INTER-AMERICAN TROPICAL TUNA COMMMISSION
COMISIÓN INTERAMERICANA DEL ATÚN TROPICAL

QUARTERLY REPORT—INFORME TRIMESTRAL

April-June 2014—Abril-Junio 2014

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 2014.

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 64th 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

Drs. Guillermo A. Compeán, Jean-Francois Pulvenis de Séligny, and Richard B. Deriso, and Ms. Mónica B. Galván participated in a Technical Experts Workshop on the Management of the Capacity of the Tuna-Fishing Fleet in the EPO in Cartagena, Colombia, on 23-25 April 2014.

The 5th meeting of the Scientific Advisory Committee took place in La Jolla, California. USA, on 12-16 May 2014. The following background papers were presented at the meeting:

SAC-05-03b Updated Summary Regarding Hammerhead Sharks Caught in the Tuna Fisheries in the Eastern Pacific Ocean, by Marlon Román-Verdesoto and Martin Hall

SAC-05-03c Proposals for the Safe Release of Bycatches of Sea Turtles and Manta Rays, by Michael D. Scott and Martín Hall

SAC-05-04a The Fishery on Fish-Aggregating Devices (FADs) in the Eastern Pacific Ocean, by Martín Hall and Marlon Román-Verdesoto

SAC-05-04b Options for Marking and Identification of Fish-Aggregating Devices (FADs)

SAC-05-05 Standardized Fishing Gear Descriptions for Scientific Purposes

SAC-05-06 The Fishery for Tunas and Billfishes in the Eastern Pacific Ocean in 2013

SAC-05-07 Status of Yellowfin Tuna in the Eastern Pacific Ocean in 2013 and Outlook for the Future, by Carolina V. Minte-Vera, Alexandre Aires-Da-Silva, and Mark N. Maunder

SAC-05-08a Status of Bigeye Tuna in the Eastern Pacific Ocean in 2013 and Outlook for the Future, by Alexandre Aires-Da-Silva and Mark N. Maunder

SAC-05-08b Updated Japanese Longline Standardized Trends for Bigeye Tuna in the Eastern Pacific Ocean from Operational-Level Data, by Cleridy E. Lennert-Cody, Hirotaka Ijima, Hiroaki Okamoto, Alexandre Aires-da-Silva, and Mark N. Maunder

SAC-05-08c Movements, Dispersion, and Mixing of Bigeye Tuna (*Thunnus obesus*) Tagged and Released in the Equatorial Eastern and Central Pacific Ocean, with Conventional and Archival Tags, by Kurt Schaefer, Daniel Fuller, John Hampton, Sylvain Caillot, Bruno Leroy, and David Itano

SAC-05-09a Updated Indicators of Stock Status for Skipjack Tuna in the Eastern Pacific Ocean, by Mark N. Maunder

SAC-05-10a Stock Status of Pacific Bluefin Tuna and the Urgent Need for Management Action, by Mark N. Maunder, Kevin, R. Piner, and Alexandre Aires-da-Silva

SAC-05-10b Management Strategy Evaluation (MSE) Implementation in Stock Synthesis: Application to Pacific Bluefin Tuna, by Mark N. Maunder

SAC-05-11a Stock Status Indicators for Silky Sharks in the Eastern Pacific Ocean, by Alexandre Aires-da-Silva, Cleridy Lennert-Cody, Mark N. Maunder, and Marlon Román-Verdesoto

SAC-05-11b Preliminary Results from IATTC Collaborative Research Activities on Dorado in the Eastern Pacific Ocean and Future Research Plan, by Alexandre Aires-da-Silva, Cleridy E. Lennert-Cody, Mark N. Maunder, Marlon Román-Verdesoto, Carolina Minte-Vera, Nickolas W. Vogel, Jimmy Martínez-Ortiz, José M. Carvajal, Pablo X. Guerrero, and Fred Sondheimer

SAC-05-11c Stock Status Indicators for Fisheries of the Eastern Pacific Ocean, by Michael G. Hinton, Mark Maunder, Nick Vogel, Robert Olson, Cleridy Lennert, Alexandre Aires-da-Silva, and Martín Hall

SAC-05-11d Progress Report on Development of an Index of Relative Abundance for Dolphins from Purse-Seine Observer Data, by Cleridy E. Lennert-Cody and Mark N. Maunder

SAC-05-12 Evaluation of the Relationship between Active Purse-Seine Fishing Capacity and Fishing Mortality in the Eastern Pacific Ocean, by Mark N. Maunder and Richard B. Deriso

SAC-05-13 Ecosystem Considerations

SAC-05-14 Proposal For Biomass and Fishing Mortality Limit Reference Points Based on Reduction in Recruitment, by Mark N. Maunder and Richard B. Deriso

SAC-05-15 Current and Planned Activities of the IATTC Staff

SAC-05-16 Recommendations by the Staff for Conservation Measures in the Eastern Pacific Ocean, 2014

SAC-05 INF-A Pacific Bluefin Tuna: Report of the ISC Working Group

SAC-05 INF-B Report of Japan's Scientific Observer Program for Tuna Longline Fishery in the Convention Area of Inter-American Tropical Tuna Commission in 2013 Calendar Year, by National Research Institute of Far Seas Fisheries, Fisheries Research Agency of Japan

SAC-05 INF-C CPC Observer Annual Report for the Year 2013 in the IATTC Convention Area, by Jiangfeng Zhu and Xiaojie Dai

SAC-05 INF-D Overview of Size Data for Bigeye Tuna Caught by Japanese Longline Fishery in the Pacific Ocean, by Hiroaki Okamoto

SAC-05 INF-E Best Practice Advice to Reduce the Bycatch of Seabirds in the Convention Area, prepared by the Agreement on the Conservation of Albatrosses and Petrels (ACAP) and Birdlife International

SAC-05 INF-F A Collaborative Attempt to Conduct a Stock Assessment for the Silky Shark in the Eastern Pacific Ocean (1993-2010): Update Report

SAC-05-INF-G United States Summary of 2013 Observer Data Per Resolution C-11-08: Resolution on Scientific Observers for Longline Vessels

SAC-05-INF H 2013 Annual Scientific Observer Report of Korean Tuna Longline Fishery in the IATTC Convention Area, by National Fisheries Research and Development Institute (NFRDI) of Korea

SAC-05 INF I On the Great Scientific Interest to Sample the Sex of Tuna Recoveries, by Alain Fonteneau, Javier Ariz, and Emmanuel Chassot

Other meetings

Several staff members attended all or parts of a symposium in honor of Dr. William F. Perrin, a longtime marine mammal scientist at the Southwest Fisheries Science Center of the U.S. National Marine Fisheries Service, in La Jolla, California, USA, on 7 April 2014. Dr. Michael D. Scott gave a presentation entitled “The Tuna-Dolphin Association” at the symposium.

Drs. Mark N. Maunder and Carolina V. Minte-Vera participated in all (Dr. Minte-Vera) or part (Dr. Maunder) of a meeting of the North Pacific Albacore Working Group of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean in La Jolla, California, USA, on 14-28 April 2014. The objectives of the workshop were: (1) to complete a new assessment of the North Pacific albacore tuna stock, (2) to develop scientific advice and recommendations on current status, future trends, and conservation of North Pacific albacore tuna, and (3) to review national fisheries and update the catch table maintained by the working group with 2013 data. The overall goal of the meeting was to define an acceptable base-case model for the upcoming assessment, working through issues identified via email among participating scientists prior to the meeting.

Several members of the IATTC staff participated in all or parts of the 65th Tuna Conference at Lake Arrowhead, California, USA, on 19-22 May 2014. Mr. Daniel W. Fuller served as moderator for a session on Pelagics and their Environment, and Mr. Kurt M. Schaefer served as moderator for a session on Life History. Talks were given by Messrs. Marlon H. Román Verdesoto, Schaefer, and Vernon P. Scholey, and Ms. Jeanne B. Wexler. In addition, research in which Drs. Martín A. Hall, Michael G. Hinton, and Daniel Margulies, and Messrs Fuller, Scholey, and Nickolas W. Vogel, and Mss. Maria S. Stein, and Wexler had participated was presented by other speakers. Also, a poster was presented by Dr. Margulies, Mr. Scholey, and Mss. Stein and Wexler.

Dr. Michael G. Hinton participated in the 13th **INFOFISH** World Tuna Trade Conference and Exhibition in Bangkok, Thailand, on 21-23 May 2014, at which he gave a presentation entitled "Eastern Pacific Tunas: Production, Management, and Outlook for the Future."

Dr. Guillermo A. Compeán participated in the III Global Sustainability Forum in Madrid, Spain, on 29-30 May 2014. Representatives of leading governments, multilateral organizations, specialized agencies, and the private sector took part in this high-level meeting, which focused on climate change and sustainability. The participants were invited to consider the major global challenges presented by ecological transition, trends in energy regulation, the development of new sources of power, and the creation of value through sustainable energy business models. Dr. Compeán gave a presentation entitled "Sustainability of the Tuna Industry in the EPO and the Urban Effort.

Dr. Guillermo A. Compeán participated in the 31st meeting of the FAO [Food and Agriculture Organization of the United Nations] Committee on Fisheries in Rome, Italy, on 9-13 June 2014. The Committee presently constitutes the only global inter-governmental forum at which major international fisheries and aquaculture problems and issues are examined periodically on a world-wide basis, and recommendations are addressed to governments, regional fishery bodies, non-governmental organizations, fishery workers, FAO, and the international community.

Dr. Richard B. Deriso and Ms. Nora Roa-Wade were in Washington, D.C., USA, on 11 June 2014, where Dr. Deriso and representatives of the three other international fishery commissions based in the USA (the International Pacific Halibut Commission, the Pacific Salmon Commission, and the Great Lakes Fishery Commission) presented information on the four commissions to staff members of the U.S Senate in the morning. (The three other commissions each have only two members, the United States and Canada.) In the afternoon, Dr. Deriso, Ms. Roa-Wade, and representatives of the three other commissions met with U.S. State Department staff members, notably Messrs. David Hogan and William Gibbons-Fly, to discuss matters of general interest to the four commissions. Ms. Roa-Wade spoke about some passport issues, and Messrs. Hogan and Gibbons-Fly offered to help with these.

Dr. Guillermo A. Compeán participated in the “Our Ocean” conference in Washington, D.C., USA, on 16-17 June 2014. This was an international conference hosted by Mr. John F. Kerry, Secretary of State of the USA, at which individuals, experts, practitioners, advocates, lawmakers, and the international ocean and foreign policy communities were brought together to discuss lessons learned, share the best science, offer unique perspectives, and demonstrate effective actions to protect the oceans.

