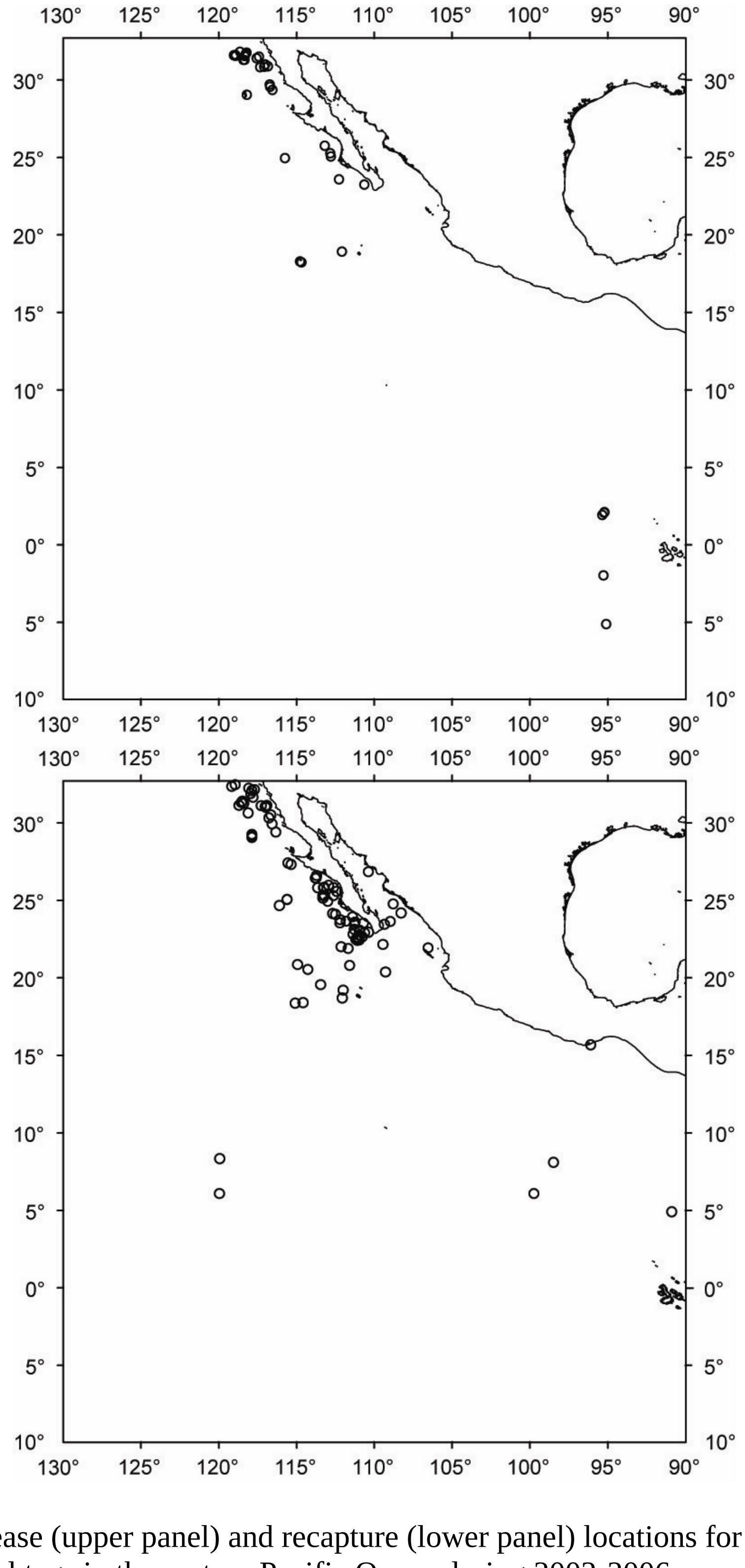

FIGURE 10. Release (upper panel) and recapture (lower panel) locations for all yellowfin tagged with archival tags in the eastern Pacific Ocean during 2002-2006.
FIGURA 10. Posiciones de liberación (panel superior) y recaptura (panel inferior) de todos los aletas amarillas marcados con marcas archivadoras en el Océano Pacífico oriental durante 2002-2006.

