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COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL
QUARTERLY REPORT—INFORME TRIMESTRAL

October-December 2004
Octubre-Diciembre 2004

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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

INFORME TRIMESTRAL

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de la

COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL

es un relato informal, publicado en inglés y español, de la situación actual de la pesca atunera en el Océano Pacífico oriental con relación a los intereses de la Comisión, y de la investigación científica y demás actividades del personal científico de la Comisión. Gran parte de los resultados de investigación presentados en este informe son preliminares y deben ser considerados como informes del avance de la investigación.

Editor—Redactor:
William H. Bayliff

INTRODUCTION

The Inter-American Tropical Tuna Commission (IATTC) operates under the authority and direction of a convention originally entered into by Costa Rica and the United States. The convention, which came into force in 1950, is open to adherence by other governments whose nationals fish for tropical tunas and tuna-like species in the eastern Pacific Ocean (EPO). Under this provision Panama adhered in 1953, Ecuador in 1961, Mexico in 1964, Canada in 1968, Japan in 1970, France and Nicaragua in 1973, Vanuatu in 1990, Venezuela in 1992, El Salvador in 1997, Guatemala in 2000, Peru in 2002, and Spain in 2003. 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 June 17, 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 May 21, 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 February 15, 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 June 24-27, 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.

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 54th 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

AIDCP meetings

The following AIDCP meetings were held in La Jolla, California, USA, during the fourth quarter of 2004. Information on these meetings is available on the IATTC's web site.

Number	Meeting	Dates
17	Permanent Working Group on Tuna Tracking	October 18
3	Working Group to Promote and Publicize the AIDCP Dolphin Safe Tuna Certification System	October 18
37	International Review Panel	October 19
12	Parties to the AIDCP	October 20

The following resolutions were adopted at the 12th meeting of the Parties to the AIDCP:

- Amendment to the Terms of Reference of the Joint Working Group on Fishing by Non-Parties – A-04-06;
- Resolution to Establish a List of Vessels Presumed to Have Carried Out Illegal, Unreported and Unregulated Fishing Activities in the Agreement Area – A-04-07;
- Criteria for Attaining the Status of Cooperating Nonparty or Fishing Entity in AIDCP – A-04-08.

Other meetings

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 October 5-7, 2004. His travel expenses were paid the by the Western Pacific Fishery Management Council.

Dr. Mark N. Maunder participated in the Conference on New Developments of Statistical Analysis in Wildlife, Fisheries, and Ecological Research (the Fifth Winemiller Symposium), in Columbia, Missouri, USA, on October 13-16, 2004, where he presented a poster "A general framework for ecological modeling." His travel expenses were paid by a grant for protected species modeling from the Pelagic Fisheries Research Program, University of Hawaii.

Mr. Vernon P. Scholey attended portions of a seminar entitled "Management of Marine Protected Areas," held at the Smithsonian Tropical Research Institute Tupper Center in Panama, R.P., on October 21-23, 2004. The conference was organized by Mr. Jon Day, Director of the Conservation, Biodiversity and World Heritage site of the Great Barrier Reef Marine Park Authority, who gave the majority of the presentations.

Dr. Mark N. Maunder participated in the West Coast Groundfish Modeling Workshop, in Seattle, Washington, USA, on October 25-29, 2004. His travel expenses were paid by the California Department of Fish and Game.

An informal workshop on purse-seine catch per unit of effort, organized by Dr. Mark N. Maunder, was held at the La Jolla office of the IATTC on November 3-5, 2004. Scientists from the Billfish Foundation, the Institut de Recherche pour le Développement of France, the Instituto Nacional de la Pesca of Mexico, the National Research Institute of Far Seas Fisheries of Japan, the Secretariat of the Pacific Community, the U.S. National Marine Fisheries Service (Hawaii and La Jolla), and the IATTC, plus one captain of a tuna boat, participated in the workshop. Presentations were made by Drs. Maunder and Cleridy E. Lennert-Cody, Messrs. Edward H. Everett, Simon D. Hoyle, Marlon H. Román Verdesoto, and Nickolas W. Vogel, and Ms. Jenny M. Suter of the IATTC staff.

Dr. Mark N. Maunder participated in the Fifth Mote International Symposium in Fisheries Ecology, "The Good, the Bad, and the Ugly: Integrating Marine and Human Ecology into Fisheries Management," in Sarasota, Florida, USA, on November 9-11, 2004, where he gave a talk entitled "Are pelagic fisheries managed well? A stock-assessment scientist's perspective." His expenses were paid by the sponsors of the symposium.

Dr. Richard B. Deriso participated in a meeting of the Ocean Sciences Board of the U.S. National Research Council in Washington, D.C., on November 10-12, 2004. His travel expenses were paid by the National Research Council. (That meeting concluded his membership on the Board, as he had completed the normal three-year appointment.)

Dr. Martín A. Hall participated in a symposium entitled "Improving Fishery Management: Melding Science and Governance" at the University of Washington, Seattle, Washington, on November 15-16, 2004. He gave a talk on the situation in the eastern Pacific Ocean in a session entitled "Managing the Catch of Non-Target Species."

Dr. Michael G. Hinton participated in the sixth meeting of the Secretariat of the Pacific Community-Forum Fisheries Agency (FFA) Data Collection Committee, held in Brisbane, Australia, on November 15-19, 2004. The participants worked on revision and development of logbook, observer, and other data collection forms and procedures utilized in the FFA treaty area of the western Pacific Ocean.

Dr. Robin Allen participated in the 14th special meeting of the International Commission for the Conservation of Atlantic Tunas in New Orleans, Louisiana, USA, on November 15-21, 2004.

Dr. Martín A. Hall presided at a workshop on mitigation of bycatches of sea turtles by artisanal longline fisheries, organized by the Instituto Nacional de Pesca of Mexico and the World Wildlife Fund-Mexico, which took place in Teacapán, Sinaloa, Mexico, on November 22, 2004. In addition, he initiated the training of personnel (managers, observers, *etc.*) for a program similar to the one in Ecuador described in the IATTC Quarterly Report for July-September 2004.

Dr. Robert J. Olson participated in the Principal Investigators Workshop of the Pelagic Fisheries Research Program (PFRP) of the University of Hawaii, in Honolulu, Hawaii, on November 29-December 1, 2004. He gave a presentation entitled "Key pelagic prey and their tuna predators: isotope ecology in the eastern tropical Pacific Ocean." The presentation was a progress report on a three-year project involving research on the trophic structure (including plankton, forage organisms, and upper-level predators) in the pelagic equatorial eastern, central, and western Pacific Ocean, using stable carbon and nitrogen isotopes and diet analysis. His travel expenses were paid by the PFRP.

DATA COLLECTION

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

Personnel at these offices collected 109 length-frequency samples and abstracted logbook information for 140 trips of commercial fishing vessels during the fourth quarter of 2004.

Also during the fourth quarter members of the field office staffs placed IATTC observers on 108 fishing trips by vessels that participate in the AIDCP On-Board Observer Program. In addition, 147 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 2004 is about 206,700 cubic meters (m^3) (Table 1). The weekly average at-sea capacity for the fleet, for the weekly periods ending October 4 through December 31, was about 102,600 m^3 (range: 45,400 to 151,300 m^3). The changes of flags and vessel names and additions to and deletions from the IATTC's fleet list during the fourth quarter of 2004 are given in Table 2. The EPO was closed to purse-seine fishing for tunas for two periods during 2004, 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 January 1-December 31, 2004, and the corresponding periods of 1999-2003, in metric tons, were:

Species	2004	1999-2003			Weekly average, 2004
		Average	Minimum	Maximum	
Yellowfin	279,900	353,200	272,700	413,900	5,400
Skipjack	198,000	203,800	141,300	263,400	3,800
Bigeye	40,100	45,800	34,200	70,100	800

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 Class-6 vessels (vessels with well volumes greater than 425 m^3), and only data for Class-6 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 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 three quarters of 2004 and the corresponding periods of 1999-2003, in metric tons, were:

Species	Region	2004	1999-2003		
			Average	Minimum	Maximum
Yellowfin	N of 5°N	11.2	16.8	12.0	22.0
	S of 5°N	7.3	5.5	4.3	7.5
Skipjack	N of 5°N	2.1	2.9	1.7	4.3
	S of 5°N	6.5	10.1	6.5	16.0
Bigeye	EPO	1.7	3.4	2.1	5.7

Preliminary estimates of the CPUEs, by pole-and-line vessels, of yellowfin (Table 4) and skipjack (Table 5) in the EPO during the first three quarters of 2004 and the corresponding periods of 1999-2003, in metric tons, were:

Species	Region	2004	1999-2003		
			Average	Minimum	Maximum
Yellowfin	EPO	4.5	3.1	1.4	5.6
Skipjack	EPO	4.5	2.2	0.3	4.5

Catch statistics for the longline fishery

The catches of bigeye by longline gear in the EPO during 2004 are shown in Table 7. Equivalent data are not available for the other species of tunas, nor 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 all of its Annual Reports since that for 1954, 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 1999-2004 are presented in this report. Two sets of length-frequency histograms are presented for each species, except bluefin; the first shows the data by stratum (gear type, set type, and area) for 2004, and the second shows the combined data for the third quarter of each year of the 1999–2004 period. For bluefin, the histograms show the 1999-2004 catches by commercial and recreational gear combined. Samples from 83 wells (including 2 from recreational vessels) were taken during the third quarter of 2004. No samples were taken from the negligible catches of yellowfin and skipjack taken by pole-and-line vessels during the third quarter. The estimates of the size distributions of these catches were obtained by using length-frequency data from fish caught in unassociated schools by purse seiners.

There are ten surface fisheries for yellowfin defined for stock assessments: four associated with floating objects, two unassociated school, three associated with dolphins, and one pole-and-line (Figure 1). The last fishery includes all 13 sampling areas. Of the 83 wells sampled, 64 contained yellowfin. The estimated size compositions of these fish during the third quarter of 2004 are shown in Figure 2a. The majority of the catch of yellowfin was taken by sets on schools associated with dolphins. The average size of these fish was less than during the first half of 2004. There were small amounts of yellowfin taken by pole-and-line vessels and in floating-object sets in the Inshore (negligible) and Southern areas.

The estimated size compositions of the yellowfin caught by all fisheries combined during the third quarter of 1999-2004 are shown in Figure 2b. The average weights of the yellowfin caught during the third quarter were the lowest since 1999. The mode between 80 and 100 cm was the most prevalent size group.