Dr. Guillermo A. Compeán participated in preparatory discussions in Guatemala City, Guatemala, on 26-27 June 2014 regarding the 87th meeting of the IATTC, which will take place in Lima, Peru, on 14-18 July 2014. He gave two presentations there, “Right-based Management for the EPO” and “IATTC and the Next Annual Meeting.”

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 composition 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 compositions 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 compositions 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 of 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 compositions 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 235 length-frequency samples from 161 wells and abstracted logbook information for 275 trips of commercial fishing vessels during the second quarter of 2014.

Reported fisheries statistics

Information reported herein is for the EPO, unless noted otherwise. Catch is reported in metric tons (t), vessel capacity in cubic meters (m^3), and effort in days of 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 after 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.

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 (http://www.iattc.org/VesselListsENG.htm). The estimated total carrying capacity of the purse-seine and pole-and-line vessels that have or are expected to fish in the EPO during 2014 is about 219,000 m^3 (Table 1). The average weekly at-sea capacity for the fleet, for the weeks ending 6 April through 29 June, was about 153,400 m^3 (range: 144,700 to 168,200 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, in metric tons, of tropical tunas in the EPO during the period of January-June in 2014, and comparative statistics for 2009-2013, were:

Species	2014	2009-2013			Weekly average, 2014
		Average	Minimum	Maximum	
Yellowfin	134,400	130,200	124,800	135,700	5,200
Skipjack	127,900	129,200	88,700	158,900	4,900
Bigeye	27,600	26,900	23,800	29,700	1,100

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 Class-6 vessels (vessels with fish-carrying capacities greater than 363 metric tons), 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 fish-carrying capacities.

The estimated nominal catches per day of fishing for yellowfin, skipjack, and bigeye in the EPO during the first quarter of 2014 and comparative statistics for 2009-2013 were:

Region	Species	Gear	2014	2009-2013		
				Average	Minimum	Maximum
N of 5° N	Yellowfin	PS	18.6	15.7	14.4	17.1
S of 5° N	Yellowfin	PS	2.2	3.6	2.7	4.7
N of 5° N	Skipjack	PS	1.1	0.8	0.4	1.5
S of 5° N	Skipjack	PS	11.2	11.4	9.4	13.9
EPO	Bigeye	PS	1.8	1.8	1.4	2.3
EPO	Yellowfin	LP	0.0	2.0	0.0	5.6
EPO	Skipjack	LP	0.0	2.5	0.0	4.5

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 (http://iattc.org/PDFFiles2/C-09-01-Tuna-conservation-2009-2011.pdf). Preliminary estimates of the catches reported for the first two quarters of 2014 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, 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 first quarter of 2009-2014 are presented in this report. Two sets of length-frequency histograms are presented for each species; the first shows the data by stratum (gear type, set type, and area) for the first quarter of 2014, and the second shows data for the combined strata for the first quarter of each year of the 2009-2014 period. Samples were obtained from 224 wells containing fish that were caught during the first quarter of 2014.

There are ten surface fisheries for yellowfin defined for stock assessments: four associated with floating objects, two with unassociated schools, three associated with dolphins, and one pole-and-line (Figure 1). The last fishery includes all 13 sampling areas. Of the 224 wells sampled that contained fish caught during the first quarter of 2014, 155 contained yellowfin. The estimated size compositions of these fish are shown in Figure 2a. The area of greatest yellowfin catch during the first quarter was taken by sets on dolphins in the Inshore area. Lesser amounts were taken in the Northern dolphin area, the Inshore floating-object area, and the Northern and Southern unassociated fisheries.

The estimated size compositions of the yellowfin caught by all fisheries combined during the first quarters of 2009-2014 are shown in Figure 2b. The average weight of yellowfin caught during the first quarter of 2014 (9.2 kg) was lower than any of the previous 5 years (range 9.6-22.8 kg). The sizes of the yellowfin caught during the first quarter of 2014 were fairly evenly distributed between about 50 and 160 cm.

There are eight fisheries for skipjack defined for stock assessments: four associated with floating objects, two with unassociated schools, one associated with dolphins, and one pole-and-line (Figure 1). The last two fisheries include all 13 sampling areas. Of the 224 wells sampled that contained fish caught during the first quarter of 2014, 148 contained skipjack. The estimated size compositions of these fish are shown in Figure 3a. The majority of the skipjack was caught in the Inshore and Southern floating-object fisheries, and in the Southern unassociated fishery, and was primarily in the 40- to 60-cm range. Smaller amounts of skipjack was caught in sets associated with dolphins, and in the Northern and Equatorial floating-object fisheries.

The estimated size compositions of skipjack caught by all fisheries combined during the first quarter of 2009-2014 are shown in Figure 3b. The average weight of skipjack caught during the first quarter of 2014 (2.4 kg) was greater than the averages of the previous 3 years, with the presence of greater quantities of larger skipjack in the 50- to 60-cm range.

There are seven surface fisheries for bigeye defined for stock assessments: four associated with floating objects, one with unassociated schools, one associated with dolphins, and one pole-and-line (Figure 1). The last three fisheries include all 13 sampling areas. Of the 224 wells sampled that contained fish caught during the first quarter of 2014, 22 contained bigeye. The estimated size compositions of these fish are shown in Figure 4a. All of the catch was taken in floating-object sets, primarily in the Southern area.

The estimated size compositions of bigeye caught by all fisheries combined during the first quarter of 2009-2014 are shown in Figure 4b. The average weight of bigeye caught during the first quarter of 2014 (9.4 kg) was greater than the average for 2013 (6.0 kg), but less than the previous 5 year high of 11.0 kg in 2012. The size distribution fairly uniform, ranging from about 40- to 150-cm.

The estimated retained purse-seine catch of bigeye less than 60 cm in length during the first quarter of 2014 was 1,700 t, or about 17 percent of the estimated total retained purse-seine catch of bigeye during that period. The corresponding amounts for 2009-2013 ranged from

1,600 to 2,600 t, or 10 to 19 percent respectively. These values may differ slightly from those given in previous Quarterly Reports due to changes in the estimation procedure.

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 during the quarter, except on April 19 and June 24 and 29. Spawning occurred between 1:15 p.m. and 3:02 p.m. The number of eggs collected ranged from 11,000 to 246,000. The water temperatures in the tank ranged from 24.0° to 29.4°C.

At the end of the quarter there were two 43-kg yellowfin, eight 26- to 34-kg yellowfin, and seven 15- to 16-kg yellowfin in Tank 1. There were four 2- to 3-kg yellowfin tuna 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, and hatching rate. The lengths of hatched larvae, duration of yolk-sac stage, 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 IATTC 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. The research on Pacific bluefin, which is conducted at the Fisheries Laboratories of KU in Wakayama Prefecture, Japan, is being supported by the Japan Science and Technology Agency (JST).

As part of this project, multiple Kinki University scientists, including faculty members, research associates, and graduate students, arrived at the Achotines Laboratory in mid-April to initiate studies that continued through the end of the quarter. ARAP biologists joined the Kinki University scientists in working with the Achotines Laboratory staff members on multiple trials and experiments.

Scientists of the IATTC's Early Life History Group and Achotines staff members also conducted multiple experiments over the quarter under the SATREPS program. Three trials were conducted to investigate the time duration until starvation of first-feeding yellowfin larvae at water temperatures of 24 to 27˚C. The results from these trials will be compared to the information collected from similar trials conducted in Oshima, Japan, with Pacific bluefin tuna (see IATTC Quarterly Report for July-September 2013).

Additionally, an experiment was conducted to examine the survival and growth of yellowfin larvae reared at relatively low food levels. The larvae were reared in replicated tanks under low (170 rotifers/L) food conditions beginning at first-feeding and continuing for 10 full days of growth (3-13 days after hatching (dah)). This experiment is part of a larger comparative study of the growth potential of yellowfin and Pacific bluefin larvae under a wide range of food conditions (first described in the IATTC Quarterly Report for April-June 2011). Analysis of the comparative growth data will be continued during the third quarter of 2014.

Another experiment was conducted during the quarter to investigate and compare patterns of food selectivity and feeding behavior at the stage of piscivory for yellowfin and Pacific bluefin larvae. Yellowfin larvae were reared from first feeding (3 dah) until they reached an average standard length of approximately 6 mm, or about 2 full weeks of feeding (17 dah). Four replicate tanks (937 L) were each stocked with 250 larvae of this size and two feeding regimes were tested. All four tanks received equal concentrations of rotifers and *Artemia*; however, a two-fold difference in the concentration of yolk-sac larval prey was maintained between the two treatments. The experiment was terminated after five full days of feeding. This trial will also be conducted with Pacific bluefin larvae during the 2015 experimental season in Japan, and the timing and intensity of piscivory of the two species will be compared.

Trial rearing of early juvenile yellowfin tuna (grown from larvae obtained from captive yellowfin tuna broodstock) in moored sea cages is planned for 2014 and 2015 as part of the SATREPS project. During the first quarter of 2014, two sea cages were successfully installed near the entrance to Achotines Bay (IATTC Quarterly Report for January-March 2014). On April 29, 2014, the JICA Resident Representative in Panama, Mr. Kazumi Kobayashi, and the Second Secretary of the Japanese Embassy in Panama, Mr. Kazuhiro Fujii, visited the Achotines Laboratory. During their visit, they viewed the recently-installed sea cages and made a complete tour of the Achotines Laboratory and the experiments in progress.

Mr. Shoji Kibe was the JICA SATREPS project counterpart stationed at the Achotines Laboratory from the beginning of the project in 2011 through 13 May 2014, when he returned to his home in Honduras. Mr. Kibe was replaced by Ms. Michiko Kawahito, who will serve as the JICA counterpart through the scheduled end of the project in March 2016.

Other collaborative studies of yellowfin eggs and larvae

Cryoocyte, Inc., a research and technology company based in Boston, Massachusetts, USA, is collaborating with the Early Life History Group on some pilot studies of the feasibility of cryopreservation techniques for yellowfin embryo stages. Two Cryoocyte scientists arrived at the Achotines Laboratory on April 28, 2014, to initiate the experimental work, which continued through May 18, 2014. Further pilot studies are planned for the fourth quarter of 2014. Cryoocyte is providing the funding for the pilot research trials.

Studies of snappers

The work on snappers (*Lutjanus* spp.) is carried out by the 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 had been unsuccessful in recent years. During the second quarter of 2013, a major fishing effort was undertaken, and more than 100 spotted rose snappers were collected in local waters. At the end of June 2014, a large group of fish continued to be held in the broodstock snapper tank.

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). (The depth of the thermocline is a proxy for the depth of the upper edge of the oxygen-minimum zone, a thick layer of oxygen-poor water underlying the upper mixed layer. In locations where the thermocline is shallow, the habitat for tunas, especially yellowfin tuna, is vertically compressed near the surface of the ocean, where they are vulnerable to capture by surface gear.) 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.