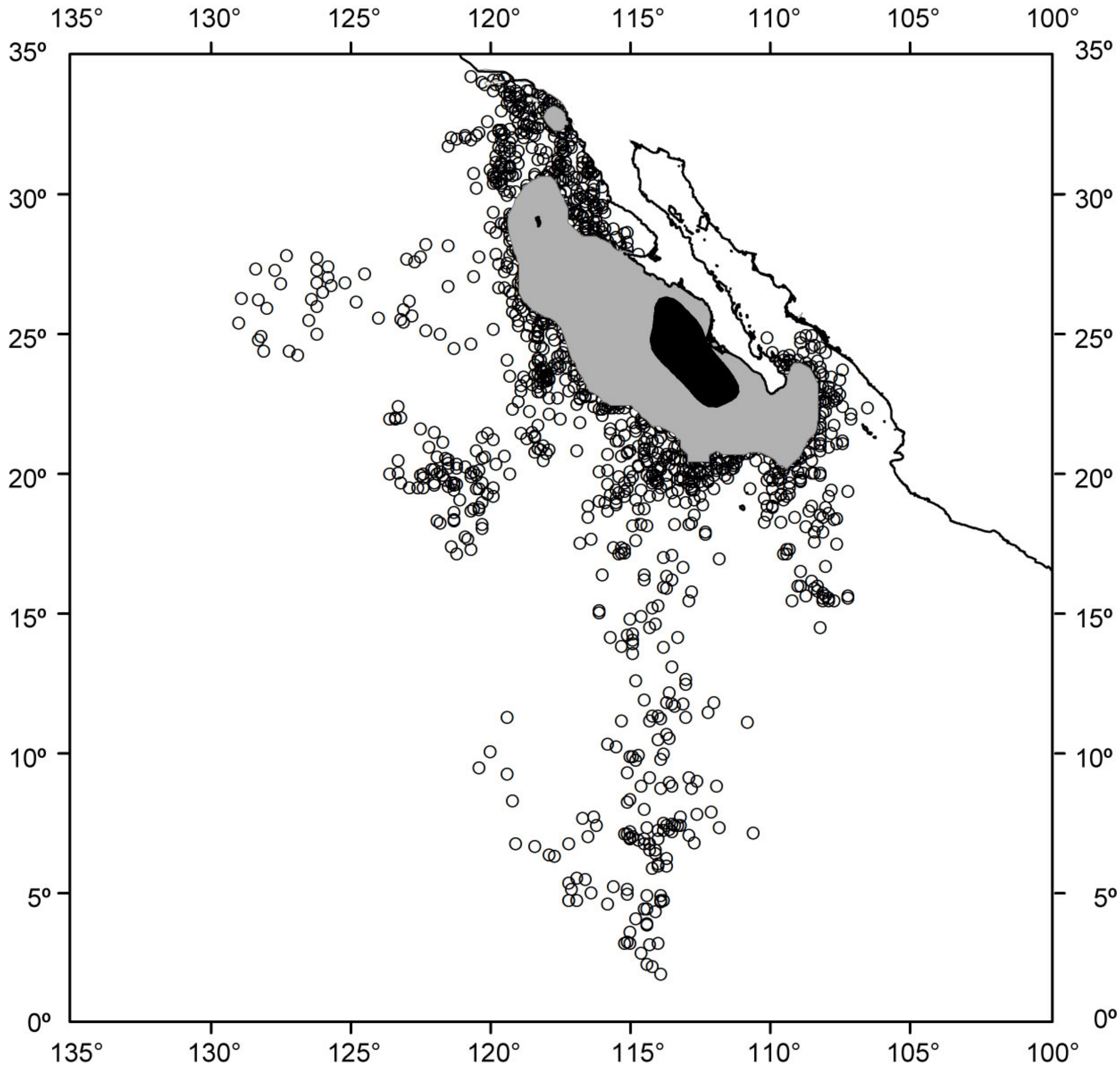

FIGURE 11. Utilization distributions (50 percent in black and 95 percent in grey), consisting of 8,283 geolocation estimates, for 34 yellowfin released off Baja California that were at liberty for more than 150 days. The circles are the geolocation estimates outside the 95-percent utilization distribution.

FIGURA 11. Distribuciones de utilización (50% en negro y 95% en gris), consistiendo en 8.283 estimaciones de geolocalización, de 34 patudos liberados frente a Baja California que estuvieron en libertad más de 150 días. Los círculos son las estimaciones de geolocalización afuera de la distribución de utilización de 95%.

