INTER-AMERICAN TROPICAL TUNA COMMMISSION
COMISION INTERAMERICANA DEL ATUN TROPICAL
QUARTERLY REPORT—INFORME TRIMESTRAL

October-December 2001
Octubre-Diciembre 2001

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The

QUARTERLY REPORT

October-December 2001

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.

The Quarterly Reports are sent to the Commissioners, their industry advisors, and a few organizations and individuals with needs for current knowledge of the tuna fishery.

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.

Los Informes Trimestrales son enviados a los Comisionados, a los asesores de la industria, y a algunas organizaciones y personas que necesitan estar al corriente de los acontecimientos de la pesca atunera.

Editor—Redactor:
William H. Bayliff

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 and in La Jolla collected 197 length-frequency samples and abstracted the logbook information for 198 trips of fishing vessels during the fourth quarter of 2001.

Also, during the fourth quarter members of the field office staffs placed IATTC observers on 94 fishing trips by vessels that participate in the on-board observer program. In addition, 102 IATTC observers completed trips during the quarter, and were debriefed at the corresponding field offices.

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

Statistical data from the Commission's field offices are continuously being collected and processed. 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 a 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 a vessel's return from a fishing trip. In this report, therefore, the catch-per-unit-of-effort statistics include only the January 1-September 30 period (hereafter called the report period).

Fleet statistics

The estimated total carrying capacity of the vessels that had fished in the eastern Pacific Ocean (east of 150°W; EPO) during 2001 is about 199,000 cubic meters (m^3) (Table 1). The weekly average at-sea capacity for the fleet, for the weekly periods ending October 8 through December 31, was about 107,000 m^3 (range: 83,100 to 136,000 m^3). The changes of flag and additions to and deletions from the IATTC's fleet list for the period of October 2-December 31 are given in Table 2.

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

Catch statistics

The total catches of tunas in the EPO during 2001 are estimated to have been about 391,100 metric tons (mt) of yellowfin, 141,300 mt of skipjack, 42,000 mt of bigeye, and 900 mt of bluefin. The annual averages and ranges for 1996-2000 are as follows: yellowfin, 266,300 mt (250,700 to 289,900 mt); skipjack, 174,100 mt (105,900 to 263,400 mt); bigeye, 46,900 mt (31,600 to 69,800 mt); bluefin, 3,300 (1,100 to 6,900 mt). During 2001 the average estimated weekly catches of yellowfin, skipjack, and bigeye in the EPO were about 7,500, 2,700, and 800 mt, respectively. Summaries of the estimated 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 fish-

ing 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 carrying capacities greater than 363 mt), and only data for Class-6 purse seiners are included herein for comparisons among years. There are now far fewer baitboats than in previous years, so the baitboat data 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.

The catch per day of fishing (CPDF) for yellowfin in the Commission's Yellowfin Regulatory Area (CYRA) by purse seiners during the 2001 report period is estimated to have been about 16.2 mt, which is much greater than the range of rates observed during the 1996-2000 report periods (9.2 to 12.6 mt) (Table 4). The CPDF of yellowfin in the CYRA by baitboats during the 2001 report period is estimated to have been about 4.9 mt, which is considerably higher than the range of rates observed during the 1996-2000 report periods (range: 1.5 to 3.5 mt) (Table 4).

During the 1996-2000 report periods the CPDF of yellowfin by purse seiners north of 5°N ranged from about 13.4 to 16.4 mt, averaging about 14.6 mt, whereas south of 5°N it ranged from about 4.7 to 7.1 mt, averaging about 5.7 mt. Preliminary estimates for 2001 show the CPDFs of yellowfin north and south of 5°N to have been about 23.5 and 11.6 mt, respectively.

The CPDF of skipjack in the EPO by purse seiners during the 2001 report period is estimated to have been about 5.4 mt, which falls within the range of rates observed during the 1996-2000 report periods (3.9 to 10.6 mt) (Table 5). The CPDF of skipjack in the EPO by baitboats during the 2001 report period is estimated to have been 0.2 mt, which is within the range of rates observed during the 1996-2000 report periods (range: 0.2 to 2.2 mt) (Table 5).

In general, the greatest catches of skipjack are taken in waters south of 5°N. During the 1996-2000 report periods the CPDF of skipjack by purse seiners south of 5°N averaged about 10.1 mt (range: about 6.5 to 19.4 mt), whereas north of 5°N it averaged about 2.7 mt (range: about 1.7 to 3.7 mt). Preliminary estimates for 2001 show the CPDFs of skipjack south and north of 5°N to have been about 7.1 and 2.4 mt, respectively.

The CPDF of bigeye in the EPO by purse seiners during the 2001 report period is estimated to have been about 2.0 mt, which falls within the range of the values for the 1996-2000 report periods (0.9 to 2.7 mt) (Table 6).

Collection of data for longline and artisanal vessels

Since its inception the IATTC staff has maintained detailed records, including names, registrations, carrying capacities, *etc*., of the purse seiners and baitboats that have fished for tunas in the EPO. More recently, it has kept such records for larger longline vessels registered in nations contiguous to the EPO. Such records have not been kept for longliners registered in Far East nations, however, nor for artisanal or recreational fishing vessels. Artisanal vessels include small vessels that fish with longlines, handlines, gill nets, and trolling gear. (Substantial numbers of trollers fished for tropical tunas in the EPO from the mid-1960s to the mid-1980s (IATTC Annual Report for 1998: Table 1), but this fishery no longer exists.) Catch data for the larger longliners, regardless of where they are based, trollers, and U.S.-based recreational fishing vessels have been obtained from various sources and entered into the IATTC's data bases.

The information for the longline and artisanal vessels operating in the EPO should be improved, so the IATTC staff is collecting more detailed information on these vessels. The ultimate goal is to obtain catch and landings data, by species, for these vessels. Since fish may be landed in one port and then transshipped to another, it is necessary to have detailed data to avoid errors, such as counting fish more than once.

Twenty countries have been identified as having longline vessels operating in the EPO or having landed longline-caught fish in ports adjacent to the EPO. The IATTC staff is developing a data base for these vessels, and it is anticipated that data for them will be added to the regional vessel register when more information is available.

Future work will probably include collection of more detailed data on vessel characteristics and coordination of collection of catch data from the countries in which these vessels unload. It would also be desirable to place logbooks aboard the vessels and to establish a design for sampling the species and size compositions of the fish in the landings.

Size compositions of the surface catches of tunas

The methods for sampling the catches of tunas have been changed, beginning on January 1, 2000, as described in the IATTC Quarterly Report for April-June 2000. Briefly, the fish in a well of a purse seiner or baitboat 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), based on the staff's most recent stock assessments.

Data for fish caught during the third quarter of 2001 are presented in this report. Two length-frequency histograms are presented for each species. For yellowfin, skipjack, and bigeye the first shows the data by stratum (area, gear type, and set type) for the third quarter. The second, which is similar to those of previous years, shows the third-quarter catch for the current year and the previous five years. For bluefin, the first and second histograms show the 1996-2001 catches by commercial and recreational gear, respectively.

There are ten surface fisheries for yellowfin defined for stock assessments: four floating-object, two unassociated school, three dolphin, and one baitboat (Figure 1). Of the 317 wells sampled, 208 contained yellowfin. The estimated size compositions of these fish are shown in Figure 2a. The majority of the yellowfin catch during the third quarter was taken in dolphin sets in the north and inshore areas. Smaller amounts of fish were caught in unassociated sets than during the previous two quarters. Small amounts of yellowfin were taken in dolphin sets in the south and by baitboats, but the estimated catches were too small to show well in the graph.

The estimated size compositions of the yellowfin caught by all fisheries combined during the third quarter of 1996-2001 are shown in Figure 2b. The size ranges of yellowfin are generally consistent over time (40-160 cm), but the size distributions differ among quarters and among years. There was a conspicuous mode between 85 and 115 cm during the third quarter of 2001.

There are eight fisheries for skipjack defined for stock assessments: four floating-object, two unassociated school, one dolphin, and one baitboat (Figure 1). The last two fisheries include all 13 sampling areas. Of the 317 wells sampled, 124 contained skipjack. The estimated size compositions of these fish are shown in Figure 3a. As was the case during the first two quarters

of 2001, the majority of the fish was taken in sets on floating objects. However, unlike the situation for the first two quarters, more fish were caught in the northern areas than in the southern areas during the third quarter. The estimated catches of skipjack taken in dolphin sets and by baitboats were too small to show in the graphs.

The estimated size compositions of the skipjack caught by all fisheries combined during the third quarter of 1996-2001 are shown in Figure 3b. The distribution of the skipjack catches remained relatively flat during the third quarter, as was the case during the first half of 2001.

There are seven surface fisheries for bigeye defined for stock assessments: four floating-object, one unassociated school, one dolphin, and one baitboat (Figure 1). The last three fisheries include all 13 sampling areas. Of the 317 wells sampled, 59 contained bigeye. The estimated size compositions of these fish are shown in Figure 4a. During the third quarter of 2001 the amounts of bigeye caught in the northern floating-object fishery were greater than during the first half of the year. The catches remained fairly high in the southern floating-object fishery. A small amount of bigeye was caught in sets on unassociated schools. There were no recorded catches of bigeye in dolphin sets or by baitboats.

The estimated size compositions of the bigeye caught by all fisheries combined during the third quarter of 1996-2001 are shown in Figure 4b. The average size of bigeye caught during the third quarter of 2001 was considerably less than those of the previous two quarters and all four quarters of 2000, when the average sizes were relatively high.

Pacific bluefin are caught near the surface off California and Baja California from about 23°N to 35°N by both commercial and sport-fishing vessels. Most of the catch is taken during May through October. During 2001 bluefin were caught between 25°N and 37°N. The catch of bluefin by commercial vessels was less in 2001 than during any of the previous five years, and all of the recorded catch was taken during July and August. Most of the catches by sport-fishing vessels were taken during June through September, but smaller amounts were taken during March and May. Histograms showing the estimated length compositions of the commercial and sport catches of bluefin during each year of the 1996-2001 period appear in Figures 5a and 5b, respectively. Distinct modal groups are evident in most of the years for both the commercial and sport catches.

Observer program

Data collection

The design for placement of observers during 2001 called for 100-percent coverage of fishing trips in the eastern Pacific Ocean (EPO) by Class-6 purse seiners (over 363 metric tons carrying capacity). Mexico's national observer program, the Programa Nacional de Aprovechamiento del Atún y de Protección de Delfines (PNAAPD), and Venezuela's national observer program, the Programa Nacional de Observadores de Venezuela (PNOV), were to sample half of the trips by vessels of their respective fleets, while IATTC observers were to sample the other half of those trips. Ecuador's national observer program, the Programa Nacional de Observadores Pesqueros de Ecuador (PROBECUADOR) had been sampling approximately one quarter of the trips by vessels of its fleet this year, but increased its sampling during the quarter to approximately one third of those trips. IATTC observers were to sample the remainder of those trips. The IATTC was to sample all trips of Class-6 vessels registered in other nations that fish for tunas in the EPO. However, not all of those trips were sampled by the IATTC. Eleven trips by Bolivian-flag vessels were not sampled, ten of them before the Bolivian fleet began to partici-

pate in the observer program, and one after that. Also, one trip by a vessel that was registered in both Vanuatu and Bolivia was not sampled before Bolivia was participating in the program. Two trips by a vessel with unknown registration were not sampled during the fourth quarter, despite the fact that its management was notified of the observer requirement. The IATTC had recently changed the size classification of that vessel from Class 5 to Class 6.

IATTC, PNAAPD, PNOV, and PROBECUADOR observers departed on 137 fishing trips aboard Class-6 purse seiners during the fourth quarter of 2001. Preliminary coverage data for these vessels during the quarter are shown in Table 7. (This table is based on information available at the end of the quarter, and is not necessarily in agreement with equivalent tables for previous quarters, nor will it necessarily be in agreement with equivalent tables for future quarters.)

Training

The IATTC and PROBECUADOR conducted a joint observer training course in Manta, Ecuador, during the quarter. There were18 IATTC trainees, 12 from Ecuador and 6 from Venezuela, and 5 trainees from PROBECUADOR.