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 83 wells sampled, 51 contained skipjack. The estimated size compositions of these fish during the third quarter of 2004 are shown in Figure 3a. The majority of the catch of skipjack was taken in the Northern floating-object (smaller fish) and unassociated (larger fish) fisheries. The catches increased in the Equatorial floating-object fishery, and decreased in the two Southern fisheries, compared to the previous quarters. Negligible amounts of skipjack were taken by pole-and-line vessels and in the Inshore floating-object fishery.

The estimated size compositions of the skipjack caught by all fisheries combined during the third quarter of 1999-2004 are shown in Figure 3b. Two distinct modes of skipjack were present during the third quarter, one between 40 and 45 cm (mostly from the floating-object fisheries) and one between 70 and 80 cm (mostly from the Northern unassociated and Equatorial floating-object fisheries).

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 83 wells sampled, 22 contained bigeye. The estimated size compositions of these fish during the third quarter of 2004 are shown in Figure 4a. The majority of the catch of bigeye was taken in floating-object sets in all but the Inshore area, where only a negligible amount was taken. A negligible amount of bigeye was caught in the unassociated fishery. There were no recorded catches of bigeye in dolphin sets or by pole-and-line vessels during the third quarter.

The estimated size compositions of the bigeye caught by all fisheries combined during the third quarter of 1999-2004 are shown in Figure 4b. The average weight of bigeye during 2004 was less than during any of the previous five years.

The estimated retained catch of bigeye less than 60 cm in length during the first three quarters of 2004 was 9,904 metric tons (t), or about 37 percent of the estimated total catch of bigeye by purse seiners. The corresponding amounts for the first three quarters of 1999-2004 ranged from 3,147 to 9,933 t.

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 2004 bluefin were caught between 26°N and 31°N from May through August. The majority of the catches of bluefin by both commercial and recreational vessels were taken during July and August. In the past, commercial and recreational catches have been reported separately. In 2004, however, only 10 samples were taken from recreational vessels and only 14 from commercial vessels (from the total of 496 samples for 2004), making 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 1999-2004 period. The estimated size compositions are shown in Figure 5. The commercial catch (8,548 t) of bluefin far exceeded the recreational catch (53 t), but the estimate for the latter is very preliminary.

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 Ecuador, the European Union, Mexico, 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 2004 the observer programs of the European Union, Mexico, 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 148 fishing trips aboard purse seiners covered by that program during the fourth quarter of 2004. Preliminary coverage data for these vessels during the quarter are shown in Table 8.

Training

IATTC staff members conducted an observer training course in Manta, Ecuador, during the period of November 8-25, 2004, for 17 trainees, 11 from Ecuador and 6 from Panama. One of the Ecuadorian trainees was from that country's national observer program.

RESEARCH

Age and growth of bigeye tuna

Tagging and oxytetracycline-marking experiments conducted by the IATTC in the Pacific Ocean have demonstrated that bigeye tuna 38 to 135 cm in length deposit increments in their sagittal otoliths at daily intervals. Frontal sections along the primordium to the post-rostral axis of the otoliths provide an optimal counting path for resolving daily increments, with a light microscope, of fish up to 4 years of age. The numbers of increments in frontal sections of otoliths from 254 bigeye, 30 to 149 cm in length, captured by purse-seine vessels in the eastern Pacific Ocean (EPO) between 2000 and 2004 were used for estimating their ages in days. The growth in length of bigeye in the EPO is described by the von Bertalanffy growth equation fitted to length-at-age data (Figure 6). Growth equations calculated for males and females were not significantly different. Equations were also developed to predict ages and weights from length data.

The growth of bigeye in the EPO was also estimated by fitting a von Bertalanffy growth equation to data for 205 bigeye tagged and recaptured between 2000 and 2004. The growth rates derived from the otolith and tagging data showed similar decreases with increasing length.

Reproductive biology of bigeye tuna

The reproductive biology of bigeye tuna was investigated by sampling 1,986 fish caught by purse-seine vessels and 124 fish caught by longline vessels in the eastern and central Pacific Ocean. The sampling was conducted by the IATTC and the National Research Institute of Far Seas Fisheries of Japan during February 2000 through March 2003. Histological evaluations of the ovaries of 683 females provided the foundation for the estimates of length-specific reproductive characteristics. The data indicate that spawning takes place from about 15°N to 15°S and from about 105°W to 175°W, and occurs during most months of the year when the sea-surface temperatures exceed about 24°C. Spawning occurs primarily at night, between about 7:00 p.m. and 4:00 a.m. Fifty percent of the females were mature at a length of 135 cm and an age of 3.4 years (Figure 6). The estimated mean relative fecundity was 24 oocytes per gram of body weight. The fraction of mature females with postovulatory follicles was 0.39, indicating that the average female spawns every 2.6 days. Reproductively-active females spawn every 1.3 days. The overall sex ratio deviated from 1:1, due to a preponderance of males in the samples.

Although the lengths at ages 1 and 4 for bigeye (56 and 151 cm) from the present study, are similar to those estimated for yellowfin (49 and 156 cm) in the EPO, the length and age at 50-percent maturity for bigeye (135 cm and 3.4 years) are considerably greater than those for yellowfin (92 cm and 2.1 years) in the EPO. The lifespan of bigeye, based on estimated maximum ages and tag returns in the western Pacific Ocean is about 15 years. For yellowfin, however, although the maximum age has been assumed to be about half that for bigeye, the lifespan has not been accurately determined.

Yellowfin tuna tagging project

The IATTC, in collaboration with the Tagging of Pacific Pelagics (TOPP) program, conducted yellowfin tuna tagging cruises aboard the long-range sportfishing vessel *Royal Star* in October 2002, October 2003, and November 2004. TOPP, which is being conducted within the framework of the Census of Marine Life (COML), is a program using electronic tagging to study the movements of large open-ocean animals and the oceanographic factors influencing their behavior.

During the most recent cruise, carried out off Baja California, Mexico, on November 3-13, 2004, archival tags (Lotek LTD 2310) were implanted into the peritoneal cavities of 81 yellowfin captured by rod and reel, 25 at Alijos Rocks, 32 on the ridge northwest of Magdalena Bay, and 24 on the finger bank northwest of Cabo San Lucas.

During 2002, 2003, and 2004 a total of 183 yellowfin have been tagged with archival tags in collaboration with the TOPP program. There have been 34 recoveries from the experiments of 2002 and 2003. The times at liberty have ranged from 9 to 560 days, with 17 fish at liberty for more than 180 days. The data for the fish at liberty for more than 10 months show seasonal movements to the south and then to the north, correlated with shifts in the sea-surface temperatures off Baja California. The depth data illustrate previously-undocumented bounce-diving behavior throughout the day to depths commonly in excess of 250 m, apparently due to foraging behavior following movements away from coastal areas and topographical features.

Early life history studies

Yellowfin broodstock

The yellowfin broodstock in Tank 1 (1,362,000 L) at the Achotines Laboratory did not spawn from October through November 22, 2004, and spawned intermittently thereafter through the end of December. Spawning occurred between 8:05 p.m. and 9:50 p.m. The numbers of eggs collected after each spawning event ranged from about 5,000 to 221,000. The water temperatures in the tank ranged from 27.2° to 28.5°C during the quarter.

Three fish, one 5-kg female, one 11-kg male, and one 25-kg male, died during the quarter from striking the wall of the tank. Another fish, a 3-kg male, died from transfer stress. Eighteen fish (3- to 9-kg) were added during the quarter, and at the end of December there were three size groups of fish in Tank 1: 2 large fish (83- and 99-kg), 16 21- to 43-kg fish, and 18 4- to 14-kg fish.

From January 2003 through April 2004 archival tags had been implanted in yellowfin tuna (IATTC Quarterly Reports for January-March 2003 and April-June 2004), and at the end of December 2004 10 fish from those groups remained in Tank 1. In September 2004 one additional yellowfin (9.8 kg) was implanted with an archival tag (IATTC Quarterly Report July-September 2004), but it later died. During the fourth quarter one 9-kg fish was tagged and added to the population in Tank 1, bringing the total number of archival-tagged fish in Tank 1 to 11.

Two yellowfin tuna remain in Tank 2, following the transfer of 18 yellowfin from Tank 2 to Tank 1 in December.

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.

Currently, two separate broodstocks of snappers are being kept in two 85,000-L tanks. The first consists of 16 individuals from the original broodstock caught in 1996. Their reproductive activity started again in the second week of June 2004, and they continued to spawn during the first half of the fourth quarter with greater frequency and intensity (number of eggs), but during the second half of the quarter the frequency of spawning diminished.

The second group consists of 26 individuals from a group bred at the Laboratory from eggs obtained from spawning in 1998. These fish, which in 2003 spawned until November, continued to spawn frequently during the first half of the fourth quarter, but less frequently at the end of the quarter.

In October an experiment to determine the influence of the intensity of light on the feeding and growth of snapper larvae was carried out. The larvae were placed in six 640-L tanks, at a density of 30 larvae/L, and were fed with rotifers at densities of between 6 and 10 rotifers/ml. The fish in two of the tanks were subjected to constant artificial light for 24 hours, those in two others to intermittent artificial light (12 hours on and 12 hours off), and those in the other two to natural light only. The data obtained during the experiment are being processed for analysis.

Workshop on operating seawater systems

Mr. Vernon P. Scholey gave a mini-workshop covering design, construction, management, and operation of the seawater systems at the Achotines Laboratory on October 27-28, 2004. The workshop was attended by eight staff members from four different laboratories of the Smithsonian Tropical Research Institute (STRI) that maintain marine animals in captivity. This was an inter-institutional courtesy, and the participants paid for their room and board at the Achotines Laboratory.

Visitors at the Achotines Laboratory

Dr. Eldridge Bermingham, Deputy Director of the STRI, and Dr. Mark Torchin, STRI staff scientist, spent the period of October 15-17, 2004, at the Achotines Laboratory, where Dr. Torchin surveyed potential sites for his research on the ecology of host-parasite interactions in marine environments.

Ms. Erica Knie, founder and president of Mar Viva, a non-profit organization with its headquarters in Barcelona, Spain, and Mr. Rafael E. Morice of Ecos, S.A., of Costa Rica, visited the Achotines Laboratory on November 24, 2004. The visit, which was arranged by the Dirección General de Recursos Marinos y Costeros de Panamá, was part of a tour of Panama to evaluate the potential for coastal aquaculture in that country

Dr. Steve Vollmer, a Marine Science Network post-doctoral Fellow at the STRI, spent the period of December 10-14, 2004, at the Achotines Laboratory. Dr. Vollmer is working on genetic diversity of corals, and this trip was for a preliminary survey of the coral populations in the area.