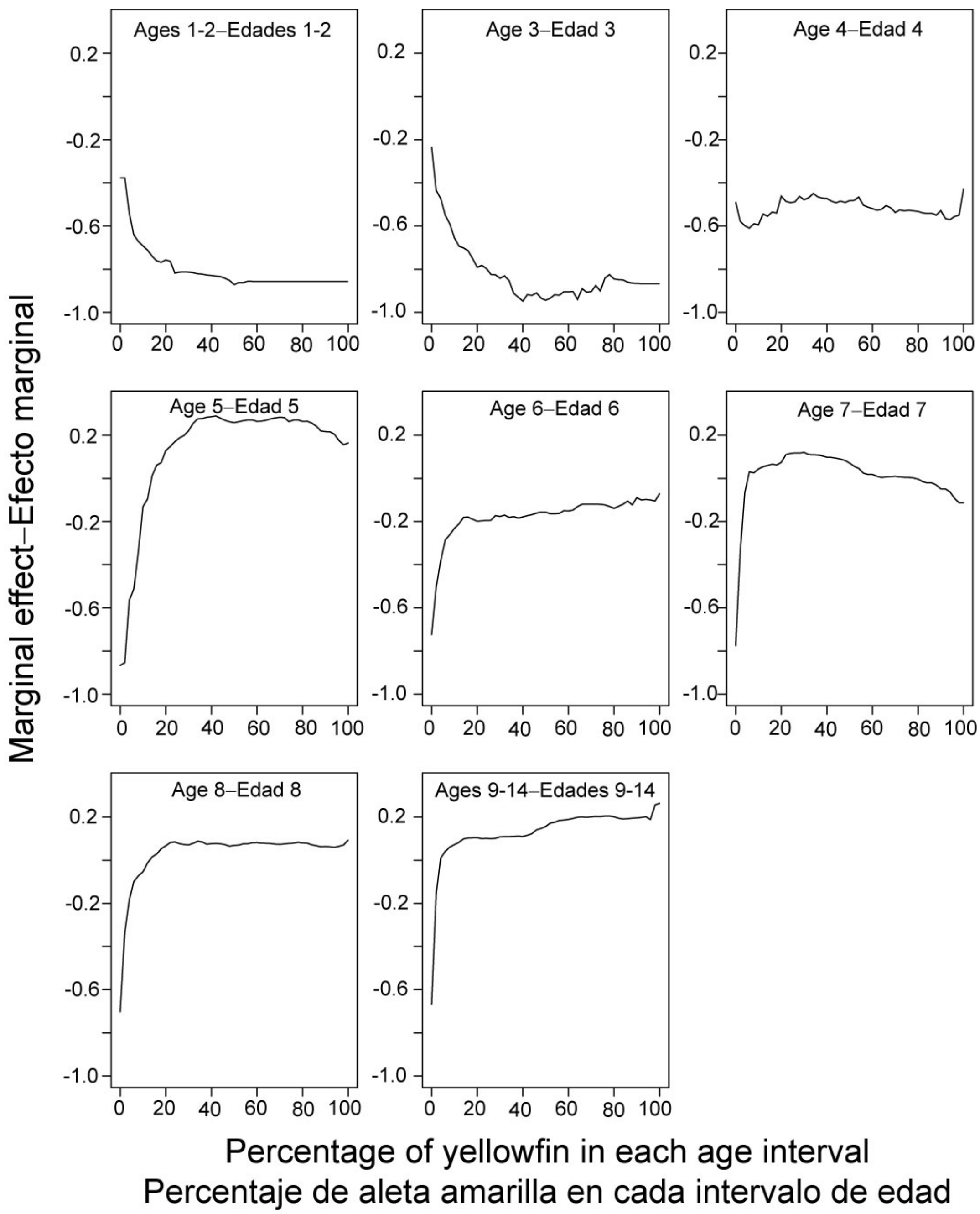

FIGURE 12. Approximate relationship between the probability that the yellowfin tuna in a sample from a large vessel were classified as having been caught in one or more dolphin sets ("marginal effect") and the proportion of fish in each age interval. The samples with the greatest positive marginal effects would be the most likely to be classified as having been caught in one or more dolphin sets.

FIGURA 12. Relación aproximada entre la probabilidad que el atún aleta amarilla en una muestra de un buque grande sea clasificado como capturado en uno o más lances sobre delfines ("efecto marginal") y la proporción de pescado en cada intervalo de edad. Las muestras con los efectos marginales positivos máximos tendrían la mayor probabilidad de ser clasificados como provenientes de lances sobre delfines.

