ISSN: 0749-8187

# INTER-AMERICAN TROPICAL TUNA COMMISSION

# COMISION INTERAMERICANA DEL ATUN TROPICAL

Special Report 13

# ORGANIZATION, FUNCTIONS, AND ACHIEVEMENTS OF THE INTER-AMERICAN TROPICAL TUNA COMMISSION

by

William H. Bayliff

La Jolla, California

2001

The Inter-American Tropical Tuna Commission (IATTC) operates under the authority and direction of a convention originally entered into by Costa Rica and the United States. The convention, which came into force in 1950, is open to adherence by other governments whose nationals fish for tropical tunas in the eastern Pacific Ocean. Under this provision Panama adhered in 1953, Ecuador in 1961, Mexico in 1964, Canada in 1968, Japan in 1970, France and Nicaragua in 1973, Vanuatu in 1990, Venezuela in 1992, El Salvador in 1997, and Guatemala in 2000. Canada withdrew from the Commission in 1984.

Additional information about the IATTC and its publications can be found on the inside back cover of this report.

La Comisión Interamericana del Atún Tropical (CIAT) funciona bajo la autoridad y dirección de una convención establecida originalmente por Costa Rica y los Estados Unidos. La Convención, vigente desde 1950, está abierta a la afiliación de otros gobiernos cuyos ciudadanos pescan atunes en el Océano Pacífico oriental. Bajo esta estipulación, Panamá se afilió en 1953, Ecuador en 1961, México en 1964, Canadá en 1968, Japón en 1970, Francia y Nicaragua en 1973, Vanuatu en 1990, Venezuela en 1991, El Salvador en 1997, y Guatemala en 2000. Canadá se retiró de la Comisión en 1984.

Información adicional sobre la CIAT y sus publicaciones puede ser encontrada en la parte interna posterior de la cubierta de este informe.

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# ORGANIZATION, FUNCTIONS, AND ACHIEVEMENTS OF THE INTER-AMERICAN TROPICAL TUNA COMMISSION

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## INTRODUCTION

The Inter-American Tropical Tuna Commission (IATTC) operates under the authority and direction of a Convention (Appendix 1) originally entered into by the governments of Costa Rica and the United States. The Convention, which came into force in 1950, is open to the adherence by other governments whose nationals participate in the fisheries for tropical tunas in the eastern Pacific Ocean (EPO). The member states of the IATTC now are Costa Rica, Ecuador, El Salvador, France, Guatemala, Japan, Mexico, Nicaragua, Panama, the United States, Vanuatu, and Venezuela.

The Convention states that the principal duties of the IATTC are (1) to study the biology of the tunas, tuna baitfishes, and other kinds of fish taken by tuna vessels in the EPO and the effects of fishing and natural factors upon them and (2) to recommend appropriate conservation measures, when necessary, so that these stocks of fish can be maintained at levels which will afford the maximum sustained catches.

In 1976 the IATTC's duties were broadened to address problems arising from the tuna-dolphin relationship in the EPO. As its objectives, it was agreed that "the Commission should strive to maintain a high level of tuna production and also to maintain [dolphin] stocks at or above levels that assure their survival in perpetuity, with every reasonable effort being made to avoid needless or careless killing of [dolphins]" (33rd meeting of the IATTC (October 11-14, 1976), minutes: page 9).

To fulfill these objectives, the IATTC is required to carry out an extensive research program. This program is conducted by a permanent, internationally-recruited staff selected by the Director, who is responsible to the Commissioners.

This report is a description of the organization, functions, and achievements of the IATTC. It has been prepared to provide, in a convenient format, answers to requests for information concerning the IATTC. It replaces similar, earlier reports (Carroz, 1965; IATTC Spec. Rep., 1 and 5), which are now largely outdated. In order to make each section of the report independent of the others, some aspects of the IATTC are described in more than one section. For example, work on the early life history of tunas financed by the Overseas Fishery Cooperation Foundation of Japan is mentioned in the subsection entitled ***Finance***, the subsection entitled ***Biology of tunas and billfishes***, and the section entitled **RELATIONS WITH OTHER ORGANIZATIONS**. Due to space constraints, however, it is not possible to describe the IATTC's activities in detail in this report. Additional information is available in publications of the IATTC, listed in Appendix 6, and in its web site, www.iattc.org. Many abbreviations are used in this report. The names of the organizations or the terms are written out the first time they are used, and, for convenience, they are also listed in the Glossary.

At the 30th intergovernmental meeting, held on October 3-4, 1995, representatives of 12 nations with interests in the purse-seine fishery for tunas in the eastern Pacific Ocean adopted the Declaration on Strengthening the Objectives and Operation of the Convention Establishing the Inter-American Tropical Tuna Commission (Appendix 2), committing themselves to formulating a new binding Convention in accordance with the Declaration of Panama (Appendix 3), adopted at the same meeting. (Intergovernmental meetings are described below in the section entitled **ORGANIZATION**.) At its 61st meeting (June 10-12, 1998) the IATTC established a working group of its member governments to review the functions of the IATTC and its Convention and, if necessary, formulate possible amendments to the Convention. This working group met on October 19, 1998, and held an “informal consultation” on January 28, 1999. At the 63rd meeting of the IATTC (June 8-11, 1999) a protocol to amend the convention (Appendix 4) was adopted. This protocol, which has not yet been ratified, would make it possible for regional economic

integration organizations, such as the European Union (EU), to join the IATTC. It was also noted at the 63rd meeting of the IATTC that alternate proposals for modifying the Convention had been made, and that these could be combined to form a single negotiating text. The working group held another meeting on October 5-6, 1999, at which a draft negotiating text was presented and discussed. This discussion was continued at two more meetings in 2000, one on May 22-25 and the other on September 11-16.

## ORGANIZATION

### *Membership*

The Convention for the establishment of the IATTC (Appendix 1) was signed by representatives of the governments of Costa Rica and the United States in 1949 and became effective on March 3, 1950.

The states that have adhered to the Convention are referred to in that document as "High Contracting Parties," but in this report they are referred to as "member states." Membership in the IATTC is open to any state whose nationals participate in the fisheries covered by the Convention, provided its membership is approved unanimously by the member states of the IATTC. Upon receiving such consent, the government of that state must deposit an "instrument of adherence" with the depositary government, which is the United States, stating the date at which it takes effect.

The states which have subsequently joined the IATTC, and their dates of entry, are as follows: Panama, 1953; Ecuador, 1961; Mexico, 1964; Canada, 1968; Japan, 1970; France, 1973; Nicaragua, 1973; Vanuatu, 1990; Venezuela, 1992; El Salvador, 1997; Guatemala, 2000.

At any date subsequent to March 3, 1960 (10 years after the Convention became effective) any member state may give notice of its intention to withdraw from the Commission, and this withdrawal would become effective 1 year after its receipt by the depositary government. Canada withdrew from the IATTC in 1984.

### *Languages*

The official languages of the IATTC are English and Spanish. At its meetings simultaneous interpretation from English to Spanish and Spanish to English is provided, and the background documents and minutes of the meetings are provided in both languages. Also, most of the IATTC publications (Appendix 6) are printed in both languages.

### *Commissioners*

In the Convention (Appendix 1) the individuals representing the member states are referred to as "members," but in the Rules of Procedure (Appendix 5) they are also referred to as "Commissioners." Because "member" might be construed to mean a member state rather than an individual, and because the word "Commissioner" has been used in the more recent Annual Reports and other documents of the IATTC, the latter word is employed in this report.

The Commission consists of a national section for each member state. Each national section is entitled to have up to four Commissioners, appointed by its government. Each national section may appoint an advisory committee to assist it with matters related to the work of the IATTC.

The IATTC Annual Reports for 1964-1997 include lists of the persons who have served as Commissioners of the IATTC from its inception through 1997.

### *Meetings*

#### *IATTC meetings*

The Convention requires that the Commission meet at least once each year. These meetings are listed in Appendix 7. During the 1950s only one meeting was held each year, but since then, especially during the periods of yellowfin regulation (1966-1979 and 1998-2000) and major involvement in dolphin conservation (1986-present), more than one meeting has sometimes been held in a single year. The times

and places of the meetings are determined by the Chairman (see below) of the Commission, in consultation with the other Commissioners. In practice, at most meetings the time and place of the next meeting are agreed upon. The locations of the meetings, as far as practical, are rotated among the member states.

Invitations to be represented at the meetings by observers are sent to non-member states with coastlines bordering the Convention area and to non-member states whose nationals participate in fisheries for tropical tunas in the EPO, and also to intergovernmental organizations "which have regular contact with the IATTC, or whose work is of interest to the IATTC, and vice versa" (Appendix 5, Rule of Procedure XIII).

Members of the advisory committees may attend the meetings and may, at the discretion of the Chairman, address these meetings. Observers may, with the authorization of the Chairman, provided no representative of a member state objects, also take the floor at these meetings.

There are two types of IATTC meetings, “annual meetings” and “special meetings.” At the annual meetings the Director and other members of the IATTC staff present the results of recent research and make recommendations, if appropriate, for regulation of the fishery. In addition, the Director presents a proposed budget for the fiscal year that begins in October of the following year. The Commission then makes decisions regarding these recommendations, and takes whatever actions it considers necessary on these and other issues. Special meetings are convened to take care of matter that, for various reasons, cannot be handled at the annual meetings.

The IATTC staff’s recommendations regarding tuna fishing have always been concerned with such scientific and technical matters as overall catches, areas of fishing, and size distribution of the fish in the catches. Nevertheless, matters such as economics, enforcement, special allowances, and distribution of the catches among users are discussed at IATTC meetings.

***Intergovernmental meetings***

Until the late 1990s, IATTC meetings were frequently adjourned temporarily so that intergovernmental meetings (IGMs) could be convened. Matters similar to those discussed at the IATTC meetings were discussed at the IGMs, but they included, in addition to representatives of states that were members of the IATTC, representatives of non-member states that participated in the fishery for tunas in the EPO. Representatives of some states that were members of the IATTC sometimes attended the IGMs as observers, rather than as participants. No IGMs have been held after 1999, as it is difficult to participate in the fishery for tunas in the EPO without ratifying or applying provisionally the Agreement on the International Dolphin Conservation Program (AIDCP) (Appendix 9), described on page 41, and by that time all the major participants in the fishery had either ratified it or were applying it provisionally. Such being the case, matters previously discussed at the IGMs could be discussed at IATTC meetings or at meetings of the Parties to the AIDCP.

At IGMs attempts were made to reach agreement as to whether to accept the recommendations of the staff for the overall quota and as to distribution of special allowances, *etc*. The principal point of contention in most years was the special allowances; the developing nations that border the EPO wanted to base these allowances on such criteria as coastal adjacency to the resource and level of economic development, whereas some of the other nations were opposed to this. Also, such questions as international cooperation in the enforcement of regulations were discussed. When agreement was reached at an IGM the recommendations of that meeting were written in the form of resolutions and passed on to the Commissioners for consideration and possible adoption at the IATTC meeting, which was reconvened after the IGM was adjourned.

The conservation of dolphins was discussed at IGMs during the 1980s and 1990s. At the 24th IGM (June 17-18, 1992), the Agreement for the Conservation of Dolphins (“the 1992 La Jolla Agreement”) (Appendix 8) was adopted. This agreement is virtually identical to a resolution adopted at the 50th IATTC meeting, held immediately before the IGM. The only differences between the resolution and

the 1992 La Jolla Agreement are that the latter (1) includes Colombia, Ecuador, Mexico, and Spain, which were not members of the IATTC at that time and (2) does not include France and Japan, which were members of the IATTC. At the 35th IGM (February 2-7, 1998) the AIDCP, mentioned above, was adopted.

