INTER-AMERICAN TROPICAL TUNA COMMMISSION
COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL

QUARTERLY REPORT—INFORME TRIMESTRAL

October-December 2012—Octubre-Diciembre 2012

The Quarterly Report of the Inter-American Tropical Tuna Commission is an informal account 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 de la Comisión Interamericana del Atún Tropical es un relato informal 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.

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INTRODUCTION

The Inter-American Tropical Tuna Commission (IATTC) operated from 1950 to 2010 under the authority and direction of a Convention signed by representatives of the governments of Costa Rica and the United States of America on 31 May 1949. The Convention was open to the adherence by other governments whose nationals participated in the fisheries for tropical tunas and tuna-like species in the eastern Pacific Ocean (EPO). The original convention was replaced by the "Antigua Convention" on 27 August 2010, 15 months after it had been ratified or acceded to by seven Parties that were Parties to the original Convention on the date that the Antigua Convention was open for signature. On that date, Belize, Canada, China, Chinese Taipei, and the European Union became members of the Commission, and Spain ceased to be a member. Spanish interests were henceforth handled by the European Union. Kiribati joined the IATTC in June 2011. There were 21 members of the IATTC at the end of the second quarter of 2012.

The Antigua Convention states that the "Scientific Staff shall operate under the supervision of the Director," that it will "conduct scientific research … approved by the Commission," and "provide the Commission, through the Director, with scientific advice and recommendations in support of the formulation of conservation and management measures and other relevant matters." It states that "the objective of this Convention is to ensure the long-term conservation and sustainable use of the "tunas and tuna-like species and other species of fish taken by vessels fishing for tunas and tuna-like species," but it also states that the Commission is to "adopt, as necessary, conservation and management measures and recommendations for species belonging to the same ecosystem and that are affected by fishing for, or dependent on or associated with, the fish stocks covered by this Convention, with a view to maintaining or restoring populations of such species above levels at which their reproduction may become seriously threatened."

The scientific program is now in its 62nd year. The results of the IATTC staff's research are published in the IATTC's Bulletin and Stock Assessment Report series in English and Spanish, its two official languages, in its Special Report and Data Report series, and in books, outside scientific journals, and trade journals. Summaries of each year's activities are reported upon in the IATTC's Annual Reports and Fishery Status Reports, also in the two languages.

MEETINGS

IATTC meetings

An External Review of IATTC Yellowfin Tuna Assessment Methods and Assumptions was held in La Jolla, California, USA, on 15-19 October 2012. Drs. Guillermo Compeán, Richard B. Deriso, Alexandre Aires-da-Silva, Martín A. Hall, Michael G. Hinton, Cleridy E. Lenner-Cody, and Mark N. Maunder participated in the meeting. The reviewers were: Dr. Steve Martell (chairman), International Pacific Halibut Commission; Mr. Nick Davies, Secretariat of the Pacific Community; Dr. Paul De Bruyn, International Commission for the Conservation of Atlantic Tunas; Dr. Billy Ernst, Universidad de Concepción, Concepción, Chile.

The following background documents were presented at the meeting:

Overview of Data Used in the EPO Yellowfin Tuna Assessment, by Mark N. Maunder;

Exploring Large-Scale Patterns in Yellowfin Tuna Data from Dolphin Sets in the Eastern Pacific Ocean Purse-Seine Fishery, by Cleridy E. Lennert-Cody, Mark N. Maunder, and Alexandre Aires-da-Silva;
Poststratification of Purse-Seine Port-Sampling Data from Dolphin Sets, by Cleridy E. Lennert-Cody, Mark N. Maunder, Alexandre Aires-da-Silva, Alejandro Pérez, and JoyDeLee Marrow;
A Review and Evaluation of Recruitment and the Stock-Recruitment Relationship for the Assessment and Management of Yellowfin Tuna in the Eastern Pacific Ocean, by Mark N. Maunder and Alexandre Aires-da-Silva;
An Exploration of Alternative Methods to Deal with Time-Varying Selectivity in the Stock Assessment of Yellowfin Tuna in the Eastern Pacific Ocean, by Alexandre Aires-da-Silva and Mark Maunder;
A Review and Evaluation of Natural Mortality for the Assessment and Management of Yellowfin Tuna in the Eastern Pacific Ocean, by Mark N. Maunder and Alexandre Aires-da-Silva;
A Review of Historical EPO YFT Stock Assessment Sensitivity Analyses by Mark N. Maunder and Alexandre Aires-da-Silva.

The 84th meeting (extraordinary) of the IATTC was held in La Jolla, California, USA, on 24 October 2012. The following items were included in the provisional agenda for the meeting:

Overlap area between [the] IATTC and WCPFC [areas of jurisdiction];
Updated resolution on North Pacific albacore;
Adoption of conservation measures for fishing in association with fish-aggregating devices (FADs);
Adoption of a monitoring program of tuna sizes per fleet;
Discussion of measures on bluefin tuna adopted within the WCPFC;
Trade, certification, and sustainability of tunas.

International Dolphin Conservation Program meetings

The following meetings of the International Dolphin Conservation Program (IDCP) were held in La Jolla, California, USA, on 22-23 October 2012:

Number	Date	Meeting
31	22 October	Permanent Working Group on Tuna Tracking
17	22 October	Working Group to Promote and Publicize the AIDCP Dolphin Safe Tuna Certification System
52	22 October	International Review Panel
26	23 October	Meeting of the Parties [to the AIDCP]

The following background documents were presented at the 26th Meeting of the Parties [to the AIDCP]:
Report on the International Dolphin Conservation Program;
AIDCP Budget;
Report on the Implementation of the Memorandum of Cooperation (MOC) on the Cross-Endorsement of Observers Approved by the WCPFC [Western and Central Pacific Fisheries Commission] and the IATTC.

Other meetings

Dr. Martín A. Hall participated in the plenary session of the Biennial Meeting of the Sociedad Latinoamericana de Especialistas de Mamiferos Acuaticos in Puerto Madryn, Argentina, on 17 September 2012, where he gave a presentation entitled "Quien Dijo que la Pesca Selectiva es Buena para el Ecosistema?"

Dr. Hall visited the offices of the Instituto del Mar del Perú (IMARPE) in Callao, Peru, on 24 September 2012, where he participated in discussions with staff members of IMARPE regarding its National Plan of Action for marine mammals, sea turtles, and seabirds.

Dr. Hall participated in workshops on bycatch mitigation in fisheries on tunas associated with fish-aggregating devices for fishing captains and crew members, boat owners, and industry leaders in Manta, Ecuador, on 27-28 September 2012.

Mr. Kurt M. Schaefer participated at an Atlantic Innovation Fund (AIF) Project review meeting at Lotek Wireless, Inc., in St. John's, Newfoundland, Canada, on 1-2 October 2012. Lotek manufactures various types of electronic tags for studying the movements, behavior, and habitat utilization of aquatic and terrestrial animals. In addition to Mr. Schaefer, the participants included Lotek engineers and other staff members and representatives of the Canadian National Research Council and the Canadian Department of Fisheries and Oceans. Mr. Schaefer has been working with Lotek in development of various tags and utilizing its products with tropical tunas since about 2002. Lotek received a significant amount of money in 2007 from the AIF for a four-year project for the further refinement, development, and commercialization of archival tags for marine applications. The purpose of the meeting was to review and discuss the various active components of this project, including new tags under development, miniaturization, increases in memory capacity, and environmental sensors. Mr. Schaefer's travel expenses were covered by funds from the AIF Project, administered by Lotek.

Dr. Guillermo A. Compeán met with representatives of the Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación (SAGARPA) and Fideicomiso de Investigación para el Desarrollo del Programa Nacional de Aprovechamiento del Atún y Protección de Delfines y Otros en Torno a Especies Acuáticas Protegidas (FIDEMAR) in Mexico City on 11 October 2012.

Mr. Kurt M. Schaefer participated in a meeting of the scientific committee of the International Seafood Sustainability Foundation (ISSF) tuna bycatch project in Montpellier, France, on 14 and 20-21 October 2012. The committee meeting was scheduled to coincide with the symposium described in the next paragraph.

Mr. Schaefer participated in a symposium entitled "Mitigating Impacts of Fishing on Pelagic Ecosystems: Towards Ecosystem Based Management of Tuna Fisheries" in Montpellier, France, on 15-19 October 2012. The symposium was sponsored by the European Union-funded MADE project, "Mitigating Adverse Ecological Impacts of Open Ocean Fisheries" and the ISSF. Mr. Schaefer presented the following papers at the symposium: "Evaluating a Purse-Seine Captain's Ability to Accurately Predict Species Composition, Sizes, and Quantities of Tunas prior to Setting around Drifting Fish-Aggregating Devices" by Daniel W. Fuller and Kurt M. Schaefer and "Simultaneous Behavior of Bigeye, Skipjack, and Yellowfin Tunas Associated with Drifting Fish-Aggregating Devices in the Equatorial Eastern Pacific Ocean" by Kurt Schaefer and Daniel Fuller. Mr. Schaefer's travel expenses for both meetings were paid by the ISSF.

Mr. Ernesto Altamirano Nieto participated in a workshop of the Organización del Sector Pesquero y Acuícola de Centroamerica, sponsored by the U.S. National Oceanic and

Atmospheric Administration and the World Wildlife Fund (WWF), in San Salvador, El Salvador, on 11-12 October 2012. IATTC Resolution C-11-08 calls for observer coverage of at least 5 percent on longline vessels with overall lengths greater than 20 meters beginning in January 2013; the purpose of the workshop was to discuss how best to comply with the resolution. Mr. Altamirano gave a presentation entitled "Experience of the IATTC International Observer Program and the Coordination with Regional Observer Programs in the Purse Seine Fisheries of the EPO," and also participated in discussions regarding implementation of the program. Mr. Altamirano's travel expenses were paid by the WWF.

Drs. Guillermo A. Compeán, Richard B. Deriso, Martín A. Hall, Michael D. Scott, Mark N. Maunder, Alexandre Aires-da-Silva, and Cleridy Lennert-Cody, and Mr. Ernesto Altamirano Nieto participated in a tuna-dolphin workshop sponsored by the International Seafood Sustainability Foundation on 25-26 October 2012 in La Jolla, California, USA. The objective of the workshop was to "review scientific information related to the current impact of the EPO dolphin-associated tuna purse seine fishery on the relevant populations of dolphins." The following presentations were made by IATTC staff members:

Pelagic Predator Associations: Tuna and Dolphins in the ETP, by Michael Scott;

Purse Seine Methods for Fishing Tuna Associated with Dolphins in the ETP, by Ernesto Altamirano;

Dolphin Mortality Estimates, Focusing on the Early Ones. Observer Programs, by Martín Hall;

International Management of the Tuna-Dolphin Problem. The Agreement for the International Dolphin Conservation Program (AIDCP), by Martín Hall;

Procedures Used to Scan Observers for Evidence of Biased Data, by Cleridy Lennert-Cody;

Revised Dolphin Mortality Figures with the Small Seiners Included, by Cleridy Lennert-Cody;

Assessment of EPO Dolphin Populations, by Mark Maunder.