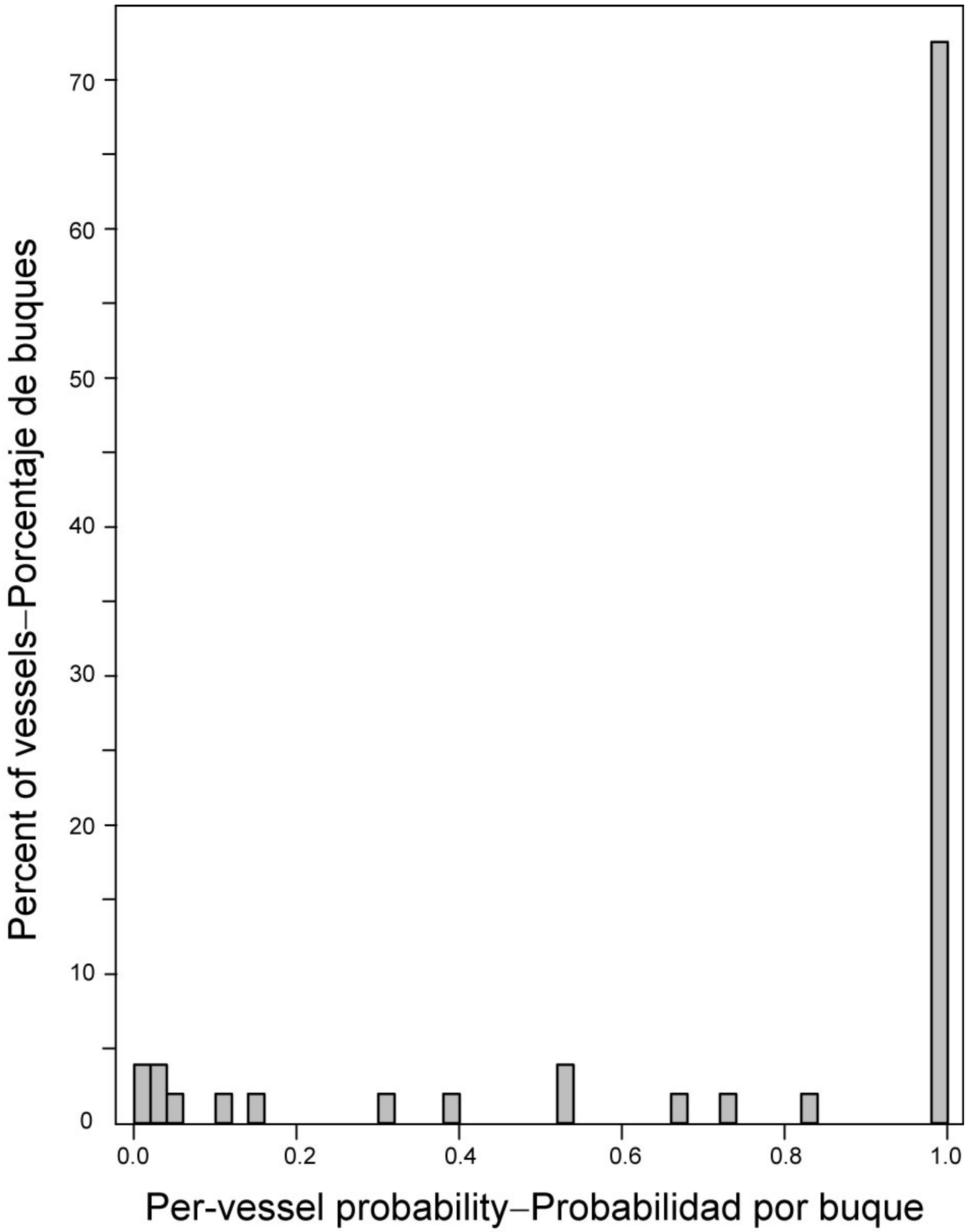

FIGURE 13. Per-vessel probabilities for small vessels. Per-vessel probabilities at or near 1.0 indicate few to no unusual residuals per vessel, while those near 0.0 indicate relatively unlikely numbers of unusual residuals.
FIGURA 13. Probabilidades por buque para los buques pequeños. Las probabilidades por buque en o cerca de 1.0 indican pocos o ningún residual atípico por buque, mientras que aquéllas cercanas a 0.0 indican números de residuales atípicos relativamente poco probables.