RESEARCH

Age and growth of bigeye tuna

Little is known about the age and growth of bigeye in the eastern Pacific Ocean (EPO). Accurate information on the age and growth is necessary for understanding the biology and population dynamics of this species. Size-at-age data permit the formulation of growth estimates, and make it feasible to incorporate age-specific characteristics, such as mortality and fecundity, into population dynamics models.

Most recent ageing studies of marine fishes have utilized natural marks in calcified structures as time indicators. The age of the fish can be accurately estimated from these structures, provided the deposition rate of the marks is known. Both sagittal otoliths and caudal vertebrae have been utilized for age determinations for several species of the genus *Thunnus*. Counts of microincrements on the surfaces of the otoliths of the fish from the tagging and oxytetracycline (OTC)-marking experiment initiated off Hawaii in 1995 demonstrated that bigeye in the size range of about 38 to 117 cm deposit the increments at daily intervals (IATTC Quarterly Report for April-June 1999). Otoliths have recently been recovered from 13 bigeye, ranging in length from 104 to 135 cm, which were tagged and injected with OTC in the equatorial EPO during March-May 2000. The initial results, based on counts of microincrements from the OTC mark to the tip of the postrostrum, also indicate that the microincrements are deposited on the surfaces of the otoliths at daily intervals.

Counting microincrements on the surfaces of otoliths is extremely time-consuming and difficult (IATTC Bulletin, Vol 18, No. 6), so the technique of sectioning the otoliths is now being investigated, using the complete set of recovered OTC-marked otoliths from Hawaii and the EPO. Frontal sections, along the primordium to the post-rostral axis of the otoliths, appear to provide an optimal counting path for bigeye otoliths. This is the longest path, so it provides wider increments than transverse sections, which maximizes the opportunity for resolving daily microincrements up to some maximum age. Sectioning, polishing, and acid-etching techniques have been established, and the OTC marks and microincrements are clearly recognizable in all

preparations to date. Validation of this ageing technique will probably be completed in early 2002.

A program to sample otoliths, caudal vertebra, and gonads of bigeye, and lengths and weights of the fish, was initiated in January 2001 at the IATTC field offices in Las Playas and Manta, Ecuador. Fish of 12 10-cm length classes between 30 and 150 cm are being sampled. Fifteen females and fifteen males will be selected for each length class, making a total of 360 specimens. As of the end of December 2001, 299 specimens had been sampled, and it is expected that the full complement of samples will have been collected by early 2002. The otoliths and vertebrae will be utilized to provide direct estimates of sex-specific age and growth of bigeye from the fishery in the EPO.

Reproductive biology of bigeye tuna

Little is known about the size and age at sexual maturity, spawning distribution, and fecundity of bigeye tuna in the eastern Pacific Ocean (EPO). A 2-year program to sample gonads of bigeye, carried out by IATTC observers aboard purse-seine vessels fishing in the EPO, was initiated in January 2000. Personnel of the National Research Institute of Far Seas Fisheries of Japan concurrently sampled gonads of bigeye caught in the EPO by longline vessels. The objective of this collaborative project is to obtain a comprehensive understanding of the reproductive biology of bigeye in the EPO, which is necessary for stock assessment.

As of the end of 2001, samples had been taken on 20 purse-seine trips, producing 838 females with ovarian tissues suitable for histological processing and examination. Those tissue samples were processed at the Achotines Laboratory, and microscope slides of them were prepared by a company in San Diego. These slides will be examined to identify the stages of oogenesis, providing an accurate assessment of the reproductive status of each fish. Ovaries are also being selected to use to estimate the fecundity of the fish.

The sampling program has not yet provided a sufficient number of samples, particularly from fish greater than 120 cm in length, for conducting a proper evaluation of the reproductive characteristics of bigeye in the equatorial EPO. The sampling program will be continued for an additional 2 years in order to attempt to obtain the required samples.

Tuna tagging

Tropical tunas

Phase 1 of a proposed multi-year bigeye tuna-tagging project was initiated during March-May 2000 on the chartered baitboat *Her Grace*. The following is a brief update on the project, including preliminary results based on recoveries of both conventional and archival tags.

The numbers of returns, as of the end of December 2001, are as follows:

Species	Tag type	Released	Returned	Percent returned
Bigeye	conventional	101	22	21.8
Bigeye	archival	96	29	30.2
Skipjack	conventional	1,238	260	21.0
Yellowfin	conventional	71	8	11.3

The greatest times at liberty for bigeye and skipjack are 446 and 224 days, respectively, and the greatest displacements of these from their release to their recapture positions are 1,499 and 2,167 nautical miles, respectively.

All but one of the 29 archival tags applied to bigeye that were recaptured have been recovered. The times at liberty, from release to recapture, ranged from 8 to 446 days. Of the 28 archival tags that were recovered, 23 were on fish that were at liberty less than 30 days. Various spatial statistics, based on filtered estimates of the locations derived from the archival tag light level data, have been obtained from these 23 fish. Static and dynamic plots of the movement paths for each of these fish have been produced, and the total distances traveled, velocities, and utilization distributions have been estimated from those movement paths.

Evaluations of the timed depth records for the bigeye from the archival tag data have made it possible to discriminate four distinct behavior types: unassociated Type 1 (diel vertical migrations), unassociated Type 2 (no diel vertical migrations), associated with floating objects, and deep-diving. The proportions of time each fish had allocated to each of these behavior types throughout its time at liberty, including residence times at fish-aggregating devices, were calculated.

The habitat selection of bigeye has been evaluated by time of day, season, and thermal structure of their habitat. When bigeye are exhibiting unassociated Type-1 behavior they are mostly at depths of less than 50 m and at temperatures of more than 20°C (within the mixed layer) throughout the night, and during the day between 200 and 300 m and 13° and 14°C. This behavior is most likely an adaptation for tracking their prey, which consists primarily of vertically-migrating mesopelagic squids and fishes. The light levels are similar at those depths during the night and day.

Plans are being formulated for the charter of a baitboat for tagging bigeye with conventional and archival tags in the equatorial EPO during March-May 2002 to provide further information on their movements, growth, mortality, behavior, and habitat selection.

Bluefin tuna

Scientists from the Monterey Bay Aquarium tagged 85 bluefin with IATTC dart tags off northern Baja California on July 15-24, 2001. Returns from five of these fish were received during 2001, two from fish recaptured off northern Baja California by recreational fishermen during August and three from fish recaptured north of Point Conception, California, by purse seiners during October.

Early life history studies

Drs. Richard B. Deriso and Daniel Margulies and Mr. Vernon P. Scholey met with representatives of the University of Miami's Center for Sustainable Fisheries and Graduate Aquaculture Program on November 28-29, 2001, in Miami, Florida, USA. On November 29, 2001, a Memorandum of Understanding pertaining to a joint research program at the Achotines Laboratory was signed.

Yellowfin broodstock

The yellowfin broodstock in Tank 1 (1,362,000 L) at the Achotines Laboratory spawned daily during October through December. The water temperatures in the tank ranged from 27.4° to 28.6°C during the quarter. The numbers of eggs collected after each spawning event ranged

from about 53,000 to 1,909,000. Spawning occurred as early as 4:25 p.m. and as late as 5:15 p.m.

Eleven yellowfin, ranging in weight from 6 to 22 kg, were placed in Tank 1 during October to supplement the 10 fish that were there at the beginning of the month. During the quarter one 7-kg fish died after striking the tank wall and one 58-kg fish that had been in captivity for approximately 4 years died of starvation.

At the end of December there were four size groups of fish in Tank 1: one 60-kg fish, eight 35- to 43-kg fish, one 22-kg fish, and nine 9- to 13-kg fish.

During the quarter the reserve broodstock Tanks 2 and 6 (170,000 L each) were restocked with yellowfin for continuing archival tag studies (IATTC Quarterly Report for January-March, 2001). There were seven fish (4 to 8 kg) in Tank 2 and 14 fish (3 to 7 kg) in Tank 6 at the end of December. Experiments are being conducted to investigate whether feeding and spawning events of yellowfin can be detected by evaluating data on the peritoneal cavity temperatures recorded by the archival tags. Two of the three remaining fish from the first experiment were sacrificed, and the third was transferred to Tank 1.

Rearing of yellowfin eggs, larvae, and juveniles

During the quarter the following parameters were recorded for each spawning event: time 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 larvae and cultured food organisms

From October through December studies were conducted to compare the effects of antibiotics and probiotics on rotifer cultures and on the survival of yellowfin larvae. Cultured rotifers are used in most of the laboratory experiments on yellowfin larvae during the first week of feeding, so it is essential to produce as many viable and nutritionally-rich rotifers as possible to provide adequate food levels for the larvae during the experiments. However, rotifer cultures are characterized by an abundant and complex bacterial flora. By treating rotifers and larvae with either antibiotics or probiotics (typically Gram-positive bacteria) it was anticipated that the occurrence of pathogenic, Gram-negative bacteria would be reduced, enhancing production of rotifers and promoting better survival of reared yellowfin larvae. The trials were conducted by Mr. Patrick Tracy, a graduate student at the University of Miami's Rosenstiel School of Marine and Atmospheric Science, working in collaboration with IATTC scientists and members of the staff of the laboratory.

A series of trials with batch cultures of rotifers included (1) administration of a probiotic solution to the microalgae (*Nannochloropsis oculata*) mass cultures that were used to feed the rotifers, (2) administration of an oxytetracycline solution to the rotifers during enrichment, or (3) no treatment (for control batches of rotifers). All batch cultures of rotifers were fed microalgae and enriched with DHA protein Selco after harvesting. Preliminary observations indicate that the probiotic treatment may enhance rotifer production, but further trials are needed.

Several trials were conducted to examine the effect of probiotic and antibiotic treatments on the hatching rate of yellowfin eggs. For comparison, replicate incubation tanks with no treatment were used as controls, and the other replicate tanks were treated with a solution of

oxytetracycline or probiotic bacteria. The results from these trials indicate that the hatching rates were similar for the two treatments and for the controls.

Three experiments were also conducted to examine the effect of probiotic and antibiotic treatments on the survival of yellowfin larvae after the first eight days of feeding. For each experiment, approximately 15 to 20 yolk-sac larvae per liter were stocked into each of six 714-L tanks. Yolk-sac larvae that hatched from eggs treated with the solution of probiotic bacteria were used to stock two replicate tanks. The larvae were treated with a similar solution of probiotic bacteria upon stocking, at first feeding, and again at 3-day intervals. The larvae were fed enriched rotifers that had been feeding on probiotic-treated microalgae. Probiotic-treated microalgae were also added to the two tanks to condition the culture water and to serve as a food source for the rotifers. Yolk-sac larvae that hatched from eggs treated with the solution of oxytetracycline were stocked into two other replicate tanks. The larvae were treated with a similar solution of oxytetracycline upon stocking, at first feeding, and then at 3 day-intervals. The larvae were fed enriched and oxytetracycline-treated rotifers. Two other replicate tanks, which served as controls, were stocked with yolk-sac larvae hatched from untreated eggs. The larvae in these tanks were not treated, and were fed only enriched and un-treated rotifers. Untreated microalgae were also added to the oxytetracycline-treated and control tanks. Preliminary results from these experiments indicated that, in most trials, both probiotics and antibiotics appeared to improve larval survival. However, the results were inconclusive and more trials will be conducted during the first quarter of 2002.

Studies of snappers and corvina

The work on snappers and corvina is carried out by the Dirección General de Recursos Marinos de Panamá.

The spotted rose snapper (*Lutjanus guttatus*) broodstock, which began to spawn at the end of May 2000, continued to spawn about three times per week during the fourth quarter. Another group of 40 fish, hatched in captivity in October 1998, is being held in two 12,000-L tanks. On average, these fish were about 46 cm long and weighed about 1.4 kg at the end of the quarter.

One group of 9 juvenile polla drum (*Umbrina xanti*), hatched in captivity in July 1999, is being held in a 12,000-L tank. The fungal infection that reduced the number of fish from 125 to 12 during the third quarter killed 3 more fish during the fourth quarter. The remaining fish are about 25 cm long and weigh about 170 g, on average. These fish will be used as broodstock.