***Meetings of the International Review Panel and the Scientific Advisory Board***

Two subsidiary bodies, the International Review Panel (IRP) and the Scientific Advisory Board (SAB), were created by the 1992 La Jolla Agreement. The organization and functions of these panels are discussed in the subsection entitled ***International Dolphin Conservation Program***. The IRP met once in late 1992, and since then has met three times each year (Appendix 7). Due to lack of funds, the SAB has met only once since its inception (Appendix 7).

***Working groups***

Working groups have been established at IATTC meetings, IGMs, and IRP meetings, especially the more recent ones, to consider various issues and make recommendations for consideration at those or other meetings.

***Chairman and Secretary***

Each year the Commissioners select one person, usually a Commissioner, to serve as Chairman and another from a different nation to serve as Secretary of the Commission for the following year. The Chairman is usually a representative of the host nation for the principal meeting of that year.

The duties of the Chairman include selection of the time and place for the meetings of the IATTC, in consultation with the other Commissioners, presiding at the meetings, deciding upon questions of order raised at the meetings (subject to the right of any Commissioner to request that any ruling by the Chairman be submitted to the Commission for decision by vote), calling for votes and announcing the results of such votes, taking such other actions as might be specifically required by decision of the Commission, and approving the minutes of the meetings.

The duties of the Secretary include signing official communications directed to the member states, the approval of the Chairman being required in each case, receiving and transmitting to the other Commissioners communications from the member states, maintaining records of actions taken in these respects, and performing other duties as assigned by decision of the Commission. Since 1994 the Secretary's duties have been performed by the IATTC staff.

***Voting***

Each national section has one vote, which may be cast by any Commissioner of that section. Official actions of the Commission require unanimous votes. When voting is conducted between meetings, as in the case of admittance of a new member state, it can be conducted by correspondence. Such can also be done when no representatives of a member state attend a meeting, as is sometimes the case.

***Director and staff***

The Commissioners appoint a technically-competent Director who is responsible for carrying out the scientific and administrative work of the IATTC, subject to their instruction and approval. These duties include planning and carrying out scientific studies and reporting on their results, preparation of budget estimates, authorization of the disbursement of funds and accounting for expenditures, arranging for coordination of the work of the IATTC with that of other organizations and individuals when this is necessary or expedient, and performance of such other duties as the Commission might require. The Director carries out his duties with the aid of an internationally-recruited staff of scientists, technicians, and administrative personnel selected by himself on the basis of technical competence.

### *Headquarters and field stations*

The Rules of Procedure (Appendix 5) of the IATTC state that its headquarters (meaning the headquarters of the staff) shall be in San Diego, California. Field stations are presently located in Ensenada and Mazatlan, Mexico; Mayaguez, Puerto Rico, USA; Panama and Achotines Bay, Republic of Panama; Las Playas and Manta, Ecuador; and Cumaná, Venezuela. At various times in the history of the IATTC staff members have also been stationed in San Pedro, California, USA; Puntarenas, Costa Rica; Taboga, Republic of Panama; Guayaquil, Ecuador; Paita and Coishco, Peru; Pago Pago, American Samoa; and several locations in Japan.

### *Finance*

The financial regulations of the IATTC appear in Appendix 10 of this report.

The IATTC Convention stipulates that the expenses of the national sections (principally transportation to and from the meetings and living expenses at the meetings) be paid by the individual member states. Meeting rooms, simultaneous interpretations, *etc*., at the meetings are normally provided by the host country but, if not, these are paid for from the budget of the IATTC. The budget of the IATTC also provides for payment of the salaries of the Director and staff and purchase of equipment and services necessary to carry out its scientific, technical, and administrative duties.

The Convention states, "The proportion of joint expenses to be paid by each High Contracting Party shall be related to the proportion of the total catch from the fisheries covered by this Convention utilized by that High Contracting Party." On the date the Convention became effective, March 3, 1950, letters were exchanged between the governments of Costa Rica and the United States "to place on record the understanding of our two Governments with respect to the manner in which certain provisions of the Convention shall be applied," specifying that, "it is understood that 'the proportion of the total catch from the fisheries covered by this Convention utilized by that High Contracting Party' shall be the part of the total catch which is used for domestic consumption in the territory of that High Contracting Party or is the object of commercial transactions the financial benefits of which accrue entirely or in their major portion to individuals or firms whose proprietors or stockholders are domiciled in the territory of that High Contracting Party." In 1952, to clarify this matter further, this was defined as “the tuna (yellowfin and skipjack) consumed fresh or substantially processed in a country. The latter is considered to include canning, regardless of the ultimate destination of the canned product." (IATTC, 18th meeting (April 19-20, 1966), Background Paper 5). Finally, in 1953, it was stated that the contributions would be "in the proportion in which tunas from the Eastern Tropical Pacific are utilized within their respective countries, regardless of the source of the fish, with a minimum annual payment of $500.00" (IATTC Ann. Rep., 1953: page 8).

The recommended and actual budgets for each fiscal year are shown in Table 1.

The IATTC also obtains money from research contracts and grants. Since the late 1960s most of the staff's oceanographic and meteorological investigations have been funded in this manner. These have included studies of the "El Niño" phenomenon, research on upwelling in various parts of the world, including the west coast of Baja California and the coasts of Peru, Oregon, and West Africa, evaluation of the applicability of satellites to the collection of oceanographic data, and preparation of predictions of weather conditions in the EPO for transmittal to tuna vessels at sea. These projects are all compatible with the research aims of the IATTC. In addition, performance of work in this manner has made it possible for the IATTC to have available, at a minimum cost, a small staff of scientists and technicians to render advice on oceanography and meteorology that is often needed for various biological studies.

The IATTC's Tuna-Dolphin Program receives substantial support from sources other than the IATTC's budget. Seventy percent of the costs of placement of observers on tuna vessels (training, transportation to and from the ports, salaries, living expenses, insurance, preparation of the data for analysis, *etc*.) are currently borne by the owners of the vessels. From 1992 through 1994 the owner of each vessel was assessed $10 per short ton of fish-carrying capacity per year for this purpose. This was increased to

$12 per short ton of fish-carrying capacity, beginning on January 1, 1995. The means of collecting these assessments were not specified in detail prior to 1994. At the 28th IGM (October 20-21, 1994) it was specified that the funds were to be collected "by one of the following methods:

a) The government of a nation issues a single check, payable in U.S. dollars to the IATTC, for the total fees for all vessels operating under that nation's flag or responsibility.
b) The government of a nation collects from each vessel operating under its jurisdiction a check, payable in U.S. dollars to the IATTC, and then forwards all these checks to the IATTC" (minutes of that meeting, Appendix 6)."

The assessment was further increased to $14.18 per cubic meter of fish-carrying capacity (equivalent to $15.05 per short ton of fish-carrying capacity), beginning on January 1, 1999. These total annual assessments for the IATTC observer program are listed in Table 1. Also, substantial contributions to the Tuna-Dolphin Program have been received from the United Nations Environmental Programme (UNEP), the U.S. National Marine Fisheries Service (NMFS), the Associazione Nazionale Conservieri Ittici e delle Tonnare of Italy, and Bumble Bee Seafoods, Inc., of the United States. In 1992 the U.S. Congress appropriated special funds for dolphin research, and the IATTC was awarded funds for three projects relating to problems resulting from the association between tunas and dolphins.

In December 1993 an agreement was reached by the Overseas Fishery Cooperation Foundation (OFCF) of Japan, the government of the Republic of Panama, and the IATTC to undertake a joint 5-year project, funded mostly by the OFCF, at the IATTC's Achotines Laboratory. The project encompasses research on the feasibility of culturing adult yellowfin tuna to supply larvae, the production of food organisms for larval and juvenile tunas, and the culturing of broodstock snappers (Lutjanidae) and/or corvina-like fishes (Sciaenidae) and production of food organisms for their larvae and juveniles. In November 1999 it was agreed, in principle, that the project would receive funding through March 2001.

Substantial funding has been received from the Food and Agriculture Organization (FAO) of the United Nations for studies of interactions among fisheries for tunas and for the costs associated with a world meeting on bigeye tuna which was held in La Jolla, California, USA, in 1996 (IATTC Spec. Rep., 9).

## AREA COVERED BY THE IATTC CONVENTION

The IATTC Convention refers several times to the "eastern Pacific Ocean" as being the area of concern, without giving any specific geographic limitations.

Although there are frequent references in IATTC publications, particularly those of the earlier years, to the "eastern tropical Pacific Ocean," the Convention uses only the term "eastern Pacific Ocean."

Prior to the mid-1960s the surface fisheries for yellowfin and skipjack operated within about 250 nm of the mainland or in the vicinity of a few offshore islands and banks (IATTC Bull., 4 (6), 8 (6), and 12 (6)). Regulation of the fishery for yellowfin was first recommended at the 14th meeting of the IATTC (September 14, 1961), but the regulatory area was not defined (IATTC Ann. Rep., 1961: pages 19-20). At the 15th meeting of the IATTC (May 16-18, 1962), however, that area, henceforth referred to as the CYRA (Commission's Yellowfin Regulatory Area), was defined (IATTC Ann. Rep., 1962: page 15). This is shown in Figure 1. It is emphasized that this area is a provisional one, subject to change, and applies only to the area within which limits on the catches of yellowfin have been applied. For oceanographic studies the "Eastern Tropical Pacific Ocean" was defined as the area between 30°N and 40°S east of 140°W (IATTC Ann. Rep., 1963: page 22). In 1969 the purse-seine fishery (Appendix 11) expanded to the area outside the CYRA, and by 1974 fishing was conducted as far west as 150°W (IATTC Ann. Rep., 1974: Figure 3). Table 1 of the IATTC's Annual Reports for 1973-1995 and Table 3 for those subsequent to 1995 include catches made west of the CYRA but east of 150°W. Several reports of the IATTC (IATTC Bull., 9 (6), 10 (4), 11 (2), 11 (3), 13 (2), 16 (2), 19 (1), 20 (4), 20 (5), 20 (8), 21 (6); Joseph *et al.*, 1974) have been concerned with the Japanese longline fishery (Appendix 11) in the EPO. In

the first six of those IATTC Bulletins only data for the fishery east of 130°W are included, whereas the other five include data for the fishery east of 150°W.

Resolutions passed for regulation of the surface fisheries for yellowfin and bigeye tuna in the EPO at the 61st through 66th meetings of the IATTC, held in 1998, 1999, and 2000, and the AIDCP (Appendix 9), which entered into force on February 15, 1999, defined the EPO, for the purposes of those resolutions and that program, as the portion of the Pacific Ocean east of 150°W between 40°N and 40°S.

Since all of the important species with which the IATTC is concerned are distributed continuously from east to west across the Pacific Ocean, it is clearly necessary in some cases to work in other areas to obtain the best possible understanding of the resources of the EPO. For instance, comparisons have been made of the morphometric characters and gill-raker counts of yellowfin and skipjack from the eastern, central, and western Pacific Ocean (IATTC Bull., 1 (4), 3 (6), 20 (3); Schaefer, 1991). Also, studies have been made of catch and other biological data for yellowfin caught by longliners throughout the Pacific Ocean to delineate stocks (which do not necessarily constitute genetic subpopulations) of this species which might be helpful in determining the limits of areas for studies of stock assessment and for regulations (IATTC Bull., 17 (5)). Since spawning of skipjack in the central and/or western Pacific contributes to the catches of that species in the EPO (IATTC Bull., 13 (1)), ecological studies of skipjack involve analyses of oceanographic data from the central Pacific, and even meteorological data from the western Pacific (IATTC Ann. Rep., 1979: pages 58-64). Also, skipjack have been tagged by IATTC employees in French Polynesia (IATTC Spec. Rep., 3) and at American Samoa. The Pacific bluefin which are caught in the EPO all come from spawning which takes place in the western Pacific, so juvenile bluefin have been tagged off Japan by IATTC personnel to learn more about the exchange of fish between the eastern and western Pacific (IATTC Bull., 20 (1)). Recent studies of the mitochondrial DNA of yellowfin, skipjack, and billfishes have shed light on the stock structure of these species; the results of these studies are described later in this report.