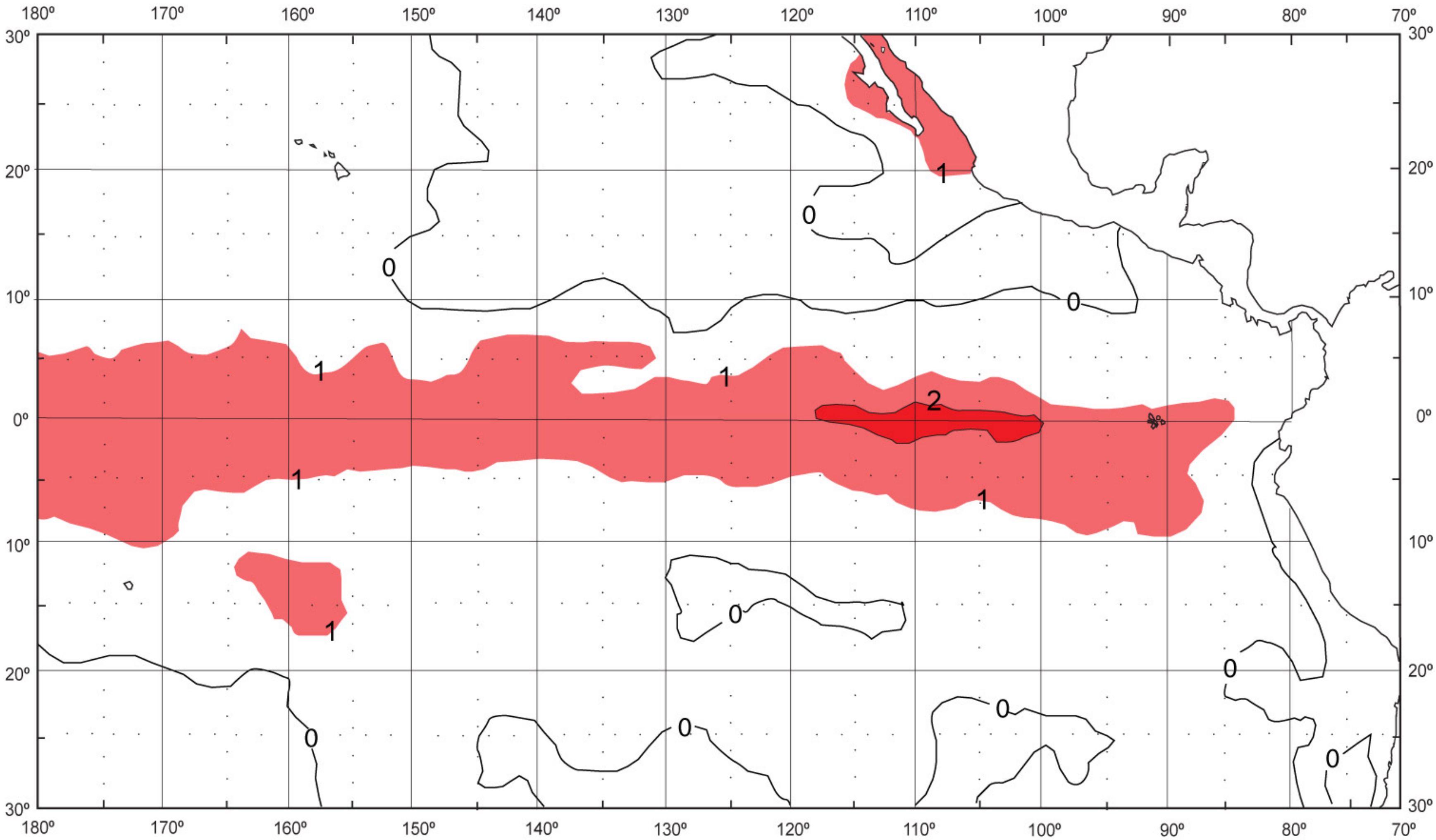

FIGURE 14. Sea-surface temperature (SST) anomalies (departures from long-term normals) for December 2006, based on data from fishing boats and other types of commercial vessels.
FIGURA 14. Anomalías (variaciones de los niveles normales a largo plazo) de la temperatura superficial del mar (TSM) en diciembre de 2006, 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 2006 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 2006, y de la capacidad de acarreo de los mismos, en metros cúbicos, por bandera, arte de pesca, y volumen de bodega. Se incluye cada buque en los totales de cada bandera bajo la cual pescó durante el año, pero solamente una vez en el total de la flota; por consiguiente, los totales de las flotas no son siempre iguales a las sumas de las banderas individuales. PS = cerquero; LP = cañero.

Flag	**Gear**	**Well volume–Volumen de bodega**				**Capacity**
Bandera	**Arte**	**1-900**	**901-1700**	**>1700**	**Total**	**Capacidad**
			Number—Número			
Bolivia	PS	1	-	-	1	222
Colombia	PS	3	10	-	13	14,439
Ecuador	PS	60	16	8	84	58,087
España—Spain	PS	-	-	3	3	6,955
Guatemala	PS	-	1	-	1	1,475
Honduras	PS	1	2	-	3	2,729
México	PS	24	32	1	57	55,830
	LP	4	-	-	4	498
Nicaragua	PS	1	6	-	7	8,308
Panamá	PS	5	14	6	25	34,339
El Salvador	PS	1	1	3	5	8,184
USA—EE.UU.	PS	-	1	-	1	1,593
Venezuela	PS	-	20	2	22	30,788
Vanuatu	PS	1	1	-	2	2,163
All flags—	PS	97	104	23	224	
Todas banderas	LP	4	-	-	4	
	PS + LP	101	104	23	228	
			Capacity—Capacidad			
All flags—	PS	43,715	132,651	48,746	225,112	
Todas banderas	LP	498	-	-	498	
	PS + LP	44,213	132,651	48,746	225,610	

TABLE 2. Changes in the IATTC fleet list recorded during the fourth quarter of 2006. PS = purse seine.
TABLA 2. Cambios en la flota observada por la CIAT registrados durante el cuarto trimestre de 2006. PS = cerquero.