Visitors

Mr. Patrick Tracy, a graduate student at the University of Miami's Rosenstiel School of Marine and Atmospheric Science, arrived for an internship at the Achotines Laboratory on October 22, 2001. During October through December he worked with IATTC scientists and members of the staff of the laboratory on intensive rotifer production and the application of commercial aquaculture techniques to rearing studies of yellowfin tuna larvae.

Scientists and technicians of the Native Species Reforestation Project (Proyecto de Reforestación con Especies Nativas—PRORENA) spent the first week of October surveying study plots in the dry forest and former pastureland surrounding the Achotines Laboratory. PRORENA is a long-term research project focusing on the use of native species of trees for reforestation of degraded lands in Panama.

The Director of the Instituto Costarricense de Pesca y Acuicultura (INCOPESCA), Commissioner Herbert Nanne, accompanied by nine other functionaries and friends, visited the Achotines Laboratory on November 16-17, 2001.

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 eastern tropical Pacific (ETP). 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. Each of the four El Niño events during the 1969-1983 period was followed by better-than-average recruitment of yellowfin in the eastern Pacific Ocean two years later (Japan. Soc. Fish. Ocean., Bull., 53 (1): 77-80), and IATTC staff members are currently studying data for more recent years to see if this relationship has persisted and to see if it applies to skipjack and/or bigeye.

Two new indices, the SOI* and the NOI*, have recently been devised. These are described in the IATTC Quarterly Report for January-March 2001. The SOI* and NOI* values are both negative during El Niño events and positive during anti-El Niño events.

It was reported in the IATTC Quarterly Report for July-September 2001 that during September there was an area of SSTs 1° to 2°C below normal off Peru and Ecuador that extended westward along the equator to about 130°W. This area of cool water persisted during the fourth quarter of 2001. In addition, two more areas of cool water appeared during December, one centered at about 25°S-85°W and the other at about 25°S-160°W (Figure 6). The data in Table 8, for the most part, indicate that conditions were near normal during most of the July-December period, although during November the SOI* value was rather high and the NOI* value was rather low. Not surprisingly, in view of the fact that the SSTs were below normal off Ecuador and Peru, the sea levels were mostly below normal at Baltra, La Libertad, and Callao. According to the Climate Diagnostics Bulletin of the U.S. National Weather Service for December 2001, there are indications that an El Niño episode may be developing. "Since June 2001 [the SSTs] have become anomalously warm in the central equatorial Pacific, with anomalies near +1°C at the date line by the end of December." Also, "a substantial increase in subsurface temperature anomalies was observed in the central and west-central equatorial Pacific during December. … It seems most likely that warm episode conditions will develop in the tropical Pacific over the next 3-6 months."

Dolphins

Research cruise

Scientists from the IATTC's Dolphin-Tuna Program participated in a research cruise conducted by the U.S. National Marine Fisheries Service (NMFS) in the eastern Pacific Ocean (EPO) from August 8 to October 4, 2001. The work was conducted aboard the U.S. National Oceanic and Atmospheric Administration ship *McArthur* and a chartered purse seiner. Studies of

the stress-related effects of repeated chase and encirclement on dolphins associated with tunas were conducted.

The chase-recapture experiment consisted of several complementary studies, including (1) analyses of single and repeated blood samples, (2) molecular analyses of skin samples, (3) measurement of thermoregulatory processes, (4) satellite tagging and tracking, and (5) studies of cow-calf separation between successive chases. The results, when combined, may provide insights into the potential for fishery-caused stress and the potential effects on the survival and reproduction of individual dolphins. The data obtained may be included in a population dynamics model to estimate a range of potential population-level effects. The results of the research will be included in a report to the U.S. Congress evaluating the potential adverse effects of the fishery on the dolphins.

On the behalf of the NMFS, the IATTC solicited bids from the international fleet and arranged the charter of a purse seiner to make this research possible. IATTC scientists were heavily involved in the chartering of the vessel, planning the research, and working out the logistics, and provided their experience in fishing operations, handling of dolphins, and radio-tracking during the at-sea work.

Preliminary estimates of the mortalities of dolphins

Preliminary estimates of the mortalities of dolphins due to fishing for tunas during 2001 are given in Table 9. This table includes only the spotted, spinner, and common dolphins identified positively to stock by the observers**.**

GEAR PROGRAM

During the fourth quarter IATTC staff members participated in dolphin safety-gear inspection and safety-panel alignment procedures aboard five Mexican-flag purse seiners and one Venezuelan-flag purse seiner.

IATTC staff members conducted one dolphin mortality reduction workshop in Mazatlan, Mexico, that was attended by 41 people, including 39 fishermen.

MEASURES FOR THE CONSERVATION OF TUNAS

Yellowfin

A resolution adopted at the 68th meeting of the IATTC, on June 21, 2001, provided for a limit on the catch of yellowfin tuna in the CYRA, by vessels fishing at the surface, of 250,000 metric tons (mt), with options for the Director to increase the quota by one to three increments of 20,000 mt if, in his opinion, this would not adversely affect the stock. On September 13, 2001, the Director advised the Commissioners that the third and last increment would be implemented, bringing the quota to 310,000 mt, and that he estimated that the catch would reach that amount on about October 25, 2001. On October 11, 2001, he advised the Commissioners that he estimated that the quota would be reached on October 27, 2001, and so, beginning on that date, the catches of yellowfin by purse-seine vessels were limited to 15 percent of their total catches of tunas. Longliners, baitboats, and sport-fishing vessels were not subject to these restrictions.

Bigeye

A resolution adopted at the 68th meeting of the IATTC, on June 21, 2001, provided that "the purse-seine fishery which takes bigeye tuna shall be closed if the Director determines … that the catch of bigeye tuna less than 60 centimeters has reached the level achieved in 1999, in which case he shall advise all Parties that the purse-seine fishery on floating objects shall close two weeks after such determination. However, in no event shall the fishery be closed before November 1, 2001." Prior to the end of the year it appeared that the catch of bigeye less than 60 cm long during 2001 would be less than that of 1999, so the resolution was not implemented.

MEETINGS

AIDCP meetings

The following meetings took place in Cartagena, Colombia, during October 2001: 28th meeting of the International Review Panel, October 25-26; eighth meeting of the Permanent Working Group on Tuna Tracking, October 27; sixth meeting of the Parties to the AIDCP, October 29. The minutes or chairman's reports of these meetings are, or soon will be, available on the IATTC's web site, www.iattc.org.

Other meetings

Dr. Martín A. Hall and Ms. Jeanne B. Wexler attended parts of a California Cooperative Oceanic Fisheries Investigations meeting held in La Jolla on November 5-8, 2001.

Dr. Robin Allen participated in a seminar in La Paz, Mexico, commemorating the 25th anniversary of the Centro Interdisciplinario de Ciencias Marinas (CICIMAR) on November 8, 2001, where he gave a presentation on the tuna fisheries of the eastern Pacific Ocean.

Dr. Mark N. Maunder participated in the Protected Species Modeling Workshop, sponsored by the Pelagic Fisheries Research Program of the University of Hawaii, in Honolulu, Hawaii, on November 13-15, 2001. He presented a paper, Integrated Analysis in Fisheries Stock Assessment, and was also coauthor of another paper, Modeling the Effect of Fisheries Bycatch on Hooker's Sea Lions in New Zealand by P. Breen, R. Hilborn, M. Maunder, and S. Kim. After that he attended the last two days of The Pacific Climate and Fisheries Workshop, described in the next paragraph.

Dr. Robert J. Olson participated in "The Pacific Climate and Fisheries Workshop," held in Honolulu, Hawaii, on November 14-17, 2001. The workshop was sponsored by the International Research Institute for Climate Prediction (IRI), based at Columbia University, New York, and the International Pacific Research Center (IPRC) of Hawaii. Dr. Olson served as discussion leader and rapporteur of the Tuna Focus Group.

Dr. Martín A. Hall participated in a meeting of the board of the National Fisheries Conservation Center in Seattle, Washington, USA, on November 15, 2001.

Dr. Michael D. Scott attended a meeting of scientists who had participated in the U.S. National Marine Fisheries Service Chase and Encirclement Stress Studies (CHESS) cruise in La Jolla on November 15-16, 2001. The participants discussed some of the preliminary results from the analyses of blood, genetics samples, thermal images and measurements, and tagging and tracking data, and outlined directions for integrating the various projects. The results will be reviewed by an independent scientific panel in February 2002.

Mr. Vernon P. Scholey attended the 7th Annual Congress of Science and Technology, which was held in Panama, R.P. on November 15-17, 2001. As an invited speaker, he gave a presentation on progress and recent activities at the Achotines Laboratory. The report on which the presentation was based was co-authored by Dr. Daniel Margulies and Mss. Jeanne B. Wexler and Sharon L. Hunt.

Drs. Michael G. Hinton and Robert J. Olson participated in the IV Foro Nacional sobre el Atún in Colima, Mexico, on November 26-28, 2001. Dr. Hinton gave a talk entitled: Habitat, Fishermen, and Fish: Interactions and Estimates of Abundance, and Dr. Olson gave a talk entitled Efectos Interactivos de la Variabilidad Climática y la Pesca sobre el Ecosistema Pelágico del Pacífico Oriental Tropical [Interactive effects of climate variability and the fishery on the pelagic ecosystem of the tropical eastern Pacific]. Their travel expenses were paid by sponsors of the meeting.

Dr. Richard B. Deriso was an invited speaker at the "World Conference on the Scientific and Technical Bases for the Sustainability of Fisheries," held November 26-30, 2001, at the University of Miami's Rosenstiel School of Marine and Atmospheric Science (RSMAS). The conference was sponsored by the Center for Sustainable Fisheries of the RSMAS.

Dr. Michael D. Scott participated in the 14th Biennial Conference on the Biology of Marine Mammals, held in Vancouver, British Columbia, Canada, on November 28-December 3, 2001. Four papers on dolphin thermoregulation, stress, and vocalizations co-authored by him were presented at the meeting.

In September 2001 Dr. Michael G. Hinton was named to the United States Argo Advisory Panel as the representative for applications to fisheries oceanography research. The Argo program is a long-term global multinational project developing a network of buoys to obtain subsurface temperature and salinity data, and, as buoy and sensor technology improve, other data as well. The Argo Advisory Panel met on December 6-7, 2001, in Alexandria, Virginia, where Dr. Hinton spoke on current and potential applications for fisheries oceanography research, and recommended priorities for deployment of US Argo buoys.

Dr. Robert J. Olson participated in a workshop at the National Center for Ecological Analysis and Synthesis (NCEAS) in Santa Barbara, California, on December 13-15, 2001. The workshop was the first meeting of a Working Group entitled "Models of Alternative Management Policies for Marine Ecosystems," which is funded by NCEAS. NCEAS is supported by the U.S. National Science Foundation and the state of California. The purpose of the Working Group is to use ecosystem modeling to identify robust approaches for incorporating ecological considerations into fisheries management objectives for five large marine ecosystems in the Pacific Ocean, including the tropical eastern Pacific.

PUBLICATIONS

IATTC publication

Inter-American Tropical Tuna Commission, Annual Report for 1999: 183 pp.

Other publications

Allen, Robin. 2001. El atún del Océano Pacífico oriental, el PICD, y la nueva certificación AIDCP dolphin safe. Industria Conserva, Revista Trimestral, 9 (35): 60-65.

Bayliff, William H. 2001. Pacific northern bluefin tuna. *In* Leet, William S., Christopher M. DeWees, Richard Klingbeil, and Eric J. Larson (editors), California's Living Marine Resources: a Status Report, Calif. Dept. Fish Game: 325-327.

Crespo, Enrique A., and Martín A. Hall. 2001. Interactions between aquatic mammals and humans in the context of ecosystem management. *In* Evans, Peter G. H., and Juan Antonio Raga (editors), Marine Mammals: Biology and Conservation, Kluwer Academic/Plenum Publishers, New York: 463-490.

Hall, Martín A., and G. P. Donovan. 2001. Environmentalists, fishermen, cetaceans, and fish: is there a balance and can science help to find it? *In* Evans, Peter G. H., and Juan Antonio Raga (editors), Marine Mammals: Biology and Conservation, Kluwer Academic/Plenum Publishers, New York: 491-521.