The IATTC staff collects data on the catch and effort by area and time for tuna baitboats, purse seiners, and longliners (Appendix 11) based in ports of the western hemisphere which operate in the EPO by making abstracts of their logbooks. Many of the baitboats have gone as far north as British Columbia during the summer to fish for albacore. Though the staff has made no studies of surface-caught albacore, it has made abstracts of the records of albacore trips by these vessels, as the time and expense involved in doing so is negligible. Many of the purse seiners based in EPO or Caribbean ports fish in the Atlantic Ocean or the central and western Pacific Ocean during part of the year. Abstracts of the logbooks of some of these trips are also made, but no scientific studies of the data have been conducted. Until recently, nearly all of the logbooks carried by these vessels have been printed and distributed by the IATTC. During the past few years, however, many of them have been printed and distributed by the various nations in which the vessels are registered, but these logbooks are similar to those of the IATTC.

## SPECIES COVERED BY THE IATTC CONVENTION AND SUBSEQUENT INSTRUCTIONS

The IATTC Convention states that the IATTC shall, "make investigations ... of yellowfin ... and skipjack ... and the kinds of fishes commonly used as bait in the tuna fisheries, ... and other kinds of fish taken by tuna fishing vessels."

### *Yellowfin tuna*

Yellowfin tuna, *Thunnus albacares*, has received more attention than any other species studied by the staff, partly because in most years its catches have exceeded those of any of the other species of tuna in the EPO, but mostly because the need for management of this species has been demonstrated since the 1960s.

Yellowfin are distributed continuously from Baja California to Peru (Figure 2) and from the EPO to the western Pacific and Indian Oceans. Prior to the mid-1950s the EPO fishery for yellowfin took place mostly within about 250 nm of the mainland or in the vicinity of a few offshore islands and banks.

It was conducted principally by baitboats and, to a lesser extent, by purse seiners. During the 1950s Japanese longliners first began to fish in the area to the east of 150°W, and by the early 1960s were fishing in most of the suitable areas of the EPO (IATTC Bull., 9 (6), 11 (3), 13 (2), 16 (2), 19 (1), 20 (5), 21 (6)). During the early 1960s purse-seining became the predominant method of fishing for tunas in the EPO. During the mid-1960s the purse-seine fishery began to expand its operations further offshore, and by the mid-1970s vessels based in EPO ports were fishing as far west as 150°W (IATTC Ann. Rep., 1974: Figure 3). The yellowfin catches by surface gear in the EPO have ranged from 62,028 to 289,375 metric tons (mt) during the 1961-1998 period (IATTC Ann. Rep., 1998: Table 3). These fish range in length from about 35 cm (less than 1 kg) to more than 165 cm (about 90 kg).

Because the population of yellowfin extends across the Pacific Ocean and the fishery of the EPO has been expanding to the westward, the questions of subpopulation and stock identification naturally arise, and these have been intensively studied since the IATTC began its investigations (IATTC Bull., 1 (4), 9 (2), 17 (2), 17 (5), 19 (5), 20 (3); Schaefer, 1991; Scoles and Graves, 1993). Since 1990 it has been assumed, for purposes of production modeling (page 25), that the catches made in the EPO (east of 150°W) come from a single stock (IATTC Ann. Rep., 1989: page 48). Limited data suggest that the amount of mixing between the EPO and the area to the west of 150°W is not extensive.

The need for regulation of the fishery for yellowfin in the EPO was first apparent in 1961, but the governments of the countries concerned were not able to implement regulations until 1966. The regulations continued through 1979, and were implemented again in 1998, 1999, and 2000. During the 1980-1997 period, except for 1987, the IATTC staff recommended catch quotas for yellowfin tuna, and these were approved at the IATTC meetings, but the countries that participated in the fishery were not able to agree on their implementation. During each year of the 1989-1997 period the catches of yellowfin were less than the recommended quotas.

***Skipjack tuna***

Skipjack tuna, *Katsuwonus pelamis*, is second in importance to yellowfin among the tunas caught by the surface fisheries of the EPO, and has received more attention by the IATTC staff than any species of tuna other than yellowfin.

Skipjack are distributed continuously from the EPO to the western Pacific and Indian Oceans. Off the coast of the Americas this species occurs in the vicinity of Baja California and the Revillagigedo Islands (northeastern region) and from Central America to Peru or Chile (southeastern region) (Figure 3). Relatively few skipjack are found in the area of warmest water off southern Mexico in most years (IATTC Bull., 13 (1), 19 (6)). The skipjack catches by surface gear in the EPO have ranged from 33,409 to 169,810 mt during the 1961-1998 period (IATTC Ann. Rep., 1998: Table 3). These fish range in length from about 35 cm (less than 1 kg) to more than 70 cm (about 9 kg).

Until recently, it has generally been believed that there is little spawning of skipjack in the EPO (Rothschild, 1965; IATTC Bull., 13 (1), 19 (6)). The fish that are caught in this area were believed to have resulted mostly from spawning in the central and/or western Pacific, west of 130°W. Fish from the central and/or western Pacific Ocean arrive in the EPO when they are about 1 to 1 1/2 years old and return to the central and/or western Pacific, where they spawn, when they are about 2 to 2 1/2 years old (IATTC Ann. Rep., 1980: page 76). Recent evidence, principally from tagging, suggests that the fish of the northeastern and southeastern regions are parts of a single group inhabiting an arc-shaped area with its tips at those two regions and its center west, southwest, and south of the area of warm water off southern Mexico. Also, it appears that the skipjack found in the northeastern and southeastern regions mix to some extent on the spawning grounds in the central and/or western Pacific (IATTC Ann. Rep., 1982: pages 32-33). Two hypotheses, the clinal hypothesis and the subpopulation hypothesis, have been proposed to describe the population structure of skipjack in the Pacific Ocean, but existing data do not permit a reasonable choice to be made between them (IATTC Ann. Rep., 1983: pages 88-91). A study of mitochondrial DNA (Graves *et al*., 1984) showed a "high degree of genetic similarity" between Atlantic and Pacific

skipjack. It is important to note, however, that these results do not imply rapid mixing of fish of the two oceans, as even very slow mixing is sufficient for maintenance of genetic homogeneity. If Atlantic and Pacific skipjack are genetically similar, it is unlikely that there are important genetic differences among skipjack of different parts of the Pacific Ocean. Studies of the elemental composition of the early-growth zones of the otoliths (bones of the inner ear) of skipjack from Baja California, Hawaii, and Fiji indicate that the fish from Baja California and Hawaii are similar to one another, but different from those from Fiji (IATTC Ann. Rep., 1992: pages 82-83). These results are consistent with those obtained from other studies, which indicate that many or most of the skipjack caught in the EPO are the result of spawning in the central Pacific.

In spite of the information presented above, it is possible that the assumption that there is little spawning of skipjack in the EPO is not valid. The results of research on the reproductive biology of skipjack in the EPO (IATTC Bull., 5 (6)) indicated some spawning off Central America and in the vicinity of the Revillagigedo Islands. In addition, larval surveys have indicated that some skipjack spawning occurs in offshore waters and, to a lesser extent, in coastal waters of the EPO. The results of a sampling program conducted during 1995 indicated that significant spawning of skipjack 50 cm or greater in length occurs in areas of the EPO where the sea-surface temperatures are equal to or greater than 24°C (Schaefer, 2001).

The catches of skipjack vary considerably from year to year. This variability is related partly to the intensity of fishing in the parts of the EPO where skipjack are most abundant and partly to natural factors. It is not known whether the natural variability represents changes in the abundance of the entire population, or merely reflects changes in the portions of a relatively constant population that are available to the fishery of the EPO in different years.

***Bigeye tuna***

The catches of bigeye tuna, *Thunnus obesus*, in the EPO are less than those of yellowfin and skipjack. Until the mid-1990s the catch of bigeye in the EPO consisted almost entirely of large longline-caught fish that were consumed fresh, whereas skipjack and yellowfin are usually canned. Since the prices are much higher for fish that are destined for fresh-fish markets, bigeye are an extremely important component of the catches of tuna in the EPO.

Bigeye are distributed continuously across the tropical and subtropical regions of the Pacific and Indian Oceans. The bigeye catches by longline vessels of Japan, the Republic of Korea, and Taiwan in the EPO ranged from 29.9 thousand to 107.4 thousand mt during the 1970-1998 period (IATTC Ann. Rep., 1998: Table 16, while the corresponding catches by the surface fishery during the 1970-1998 period ranged from 0.8 thousand to 51.4 thousand mt (IATTC Ann. Rep., 1998: Table 3). The surface catches of bigeye are taken mostly south of 5°N (Figure 4). Most of the fish caught by the surface fishery range in length from about 35 cm (less than 1 kg) to 150 cm (about 60 kg) and those caught by the longline fishery from about 120 to 170 cm (about 40 to 105 kg). Until about 1975 the catch of bigeye by surface gear in the EPO appeared to be incidental to that of yellowfin and skipjack, not exceeding 3 thousand mt per year. During most years of the 1975-2000 period, however, the catches have been considerably greater. The increase prior to 1994 may have been due to improved reporting by fisherman and/or the diversion of fishing effort toward bigeye to compensate partially for management restrictions on the catches of yellowfin (Table 5). Two recent studies (IATTC Ann. Rep., 1991: pages 34-35; IATTC Ann. Rep., 1996: 24-25) showed that misidentification of bigeye as yellowfin has not been a serious problem during recent years. Nevertheless, a report comparing the appearances of yellowfin and bigeye of different sizes (IATTC Bull., 21 (7)) was published in 1999.

The catches of bigeye by surface gear, which had previously never exceeded 15 thousand mt, rose to 29.4 thousand mt in 1994, 37.3 thousand mt in 1995, and 51.4 thousand mt in 1996 and 1997, and then dropped to 34.7 thousand mt in 1998. The increased catches of bigeye during those years were apparently due to the discovery, during the early 1990s, that tunas associated with floating objects, but well below

the surface, can be detected with sonar and caught with purse seines. Many of these floating objects were fish-aggregating devices (FADs) placed in the water by the fishermen (Hampton and Bailey, 1993; Armstrong and Oliver, 1995). Most of these catches of bigeye were taken between about 5°N and 10°S and about 85°W to 120°W. The IATTC staff began to devote more attention to research on bigeye in 1995.

The effect of the purse-seine fishery on the longline fishery is obviously a matter of concern. Little is known about the population structure of bigeye, but tagging studies, particularly in the western Pacific and Atlantic Oceans, have shown that many of them move long distances, so the surface fishery of the EPO between 5°N and 10°S could affect the longline fishery in a much larger area. The possible effects of the purse-seine fishery on the longline fishery are discussed on page 255 of IATTC Special Report 9. At the time that that report was written there was insufficient information, particularly on natural mortality rates, to come to definite conclusions.

The IATTC staff has collaborated with scientists from the National Research Institute of Far Seas Fisheries (NRIFSF; formerly the Nankai Fisheries Research Laboratory (NRFRL), and then the Far Seas Fisheries Research Laboratory (FSFRL)) of Japan in studies of the Japanese longline fishery for bigeye in the EPO (IATTC Bull., 9 (6), 11 (2), 11 (3), 13 (2), 16 (2), 19 (1), 20 (4), 20 (5), 20 (8), 21 (6)).

***Pacific bluefin tuna***

The catches of Pacific bluefin tuna, *Thunnus orientalis*, in the EPO are considerably less than those of yellowfin, skipjack, or bigeye, but the fishery is still of considerable economic value.

Pacific bluefin occur continuously across the North Pacific Ocean from North America to Asia. In the EPO they are caught off Baja California and California, principally by purse seining. Bluefin are an important component of the catches of recreational fishermen in this area, but the amounts taken by this fishery are far less than those taken by the commercial fishery. The catches by surface gear in the EPO have ranged from 461 to 15,897 mt during the 1961-1998 period (IATTC Ann. Rep., 1998: Table 3). These fish range in length from about 50 cm (slightly less than 3 kg) to about 270 cm (about 450 kg).