Oceanography and meteorology

Easterly 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.

The SSTs in the tropical EPO increased during the third quarter, especially west of 120°W. The southern boundary of the area of warm water that occurred north of 20°N and west of 120°W during September 2004 (IATTC Quarterly Report for July-September 2004: Figure 5) receded to 25°N in October and to north of 30°N in November. The area of warm water that occurred between the equator and 10°S during September 2004 (IATTC Quarterly Report for July-September 2004: Figure 5) persisted throughout the fourth quarter, and several small areas of warm water appeared east of it during November and December (Figure 7). The data in Table 9, for the most part, indicate that a weak El Niño event was in effect during the fourth quarter, although the NOI* for November was unusually high. According to the Climate Diagnostics Bulletin of the U.S. National Weather Service for December 2004, "El Niño conditions are expected to continue for the next three months [January-March 2005]."

Experiments with sorting grids

Dr. Peter A. Nelson, a visiting scientist at the headquarters of the IATTC, spent the period of October 25-November 14, 2004, at the Achotines Laboratory, where he and staff members at the Laboratory studied the behavioral responses of yellowfin tuna to sorting grids and a bubble curtain. Several experiments were conducted to explore the following questions:

- How does the orientation (vertical versus horizontal) of the grid's bars affect tuna passage?
- Do the responses to white and black gear differ?
- How do two specific sorting grid designs (steel rings and polyvinyl chloride (PVC) panels with oblong holes) compare?
- What is the potential for corralling tunas with a bubble curtain?

Briefly, both orientation and color had significant effects on the relative frequency with which the fish chose one device over the other, though these results were complicated by interesting interaction effects. Coincidentally, the investigators were also able to test the importance of grid position in the experimental set-up; this factor turned out to be the most important of all. The latter result suggests that the physical crowding of tunas in a purse seine may be of fundamental importance in developing a workable strategy for using sorting grids in the purse-seine fishery.

The PVC panels were far superior to the rings in the experimental trials.

A simple test of tuna behavioral response to bubble curtains indicated that the fish are reluctant to pass through such a barrier.

While experimental conditions were clearly different from those likely to be encountered at sea, the results of these experiments suggest that sorting grid devices and bubble curtains are worthy of trials at sea.

Silky sharks

Silky sharks, *Carcharias falciformis,* are the most commonly-caught species of shark in the purse-seine fishery for tunas in the eastern Pacific Ocean (EPO). Dr. Mihoko Minami, a statistician at the Institute of Statistical Mathematics and the Graduate University for Advanced Studies in Tokyo, Japan, and an IATTC staff member have carried out a preliminary analysis of the purse-seine bycatch rates of large silky sharks (>150 cm total length), most likely sub-adult and adult animals. Because of the existence of a large percentage of purse-seine sets with no bycatch of silky sharks, but also sets with large bycatches, the bycatch rates (numbers of sharks per set) were modeled using a zero-inflated negative binomial model. Comparison of log-likelihood values obtained for Poisson, negative binomial, zero-inflated Poisson, and zero-inflated negative binomial models fitted to a test data set showed that the zero-inflated negative binomial model provided the best fit to the data. Smoothing splines were used to capture non-monotonic relationships between bycatch rates and variables such as latitude, longitude, and date. Variables describing the local environment, such as sea-surface temperature and measures of local biomass (*e.g.* amount of tunas encircled) were also included in the models. For floating-object sets, two proxies for floating-object density were also included to capture the effects of their density on the bycatch rates. To try to ensure complete sampling of species aggregations, analysis was restricted to purse-seine sets that captured at least 1 metric ton of target tunas (yellowfin, skipjack, and bigeye). Two separate analyses were performed for unassociated sets and dolphin sets, one with data for all bycatches of large silky sharks and one with the largest bycatches excluded. The largest bycatches were not well described by any of the types of statistical models explored.

Preliminary estimates of indices of relative abundance of large silky sharks show decreasing trends over the 1993-2003 period for each of the three types of purse-seine sets. It is not known whether these decreasing trends are due to fishing, changes in the environment (perhaps associated with the 1997-1998 El Niño event), or other processes.

Silky sharks are taken as bycatch in both the purse-seine and the longline fisheries in the EPO. The decreasing trend in the indices of relative abundance based on floating-object set data is not believed to be due to changes in the density of floating objects, because proxies for floating-object density were included in the statistical model to account for trends in floating-object density over the 1993-2003 period. Future work will focus on developing indices of relative abundance for all sizes of silky sharks and on alternative methods for handling sets with extremely large bycatches. The spatial consistency of the trends throughout the portion of the EPO in which purse-seining for tunas takes place will also be explored.

Identification of bycatch species

The staff of the IATTC has been working to improve the identification of sharks and other bycatch species commonly encountered in the purse-seine fishery for tunas in the eastern Pacific Ocean (EPO). A shark identification form that will allow IATTC staff members to collect diagnostic characteristics for several species of sharks was introduced in late 2004. Information collected on this form will be used to corroborate at-sea species identifications and to provide guidance on ways to improve species identification training for observers.

In addition, the staff of the IATTC, with the assistance of Drs. Felipe Galván of the Centro Interdisciplinario de Ciéncias Marinas, La Paz, Mexico, and Ross Robertson of the Smithsonian Tropical Research Institute, Balboa, Panama, has designed an identification guide specifically for common species of fish caught by tuna purse-seiners in the EPO. This guide provides observers with key diagnostic characteristics that are easily observable from a distance and do not require the observers to handle the bycatch species. (It is sometimes difficult or impossible for the observers to handle the catch because some species are too dangerous to approach when alive and because the crews of the vessels are anxious to discard the bycatches as soon as possible so that they can make preparations for the next set.) An important feature of this species guide is that it provides the observers with common names used by fishermen in several countries, as the common names used by fishermen sometimes differ from the widely-accepted common names used by scientists. For example, “black-tipped shark” is often applied to the silky shark, *Carcharhinus falciformes*, but to scientists “black-tipped shark” means *C. limbatus*.

GEAR PROGRAM

During the fourth quarter IATTC staff members participated in two dolphin safety-gear inspection and safety-panel alignment procedures, one aboard a Mexican-flag purse seiner and the other aboard an Ecuadorian-flag purse seiner.

There were five AIDCP seminars for fishermen conducted during the fourth quarter. The Mexican national observer program (PNAAPD) conducted two seminars; one in Mazatlan, Mexico, on December 10 for 60 attendees, and the other in Ensenada, Mexico, on December 16 for 33 attendees. The Venezuelan national program (PNOV) also conducted two seminars; one in Caracas, Venezuela, on December 7 for 8 attendees, and the other in Panama, R.P., on December 30 for 25 attendees. The U.S. National Marine Fisheries Service conducted a seminar in Long Beach, California, USA, on December 14 for 2 attendees.

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Maunder Mark N., and Adam D. Langley. 2004. Integrating the standardization of catch-per-unit-of-effort into stock assessment models: testing a population dynamics model and using multiple data types. Fish. Res., 70 (2-3): 385-391.

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Wells, Randall S., Howard L. Rhinehart, Larry J. Hansen, Jay C. Sweeney, Forrest I. Townsend, Rae Stone, David R. Casper, Michael D. Scott, Aleta A Hohn, and Teri K. Rowles. 2004. Bottlenose dolphins as marine ecosystem sentinels: developing a health monitoring system. EcoHealth, 1 (3): 246-254.

ADMINISTRATION

Ms. Teresa Musano, who had worked for the IATTC since August 1998, resigned on December 15, 2004. Ms. Musano worked as a secretary from 1998 to August 2001, at which time she replaced Mr. Daniel R. Lilly as Administrative Assistant.

Ms. Musano's replacement, Ms. Keri Grim, began work on December 6, 2004.

Dr. William H. Bayliff, the longest-serving staff member of the IATTC, received the Distinguished Service Award for 2003 from the American Institute of Fishery Research Biologists (AIFRB). The AIFRB citation noted Dr. Bayliff's long and outstanding dedication to advancing the objectives of the Institute and service to that organization.