Vessel name Nombre del buque	Flag Bandera	Gear Arte	Capacity (m^3) Capacidad (m^3)	Remarks Comentarios
Vessels removed from fleet—Buques retirados de la flota				
Estado 29	México	PS	734	
Judith I	México	PS	702	
San José	México	PS	220	
San Rafael	México	PS	294	
Mary Lynn	Unknown—desconocida	PS	285	
Donna B	USA—EE.UU.	PS	170	

TABLE 3. Preliminary estimates of the retained catches of tunas in the EPO from 1 January through 31 December 2006, 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 31 de diciembre 2006, por especie y bandera del buque, en toneladas métricas**.**

Flag	Yellowfin	Skipjack	Bigeye	Pacific bluefin	Bonitos (*Sarda* spp.)	Albacore	Black kipjack	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	29,122	136,997	30,382	-	-	-	85	387	196,973	35.8
Honduras	2,056	6,088	2,545	-	-	-	-	-	10,689	1.9
México	66,184	21,121	111	9,786	3,233	94	1,897	189	102,615	18.6
Nicaragua	8,367	5,183	1,513	-	-	-	2	1	15,066	2.7
Panamá	27,081	43,773	8,966	-	-	-	8	37	79,865	14.5
Venezuela	20,315	23,590	3,420	-	248	-	11	-	47,584	8.6
Other—Otros[2]	27,136	56,695	14,092	-	-	-	5	-	97,928	17.9
Total	180,261	293,447	61,029	9,786	3,481	94	2,008	614	550,720	

[1] Includes other tunas, sharks, and miscellaneous fishes
[1] Incluye otros túnidos, tiburones, y peces diversos
[2] Includes Bolivia, Colombia, El Salvador, Guatemala, Spain, United States, and Vanuatu; this category is used to avoid revealing information about the operations of individual vessels or companies.
[2] Incluye Bolivia, Colombia, El Salvador, España, Estados Unidos, Guatemala, y Vanuatú; 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-30 September, based on fishing vessel logbook information.

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-30 de septiembre, basado en información de los cuadernos de bitácora de buques pesqueros.

Area	Fishery statistic Estadística de pesca	Year-Año					
		2001	**2002**	**2003**	**2004**	**2005**	**2006[2]**
Purse seine—Red de cerco							
North of 5°N Al norte de 5°N	Catch—Captura	137,900	169,300	186,800	102,800	91,200	50,700
	CPDF—CPDP	21.4	24.3	20.2	10.8	11.3	8.7
South of 5°N Al sur de 5°N	Catch—Captura	75,500	45,800	40,000	65,100	39,600	15,300
	CPDF—CPDP	8.5	5.1	4.5	6.1	4.6	2.3
Total	Catch—Captura	213,400	215,100	226,800	167,900	130,800	66,000
	CPDF—CPDP	16.8	20.2	17.5	9.0	9.3	7.2
Annual total Total anual	Catch—Captura	255,600	261,800	275,100	192,800	160,600	
Pole and line—Cañero							
Total	Catch—Captura	2,400	400	100	900	800	
	CPDF—CPDP	3.2	1.2	0.7	3.1	2.5	
Annual total Total anual	Catch—Captura	3,300	800	500	1,800	800	

1 Purse-seiners with carrying capacities greater than 363 metric tons 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 toneladas métricas 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

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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-30 September, based on fishing vessel logbook information.

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-30 de septiembre, basado en información de los cuadernos de bitácora de buques pesqueros.

Area	Fishery statistic Estadística de pesca	Year-Año					
		2001	2002	2003	2004	2005	2006[2]
Purse seine—Red de cerco							
North of 5°N	Catch—Captura	11,800	9,200	29,000	22,100	35,700	19,100
Al norte de 5°N	CPDF—CPDP	1.8	1.3	3.1	2.3	4.4	3.3
South of 5°N	Catch—Captura	53,500	62,200	84,600	73,200	87,300	61,100
Al sur de 5°N	CPDF—CPDP	6.0	6.9	9.6	6.9	10.2	9.0
Total	Catch—Captura	65,300	71,400	113,600	95,300	123,000	80,200
	CPDF—CPDP	5.2	6.2	7.9	5.8	8.5	7.6
Annual total Total anual	Catch—Captura	85,600	84,300	155,200	131,900	147,700	
Pole and line—Cañero							
Total	Catch—Captura	100	500	200	500	300	
	CPDF—CPDP	.2	1.5	2.5	1.7		
Annual total Total anual	Catch—Captura	300	500	500	500	400	

1 Purse-seiners with carrying capacities greater than 363 metric tons 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 toneladas métricas únicamente; todos buques cañeros. Se redondean los valores de captura al 100 más cercano, y los de CPDP al 0.1 más cercano.

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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-30 September, based on purse-seine vessel logbook information.

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-30 de septiembre, basado en información de los cuadernos de bitácora de buques cerqueros.

Fishery statistic—Estadística de pesca	**Year—Año**					
	2001	**2002**	**2003**	**2004**	**2005**	**2006[2]**
Catch—Captura	27,900	22,000	21,100	28,000	18,000	16,300
CPDF—CPDP	2.9	2.2	2.0	2.1	1.7	1.8
Total annual catch—Captura total anual	36,600	26,700	33,100	43,100	28,300	

1 Vessels with carrying capacities greater than 363 metric tons 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 toneladas métricas únicamente. Se redondean los valores de captura al 100 más cercano, y los de CPDF al 0.1 más cercano.