Mr. Kurt M. Schaefer participated at the Indian Ocean Tuna Tagging Symposium in Grand Baie, Mauritius, during the period of 30 October-2 November 2012. Mr. Schaefer presented the following paper at the symposium: "Improved Growth Estimates from Integrated Analysis of Age-at-Length and Tag-Recapture Data for Bigeye and Yellowfin Tuna in the Eastern Pacific Ocean and Their Impact on Stock Assessment Results and Management" authored by Alexandre Aires-da-Silva, Mark. N Maunder, Kurt M. Schaefer, and Daniel W. Fuller. Mr. Schaefer's expenses for the trip were covered by the Indian Ocean Tuna Commission.

Dr. Michael D. Scott participated in the 13th International Conference of the American Cetacean Society in San Diego, California, USA, on 9-11 November 2012.

Drs. Mark N. Maunder and Alexandre Aires-da-Silva participated in a meeting of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean in Honolulu, Hawaii, USA, on 10-17 November 2012, at which a full stock assessment of Pacific bluefin tuna was performed.

Dr. Martín A. Hall attended the Stakeholder Council meeting of the Marine Stewardship Council in London on 14-15 November 2012. Later, on 21-22 November 2012, he was at the Universitat de València in Spain, where he conducted a conference entitled "La Pesca del Atún y las Capturas Accidentales: Implicaciones en la Conservación de Delfines." In addition, he conducted a workshop on "The Development of Research Strategies to Address Bycatch

Problems, Using as an Example the Sea Turtle-Longline Interactions." He also met with the research group from the Aquarium de Valencia (L'oceanografic) to discuss activities to mitigate bycatches in its regional fisheries and ways to improve its communication with the public on sustainability and conservation issues.

Dr. Guillermo A. Compeán and Mr. Marlon H. Román Verdesoto participated in the XV Foro Nacional sobre el Atún, "Estado de las Poblaciones de Atunes en el Océano Pacífico Oriental (OPO)," in Ensenada, Baja California, Mexico, on 21-23 November 2012. Mr Román gave a talk entitled "Estimación de la Trayectoria Lineal, Distancia y Tiempo de Remojo de FADs Sembrados el Viaje Previo" at the meeting.

Dr. Daniel Margulies participated in an international symposium entitled "Innovative Technology and Globalization of Tuna Aquaculture," held in Kushimoto, Wakayama Prefecture, Japan, on 23-24 November 2012. The symposium was sponsored by the Global Center of Excellence (GCOE) Program of Kinki University. Dr. Margulies presented a paper entitled "Comparative Studies of the Reproductive Biology and Early Life History of Yellowfin and Pacific Bluefin Tuna Conducted in Panama and Japan," co-authored with Vernon P. Scholey, Jeanne B. Wexler, Maria Stein, Luis C. Tejada, Susana Cusatti, Yoshifumi Sawada, Yang-Su Kim, Tomoki Honryo, and Angel Guillén. Dr. Margulies's expenses were paid by the Kinki University GCOE Program.

RESEARCH

DATA COLLECTION AND DATABASE PROGRAM

There are two major fisheries for tunas in the eastern Pacific Ocean (EPO; the region east of 150ºW, south of 50ºN, and north of 50°S), the commercial surface fishery and the longline fishery. The catches by the commercial surface fishery are taken almost entirely by purse-seine and pole-and-line vessels based in ports of Western Hemisphere nations. The longline catches are taken almost entirely by vessels registered and based in Far Eastern nations. The staff of the IATTC collects data on the catches by purse-seine and pole-and-line vessels and samples the catches of these vessels at unloading facilities in Las Playas and Manta, Ecuador; Manzanillo and Mazatlan, Mexico; Panama, Republic of Panama; and Cumaná, Venezuela, where it has field offices, and also, to a lesser extent, at other ports. The governments of the nations in which the catches of the longliners that fish in the EPO are registered compile the catch and size data for those vessels and make the data, in aggregated form, available to the IATTC staff. The rest of this section deals almost entirely with the surface fisheries.

Compilation of data on the amounts of catch, and on species and length composition of the catch for the surface fisheries is complicated. Observers accompany all trips of Class-6 purse seiners (vessels with fish-carrying capacities greater than 363 metric tons) that fish in the EPO, and the data that they collect include the locations and dates of each set, the type of each set (dolphin, floating object, or unassociated), the approximate total weights of each species caught in each set, and the wells in which the fish caught in each set are stored. Similar data are obtained from the logbooks of smaller purse seiners and of pole-and-line vessels, although these data may be less accurate or less precise than those collected by the observers. Then, when a vessel unloads its catch, the weight of the contents of each well is made available to the IATTC staff. These "reported catch statistics"—catch statistics obtained from every possible source, including observer records, fishing vessel logbooks, unloading records, and data compiled by governmental agencies—are compiled to provide an estimate of the total amount of tropical tunas (yellowfin, bigeye, and skipjack combined) caught annually by the surface fisheries. In addition, sample data on the species and length composition of the catch are also obtained when a vessel unloads. The methods for collection of these sample data are described in the IATTC Annual Report for 2000 and in IATTC Stock Assessment Reports 2, 4, 10, 11, 12, and 13. 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 in the same sampling area, during the same calendar month, and by the same type of gear (pole-and-line, or in the same type of set of a Class 1-5 or a Class-6 vessel). These data are then categorized by fishery (Figure 1).

The sample data on species and length composition of the catch are eventually combined with the reported catch statistics to make the "final" estimates of the catches by species and length- and weight-frequency distributions by species that appear in the IATTC's Stock Assessment Reports, Fishery Status Reports, and papers in outside journals, but this does not take place until two or more months after the end of the calendar year. (If additional information is acquired after the "final" estimates are calculated, that information is used to recalculate the estimates.) Most of the catch statistics that appear in the rest of this report are preliminary, as the calculations cannot be performed until after the end of the year.

IATTC personnel stationed at its field offices collected 311 length-frequency samples from 195 wells and abstracted logbook information for 280 trips of commercial fishing vessels during the fourth quarter of 2012.

Reported fisheries statistics

The information reported herein are for the eastern Pacific Ocean (EPO: the region east of 150ºW, south of 50ºN, and north of 50°S), unless noted otherwise. The catches are reported in metric tons (t), vessel capacities in cubic meters (m^3), and effort in days fishing. Estimates of fisheries statistics with varying degrees of accuracy and precision are available. The most accurate and precise are those made after all available information has been entered into the data base, processed, and verified. 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. Thus the estimates for the current week are the most preliminary, while those made a year later are much more accurate and precise. The statistics are developed using data from many sources, including reports of landing, fishing vessel logbooks, scientific observers, and governmental agencies.

Fleet statistics for the purse seine and pole-and-line fisheries

The lists of vessels authorized to fish for tunas in the EPO are given in the IATTC Regional Vessel Register. The estimated total carrying capacity of the purse-seine and pole-and-line vessels that have fished or are expected to fish in the EPO during 2012 is about 219,237 m^3 (Table 1). The average weekly at-sea capacity for the fleet, for the weeks ending 1 October through 31 December, was about 111,664 m^3 (range: 42,469 to 169,660 m^3).

Catch and catch-per-unit-of-effort statistics for the purse-seine and pole-and-line fisheries

Catch statistics

The estimated total retained catches (t) of tropical tunas from the EPO during the period of January-December 2012, and comparative statistics for 2007-2011, were:

Species	**2012**	**2007-2011**			**Weekly average, 2012**
		Average	**Minimum**	**Maximum**	
Yellowfin	203,500	209,600	181,600	235,100	3,900
Skipjack	265,600	233,200	170,700	297,500	5,100
Bigeye	51,700	51,800	44,100	60,000	1,000

Summaries of the estimated retained catches, by species and by flag of vessel, are shown in Table 2.

Catch-per-unit-of-effort statistics for purse seine vessels

No adjustments in the catch-per-unit-of-effort data are included for 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 measures of catch rate used in analyses are based on fishing trips landing predominantly yellowfin, skipjack, bigeye, and bluefin tuna. The great majority of the purse-seine catches of yellowfin, skipjack, and bigeye are made by vessels with fish-carrying capacities greater than about 425 m^3, and only data for these vessels are included in these measures of catch rate. There are now far fewer pole-and-line vessels than in previous years, so the data for these vessels are combined without regard to carrying capacity.

The estimated nominal catches per day of fishing for yellowfin, skipjack, and bigeye in the EPO during the third quarter of 2012 and comparative statistics for 2007-2011 were:

Region	**Species**	**Gear**	**2012**	**2007-2011**		
				Average	**Minimum**	**Maximum**
N of 5° N	Yellowfin	PS	12.0	11.6	8.2	14.0
S of 5° N			3.5	2.8	2.4	3.5
N of 5° N	Skipjack	PS	2.1	2.2	0.8	3.5
S of 5° N			8.8	9.1	6.3	11.4
EPO	Bigeye	PS	2.2	2.4	1.9	3.1
EPO	Yellowfin	LP	3.1	5.0	2.3	9.2
EPO	Skipjack	LP	1.1	0.6	0.4	1.1

Catch statistics for the longline fishery

The catches of bigeye by longline gear in the EPO are reported by flag states whose annual catches have exceeded 500 t (C-09-01-Tuna-conservation-2009-2011). Preliminary estimates of the catches reported for January-December 2012, are shown in Table 3.

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. 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.

Data for fish caught during the third quarter of 2007-2012 are presented in this report. Two sets of length-frequency histograms are presented for each species; the first shows the data by stratum (gear type, set type, and area) for the third quarter of 2012, and the second shows data for the combined strata for the third quarter of each year of the 2007-2012 period. Samples from 280 wells were taken during the third quarter of 2012.

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 280 wells sampled that contained fish caught during the third quarter of 2012, 163 contained yellowfin. The estimated size compositions of these fish are shown in Figure 2a. The majority of the yellowfin catch during the third quarter was taken by sets on dolphins in the Northern, Inshore, and Southern areas, and in the Northern unassociated fishery. Smaller amounts of yellowfin were taken in the floating object fishery.