Joseph, J. 2001. Open ocean fisheries for large pelagic species. *In* Steele, John H., Steve A. Thorpe, and Karl K. Turekian (editors), Encyclopedia of Ocean Sciences, Vol. 4, Academic Press, San Diego: 2031-2039.

Olson, Robert. 2001. Yellowfin, bigeye, skipjack, bluefin, and albacore tunas in the eastern Pacific Ocean. *In* Alexander, Vera, Alexander S. Bychkov, Patricia Livingston, and Stewart M. McKinnell (editors), Proceedings of the PICES/CoML/IPRC Workshop on "Impact of Climate Variability on Observation and Prediction of Ecosystem and Biodiversity Changes in the North Pacific." North Pacific Marine Science Organization (PICES), Sci. Rep., 18: 184-197.

Schaefer, Kurt M. 2001. Reproductive biology of tunas. *In* Block, Barbara A., and E. Donald Stevens (editors), Tuna: Physiology, Ecology, and Evolution, Academic Press, San Diego: 225-270.

AWARD

Dr. Mark N. Maunder won (first equal) the National Center for Ecological Analysis and Synthesis Extinction Risk Working Group's extinction prediction competition. The competition involved predicting extinction-related criteria for four different terrestrial populations (frog, herb, snail, and a small mammal). He used modeling methods based on those he has developed for assessing stocks of tunas and other marine species (*i.e.* hierarchical Bayesian integrated analysis). He will participate in a meeting of the Extinction Risk Working Group in Santa Barbara, California, USA, in February 2002.

ADMINISTRATION

Ms. Martha Gómez resigned her position as bilingual secretary for the Tuna-Dolphin Program on October 31, 2001, to return to Colombia. She will be missed, but everyone wishes her well in whatever she undertakes in the future. Ms. Jacqueline Castañeda was hired on November 6, 2001, to replace Ms. Gómez.

Ms. Sharon L. Hunt was awarded the degree of Master of Science by Humboldt State University in December 2001.

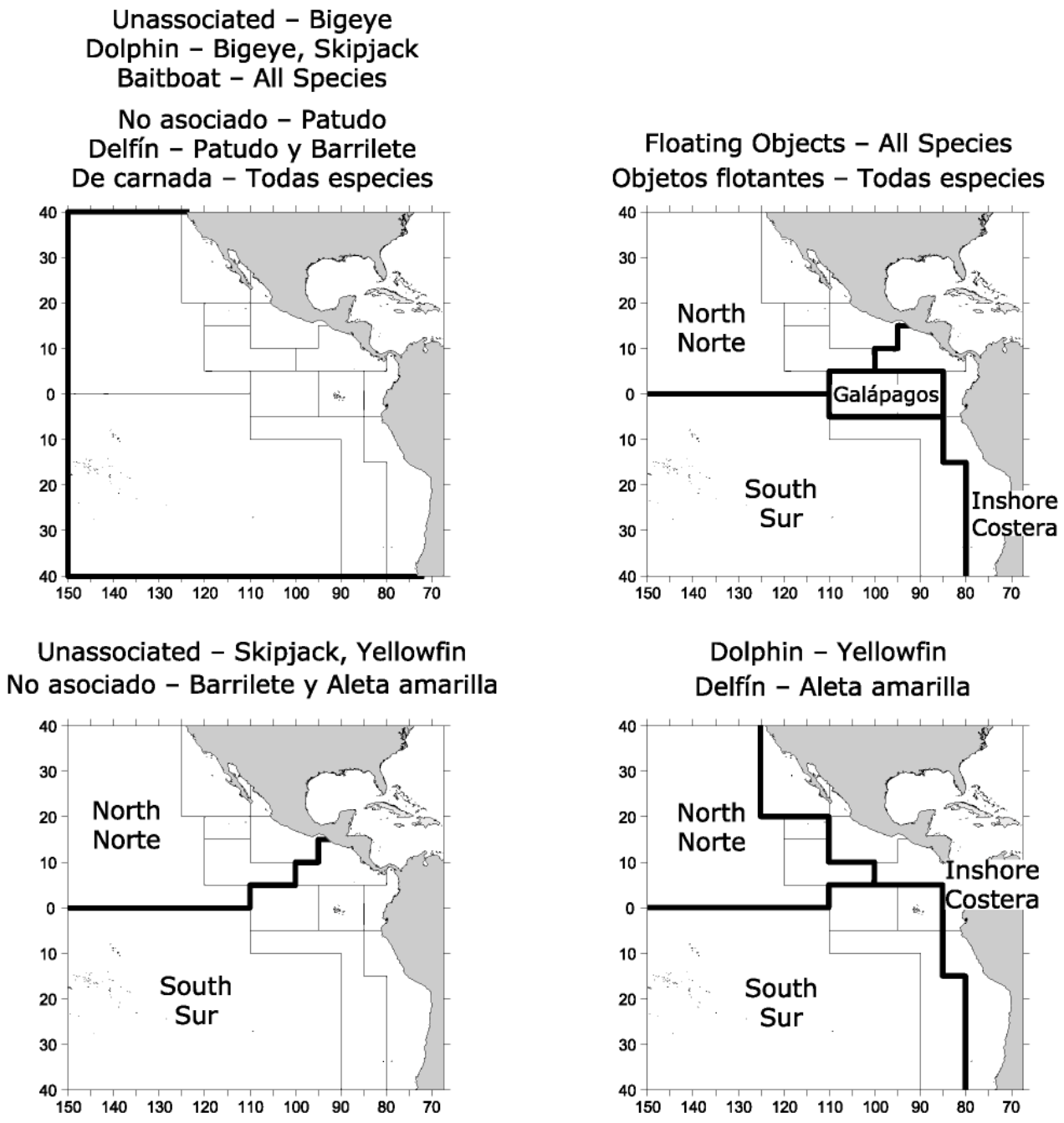

FIGURE 1. Spatial extents of the fisheries defined by the IATTC staff for stock assessment of yellowfin, skipjack, and bigeye in the EPO. The thin lines indicate the boundaries of the 13 length-frequency sampling areas, and the bold lines the boundaries of the fisheries.
FIGURA 1. Extensión especial de las pesquerías definidas por el personal de la CIAT para la evaluación de los stocks de atún aleta amarilla, barrilete, 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.

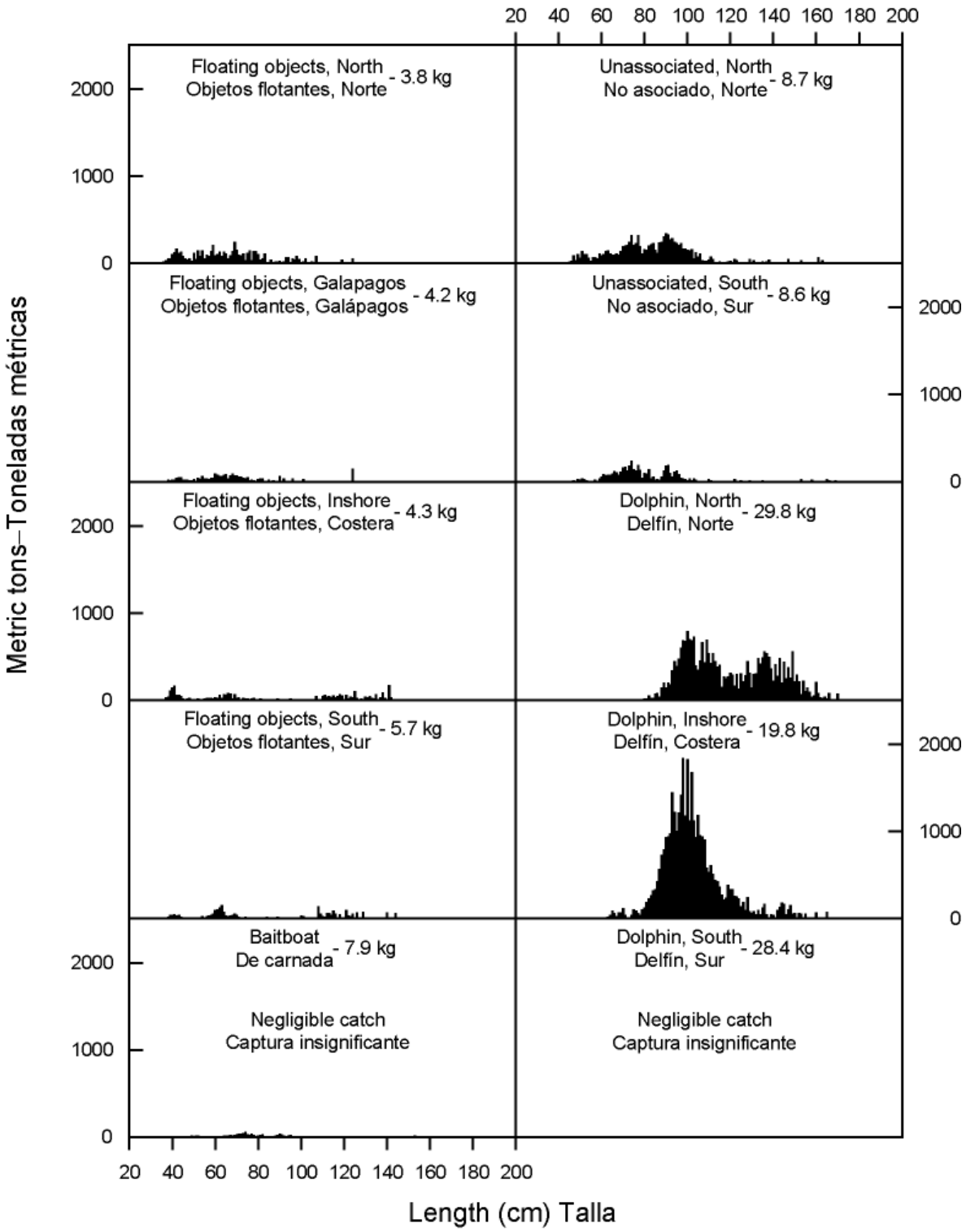

FIGURE 2a. Estimated size compositions of the yellowfin caught in each fishery of the EPO during the third quarter of 2001. The average weights of the fish in the samples are given at the tops of the panels.
FIGURA 2a. Composición por tallas estimada para el aleta amarilla capturado en cada pesquería del OPO durante el tercero trimestre de 2001. En cada recuadro se detalla el peso promedio de los peces en las muestras.