2 Preliminary

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TABLE 7. Catches of bigeye tuna in the eastern Pacific Ocean during 2006 by longline vessels.
TABLA 7. Captures de atún patudo en el Océano Pacífico oriental durante 2006 por buques palangreros.

Flag	Quarter				Month			Fourth quarter	Total
	1	2	3	1-3	10	11	12		
Bandera	**Trimestre**				**Mes**			**Cuarto trimestre**	**Total**
	1	**2**	**3**	**1-3**	**10**	**11**	**12**		
China	-	-	-	-	-	-	-	-	-
Japan—Japón	3,819	2,980	3,715	10,514	1,096	1,031	-	2,127	12,641
Republic of Korea—República de Corea	2,048	2.213	1,596	5,857	-	-	-	-	5,857
Chinese Taipei—Taipei Chino	2,082	1,640	867	4,589	-	-	-	-	4,589
Vanuatu	405	142	101	648	-	-	-	-	648
Total	8,354	6,975	6,279	21,608	1,096	1,031	-	2,127	23,735

TABLE 8. Preliminary data on the sampling coverage of trips by vessels with carrying capacities greater than 363 metric tons by the observer programs of the IATTC, Ecuador, the European Union, Mexico, Nicaragua, Panama, and Venezuela during the fourth quarter of 2006. 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 de acarreo más que 363 toneladas métricas por los programas de observadores de la CIAT, Ecuador, México, Nicaragua, Panamá, el Unión Europea, y Venezuela durante el cuarto trimestre de 2006. 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	(53)	3	(25)	9	(28)	12	(53)	100.0	(100.0)
Ecuador	62	(288)	41	(189)	21	(99)	62	(288)	100.0	(100.0)
España—Spain	4	(24)	3	(14)	1	(10)	4	(24)	100.0	(100.0)
Guatemala	1	(5)	1	(5)			1	(5)	100.0	(100.0)
Honduras	4	(19)	4	(19)			4	(19)	100.0	(100.0)
México	11	(181)	4	(91)	7	(90)	11	(181)	100.0	(100.0)
Nicaragua	5	(26)	4	(25)	1	(1)	5	(26)	100.0	(100.0)
Panamá	19	(122)	7	(80)	12	(42)	19	(122)	100.0	(100.0)
El Salvador	5	(24)	5	(24)			5	(24)	100.0	(100.0)
U.S.A.—EE.UU.	0	(3)	0	(3)			0	(3)	100.0	(100.0)
Venezuela	12	(79)	7	(41)	5	(38)	12	(79)	100.0	(100.0)
Vanuatu	2	(12)	2	(12)			2	(12)	100.0	(100.0)
Total	137	(836)[1]	81	(528)	56	(308)	137	(836	100.0	(100.0)

[1] Includes 90 trips (57 by vessels with observers from the IATTC program and 33 by vessels with observers from the national programs) that began in late 2005 and ended in 2006

[1] Incluye 90 viajes (57 por buques con observadores del programa del CIAT y 33 por buques con observadores de los programas nacionales) iniciados a fines de 2005 y completados en 2006

TABLE 9a. Releases of tunas tagged with conventional tags in the equatorial eastern Pacific Ocean during 2000 and 2002-2006 and returns of those tags through 31 December 2006.

Year	Bigeye—Patudo			Skipjack—Barrilete			Yellowfin—Aleta amarilla		
Año	Releases Liberaciones	Returns Retornos	Percent Porcentaje	Releases Liberaciones	Returns Retornos	Percent Porcentaje	Releases Liberaciones	Returns Retornos	Percent Porcentaje
2000	101	22	21.8	1,238	262	21.2	71	8	11.3
2002	1,421	581	40.9	257	30	11.7	196	33	16.8
2003	8,610	4,029	46.8	138	22	15.9	863	241	27.9
2004	7,089	2,792	39.4	878	152	17.3	306	39	12.7
2005	1,928	79	41.0	333	32	9.6	265	38	14.3
2006	32	8	25.0	592	37	6.3	541	30	5.5
Total	19,181	8,222	39.2	3,436	535	15.6	2,242	389	17.4

Table 9b. Releases of tunas tagged with archival tags in the equatorial eastern Pacific Ocean during 2000 and 2002-2006 and returns of those tags through 31 December 2006.