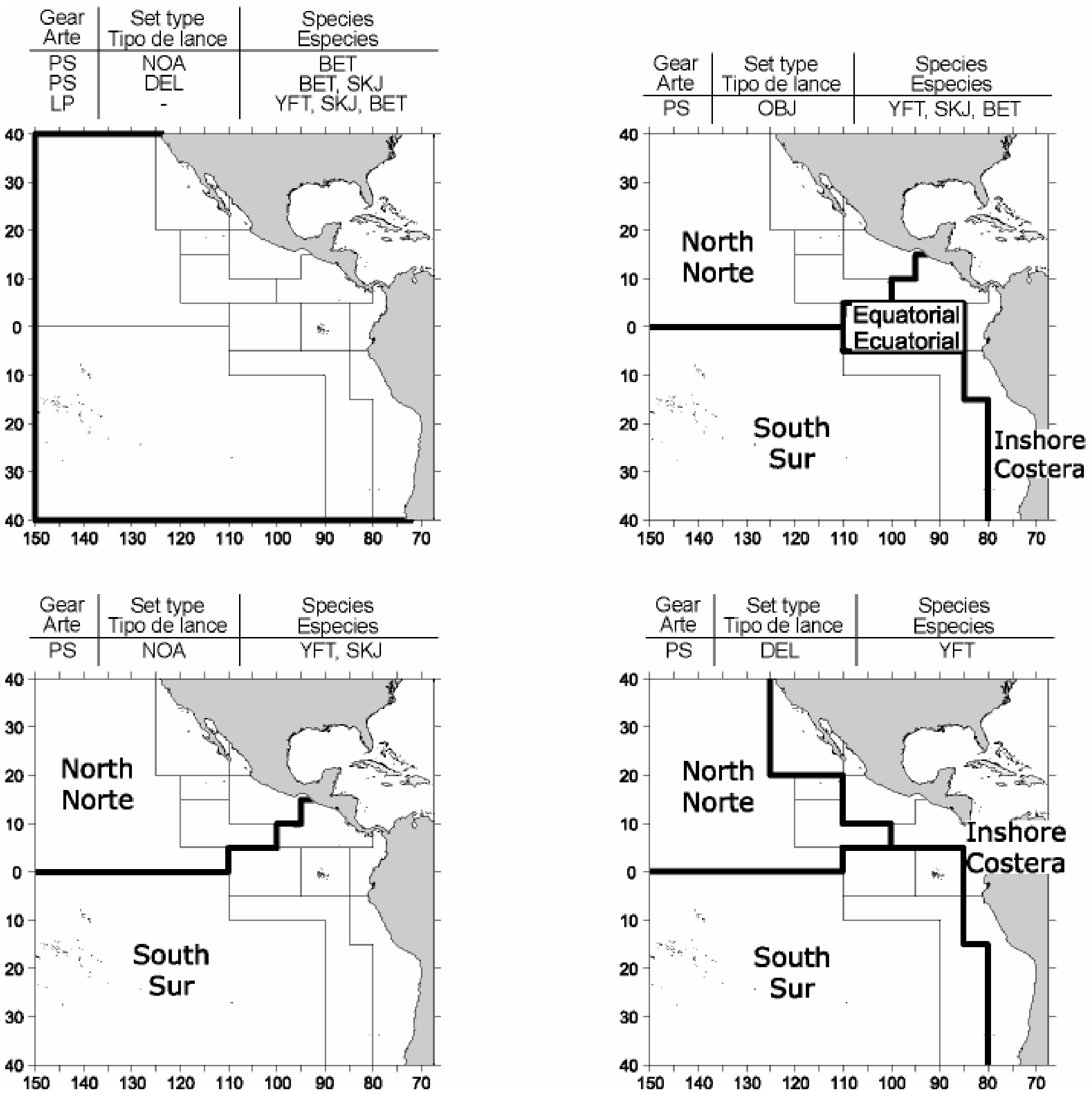

FIGURE 1. Spatial extents of the fisheries defined by the IATTC staff for stock assessment of yellowfin, skipjack, and bigeye in the EPO. The thin lines indicate the boundaries of the 13 length-frequency sampling areas, and the bold lines the boundaries of the fisheries. BET= bigeye; SKJ = skipjack; YFT = yellowfin; PS = purse seine; DEL = sets on dolphins; NOA = sets on unassociated schools; OBJ = sets on floating objects; LP = pole-and-line gear.

FIGURA 1. Extensión espacial de las pesquerías definidas por el personal de la CIAT para la evaluación de los stocks de atún aleta amarilla, barrilete, y patudo en el OPO. Las líneas delgadas indican los límites de las 13 zonas de muestreo de frecuencia de tallas, y las líneas gruesas los límites de las pesquerías. BET = patudo; SKJ = barrilete; YFT = aleta amarilla; PS = red de cerco; DEL = lances sobre delfines; NOA = lances sobre peces no asociados; OBJ = lances sobre objetos flotantes; LP = cañas.

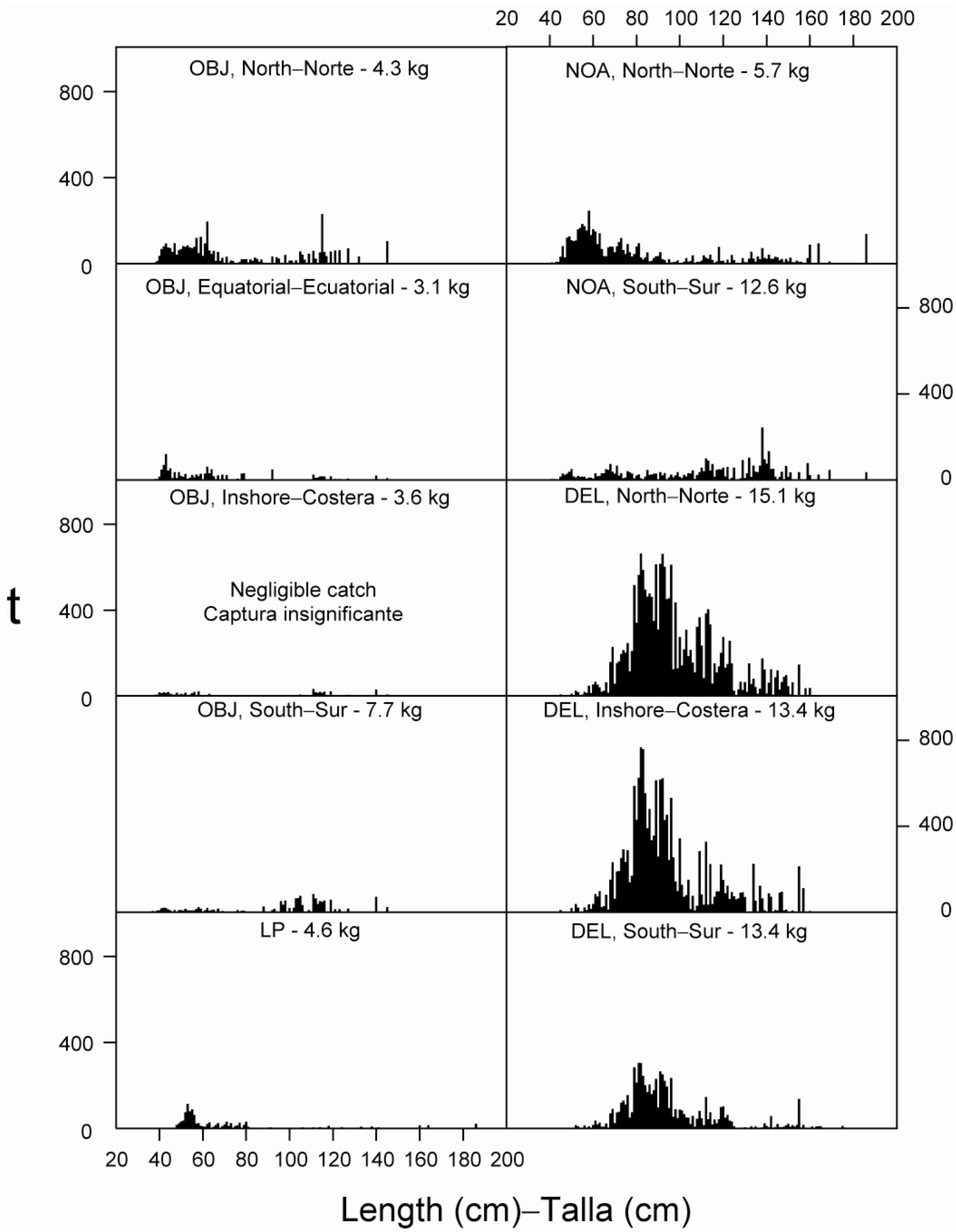

FIGURE 2a. Estimated size compositions of the yellowfin caught in each fishery of the EPO during the third quarter of 2004. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons; DEL = sets on dolphins; NOA = sets on unassociated schools; OBJ = sets on floating objects; LP = pole-and-line gear.

FIGURA 2a. Composición por tallas estimada para el aleta amarilla capturado en cada pesquería del OPO durante el tercero trimestre de 2004. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas; DEL = lances sobre delfines; NOA = lances sobre peces no asociados; OBJ = lances sobre objetos flotantes; LP = cañas.

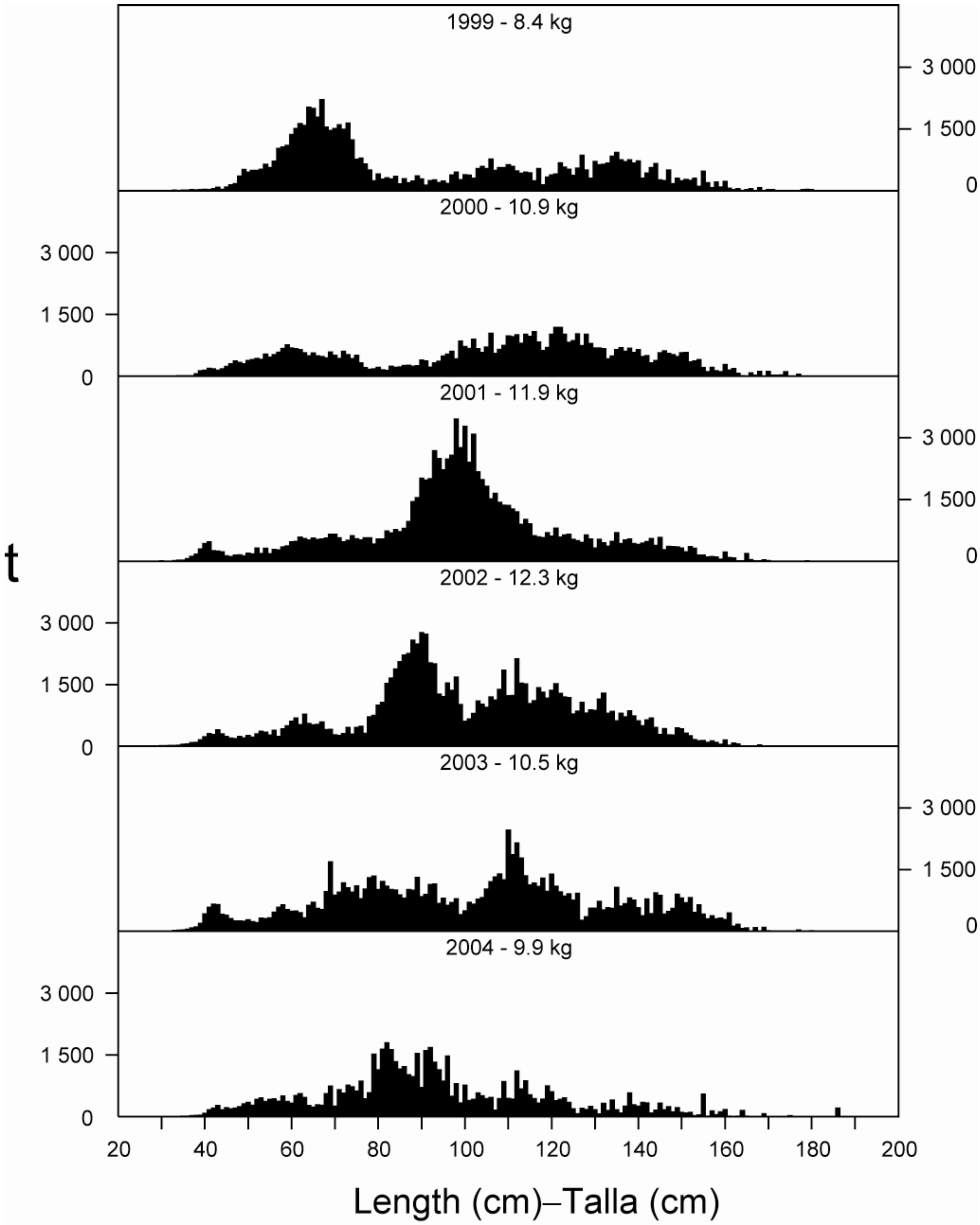

FIGURE 2b. Estimated size compositions of the yellowfin caught in the EPO during the third quarter of 1999-2004. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 2b. Composición por tallas estimada para el aleta amarilla capturado en el OPO en el tercero trimestre de 1999-2004. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas.