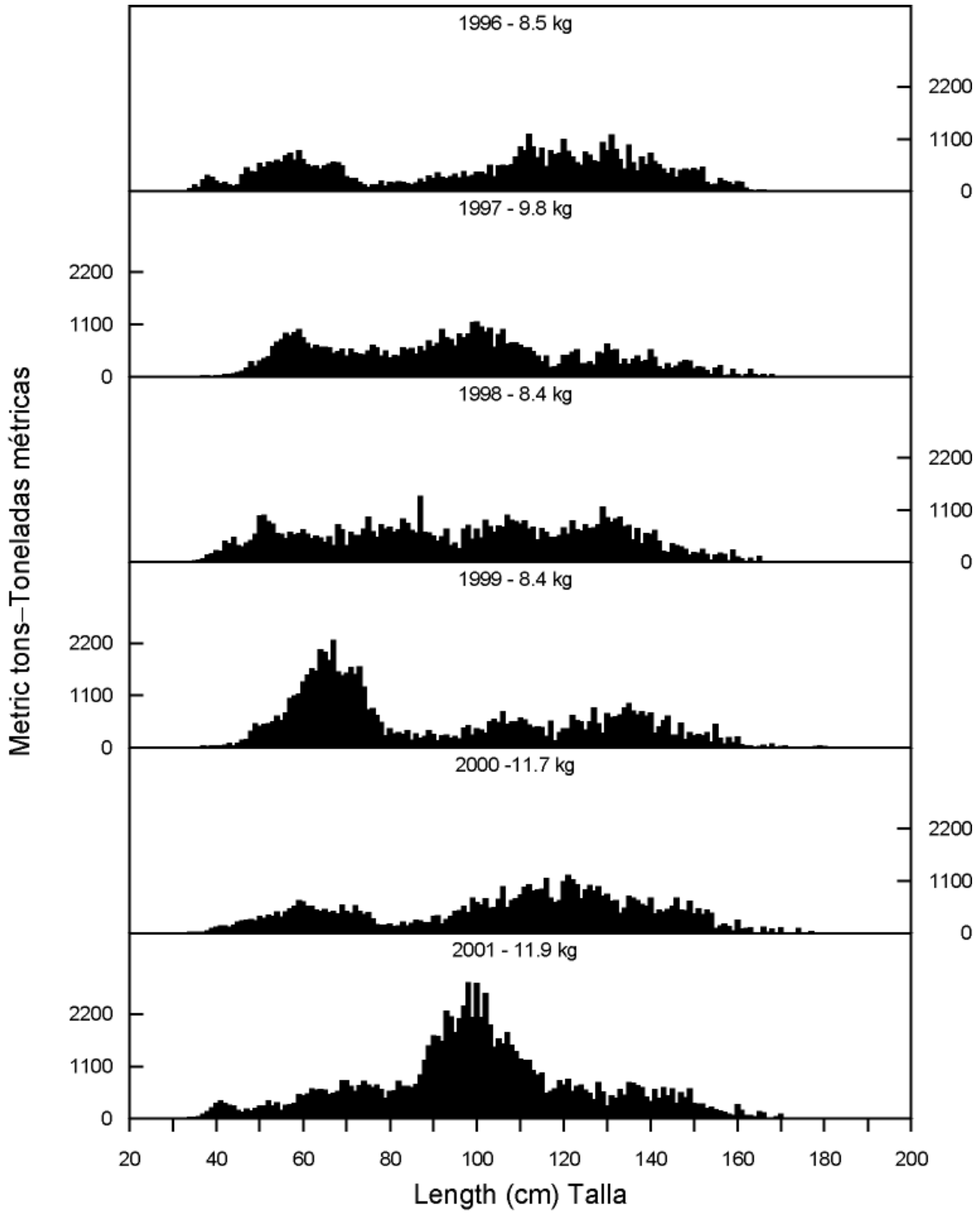

FIGURE 2b. Estimated size compositions of the yellowfin caught in the EPO during the third quarter of 1996-2001. The average weights of the fish in the samples are given at the tops of the panels.
FIGURA 2b. Composición por tallas estimada para el aleta amarilla capturado en el OPO en el tercero trimestre de 1996-2001. En cada recuadro se detalla el peso promedio de los peces en las muestras.

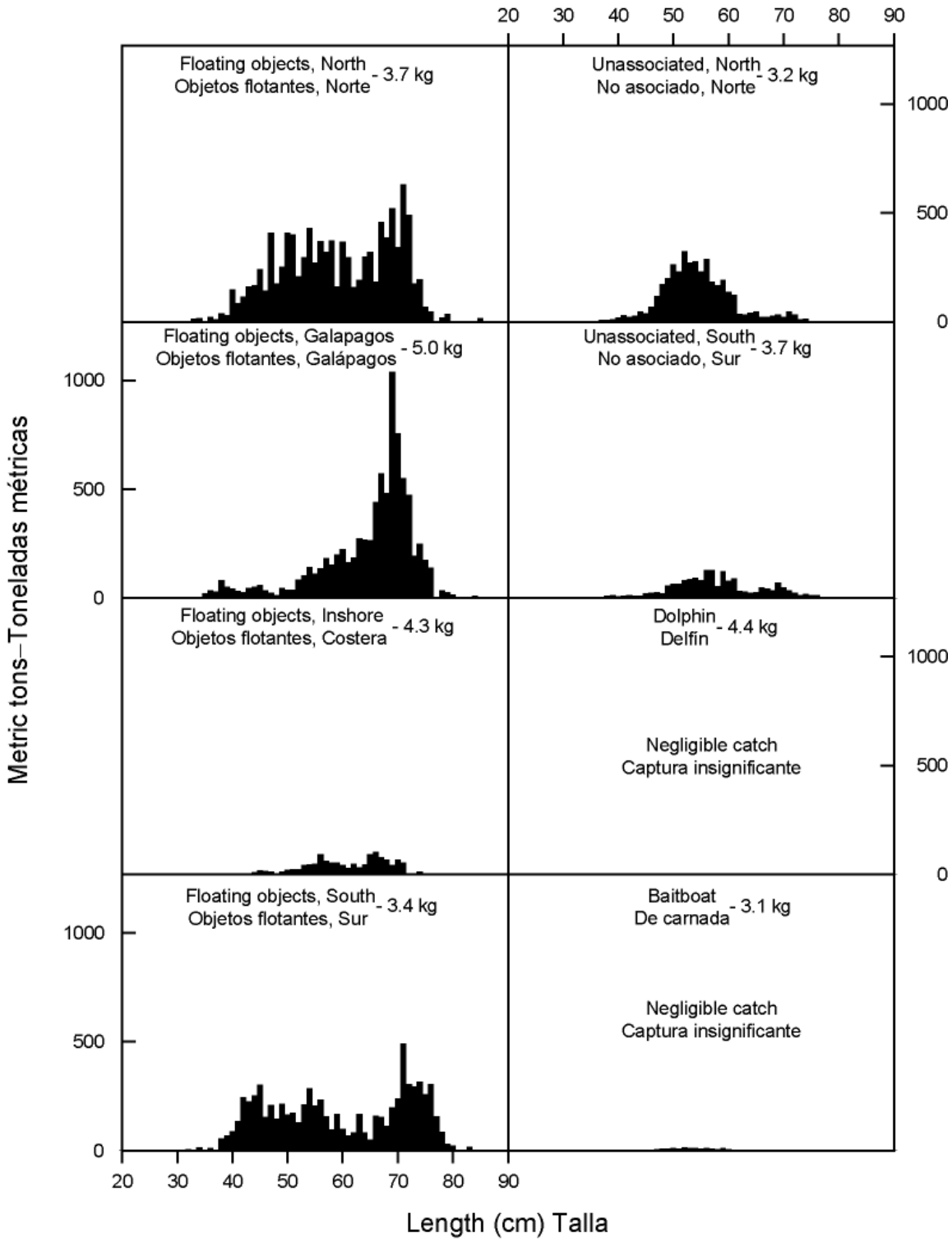

FIGURE 3a. Estimated size compositions of the skipjack caught in each fishery of the EPO during the third quarter of 2001. The average weights of the fish in the samples are given at the tops of the panels.
FIGURA 3a. Composición por tallas estimada para el barrilete capturado en cada pesquería del OPO durante el tercero trimestre de 2001. En cada recuadro se detalla el peso promedio de los peces en las muestras.

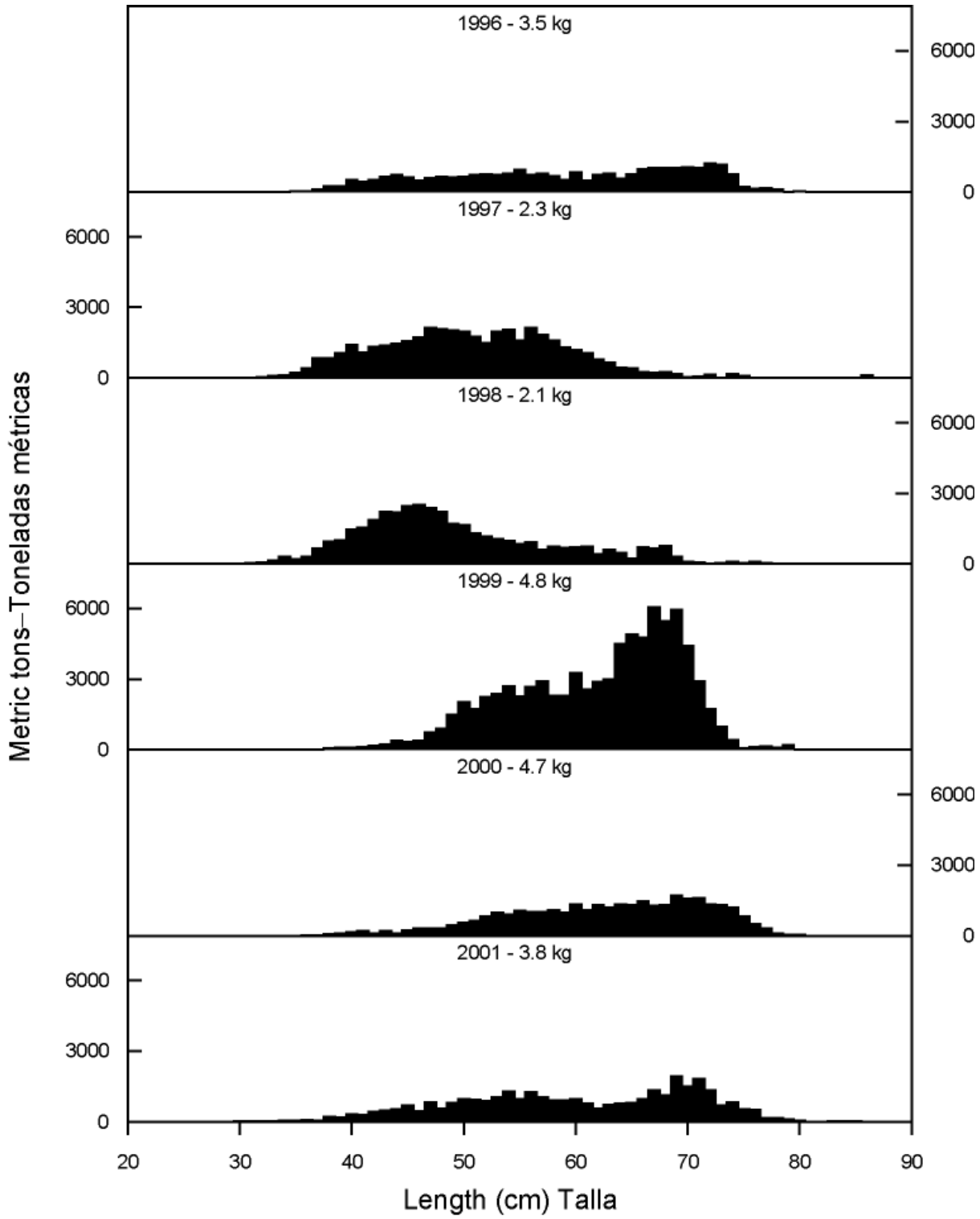

FIGURE 3b. Estimated size compositions of the skipjack caught in the EPO during the third quarter of 1996-2001. The average weights of the fish in the samples are given at the tops of the panels.
FIGURA 3b. Composición por tallas estimada para el barrilete capturado en el OPO en el tercero trimestre de 1996-2001. En cada recuadro se detalla el peso promedio de los peces en las muestras.

