INTER-AMERICAN TROPICAL TUNA COMMMISSION
COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL

QUARTERLY REPORT—INFORME TRIMESTRAL

April-June 2006 Abril-Junio 2006

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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 2004 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 by seven signatories that are Parties to the 1949 Convention. It was ratified by Mexico on 14 January 2005, and by El Salvador on 10 March 2005.

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.

MEETINGS

IATTC and AIDCP meetings

The reports of the IATTC and AIDCP meetings are available on the Meetings page of the IATTC web site.

The seventh meeting of the IATTC Working Group on Stock Assessment was held in La Jolla on 15-19 May 2006. Dr. Robin Allen presided at the meeting, Dr. Robert J. Olson served as rapporteur, and presentations were made by Drs. Martín A. Hall, Michael G. Hinton, Cleridy E. Lennert-Cody, Mark N. Maunder, and Michael D. Scott and Messrs. Edward H. Everett and Simon D. Hoyle.

The following meetings of the IATTC and the IDCP and their working groups were held in Busan, Republic of Korea, in June 2006:

Inter-American Tropical Tuna Commission		
Meeting		**Dates**
7	Permanent Working Group on Compliance	22 June 2006
5	Working Group on Bycatch	24 June 2006
7	Working Group on Finance	27-28 June 2006
74	Inter-American Tropical Tuna Commission	26-30 June 2006

The following resolutions were adopted at the 74th meeting of the IATTC:

- C-06-01 Resolution on Financing
- C-06-02 Resolution for a Program on the Conservation of Tuna in the Eastern Pacific Ocean for 2007
- C-06-03 Resolution on Full Retention
- C-06-04 Resolution on Establishing a Program for Transhipments by Large-Scale Fishing Vessels
- C-06-05 Adoption of Trade Measures to Promote Compliance

International Dolphin Conservation Program		
Meeting		**Dates**
21	Permanent Working Group on Tuna Tracking	19 June 2006
7	Working Group to Promote and Publicize the AIDCP Dolphin Safe Tuna Certification System	19 June 2006
41	International Review Panel	20 June 2006
15	Parties to the AIDCP	21 June 2006
4	Scientific Advisory Board	22 June 2006

The following resolution was adopted at the 15th meeting of the Parties to the AIDCP:

- A-06-01 Vessel Assessments and Financing

IATTC and IDCP		
Meeting		**Date**
5	Joint Working Group on Fishing by non-Parties	23 June 2006

Other meetings

Dr. Robin Allen and Ms. Nora Roa-Wade participated in a meeting of the International Fisheries Commissions Pension Society in La Jolla on 5-7 April 2006.

Dr. Mark N. Maunder was an invited discussant in the population dynamics session at the Workshop on Uncertainty in Ecological Analysis, conducted by the Mathematical Biosciences Institute, Ohio State University, Columbus, Ohio, on 3-7 April 2006. His expenses were paid by that organization.

Mr. Brian S. Hallman attended the second meeting of the ICCAT Working Group to Review Statistical Monitoring Programs, in Palma de Mallorca, Spain, on 24-26 April 2006. The Working Group discussed ways to improve ICCAT's statistical documents, which are very similar to the IATTC's Bigeye Tuna Statistical Document, and also ways to improve statistical monitoring and enhance cooperation among the governments involved. (The IATTC's Bigeye Tuna Statistical Document program was established by IATTC Resolution C-03-01.)

Drs. Robin Allen, Richard B. Deriso, Pablo R. Arenas, William H. Bayliff, and Michael G. Hinton and Mr. Brian S. Hallman participated in the FAO Methodological Workshop on the Management of Tuna Fishing Capacity in La Jolla on 8-12 May 2006. Dr. Allen served as chairman of the meeting, and Dr. Arenas presented a paper entitled "Estimated target fleet capacity for the tuna fleet in the eastern Pacific Ocean, based on stock assessments of target species."

Dr. Robin Allen spent the period of 21-26 May 2006, in New York City. On 21 May he chaired a meeting of Tuna Commissions' secretariats, which, among other things, established a new web site, www.tuna-org.org. He participated in the United Nations Fish Stocks Agreement Review Conference on 22-26 May. The Review Conference devoted much of its attention to the role and performance of Regional Fisheries Management Organizations, including the IATTC.

Many members of the IATTC staff attended all or parts of the 57th Tuna Conference in Lake Arrowhead, California, on 22-25 May 2006. Dr. Martín A. Hall and Mr. Brian S. Hallman were members of panels on "Ecosystem Approaches to the Science and Management of Large Pelagics" and "Fleet Capacity and the Economics of Tuna Fisheries," respectively. Dr. William H. Bayliff was chairman of a session on "Advancements [sic.] in Electronic Tagging." Talks were given by Drs. Bayliff and Daniel Margulies and Messrs. Daniel W. Fuller, Simon D. Hoyle, and Kurt M. Schaefer. In addition, research in which Dr. Robert J. Olson, Messrs. Fuller, Schaefer, and Vernon P. Scholey, and Mss. Sharon L. Hunt, Maria C. Santiago, Jenny M. Suter, and Jeanne B. Wexler had participated was presented by other speakers.

Dr. Michael G. Hinton participated in Tuna 2006, the ninth INFOFISH World Tuna Trade Conference, in Bangkok, Thailand, on 25-27 May 2006, where he presented a paper entitled "Global Tuna Production: Status of Stocks, Management Issues, and the Outlook for the Future." (This paper will eventually be available at http://www.infofish.org/tuna2006bangkok.html.)

Dr. Robert J. Olson participated in a meeting of the American Society of Limnology and Oceanography in Victoria, British Columbia, Canada, on 4-9 June 2006, where he presented a paper entitled "Insights into the trophic ecology of pelagic ecosystems in the tropical Pacific Ocean using stable isotope analysis."

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 length-frequency samples from 252 wells and abstracted logbook information for 286 trips of commercial fishing vessels during the second quarter of 2006.

Also during the second quarter members of the field office staffs placed IATTC observers on 135 fishing trips by vessels that participate in the AIDCP On-Board Observer Program. In addition, 133 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 2006 is about 221,600 cubic meters (m^3) (Table 1). The weekly average at-sea capacity for the fleet, for the weekly periods ending 9 April through 2 July, was about 164,400 m^3 (range: 156,700 to 170,600 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-2 July 2006 period, in metric tons (t), were:

Species	**2006**	**2001-2005**			**Weekly average, 2006**
		Average	**Minimum**	**Maximum**	
Yellowfin	114,400	204,400	171,700	229,200	4,400
Skipjack	143,200	104,300	78,400	144,900	5,500
Bigeye	31,900	19,900	13,000	28,000	1,200

Preliminary estimates of the retained catches, by species and by flag of vessel, are shown in Table 3. It is noteworthy that the retained catch of bluefin up to 2 July was 6,437 t; this is the greatest total for the first half of the year on record.

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 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	10.3	20.1	12.9	29.5
	S of 5°N	2.8	9.1	5.8	15.4
Skipjack	N of 5°N	1.1	1.9	0.3	3.5
	S of 5°N	8.4	9.6	6.9	14.7
Bigeye	EPO	1.9	1.8	1.5	2.3

Catch statistics for the longline fishery

The catches of bigeye by longline gear in the EPO during the first and second quarters of 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, its Annual Reports for 1954-2002, its Fishery Status Reports 1, 2, and 3, and its Stock Assessment Reports 1-6.

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 2001-2006 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 2006, and the second shows the combined data for the first quarter of each year of the 2001-2006 period. Samples from 252 wells were taken during the first quarter of 2006. There were no reported catches made by pole-and-line vessels during the first 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 252 wells sampled during the first quarter of 2006, 210 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 unassociated schools in the North and South, and on schools associated with dolphins in the Southern and Inshore areas. Small amounts of yellowfin were taken in floating-object sets and in association with dolphins in the Northern area. A mode of fish around 60 cm in length was evident in the Northern unassociated fishery, while in the Southern unassociated fishery modes of fish at about 40, 80, and 110 cm were present. In the Inshore dolphin fishery a large mode of fish at about 100 cm was evident.

The estimated size compositions of the yellowfin caught by all fisheries combined during the first quarter of 2001-2006 are shown in Figure 2b. The average weight of the fish caught during the first quarter of 2006 was less than those of any of the previous five years, probably as a result of the large proportions of fish around 40 to 70 cm in length in the catches.

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 252 wells sampled during the first quarter of 2006, 199 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 floating object fisheries. Small amounts of skipjack were taken in the Northern unassociated fishery and in schools associated with dolphins.

The estimated size compositions of the skipjack caught by all fisheries combined during the first quarter of 2001-2006 are shown in Figure 3b. The average weights of skipjack caught during the first quarter of 2006 were considerably less than those of any of the previous five years. Most of the fish caught were between 35 and 55 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 252 wells sampled during the first quarter of 2006, 52 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. There were no recorded catches of bigeye in sets on fish associated with dolphins or in the pole-and-line fishery.

The estimated size compositions of the bigeye caught by all fisheries combined during the first quarter of 2001-2006 are shown in Figure 4b. The average weight of bigeye during the first quarter of 2006 was less than those of four of the five previous years, the exception being 2003. Two distinct modes of fish, at about 40 to 60 cm and 80 to 105 cm, are evident.

A preliminary estimate of the retained catch of bigeye less than 60 cm in length during the first quarter of 2006 is 5,767 metric tons (t), or about 39 percent of the estimated total catch of bigeye by purse seiners. The corresponding amounts for 2001-2005 ranged from 742 to 3,365 t.

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

Training

The IATTC staff conducted an observer training course from 27 March to 12 April 2006 in Manta, Ecuador, for 18 trainees, 12 for the IATTC observer program and 6 for the Ecuadorian national program.

RESEARCH

Tuna tagging

The chartered pole-and-line vessel *Her Grace*, with two IATTC employees aboard, returned to San Diego on 9 May 2006, following a 69-day tagging cruise in the equatorial eastern Pacific Ocean. The principal object of the cruise was to tag bigeye, but only 32 of them, 43 to 61 cm in length, were tagged. No geolocating archival tags were applied to them because so few were caught, and nearly all of them were too small to carry those tags. However, 594 skipjack, 36 to 65 cm in length, and 585 yellowfin, 36 to 71 cm in length, were tagged. Functional geolocating archival tags (LTD 2310 from Lotek Wireless) were implanted into the peritoneal cavities of 45 yellowfin ranging in length from 51 to 64 cm. In addition, functional archival tags (Mk9 from Wildlife computers) were implanted into the peritoneal cavities of two skipjack measuring 53 and 55 cm.