Larvae of Pacific bluefin have been found only in the western Pacific Ocean (WPO), and it is assumed that spawning occurs only in that area. Some of the young fish migrate to the EPO, where they remain for one or more years before returning to the WPO to spawn, while others apparently remain their entire lives in the WPO.

The staff of the IATTC has been studying Pacific bluefin on a modest scale since 1958, when 122 purse seine-caught bluefin were tagged and released near Guadalupe Island, Mexico. Prior to 1979 the work consisted mostly of collection of logbook data and measurement of samples of fish caught by purse seiners in the EPO to estimate their length compositions. In 1979 a review of information pertinent to stock assessment of this species was prepared (IATTC Internal Rep., 12). In 1982 data on the surface catches of bluefin in the EPO by area, date, vessel size class, size of school, type of school, *etc*., were assembled and analyzed (IATTC Bull., 18 (2)). In addition, purse seine-caught bluefin were tagged in the EPO in 1979 and 1980, and troll- and trap-caught bluefin were tagged in the WPO by IATTC employees who were stationed in Japan intermittently during 1980-1982. The results of those tagging experiments, plus experiments conducted in the EPO during 1962-1968 by the U.S. Bureau of Commercial Fisheries (BCF; now the NMFS), the California Department of Fish and Game (CDFG), and the Mission Bay Research Foundation and in the WPO during 1980-1988 by the FSFRL of Japan were analyzed in 1991 (IATTC Bull., 20 (1)). Analysis of length-frequency data collected by the CDFG during 1952-1971 and by the IATTC staff during 1973-1991 has produced estimates of the catches of bluefin in the EPO, in numbers of fish of the various age classes, for the 1952-1991 period (IATTC Bull., 20 (9)). Also, research has been conducted on the determination of the age and growth of bluefin tuna from hard parts (IATTC Bull., 21 (2)).

Information pertinent to stock assessment (IATTC Ann. Rep., 1996: pages 67-70) of Pacific bluefin has been studied, and it appears that the catches of this species could be increased if the minimum size

at entry of the fish to the fishery were increased, but no recommendations for management of bluefin have been made by the IATTC staff.

***Black skipjack tuna***

Black skipjack, *Euthynnus lineatus*, occur in the EPO from Baja California to northern Peru. Judging from IATTC studies based on the collection of larval and juvenile black skipjack and records of catches and sightings of black skipjack schools, their abundance appears to be high, but the market demand is low because of its small size and dark flesh. In recent years, however, small quantities caught by purse seiners have been landed for processing into pet food, and it is expected that eventually this species will assume greater importance as food for humans. During the 1972-1998 period the annual landings of black skipjack have ranged from 101 to 3,742 mt (IATTC Ann. Rep., 1998: Table 3), and during the 1993-1998 period the bycatches of this species have ranged from 805 to 3,950 mt ((IATTC Ann. Rep., 1998: Table 39).

Until 1979 the IATTC's only involvement in studies of black skipjack was the collection of catch data from logbooks of purse seiners, measurement of small numbers of fish which were landed, some studies of their early life history (IATTC Bull., 6 (9), 14 (4)), and the preparation of summaries of biological knowledge available on this species (Calkins and Klawe (1963); IATTC Spec. Rep., 2). In 1979, 1980, and 1981, however, some black skipjack were tagged incidentally to yellowfin and skipjack on three cruises. It is evident from the tag return data that black skipjack, like the other tunas studied by the IATTC staff, move considerable distances (IATTC Ann. Rep., 1982: pages 33-34). Some observations on the swimming performance, body temperatures, and gastric evacuation times of black skipjack were made on a tagging cruise conducted in 1981 (Schaefer, 1984). During the 1980s a study of the areas and duration of spawning, size at sexual maturity, sex ratios, fecundity, and spawning frequency of black skipjack (IATTC Bull., 19 (2)) was carried out.

Research conducted on the early life history of black skipjack at the IATTC's Achotines and La Jolla laboratories is described later in this report.

***Other tunas and tuna-like fishes***

Albacore tuna, *Thunnus alalunga*, occur at the surface in temperate waters in both the North Pacific and the South Pacific oceans, and well beneath the surface in tropical waters as well. In the northeastern Pacific, principally from California to British Columbia, they are fished at the surface, chiefly by trollers (Appendix 11), but also by baitboats and purse seiners. The annual catches by the surface fishery of the northeastern Pacific are highly variable, ranging from about 2 thousand to 30 thousand mt (Bartoo and Foreman, 1994: Table 2). In the southeastern Pacific, off Chile, small amounts of albacore are caught at the surface by trollers (Barbieri *et al*., 1987). In addition, there is a substantial offshore troll fishery for albacore in the South Pacific. During the 1996-1997 season albacore were caught between about 115°W and 180° and between about 30°S and 45°S (Childers and Miller, 1998). There is also a longline fishery for albacore in both temperate and tropical waters. The NMFS carries out extensive studies of the surface fishery for albacore in the northeastern Pacific, so the IATTC staff's research on this species has been limited to collection of logbook records from the baitboats and purse seiners and study of catch and effort data for the longline fishery of the EPO.

Bonito, *Sarda chiliensis*, occur in the EPO off Baja California and California and off Peru and Chile, where they are fished by purse seiners, baitboats, and recreational fishing vessels. The average annual catches in the northern area have ranged from 490 to 16,838 mt during the 1961-1998 period (IATTC Ann. Rep., 1998: Table 3). The CDFG and the Instituto del Mar del Perú have studied bonito for many years, so the IATTC staff has limited its work with this species to the collection of logbook records of the purse seiners and baitboats.

Frigate tuna, *Auxis thazard*, and bullet tuna, *A. rochei*, are abundant in the EPO (IATTC Bull., 14 (4)) but, because of their small size, they are of little commercial value. However, they are an important

source of food for yellowfin tuna (Olson and Boggs, 1986). Some studies of *Auxis* larvae and juveniles have been made at the IATTC's Achotines Laboratory in Panama (Margulies, 1993).

Sierra, *Scomberomorus sierra*, are not often caught by vessels fishing for tuna. They are abundant near the Achotines Laboratory, however, and information on the nutrition of their larvae and juveniles has been published by Margulies (1993).

### *Billfishes*

The IATTC staff's involvement in billfish research has consisted of analysis, with scientists from the NRIFSF, of catch and effort and other biological data on the Japanese longline fishery for tunas and billfishes in the EPO (IATTC Bull., 9 (6), 11 (3), 13 (2), 16 (2), 19 (1), 20 (5), 21 (6); Joseph *et al*. (1974)), studies of the relationships of the billfishes to their environment (IATTC Ann. Rep., 1991: pages 35-36; 1992: pages 42-43), genetic studies (Graves and McDowell, 1994 and 1995), development of a mathematical model for the standardization of fishing effort for billfishes, incorporating biological and oceanographic data (IATTC Bull., 21 (4); Hinton and Deriso, 1998), analyses of stock structure and development of production models for swordfish (Hinton and Deriso, 1998), formulation of an improved method for estimating the maturity of swordfish from their ovaries (Hinton *et al*., 1997), and analyses of billfish management in the Pacific and Indian Oceans (Joseph and Greenough, 1979; Greenough and Joseph, 1986; Greenough and Rothschild, 1989; Joseph, 1989). Estimates of the incidental catches of billfishes in purse seines are given in the IATTC Annual Reports for 1991 (page 36), 1992 (pages 42-43), and 1998 (page 90 and Table 40).

#### *Swordfish*

Information on the biology, fisheries, marketing and utilization, fishing regulations, and stock assessment of swordfish, *Xiphias gladius*, appears in IATTC Internal Report 24 and in many of the papers in Barrett *et al*. (1998). Swordfish are distributed continuously between about 50°N and 50°S from the EPO to the western Pacific and Indian Oceans. In the EPO they are exploited principally by longline vessels off Baja California and central Mexico, west of 125°W between about 30°N and 35°N, off northern Chile, and west of 90°W between about 5ºN and 15°S, and by gillnet vessels (Appendix 11) off California, Baja California, and Chile. Most of the longlining effort is conducted by vessels registered in Japan, the Republic of Korea, and Taiwan, but there are also longline vessels based in Chile, Mexico, the United States, and a few other nations of the western hemisphere. The annual commercial catches during the 1971-1997 period have ranged about 2,684 to 14,003 mt (IATTC Ann. Rep., 1998: Table 30). Swordfish are seldom caught by recreational fishermen. Swordfish reach maximum weights of well over 450 kg. A tagged swordfish released northeast of Hawaii in May 1993, as part of a NMFS program, was recaptured off Southern California in January 1995, indicating that these fish may be highly migratory. To familiarize themselves with the developing North America-based longline fishery in the northeastern Pacific Ocean, IATTC staff members accompanied two U.S.-based longliners that were fishing primarily for swordfish on two trips during 1994.

#### *Marlins, spearfish, and sailfish*

The marlins, spearfish, and sailfish are caught principally by longline and recreational gear in the EPO. The ratios of the recreational to the commercial catches are far greater for marlins, sailfish, and spearfish than for tunas or swordfish. The great majority of the marlins, sailfish, and spearfish that are caught commercially are consumed raw as *sashimi* or in *sushi*. In Japan the highest prices are paid for striped marlin and the lowest prices for sailfish and spearfish (IATTC Bull., 21 (6): Table 5).

##### *Blue marlin*

There is disagreement among scientists regarding the taxonomic status of blue marlin. Some of them, *e.g*. Nakamura (1985), consider that there are two species, *Makaira nigricans* in the Atlantic Ocean and *M. mazara* in the Pacific and Indian Oceans, while others, *e.g*. Graves and McDowell (1995), con-

sider them to belong to a single species, *M. nigricans*. The commercial catches of blue marlin in the EPO were less than 10 thousand mt during most years of the 1970-1996 period. Blue marlin are caught by longliners principally off Central America and northern South America and offshore west of about 100°W between about 10°N and 10°S (IATTC Bull., 19 (1), 20 (5), 21 (6)). Blue marlin reach maximum weights of well over 450 kg. Previous to 1988 only about 1,500 tagged blue marlin had been released worldwide, and only a few of these had been returned (Sakagawa, 1988). One fish released south of Hawaii in 1986 was recaptured off the east coast of Australia 5 months later.

***Black marlin***

The commercial catches of black marlin, *M. indica*, in the EPO were less than 1 thousand mt during most years of the 1970-1996 period. Black marlin are caught by longliners principally south of Baja California, off northern South America, and offshore west of about 90°W between about 10°N and 20°S (IATTC Bull., 20 (5), 21 (6)). Black marlin reach maximum weights of well over 450 kg. Of 59 returns of tagged black marlin released off Queensland, Australia, 55 were from fish recaptured off eastern Australia, 1 from a fish caught off the north coast of Papua New Guinea, 2 from fish recaptured off New Zealand, and 1 from a fish caught at approximately 4°S-166°E, 1,440 nm northeast of the point of release (Squire and Neilson, 1983).

***Striped marlin***

The commercial catches of striped marlin, *Tetrapturus audax*, in the EPO ranged were less than 10 thousand mt during most years of the 1970-1996 period. Striped marlin are caught by longliners principally south and southwest of Baja California and offshore west of 90ºW between about 10ºN and 20ºS (IATTC Bull., 19 (1), 20 (5), 21 (6)). Striped marlin reach maximum weights of about 225 kg. Of 155 returns of tagged striped marlin released off Mexico, only two were from fish recaptured more than 1,000 nm from the location of release (Squire, 1987). One of these was recaptured 1,560 nm "south of the Baja California peninsula" and the other was recaptured near Hawaii. Two of 11 returns of fish released off Southern California were from fish that had traveled more than 2,000 nm. Graves and McDowell (1994) found genetic differences among samples of striped marlin collected off Baja California, Ecuador, Hawaii, and Australia, and pointed out that these differences should be taken into account in any scheme for the management of striped marlin.