The estimated size compositions of the yellowfin caught by all fisheries combined during the third quarters of 2007-2012 are shown in Figure 2b. The average weight of yellowfin caught during the third quarter of 2012 (8.2 kg) was less than those of any of the previous five years.

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 280 wells sampled that contained fish caught during the third quarter of 2012,144 contained skipjack. The estimated size compositions of these fish are shown in Figure 3a. Large amounts of skipjack in the 40- to 50-cm range were caught in the Northern, Equatorial, and Southern floating-object fishery, and in the Northern and Southern unassociated fishery during the third quarter.

The estimated size compositions of the skipjack caught by all fisheries combined during the third quarter of 2007-2012 are shown in Figure 3b. The average weight of skipjack caught during the third quarter of 2012 (1.7 kg) was less than those of four of the five preceding years.

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 280 wells sampled that contained fish caught during the third quarter of 2012, 50 contained bigeye. The estimated size compositions of these fish are shown in Figure 4a. The majority of the bigeye catches during the third quarter came from the Northern, Equatorial, and Southern floating-object fisheries, with smaller amounts taken in the unassociated fishery. The majority of the bigeye caught during the third quarter were in the 40-60 cm size range.

The estimated size compositions of the bigeye caught by all fisheries combined during the third quarter of 2007-2012 are shown in Figure 4b. The average weight of bigeye caught during the third quarter of 2012 (3.7 kg) was considerably less than that of any of the previous five years.

The estimated retained purse-seine catch of bigeye less than 60 cm in length during the third quarter of 2012 was 5,542 metric tons (t), or about 33 percent of the estimated total retained purse-seine catch of bigeye during that period. The corresponding amounts for 2007-2011 ranged from 2,469 to 9,587 t, or 16 to 46 percent. These values may differ slightly from those given in previous Quarterly Reports due to changes in the estimation procedure.

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 2012, bluefin were caught between 26°N and 32°N from June through September. In the past, commercial and recreational catches have been reported separately. The inability to collect sufficient numbers of samples during 2004 through 2012, however, has made it infeasible to estimate the catches and size compositions separately. Therefore, the commercial and recreational catches of bluefin have been combined for each year of that period. The estimated size compositions for 2007-2012 are shown in Figure 5.

BIOLOGY AND ECOSYSTEM PROGRAM

Early life history studies

Yellowfin broodstock

The yellowfin broodstock in Tank 1 (1,362,000 L) at the Achotines Laboratory spawned daily except on 15 November and 14 and 16 December 2012. Spawning occurred between 10:05 p.m. and 11:30 p.m. The numbers of eggs collected after each spawning event ranged from about 9,000 to 433,000. The water temperatures in the tank during the quarter ranged from 27.1° to 28.7°C.

At the end of the quarter there were four 55- to 61-kg yellowfin, two 44- to 45-kg yellowfin, and five 20- to 26-kg yellowfin in Tank 1. There were four 7- to 10-kg yellowfin in the 170,000-L reserve broodstock tank (Tank 2).

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.

Comparative studies of yellowfin and Pacific bluefin larvae

A joint Kinki University (KU)-IATTC-ARAP [Autoridad de los Recursos Acuáticos de Panamá] 5-year research project is being supported in Panama by the Japan International Cooperation Agency (JICA) (see Quarterly Report for January-March 2011). This project, which is being conducted through the Science and Technology Research Partnership for Sustainable Development (SATREPS) Program, involves comparative studies of the early life histories of Pacific bluefin and yellowfin tuna.

In October scientists of the IATTC's Early Life History Group participated in joint KU-IATTC-ARAP-JICA planning meetings for the SATREPS project. During these meetings, overall project coordination and communication were discussed. In addition, the participants reviewed research schedules, training and education schedules, and equipment needs and budgets for the next several years.

As part of the SATREPS project, scientists of the IATTC's Early Life History Group spent the period of mid-November through mid-December at the Achotines Laboratory to conduct experiments on yellowfin tuna larvae.

One experiment investigated the growth potential and responses to delayed feeding in yellowfin larvae during the first week of feeding. Yolk-sac larvae were stocked in six experimental tanks at equal densities of 10 larvae per liter. The fish in three tanks were fed at low food levels of 75 rotifers per liter for the first day of feeding, followed by a more nearly optimal level of 3000 rotifers per liter for 6 days of feeding. Those in the other three tanks were fed at the low level for the first two days, followed by 5 full days of feeding at the level of 3000 rotifers per liter. The trial was ended after 7 full days of feeding. Preliminary results show that yellowfin larvae were able to recover from either 1- or 2-day delays in optimal food conditions. The mean survival in the 2-day delayed treatment was almost 50 percent of that in the 1-day delayed treatment. However, the mean growth in weight and length of the survivors of the 2-day delayed treatment was only slightly less than that of the larvae subject to only 1 day at low food levels. These trials will be repeated with Pacific bluefin larvae in Japan during 2013 to compare the two species' growth and survival potential after experiencing periods of sub-optimal food conditions.

In another experiment, patterns of density-dependent growth were investigated in 3- to 9- and 10-day-old yellowfin larvae. Yolk-sac larvae were stocked in two sets of three replicate tanks at a high density of 16 larvae per liter and at a low density of 4 larvae per liter. They were fed moderate to high food levels during the experiment. A similar experiment was also conducted during June 2112 (IATTC Quarterly Report for April-June 2012) with 3- to 11-day-old yellowfin larvae. The results of this experiment indicated that the growth rates in both length and weight were slightly less for larvae at the higher densities than for those at the lower densities, but the difference was not statistically significant. A four- to seven-fold increase in densities resulted in growth deficits of 2 to 12 percent in weight and 1 to 18 percent in length.

The results of previous density experiments conducted on yellowfin larvae during the first week of feeding (between the ages of 3 to 7, 3 to 8, and 3 to 9 days after hatching) have indicated that larvae maintained at higher stocking densities grow significantly more slowly than those maintained at lower densities when fed similar food levels to those used in the current experiment. Two- and four-fold increases in larval densities resulted in much greater growth deficits of 21 to 53 percent in weight and 21 to 79 percent in length. The discrepancy in growth differences between the June experiment and the previous experiments may be due to the difference in age of the larvae used in the experiments. The more recent experiment was terminated when the larvae were two days older than those in the earlier experiments. The effect of stocking density on growth during older stages of development appears to diminish with age, but may be affected more by food levels (IATTC Quarterly Report for October-December 2008). The growth of larvae between the ages of 3 and 9 days after hatching appears to be more affected by stocking densities than does the growth of older larvae, regardless of food levels. The results of the experiment conducted during December 2012 will be analyzed during 2013 and may confirm stage-specific effects of density on growth in yellowfin larvae. Comparative trials examining density-dependent growth in larvae of Pacific bluefin will also be conducted in Japan during 2013.

Dr. Yang-Su Kim, a Kinki University post-doctoral fellow, arrived at the Achotines Laboratory in September 2012 to initiate trials with yellowfin tuna larvae. Dr. Kim was joined near the end of October by other Kinki University professors, graduate students, and post-doctoral researchers, and also ARAP scientists and IATTC early life history staff members. This period of joint research activity at the Achotines Laboratory continued through mid-December of 2012.

Studies of snappers

The work on snappers (*Lutjanus* spp.) is carried out by the Autoridad de los Recursos Acuáticos de Panamá (ARAP).

During 1996-2009, the ARAP staff had conducted full life cycle research on spotted rose snappers (*Lutjanus guttatus*) in captivity. Efforts to rebuild the broodstock population of this species, in order to continue research, has been unsuccessful in recent years, with only one fish remaining in the broodstock snapper tank at the end of the fourth quarter of 2012. The ARAP staff plans to continue work with this species when it is able to establish a broodstock population.

Oceanography and meteorology

Easterly surface winds blow almost constantly over northern South America, which cause upwelling of cool, nutrient-rich subsurface water along the equator east of 160ºW, in the coastal regions off South America, and in offshore areas off Mexico and Central America. El Niño events are characterized by weaker-than-normal easterly surface winds, which cause above-normal sea-surface temperatures (SSTs) and sea levels and deeper-than-normal thermoclines over much of the tropical eastern Pacific Ocean (EPO). In addition, the Southern Oscillation Indices (SOIs) are negative during El Niño episodes. (The SOI is the difference between the anomalies of sea-level atmospheric pressure at Tahiti, French Polynesia, and Darwin, Australia. It is a measure of the strength of the easterly surface winds, especially in the tropical Pacific in the Southern Hemisphere.) Anti-El Niño events, which are the opposite of El Niño events, are characterized by stronger-than-normal easterly surface winds, below-normal SSTs and sea levels, shallower-than-normal thermoclines, and positive SOIs. Two additional indices, the NOI* (Progress Ocean., 53 (2-4): 115-139) and the SOI*, have recently been devised. The NOI* is the difference between the anomalies of sea-level atmospheric pressure at the North Pacific High (35°N-130°W) and Darwin, Australia, and the SOI* is the difference between the anomalies of sea-level atmospheric pressure at the South Pacific High (30°S-95°W) and Darwin. Ordinarily, the NOI* and SOI* values are both negative during El Niño events and positive during anti-El Niño events.

In December 2011 there was a band of cool water along the equator from the coast of South America to west of 180° and also a large area of cool water between about 110°W and 150°W and 10°S and 20°S (IATTC Quarterly Report for October-December 2011: Figure 6). These began to dissipate in January 2012, and in February and March an area of cool water extended from southern Baja California to the Equator at about 125°W, and then westward along the Equator to west of 180° (IATTC Quarterly Report for January-March 2012: Figure 8). This area of cool water moved northward during the ensuing months and persisted through September. A large area of warm water appeared off southern Peru and northern Chile in February 2012, and this persisted through July. In April a portion of this area of warm water extended westward along the equator to about 115°W. This extension retreated in May, but then extended further to the west in June (IATTC Quarterly Report for April-June 2012: Figure 5). It began to weaken in August and nearly disappeared in September. The area of warm water that had been off South America since February 2012 began to retreat to the north during July, becoming a narrow band along the Equator during August, and nearly disappearing in September. In December a small area of warm water formed off Mexico and a short tongue of cool water formed along the Equator off Ecuador (Figure 6). The SSTs were mostly below normal from January through March and mostly above normal from June through November (Table 4). The SST anomalies for December 2012 are quite different to those of December 2011, when there were large areas of cool water over much of the tropical EPO (plus a large area of warm water far offshore south of 20°S). According to the Climate Diagnostics Bulletin of the U.S. National Weather Service for December 2012, "Model predictions favor near-average SST … from the Northern Hemisphere winter 2012-13 into summer 2013 … Because predictions through the April-June season are known to be less skillful, the forecasts for the summer carry limited confidence at this time. Thus, it is considered unlikely that an El Niño or [anti-El Niño] will develop during the next several months, and … neutral [conditions are] … favored through Northern Hemisphere spring [of] 2013."