This was the first cruise since 2000 during which the primary objective of tagging significant numbers of bigeye with conventional and/or archival tags was not accomplished. The primary reasons for this were the short duration of charter time (69 days versus the usual 90 days) and the fact that the three NOAA Tropical Atmosphere-Ocean (TAO) buoys (2°N, 0°, and 2°S) on the 95°W meridian had all recently been set on by purse-seine vessels. Many large purse seiners, some with helicopters, were observed in the area, reportedly due to poor fishing for yellowfin associated with dolphins.

Early life history studies

Yellowfin broodstock

The yellowfin broodstock in Tank 1 (1,362,000 L) at the Achotines Laboratory spawned daily during the quarter. Spawning occurred between 2:40 p.m. and 10:30 p.m. The numbers of eggs collected after each spawning event ranged from about 12,000 to 2,080,000. The water temperatures in the tank ranged from 24.3° to 29.1°C during the quarter.

One archival-tagged female, weighing 51 kg, died during the quarter from striking the tank wall. At the end of June there were 22 fish, ranging in weight from approximately 32 to 61 kg, in Tank 1. The estimates of the weights of the broodstock fish are based on a revised analysis of growth of the fish in Tank 1. The revised analysis indicates that the growth for the broodstock fish during 2000-2006 was slower than that of those held during 1996-2000 in the same tank.

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, six fish from those groups remained in Tank 1.

At the end of June there were nine small (4- to 6-kg) yellowfin tuna in Tank 2 (170,000 L). These fish will be used in archival tag trials during the latter half of 2006.

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 eggs, larvae, and juveniles*

Two experiments were conducted during April 2006 to determine the lower lethal water temperature during egg development, hatching, and post-hatching of yellowfin tuna. These experiments, along with those conducted during 2004 (IATTC Quarterly Report for April-June 2004) and 2005 (IATTC Quarterly Reports for April-June 2005 and July-September 2005), were designed to examine the physical limits for the distribution of eggs and larvae in the ocean. Two trials were conducted during the quarter at low water temperatures of 19.0 to 20.3°C (mode = 19.7°C; mean = 19.6°C) and 19.9 to 21.2°C (mode = 20.8°C; mean = 20.6°C). During the trial at a mean water temperature of 19.6°C, egg development appeared normal, but hatching was delayed or did occur and survival of the yolk-sac larvae was poor relative to the larvae in the control tanks at an ambient water temperature range of 24.4 to 25.3°C. During the trial at a mean water temperature of 20.6°C, hatching was delayed, but the eggs and yolk-sac larvae developed normally and the survival of the larvae was comparable to that of those in the control tanks for up to 12 hours after hatching.

During May, an experiment was conducted to estimate the density-dependent growth of early-stage juvenile yellowfin tuna between 15 and 21 days after hatching. Previous experiments had been conducted to estimate the density-dependent growth of larvae during the first 3-18 days of feeding, and the results indicated that the larvae grow more rapidly when they are maintained at lower densities. Preliminary results of the experiment with the early-stage juveniles indicated similar density effects on growth (in both length and weight) four days after the beginning of the experiment (19 days after hatching), but the effects on growth at 21 days after hatching were inconclusive. Further experiments will be conducted to examine the effect of density on growth in juvenile yellowfin.

Six experiments were conducted during June and July to determine the optimum conditions for rearing yellowfin eggs to the stage of first-feeding larvae. The main purpose of these experiments was to test the protocols routinely used in the rearing of yellowfin larvae at the Achotines Laboratory. The trials produced data for examining the effects of transfer stage, turbulence rate, and larval density on survival of eggs and yolk-sac larvae.

The transfer stage experiment compared methods for the transfer of larvae from egg incubation tanks to larval rearing tanks. One group of larvae was transferred during the egg stage and the other group was transferred after hatching. Three 714-L experimental tanks were stocked with eggs at about 12 eggs/L and three tanks were stocked with newly-hatched yolk-sac larvae at about 10 larvae/L. The survivors were then counted at the first feeding stage. Two trials were conducted, and the preliminary results indicated that there was no significant difference between the survival rates of the two groups.

Two trials were conducted to examine the effect of turbulence on survival during the yolk-sac larval stage. The first trial compared the survival of yolk-sac larvae under high turbulence to those under low turbulence. (The low-turbulence level is routinely used in rearing of yolk-sac yellowfin larvae at the Achotines Laboratory). The turbulence levels were created by adjusting the levels of aeration. The second trial compared survival at three different turbulence levels; a high and a low level created with aeration, and an even lower level created only by the current resulting from water inflow. In both trials the larvae were stocked in 714-liter experimental tanks at densities of 6/L. The larvae reared under the low turbulence conditions had better overall survival rates than did those subjected to the high turbulence level, but the survival rates at the two low-turbulence levels were not significantly different.

The final two experiments were designed to examine the effect of density on the survival of eggs and of yolk-sac larvae. The first trial compared the survival of eggs stocked at 150/L (the normal protocol at the Achotines Laboratory) versus that at 300/L. Survival was determined after hatching. The results indicated no significant difference in hatching success between the two stocking densities. The final experiment compared the survival of yolk-sac larvae reared at four different densities: 5/L, 10/L, 20/L, and 40/L. In this trial, the mean percentage survival ranged from 48.2 to 67.6 percent, with the lowest survival rate at a stocking density of 20 larvae/L and the highest survival rate at 10 larvae/L.

Further analyses are being conducted on the results from these experiments. Additional trials to repeat the experimental treatments are also planned during the third quarter of 2006.

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 intermittently during the quarter.

The second group consists of 20 individuals from a group bred at the Laboratory from eggs obtained from spawning in 1998. These fish also spawned intermittently during the quarter.

Visitors at the Achotines Laboratory

Mr. Guillermo Salazar Nicolau, Minister of Agriculture of Panama, visited the Achotines Laboratory on 7 April 2006. He was accompanied by Dr. Richard Pretto, Director of Aquaculture of the Ministerio de Desarrollo Agropecuario, and Mr. George Novey, Director of the Dirección General de Recursos Marinos y Costeros.

Dr. Kathryn Dickson, a professor in the Department of Biological Science at California State University at Fullerton and Ms. Juleen Dickson (no relation), one of Dr. Dickson's MS candidates, arrived at the Achotines Laboratory on 20 June 20 2006. They plan to stay through 10 July 2006, gathering samples and data for Dr. Dickson's research and Ms. Dickson's thesis. The objective of their research is to determine when and how the internalized slow-oxidative, red locomotor muscle first develops in tunas. They are identifying red muscle fibers in a developmental series of larval and juvenile yellowfin tunas (approximately 5 to 75 mm in length), using immunohistochemistry (labeling with red muscle-specific antibodies) and/or histochemistry (using mitochondrial marker enzymes).

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 California in April and May, but only the one off Baja California persisted in June (Figure 5). The data in Table 9 are mixed. Most notably, the SST anomalies in Areas 2, 3, and 4 went from negative values in January-April to positive values in May and June. Also, the sea levels were higher at Baltra, Ecuador, and Callao, Peru, during the second quarter than they had been during the first quarter. 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 June 2006, “ENSO [El Niño-Southern Oscillation]-neutral conditions are expected during the next 3-6 months.”

Estimates of the mortality of dolphins due to fishing

The preliminary estimate of the incidental mortality of dolphins in the fishery in 2005 is 1,151 animals (Table 10), a 21.6 percent decrease relative to the 1,469 mortalities recorded in 2004. The mortalities for 1979-2005, by species and stock, are shown in Table 11a, and the standard errors of these estimates are shown in Table 11b. 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 1995-2005 represent the sums of the observed species and stock tallies recorded by the programs of the IATTC, Ecuador, Mexico, and Venezuela. The mortalities for 2001-2003 have been adjusted for unobserved trips of vessels with carrying capacities greater than 363 metric tons (t). The mortalities of the principal dolphin species affected by the fishery show declines in the last decade (Figure 6) similar to that for the mortalities of all dolphins combined (Figure 7). Estimates of the abundances of the various stocks of dolphins for 1986-1990 and the relative mortalities (mortality/abundance) are also shown in Table 10. The level of relative mortality was highest for eastern spinner dolphins (0.05 percent).

The number of sets on dolphin-associated schools of tuna made by vessels with carrying capacities greater than 363 t increased by 3 percent, from 11,783 in 2004 to 12,173 in 2005, and this type of set accounted for 48 percent of the total number of sets made in 2005, compared to 52 percent in 2004. The average mortality per set decreased from 0.12 dolphins in 2004 to 0.09 dolphins in 2005. The estimated spatial distribution of the average mortalities per set during 2005 is shown in Figure 8. Typically, patches of relatively high mortalities per set were found throughout the fishing area, but in 2005 the higher-mortality areas were west of the Galapagos Islands, off the tip of Baja California, off southern Mexico, and at the far western edge of the fishery along the 10ºN parallel. The trends in the numbers of sets on dolphin-associated fish, mortality per set, and total mortality in recent years are shown in Figure 7.

The catches of dolphin-associated yellowfin decreased by 6 percent in 2005 relative to 2004. The percentage of the catch of yellowfin taken in sets on dolphins decreased from 69 percent of the total catch in 2004 to 68 percent of the catch in 2005, and the average catch of yellowfin per set on dolphins decreased from 15 to 14 t. The mortality of dolphins per metric ton of yellowfin caught decreased from 0.0080 in 2004 to 0.0067 in 2005.

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 1986-2005 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 risen from 38 percent in 1986 to 95 percent in 2005, 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 2005 (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 1998-2005; in the same period the percentage of sets with net collapses decreased from about 30 percent to less than 5 percent, on average, and that of net canopies from about 20 percent to less than 5 percent, on average. 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.