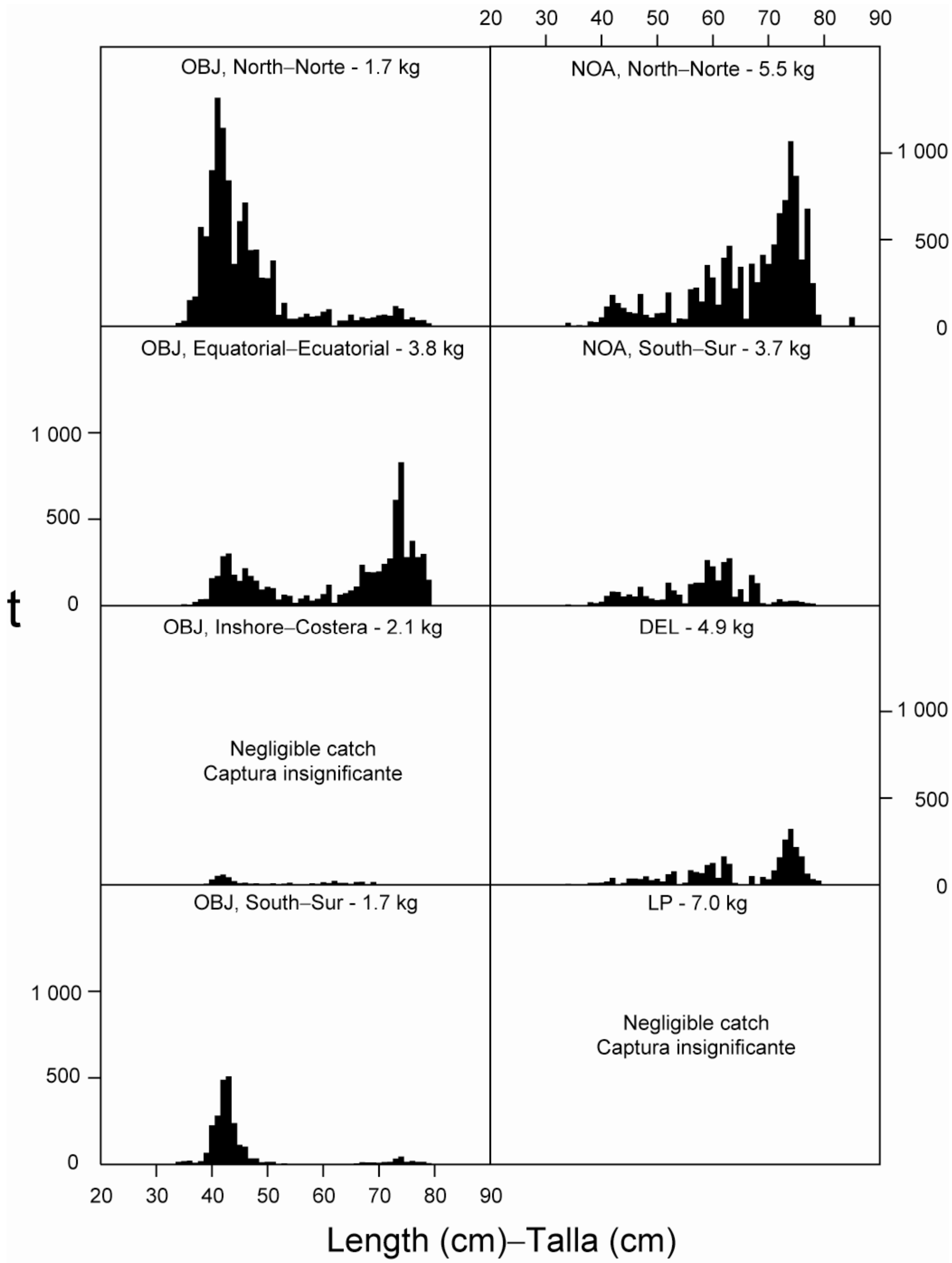

FIGURE 3a. Estimated size compositions of the skipjack caught in each fishery of the EPO during the third quarter of 2004. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons; DEL = sets on dolphins; NOA = sets on unassociated schools; OBJ = sets on floating objects; LP = pole-and-line gear.
FIGURA 3a. Composición por tallas estimada para el barrilete capturado en cada pesquería del OPO durante el tercero trimestre de 2004. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas; DEL = lances sobre delfines; NOA = lances sobre peces no asociados; OBJ = lances sobre objetos flotantes; LP = cañas.

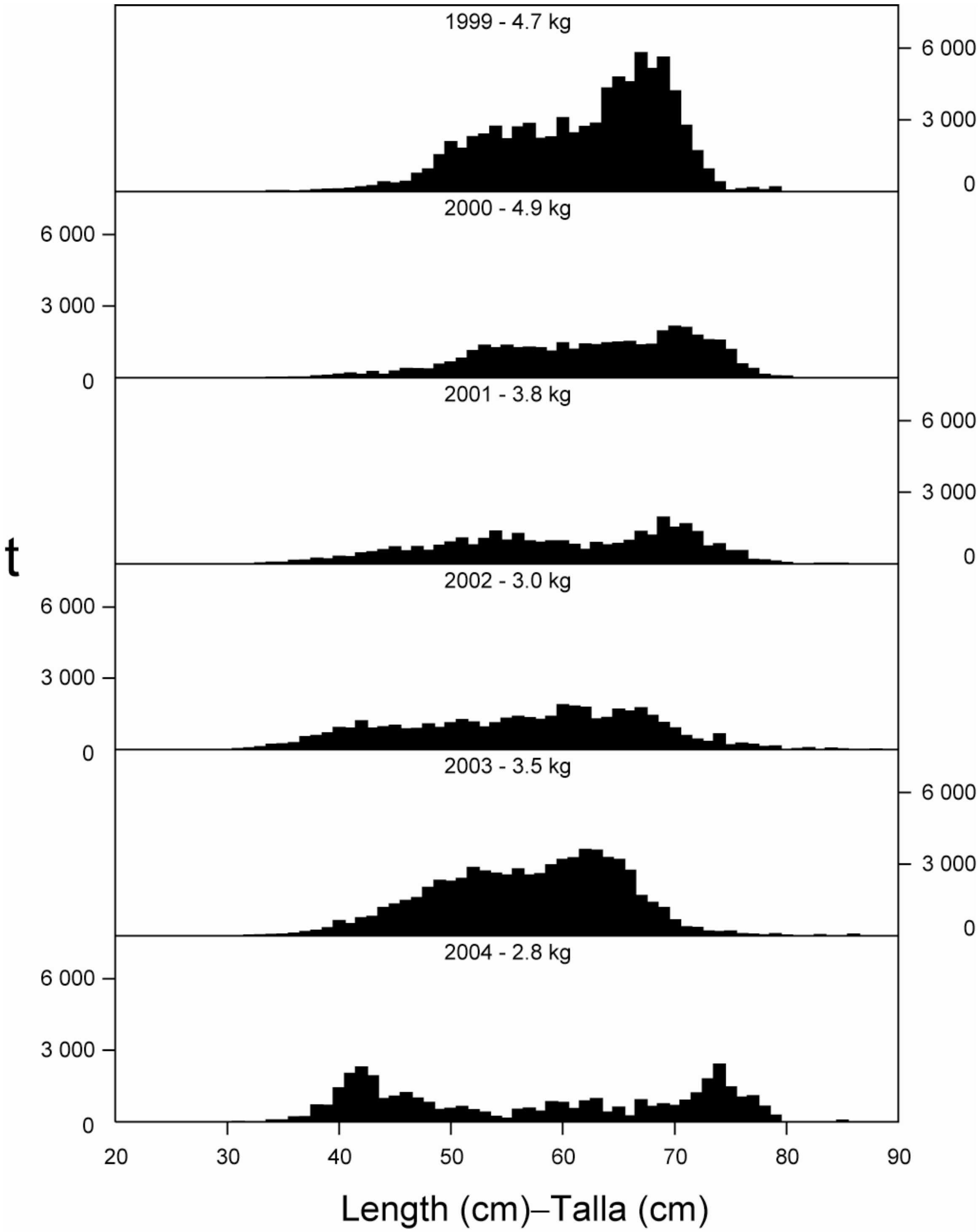

FIGURE 3b. Estimated size compositions of the skipjack caught in the EPO during the third quarter of 1999-2004. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 3b. Composición por tallas estimada para el barrilete capturado en el OPO en el tercero trimestre de 1999-2004. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas.