***Shortbill spearfish***

The commercial catches of shortbill spearfish, *T. angustirostris*, in the EPO were less than 1 thousand mt during most years of the 1970-1996 period. Shortbill spearfish are caught by longliners principally offshore west of about 125°W between about 15°N and 30°N, west of 90ºW between about 0º and 10ºN, and west of 80°W between about 0º and 20°S (IATTC Bull., 20 (5), 21 (6)). Shortbill spearfish reach maximum weights of more than 45 kg.

***Sailfish***

There is disagreement among scientists regarding the taxonomic status of sailfish. Some of them, *e.g*. Nakamura (1985), consider that there are two species, *Istiophorus albicans* in the Atlantic Ocean and *I. platypterus* in the Pacific and Indian Oceans, while others, *e.g*. Graves and McDowell (1995), consider them to belong to a single species, *I. platypterus*. The commercial catches of sailfish in the EPO were less than 10 thousand mt during most years of the 1970-1996 period. Sailfish are caught by longliners principally from the Gulf of California to northern South America within a few hundred nautical miles of the coast (IATTC Bull., 19 (1), 20 (5), 21 (6)). Sailfish reach maximum weights of more than 90 kg. Only a few records for movements of tagged sailfish are available, and none of these had traveled more than 250 nm (Squire, 1974).

***Baitfishes***

Prior to the 1960s about 80 to 90 percent of the yellowfin and skipjack caught in the EPO were taken by baitboats (IATTC Bull., 1 (7)). The numbers of baitboats declined precipitously during the late 1950s and early 1960s (IATTC Ann. Rep., 1988: Table 4) and more gradually thereafter (IATTC Ann. Rep., 1998: Table 1). By the late 1990s baitboats were taking about 1 to 2 percent of the annual catches of yellowfin and skipjack.

Baitfishing is described in Appendix 11. In the EPO the tuna fishermen usually catch their own bait with lampara nets, although in some cases they buy it from purse-seine fishermen who fish only for bait species, principally for fish meal and oil. To be suitable for tuna bait, a fish must occur fairly close to the tuna-fishing grounds, be catchable in large numbers, survive well aboard the fishing vessels, and be attractive to the tunas when they are used. Most fish with these characteristics belong to the herring (Clupeidae) or anchovy (Engraulidae) families.

At the time that the IATTC staff initiated its work the anchoveta, *Cetengraulis mysticetus*, was the most widely-used baitfish, and considerable effort was devoted to study of this species, especially in the Gulf of Panama (IATTC Bull., 1 (1), 2 (2), 2 (8), 2 (9), 3 (1), 3 (10), 5 (2), 6 (2), 6 (4), 6 (8), 7 (6), 8 (3), 9 (1), 10 (3), 11 (4), 12 (5)). The other species which the staff has studied include the colorado, *Anchoa naso*, which is used for bait in Ecuador (IATTC Bull., 8 (1)) and the thread herring, *Opisthonema* spp., which occurs in many tropical areas and has been used for bait, principally as a substitute for anchovetas (IATTC Bull., 7 (2)). The northern anchovy, *Engraulis mordax*, and the Pacific sardine, *Sardinops sagax*, are used extensively for bait in the vicinity of Baja California and the Revillagigedo Islands, and the southern anchovy, *Engraulis ringens*, was formerly used off Peru and Chile. These species have not been investigated by the IATTC staff because they were already being studied by other organizations, although it has kept records of the amounts of all species used for bait, obtained from logbook records (IATTC Bull., 2 (2)).

During 1959-1961 most of the baitboats that were fishing for tunas in the EPO were converted to purse seiners. The remaining baitboats include small to medium vessels (mostly under 150 short tons (st) (136 mt) of fish-carrying capacity) which fish mostly off Baja California and near the Revillagigedo Islands, and small vessels that fish off Ecuador, making trips of one to a few days. The former use northern anchovies and Pacific sardines for bait (except on their infrequent trips to more southerly areas), while the latter use colorado and other species for that purpose.

Because of the greatly reduced catches of baitfishes following the conversion of most of the baitboats to purse seiners, the IATTC staff terminated its investigations of these species during the late 1960s.

***Dolphins***

During the late 1950s and early 1960s most of the baitboats that were fishing for tunas in the EPO were converted to purse seiners, and construction of new purse seiners began during the mid-1960s. Yellowfin tuna frequently associate with dolphins, and the fishermen found that yellowfin could be caught by encircling herds of dolphins which had yellowfin associated with them. During the early years of the purse-seine fishery large numbers of dolphins were killed by fishermen who were using this method to catch yellowfin. The public first became aware of the fact that such mortalities were occurring during the late 1960s. At about the same time there was considerable concern about the effects of human activities on other marine mammals. Shortly thereafter, in 1972, the U.S. Marine Mammal Protection Act (MMPA; U.S. Public Law 92-522, October 21, 1972) was passed.

The IATTC's responsibilities were broadened in 1976 to address the problems arising from the incidental mortality in purse seines of dolphins that associate with tunas in the EPO. The Commissioners agreed that the IATTC "should strive to maintain a high level of tuna production and also to maintain [dolphin] stocks at or above levels that assure their survival in perpetuity, with every reasonable effort being made to avoid needless or careless killing of [dolphins] (33rd meeting of the IATTC (October 11-

14, 1976), minutes: page 9). The principal responsibilities of the IATTC's Tuna-Dolphin Program are (1) to monitor the abundance of dolphins and their mortality incidental to fishing through the collection of data aboard tuna purse seiners fishing in the EPO, (2) to analyze these data and make appropriate recommendations for the conservation of dolphins, (3) to study the causes of mortality of dolphins during fishing operations and encourage fishermen to adopt the techniques of fishing which minimize these mortalities, and (4) to study the effects of different modes of fishing on the various fish and other animals of the pelagic ecosystem.

The IATTC staff has directed most of its attention to spotted, *Stenella attenuata*, spinner, *S. longirostris*, and common, *Delphinus delphis* and, possibly, *D. capensis*, dolphins, the species which are most often associated with tunas. The ranges of the various stocks of these species, as defined by the NMFS, are shown in Figure 5. When other species of marine mammals are observed at sea, that fact is recorded by the observers who are aboard the vessels, but no attempts have been made to analyze these data. (The observer program is described in the subsection entitled ***Tuna-Dolphin Program***.) One IATTC staff member has been involved peripherally in research on bottlenose dolphins, *Tursiops truncatus*, in Florida, and a book on whales, dolphins, and porpoises of the northeastern Pacific Ocean has been translated from English to Spanish by the IATTC staff (IATTC Spec. Rep., 6).

## RESEARCH

### *Tuna-Billfish Program*

The Convention states that it is the objective of the IATTC to maintain "the populations of yellowfin and skipjack tuna and of other kinds of fish taken by tuna fishing vessels in the eastern Pacific Ocean ... at a level which will permit maximum sustained catches year after year." As some authorities contend that the maximum catch is a less desirable objective than the maximum economic yield, it is important to note that the Convention specifies that the former is the objective of the IATTC. This is achieved by making recommendations, as necessary, to the member states that they take appropriate actions to maintain the populations of fish at the proper levels. Thus it is the responsibility of the member states to enact and enforce the necessary legislation.

The recommendations of the IATTC are based upon the research of the scientific staff, presented to the Commissioners at IATTC meetings and, when necessary, between meetings, by correspondence. Five types of research, (1) fishery statistics, (2) biology of tunas and billfishes, (3) biology of baitfishes, (4) oceanography and meteorology, and (5) stock assessment are described. Basically, information on statistics, biology, and oceanography and meteorology are combined to arrive at conclusions regarding the status of the stocks. The classification of the research into these categories is artificial, however, for biological and oceanographic data are used to determine how best to organize the statistical system, statistical and oceanographic data are extensively used in biological studies, *etc*.

#### *Fishery statistics*

It is of utmost importance that detailed statistics of the catch and effort of the surface and subsurface fisheries for tropical tunas and billfishes in the EPO be available by species, gear, area, and time. To ensure this objective it is necessary that the IATTC staff has intimate knowledge of the fishery and an extensive and sophisticated system for collecting and processing the data.

The tunas to which the IATTC has directed most of its research and expenditures are taken almost entirely by purse seiners, baitboats, and longliners, described in Appendix 11. During the late 1950s the addition of power blocks, nylon nets, and improved fish-carrying facilities to the purse seiners (IATTC Spec. Rep., 2: 99) improved their overall efficiency so much that during the 1959-1961 period most of the medium to large baitboats were converted to purse seiners. During the 1960s and 1970s these vessels and the original purse seiners were gradually replaced by new, larger purse seiners which were much more efficient than those of the early 1960s. Also, the remaining baitboats were gradually replaced by new, more efficient, small to medium vessels. The total fish-carrying capacity of the surface-fishing vessels

(purse seiners and baitboats) reached a peak of more than 171 thousand mt in 1980 (Table 2) and then declined to less than 107 thousand mt by 1983. This decrease was due to the fact that, for various reasons, including decreased abundance of yellowfin and a strong El Niño event, many of the vessels were inactive in 1982 and 1983 (and therefore were not counted as part of the fleet) and many purse seiners left the EPO to fish in the WPO or the Atlantic Ocean. Fishing conditions improved in the EPO during the mid-1980s, which resulted in an increase in the numbers of purse seiners fishing in that area. During the early 1990s, however, the number of purse seiners again declined, and in 1992 the total fish-carrying capacity of the surface fleet was at its lowest level, less than 102 thousand mt, since 1971. During the mid-1990s the numbers of purse seiners began to increase again, and in 1998 the fish-carrying capacity of the surface fleet reached its highest level, nearly 140 thousand mt, since 1982 (IATTC Ann. Rep., 1998: Table 1).

Billfishes are taken principally by longline, gillnet (swordfish), and recreational-fishing (marlins and sailfish) gear. The California gillnet fishery for swordfish and sharks is described by Hanan *et al*. (1993), and the Chilean gillnet fishery for swordfish is described by Barbieri *et al.* (1998). The recreational fishery for marlins off California and Mexico is described by Talbot and Wares (1975).

Since the IATTC's inception studies of the relationship between catch per unit of fishing effort (CPUE) and total fishing effort expended have been given high priority (IATTC Bull., 1 (2), 2 (6), 12 (3), 13 (3), 19 (3), 20 (2), 20 (4), 21 (4), 21 (8)). Data on the total fishing effort are not available, but estimates can be obtained by dividing the total catch by the average CPUE of a large sample of the fishing fleet.

Virtually complete data on the total catches of yellowfin, skipjack, bigeye, Pacific bluefin, and swordfish in the EPO are compiled from various sources. Most of the information for the surface fisheries is furnished by canneries, and most of that for the longline fisheries is obtained from the governments of Japan, the Republic of Korea, and Taiwan (IATTC Ann. Rep., 1998: Tables 3, 14, 16, 28, and 30).

Data on the catches and fishing effort by surface gear are obtained from logbook records covering more than 90 percent of the catches of the purse seiners and baitboats that fish in the EPO. Specially-prepared logbooks with spaces for the information of interest to the fishermen and to the IATTC staff are distributed to the fishermen. These logbooks remain on the vessels; at the end of each trip abstracts of the pertinent information are made for retention and analysis by the staff. The data for individual vessels or fishing companies are kept confidential. The information of prime interest to the staff is, for each day, the location of the vessel, whether or not it was fishing for tunas or for bait (the latter applying only to baitboats, of course), the times of initiation and completion of each set and the types of sets (Appendix 11) by the purse seiners, and the catches of each species. The data for a trip are entered into a computerized data base, where they are subjected to various error-checking procedures. If no errors are found, or if the errors can be corrected, the data are transferred to a permanent catch and effort data base. Usable logbook data are obtained for about 80 to 90 percent of the total catch.