GEAR PROGRAM

During the second quarter IATTC staff members participated in two dolphin safety-gear inspection and safety-panel alignment procedures, one aboard a Mexican-flag purse seiner and one aboard a Panamanian-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 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 and the numbers of samples taken were as follows:

Month	Trips completed	Samples taken	Fish sampled		
			Yellowfin	Skipjack	Bigeye
April	17	13	4,435	800	75
May	19	18	4,135	800	0
June	21	16	2,248	800	250
Total	57	47	10,818	2,400	325

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Maunder, Mark N., and Shelton J. Harley. 2006. Evaluating tuna management in the eastern Pacific Ocean. Bull. Mar. Sci., 78 (3): 593-606.

Parnell, P. Ed, Paul K. Dayton, Cleridy E. Lennert-Cody, Linda L. Rasmussen, and James J. Leichter. 2006. Marine reserve design: optimal size, habitats, species affinities, diversity, and ocean microclimate. Ecol. Applications, 16 (3): 945–962.

Olson, Robert J., Marlon H. Román-Verdesoto, and Glenthon L. Macías-Pita. 2006. Bycatch of jumbo squid *Dosidicus gigas* in the tuna purse-seine fishery of the eastern Pacific Ocean and predatory behaviour during capture. Fish. Res., 79 (1-2): 48-55.

Schaefer, Kurt M., and Daniel W. Fuller. 2006. Comparative performance of current-generation geolocating archival tags. Mar. Tech. Soc. Jour., 40 (1): 15-28.

VIDEO CONFERENCE PRESENTATION

Authors: Mark N. Maunder and Richard B. Deriso
Title: Including covariates in population dynamics models
Date: 19 June 2006
Audience:

University of St. Andrews, Scotland;
Fisheries Research Services, Aberdeen and Pitlochry, Scotland;
University of Cambridge, England;
University of Kent, England;
Scripps Institution of Oceanography.

INTER-AGENCY COOPERATION

Drs. Cleridy Lennert of the IATTC staff and James Leichter of Scripps Institution of Oceanography (SIO) taught a course entitled Descriptive Statistics for Ecology at SIO during the spring semester of 2006.

ADMINISTRATION

Mr. Fernando Pérez Gutierrez, a graduate of the Instituto Tecnológico del Mar in Mazatlan, Sinaloa, Mexico, was hired on 1 April 2006 to work with Mr. José M. Lutt Manríquez at the Manzanillo field office.

Ms. María Teresa Musano, who had worked as administrative assistant at the La Jolla office from August 1998 to December 2004, was rehired on 17 April 2006, to replace Ms. Keri Grim, who had resigned on 13 February 2006.

Dr. Heidi Dewar, who had been a visiting scientist at the IATTC La Jolla office since August 2002, accepted employment with the U.S. National Marine Fisheries Service in La Jolla, beginning on 15 May 2006.

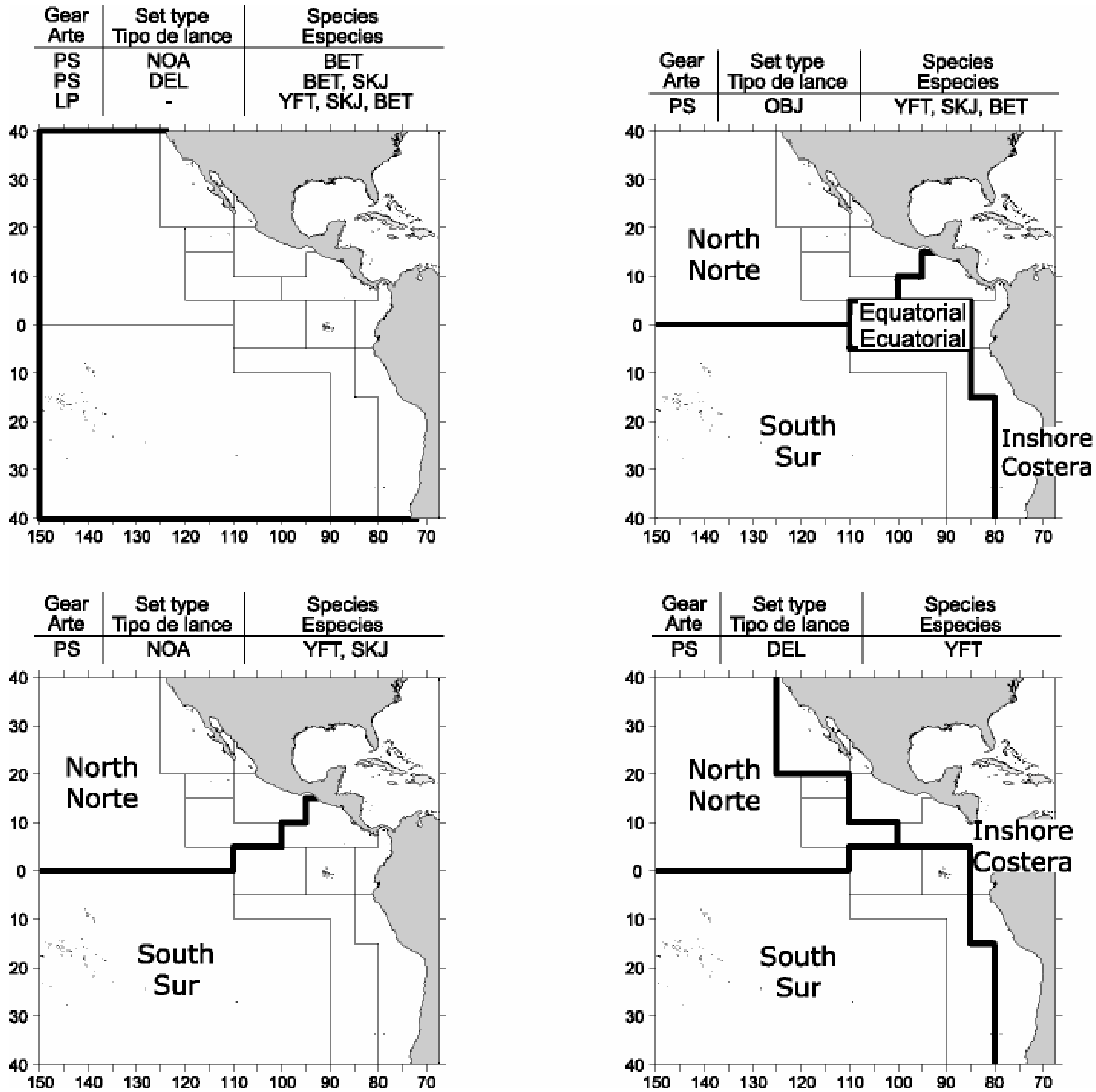

FIGURE 1. Spatial extents of the fisheries defined by the IATTC staff for stock assessment of yellowfin, skipjack, and bigeye in the EPO. The thin lines indicate the boundaries of the 13 length-frequency sampling areas, and the bold lines the boundaries of the fisheries. Gear – PS = purse seine, LP =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

FIGURA 1. Extensión especial de las pesquerías definidas por el personal de la CIAT para la evaluación de los stocks 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 = cerquero, LP = caño; Tipo de arte – NOA = no asociada, DEL = delfín; OBJ = objeto flotante; Especies – YFT = aleta amarilla, SKJ = barrilete, BET = patudo.

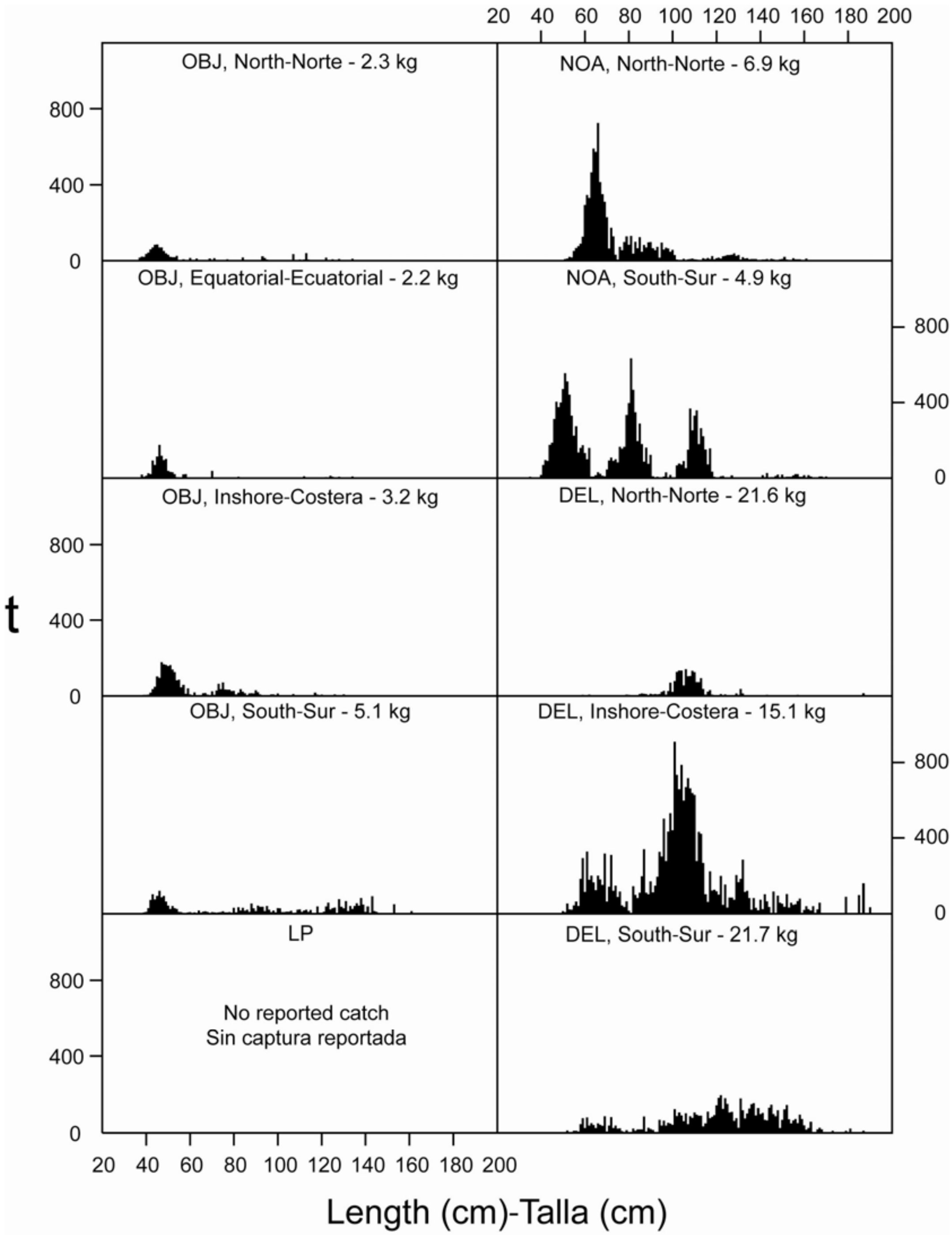

FIGURE 2a. Estimated size compositions of the yellowfin caught in each fishery of the EPO during the first quarter of 2006. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons; OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin.