Year	Bigeye—Patudo			Skipjack—Barrilete			Yellowfin—Aleta amarilla		
Año	Releases Liberaciones	Returns Retornos	Percent Porcentaje	Releases Liberaciones	Returns Retornos	Percent Porcentaje	Releases Liberaciones	Returns Retornos	Percent Porcentaje
2000	96	35	36.5	-	-	-	-	-	-
2002	26	8	30.8	36	1	2.8	-	-	-
2003	90	54	60.0	10	0	0.0	8	3	37.5
2004	58	32	55.2	33	6	18.2	-	-	-
2005	53	33	62.3	48	0	0.0	-	-	-
2006	-	-	-	2	0	0.0	45	4	8.9
Total	323	162	50.2	129	7	5.4	53	7	13.2

TABLE 10. Releases of yellowfin tagged with archival tags in the eastern Pacific Ocean during 2002-2006 and returns of those tags through 31 December 2006.

Year Año	Month Mes	Area	Releases Liberaciones	Returns by days at liberty—Retornos por días en libertad <30	30-89	90-180	181-365	>365	Total
Baja California									
2002	October— Octubre	Southern Baja California— Baja California sureña	25	7	0	0	4	2	13
2003	October— Octubre	Southern Baja California— Baja California sureña	43	7	2	2	12	0	23
2004	August— Agosto	Northern Baja California— Baja California norteña	34	6	4	0	5	4	19
2004	November— Noviembre	Southern Baja California— Baja California sureña	81	5	2	10	10	8	35
2005	August— Agosto	Northern Baja California— Baja California norteña	47	4	2	0	19	0	25
2005	October— Octubre	Southern Baja California— Baja California sureña	75	13	13	13	4	1	44
2006	August— Agosto	Northern Baja California— Baja California norteña	41	5	1	0	0	0	6
2006	November— Noviembre	Southern Baja California— Baja California sureña	74	12	0	0	0	0	12
Total			420	59	24	25	54	15	177
Revillagigedo Islands—Islas Revillagigedo									
2006	February— Febrero		38	3	2	1	0	0	6
Equatorial eastern Pacific Ocean—Océano Pacífico oriental ecuatorial									
2003	March-May— Marzo-Mayo		8	3	0	0	0	0	3
2006	March-April— Marzo-Abril		45	0	4	0	0	0	4
Total			53	3	4	0	0	0	7
Total			511	65	30	26	54	15	190

TABLE 11. Classification errors (percentages of samples misclassified) for data for large vessels.
TABLA 11. Errores de clasificación (porcentajes de muestras incorrectamente clasificadas) de datos de buques grandes.

Reported set type	Predicted set type		Classification error (percent)
	Dolphin	Other	
Tipo de lance reportado	**Tipo de lance predicho**		**Error en clasificación (porcentaje)**
	Delfín	**Otro**	
Dolphin—Delfín	846	86	9.2
Other—Otro	86	1000	7.9

TABLE 12. Oceanographic and meteorological data for the Pacific Ocean, July-December 2006. The values in parentheses are anomalies. SST = sea-surface temperature; SOI = Southern Oscillation Index; NOI* = Northern Oscillation Index.
TABLA 12. Datos oceanográficos y meteorológicos del Océano Pacífico, julio-diciembre 2006. Los valores en paréntesis son anomalías. TSM = temperatura superficie del mar; IOS = Índice de Oscilación del Sur; ION* = Índice de Oscilación del Norte.

Month—Mes	**7**	**8**	**9**	**10**	**11**	**12**
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	22.2 (0.4)	21.6 (0.8)	21.4 (0.9)	22.1 (1.2)	22.7 (1.0)	23.3 (0.5)
Area 2 (5°N-5°S, 90°-150°W	25.8 (0.3)	25.4 (0.5)	25.8 (0.9)	26.0 (1.1)	26.1 (1.1)	26.3 (1.3)
Area 3 (5°N-5°S, 120°-170°W)	27.4 (0.3)	27.2 (0.5)	27.4 (0.7)	27.4 (0.9)	27.7 (1.2)	27.8 (1.3)
Area 4 (5°N-5°S, 150W°-160°E)	29.1 (0.5)	29.2 (0.8)	29.4 (0.9)	29.4 (1.0)	29.6 (1.3)	29.5 (1.2)
Thermocline depth—Profundidad de la termoclina, 0°, 80°W (m)	40	40	40	45	45	40
Thermocline depth—Profundidad de la termoclina, 0°, 110°W (m)	50	50	95	80	90	95
Thermocline depth—Profundidad de la termoclina, 0°, 150°W (m)	140	140	150	140	170	160
Thermocline depth—Profundidad de la termoclina, 0°, 180°W (m)	175	170	160	175	170	170
Sea level—Nivel del mar, Baltra, Ecuador (cm)	193.2 (12.7)	187.6 (9.9)	195.6 (18.3)	195.4 (18.2)	195.8 (16.9)	200.3 (20.5)
SOI—IOS	-0.8	-1.6	-0.7	-1.7	0.1	-0.5
SOI*—IOS*	-3.67	-3.29	-2.65	-1.43	0.80	0.35
NOI*—ION*	-0.91	-0.47	0.58	-1.14	0.90	2.74