A spot of cool water appeared at about 20°S-125° to 140°W in September (IATTC Quarterly Report for July-September 2013: Figure 5). This spot of cool water had disappeared by October, but there were areas of cool water near the coast off the Baja California peninsula and off South America from the Equator to about 35°S. In November most of this cool water had disappeared, except for two spots off South America between the Equator and 10°S. During December 2013 (IATTC Quarterly Report for October-December 2013: Figure 5) and January 2014, the SSTs were very close to normal throughout the entire tropical EPO. In February, however, a band of cool water, which extended along the equator from the coast of South America to about 145°W, appeared. Also some spots of warm water appeared off Mexico and Central America. The band of cool water along the equator mostly disappeared in March, but there were spots of cool water along the coasts of Ecuador and Peru, and the spots of warm water off Mexico and Central America were more pronounced than they had been in February. By April the band of cool water along the equator had disappeared, but the spots of cool water along the coast of South America persisted. By May the spots of cool water off South America had virtually disappeared. In May and June there was a band of warm water along the equator that extended from the coast of South America to west of 180° and the area of warm water off

Mexico was still in existence (Figure 5). The SSTs were mostly below normal from July 2013 through March 2014, but during April-June 2014 they were mostly above normal (Table 4).

According to the Climate Diagnostics Bulletin of the U.S. National Weather Service for June 2014, "Over the last month, no significant change was evident in the model forecasts of [an El Niño event], with the majority of models indicating El Niño onset within June-August and continuing into early 2015 … The chance of a strong El Niño is not favored in any of the ensemble averages for Niño-3.4. At this time, the forecasters anticipate El Niño will peak at weak-to-moderate strength during the late fall and early winter … The chance of El Niño is about 70% during the Northern Hemisphere summer and is close to 80% during the fall and early winter".

BYCATCH PROGRAM AND INTERNATIONAL DOLPHIN CONSERVATION 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 eastern Pacific Ocean (EPO). This mandate is carried out by the International Dolphin Conservation Program's (IDCP's) 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 and the Regional Observer Program (ROP) under the umbrella of the Western and Central Pacific Fisheries Commission (WCPFC), based on a Memorandum of Cooperation (MOC) signed by representatives of the IATTC and the WCPFC.

In addition, Resolution C-12-08 of the IATTC requires that "Any vessel [regardless of size class] with one or more of its wells sealed to reduce its well volume recorded on the Regional Vessel Register shall be required to carry an observer from the International Dolphin Conservation Program (IDCP) on board." Resolution C-12-01 allows Class-4 purse-seine vessels (vessels with fish-carrying capacities of 182 to 272 metric tons) to make a single fishing trip of up to 30 days duration during the specified closure periods, provided that such vessel carries an observer of the IDCP On-Board Observer Program. Resolution A-02-01, also requires "purse-seine vessels of less than 363 metric tons carrying capacity … that have been identified by the IRP to have committed a possible infraction by intentionally setting on dolphins … to carry observers".

The observers are biologists trained to collect a variety of data on the mortalities of dolphins associated with the fishery, sightings of dolphin herds, catches of tunas and bycatches of fish and other animals, oceanographic and meteorological data, and other information used by the IATTC staff to assess the conditions of the various stocks of dolphins, study the causes of dolphin mortality, and assess the effect of the fishery on tunas and other components of the ecosystem. The observers also collect data relevant to compliance with the provisions of the AIDCP and data required for the tuna-tracking system established under the AIDCP, which tracks the "dolphin-safe" status of tuna caught in each set from the time it is captured until it is unloaded (and, after that, until it is canned and labeled).

In 2014 the observer programs of Colombia, the European Union, Mexico, Nicaragua, Panama, and Venezuela are to sample half, and that of Ecuador approximately one-third, of the trips by vessels of their respective fleets, while IATTC observers are to sample the remainder of those trips. Except as described in the next paragraph, the IATTC is to cover all trips by vessels registered in other nations that are required to carry observers.

At the fifth meeting of the Parties to the AIDCP in June 2001, observers from the international observer program of the South Pacific Forum Fisheries Agency (FFA) were approved to collect pertinent information for the IDCP's 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 IDCP's On-Board Observer Program is not practical. In 2011, the IATTC and the WCPFC agreed on the MOC described above. As part of the implementation of the MOC, representatives of the two organizations put together a series of procedures for the observers of the ROP to follow under the umbrella of the WCPFC for tuna purse seiners, while observing fishing activity in the IATTC's convention area. Under that MOC, three Parties to both regional fisheries management organizations, and to the AIDCP, requested that cross-endorsed observers be allowed to be deployed on three trips of vessels planning to operate in both areas during the second quarter of 2014. These requests were granted.

Observers from the IDCP's On-Board Observer Program departed on 209 fishing trips aboard purse seiners covered by that program during the second quarter of 2014. Preliminary coverage data for these vessels during the quarter, plus data for the three trips of EPO-based vessels that operated in the EPO, but carried ROP observers, are shown in Table 5. (If vessels based in ports in the western or central Pacific Ocean fish in the EPO, more rows, and possibly more columns, will be required in the tables equivalent to Table 5.)

Training

Messrs. Ernesto Altamirano and Erick Largacha of the IATTC staff conducted a training course in Manta, Ecuador, from June 9 through 26, 2014, for 14 trainees, including 3 from the Programa Nacional de Observadores Pesqueros de Ecuador (ROBECUADOR).

Gear project

There was one dolphin safety-gear inspection and safety-panel alignment procedures carried out aboard a Mexican-flag purse seiner during the second quarter of 2014. This was performed by staff members of the Programa Nacional de Aprovechamiento del Atún y Protección de Delfines (PNAAPD) of Mexico.

INTER-AGENCY COOPERATION

Dr. Michael D. Scott participated in field studies of bottlenose dolphins in Sarasota, Florida, USA, on 5-9 May 2014. The research included capture, tagging, and release of dolphins, sampling for health assessment, testing of small remote-controlled aircraft for obtaining aerial video and photographs of free-ranging dolphins, and attachment of devices to record sounds of free-ranging dolphins.

Drs. Carolina V. Minte-Vera and Steven L.H. Teo (U.S. National Marine Fisheries Service, La Jolla) were co-instructors of a seven-day course entitled to "Introduction to Fisheries Stock Assessment and Stock Synthesis," which was given in La Jolla on 24 June-1 July 2014. There were nine students, three from the Centro de Investigación Científica y de Educación Superior de Ensenada, two from the Instituto Nacional de Pesca of Mexico, two from the Universidad Autónoma de Sinaloa (Mexico), one from the Universidad Nacional Autónoma de México, and one from the U.S. National Marine Fisheries Service in La Jolla. Drs. Mark N. Maunder, Paul R. Crone, Kevin T. Hill, and Kevin R. Piner participated in some of laboratory and discussion sections. (The last three are all with the U.S. National Marine Fisheries Service in La Jolla.)

Two visiting scientists, Mr. Jon Lopez and Ms. Nerea Lezama-Ochoa, both from AZTI-Tecnalia (a non-profit private foundation committed to the social and economic development of the marine environment and food sector), Vizcaya, Spain, spent the period of 23 May-2 July 2014 at the La Jolla headquarters of the IATTC. Mr. Lopez worked with Drs. Mark N. Maunder and Cleridy E. Lennert-Cody on the ecology and behavior of tunas associated with FADs, as assessed with acoustic equipment, and Ms. Lezama-Ochoa worked with Drs. Martín A. Hall and Robert J. Olson on diversity of bycatches in the tuna fishery.

PUBLICATIONS

IATTC

IATTC Stock Assessment Report 14 consists of the following background documents, prepared for the 4th meeting of the IATTC Scientific Advisory Committee (29 April -3 May 2013).

Outside journals

Carvalho, Felipe, Robert Ahrens, Debra Murie, José M. Ponciano, Alexandre Aires-da-Silva, Mark N. Maunder, and Fábio Hazin. 2014. Incorporating specific change points in catchability in fisheries stock assessment models: an alternative approach applied to the blue shark (*Prionace glauca*) stock in the South Atlantic Ocean. Fish. Res., 154: 135-146.

Nakase, Gentoku, Tomoki Honryo, Liliana Guerra, Diana Perz, Amado Cano, Daniel Margulies, Vernon P. Scholey, and Yosjifumi Sawada. 2013. Addition of *Nannochloropsis* sp. to pre-rearing water improves survival of yellowfin tuna *Thunnus albacares* larvae. Aquaculture Science, 61 (4): 395-398.

Crone, Paul, Mark Maunder, Juan Valero, Jenny McDaniel, and Brice Semmens (editors). 2013. Sensitivity: theory, estimation, and application in fishery stock assessment models. Center for the Advancement of Population Assessment Methodology (CAPAM), Workshop Series Report 1: iii, 46 pp. ftp://ftp.capamresearch.org/incoming/selevtivity_workshop/report/CAPAM_Selectivity%20Workshop_Series%20Report_August%202013.pdf.

The papers presented at the CAPAM meeting are published in the journal Fisheries Research. The following were co-authored by IATTC staff members:

Maunder, M.N., P.R. Crone, J.L. Valero, and B.X. Semmens. 2014. Selectivity: theory, estimation, and application in fishery stock assessment models. Fish. Res., 158: 1-4.

Waterhouse, Lynn, David B. Sampson, Mark Maunder, and Brice X. Semmens. 2014. Using areas-as-fleets selectivity to model spatial fishing: asymptotic curves are unlikely under equilibrium conditions. Fish. Res., 158: 15-25.

Lee, Hui-Hua, Kevin R. Piner, Richard D. Methot, Jr., and Mark N. Maunder. 2014. Use of likelihood profiling over a global scaling parameter to structure the population dynamics model: an example using blue marlin in the Pacific Ocean. Fish. Res., 158: 138-146.

Wang, Sheng-Ping, Mark N. Maunder, Kevin R. Piner, Alexandre Aires-da-Silva, and Hui-Hua Lee. 2014. Evaluation of virgin recruitment profiling as a diagnostic for selectivity curve structure in integrated stock assessment models. Fish. Res., 158: 158-164.

Wang, Sheng Ping, Mark N. Maunder, and Alexandre Aires-da-Silva. 2014. Selectivity's distortion of the production function and its influence on management advice from surplus production models. Fish. Res., 158: 181-193.