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

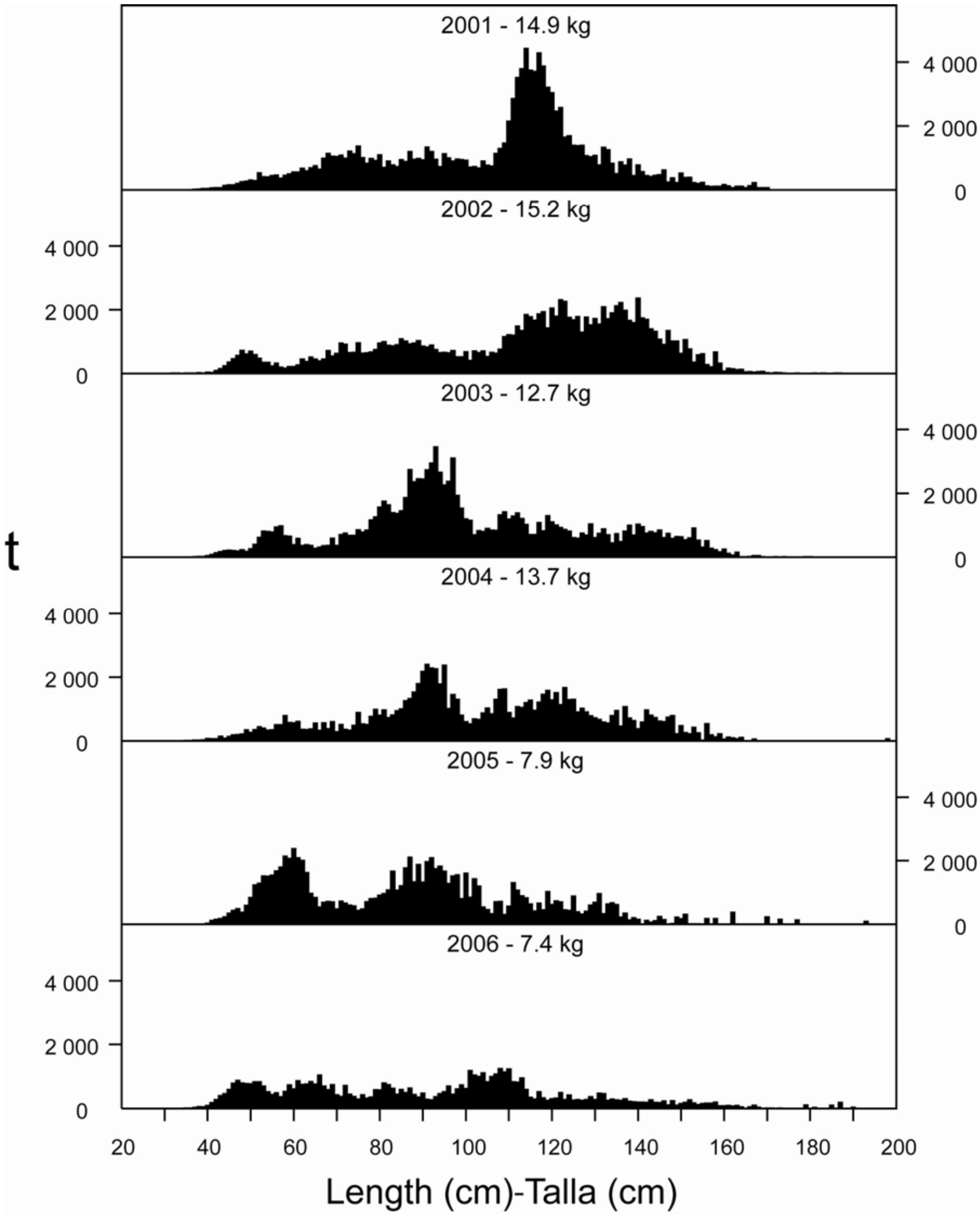

FIGURE 2b. Estimated size compositions of the yellowfin caught in the EPO during the first quarter of 2001-2006. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

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

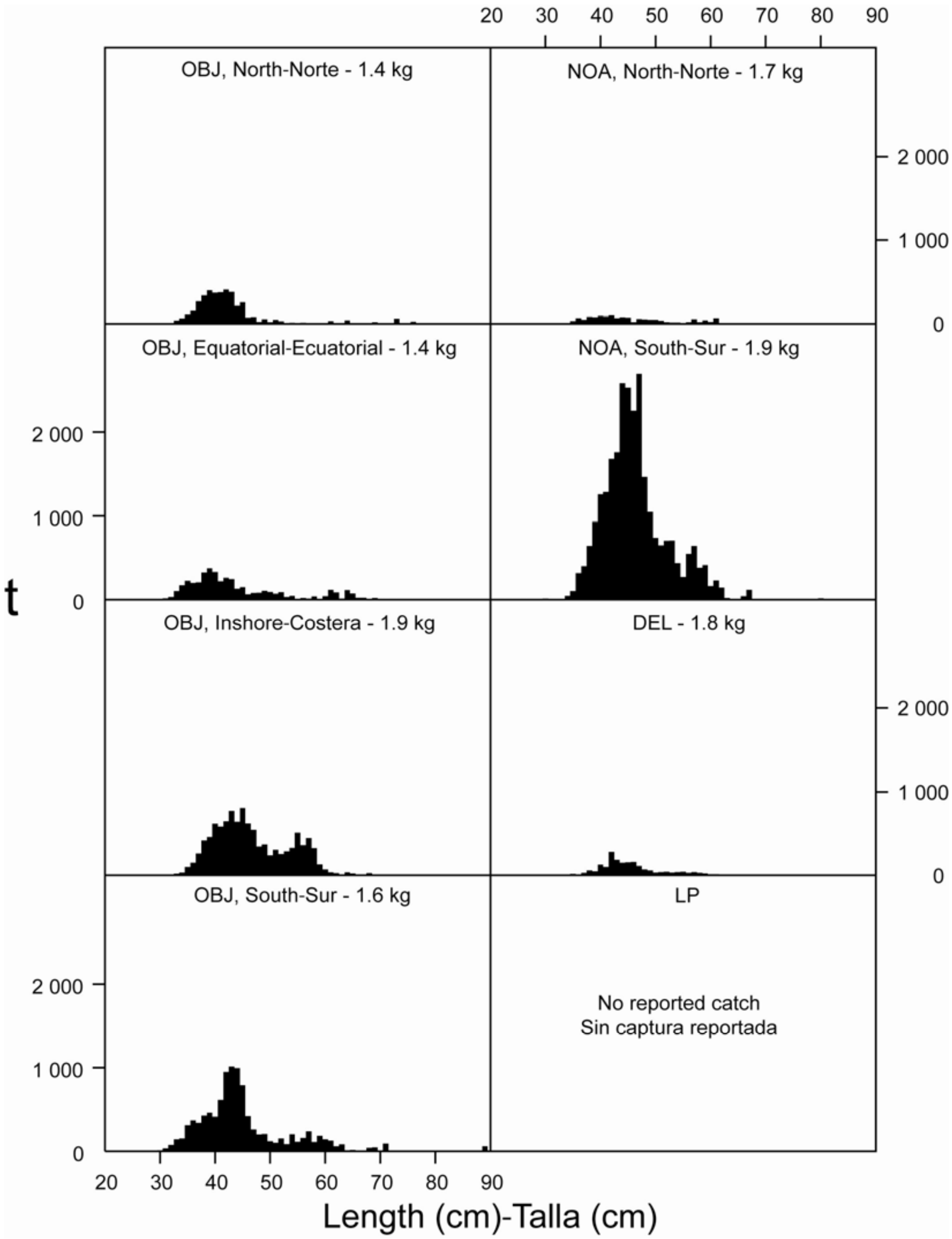

FIGURE 3a. Estimated size compositions of the skipjack caught in each fishery of the EPO during the first quarter of 2006. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons; OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin.