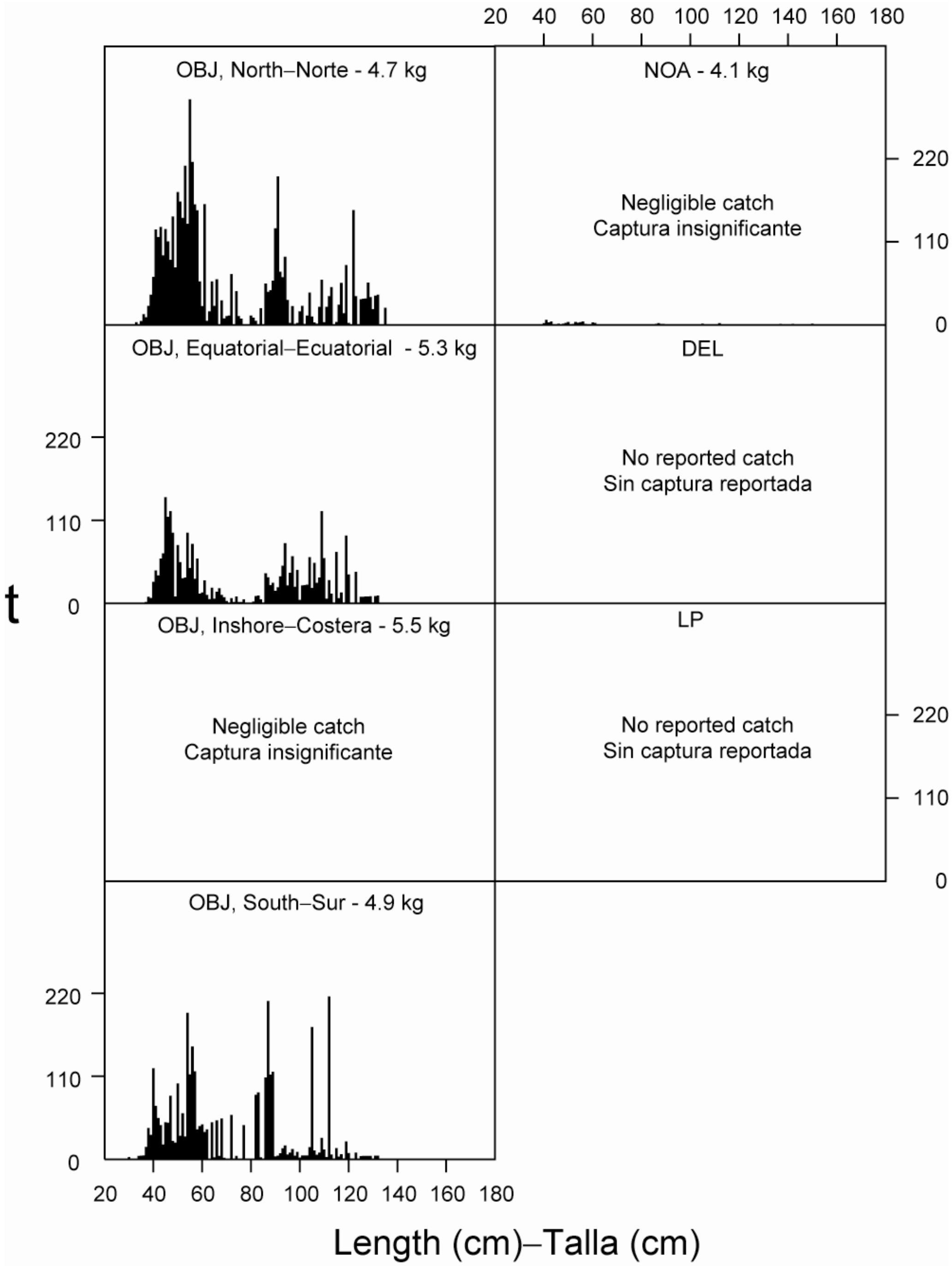

FIGURE 4a. Estimated size compositions of the bigeye caught in each fishery of the EPO during the third quarter of 2004. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons; DEL = sets on dolphins; NOA = sets on unassociated schools; OBJ = sets on floating objects; LP = pole-and-line gear.

FIGURA 4a. Composición por tallas estimada para el patudo capturado en cada pesquería del OPO durante el tercero trimestre de 2004. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas; DEL = lances sobre delfines; NOA = lances sobre peces no asociados; OBJ = lances sobre objetos flotantes; LP = cañas.

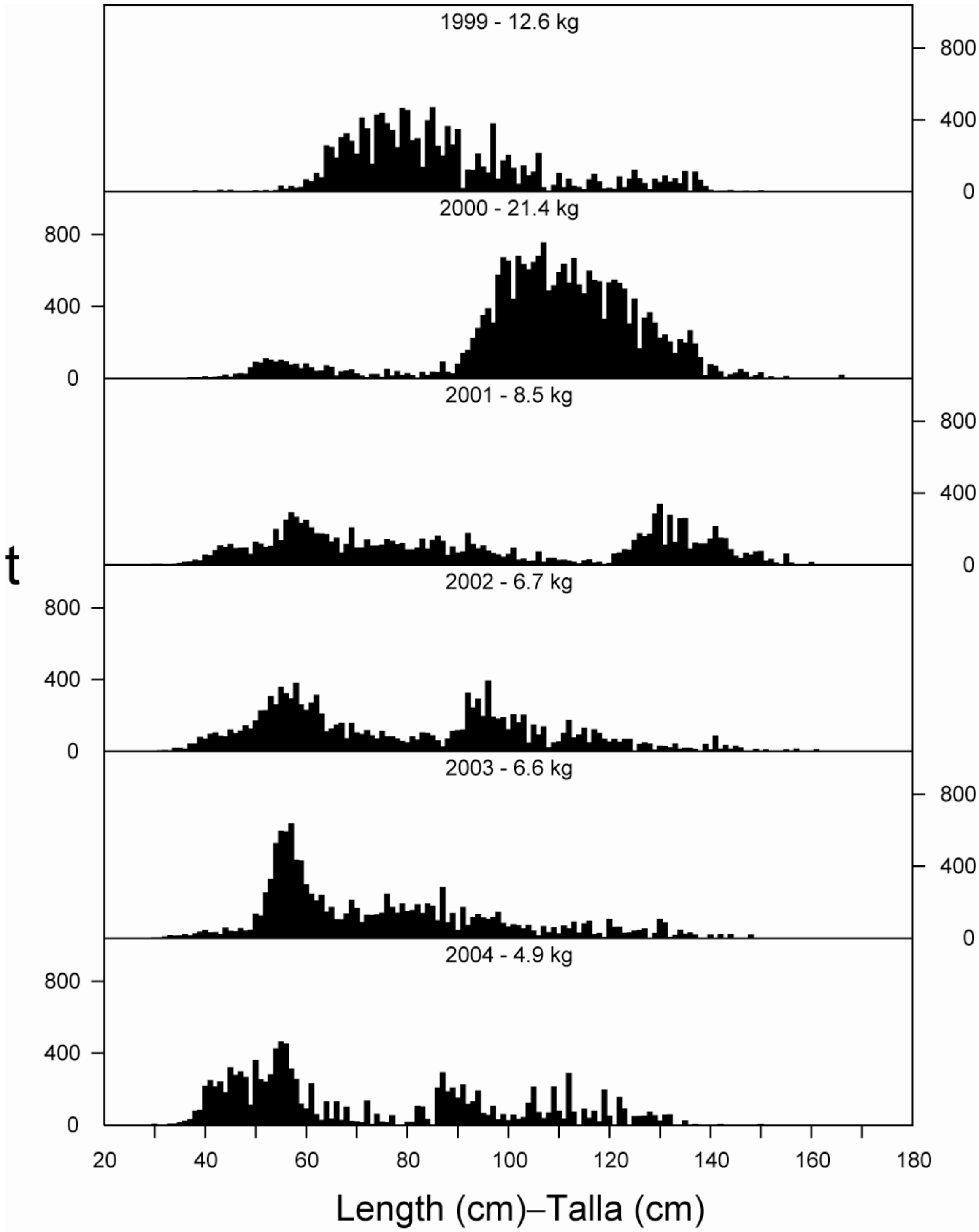

FIGURE 4b. Estimated size compositions of the bigeye caught in the EPO during the third quarter of 1999-2004. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 4b. Composición por tallas estimada para el patudo capturado en el OPO en el tercero trimestre de 1999-2004. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas.

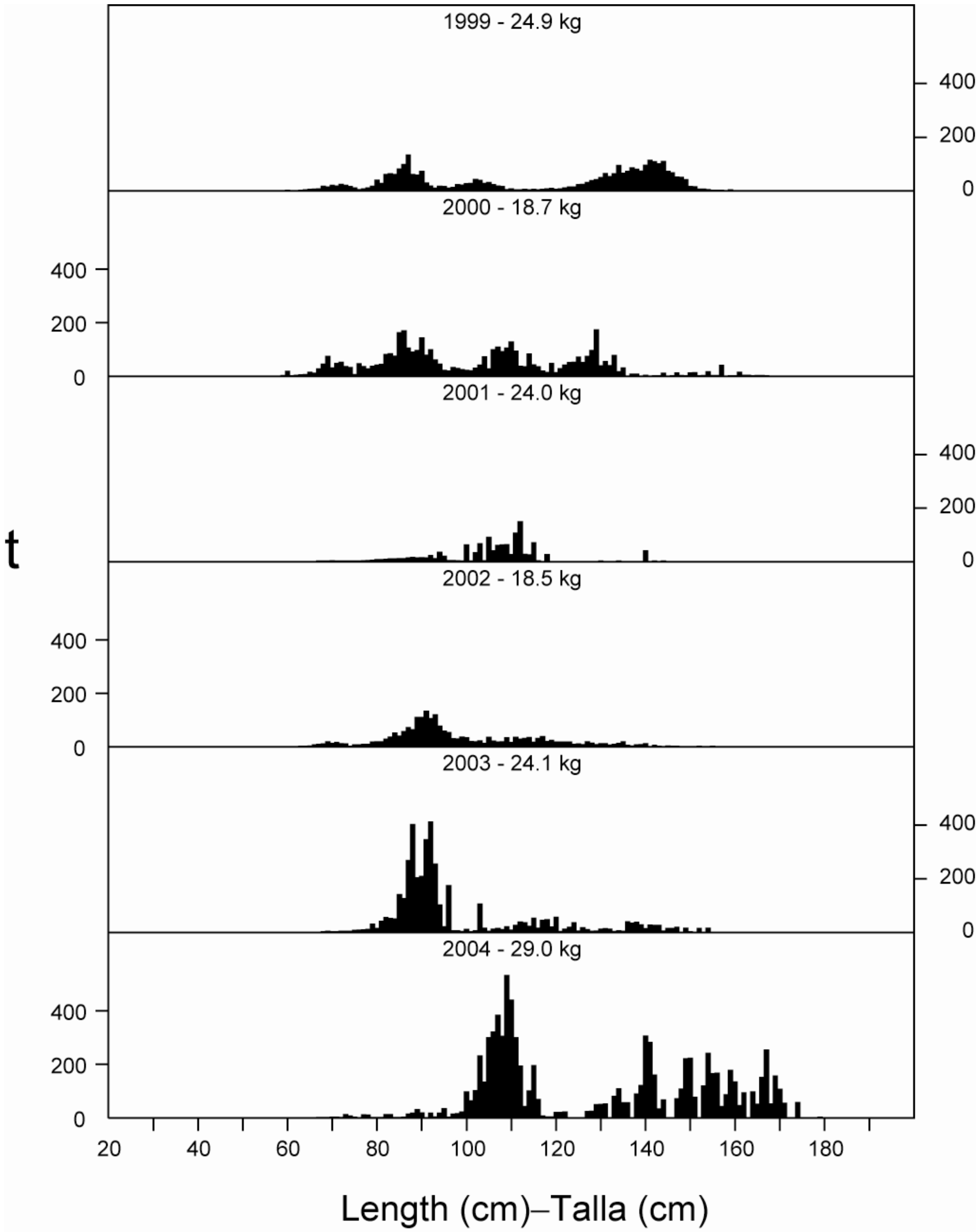

FIGURE 5. Estimated catches of Pacific bluefin by purse-seine and recreational gear in the EPO during 1999-2004. The values at the tops on the panels are average weights. t = metric tons.