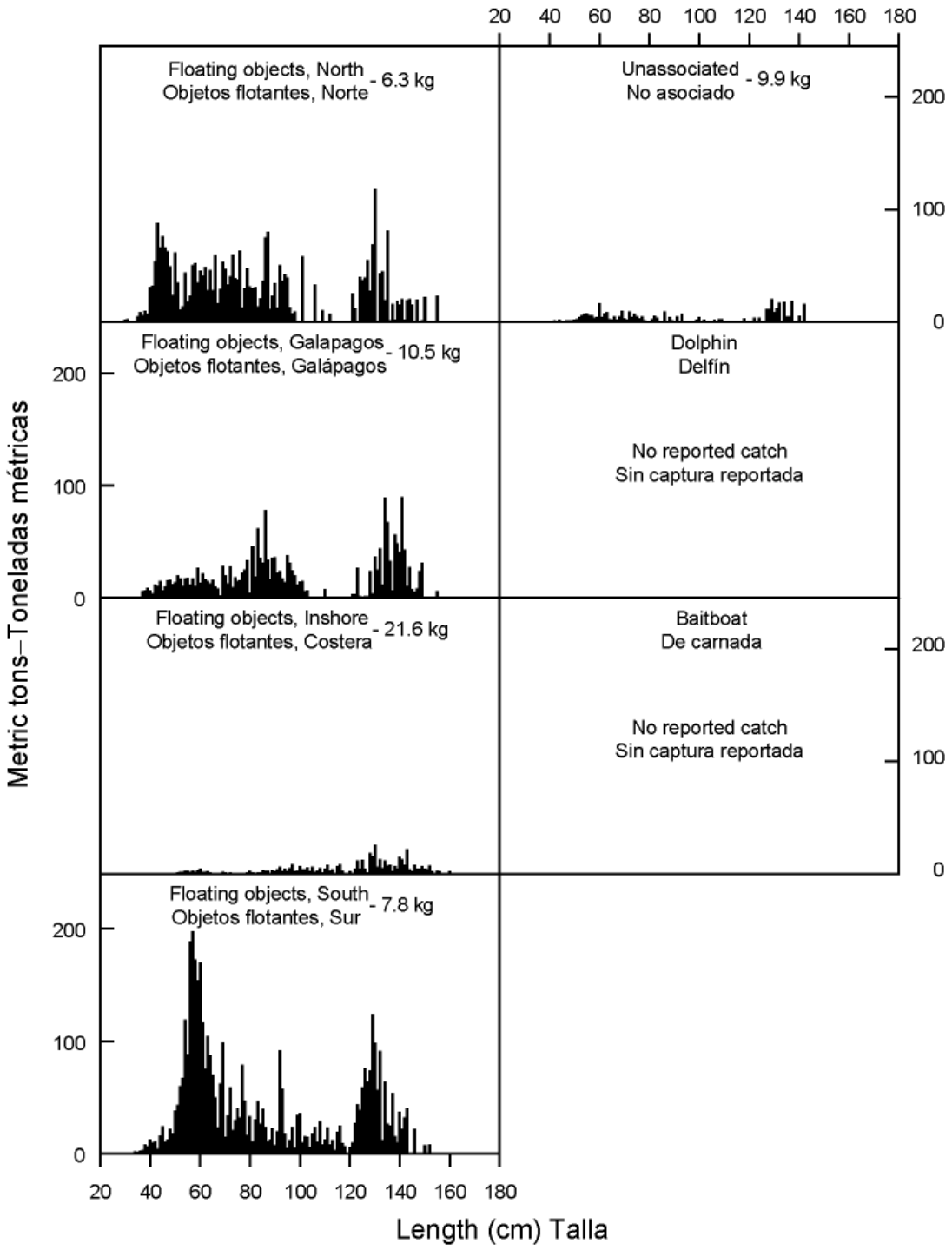

FIGURE 4a. Estimated size compositions of the bigeye caught in each fishery of the EPO during the third quarter of 2001. The average weights of the fish in the samples are given at the tops of the panels.

FIGURA 4a. Composición por tallas estimada para el patudo capturado en cada pesquería del OPO durante el tercero trimestre de 2001. En cada recuadro se detalla el peso promedio de los peces en las muestras.

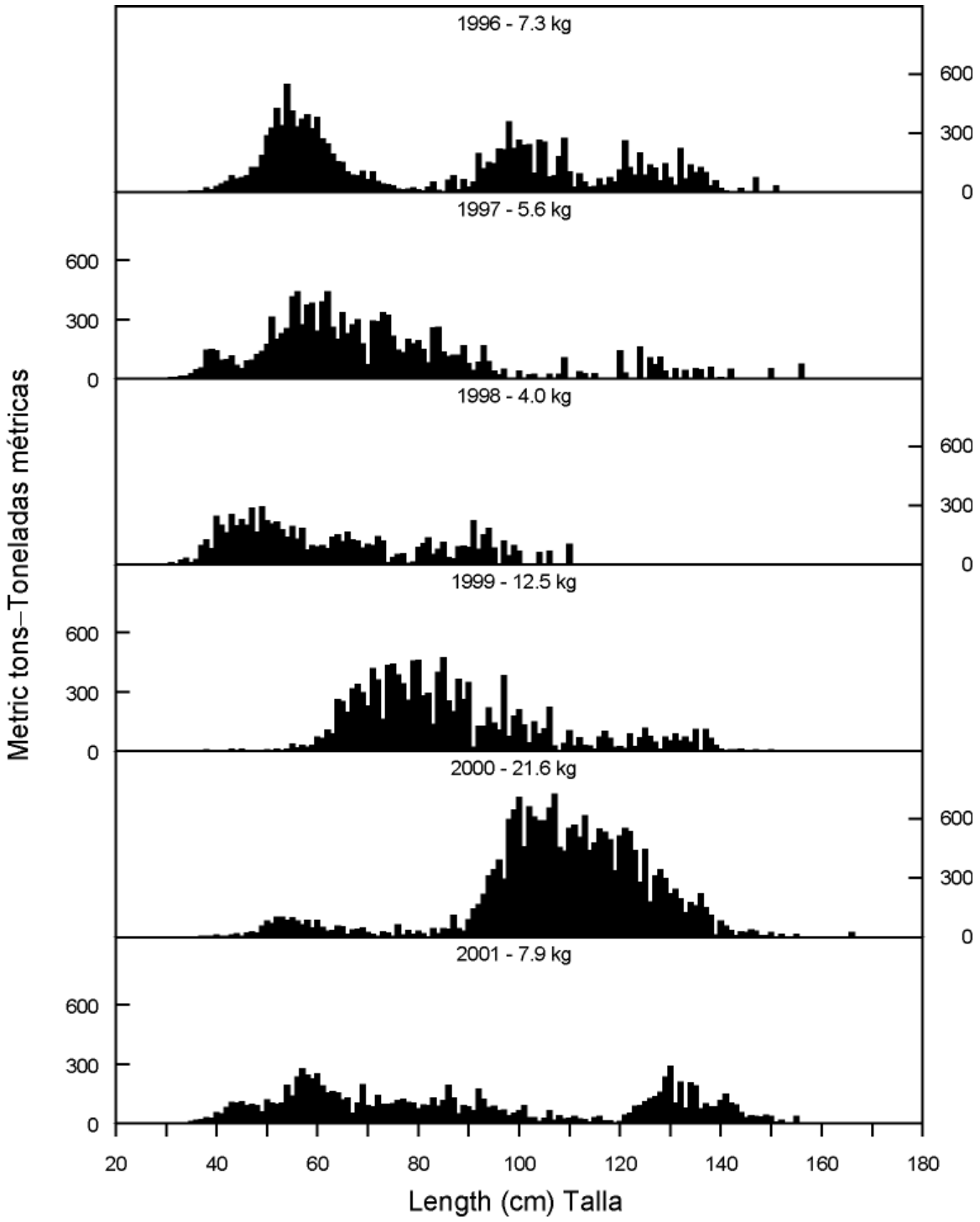

FIGURE 4b. Estimated size compositions of the bigeye caught in the EPO during the third quarter of 1996-2001. The average weights of the fish in the samples are given at the tops of the panels.

FIGURA 4b. Composición por tallas estimada para el patudo capturado en el OPO en el tercero trimestre de 1996-2001. En cada recuadro se detalla el peso promedio de los peces en las muestras.

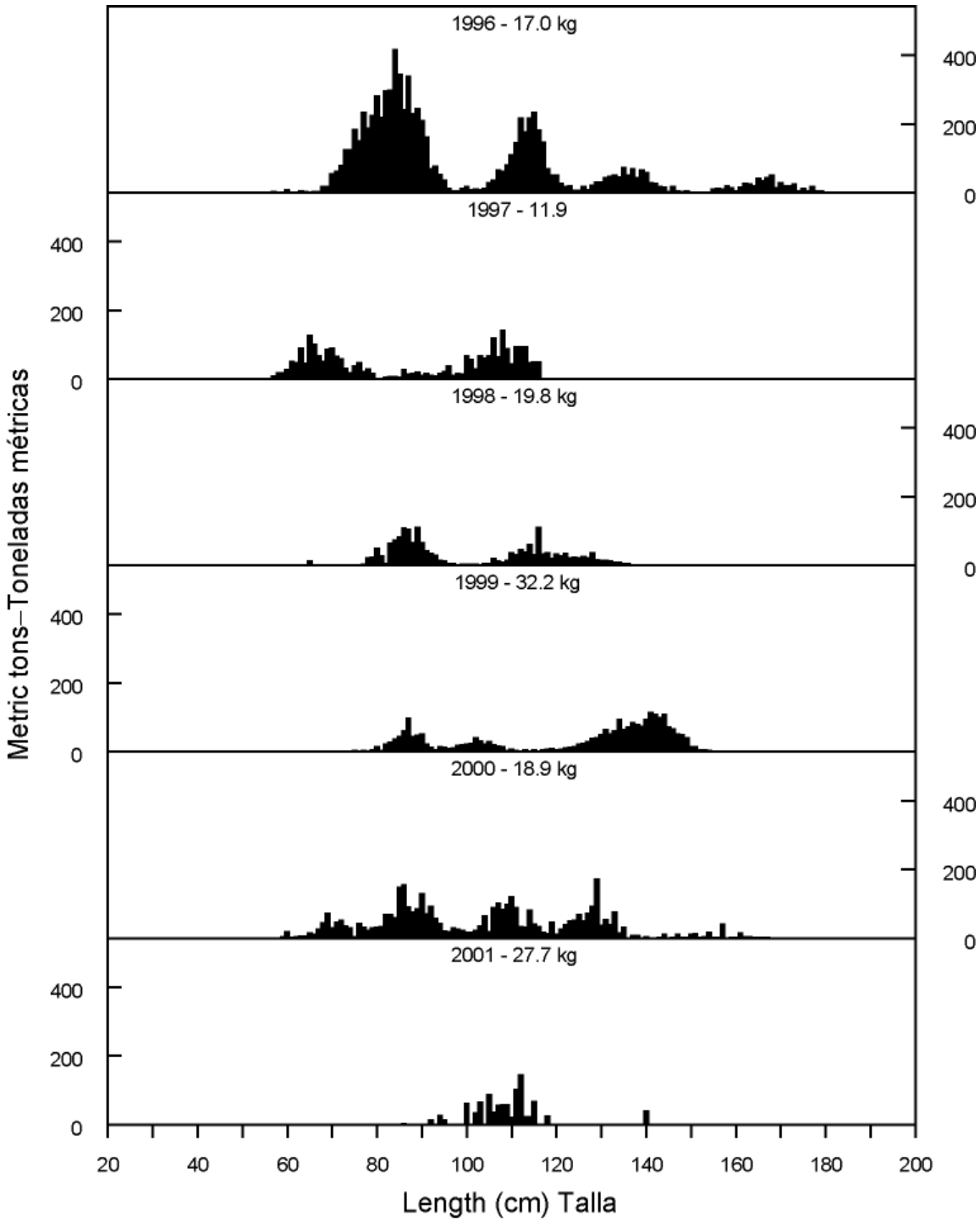

FIGURE 5a. Estimated size compositions of the bluefin caught in the commercial fisheries of the EPO during 1996-2001. The average weights of the fish in the samples are given at the tops of the panels.

FIGURA 5a. Composición por tallas estimada para el aleta azul capturado en las pesquerías comerciales del OPO durante 1996-2001. En cada recuadro se detalla el peso promedio de los peces en las muestras.