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

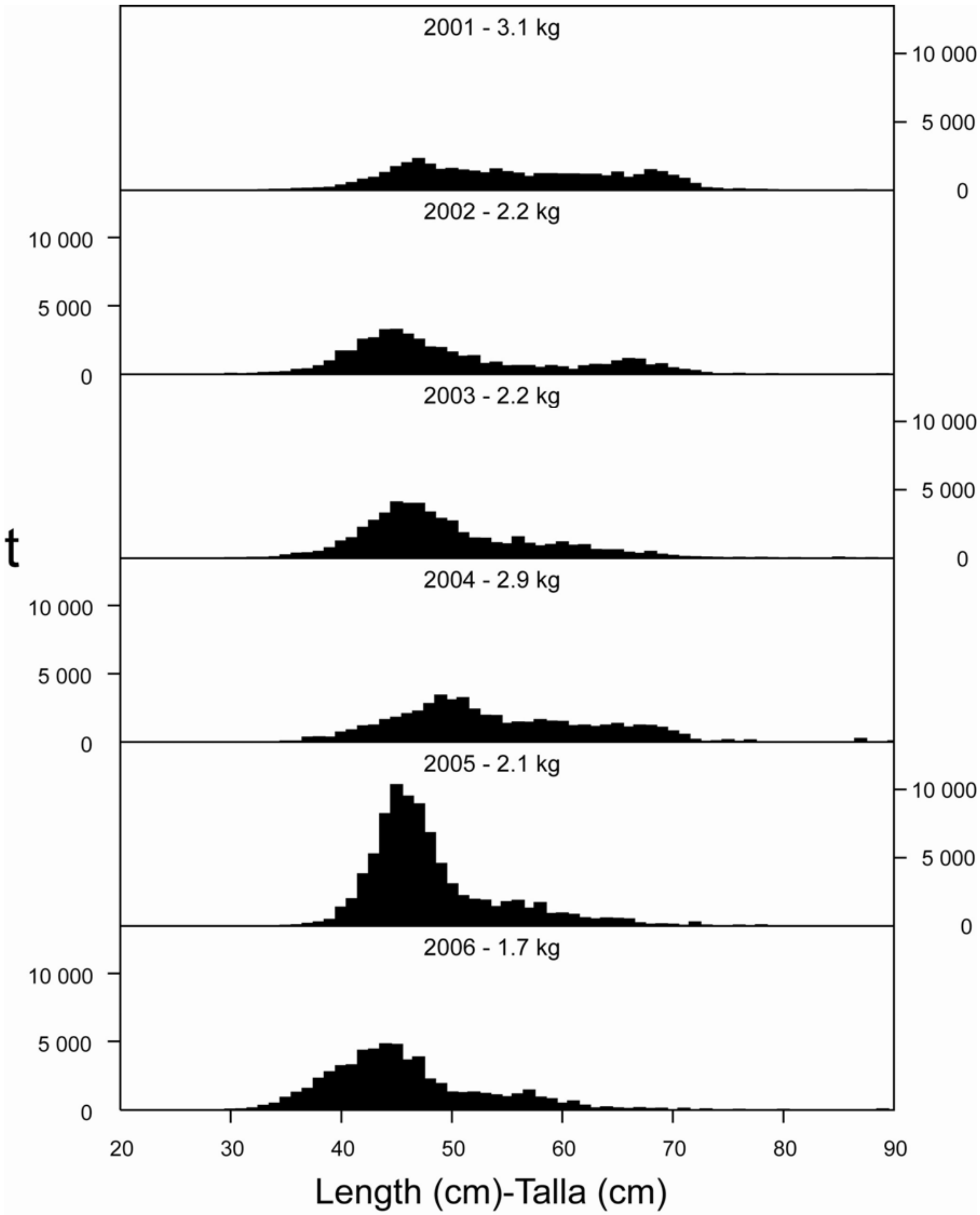

FIGURE 3b. Estimated size compositions of the skipjack caught in the EPO during the first quarter of 2001-2006. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.
FIGURA 3b. Composición por tallas estimada para el barrilete capturado en el OPO en el primer trimestre de 2001-2006. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas.

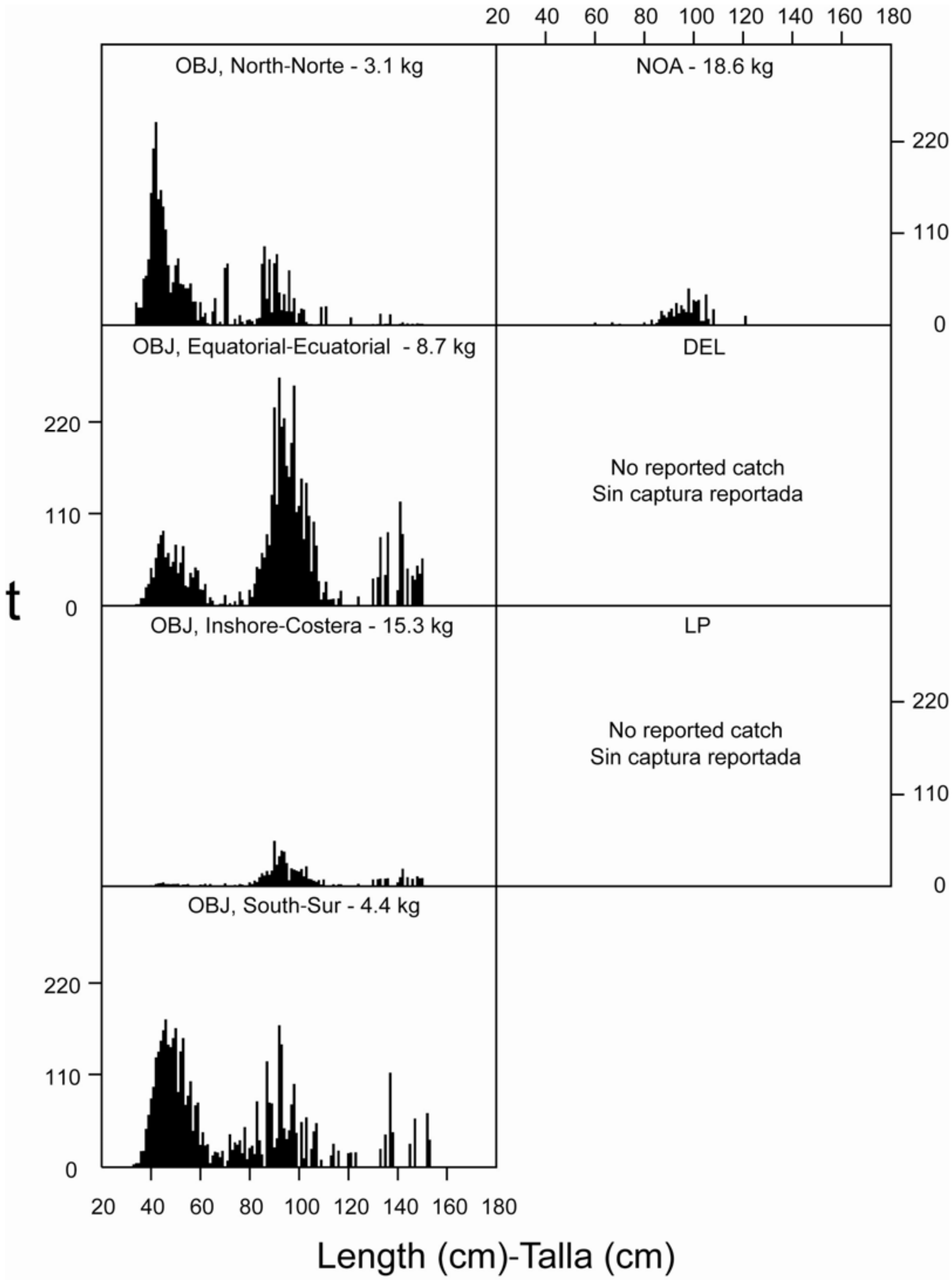

FIGURE 4a. Estimated size compositions of the bigeye caught in each fishery of the EPO during the first quarter of 2006. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons; OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin.

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

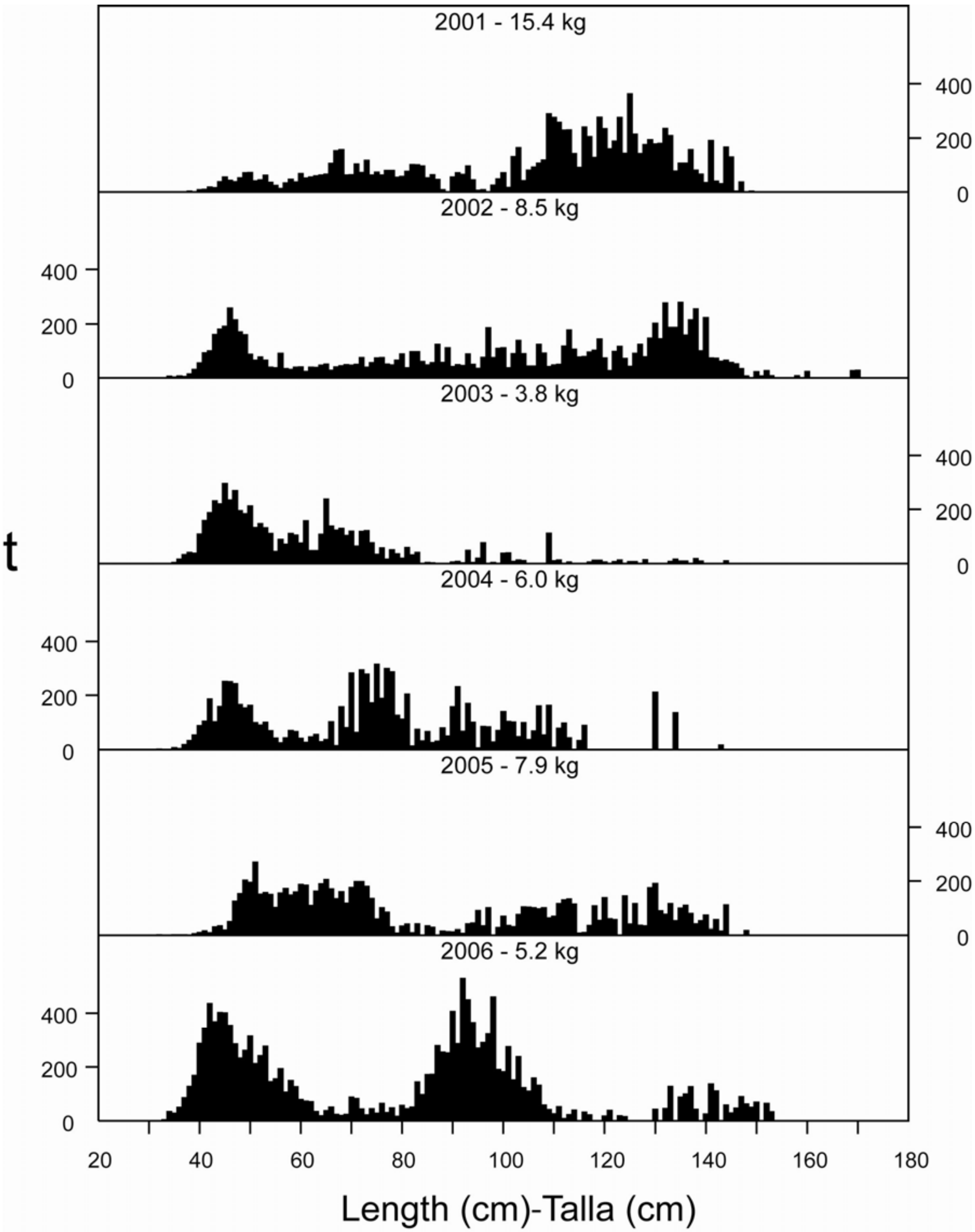

FIGURE 4b. Estimated size compositions of the bigeye caught in the EPO during the first quarter of 2001-2006. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.
FIGURA 4b. Composición por tallas estimada para el patudo capturado en el OPO en el primer trimestre de 2001-2006. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas.