In addition, the following papers were accepted for publication in other journals and are available online:

Bromhead, Don, Vernon Scholey, Simon Nicol, Daniel Margulies, JeanneWexler, Maria Stein, Simon Hoyle, Cleridy Lennert-Cody, Jane Williamson, Jonathan Havenhand, Tatiana Ilyina, and Patrick Lehodey. 2014. The potential impact of ocean acidification upon eggs and larvae of yellowfin tuna (*Thunnus albacares*). Deep-Sea Res. II, http://dx.doi.org/10.1016/jdsr2.2014.03.019.

Young, Jock W., Brian P.V. Hunt, Timothée Cook, Joel Llopiz, Elliott Hazen, Heidi Pethybridge, Daniela Ceccarelli, Anne Lorrain, Robert J. Olson, Valerie Allain, Christophe Menkes, Toby Patterson, Simon Nicol, Patrick Lehodey, Rudy Kloser, Haritz

Arrizabalaga, and C. Anela Choy. 2014. The trophodynamics of marine top predators: current knowledge, recent advances and challenges. Deep Sea Res. II Top. Stud. Oceanogr., doi: 10.1016/j.dsr2.2014.05.015.

Aires-da-Silva, Alexandre M., Mark N. Maunder, Kurt M. Schaefer, and Daniel W. Fuller. 2014. Improved growth estimates from integrated analysis of direct aging and tag-recapture data: an illustration with bigeye tuna (*Thunnus obesus*) of the eastern Pacific Ocean with implications for management. Fish. Res., http://dx.doi.org/10.1016/j.fishres.2014.04.001

Lee, Hui-Hua, Kevin R. Piner, Michael G. Hinton, Yi-Jay Chang, Ai Kimoto, Minoru Kanaiwa, Nan-Jay Su,, William Walsh, Chi-Lu Sun, and Gerard DiNardo. 2014. Sex-structured population dynamics of blue marlin *Makaira nigricans* in the Pacific Ocean. Fish. Sci., DOI 10.1007/s12562-014-0762-6.

HONOR

The following paper has been included in an Editor's Choice selection of articles published in the journal Optimization Methods and Software:

Fournier, David A., Hans J. Skaug, Johnoel Ancheta, James Ianelli, Arni Magnusson, Mark N. Maunder, Anders Nielsen, and John Sibert. 2012. AD Model Builder: using automatic differentiation for statistical inference of highly parameterized complex nonlinear models. Optimization Methods and Software, 27 (2): 233-249.

ADMINISTRATION

Mr. Aldo Basantes Cuesta, who had been stationed at the IATTC's field office in Manta, Ecuador, since February 1997, resigned his position effective 30 April 2014. Everyone wishes Mr. Basantes well in his future endeavors.

DR. ROBERT J. OLSON

Dr. Robert J. Olson, an IATTC employee for more than 40 years, retired on 15 June 2014.

Mr. Olson, after graduating from California Polytechnic State University in San Luis Obispo, California, began his career in fisheries with two trips as a U.S. National Marine Fisheries Service (NMFS) observer on tuna purse seiners during January-June 1973. He was then hired by the IATTC in mid-June 1973, and he spent most of the next year working part time on catch and effort data and part time performing electrophoretic analyses of tuna blood samples in the laboratory.

In May 1974 he was transferred to Manta, Ecuador, where he spent the next two years collecting catch, effort, and size composition data, tagging tunas, and collecting yellowfin blood samples and morphometric data at sea and in canneries.

He was transferred back to La Jolla in May 1976, where he was assigned the task of analyzing the stomach contents of yellowfin tuna collected at canneries in San Diego and San Pedro, California (a project begun by the late Witold L Klawe).

In 1983, Mr. Olson earned his M.S. degree from San Diego State University. His thesis, entitled "Gastric Evacuation and Daily Ration in Yellowfin Tuna, *Thunnus albacares,*" was based on experiments with captive yellowfin at the NMFS Kewalo Research Facility in Honolulu, Hawaii, USA, and the aforementioned diet data. The bulk of his thesis was published in the Canadian Journal of Fisheries and Aquatic Sciences in 1986 jointly with a bioenergetics analysis developed by Christofer H. Boggs (presently with the NMFS in Hawaii) as part of his Ph.D. dissertation at the University of Wisconsin, Madison, Wisconsin, USA. That paper won the W.F. Thompson Award of the American Institute of Fishery Research Biologists in 1987, and was later reprinted in a book entitled "Readings in Ecology" designed to accompany a modern text book on ecology. (It is not often that a paper in a scientific journal is selected for reprinting as a chapter in a book, so this was obviously an excellent paper.)

Mr. Olson spent all of 1985 and half of 1986 at the Center for Limnology at the University of Wisconsin, where he studied under Drs. James F. Kitchell and John J. Magnuson. He earned his Ph.D. degree from that university in 1990; his dissertation was entitled "A Bioenergetics Analysis of Yellowfin Tuna (*Thunnus albacares*) Predation in the Eastern Pacific Ocean."

After returning from Wisconsin, he spent 11 years working in the IATTC Early Life History program with Dr. Daniel Margulies, Mr. Vern P. Scholey, Ms. Jeanne B. Wexler, and others. His involvement focused on development of the IATTC's Achotines Laboratory, administration of the project and Laboratory, and research, primarily on net sampling of tuna larvae in the ocean off the Achotines Laboratory.

In November 1997 Dr. Olson was assigned the leadership of the IATTC ecosystem research program. The period from 1997 to 2014 was an exceptionally productive one. He and Dr. George M. Watters (now with the NMFS in La Jolla) developed an ecosystem model for the pelagic EPO, which resulted in IATTC Bulletin, Vol. 22, No. 3, and five publications in outside journals. He later worked with staff members of the Secretariat of the Pacific Community in Noumea, New Caledonia, to develop a similar model for the western Pacific Ocean. He worked with scientists from all over the world on many aspects of ocean ecology, with funding from the National Center for Ecological Analysis and Synthesis (NCEAS) at the University of California at Santa Barbara, the Pelagic Fisheries Research Program (PFRP) of the University of Hawaii, the Comparative Analysis of Marine Ecosystem Organization (CAMEO) program of the U.S. National Science Foundation and the US. National Oceanic and Atmospheric Administration, and the Climate Impacts on Oceanic Top Predators (CLIOTOP) Regional Project, under international research programs: Global Ocean Ecosystem Dynamics (GLOBEC) and later Integrated Marine Biogeochemistry and Ecosystem Research (IMBER).

Dr. Olson worked extensively with colleagues of the Centro Interdisciplinario de Ciencias Marinas (CICIMAR) of the Instituto Politecnico Nacional, La Paz, Mexico, the Commonwealth Scientific and Industrial Organisation (CSIRO) of Australia, the Institut de Recharche pour le Développement (IRD) of France, the Secretariat of the Pacific Community (SPC), Noumea, New Caledonia, the University of Washington, the University of Hawaii, and the U.S National Marine Fisheries Service.

Importantly, he put into practice in the EPO the latest techniques of analyzing food web dynamics based on the stable isotopes of nitrogen and carbon in bulk muscle tissue and in the amino acids of muscle tissue, in collaboration with scientists from many countries.

Dr. Olson served as an Affiliate Faculty member of the University of San Diego Marine Science Graduate Program. In addition, he served on graduate committees of three doctoral students and one M.S. student at the Centro Interdisciplinario de Ciencias Marinas (CICIMAR), Instituto Politecnico Nacional, La Paz, Mexico, one doctoral student at the Centro de Investigación Cientifica y de Educación Superior (CICESE), Ensenada, Mexico, two M.S. students at the University of San Diego, and one M.S. student at Humboldt State University, Arcata, California.

He was author or co-author of two IATTC Bulletins, two IATTC Special Reports, and more than 50 papers in peer reviewed scientific journals. Among the most noteworthy of his papers are:

Olson, R.J., and C.H. Boggs. 1986. Apex predation by yellowfin tuna (*Thunnus albacares*): independent estimates from gastric evacuation and stomach contents, bioenergetics, and cesium concentrations. Can. J. Fish. Aquat. Sci. 43 (9): 1760-1775.

Essington, T.E., D.E. Schindler, R.J. Olson, J.F. Kitchell, C. Boggs, and R. Hilborn. 2002. Alternative fisheries and the predation rate of yellowfin tuna in the eastern Pacific Ocean. Ecol. Appl. 12 (3): 724-734.

Olson, R.J., and G.M. Watters. 2003. A model of the pelagic ecosystem in the eastern tropical Pacific Ocean. Inter-Amer Trop Tuna Comm Bull. 22 (3): 133-218.

Watters, G.M., R.J. Olson, R.C. Francis, P.C. Fiedler, J.J. Polovina, S.B. Reilly, K.Y. Aydin, C.H. Boggs, T.E. Essington, C.J. Walters, and J.F. Kitchell. 2003. Physical forcing and the dynamics of the pelagic ecosystem in the eastern tropical Pacific: simulations with ENSO-scale and global-warming climate drivers. Can. Jour. Fish. Aquat. Sci. 60 (9): 1161-1175.

Wexler, J.B., V.P. Scholey, R.J. Olson, D. Margulies, A. Nakazawa, and J.M. Suter. 2003. Tank culture of yellowfin tuna, *Thunnus albacares*: developing a spawning population for research purposes. Aquaculture. 220 (1-4): 327-353.

Dambacher, J.M., J.W. Young, R.J. Olson, V. Allain, F. Galván-Magaña, M.J. Lansdell, N. Bocanegra-Castillo, V. Alatorre-Ramírez, S.P. Cooper, and L.M. Duffy. 2010. Analyzing pelagic food webs leading to top predators in the Pacific Ocean: a graph-theoretic approach. Prog. Oceanogr. 86 (1-2): 152-165.

Olson, R.J., B.N. Popp, B.S. Graham, G.A. López-Ibarra, F. Galván-Magaña, C.E. Lennert-Cody, N. Bocanegra-Castillo, N.J. Wallsgrove, E. Gier, V. Alatorre-Ramírez, L.T. Ballance, and B. Fry. 2010. Food web inferences of stable isotope spatial patterns in copepods and yellowfin tuna in the pelagic eastern Pacific Ocean. Prog. Oceanogr. 86 (1-2): 124-138.

Gerrodette, T., R. Olson, S. Reilly, G. Watters, and W. Perrin. 2012. Ecological metrics of biomass removed by three methods of purse-seine fishing for tunas in the eastern tropical Pacific Ocean. Cons. Bio. 26 (2): 248-256.

Hunsicker, M.E., R.J. Olson, T.E. Essington, M.N. Maunder, L.M. Duffy, and J.F. Kitchell. 2012. Potential for top-down control on tropical tunas based on size structure of predator-prey interactions. Mar. Ecol. Prog. Ser. 445: 263-277.

Scott, M.D., S.J. Chivers, R.J. Olson, P.C. Fiedler, and K. Holland. 2012. Pelagic predator associations: tuna and dolphins in the eastern tropical Pacific Ocean. Mar. Ecol. Prog. Ser. 458: 283-302.