BYCATCH PROGRAM AND INTERNATIONAL DOLPHIN CONSERVATION PROGRAM

Data collection

The IATTC had field offices at Las Playas and Manta, Ecuador; Manzanillo and Mazatlan, Mexico; Panama, Republic of Panama; and Cumaná, Venezuela, during the fourth quarter of 2012. Members of the field office staffs placed IATTC observers on 63 fishing trips by vessels that participate in the AIDCP On-Board Observer Program.

Observer program

Coverage

The Agreement on the International Dolphin Conservation Program (AIDCP) requires 100-percent coverage by observers on trips by Class-6 purse seiners (vessels with fish-carrying capacities greater than 363 metric tons) that fish for tunas in the EPO. This mandate is carried out by the AIDCP On-Board Observer Program, made up of the IATTC's international observer program and the observer programs of Colombia, Ecuador, the European Union, Mexico, Nicaragua, Panama, and Venezuela. The observers are professionals in biology or related fields 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 effects 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 IATTC resolutions 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 2012 the observer programs of Colombia, the European Union, Mexico, Nicaragua, Panama, and Venezuela were to sample half, and that of Ecuador approximately one-third, of the trips by vessels of their respective fleets, while IATTC observers were 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 other ocean areas 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. In 2011, the IATTC and Western and Central Pacific Fisheries Commission (WCPFC) member nations agreed on a memorandum of cooperation (MOC) on the cross endorsement of observers aboard vessels operating in the convention areas of both organizations). As part of the implementation of the MOC, the secretariats of the two organizations put together a series of procedures for the observers of the Regional Observer Program (ROP) to follow under the umbrella of the WCPFC for tuna purse seiners, while observing fishing activity in the IATTC convention area. Under that MOC, one Party to both organizations and to the AIDCP requested that a cross-endorsed observer be allowed to be deployed on a vessel planning to operate in both areas. This request was granted.

Observers from the On-Board Observer Program, as described above, departed on 117 fishing trips aboard purse seiners covered by that program during the fouth quarter of 2012. Preliminary coverage data for these vessels during the quarter are shown in Table 5.

Training

The IATTC staff did not conduct any training of observers during the last quarter of 2012.

GEAR PROJECT

No purse-seine vessels participated in safety-gear inspections or safety-panel alignments during the fourth quarter of 2012.

ADMINISTRATION

Mr. David A. Bratten has elected to retire. He has been a hardworking, conscientious, and effective member of the Bycatch and International Dolphin Conservation Program staff since December 1978, and he had led the observer and gear programs since the mid-1980s. He participated in nearly all of the 52 meetings of the International Review Panel that have been held since it was established in 1992. He is an expert on gear configuration, and has made many trips to ports in Latin America to participate in test sets and prepare reports to the vessel owners and captains about the condition of the gear in regard to minimizing dolphin mortalities. In addition, he has had a major role in the development and implementation of the fishing captains' seminar programs, which are essential to the reduction of dolphin mortality. In these workshops, the data for individual vessels are reviewed with each captain, and the averages for the fleet are discussed with the entire group, pinpointing areas that need improvement and offering advice on possible solutions. Mr. Bratten was liked and respected by everyone with whom he worked—fellow staff members and members of the fishing industry—which has contributed greatly to the success of the Tuna-Dolphin Program. Before his employment with the IATTC, from December

1974 to December 1978, Mr. Bratten was an observer for the U.S. National Marine Fisheries Service observer program.

Mr. Bratten will be missed by everyone on the IATTC staff, but we all wish him the best, and hope that he will drop in on us as often as he can.

Mr. Ernesto Altamirano Nieto has been appointed to replace Mr. Bratten in his functions.

Messrs. José Miguel Carvajal of the Instituto Costarricense de Pesca y Acuicultura (INCOPESCA) and Fernando Márquez Farías of the Universidad Autónoma de Sinaloa, México, spent the period of 4-20 December 2012, at the IATTC headquarters in La Jolla, California, USA, where they worked with IATTC staff members on Costa Rican and Mexican shark-related fisheries within the context of the IATTC stock assessment of silky sharks in the EPO.

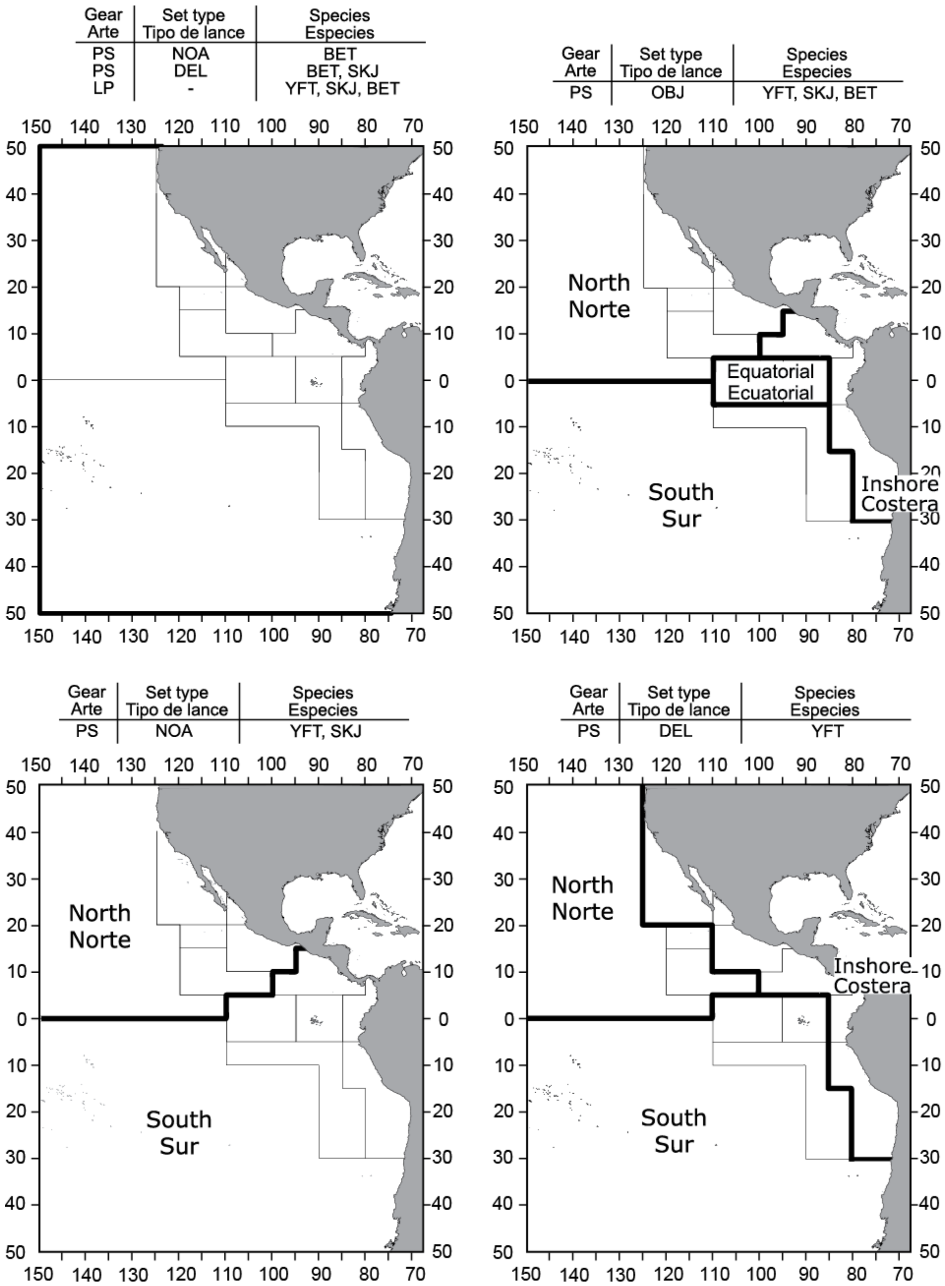

FIGURE 1. Spatial extents of the fisheries defined by the IATTC staff for stock assessment of yellowfin, skipjack, and bigeye in the EPO. The thin lines indicate the boundaries of the 13 length-frequency sampling areas, and the bold lines the boundaries of the fisheries. Gear: PS = purse seine, LP =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

FIGURA 1. Extensión espacial de las pesquerías definidas por el personal de la CIAT para la evaluación de las poblaciones de atún aleta amarilla, barrilete, 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. Artes: PS = red de cerco, LP = caña; Tipo de lance: NOA = peces no asociados, DEL = delfín; OBJ = objeto flotante; Especies: YFT = aleta amarilla, SKJ = barrilete, BET = patudo.