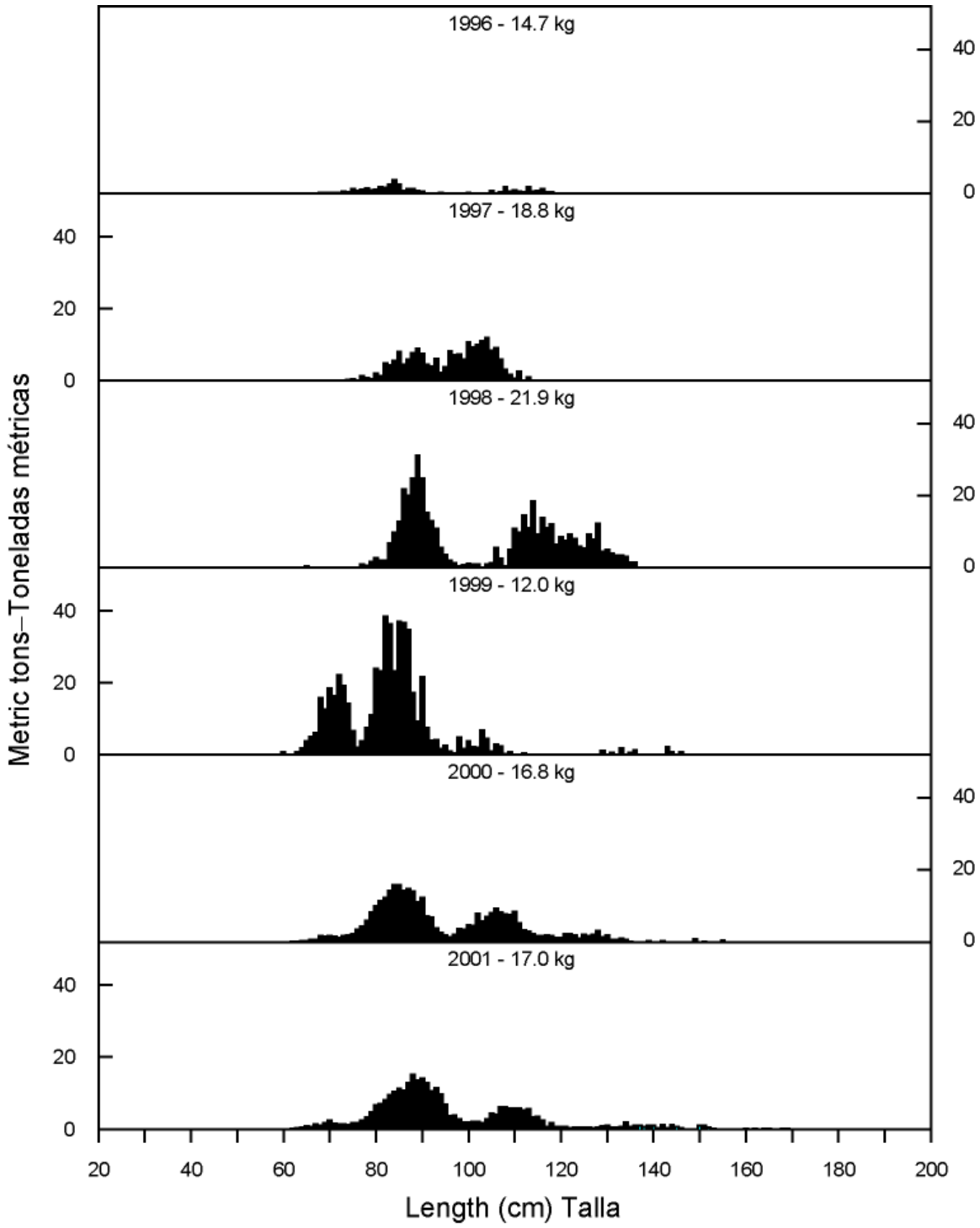

FIGURE 5b. Estimated size compositions of the bluefin caught in the recreational fishery of the EPO during 1996-2001. The average weights of the fish in the samples are given at the tops of the panels.

FIGURA 5b. Composición por tallas estimada para el aleta azul capturado en la pesquería deportiva del OPO durante 1996-2001. En cada recuadro se detalla el peso promedio de los peces en las muestras.

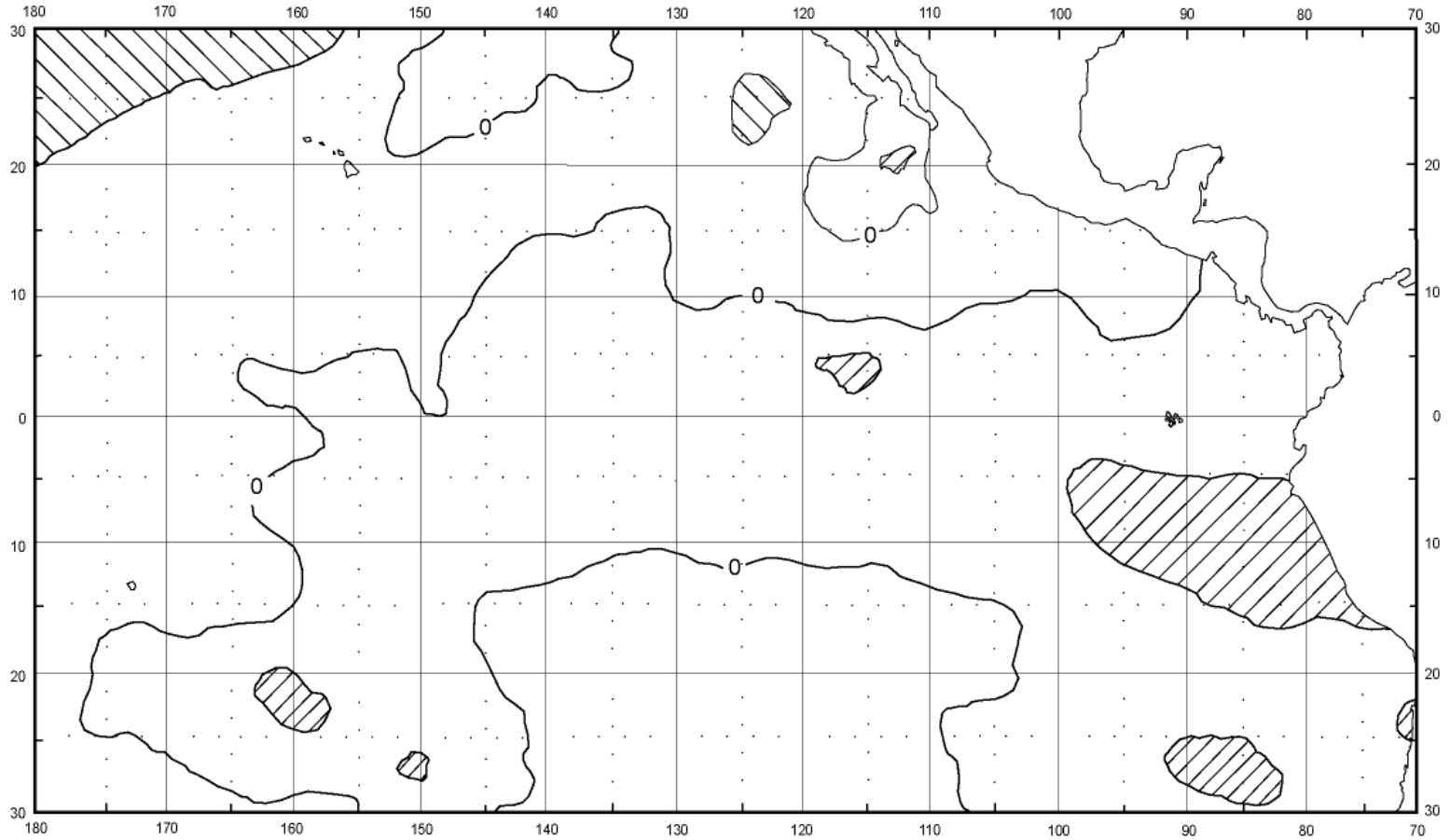

FIGURE 6. Sea-surface temperature (SST) anomalies (departures from long-term normals) for December 2001, based on data from fishing boats and other types of commercial vessels. The areas with SSTs more than 1°C below normal are hatched from lower left to upper right, and those with SSTs more than 1°C above normal are hatched from upper left to lower right.

FIGURA 6. Anomalías (variaciones de los niveles normales a largo plazo) de la temperatura superficial del mar (TSM) en diciembre de 2001, basadas en datos tomados por barcos pesqueros y otros buques comerciales. Las zonas TSM más de 1°C inferiores a lo normal están sombreadas con rayas diagonales que suben hacia la derecha, y aquéllas con TSM más de 1°C superiores a lo normal con rayas diagonales que suben hacia la izquierda.

TABLE 1. Preliminary estimates of the numbers and carrying capacities, in cubic meters, of purse seiners and baitboats operating in the EPO in 2001 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; BB = baitboat.

TABLA 1. Estimaciones preliminares del número de buques que pescaron en el OPO en 2001 (sin incluir palangreros y buques pequeños diversos), y de la capacidad de acarreo de los mismos, en toneladas métricas, 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; BB = buque de carnada.

Flag	Gear	Size class—Clase de arqueo							Capacity
Bandera	Arte	1	2	3	4	5	6	Total	Capacidad
					Number—Número				
Belize—Belice	PS	-	-	-	-	-	2	2	1,850
Bolivia	PS	-	-	-	-	-	5	5	5,830
Colombia	PS	-	-	2	1	2	5	10	7,397
Ecuador	PS	-	7	12	13	7	39	77	49,799
	BB	1	-	-	-	-	-	1	32
España—Spain	PS	-	-	-	-	-	5	5	12,137
Guatemala	PS	-	-	-	-	-	4	4	7,640
Honduras	PS	-	-	-	-	-	4	4	3,040
México	PS	-	-	6	4	9	42	61	52,869
	BB	1	4	6	-	-	-	11	1,349
Nicaragua	PS	-	-	-	-	-	1	1	1,229
Panamá	PS	-	-	2	2	-	6	10	9,517
El Salvador	PS	-	-	-	-	-	2	2	4,469
U.S.A.—EE.UU.	PS	-	3	2	-	2	5	12	7,864
Venezuela	PS	-	-	-	-	-	25	25	31,687
Vanuatu	PS	-	-	-	-	-	6	6	7,803
Unknown—Desconocido	PS	-	-	-	-	-	2	2	1,242
All flags—Todas banderas	PS	-	10	24	20	20	146	220	
	BB	2	4	6	-	-	-	12	
	PS + BB	2	14	30	20	20	146	232	
					Capacity—Capacidad				
All flags—Todas banderas	PS	-	984	4,294	5,786	9,246	177,111	197,421	
	BB	85	383	913	-	-	-	1,381	
	PS + BB	85	1,367	5,207	5,786	9,246	177,111	198,802	

TABLE 2. Changes in the IATTC fleet list recorded during the fourth quarter of 2001. PS = purse seine; BB = baitboat.
TABLA 2. Cambios en la flota observada por la CIAT registrados durante el cuarto trimestre de 2001. PS = cerquero; BB = buque de carnada.

Vessel name	Flag	Gear	Size class	Capacity (m^3)	Remarks
Nombre del buque	**Bandera**	**Arte**	**Clase de arqueo**	**Capacidad(m^3)**	**Comentarios**
Vessels added to the fleet—Buques agregados a la flota					
Azteca 12	MEX	PS	5	410	New entry—1er ingreso
Chasca	ECU	PS	5	399	Re-entry—Reingreso
Jose Gerardo	MEX	PS	6	511	Re-entry—Reingreso
Don Abel	VEN	PS	6	1,226	Re-entry—Reingreso
Vessels changing name and/or flag—Buques de nombre y/o bandera cambiada					
Jenny Margot II	VEN	PS	6	1,784	Name changed to—Ahora: *Maria Del Mar A*
Don Italo	BLZ	PS	6	456	Flag changed to unknown—Ahora bandera desconocida
MariaJose	BLZ	PS	6	1,041	Flag changed to—Ahora bandera: ECU
Atun IV	MEX	PS	6	809	Flag changed to—Ahora bandera: BLZ
Gold Coast	VUT	PS	6	1,194	Flag changed to—Ahora bandera: BOL
Ignacio	ECU	PS	6	1,470	Sank—Hundido

TABLE 3. Preliminary estimates of the catches of tunas in the EPO from January 1 through December 31, 2001, by species and vessel flag, in metric tons.

TABLA 3. Estimaciones preliminares de las capturas de atunes en el OPO del 1 de enero al 31 diciembre de 2001, por especie y bandera del buque, en toneladas métricas.

Flag	Yellowfin		Skipjack	Bigeye	Bluefin	Bonito	Albacore	Black skipjack	Other[1]	Total	Percentage of total
	CYRA	Outside									
Bandera	Aleta amarilla		Barrilete	Patudo	Aleta azul	Bonito	Albacora	Barrilete negro	Otras[1]	Total	Porcentaje del total
	ARCAA	Exterior									
Ecuador	48,402	4,038	69,072	18,899	-	-	-	1,456	237	142,104	24.6
España—Spain	6,220	3,995	21,191	6,923	-	-	-	-	-	38,329	6.6
México	116,037	19,081	8,147	94	786	18	22	-	-	144,185	25.0
Panamá	11,701	1,247	6,483	1,708	-	-	-	-	3	21,142	3.7
U.S.A.—EE.UU.	4,037	1,376	4,056	2,189	143	-	2	72	-	11,875	2.1
Venezuela	98,341	8,401	2,155	51	-	-	-	-	-	108,948	18.9
Vanuatu	12,162	1,014	7,364	3,840	-	-	-	-	-	24,380	4.2
Other—Otros[2]	48,460	6,544	22,794	8,271	-	-	-	44	-	86,113	14.9
Total	345,360	45,696	141,262	41,975	929	18	24	1,572	240	577,076	

[1] Includes mackerel, sharks, other tunas, and miscellaneous fishes

[1] Incluye caballas, tiburones, otros túnidos, y peces diversos

[2] Includes Belize, Bolivia, Colombia, El Salvador, Guatemala, Honduras, and Nicaragua. This category is used to avoid revealing the operations of individual vessels or companies.