Griffiths, S.P., R.J. Olson, and G.M. Watters. 2013. Complex wasp-waist regulation of pelagic ecosystems in the Pacific Ocean. Rev. Fish Biol. Fish. 23 (4): 459-475.

Olson, R.J., L.M. Duffy, P.M. Kuhnert, F. Galván-Magaña, N. Bocanegra-Castillo, and V. Alatorre-Ramírez. 2014. Decadal diet shift in yellowfin tuna (*Thunnus albacares*) suggests broad-scale food web changes in the eastern tropical Pacific Ocean. Mar. Ecol. Prog. Ser. 497: 157-178.

Dr. Olson will be missed by the IATTC staff and the many other people all over the world with whom he worked. Everyone wishes him a long and happy period of retirement.

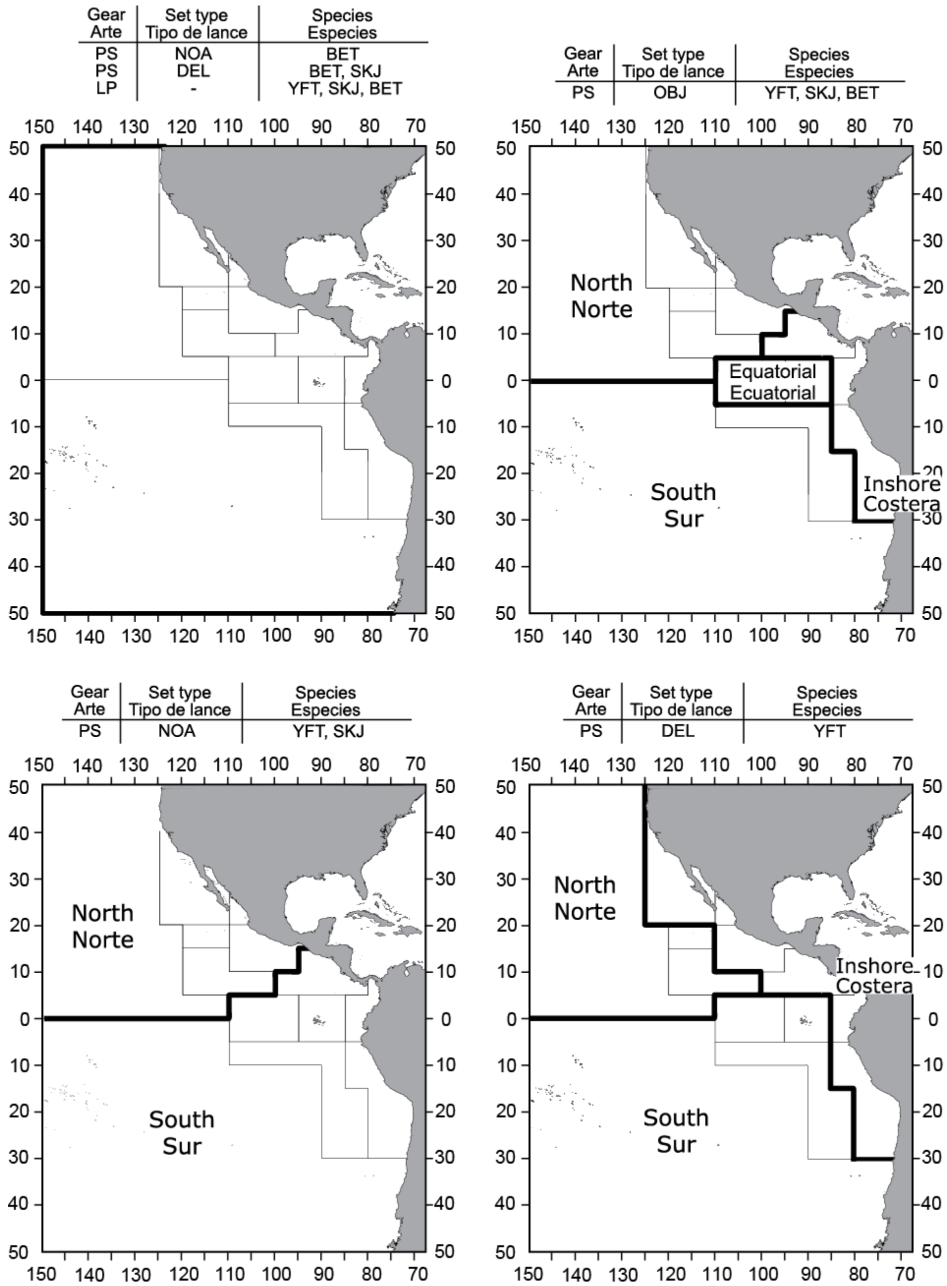

FIGURE 1. Spatial extents of the fisheries defined by the IATTC staff for stock assessment of yellowfin, skipjack, and bigeye in the EPO. The thin lines indicate the boundaries of the 13 length-frequency sampling areas, and the bold lines the boundaries of the fisheries. Gear: PS = purse seine, LP =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

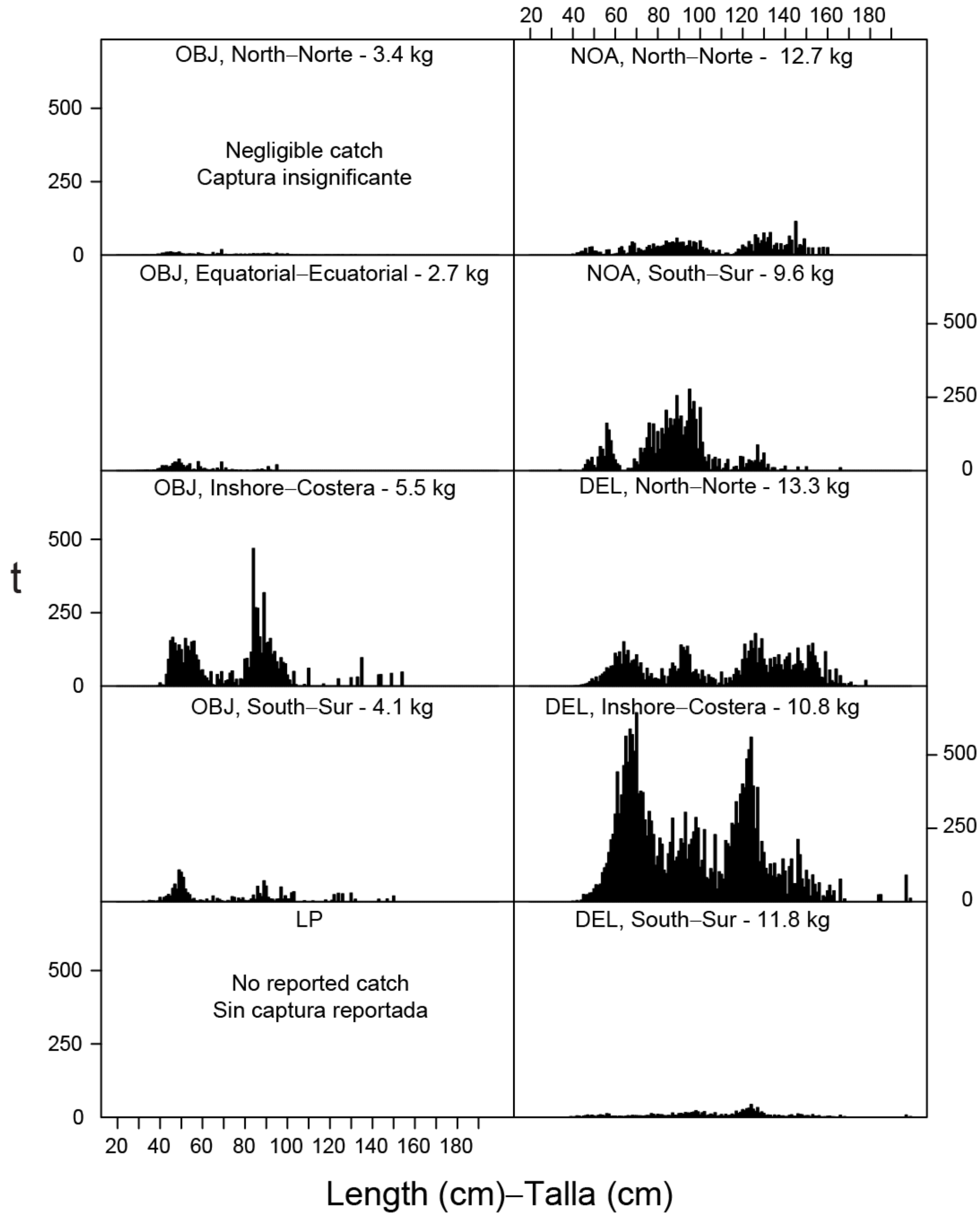

FIGURE 2a. Estimated size compositions of the yellowfin caught in each fishery of the EPO during the first quarter of 2014. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 2a. Composición por tallas estimada para el aleta amarilla capturado en cada pesquería del OPO durante el primero trimestre de 2014. 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.