All effort that meets the criterion that two thirds or more of the catch on the trip in question must be yellowfin, skipjack, and/or bigeye is considered to be yellowfin effort, as this species occurs in all areas where skipjack are caught. In most years skipjack occur only rarely in the area off southern Mexico, and therefore effort in this area should not be considered to be skipjack effort. Hence, for analyses of CPUE and effort data for skipjack the data for areas of low skipjack catches, which varied from year to year, were deleted (IATTC Bull., 13 (1), 19 (5)).

In general, the CPUEs are greater for the larger vessels. As the proportions of small, medium, and large vessels have not remained constant from year to year, it has been necessary to "standardize" the CPUEs. The vessels have been assigned to the following "size classes," according to their fish-carrying capacities: 1, up to and including 50 (st) (45 mt); 2, 51-100 st (46 to 91 mt); 3, 101 to 200 st (92 to 181 mt); 4, 201 to 300 st (182 to 272 mt); 5, 301 to 400 st (273 to 363 mt); 6, more than 400 st (363 mt). The CPUEs for the classes other than the "standard" ones (see next paragraph) have been divided by "effi-

ciency factors" (IATTC Bull., 1 (7), 13 (1)) to compensate for the differences in efficiency of these vessels. In recent years the IATTC staff has used data for Class-6 purse seiners almost exclusively in its assessment studies (see below), so it has not been necessary to standardize the data for those years.

Until the end of the 1950s baitboats were the predominant form of gear. Thus data for baitboat CPUE and effort, standardized to Class-4 vessels, for 1934 and subsequent years were used in studies conducted prior to the 1960s of the relationship of the former to the latter for yellowfin (IATTC Bull., 2 (6)). (The data for the years prior to the initiation of the IATTC's logbook system in the early 1950s were obtained from logbooks for previous years kept by the fishermen and made available to the staff (IATTC Bull., 1 (7)).) The equivalent data for purse seiners were not used, as the catches of these vessels were small and the effort was restricted to a small part of the range of the baitboat fishery. When the majority of the fleet was converted to purse seiners during 1959-1961 the situation was reversed, that is most of the catch during the 1960s, 1970s, 1980s, and 1990s has been made by purse seiners, and the effort by baitboats has been restricted to a small part of its former range. To continue the series of data that began with 1934, it was necessary to convert the data for Class-3 purse-seine effort to the equivalent in Class-4 baitboat effort, or *vice versa*. A method for doing the former for yellowfin, based on data for 1959 and 1960, when both types of vessels were fishing in most of the usually-exploited fishing areas, was devised (IATTC Bull., 6 (7)). Later, when the need to convert baitboat data to purse-seine data arose, the same data were used to accomplish this (IATTC Bull., 15 (4)). Approximately the same thing has been done for skipjack, using the 1959-1961 data to convert unstandardized purse-seine effort data to Class-4 baitboat effort data (IATTC Bull., 13 (1)) or the reverse (IATTC Internal Rep., 10 and 18).

Since 1982 only the effort data for Class-6 vessels have been used for the IATTC's assessment studies. Also, since the mid-1970s the staff has not used the purse-seine data for years prior to 1967 because fishing effort prior to that year was not as widely dispersed over the CYRA as it has been in later years (IATTC Ann. Rep., 1975: pages 60-61).

Data on the catches and effort for baitfishes are obtained from the logbooks of over 90 percent of the baitboats that fish in the EPO, with the exception of the small baitboats based in Ecuador. These data have been standardized to Class-4 baitboat effort in the same manner as those for tunas. The standardized data have been used to study the relationship between CPUE and total fishing effort expended for anchovetas in several important fishing areas (IATTC Bull., 2 (2)).

Catch, effort, and CPUE data are used for many studies other than those of the relationship between CPUE and total fishing effort expended. Among these are studies of year-class strength (IATTC Bull., 14 (1)), distribution (IATTC Bull., 14 (2)), mortality (IATTC Bull., 15 (4)), and movements (IATTC Bull., 17 (6)). Statistical summaries of catch and effort by species, 5- and 1-degree areas, quarters and months, vessel size classes, and regulation status which are prepared for each year form the basis for much of this work.

During 1966-1979 and 1998-2000, when the fishery was under international regulation, the catch of yellowfin in the CYRA in a given year consisted of fish caught (1) before regulation began, (2) by vessels which were temporarily or permanently exempt from regulation after that date, and (3) incidentally by regulated vessels fishing primarily for other species. Thus, if the catch of yellowfin was to be 120,000 mt, for example, and the fleet was capable of catching more than that if there were no regulation, the regulation would have to begin before 120,000 mt of yellowfin were caught to allow for the expected catches of fish in the second and third categories. The task of monitoring the catches, including those on vessels still at sea, was assigned to the IATTC staff (IATTC Ann. Rep., 1961: pages 20-21). Since then the staff has made weekly estimates of the total catches to date (from January 1 of the year in question) of all species of tunas inside and outside the CYRA. The collection and processing of these data requires close contact with many industry sources of information and an efficient system of data processing.

Tuna fishermen rarely record discards of commercially-important tunas or bycatches of other species in their logbooks, so reliable estimates of the amounts of discards and bycatches are not readily

available. Fortunately, however, in recent years observers have been placed aboard all Class-6 tuna purse-seiners, and some Class-5 vessels as well, for the purpose of gathering data on marine mammals, and these observers have also gathered data on discards and bycatches. Information on the bycatches of billfishes appears in the IATTC Annual Reports for 1991 (page 36) and 1992 (page 43), and information on the discards of commercially-important tunas and the bycatches of various species of fish, dolphins, and sea turtles appears in the IATTC Annual Report for 1998 (Tables 39-41).

***Biology of tunas and billfishes***

Studies of population structure are of prime importance, for the status of a species of fish in a particular area cannot be determined until its relationship with fish of the same species in other areas is determined. For instance, if the fish of Area A do not mix with those of Areas B and C at any stage of their life history, then only the fishery in Area A need be considered when studying the effect of fishing on the fish of Area A. However, if there is exchange among fish of Areas A, B, and C the fisheries of all three areas must be considered in such studies. The population structure of tunas and billfishes in the EPO has been studied by analysis of data on tagging (IATTC Bull., 5 (5), 15 (1), 16 (1), 17 (6), 20 (1); IATTC Internal Rep., 12 and 18), morphometric and meristic characters (IATTC Bull., 1 (4), 3 (6), 3 (8), 19 (5), 20 (3); Schaefer, 1991), serological characteristics (IATTC Ann. Rep., 1979: pages 36-39; IATTC Data Rep., 7; Ward *et al*., 1997), mitochondrial DNA (Scoles and Graves, 1993; Graves and McDowell, 1994 and 1995; Ward *et al*., 1997), trace element chemistry (IATTC Ann. Rep., 1983: pages 36-40; 1993: pages 32-33), length frequencies (IATTC Bull., 17 (5)), gonad development (IATTC Bull., 1 (6), 5 (6), 17 (2), 17 (5)), and distribution of larvae (IATTC Bull., 6 (9), 17 (5)). Such studies complement each other, so that the evidence from several studies combined is much stronger than that from any of the studies alone.

Studies of recruitment, growth, and mortality are also extremely important, especially for use in age-structured models (IATTC Bull., 6 (1), 12 (3); IATTC Ann. Rep., 1998: pages 53-58, 69, and 74-77) and in computer simulation studies (IATTC Bull., 16 (3), 17 (4)) conducted to investigate the effect of fishing on yellowfin in the EPO. Recruitment, growth, and mortality rates are estimated principally by analysis of data on length-frequencies (IATTC Bull., 8 (4), 10 (6), 11 (2), 13 (1), 14 (1), 20 (9); IATTC Ann. Rep., 1982: pages 54-55), tagging (IATTC Bull., 13 (1), 15 (4), 19 (4), 20 (1); IATTC Internal Rep., 8 and 10), and hard parts, *e.g*. otoliths (bones of the inner ear) and spines (IATTC Bull., 17 (7), 18 (6), 21 (2)).

Detailed knowledge of the way the fisheries operate is necessary to ensure that the IATTC's statistical system is as effective as possible, so as to enable the IATTC staff to give sound advice on what types of regulation are feasible, *etc*. Studies of distribution have been conducted, using logbook data for the surface fisheries for yellowfin, skipjack, bigeye, and Pacific bluefin (IATTC Bull., 13 (1), 17 (5), 18 (1), 18 (2), 20 (8); Spec. Rep., 2), and for the longline fisheries for tunas and billfishes (IATTC Bull., 12 (7), 16 (2), 17 (5), 19 (1), 20 (5), 20 (8), 21 (6)). Most of these publications deal only with the fisheries of the EPO, but two (IATTC Bull., 12 (7), 17 (5)) include data for longline-caught skipjack and yellowfin for the entire Pacific Ocean. The species and size compositions of tuna schools have been scrutinized (IATTC Bull., 2 (3), 4 (7), 10 (8), 18 (2), 20 (8)), using logbook data and length-frequency data gathered at sea, and tagging and logbook data have been used to study the integrity of schools of skipjack (Bayliff, 1988). Studies of "concentration indices" (measures of the extent to which the fishermen are able to concentrate their efforts in the areas where the fish are most abundant) have been carried out with logbook data (IATTC Bull., 4 (3), 6 (3), 8 (5)). In 1992 the IATTC staff organized a workshop on the ecology and fisheries for tunas associated with floating objects (IATTC Spec. Rep., 11), at which scientists from all over the world discussed information on this subject.

The food and feeding habits of yellowfin and skipjack in the EPO were investigated during the late 1950s when the fishery was conducted relatively close to shore and to a few offshore islands and banks (IATTC Bull., 7 (5)). Since then the stomach contents of yellowfin caught in offshore areas

(IATTC Ann. Rep., 1981: pages 43-44; Olson and Boggs, 1986) and of juvenile yellowfin (IATTC Ann. Rep., 1991: page 30) have been studied. The results of those investigations, and studies of the gastric evacuation rates (Olson and Boggs, 1986; Olson and Mullen, 1986), energetics (Olson and Boggs, 1986; IATTC Ann. Rep., 1990: pages 26-28), and swimming speeds (Carey and Olson, 1982), have been used to obtain a reasonably thorough understanding of the food requirements of yellowfin. Also, studies of the trophic interactions of yellowfin, dolphins, and associated predators have been carried out (IATTC Ann. Rep., 1994: pages 31-32). Studies of the food habits (IATTC Ann. Rep., 1980: pages 39-40) and gastric evacuation times (Schaefer, 1984) of black skipjack have also been conducted. In 1998 the IATTC staff began working on a modeling approach to evaluate the ecological implications of various purse-seine fishing methods. The *Ecopath* model (IATTC Ann. Rep., 1998: pages 37-38), which creates a mass balance of trophic exchanges for entire ecosystems based on estimates of biomass for many species and trophic levels, and uses the principles of energetics and trophic transfer, is being used in these studies. It provides input to *Ecosim*, which incorporates the principles of population dynamics into the higher trophic levels and the consequent feedback for all trophic levels.

Studies of the maturation and spawning of tunas and billfishes are also important. The IATTC staff has carried out research on the maturation and spawning of surface-caught yellowfin (IATTC Bull., 1 (6), 5 (6), 7 (4), 17 (2), and 21 (5); Schaefer, 1996), skipjack (IATTC Bull., 1 (6), 5 (6); IATTC Ann. Rep., 1996: page 26), and black skipjack (IATTC Bull., 19 (2)), and on the maturation and spawning of longline-caught yellowfin, bigeye, albacore, swordfish, blue marlin, black marlin, striped marlin, shortbill spearfish, and sailfish (IATTC Bull., 11 (2), 11 (3), 13 (2), 16 (2), 19 (1), 20 (5), and 21 (6)). Also, Hinton *et al*. (1997) devised an improved method to measure the maturity of swordfish.