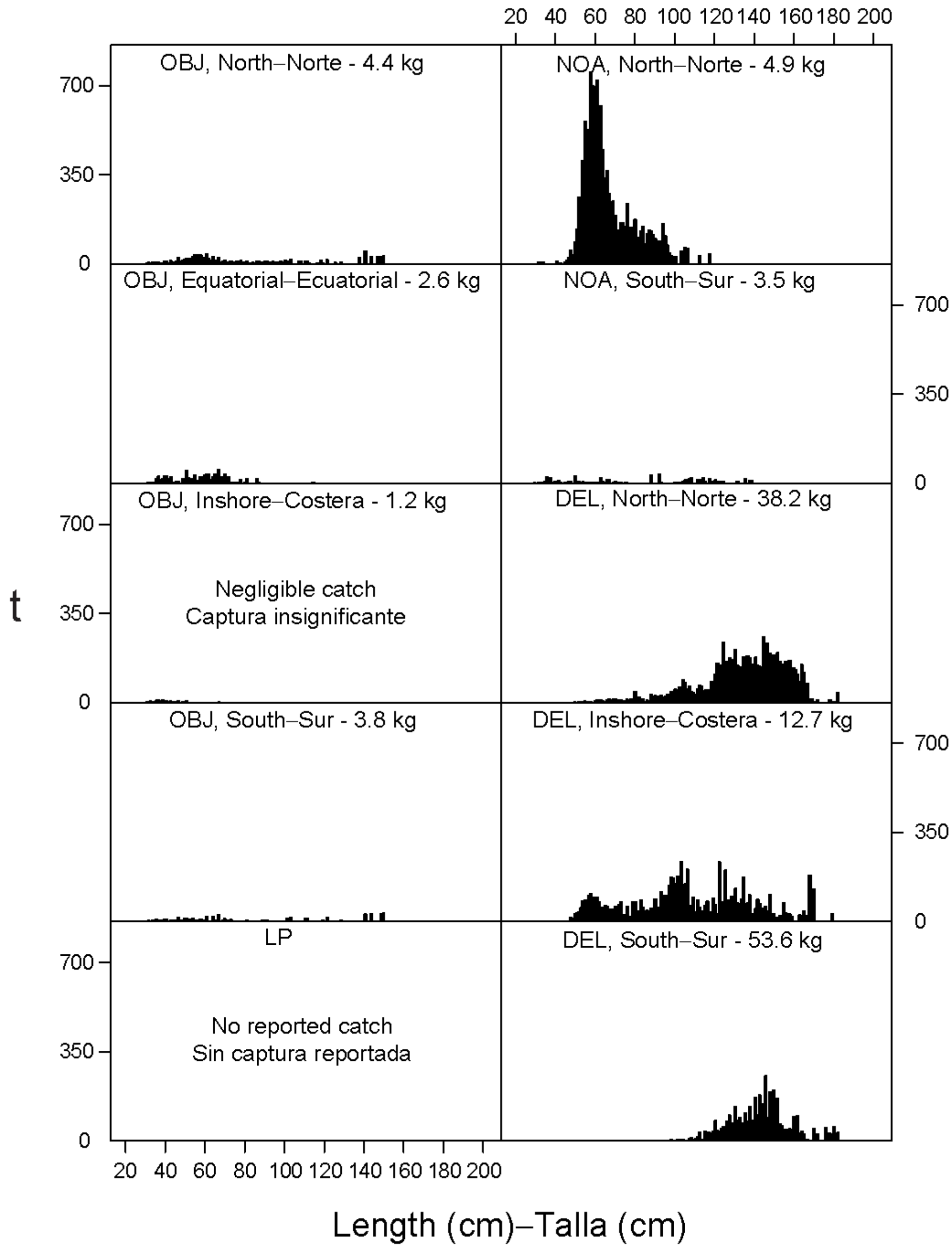

FIGURE 2a. Estimated size compositions of the yellowfin caught in each fishery of the EPO during the third quarter of 2012. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 2a. Composición por tallas estimada para el aleta amarilla capturado en cada pesquería del OPO durante el tercer trimestre de 2012. En cada recuadro se detalla el peso promedio de los peces en las muestras. OBJ = objeto flotante; LP = caña; NOA = peces no asociados; DEL = delfín; t = toneladas métricas.

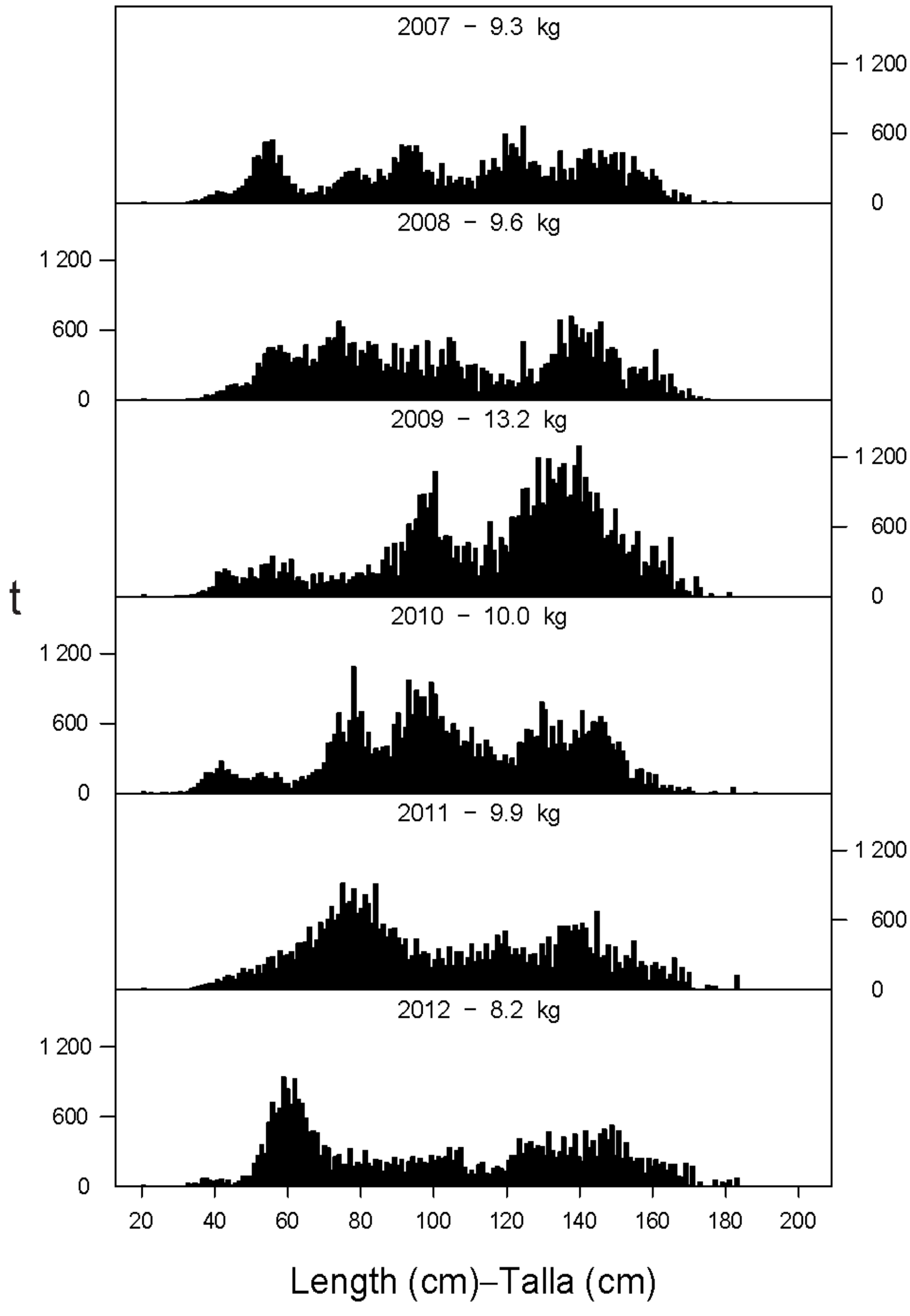

FIGURE 2b. Estimated size compositions of the yellowfin caught in the EPO during the third quarter of -2012. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.
FIGURA 2b. Composición por tallas estimada para el aleta amarilla capturado en el OPO en el tercer trimestre de 2007-2012. En cada recuadro se detalla el peso promedio de los peces en las muestras; t = toneladas métricas.

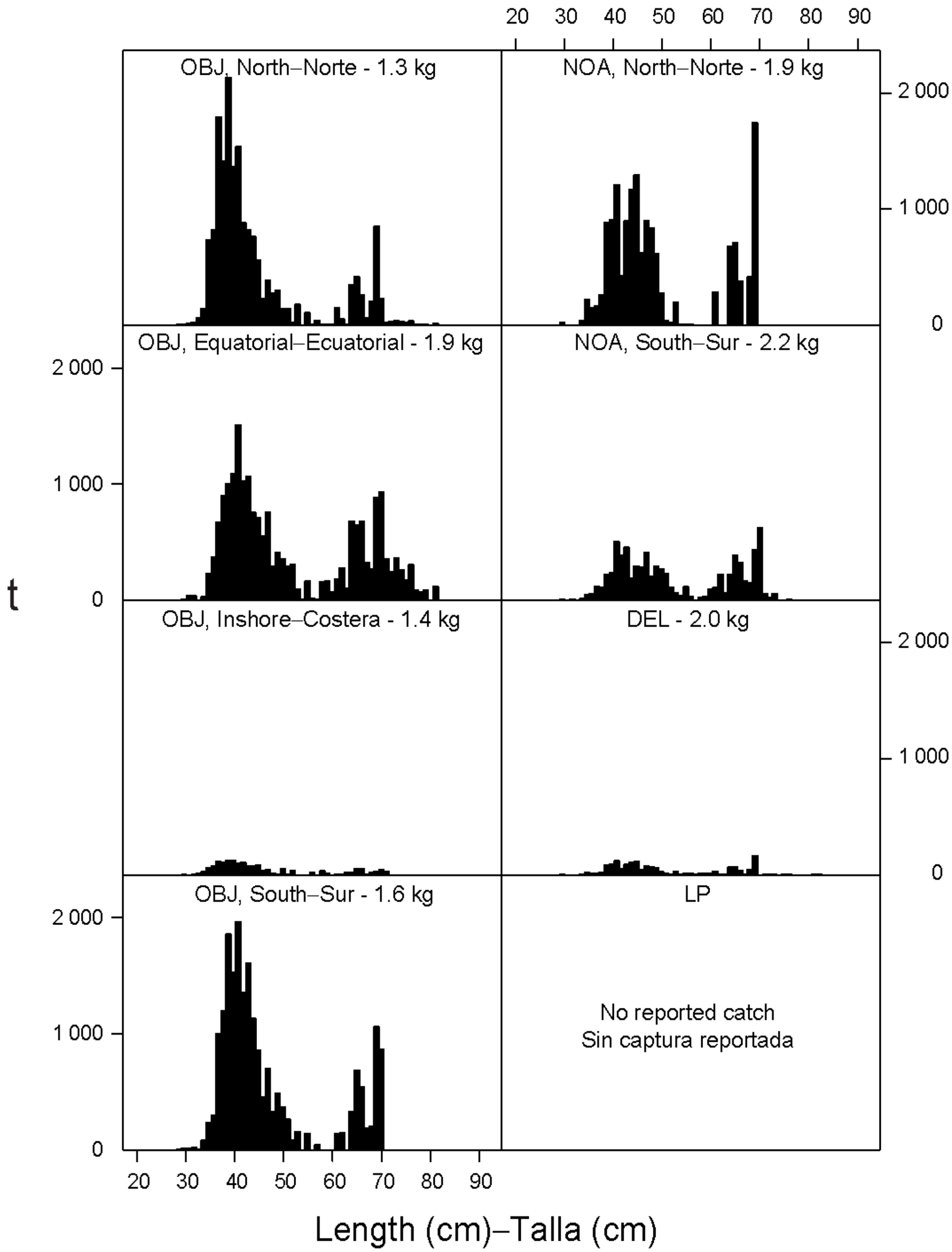

FIGURE 3a. Estimated size compositions of the skipjack caught in each fishery of the EPO during the third quarter of 2012. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.
FIGURA 3a. Composición por tallas estimada para el barrilete capturado en cada pesquería del OPO durante el tercer trimestre de 2012. En cada recuadro se detalla el peso promedio de los peces en las muestras. OBJ = objeto flotante; LP = caña; NOA = peces no asociados; DEL = delfín; t = toneladas métricas.