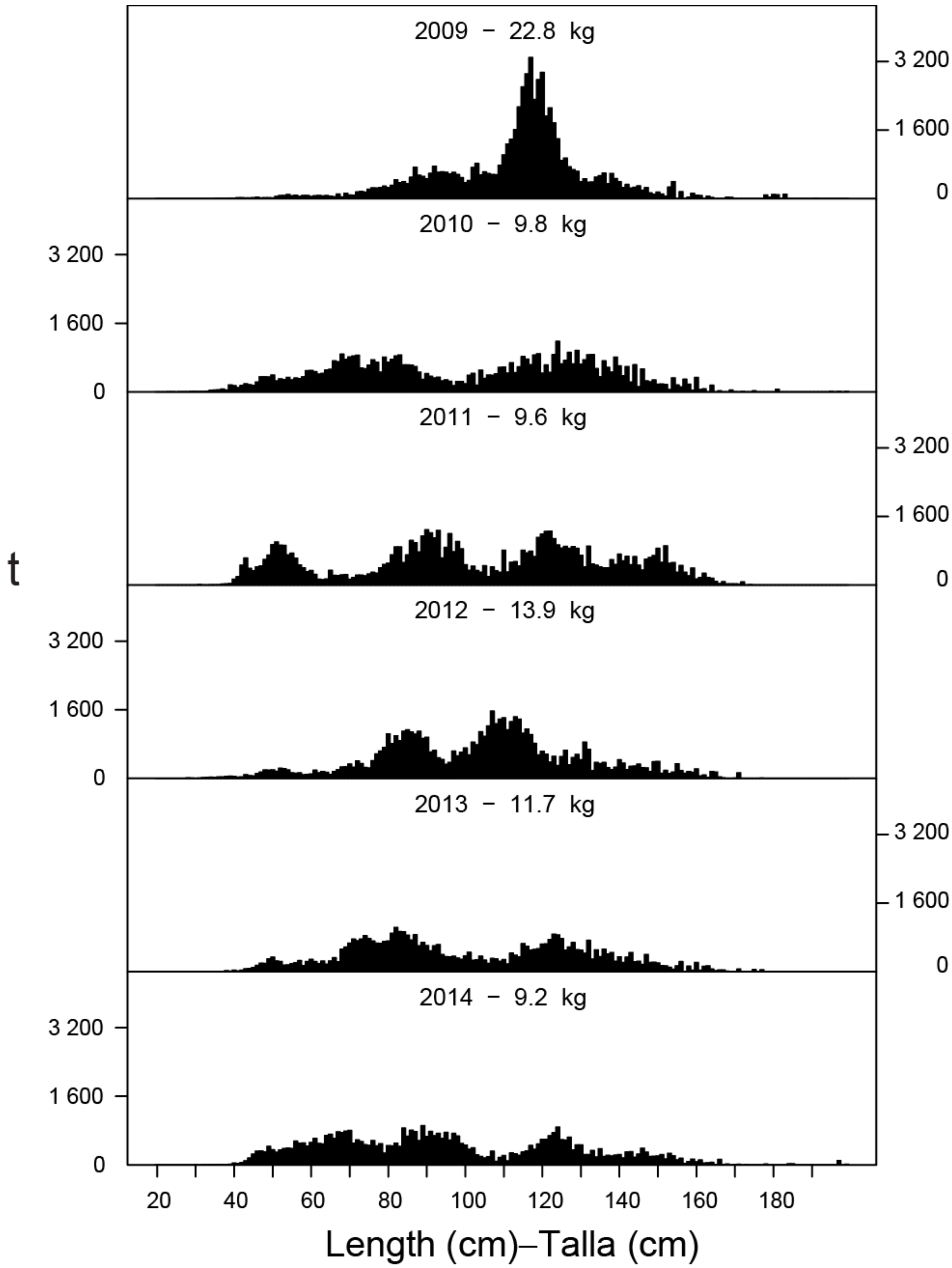

FIGURE 2b. Estimated size compositions of the yellowfin caught in the EPO during the first quarter of 2009-2014. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 2b. Composición por tallas estimada para el aleta amarilla capturado en el OPO en el cuarto trimestre de 2009-2014. En cada recuadro se detalla el peso promedio de los peces en las muestras; t = toneladas métricas.

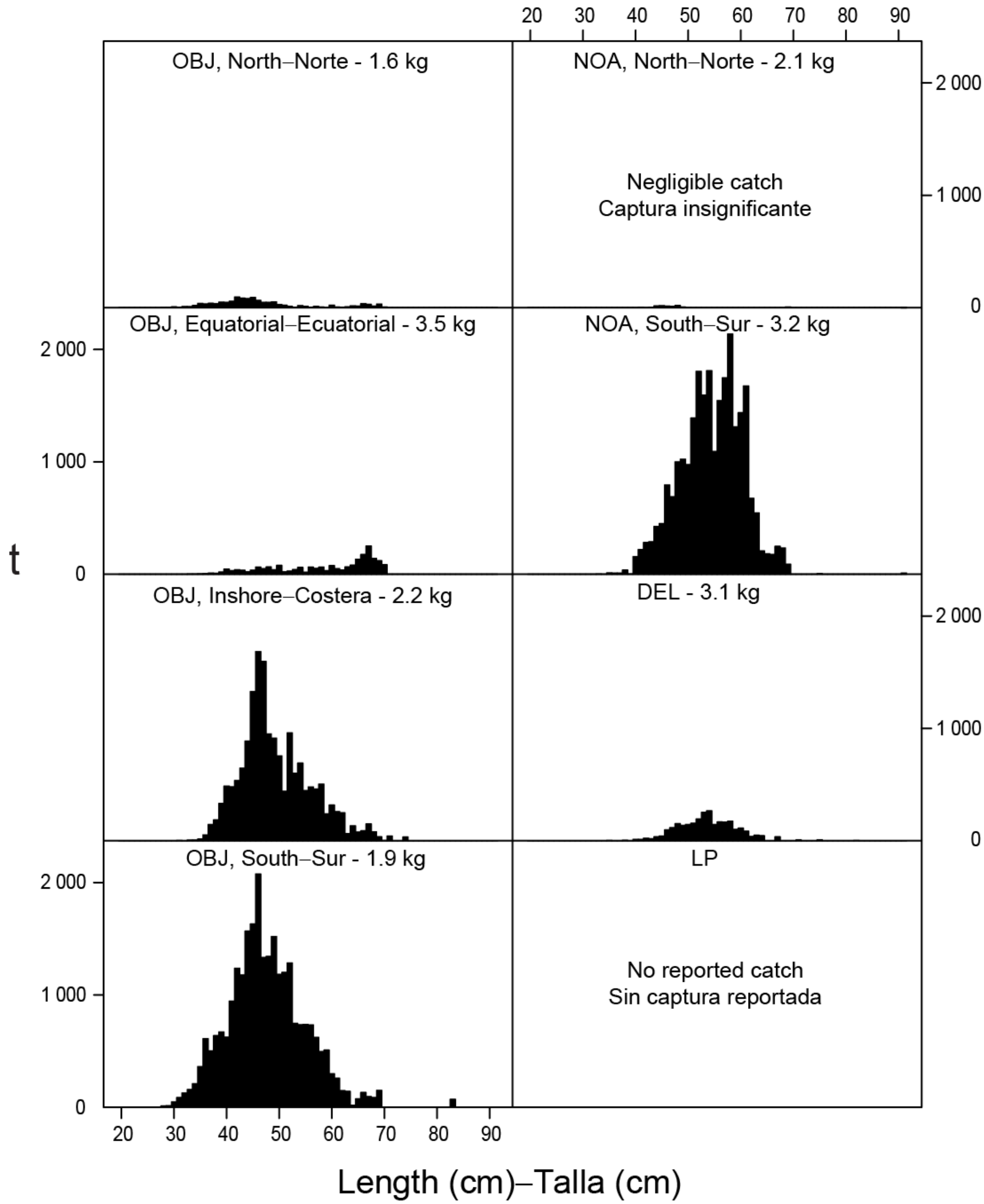

FIGURE 3a. Estimated size compositions of the skipjack caught in each fishery of the EPO during the first quarter of 2014. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 3a. Composición por tallas estimada para el barrilete capturado en cada pesquería del OPO durante el primero trimestre de 2014. 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.

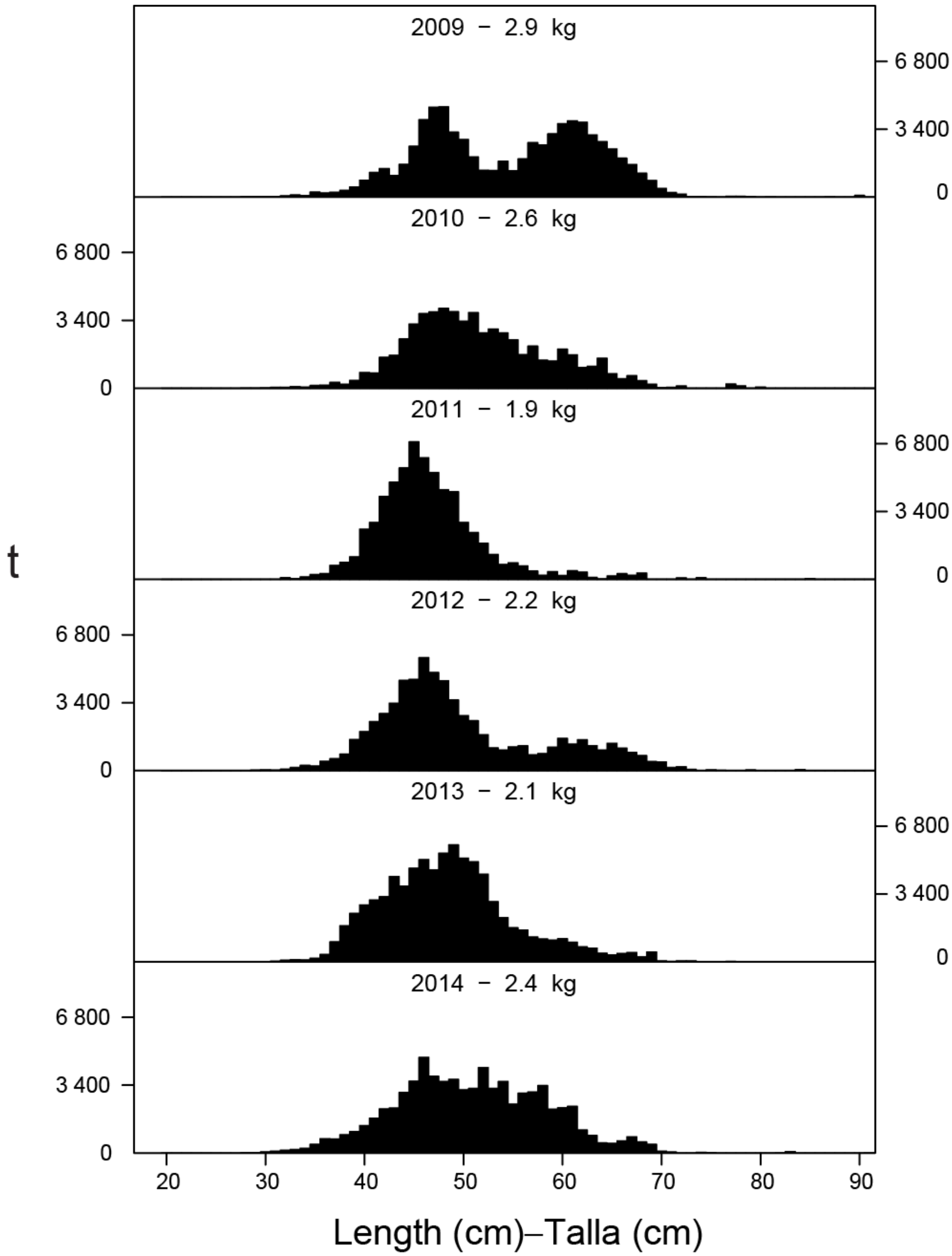

FIGURE 3b. Estimated size compositions of the skipjack caught in the EPO during the first quarter of 2009-2014. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 3b. Composición por tallas estimada para el barrilete capturado en el OPO en el primero trimestre de 2009-2014 En cada recuadro se detalla el peso promedio de los peces en las muestras. t = toneladas métricas.