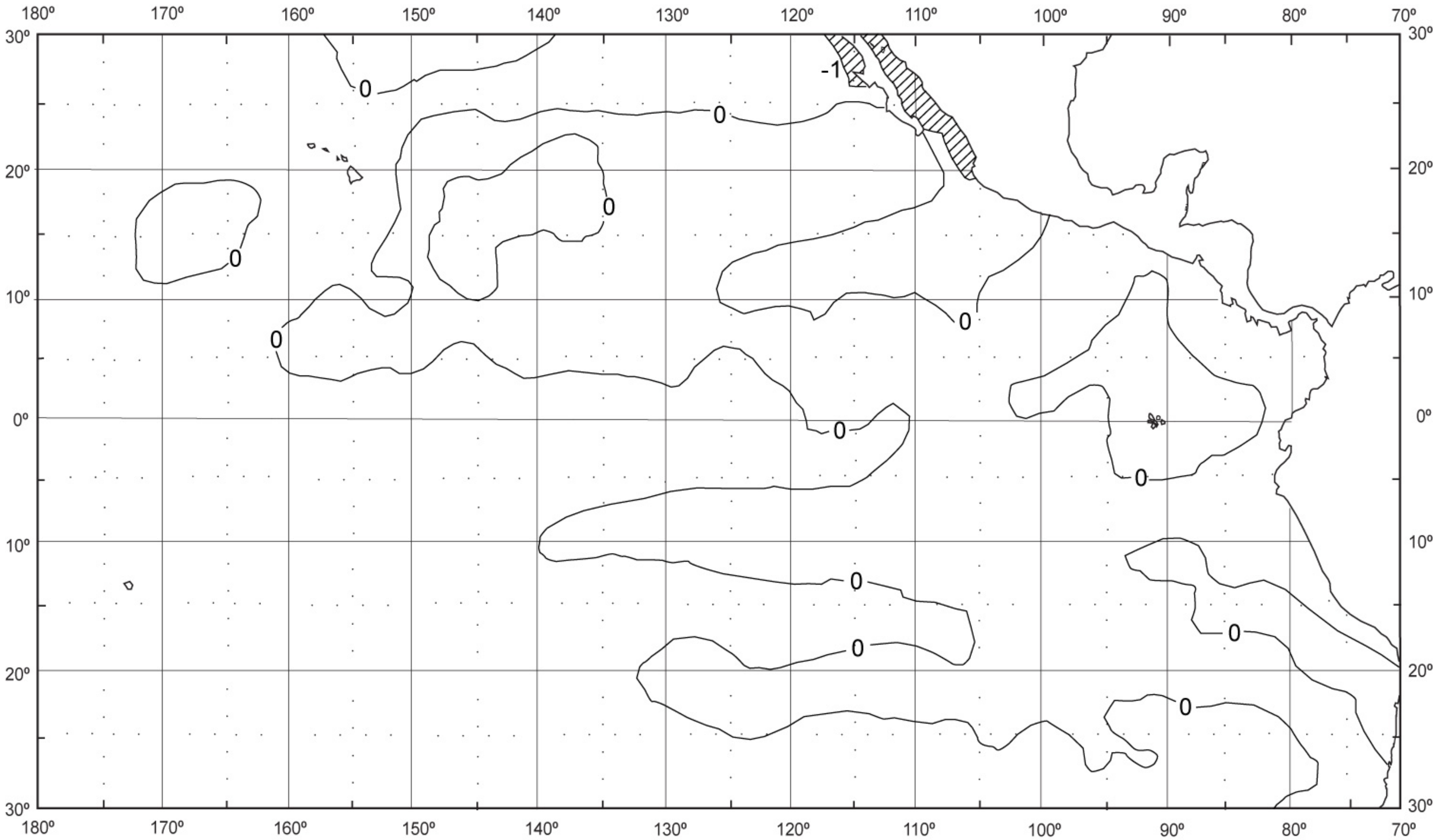

FIGURE 5. Sea-surface temperature (SST) anomalies (departures from long-term normals) for June 2006, based on data from fishing boats and other types of commercial vessels.
FIGURA 5. Anomalías (variaciones de los niveles normales a largo plazo) de la temperatura superficial del mar (TSM) en junio de 2006, basadas en datos tomados por barcos pesqueros y otros buques comerciales.

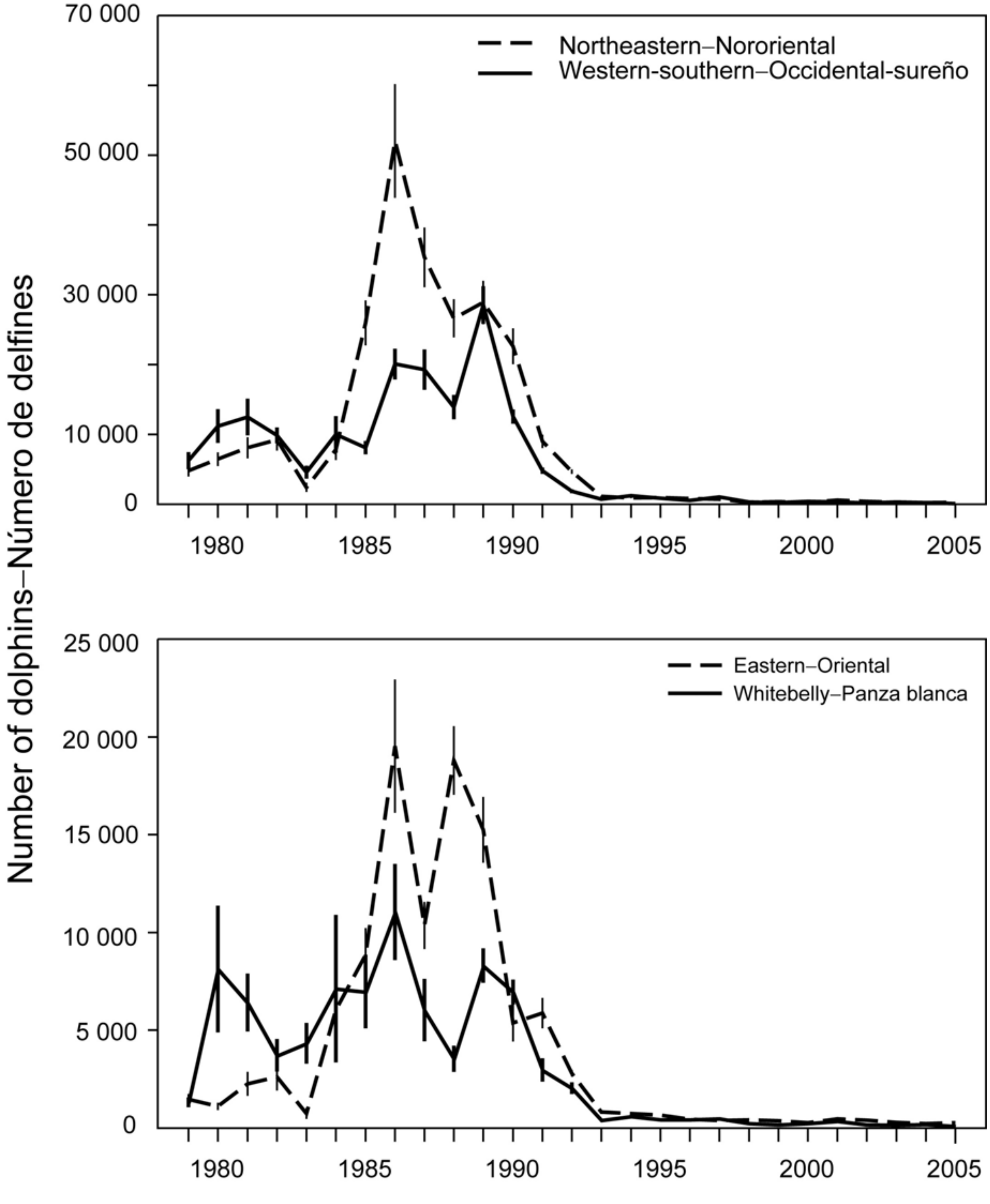

FIGURE 6. Estimated numbers of mortalities for the stocks of spotted (upper panel) and spinner (lower panel) dolphins in the EPO. Each vertical line represents one positive and one negative standard error.
FIGURA 6. Número estimado de mortalidades para los stocks de delfines manchado (panel superior) y tornillo (panel inferior) en el OPO. Cada línea vertical representa un error estándar positivo y un error estándar negativo.