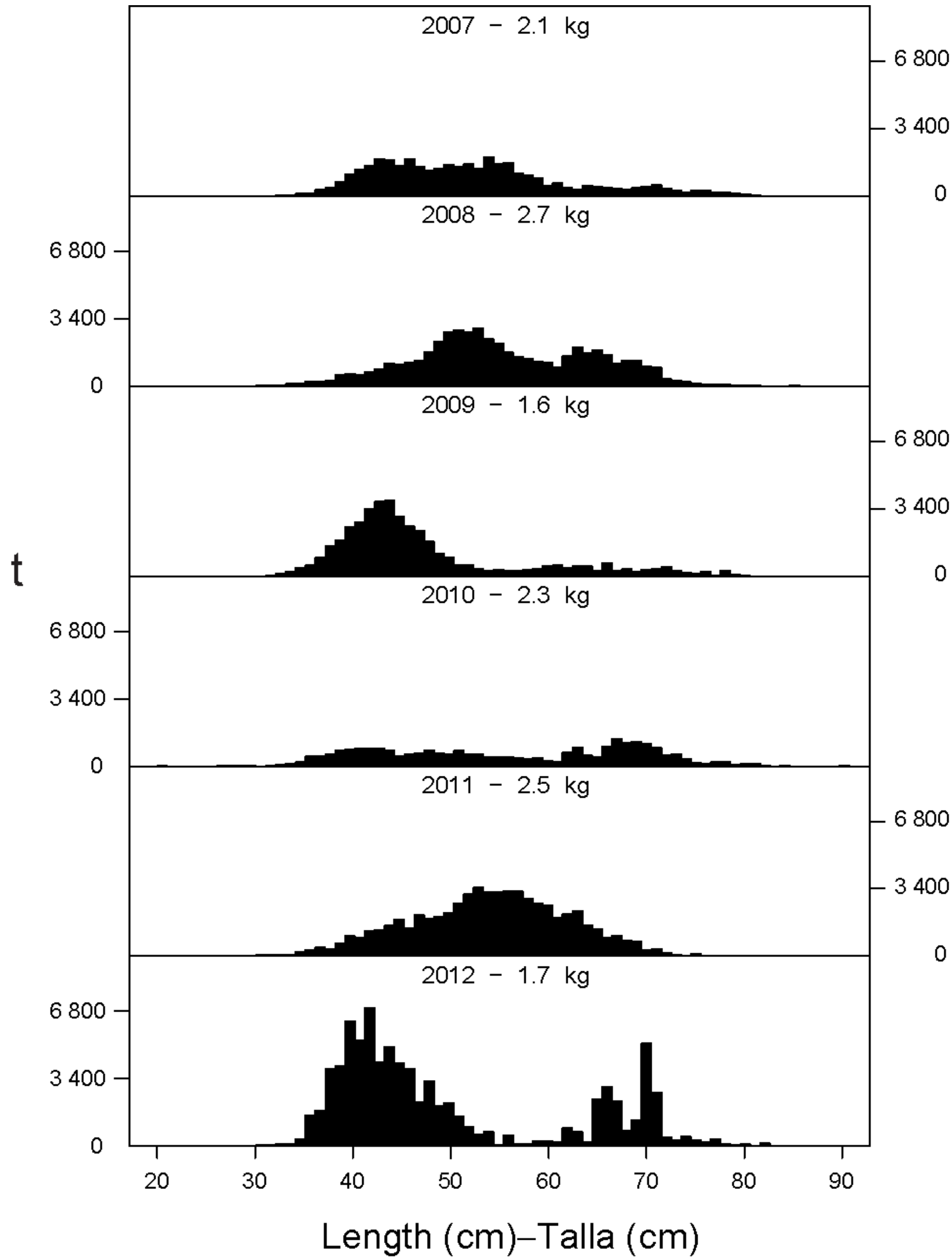

FIGURE 3b. Estimated size compositions of the skipjack caught in the EPO during the third quarter of 2007-2012. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 3b. Composición por tallas estimada para el barrilete capturado en el OPO en el tercer trimestre de 2007-2012. En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas.

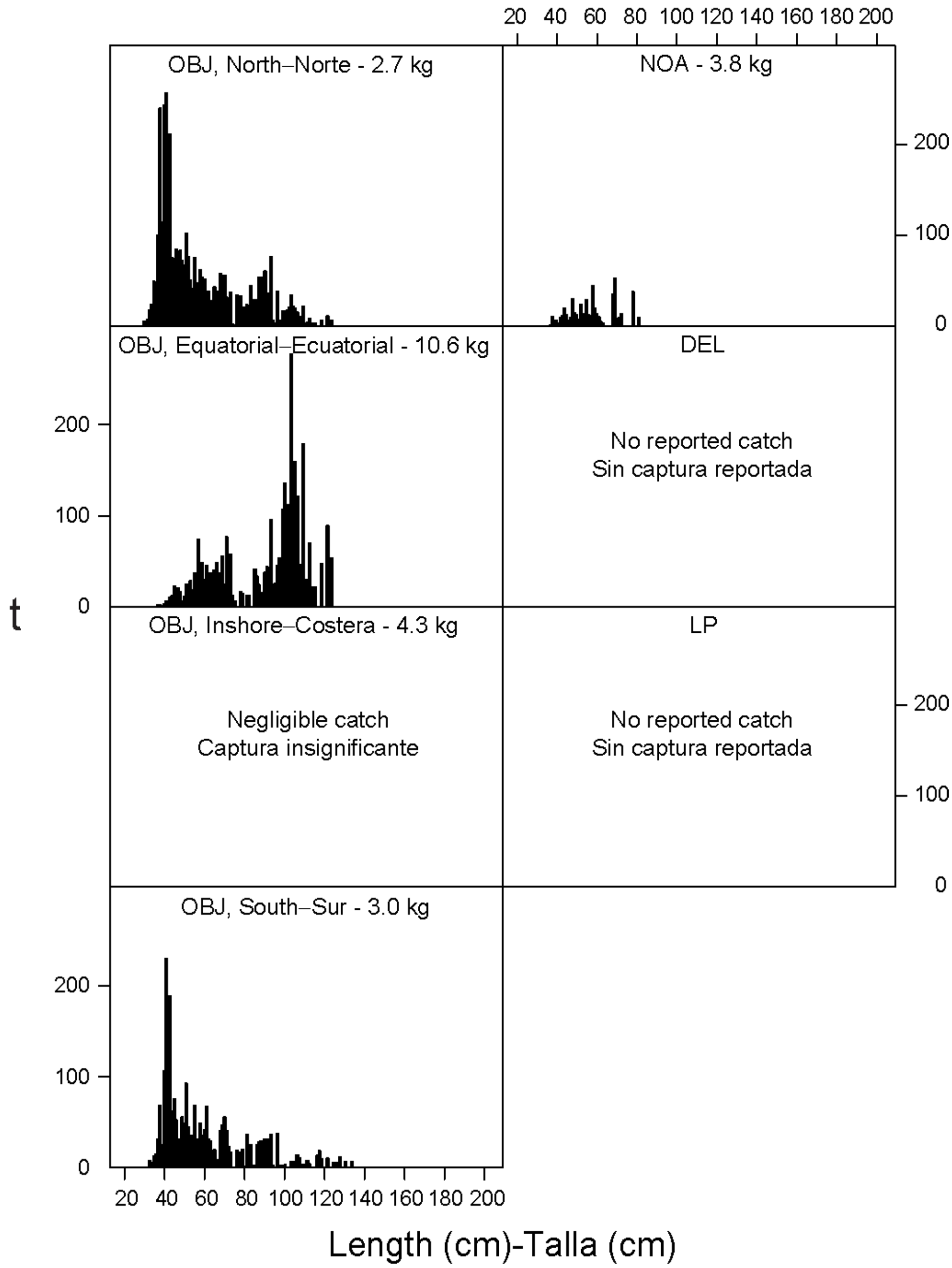

FIGURE 4a. Estimated size compositions of the bigeye caught in each fishery of the EPO during the third quarter of 2012. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 4a. Composición por tallas estimada para el patudo capturado en cada pesquería del OPO durante el tercer trimestre de 2012. En cada recuadro se detalla el peso promedio de los peces en las muestras. OBJ = objeto flotante; LP = caña; NOA = peces no asociados; DEL = delfín; t = toneladas métricas.