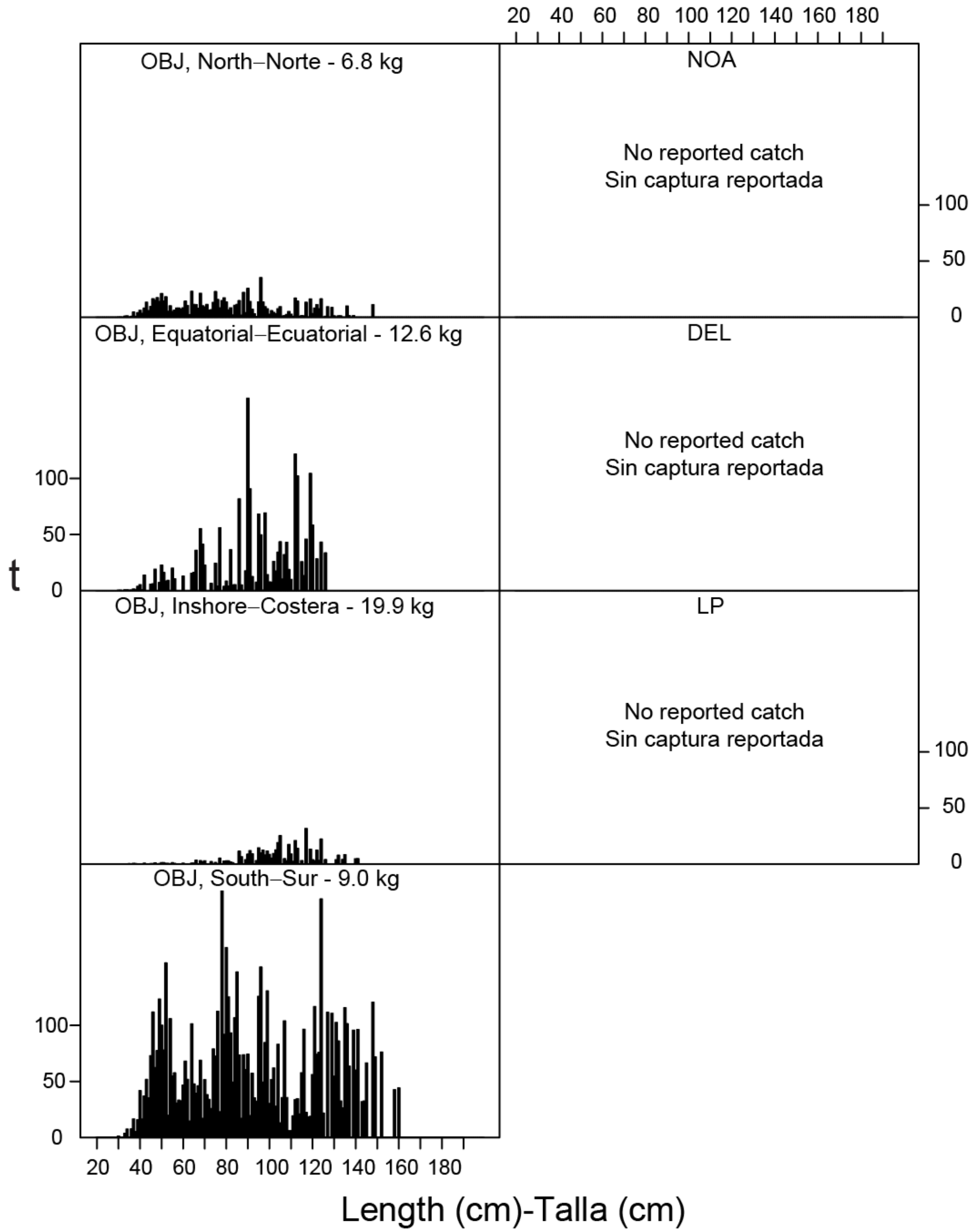

FIGURE 4a. Estimated size compositions of the bigeye caught in each fishery of the EPO during the first quarter of 2014. The average weights of the fish in the samples are given at the tops of the panels. OBJ = floating object; LP = pole and line; NOA = unassociated; DEL = dolphin; t = metric tons.

FIGURA 4a. Composición por tallas estimada para el patudo capturado en cada pesquería del OPO durante el primero trimestre de 2014. 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.

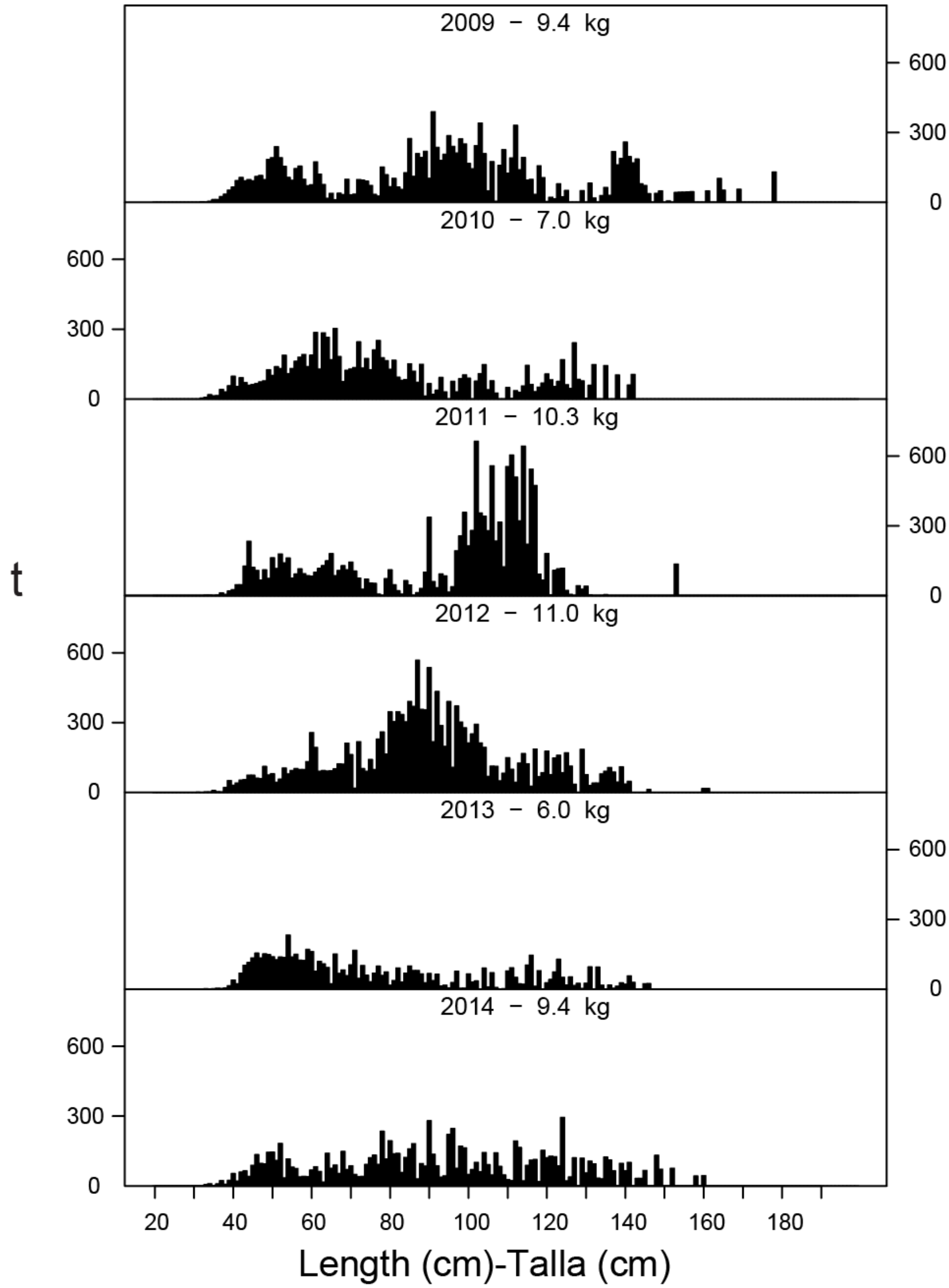

FIGURE 4b. Estimated size compositions of the bigeye caught in the EPO during the first quarter of 2008-2013. The average weights of the fish in the samples are given at the tops of the panels. t = metric tons.

FIGURA 4b. Composición por tallas estimada para el patudo capturado en el OPO en el primero trimestre de 2008-2013. En cada recuadro se detalla el peso promedio de los peces en las muestras; t = toneladas métricas.