For many years fisheries scientists have believed that the abundance of a population of fish is determined principally during its early life history (egg, larval, and/or early-juvenile) stages. Although decades of research have provided considerable information on the populations of adult tunas, relatively little is known about the early life history stages and the factors that affect their recruitment to the exploitable stocks. These considerations motivated the IATTC to establish a research facility at Achotines Bay in the Republic of Panama for the purpose of studying the early life histories of tunas. Surveys have been conducted near the laboratory during every month of the year to determine the distribution and abundance of the larvae of scombrids (tunas and mackerels) and other fishes (IATTC Bull., 21 (3)). Late-larval and early-juvenile black skipjack caught at sea have been transported to the laboratory for rearing for experimental purposes (Olson and Scholey, 1990), and adult black skipjack have spawned successfully in captivity (IATTC Ann. Rep., 1993: pages 38-40). Histological studies of wild-caught and laboratory-reared larval and juvenile black skipjack, bullet and/or frigate tuna, and sierra (Margulies, 1993) have revealed important information about the incidence of starvation of these in natural conditions. A study of the age and growth of black skipjack larvae and early juveniles, as determined from laboratory experiments and examination of their otoliths (IATTC Bull., 20 (7)), has been carried out. A 5-year project to investigate the feasibility of culturing adult yellowfin tuna to supply larvae and the production of food organisms for larval and juvenile tunas, funded mostly by the Overseas Fishery Cooperation Foundation (OFCF) of Japan, was begun at the IATTC's Achotines Laboratory in 1994. In November 1999 if was agreed, in principle, that the project would receive funding through March 2001. Yellowfin tuna held in tanks at the Achotines Laboratory spawned during 1996-2000; this has not been accomplished anywhere else in the world. The resulting larvae have been reared for periods of up to 100 days after hatching.

***Biology of baitfishes***

The IATTC's studies of the biology of baitfishes, which were drastically reduced and then terminated because most of the baitboats were converted to purse seiners during the 1959-1961 period, have been briefly described in the section entitled **SPECIES COVERED BY THE IATTC CONVENTION AND SUBSEQUENT INSTRUCTIONS**.

***Oceanography and meteorology***

To separate the effects of fishing, which can be controlled by man, from the effects of the environment, which usually cannot, it is necessary to understand how the environment affects the tunas, billfishes, and baitfishes. For this reason the IATTC staff conducts studies of oceanography and meteorology, the latter because atmospheric conditions affect conditions in the ocean. Most oceanographic research is exceedingly expensive, but much has been accomplished by using "ships of opportunity," sharing expenses with other organizations, analyzing data from various sources which have not been put fully to use, obtaining contracts and grants from other organizations, *etc*.

The oceanographic and meteorological investigations include studies of offshore oceanography, coastal and estuarine oceanography, and relationships of tunas, billfishes, and baitfishes to the environment. Biological oceanography is emphasized, but physical and chemical oceanography are included too.

The offshore studies include data gathered mostly at the expense of other organizations. For instance, three publications (IATTC Bull., 2 (4), 3 (9), 8 (2)) are based on the EASTROPIC expedition, carried out in 1955, which utilized vessels of the University of California, the CDFG, the U.S. Fish and Wildlife Service (FWS; now the NMFS), and the Peruvian navy.

The IATTC staff's work in the Gulf of Nicoya (IATTC Bull., 4 (4)), the Gulf of Panama (IATTC Bull., 3 (2), 7 (1), 7 (3), 10 (7), 11 (5)), the Gulf of Guayaquil (Stevenson, 1981), the entrance of the Gulf of California (IATTC Data Rep., 3), and the Panama Bight (IATTC Bull., 14 (2)) during the 1950s and 1960s was done to gain sufficient knowledge of the oceanography of these areas to study the effects of the environment on the baitfishes and tunas which occur there. These investigations are of particular interest because so little oceanographic work has been done in tropical estuaries. The data used for these studies were gathered from small vessels of the IATTC, Ecuador, and Colombia or furnished by government agencies of Colombia, Costa Rica, Ecuador, Mexico, and the United States. Oceanographic research was initiated in 1989 at the Achotines Laboratory in Panama, where proximity to the spawning grounds of tunas and tuna-like fishes permits the use of small boats at a relatively low cost (IATTC Bull., 21 (3); IATTC Data Rep., 9).

Several studies of the effects of the environment on tunas and baitfishes have been conducted (IATTC Bull., 7 (1), 8 (8), 14 (2), 14 (4), 15 (2), 16 (5), 19 (6); IATTC Ann. Rep., 1983: pages 66-71), and the effects of the environment have been considered in many other investigations. Because of the important effects that the El Niño phenomenon has on the success of fishing for tunas, the IATTC staff closely monitors data on sea-surface temperatures, sea levels, and thermocline depths in the tropical Pacific Ocean and regularly publishes analyses of these data in its Quarterly and Annual Reports.

During the 1990s a study of the effects of thermal structure on the vulnerability to capture of yellowfin tuna was carried out, and oceanographic data were incorporated into estimates of the abundance of yellowfin tuna by age groups and regions (IATTC Ann. Rep., 1993: 22-25; IATTC Internal Rep., 25). The study of the effects of thermal structure was conducted in collaboration with the NMFS.

The IATTC has reduced its expenditures for oceanography in recent years, but its staff has managed to remain active in this field through contracts and grants and analysis of data collected by other organizations.

***Stock assessment***

Information on statistics, biology, and oceanography and meteorology are combined by the IATTC staff to arrive at conclusions regarding the status of the stocks of the species of concern to the IATTC. The Commission then uses these conclusions as a basis for taking whatever action is necessary to ensure that overexploitation does not occur.

### *Yellowfin tuna*

More success has been achieved in the evaluation of the status of yellowfin than in that of the other species of tuna. Studies of population structure and distribution of effort (IATTC Bull., 1 (4), 3 (8), 5 (5), 6 (9), 17 (5); IATTC Ann. Rep., 1989: page 48) have demonstrated that, for management purposes, it is practical to consider the fish of the area exploited by the fishery to belong to a single stock.

#### *Production models*

Studies conducted during the 1950s (IATTC Bull., 1 (2), 1 (7), 2 (6)) showed an inverse relationship between CPUE of yellowfin and total fishing effort, indicating that fishing had reduced the average abundance of the fish. From the production models formulated from these studies, it was estimated that the average maximum sustainable yield (AMSY) for yellowfin in the portion of the EPO where the fishery took place was about 86 to 91 thousand mt. This work was an important milestone in the development of the theory of the effect of exploitation on populations of fish. Since then considerable effort has been devoted to evaluation and improvement of production models. For these models it is first necessary that the CPUE be a reliable index of the abundance of the fish. This has been subjected to intensive scrutiny in several ways. For instance, the "biomass index" appears to eliminate some biases which exist in the original index, catch per standard day of fishing (IATTC Bull., 16 (4)). The IATTC staff has also used catch per hour of searching time (IATTC Bull., 18 (4), 19 (3)) as an estimate of abundance. These estimates have then been adjusted for fishing mode, vessel speed, fish-carrying capacity, use of aerial assistance, net dimensions, and sea-surface temperatures. Second, it is necessary to determine the best theoretical relationship between whatever abundance index is used and total effort. Prior to the late 1960s the relationship between these two parameters was assumed to be parabolic, but a more general version of the model has been developed in which the relationship is in the form of a dome which can be skewed to the left or right instead of symmetrical (IATTC Bull., 13 (3)). Third, as fishing effort began to be exerted further offshore during the middle and late 1960s the question arose as to whether the AMSY for the expanded area was the same as or greater than that for the old area. This has been studied by analysis of tag return and length-frequency data, experimental overfishing coupled with simultaneous monitoring of CPUE data to prevent disastrous reduction of the population (IATTC Ann. Rep., 1973: pages 47-54), and computer simulation (Mullen, 1994). The most recent calculations (IATTC Ann. Rep., 1998: page 62) indicate that the AMSY for the EPO, with fishing effort directed primarily at older, larger fish, as was the case during 1984-1998, is about 270 to 292 thousand mt. As noted in that report, however, this estimate, which is based on only 15 years of data, may be too high.

#### *Yield-per-recruit models*

During the 1950s information on growth, mortality, and exploitation were integrated to estimate the yields per recruit possible with different combinations of fishing effort and ages at entry into the fishery (IATTC Bull., 6 (1)). This study, based on data collected during the period when baitboats were the predominant gear, revealed that if the average age at entry into the fishery could be increased the yield per recruit could be increased. Shortly thereafter, when baitboats were largely replaced by purse seiners, the average age at entry did increase, increasing the yield per recruit obtainable (IATTC Ann. Rep., 1965: pages 17-18). Then during the mid- and late 1970s the purse seiners began to catch more smaller fish, which reduced the yield per recruit and the catch (IATTC Ann. Rep., 1983: pages 81-82). From the mid-1980s to the mid-1990s the purse seiners directed their effort more toward larger fish, which increased the yield per recruit. Then during the mid-1990s more effort was directed toward smaller yellowfin, and the yield per recruit again decreased, but not to the levels of the late 1970s and early 1980s. The original yield-per-recruit studies have been improved by better estimates of growth and mortality and by the use of a method which permits more accurate description of these parameters and assignment of different rates of fishing to fish of different ages (IATTC Ann. Rep., 1998: pages 55-58).

A study of the production and yield-per-recruit models together (IATTC Bull., 12 (3)) has provided evidence that both are useful indicators of the condition of the stock and complement each other.

Computer simulation studies (IATTC Bull., 16 (3), 17 (4); Mullen, 1994) have been carried out which incorporate features of both the production and yield-per-recruit models, and these have contributed to understanding of the population dynamics of yellowfin.

***Cohort analyses***

The IATTC staff's recommendations for management of yellowfin are now based mostly on cohort analyses (IATTC Ann. Rep., 1998: pages 53-55). (A cohort consists of all the fish of the stock recruited to the fishery at the same time.) Length-frequency and catch data are combined to estimate the contributions of various cohorts to the catches in each year. The results of these analyses include estimates of the abundance of fish of each cohort at the beginning of each quarter, their fishing and natural mortalities during that quarter, and the abundance of fish of that cohort at the end of that quarter. It is not possible to increase the recruitment or decrease the natural mortality, of course, but it is possible to predict the effects of various levels of fishing effort and of various distributions of fishing effort among age groups of fish on the catches of fish of various age groups and on the abundance of survivors of various age groups.

***Spawner-recruit relationship***

The relationship between spawning stock and recruitment has been examined (IATTC Ann. Rep., 1998: Figure 41), and it does not appear that these are related at the levels of spawning stock that have been observed.

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Overfishing of yellowfin occurred for the first time in 1960 (IATTC Ann. Rep., 1960: pages 51-60), when the catch (all of which was taken within about 250 nm of the mainland or in the vicinity of a few offshore islands and banks) amounted to about 111 thousand mt. It was not possible at that time to regulate the fishery. Fortunately, however, the fishing effort did not increase substantially during the next few years, which prevented heavy overfishing and enabled the staff to obtain additional data on the effects of fishing near the level of AMSY. Regulations to prevent overfishing were first promulgated in 1966, and were in effect each year up to and including 1979, after which, until 1998, the nations participating in the fishery could no longer reach unanimous agreement to continue international regulation of this resource. The fishing effort decreased after 1982 (IATTC Ann. Rep., 1998: Figure 48), however, so that in most years it has not exceeded that necessary for maintaining the population at levels at or above those which would produce the maximum sustainable yield.

***Skipjack tuna***

The catches and apparent abundance of skipjack in the EPO vary considerably from year to year. The landed catches of skipjack (*i.e.* the catches of skipjack which are not discarded at sea) are strongly correlated with the numbers of purse-seine sets on schools of tunas associated with floating objects (IATTC Ann. Rep., 1997: Figure 56). Age-structured modeling indicates that changes in the amount of fishing effort and the size of entry of the fish into the fishery would increase the catch of skipjack by a maximum of only 3 percent (IATTC Ann. Rep., 1998: page 69). Such being the case, there appears to be no need to regulate the fishery to protect skipjack from over-exploitation.