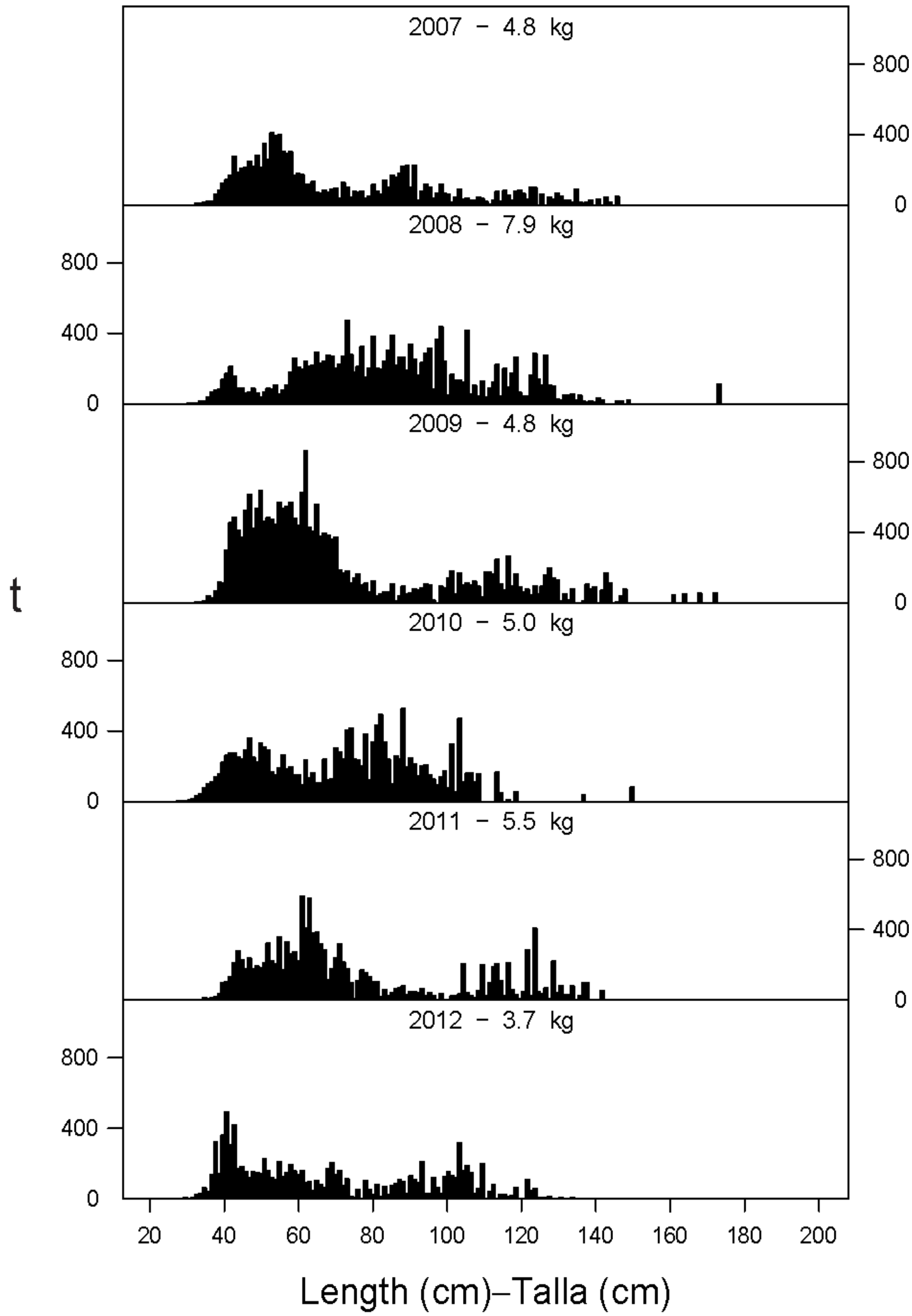

FIGURE 4b. Estimated size compositions of the bigeye caught in the EPO during the third quarter of 2007-2012. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 4b. Composición por tallas estimada para el patudo capturado en el OPO en el tercer trimestre de 2007-2012. En cada recuadro se detalla el peso promedio de los peces en las muestras; t = toneladas métricas.

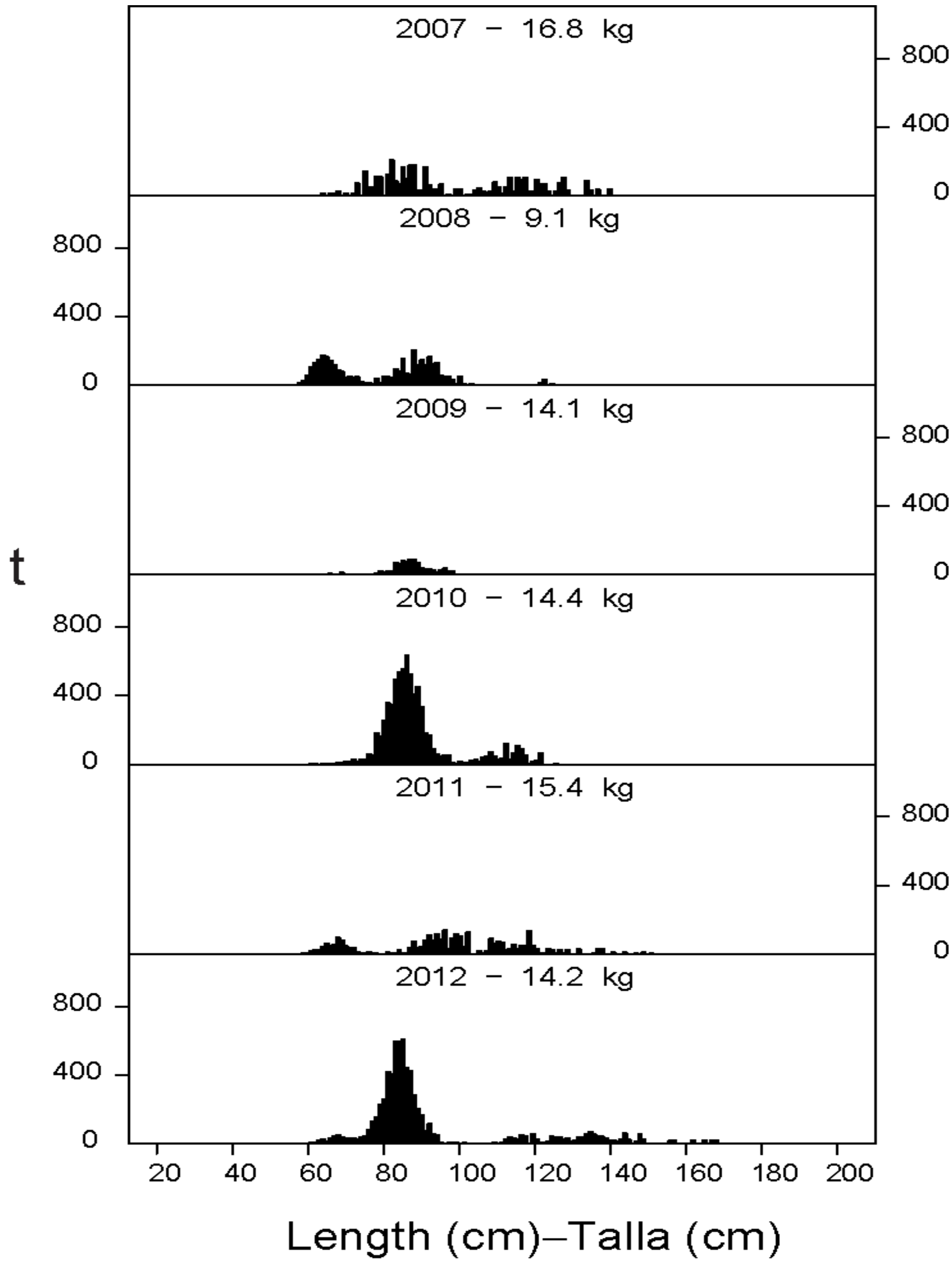

FIGURE 5. Estimated size compositions of Pacific bluefin by purse-seine and recreational gear in the EPO during 2007-2012. The values at the tops of the panels are the average weights. t = metric tons.

FIGURE 5. Composición por tallas estimada para aleta azul del Pacífico con arte de cerco y deportiva en el OPO durante 2007-2012. El valor en cada recuadro representa el peso promedio. t = toneladas métricas.

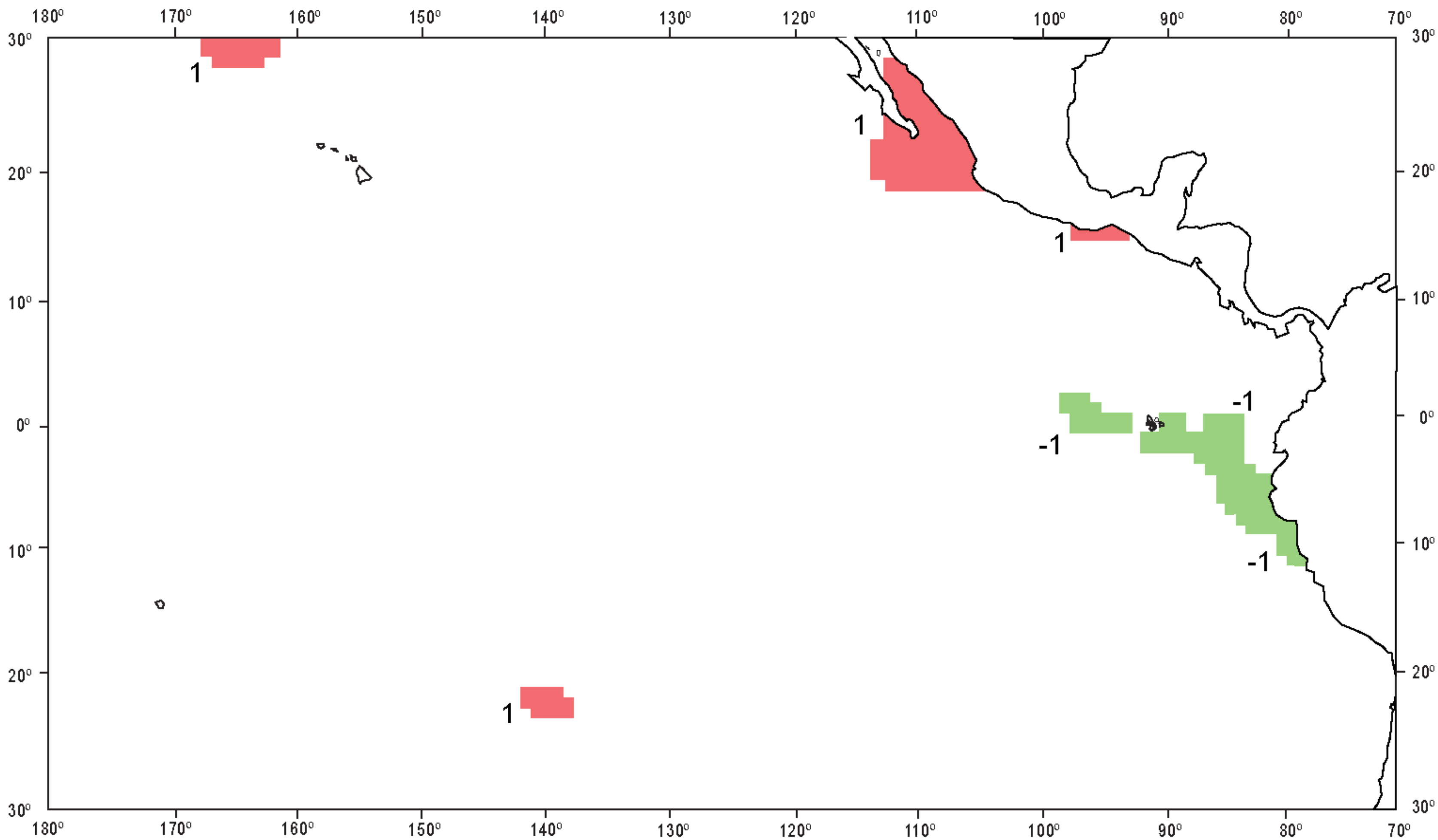

FIGURE 6. Sea-surface temperature (SST) anomalies (departures from long-term normals) for December 2012, based on data from fishing boats and other types of commercial vessels.
FIGURA 6. Anomalías (variaciones de los niveles normales a largo plazo) de la temperatura superficial del mar (TSM) en diciembre de 2012, basadas en datos tomados por barcos pesqueros y otros buques comerciales.