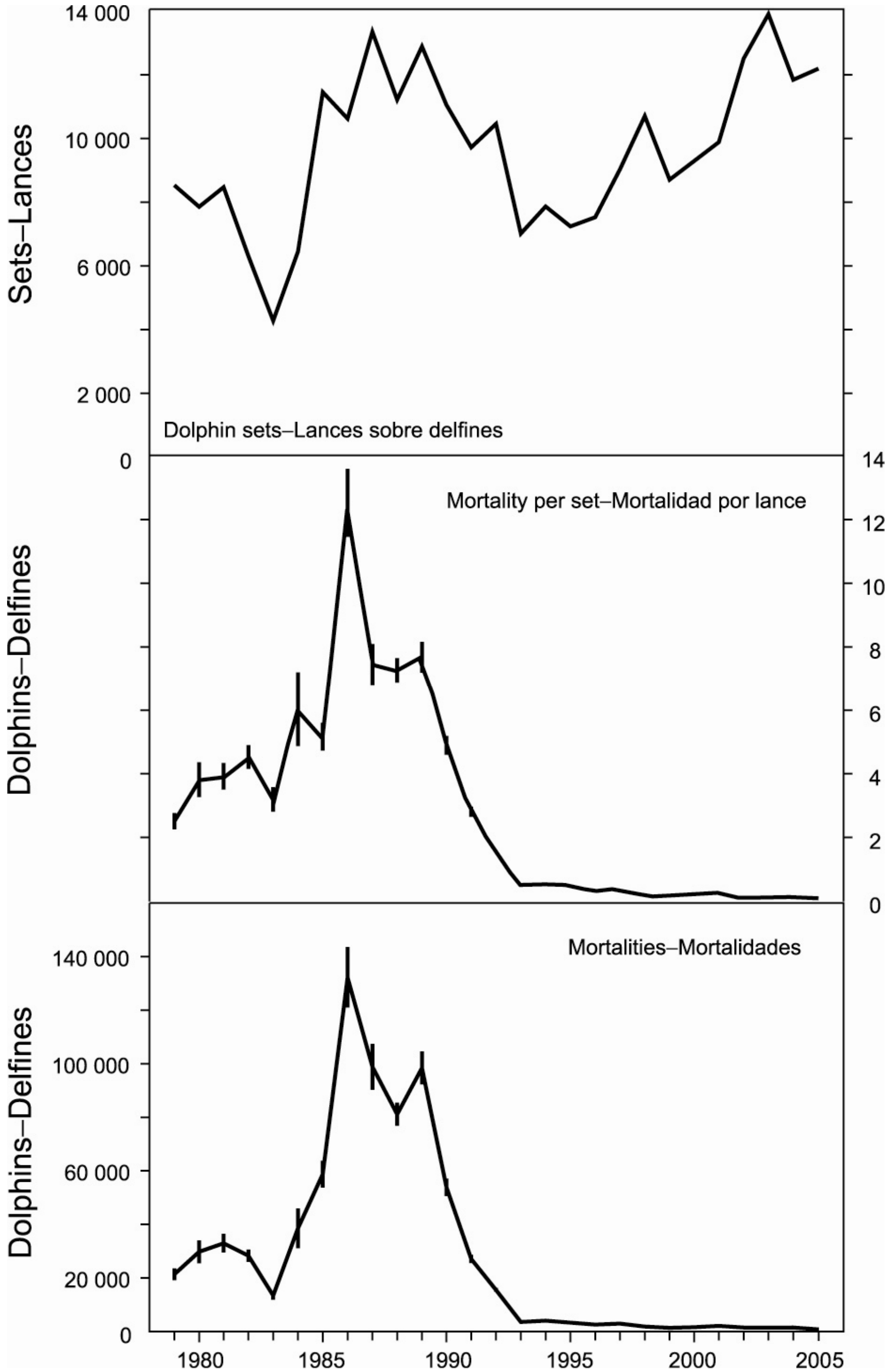

FIGURE 7. Estimated numbers of sets on tunas associated with dolphins, dolphin mortalities per set, and total mortalities of dolphins due to fishing in the EPO. Each vertical line represents one positive and one negative standard error.

FIGURA 7. Número estimado de lances sobre atunes asociados con delfines, mortalidades de delfines por lance, y mortalidad total de delfines causada por la pesca en el OPO. Cada línea vertical representa un error estándar positivo y un error estándar negativo.

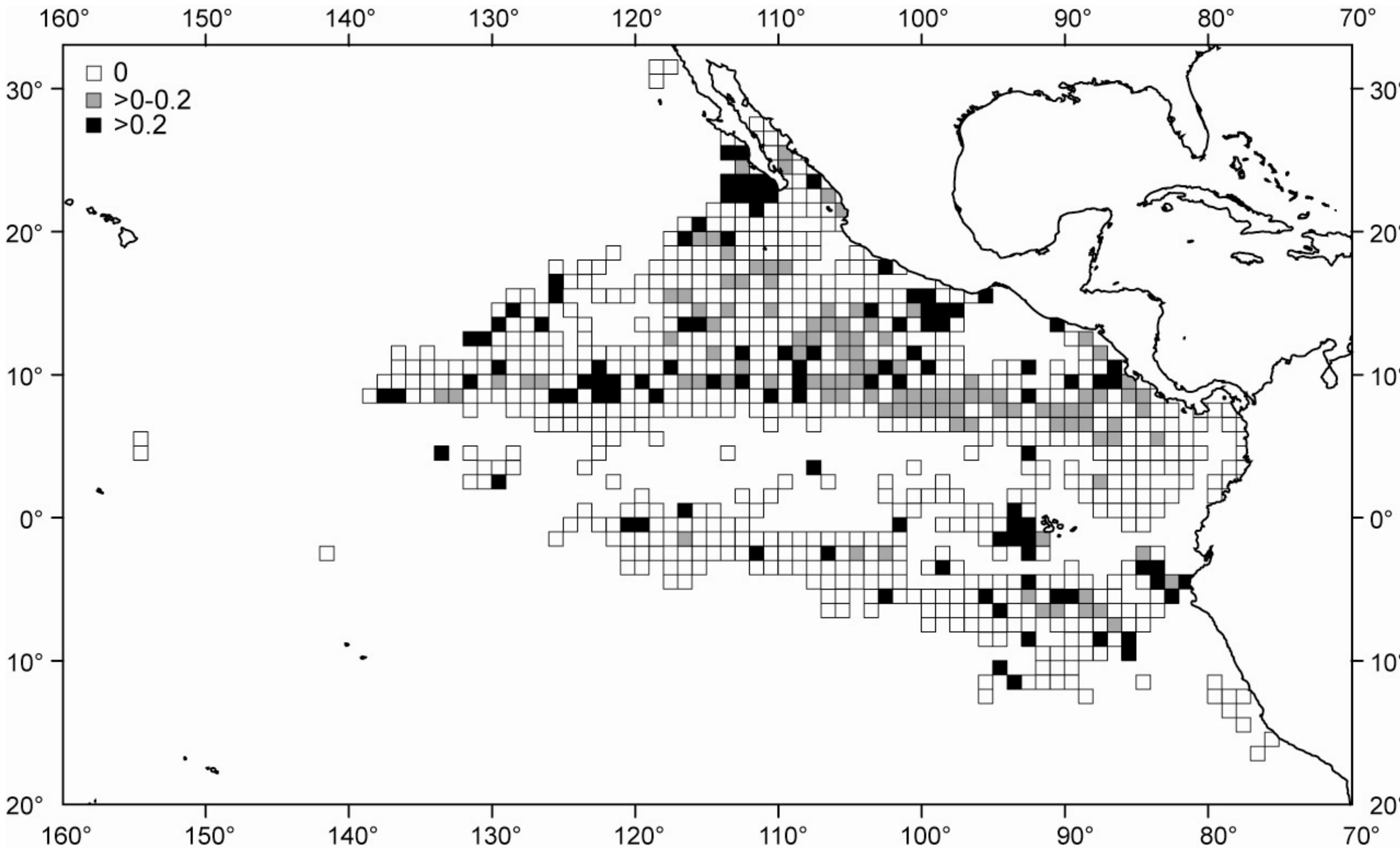

FIGURE 8. Spatial distribution of the average mortality of dolphins per set for all stocks combined, 2005.
FIGURA 8. Distribución de la mortalidad media de delfines por lance para todas las poblaciones combinadas, 2005.

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 Bandera	Gear Arte	Well volume–Volumen de bodega 1-900	 901-1700	 >1700	 Total	Capacity Capacidad
			Number—Número			
Bolivia	PS	1	-	-	1	222
Colombia	PS	3	10	-	13	14,439
Ecuador	PS	58	16	7	81	55,102
España—Spain	PS	-	-	3	3	6,955
Guatemala	PS	-	1	-	1	1,475
Honduras	PS	1	2	-	3	2,810
México	PS	27	31	1	59	56,197
	LP	4	-	-	4	498
Nicaragua	PS	-	7	-	7	9,255
Panamá	PS	5	14	6	25	33,849
El Salvador	PS	1	1	3	5	8,184
USA—EE.UU.	PS	1	1	-	2	1,763
Venezuela	PS	-	19	2	21	28,734
Vanuatu	PS	1	1	-	2	2,163
All flags—	PS	98	103	22	223	
Todas banderas	LP	4	-	-	4	
	PS + LP	102	103	22	227	
			Capacity—Capacidad			
All flags—	PS	43,610	131,436	46,102	221,148	
Todas banderas	LP	498	-	-	498	
	PS + LP	44,108	131,436	46,102	221,646	

TABLE 2. Changes in the IATTC fleet list recorded during the second quarter of 2006. PS = purse seine; LP = pole-and-line.
TABLA 2. Cambios en la flota observada por la CIAT registrados durante el segundo trimestre de 2006. 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—1er ingreso				
				Now—Ahora
Daniela F	Venezuela	PS	1,958	
Re-entries—Reingresos				
				Now—Ahora
Emperador	Ecuador	PS	82	
Vessels removed from fleet—Buques retirados de la flota				
Edgar Ivan	México	PS	260	Sunk—hundido

TABLE 3. Preliminary estimates of the retained catches of tunas in the EPO from 1 January through 2 July 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 2 de julio 2006, 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	19,412	70,000	15,867	-	-	-	70	80	105,429	35.4
Honduras	1,100	3,543	1,185	-	-	-	-	-	5,828	1.9
México	42,639	6,276	45	6,437	391	-	989	190	56,967	19.1
Nicaragua	5,206	1,731	694	-	-	-	-	1	7,632	2.6
Panamá	13,991	25,257	4,970	-	-	-	8	14	44,240	14.9
Venezuela	12,184	10,137	1,104	-	248	-	-	-	23,673	7.9
Other—Otros[2]	19,885	26,266	7,987	-	-	-	-	2	54,140	18.2
Total	114,417	143,210	31,852	6,437	639	-	1,067	287	297,909	

[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 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-31 March, 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-31 de marzo, 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	39,400	56,200	65,300	35,000	44,200	11,800
	CPDF—CPDP	20.1	29.5	22.5	12.9	15.5	10.3
South of 5°N Al sur de 5°N	Catch—Captura	49,700	24,900	19,300	46,100	23,400	6,400
	CPDF—CPDP	15.4	7.3	5.8	9.7	7.2	2.8
Total	Catch—Captura	89,100	81,100	84,600	81,100	67,600	18,200
	CPDF—CPDP	17.5	22.7	18.7	11.1	12.6	7.7
Annual total Total anual	Catch—Captura	255,600	261,800	274,900	212,000	164,800	
		Pole and line—Cañero					
Total	Catch—Captura	900	100	<100	<100	200	
	CPDF—CPDP	3.8	.9	.1	1.8	3.0	
Annual total	Catch—Captura	3,300	800	500	1,800	300	

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.
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.