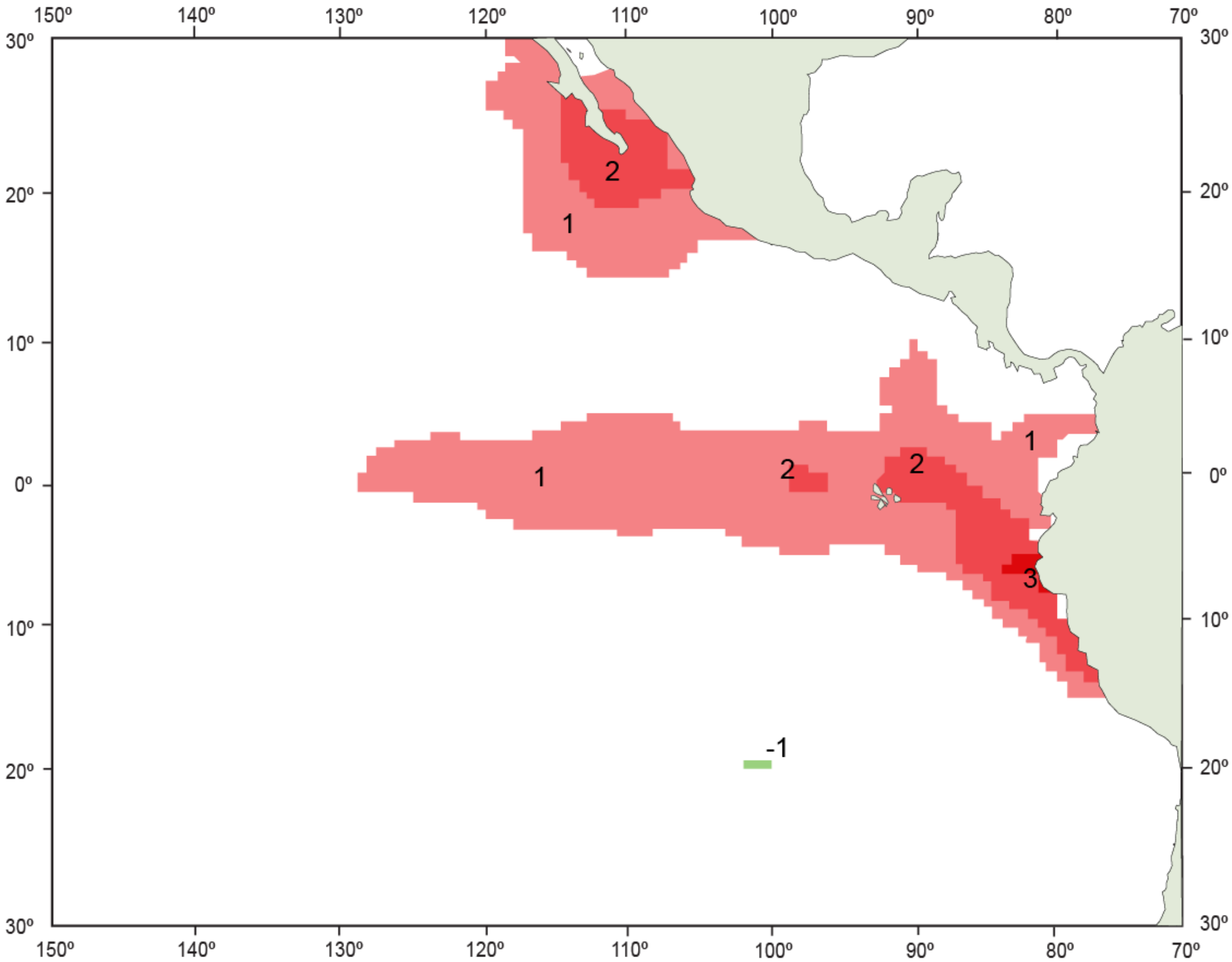

FIGURE 5. Sea-surface temperature (SST) anomalies (departures from long-term normals) for June 2014, based on data from fishing boats and other types of commercial vessels.
FIGURA 5. Anomalías (variaciones de los niveles normales a largo plazo) de la temperatura superficial del mar (TSM) en junio de 2014, basadas en datos tomados por barcos pesqueros y otros buques comerciales.

TABLE 1. Estimates of the numbers and capacities (m³) of purse seiners and pole-and-line vessels operating in the EPO in 2014 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 2014, y de la capacidad de acarreo (m³) de los mismos por bandera, arte de pesca, y volumen de bodega. Se incluye cada buque en los totales de cada bandera bajo la cual pescó durante el año, pero solamente una vez en el total de la flota; por consiguiente, los totales de las flotas no son siempre iguales a las sumas de las banderas individuales. PS = cerquero; LP = cañero.

Flag	Gear	Well volume–Volumen de bodega				Capacity
Bandera	Arte	1-900	901-1700	>1700	Total	Capacidad
		Number—Número				
Colombia	PS	4	10	-	14	14,860
Ecuador	PS	71	23	12	106	85,547
Unión Europea (España)—European Union (Spain)	PS	-	-	4	4	10,116
Guatemala	PS	-	1	-	1	1,475
México	PS	10	31	1	42	49,310
	LP	3	-	-	3	268
Nicaragua	PS	-	6	1	7	9,966
Panamá	PS	2	8	3	13	18,039
Perú	PS	2	-	-	2	599
El Salvador	PS	-	1	3	4	7,892
Venezuela	PS	-	14	1	15	20,890
All flags—Todas banderas	PS	89	94	25	208	
	LP	3	-	-	3	
	PS + LP	92	94	25	211	
		Capacity—Capacidad				
All flags—Todas banderas	PS	42,695	122,908	53,091	218,694	
	LP	268	-	-	268	
	PS + LP	42,963	122,908	53,091	218,962	

TABLE 2. Estimates of the retained catches of tunas in the EPO, from 1 January through 29 June 2014, by species and vessel flag, in metric tons.
TABLA 2. Estimaciones preliminares de las capturas retenidas de atunes en el OPO del 1 de enero al 29 de junio 2014, 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	9,237	13,683	986	-	-	-	-	-	23,906	8.0
Ecuador	17,103	85,150	19,757	-	1,671	-	12	332	124,025	41.5
México	74,883	4,652	13	4,029	52	-	2,482	3	86,114	28.8
Nicaragua	5,818	3,127	1,719	-	-	-	1	-	10,665	3.6
Panamá	11,186	11,015	3,511	-	2	-	-	170	25,884	8.7
Venezuela	13,422	5,323	223	-	-	-	10	1	18,979	6.4
Other—Otros[2]	2,760	4,932	1,348	2	-	-	-	-	9,042	3.0
Total	134,409	127,882	27,557	4,031	1,725	-	2,505	506	298,615	

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

TABLE 3. Preliminary estimates of the catches of bigeye tuna, in metric tons, in the eastern Pacific Ocean during the first and second quarters of 2014 by longline vessels more than 24 meters in overall length.
TABLA 3. Estimaciones preliminares de las capturas de atún patudo, en toneladas métricas, en el Océano Pacífico oriental durante el primero y segundo trimestres de 2014 por buques palangreros de más de 24 metros en eslora total.

Flag	First quarter	Month			Second quarter	Total to date
		4	5	6		
Bandera	**Primer trimestre**	**Mes**			**Segundo trimestre**	**Total al fecha**
		4	**5**	**6**		
China	786	271	402	348	1,021	1,807
Republic of Korea—República de Corea	1,666	562	263	220	1,045	2,711
Japan—Japón	3,622	659	652	555	1,866	5,488
Chinese Taipei—Taipei Chino	1,304	41	89	63	193	1,497
USA—EE.UU.	-	-	-	-	-	-
Vanuatu	-	-	-	-	-	-
Total	7,378	1,533	1,406	1,186	4,125	11,503

TABLE 4. Oceanographic and meteorological data for the Pacific Ocean, April 2013-March 2014. 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, abril 2013-marzo 2014. 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	**7**	**8**	**9**	**10**	**11**	**12**
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	20.3 (-1.3)	19.7 (-1.0)	19.8 (-0.6)	20.2 (-0.6)	21.1 (-0.5)	22.6 (-0.2)
Area 2 (5°N-5°S, 90°-150°W	25.0 (-0.7)	24.4 (-0.6)	24.7 (-0.1)	24.7 (-0.2)	24.8 (-0.2)	25.1 (0.0)
Area 3 (5°N-5°S, 120°-170°W)	26.9 (-0,3)	26.5 (-0.3)	26.7 (-0.1)	26.4 (-0.3)	26.7 (0.0)	26.5 (0.0)
Area 4 (5°N-5°S, 150W°-160°E)	28.8 (0.0)	28.7 (0.0)	28.7 (0.0)	28.7 (0.0)	28.9 (0.3)	28.6 (0.2)
Thermocline depth—Profundidad de la termoclina, 0°-80°W	25	30	20	30	30	35
Thermocline depth—Profundidad de la termoclina, 0°-110°W	60	55	60	80	80	120
Thermocline depth—Profundidad de la termoclina, 0°-150°W	140	150	140	140	165	155
Thermocline depth—Profundidad de la termoclina, 0°-180°	170	170	160	180	180	170
SOI—IOS	0.8	0.2	0.3	-0.1	0.7	0.1
SOI*—IOS*	3.37	2.18	-0.80	-0.55	3.28	0.41
NOI*—ION*	0.47	-1.30	-0.26	0.93	0,14	4.97

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

Month—Mes	**1**	**2**	**3**	**4**	**5**	**6**
SST—TSM (°C)						
Area 1 (0°-10°S, 80°-90°W)	24.8 (0.3)	25.4 (-0.8)	25.9 (-0.8)	25.2 (-0.4)	25.6 (1.3)	24.6 (1.8)
Area 2 (5°N-5°S, 90°-150°W	25.3 (-0.4)	25.6 (-0.8)	26.9 (-0.2)	27.7 (0.2)	27.7 (0.6)	27.4 (0.9)
Area 3 (5°N-5°S, 120°-170°W)	26.1 (-0.5)	26.2 (-0.6)	27.0 (-0.2)	28.0 (0.2)	28.3 (0.5)	28.1 (0.5)
Area 4 (5°N-5°S, 150W°-160°E)	28.1 (-0.2)	28.4 (0.3)	28.7 (0.5)	29.1 (0..6)	29.6 (0.8)	29.5 (0.6)
Thermocline depth—Profundidad de la termoclina, 0°-80°W	35	15	10	50	70	50
Thermocline depth—Profundidad de la termoclina, 0°-110°W	45	25	60	110	90	95
Thermocline depth—Profundidad de la termoclina, 0°-150°W	140	150	160	150	150	130
Thermocline depth—Profundidad de la termoclina, 0°-180°	185	180	180	170	170	160
SOI—IOS	1.4	0.1	-0.9	0.8	0.5	0.2
SOI*—IOS*	1.61	1.77	1.20	4.67	2.33	1.19
NOI*—ION*	3.98	-0.95	-0.60	1.16	1.39	1.56

TABLE 5. Preliminary data on the sampling coverage of trips of tuna purse seine vessels deployed by the observer programs of the IATTC, Colombia, Ecuador, the European Union, Mexico, Nicaragua, Panama, Venezuela, and under the MOC described above, departing during the second quarter of 2014. The numbers in parentheses indicate cumulative totals for the year.
TABLA 5. Datos preliminares de la cobertura de muestreo de viajes de buques atuneros de cerco asignados por los programas de observadores de la CIAT, Colombia, Ecuador, México, Nicaragua, Panamá, la Unión Europea, Venezuela y bajo el MDC descrito arriba, durante el segundo trimestre de 2014. Los números entre paréntesis indican los totales acumulados para el año.

Flag	**Trips**		**Class-6 – Observed by program**						**Percent observed**	
			IATTC		**National**		**WCPFC**			
Bandera	**Viajes**		**Clase-6 – Observado por programa**						**Porcentaje observado**	
			CIAT		**Nacional**		**WCPFC**			
Colombia	8	(25)	7	(15)	1	(10)			100.0	(100)
Ecuador	89	(189)	57	(124)	31	(62)	1	(3)	100.0	(100)
El Salvador	5	(11)	4	(8)			1	(3)	100.0	(100)
EU – UE (ESP)	7	(16)	3	(4)	4	(12)			100.0	(100)
EE.UU. – USA	1	(1)					1	(1)	100.0	(100)
Guatemala	1	(3)	1	(3)					100.0	(100)
México	63	(122)	30	(58)	33	(64)			100.0	(100)
Nicaragua	8	(16)	3	(8)	5	(8)			100.0	(100)
Panamá	19	(38)	9	(20)	10	(18)			100.0	(100)
Venezuela	11	(29)	6	(14)	5	(15)			100.0	(100)
Total	212	(450)	120	(254)	89	(189)	3	(7)	100.0	(100)