TABLE 1. Estimates of the numbers and capacities, in cubic meters, of purse seiners and pole-and-line vessels operating in the EPO in 2012 by flag, gear, and well volume. Each vessel is included in the totals for each flag under which it fished during the year, but is included only once in the fleet total. Therefore the totals for the fleet may not equal the sums of the individual flag entries. PS = purse seine; LP = pole-and-line.
TABLA 1. Estimaciones del número de buques cerqueros y cañeros que pescan en el OPO en 2012, y de la capacidad de acarreo de los mismos, en metros cúbicos, por bandera, arte de pesca, y volumen de bodega. Se incluye cada buque en los totales de cada bandera bajo la cual pescó durante el año, pero solamente una vez en el total de la flota; por consiguiente, los totales de las flotas no son siempre iguales a las sumas de las banderas individuales. PS = cerquero; LP = cañero.

Flag Bandera	Gear Arte	Well volume–Volumen de bodega				Capacity Capacidad
		1-900	901-1700	>1700	Total	
		Number—Número				
Colombia	PS	4	10	-	14	14,860
Ecuador	PS	73	19	11	103	79,222
EU (España—Spain)	PS	-	-	4	4	10,116
Guatemala	PS	-	1	1	2	3,575
México	PS	10	31	1	42	48,054
	LP	3	-	-	3	268
Nicaragua	PS	-	6	1	7	9,966
Panamá	PS	2	8	3	13	17,976
Perú	PS	1	-	-	1	299
El Salvador	PS	-	1	3	4	7,892
USA—EE.UU.	PS	-	2	1	3	4,887
Venezuela	PS	-	17	-	17	22,862
Vanuatu	PS	-	1	-	1	1,360
All flags—	PS	90	96	24	210	
Todas banderas	LP	3	-	-	3	
	PS + LP	93	96	24	213	
		Capacity—Capacidad				
All flags—	PS	42,089	124,993	51,887	218,969	
Todas banderas	LP	268	-	-	268	
	PS + LP	42,357	124,993	51,887	219,237	

TABLE 2. Estimates of the retained catches of tunas in the EPO from 1 January through 31 December 2012, by species and vessel flag, in metric tons.
TABLA 2. Estimaciones de las capturas retenidas de atunes en el OPO del 1 de enero al 31 de diciembre de 2012, 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**
Colombia	21,503	15,093	1,201	-	-	-	-	-	37,797	7.0
Ecuador	28,982	152,915	36,086	-	3,787	5	643	1,463	223,881	41.4
México	94,668	16,815	155	6,551	4,024	-	3,245	61	125,519	23.2
Nicaragua	8,168	3,841	875	-	-	-	-	-	12,884	2.4
Panamá	17,989	25,788	5,110	-	25	-	-	77	48,989	9.1
Venezuela	24,351	19,537	819	-	-	-	7	33	44,747	8.3
Other—Otros[2]	7,839	31,579	7,166	-	1	-	-	1	46,586	8.6
Total	203,500	265,568	51,412	6,551	7,837	5	3,895	1,635	540,403	

[1] Includes other tunas, sharks, and miscellaneous fishes
[1] Incluye otros túnidos, tiburones, y peces diversos
[2] Includes El Salvador, European Union (Spain), Guatemala, United States, and Vanuatu; this category is used to avoid revealing the operations of individual vessels or companies.
[2] Incluye El Salvador, Estados Unidos, Guatemala, Unión Europea (España) y Vanuatú; se usa esta categoría para no revelar información sobre faenas de buques o empresas individuales.

TABLE 3. Reported catches of bigeye tuna in the EPO during 2012 by longline vessels.
TABLA 3. Capturas reportadas de atún patudo en el OPO durante 2012 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	1,621	372		1,993					1,993
Japan—Japón	3,584	2,728	1,112	7,424					7,424
Republic of Korea—República de Corea	1,575	505	1,203	3,283	749	1,028	1,832	3,609	6,892
Chinese Taipei—Taipei Chino	862	820	1,255	2,937					2,937
Vanuatu	195	29		224					224
Total	7,837	4,454	3,570	15,861	749	1,028	1,832	3,609	19,470

TABLE 4. Oceanographic and meteorological data for the Pacific Ocean, January-December 2012. The values in parentheses are anomalies. SST = sea-surface temperature; SOI = Southern Oscillation Index; SOI* and NOI* are defined in the text.
TABLA 4. Datos oceanográficos y meteorológicos del Océano Pacífico, enero-diciembre 2012. Los valores en paréntesis son anomalías. TSM = temperatura superficie del mar; IOS = Índice de Oscilación del Sur; IOS* y ION* están definidas en el texto.

Month—Mes	**1**	**2**	**3**	**4**	**5**	**6**
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	23.7 (-0.8)	26.3 (0.2)	26.9 (0.3)	26.9 (1.3)	25.5 (1.2)	24.5 (1.6
Area 2 (5°N-5°S, 90°-150°W	24.8 (-0.8)	26.2 (-0.2)	26.9 (-0,2)	27.6 (0.1)	27.2 (0.2)	27.1 (0.7)
Area 3 (5°N-5°S, 120°-170°W)	25.5 (-1.1)	26.0 (-0.7)	26.6 (-0.6)	27.4 (-0.4)	27.8 (-0.1)	28.0 (0.3)
Area 4 (5°N-5°S, 150W°-160°E)	27.1 (-1.2)	27.2 (-0.9)	27.5 (-0.7)	28.2 (-0.3)	28.5 (-0.3)	28.7 (-0.1)
Thermocline depth—Profundidad de la termoclina, 0°, 80°W (m)	15	15	10	10	15	35
Thermocline depth—Profundidad de la termoclina, 0°, 110°W (m)	50	45	60	40	90	80
Thermocline depth—Profundidad de la termoclina, 0°, 150°W (m)	150	120	110	130	130	125
Thermocline depth—Profundidad de la termoclina, 0°, 180°W (m)	180	190	180	195	180	190
SOI—IOS	-1.1	0.5	0.7	-0.3	0.0	-0.4
SOI*—IOS*	-0.28	-1.61	0.80	2.98	-3.19	-1.36
NOI*—ION*	4.86	3.72	0.16	-1.34	2.67	0.17

TABLE 4. (continued)
TABLA 4. (continuación)

Month—Mes	**7**	**8**	**9**	**10**	**11**	**12**
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	22.8 (1.2)	21.0 (0.4)	20.8 (0.5)	20.7 (-0.1)	21.2 (-0.4)	22.0 (-0.9)
Area 2 (5°N-5°S, 90°-150°W	26.6 (1.0)	25.7 (0.7)	25.3 (0.4)	24.9 (0.0)	25.1 (0.1)	24.9 (-0.2)
Area 3 (5°N-5°S, 120°-170°W)	27.8 (0.6)	27.6 (0.7)	27.2 (0.5)	27.0 (0.3)	27.0 (0.4)	26.5 (-0.1)
Area 4 (5°N-5°S, 150W°-160°E)	28.8 (0.0)	29.1 (0.4)	29.1 (0.4)	29.2 (0.5)	29.2 (0.5)	28.7 (0.3)
Thermocline depth—Profundidad de la termoclina, 0°, 80°W (m)	25	30	40	35	30	35
Thermocline depth—Profundidad de la termoclina, 0°, 110°W (m)	80	45	65	100	100	100
Thermocline depth—Profundidad de la termoclina, 0°, 150°W (m)	140	140	140	150	150	150
Thermocline depth—Profundidad de la termoclina, 0°, 180°W (m)	175	175	170	175	165	180
SOI—IOS	0.0	-0.2	0.2	0.3	0.3	-0.6
SOI*—IOS*	5.60	2.99	2.28	1.08	-0.23	1.51
NOI*—ION*	1.87	-1.32	2.83	-0.19	-2.34	0.02

TABLE 5. Preliminary data on the sampling coverage of trips by Class-6 vessels (vessels with fish-carrying capacities greater than 363 metric tons) fishing in the EPO by the observer programs of the IATTC, Colombia, Ecuador, the European Union, Mexico, Nicaragua, Panama, Venezuela and the regional national program(s) under the umbrella of the WCPFC, as permitted by the referenced Memorandum of Cooperation, departing during the fourth quarter of 2012. The numbers in parentheses indicate cumulative totals for the year.

TABLA 5. Datos preliminares de la cobertura de muestreo de viajes de buque de Clase 6 (buques con capacidad de acarreo mayor a 363 toneladas métricas) que pescaron en el OPO) por los programas de observadores de la CIAT, Colombia, Ecuador, México, Nicaragua, Panamá, la Unión Europea, Venezuela y el (los) programa(s) regional(es) de observadores bajo la tutela de la WCPFC, como lo permite por el Memorándum de Cooperación mencionado, durante el cuarto trimestre de 2012. Los números entre paréntesis indican los totales acumulados para el año.

Flag	Trips		Observed by program						Percent observed	
			IATTC		National		Total			
Bandera	Viajes		Observado por programa						Porcentaje observado	
			CIAT		Nacional		Total			
Colombia	6	(42)	4	(21)	2	(21)	6	(42)	100.0	(100)
Ecuador	59	(303)	35	(194)	24	(109)	59	(303)	100.0	(100)
El Salvador	2	(19)	2	(19)			2	(19)	100.0	(100)
España—Spain	7	(24)	2	(11)	5	(13)	7	(24)	100.0	(100)
Guatemala	1	(7)	1	(7)			1	(7)	100.0	(100)
México	16	(205)	8	(108)	8	(97)	16	(205)	100.0	(100)
Nicaragua	5	(22)	2	(11)	3	(11)	5	(22)	100.0	(100)
Panamá	10	(61)	3	(29)	7	(32)	10	(61)	100.0	(100)
United States—EE.UU.	1	(3)	1	(3)			1	(3)	100.0	(100)
Vanuatu	1	(3)	1	(3)			1	(3)	100.0	(100)
Venezuela	9	(62)	4	(30)	5	(32)	9	(62)	100.0	(100)
Total	117	(751)	63	(436)	54	(315)	117	(751)	100.0	(100)