Area	**Fishery statistic**	**Year-Año**					
	Estadística de pesca	**2001**	**2002**	**2003**	**2004**	**2005**	**2006[2]**
	Purse seine—Red de cerco						
North of 5°N Al norte de 5°N	Catch—Captura	4,500	600	5,700	4,500	9,900	1,300
	CPDF—CPDP	2.3	.3	2.0	1.7	3.5	1.1
South of 5°N Al sur de 5°N	Catch—Captura	22,300	26,600	33,900	40,400	47,800	19,500
	CPDF—CPDP	6.9	7.8	10.1	8.5	14.7	8.4
Total	Catch—Captura	26,800	27,200	39,600	44,900	57,700	20,800
	CPDF—CPDP	6.1	7.6	8.9	7.8	12.7	8.0
Annual total Total anual	Catch—Captura	85,600	84,300	155,200	151,700	149,800	
	Pole and line—Cañero						
Total	Catch—Captura	<100	200		<100	<100	
	CPDF—CPDP	.1	1.2		1.9		
Annual total	Catch—Captura	300	500	500	500	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.
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.

Fishery statistic—Estadística de pesca	Year—Año					
	2001	2002	2003	2004	2005	2006[2]
Catch—Captura	7,900	7,400	5,800	7,300	6,800	4,800
CPDF—CPDP	2.3	2.1	1.6	1.5	1.7	1.9
Total annual catch—Captura total anual	36,600	26,700	33,100	47,000	29,600	

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 2006 by longline vessels.
TABLA 7. Captures de atún patudo en el Océano Pacífico oriental durante 2006 por buques palangreros.

	Month			First	Month			Second	Total to
	1	**2**	**3**	**quarter**	**4**	**5**	**6**	**quarter**	**date**
	Mes			**Primer**	**Mes**			**Segundo**	**Total al**
	1	**2**	**3**	**trimestre**	**4**	**5**	**6**	**trimestre**	**fecha**
China	-	-	-	-	-	-	-	-	-
European Union—Unión Europea	-	-	-	-	-	-	-	-	-
Japan—Japón	1,381	1,320	1,118	3,819	1,034	1,055	853	2,942	6,761
Republic of Korea—República de Corea	803	668	577	2,048	633	900		1,533	3,581
Chinese Taipei—Taipei Chino	743	610	729	2,082	520	509	611	1,640	3,722
Vanuatu	87	92	43	222	5	4		9	231
Total	3,014	2,690	2,467	8,171	2,192	2,468	1,464	6,124	14,295

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, Ecuador, the European Union, Mexico, Venezuela, and the Forum Fisheries Agency (FFA) during the second 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 más que 363 toneladas métricas por los programas de observadores de la CIAT, Ecuador, México, el Unión Europea, Venezuela, y el Forum Fisheries Agency (FFA) durante el segundo trimestre de 2006. Los números en paréntesis indican totales acumulados para el año.

Flag	Trips		Observed by program							Percent observed	
			IATTC		National		FFA	Total			
Bandera	**Viajes**		**Observado por programa**							**Porcentaje observado**	
			CIAT		**Nacional**		**FFA**	**Total**			
Colombia	11	(32)	5	(15)	6	(17)		11	(32)	100.0	(100.0)
Ecuador	79	(179)	54	(118)	25	(61)		79	(179)	100.0	(100.0)
España—Spain	7	(14)	4	(9)	3	(5)		7	(14)	100.0	(100.0)
Guatemala	0	(3)	0	(3)				0	(3)	-	(100.0)
Honduras	6	(13)	6	(13)				6	(13)	100.0	(100.0)
México	47	(110)	24	(56)	23	(54)		47	(110)	100.0	(100.0)
Nicaragua	6	(15)	6	(15)				6	(15)	100.0	(100.0)
Panamá	33	(76)	17	(58)	16[2]	(18)		33	(76)	100.0	(100.0)
El Salvador	4	(14)	4	(14)				4	(14)	100.0	(100.0)
U.S.A.—EE.UU.	1	(2)	1	(2)				1	(2)	100.0	(100.0)
Venezuela	19	(48)	12	(26)	7	(22)		19	(48)	100.0	(100.0)
Vanuatu	2	(6)	2	(6)				2	(6)	100.0	(100.0)
Total	215	(512)[1]	135	(335)	80	(177)		215	(512)	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 observadores del programa del CIAT y 33 por observadores de los programas nacionales) iniciados a fines de 2005 y completados en 2006

TABLE 9. Oceanographic and meteorological data for the Pacific Ocean, January-June 2006. The values in parentheses are anomalies. SST = sea-surface temperature; SOI = Southern Oscillation Index; NOI* = Northern Oscillation Index.

TABLA 9. Datos oceanográficos y meteorológicos del Océano Pacífico, Enero-Junio 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	**1**	**2**	**3**	**4**	**5**	**6**
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	24.2 (-0.3)	26.3 (0.3)	26.8 (0.3)	24.2 (-1.2)	24.0 (-0.4)	22.8 (-0.2)
Area 2 (5°N-5°S, 90°-150°W	24.9 (-0.7)	26.0 (-0.3)	26.5 (-0.6)	27.3 (-0.1)	27.1 (0.0)	26.5 (0.1)
Area 3 (5°N-5°S, 120°-170°W)	25.7 (-0.9)	26.1 (-0.6)	26.5 (-0.6)	27.8 (-0.1)	27.9 (0.1)	27.9 (0.4)
Area 4 (5°N-5°S, 150W°-160°E)	27.7 (-0.4)	27.4 (-0.6)	27.8 (-0.3)	28.4 (-0.1)	28.9 (0.2)	29.2 (0.5)
Thermocline depth—Profundidad de la termoclina, 0°, 80°W (m)	30	30	20	15	40	40
Thermocline depth—Profundidad de la termoclina, 0°, 110°W (m)	50	30	40	40	45	45
Thermocline depth—Profundidad de la termoclina, 0°, 150°W (m)	140	140	140	140	130	140
Thermocline depth—Profundidad de la termoclina, 0°, 180°W (m)	170	180	180	170	175	180
Sea level—Nivel del mar, Baltra, Ecuador (cm)	185.5 (4.8)	196.0 (13.7)	190.2 (8.4)	192.1 (9.4)	196.5 (15.1)	197.3 (16.4)
Sea level—Nivel del mar, Callao, Perú (cm)	106.7 (-4.8)	107.5 (-6.6)	105.1 (-9.6)	107.7 (-6.8)	112.0 (-1.5)	109.0 (-3.0)
SOI—IOS	1.8	-0.2	1.4	0.9	-0.8	-0.7
SOI*—IOS*	0.99	-1.22	1.06	3.05	-3.13	-2.78
NOI*—ION*	4.12	2.26	-0.07	-0.89	-0.66	-0.15

TABLE 10. Preliminary estimates of mortalities of dolphins in 2005, population abundance pooled for 1986-1990 (from Report of the International Whaling Commission, 43: 477-493), and relative mortality (with approximate 95-percent confidence intervals), by stock.
TABLA 10. Estimaciones preliminares de la mortalidad incidental de delfines en 2005, la abundancia de poblaciones agrupadas para 1986-1990 (del Informe de la Comisión Ballenera Internacional, 43: 477-493), y la mortalidad relativa (con intervalos de confianza de 95% aproximados), por población.

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	271	782,900	0.03
Western/southern—Occidental y sureño	99	892,600	0.01
Spinner dolphin—Delfín tornillo[1]			
Eastern—Oriental	274	592,200	0.05
Whitebelly—Panza blanca	115	617,100	0.02
Common dolphin—Delfín común[2]			
Northern—Norteño	114	449,462	0.03
Central	57	577,048	<0.01
Southern—Sureño	154	1,525,207	0.01
Other dolphins—Otros delfines[3]	67	2,802,300	<0.01
Total	1,151		

[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] "Other dolphins" includes the following species and stocks, whose observed mortalities were as follows: striped dolphins (*Stenella coeruleoalba*), 15; coastal spotted dolphin (*Stenella attenuata*), 3; Central American spinner dolphin (*Stenella longirostris centroamericana*) 11; bottlenose dolphin (*Tursiops truncatus*) 7; Fraser's dolphin (*Lagenodelphis hosei*), 1; and unidentified dolphins, 30.
[3] "Otros delfines" incluye las siguientes especies y poblaciones, con las mortalidades observadas correspondientes: delfín listado (*Stenella coeruleoalba*) ,15; delfin manchado costero (*Stenella attenuata*), 3; delfin tornillo centroamericano (*Stenella longirostris centroamericana*) 11; tonina (*Tursiops truncatus*) 7; delfin de Fraser (*Lagenodelphis hosei*), 1; y delfines no identificados, 30.

TABLE 11a. Annual estimates of dolphin mortality, by species and stock, 1979-2005. The data for 2005 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 11a. Estimaciones anuales de la mortalidad de delfines, por especie y población, 1979-2005. Los datos de 2005 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	274	99	274	115	114	57	154	64	1,151

[1] 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 11b. 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 2004-2005, because the coverage was at or nearly at 100 percent during those years.

TABLA 11b. 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 2004-2005, 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	Sets with zero mortality (percent)	Sets with major malfunctions (percent)	Sets with net collapse (percent)	Sets with net canopy (percent)	Average duration of backdown (minutes)	Average number of live dolphins left in net after backdown
Año	**Lances sin mortalidad (%)**	**Lances con averías mayores (%)**	**Lances con colapso de la red (%)**	**Lances con abultamiento de la red (%)**	**Duración media del retroceso (minutos)**	**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