FIGURA 5. Captura estimada de aleta azul del Pacífico por buques cerqueros y deportivos en el OPO durante 1999-2004. El valor en cada recuadro reprsenta el peso promedio. t = toneladas métricas.

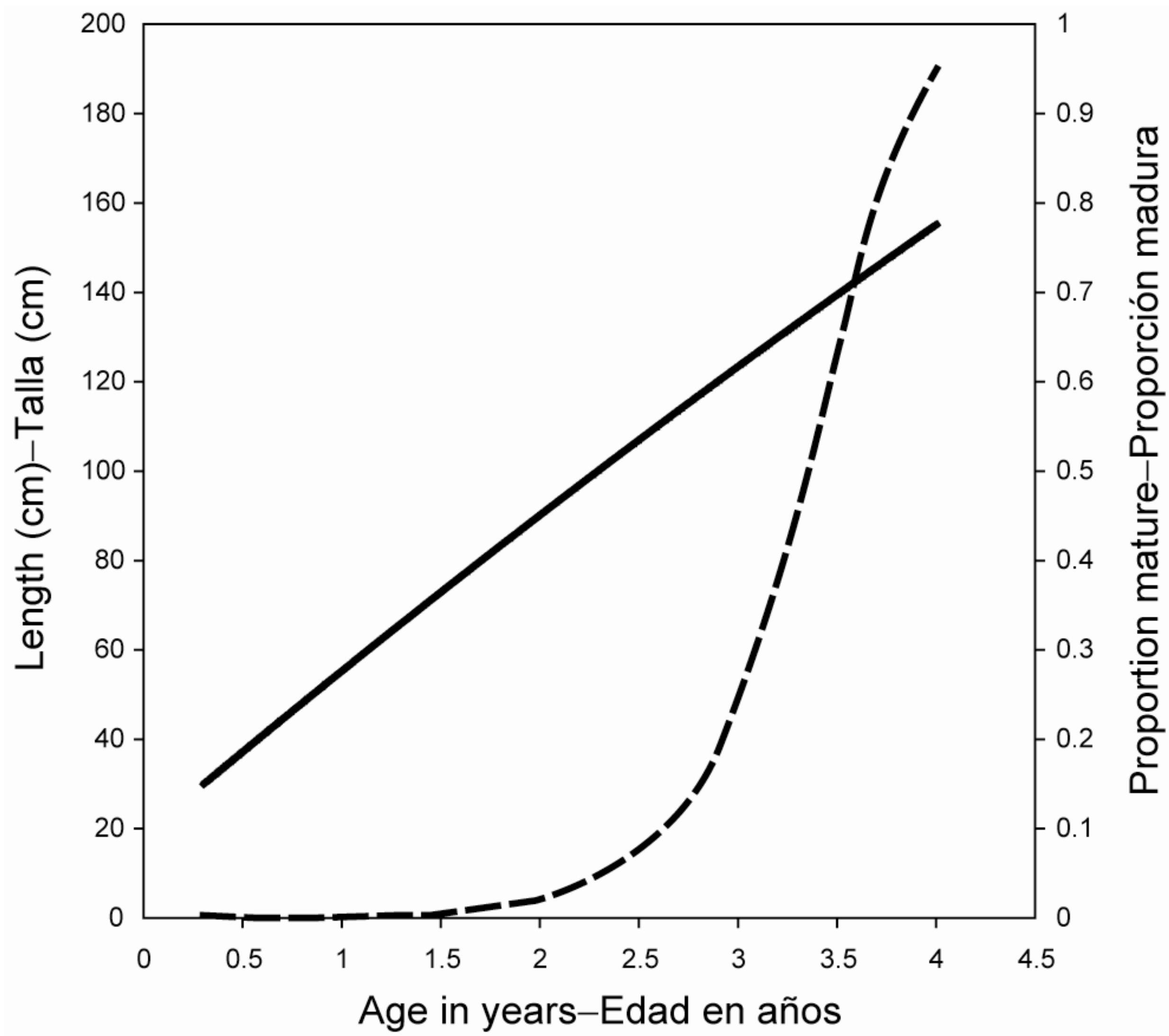

FIGURE 6. Relationships between length and estimated age (solid curve), and proportion of mature females and estimated age (dashed curve), for bigeye tuna.
FIGURA 6. Relaciones entre talla y edad estimada (curva sólida) y proporción de hembras maduras y edad estimada (curva de trazos) del atún patudo.

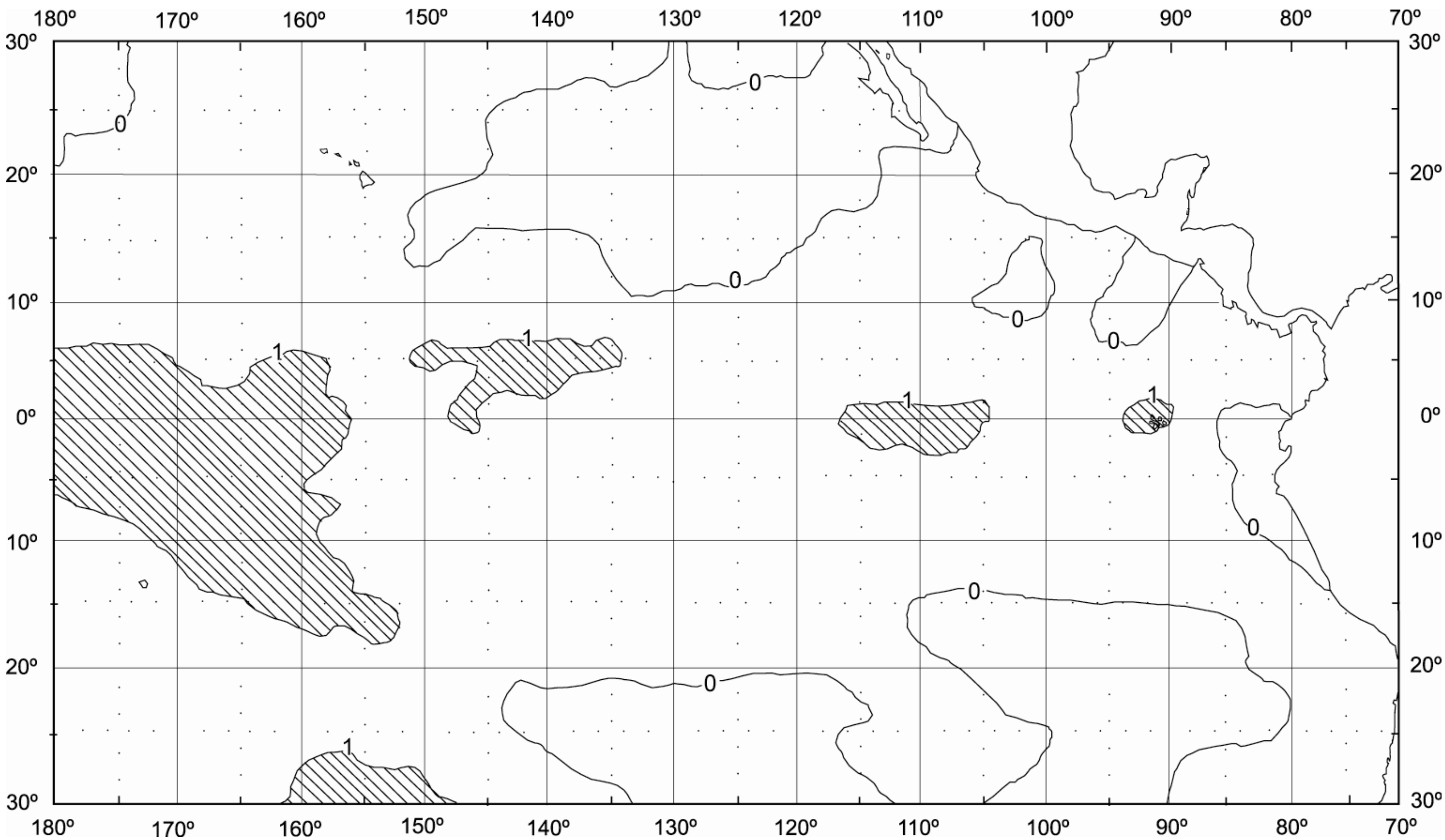

FIGURE 7. Sea-surface temperature (SST) anomalies (departures from long-term normals) for December 2004, based on data from fishing boats and other types of commercial vessels.

FIGURA 7. Anomalías (variaciones de los niveles normales a largo plazo) de la temperatura superficial del mar (TSM) en diciembre de 2004, basadas en datos tomados por barcos pesqueros y otros buques comerciales.