[2] Incluye Belice, Bolivia, Colombia, El Salvador, Guatemala, Honduras, y Nicaragua. Se usa esta categoría para no revelar información sobre faenas de buques o empresas individuales**.**

TABLE 4. Report period (January 1-September 30) logged yellowfin catch in metric tons [C(L)], and catch per day's fishing[1] [C(L)/E(L)], by year, area, and gear type, based on fishing vessel logbook information.
TABLA 4. Captura registrada de aleta amarilla [C(R)], y captura por día de pesca[1] [C(R)/E(R)], por año, área y tipo de arte, en toneladas métricas, en el período del informe (1 de enero-30 de septiembre), basado en información de los cuadernos de bitácora de buques pesqueros.

Gear and area	Fishery statistic	Year-Año					
Arte y área	Estadística de pesca	1996	1997	1998	1999	2000	2001[2]
Purse seine	C(L)						
Red de cerco	C(R)	145,400	134,100	133,500	148,700	123,300	166,400
CYRA	C(L)/E(L)						
ARCAA	C(R)/E(R)	12.6	11.1	10.2	11.3	9.2	16.2
Outside[3]	C(L)						
Exterior[3]	C(R)	21,700	41,900	22,400	24,100	42,400	23,900
	C(L)/E(L)						
	C(R)/E(R)	8.6	12.4	6.8	13.6	14.1	14.3
EPO[4]	C(L)						
OPO[4]	C(R)	167,100	176,000	155,900	172,800	165,700	190,300
	C(L)/E(L)						
	C(R)/E(R)	11.9	11.4	9.5	11.6	10.1	15.9
Annual total	C(L)	201,200	209,900	192,400	205,900	205,300	
Total anual	C(R)						
Baitboat	C(L)						
Carnada	C(R)	2,400	3,100	2,500	1,100	1,400	1,700
	C(L)/E(R)						
	C(R)/E(R)	3.5	3.4	2.7	1.5	2.7	4.9
Annual total	C(L)	2,800	3,500	2,600	1,600	2,100	
Total anual	C(R)						

[1] Purse-seiners, class-6 only; all baitboats. The C(L) values are rounded to the nearest 100, and the C(L)/E(L) values to the nearest 0.1.
[1] Cerqueros de las clase 6; todos buques de carnada. Se redondean los valores de C(R) al 100 más cercano, y los de C(R)/E(R) al 0.1 más cercano.
[2] Preliminary: January 28, 2002
[2] Preliminar: 28 de enero de 2002
[3] Includes the area west of the CYRA but east of 150°W
[3] Incluye la zona al oeste del ARCAA al este de 150°O
[4] Includes the Pacific Ocean east of 150°W
[4] Incluye el Océano Pacífico al este de 150°O

TABLE 5. Report period (January 1-September 30) logged skipjack tuna catch in metric tons [C(L)] and catch per day's fishing[1] [C(L)/E(L)] in the EPO[2], by year and gear type, based on fishing vessel logbook information.
TABLA 5. Captura registrada de barrilete [C(R)], y captura por día de pesca[1] [C(R)/E(R)] en el OPO[2], por año y tipo de arte, en toneladas métricas, en el período del informe (1 de enero-30 de septiembre), basado en información de los cuadernos de bitácora de buques pesqueros.

Gear	Fishery statistic	Year—Año					
Arte	**Estadística de pesca**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001[3]**
Purse seine	C(L)						
Red de cerco	C(R)						
	C(L)/E(L)	55,600	69,400	63,100	158,400	118,300	65,000
	C(R)/E(R						
		4.0	4.5	3.9	10.6	7.2	5.4
Annual total	C(L)						
Total anual	C(R)	74,900	98,800	97,200	177,400	128,600	
Baitboat	C(L)						
Carnada	C(R)	1,400	1,700	900	1,600	100	100
	C(L)/E(L)						
	C(R)/E(R)	2.1	1.8	1.0	2.2	0.2	0.2
Annual total	C(L)	1,800	2,300	1,000	1,800	100	
Total anual	C(R)						

[1] Purse-seiners, class-6 only; all baitboats. The C(L) values are rounded to the nearest 100, and the C(L)/E(L) values to the nearest 0.1.
[1] Cerquero de la clase 6; todos buques de carnada. Se redondean los valores de C(R) al 100 más cercano, y los de C(R)/E(R) al 0.1 más cercano.
[2] Includes the Pacific Ocean east of 150°W
[2] Incluye el Océano Pacífico al este de 150°O
[3] Preliminary: January 28, 2002
[3] Preliminar: 28 de enero de 2002

TABLE 6. Report period (January 1-September 30) logged bigeye catch in the EPO[1] and catch per day of fishing (CPDF) in the EPO, in metric tons, based on logbook information from purse seiners.

TABLA 6. Captura registrada de atún patudo en el OPO[1] en el período del informe (1 de enero-30 de septiembre) y captura por día de pesca (CPDP) en el OPO, en toneladas métricas, basadas en información de las bitácoras de buques cerqueros.

Fishery statistic—Estadística de pesca	Year—Año					
	1996	**1997**	**1998**	**1999**	**2000**	**2001[2]**
Catch—Captura	28,500	24,600	14,100	20,500	44,300	23,700
CPDF—CPDP	2.0	1.6	0.9	1.4	2.7	2.0
Total annual catch—Captura total anual	41,300	34,100	20,400	22,700	48,900	

[1] Includes the Pacific Ocean east of 150°W

[1] Incluye el Océano Pacífico al este de 150°O

[2] Preliminary: January 28, 2002

[2] Preliminar: 28 de enero de 2002

TABLE 7. Preliminary data on the sampling coverage of trips by Class-6 vessels (capacity >363 metric tons) by the IATTC, Ecuadorian, Mexican, and Venezuelan programs during the fourth quarter of 2001. The numbers in parentheses indicate totals for the year. NA = not available.
TABLA 7. Datos preliminares de la cobertura de muestreo de viajes de barcos de la Clase 6 (capacidad >363 toneladas métricas) por los programas de la CIAT, Ecuador, México, y Venezuela durante el cuarto trimestre de 2001. Los números en paréntesis indican totales para el año. NA = no disponible.

Fleet	**Number of trips**		**Trips sampled by program**						**Percent sampled**	
			IATTC		**National**		**Total**			
Flota	**Número de viajes**		**Viajes muestreados por programa**						**Porcentaje muestreado**	
			CIAT		**Nacional**		**Total**			
Belize—Belice	1	(5)	1	(5)			1	(5)	100	(100)
Bolivia	7	(25)	6	(12)[1]	0	(2)[2]	6	(14)	85.7	(56.0)
Colombia	5	(25)	5	(25)			5	(25)	100	(100)
Ecuador	45	(236)	33	(176)	12	(60)	45	(236)	100	(100)
España—Spain	6	(34)	6	(34)			6	(34)	100	(100)
Guatemala	5	(27)	5	(27)			5	(27)	100	(100)
Honduras	3	(12)	3	(12)			3	(12)	100	(100)
México	26	(169)	11	(82)	15	(87)	26	(169)	100	(100)
Nicaragua	0	(5)	0	(5)			0	(5)	NA	(100)
Panamá	2	(22)	2	(22)			2	(22)	100	(100)
El Salvador	3	(10)	3	(10)			3	(10)	100	(100)
U.S.A.—EE.UU.	2	(18)	2	(18)			2	(18)	100	(100)
Venezuela	30	(145)	14	(72)	16	(73)	30	(145)	100	(100)
Vanuatu	3	(30)	3	(29)			3	(29)	100	(96.7)
Unknown—Desconocido	1	(3)	0	(1)			0	(1)	0.0	(33.3)
Total	139	(766)[3]	94	(530)[4]	43	(222)	137	(752)[3]	98.6	(98.2)

[1] Does not include one trip that was only partially observed by the IATTC
[1] No incluye un viaje sólo parcialmente observado por la CIAT
[2] Sampled by the Ecuadorian national observer program (PROBECUADOR)
[2] Muestrado por el programa nacional de observadores de Ecuador (PROBECUADOR)
[3] Includes 54 trips that began in late 2000 and ended in 2001
[3] Incluye 54 viajes iniciados a fines de 2000 y completados en 2001
[4] Includes 1 research trip
[4] Incluye 1 viaje de investigación

TABLE 8. Oceanographic and meteorological data for the Pacific Ocean, July-December 2001. The values in parentheses are anomalies.

TABLA 8. Datos oceanográficos y meteorológicos del Océano Pacífico, julio-diciembre 2001. Los valores en paréntesis son anomalías.

Month—Mes	**7**	**8**	**9**	**10**	**11**	**12**
SST—TSM, 0°-10°S, 80°-90°W (°C)	21.0 (-0.8)	20.0 (-0.8)	19.2 (-1.2)	19.5 (-1.4)	20.5 (-1.2)	21.8 (-1.1)
SST—TSM, 5°N-5°S, 90°-150°W (°C)	25.4 (-0.2)	24.7 (-0.3)	24.3 (-0.6)	24.5 (-0.5)	24.4 (-0.6)	24.6 (-0.5)
SST—TSM, 5°N-5°S, 120°-170°W (°C)	27.3 (0.2	26.9 (0.2)	25.6 (-0.1)	26.6 (0.0)	26.5 (-0.1)	26.2 (-0.3)
SST—TSM, 5°N-5°S, 150W°-160°E (°C)	29.1 (0.5)	28.9 (0.5)	29.1 (0.6)	29.0 (0.6)	29.0 (0.6)	28.6 (0.3)
Thermocline depth—Profundidad de la termoclina, 0°, 80°W (m)	40	40	40	40	40	40
Thermocline depth—Profundidad de la termoclina, 0°, 110°W (m)	50	60	50	60	70	70
Thermocline depth—Profundidad de la termoclina, 0°, 150°W (m)	130	140	150	140	160	160
Thermocline depth—Profundidad de la termoclina, 0°, 180°W (m)	180	150	180	180	170	180
Sea level—Nivel del mar, Baltra, Ecuador (cm)	175.3	173.8	172.6	174.9	174.5	178.7
	(-5.2)	(-3.9)	(-4.7)	(–2.3)	(-4.4)	(-1.1)
Sea level—Nivel del mar, La Libertad, Ecuador (cm)	219.8	215.0	220.7	232.1	229.8	--
	(-10.5)	(-12.6)	(-7.2)	(2.6)	(0.2)	--
Sea level—Nivel del mar, Callao, Perú (cm)	103.7	101.1	93.2	109.8	98.6	103.4
	(-6.4)	(-6.5)	(-12.8)	(4.2)	(-8.3)	(-5.2)
SOI—IOS	-0.4	-1.0	0.2	-0.4	0.7	-1.2
SOI*—IOS*	-4.35	-1.56	3.14	-2.28	3.16	0.79
NOI*—ION*	0.61	0.01	-0.72	0.73	-2.98	-0.80

TABLE 9. Preliminary estimates of the mortalities of dolphins due to purse-seining for tunas in the eastern Pacific Ocean during 2001.
TABLA 9. Estimaciones preliminares de la mortalidad de delfines ocasionada por la pesca con red de cerco en el Océano Pacífico oriental durante 2001.

Stock	Mortality—Mortalidad
Offshore spotted dolphin—Delfín manchado de altamar	
Northeastern—Nororiental	656
Western-southern—Occidental-sureño	210
Spinner dolphin—Delfín tornillo	
Eastern—Oriental	466
Whitebelly—Panza blanca	365
Common dolphin—Delfín común	
Northern—Norteño	94
Central	195
Southern—Sureño	41
Total	2,027