TABLE 1. Preliminary estimates of the numbers and carrying capacities, in cubic meters, of purse seiners and pole-and-line vessels operating in the EPO in 2004 by flag, gear, and size class. 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 de cañero que pescan en el OPO en 2004, y de la capacidad de acarreo de los mismos, en metros cúbicos, por bandera, arte de pesca, y clase de arqueo. 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	Size class—Clase de arqueo							Capacity
	Arte	1	2	3	4	5	6	Total	Capacidad
				Number—Número					
Bolivia	PS	-	-	2	1	-	5	8	6,412
Colombia	PS	-	-	-	1	1	6	8	8,318
Ecuador	PS	-	3	8	12	8	39	70	47,922
España—Spain	PS	-	-	-	-	-	4	4	8,859
Guatemala	PS	-	-	-	-	-	2	2	3,415
Honduras	PS	-	-	-	-	-	3	3	2,810
México	PS	-	-	2	7	11	39	59	52,443
	LP	-	1	2	-	-	-	3	338
Nicaragua							3	3	3,926
Panamá	PS	-	-		2	1	20	23	29,079
Perú	PS	-	-	-	-	-	1	1	996
El Salvador	PS	-	-	-	-	-	3	3	5,377
USA—EE.UU.	PS	-	-	1	-	-	6	7	8,178
Unknown—Desconocida				2				2	360
Venezuela	PS	-	-	-	-	-	23	23	29,874
Vanuatu	PS	-	-	-	-	-	5	5	5,585
All flags—	PS	-	3	13	23	20	153	212	
Todas banderas	LP	-	1	2	-	-	-	3	
	PS + LP	-	4	15	23	20	153	215	
				Capacity—Capacidad					
All flags—	PS	-	301	2,294	6,374	8,941	188,493	206,403	
Todas banderas	PL	-	101	237	-	-	-	338	
	PS + LP	-	402	2,531	6,374	8,941	188,493	206,741	

TABLE 2. Changes in the IATTC fleet list recorded during the fourth quarter of 2004. PS = purse seine; LP = pole-and-line.
TABLA 2. Cambios en la flota observada por la CIAT registrados durante el cuarto trimestre de 2004. 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				
Alessia	Ecuador	PS	399	
Re-entries—Reingresos				
Geminis	Panamá	PS	255	
Changes of name or flag—Cambios de nombre o pabellon				
				Now—Ahora
Cervantes	Panamá	PS	775	*Delia*
Monteneme	El Salvador	PS	908	Ecuador
Vessels removed from fleet—Buques retirados de la flota				
Diana Maria	Ecuador	PS	154	
Jacobita	Ecuador	PS	374	
Killa	Ecuador	PS	412	
Maria	Ecuador	PS	168	
Maria Del Carmen	Ecuador	PS	320	
Roberto M	Ecuador	PS	1,161	
Saturno	Ecuador	PS	106	
Victor Andres	Ecuador	PS	115	
Ana Maria	México	LP	188	
Jose Antonio	México	PS	142	
Juan Pablo II	México	PS	250	
Tlaloc	México	PS	810	
Caribbean Star No 31	Unknown—Desconocida	PS	209	

TABLE 3. Preliminary estimates of the retained catches of tunas in the EPO from January 1 through December 31, 2004, 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 2004, 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	43,891	85,788	19,633	-	7	-	63	4	149,386	28.3
España—Spain	4,125	15,245	3,854	-	-	-	-	-	23,224	4.4
México	86,713	29,722	-	8,973	8	97	418	54	125,985	23.9
Panamá	33,594	19,832	6,846	-	-	-	3	-	60,275	11.4
U.S.A.–EE.UU.	2,823	4,751	2,420	-	-	-	44	3	10,041	1.9
Venezuela	57,091	13,049	1,055	-	-	-	47	1	71,243	13.5
Vanuatú	2,016	7,754	3,095	-	-	-	-	-	12,865	2.4
Other—Otros[2]	49,616	21,838	3,219	-	-	-	11	-	74,684	14.2
Total	279,869	197,979	40,122	8,973	15	97	586	62	527,703	

[1] Includes other tunas, sharks, and miscellaneous fishes
[1] Incluye otros túnidos, tiburones, y peces diversos
[2] Includes Bolivia, Colombia, El Salvador, Guatemala, Honduras, Nicaragua, and unknown; this category is used to avoid revealing the operations of individual vessels or companies.
[2] Incluye Bolivia, Colombia, El Salvador, Guatemala, Honduras, Nicaragua, y desconocida; 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 January 1-September 30, 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					
		1999	**2000**	**2001**	**2002**	**2003**	**2004[2]**
Purse seine—Red de cerco							
North of 5°N	Catch—Captura	101,700	67,000	71,600	94,000	103,700	46,600
Al norte de 5°N	CPDF—CPDP	12.7	12.0	18.5	22.0	18.8	11.2
South of 5°N	Catch—Captura	39,800	61,000	53,400	28,400	28,700	37,900
Al sur de 5°N	CPDF—CPDP	5.1	6.2	7.5	4.3	4.4	7.3
Total	Catch—Captura	141,500	128,000	125,000	122,400	132,400	84,500
	CPDF—CPDP	10.5	9.2	13.8	17.9	15.7	9.4
Annual total Total anual	Catch—Captura	169,300	157,100	149,000	148,900	158,200	
Pole and line—Cañero							
Total	Catch—Captura	1,100	1,500	2,400	400	<100	200
	CPDF—CPDP	2.7	3.8	5.6	1.9	1.4	4.5
Annual total Total anual	Catch—Captura	1,500	2,200	3,300	800	500	

[1] Purse-seiners, Class-6 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 de las Clase 6; 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 January 1-September 30, 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					
		1999	2000	2001	2002	2003	2004[2]
Purse seine—Red de cerco							
North of 5°N	Catch—Captura	34,900	14,600	8,800	7,400	18,900	8,600
Al norte de 5°N	CPDF—CPDP	4.3	2.6	2.3	1.7	3.4	2.1
South of 5°N	Catch—Captura	125,500	103,900	46,600	50,500	63,300	33,900
Al sur de 5°N	CPDF—CPDP	16.0	10.7	6.5	7.6	9.6	6.5
Total	Catch—Captura	160,400	118,500	55,400	57,900	82,200	42,500
	CPDF—CPDP	13.5	9.7	5.9	6.8	8.2	5.6
Annual total Total anual	Catch—Captura	184,700	128,800	71,700	67,700	108,400	
Pole and line—Cañero							
Total	Catch—Captura	1,400	100	100	500	200	200
	CPDF—CPDP	3.6	.3	.3	2.4	4.5	4.5
Annual total Total anual	Catch—Captura	1,700	100	300	500	500	

1 Purse-seiners, Class-6 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 de las Clase 6; 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 January 1-September 30, 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					
	1999	2000	2001	2002	2003	2004[2]
Catch—Captura	38,400	60,200	24,200	17,000	16,600	9,700
CPDF—CPDP	3.5	5.7	3.2	2.3	2.1	1.7
Total annual catch—Captura total anual	43,100	64,500	31,500	21,000	23,500	

1 Class-6 vessels only. The catch values are rounded to the nearest 100, and the CPDF values to the nearest 0.1.
1 Buques de las Clase 6 solamente. 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 2004 by longline vessels.
TABLA 7. Captures de atún patudo en el Océano Pacífico oriental durante 2004 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	501	63	175	739	-	-	-	-	739
European Union—Unión Europea	4	-	-	4	-	-	-	-	4
Japan—Japón	5,696	4,043	4,325	14,064	1,444	1,435	1,419	4,298	18,362
Republic of Korea—República de Corea	2,802	3,042	2,111	7,955	831	917	1,025	2,773	10,728
Chinese Taipei—Taipei Chino	2,910	2,025	659	5,594	-	-	-	-	5,594
Vanuatu	350	81	-	431	-	-	-	-	431
Total	12,263	9,254	7,270	28,787	2,275	2,352	2,444	7,071	35,858

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 fourth quarter of 2004. 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 cuarto trimestre de 2004. 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			
Bolivia	5	(30)	5	(30)					5	(30)	100.0	(100.0)
Colombia	4	(29)	4	(29)					4	(29)	100.0	(100.0)
Ecuador	68	(254)	48	(168)	20	(86)			68	(254)	100.0	(100.0)
España—Spain	4	(22)	2	(13)	2	(9)			4	(22)	100.0	(100.0)
Guatemala	1	(3)	1	(3)					1	(3)	100.0	(100.0)
Honduras	4	(16)	4	(16)					4	(16)	100.0	(100.0)
Mexico	27	(218)	14	(114)	13	(104)			27	(218)	100.0	(100.0)
Nicaragua	2	(8)	2	(8)					2	(8)	100.0	(100.0)
Panamá	10	(88)	10	(88)					10	(88)	100.0	(100.0)
El Salvador	5	(20)	5	(20)					5	(20)	100.0	(100.0)
U.S.A.—EE.UU.	1	(17)	1	(15)			0	(2)	1	(17)	100.0	(100.0)
Venezuela	14	(107)	9	(57)	5	(50)			14	(107)	100.0	(100.0)
Vanuatu	3	(21)	3	(21)					3	(21)	100.0	(100.0)
Total	148	(833)[1]	108	(582)	40	(249)	0	(2)	148	(833)[1]	100.0	(100.0)

[1] Includes 74 trips (52 by vessels with observers from the IATTC program and 22 by vessels with observers from the national programs) that began in late 2003 and ended in 2004

[1] Incluye 74 viajes (52 por observadores del programa del CIAT y 22 por observadores de los programas nacionales) iniciados a fines de 2003 y completados en 2004

TABLE 9. Oceanographic and meteorological data for the Pacific Ocean, July-December 2004. The values in parentheses are anomalies.
TABLA 9. Datos oceanográficos y meteorológicos del Océano Pacífico, Julio-Diciembre 2004. Los valores en paréntesis son anomalías.

Month—Mes	**7**	**8**	**9**	**10**	**11**	**12**
SST—TSM, 0°-10°S, 80°-90°W (°C)	20.7 (-1.1)	19.6 (-1.2)	20.1 (-0.4)	20.9 (0.0)	22.0 (0.3)	22.9 (0.1)
SST—TSM, 5°N-5°S, 90°-150°W (°C)	25.4 (-0.2))	25.1 (0.1)	25.2 (0.3)	25.3 (0.4)	25.5 (0.5)	25.8 (0.7)
SST—TSM, 5°N-5°S, 120°-170°W (°C)	27.7 (0.6)	27.5 (0.8)	27.5 (0.8)	27.4 (0.8)	27.3 (0.8)	27.3 (0.9)
SST—TSM, 5°N-5°S, 150W°-160°E (°C)	29.4 (0.8)	29.3 (0.9)	29.5 (1.1)	29.6 (0.8)	29.6 (1.2)	29.4 (1.1)
Thermocline depth—Profundidad de la termoclina, 0°, 80°W (m)	50	40	40	45	45	40
Thermocline depth—Profundidad de la termoclina, 0°, 110°W (m)	40	70	80	100	80	110
Thermocline depth—Profundidad de la termoclina, 0°, 150°W (m)	130	130	160	160	180	170
Thermocline depth—Profundidad de la termoclina, 0°, 180°W (m)	170	170	160	180	180	180
Sea level—Nivel del mar, Callao, Perú (cm)	108.4 (-1.7)	110.9 (3.3)	105.8 (-0.8)	112.4 (6.8)	109.3 (2.4)	111.8 (3.2)
Sea level—Nivel del mar, Baltra, Ecuador (cm)	-	185.0 (7.3)	183.5 (6.2)	190.9 (13.7)	185.8 (6.9)	190.8 (11.0)
SOI—IOS	-0.7	-0.8	-0.4	-0.3	-0.9	-1.1
SOI*—IOS*	0.51	1.75	-0.60	2.92	-0.92	0.38
NOI*—ION*	-1.06	-0.77	0.67	-2.11	4.44	0.04