***Bigeye tuna***

Almost nothing is known of the stock structure of bigeye in the Pacific Ocean. The analyses conducted by the IATTC staff are based upon the assumption that the bigeye east of 150°W constitute a single independent stock. If future studies indicate that there is considerable exchange of fish across this line most of the assessments described below will have to be modified to take this into account. In addition, no direct estimates of the annual coefficient of natural mortality are available, so values ranging from 0.4 to 0.8, equivalent to arithmetic rates of 33 to 55 percent, have been used in cohort analyses and simulations.

Production modeling for bigeye in the EPO produces inconclusive results (IATTC Spec. Rep., 9: pages 254-255).

Yield-per-recruit analyses of bigeye (IATTC Ann. Rep., 1994: pages 76-77) indicate that the fish caught by the longline fishery are harvested at near-optimum sizes, although the loss to the population due to natural mortality may slightly exceed the gain to it by growth.

The purse-seine fishery harvests bigeye which are much smaller, on average, than those taken by the longline fishery (IATTC Bull., 20 (8)). Previous to 1994 these catches averaged about 5 thousand mt per year, but then they rose to about 29 thousand mt in 1994, 37 thousand mt in 1995, 51 thousand mt in 1996 and 1997, and 35 thousand mt in 1998. Computer simulations conducted with longline fishing mortality at the 1995 level and surface fishing mortality at the 1996 level, multiplied by 0.1 (Pattern A), 1.0 (Pattern B), and 1.5 (Pattern C), indicate that if the annual coefficient of natural mortality is 0.4 the combined catch by both gears will decline, if it is 0.6 the combined catch will stay at about the same level, and if it is 0.8 the combined catch will stay at about the same level (Patterns B and C) or decline (Pattern A) (IATTC Spec. Rep., 9: page 274). It is obviously of prime importance to obtain more precise estimates of the coefficient of natural mortality.

The relationship between spawning stock and recruitment has been examined (IATTC Spec. Rep., 9: page 270), and it does not appear that these are related at the levels of spawning stock that have been observed.

***Pacific bluefin tuna***

A wide range of sizes of Pacific bluefin is harvested. The summer troll fishery off Japan takes bluefin weighing less than 200 g, whereas the purse-seine and longline fisheries take fish weighing as much as 450 kg. The minimum size of bluefin harvested in the EPO is about 3 kg. Yield-per-recruit studies of bluefin (IATTC Ann. Rep., 1993: pages 34-35, 85) indicate that if the minimum size at entry into the fishery were increased the yield per recruit would increase.

***Swordfish***

Due to increased demand for swordfish, the effort directed at this species in the Pacific Ocean has increased considerably in recent years. Accordingly, the IATTC staff began to devote more time to research on swordfish in 1994 (IATTC Ann. Rep., 1995: pages 30-32). The catches in the EPO decreased from 14.0 thousand mt in 1992 to 7.9 thousand mt in 1996, and then increased to 11.5 thousand mt in 1997 (IATTC Ann. Rep., 1998: Table 30).

***Blue marlin***

Currently-available biological and fishery data indicate that there is a single stock of blue marlin in the Pacific Ocean, so management measures, if they are taken, should be applied on a Pacific-wide basis. The Deriso-Schnute delay-difference model (Quinn and Deriso, 1999), a form of production model, was used with total catch and effort data for blue marlin, and the results indicate that the stock in the Pacific Ocean is in a healthy condition, with the current levels of biomass and fishing effort near the levels required to maintain the AMSY.

***Baitfishes***

A study of the relationships of the CPUEs and total effort for the major species of baitfishes (IATTC Bull., 2 (2)) indicated that the fishing intensity was not sufficiently high to affect markedly any of these. An analysis of the yield per recruit of the anchoveta in the Gulf of Panama (IATTC Bull., 11 (4)) showed that this species was probably underfished in that area.

### *Multi-species assessments*

The IATTC staff prepared a report, Estimated Effects of Various Restrictions on the Fishery for Tunas in the Eastern Pacific Ocean, for the IATTC Working Group of Fish-Aggregating Devices for consideration at the 63rd meeting of the IATTC (June 8-10, 1999). This report presented the results of computer simulations of the effects on the catches of yellowfin, skipjack, and bigeye of banning discards of undersized tunas, setting minimum size limits for yellowfin and bigeye, restrictions on setting on various types of schools (tunas associated with dolphins, tunas associated with floating objects (either flotsam or FADs), and/or tunas associated only with other fish ("unassociated schools")), areal restrictions, and seasonal restrictions.

## *Tuna-Dolphin Program*

During the late 1950s and early 1960s most of the baitboats that were fishing for tunas in the EPO were converted to purse seiners, and construction of new purse seiners began during the mid-1960s. Yellowfin tuna frequently associate with dolphins, and the fishermen found that yellowfin could be caught by encircling herds of dolphins that had yellowfin associated with them (Appendix 11). During the early years of the purse-seine fishery large numbers of dolphins were killed by fishermen who were using this method to catch yellowfin (Wade, 1995: Table 4). The public first became aware of the fact that mortalities of dolphins were occurring in the purse-seine fishery for tunas during the late 1960s. At about the same time there was considerable concern about the effects of human activities on other marine mammals. Shortly thereafter, in 1972, the United States enacted its MMPA, and within a few years most of the other nations involved in the fishery for tunas associated with dolphins had passed similar laws. Subsequently the provisions of the MMPA became more restrictive as additional laws were passed and additional regulations were promulgated.

The IATTC's responsibilities were broadened in 1976 to address the problems arising from the incidental mortality in tuna purse seines of dolphins that associate with tunas in the EPO. The Commissioners agreed that the IATTC "should strive to maintain a high level of tuna production and also to maintain [dolphin] stocks at or above levels that assure their survival in perpetuity, with every reasonable effort being made to avoid needless or careless killing of [dolphins] (33rd meeting of the IATTC (October 11-14, 1976), minutes: page 9). The principal responsibilities of the IATTC's Tuna-Dolphin Program are (1) to monitor the abundance of dolphins and their mortality incidental to fishing through the collection of data aboard tuna purse seiners fishing in the EPO, (2) to analyze these data and make appropriate recommendations for the conservation of dolphins, (3) to study the causes of mortality of dolphins during fishing operations, make these results known to the fishermen, and encourage them to adopt fishing techniques which minimize the mortalities of dolphins, and (4) to study the effects of different modes of fishing on the various fish and other animals of the pelagic ecosystem.

### *Data collection*

Specially-trained observers are placed on all Class-6 tuna purse-seine vessels that fish in the EPO by the IATTC's Tuna-Dolphin Program, the Programa Nacional de Aprovechamiento del Atún y Protección de Delfines (PNAAPD) of Mexico, and the Programa Nacional de Observadores de Venezuela (PNOV). During recent years one half to one third of the observers on Mexican vessels have been placed there by the IATTC and one half to two thirds by the PNAAPD. The PNOV began placing observers aboard Venezuelan vessels in early 2000, and had increased its coverage to 50 percent by the end of that year. Ecuador initiated its own observer program, Programa Nacional de Observadores Pesqueros de Ecuador (PROBECUADOR) in late 2000. (The NMFS conducted an observer program during the 1970s, 1980s, and early 1990s, but this was phased out after 1994 as the participation of U.S. vessels in the fishery decreased. During the 1986-1991 period the coverage of the international fleet ranged from about 30 to 60 percent, but since then it has been 100 percent, or nearly so (96.2 percent in 1992, 99.6 percent in 1993, 99.8 percent in 1994, and 100 percent thereafter), for Class-6 vessels, regardless of whether they intended to fish for tunas associated with dolphins. In addition, observers made a few trips on Class-5

vessels that fished for tunas associated with dolphins during 1994-1997. After 1997 vessels with fish-carrying capacities equal to or less than 363 mt were no longer permitted to make sets on dolphin-associated tunas, and observers were no longer placed aboard these vessels. The observers keep counts of dolphin mortalities during fishing operations, and these data are used by the IATTC staff to make its annual estimates of dolphin mortality due to the fishery. The observers also record data on herds of dolphins sighted that are used to make estimates of the relative abundance of dolphins. Information recorded on the conditions coincident with mortality of dolphins is used to study the causes of dolphin mortality, and the knowledge gained from those studies is shared with the fishermen through the IATTC's educational activities, such as seminars for tuna boat captains and crew members and analyses of the performances of individual captains. ***Trip analyses*****,** detailed reports of fishing trips which had IATTC observers aboard, are prepared upon request and, after the required authorizations are obtained, sent to the vessel owners to allow them to assess the performances of the vessels and fishing captains. The observers also record data on unmarketable fish and on sea turtles that are caught with the tunas and discarded or released alive. These data are used for evaluation of the ecological effects of the different modes of fishing (see below).

The data collected by the IATTC observers are edited by IATTC staff members and stored in computer files. The data collected by the NMFS observer program were made available to the IATTC staff after they were edited by the supervisors of this program, and these data were added to the IATTC's data base. In addition, some of the data collected by PNAAPD, PNOV, and PROBECUADOR observers have been or will be added to the IATTC data base.

***Stock assessment***

In an effort to assess the effects of fishing on the various dolphin stocks, the IATTC staff has developed three general lines of research, calculation of indices of population abundance, calculation or estimation of the mortality of dolphins caused by fishing, and collection of life history data.

While at sea the IATTC observers remain on the bridge or in the pilot house of the vessel while it is searching for fish so that they can be in contact with the fishermen who are looking for signs of fish. Whenever a herd of dolphins is sighted the observer estimates its distance and bearing relative to the course of the vessel at the time the dolphins were sighted. These data, plus information on the average herd sizes and areas of distribution of the stocks in question, have been used to calculate estimates of the relative abundances, by line-transect methods (Buckland *et al*., 1993), of the various stocks of dolphins in the EPO. Because neither the dolphins nor the fishing effort is randomly distributed in the areas in which dolphins occur, the data must be spatially stratified to minimize the bias in the estimates of relative abundance. The estimates are referred to as estimates of *relative abundance*, rather than abundance, because of various problems, especially in stratifying the data, detecting the presence of the herds, and estimating the numbers of animals in the herds, which may, in spite of the efforts to minimize the bias, cause the estimates to be too high or too low. Since estimation of the numbers of animals in the herds of dolphins is an important facet of estimating population abundance, the IATTC staff has studied herd size by observations from chartered purse seiners (IATTC Data Rep., 6) and aircraft (IATTC Bull., 18 (5)). The problems associated with estimation of the relative abundances of dolphins are discussed in IATTC Annual Reports, especially those for 1987 (pages 33-35), 1991 (pages 49-50), and 1993 (pages 54-55).

The NMFS has carried out cruises on research vessels and chartered aircraft for the purpose of making estimates of the abundances of various stocks of dolphins by line-transect methods (Holt *et al*., 1987; Wade and Gerrodette, 1993). The advantage of research vessels and chartered aircraft is that these can follow track lines that have previously been determined to be the most efficient for statistical purposes (although poor weather may make it necessary to change the track lines). The disadvantage is that collection of data by this method is expensive, so relatively few observations are collected. Such being the case, the confidence limits of the estimates are rather wide. However, the research vessel and aircraft

surveys are of great value because they are designed in accordance with the principles of statistical sampling and because they include areas where the coverage by fishing vessels is inadequate.

Not long after the IATTC became involved in tuna-dolphin research it was determined that 25-percent coverage of the fleet by observers would be adequate for estimating the mortality of dolphins due to tuna fishing, but to allow some leeway a goal of 33-percent coverage of the international fleet was adopted (IATTC Ann. Rep., 1988: page 47). Eventually the coverage was increased to 100 percent. During the period when the coverage of the fleet by observers was less than 100 percent the total mortality of dolphins was estimated by a simple ratio method based on the extrapolation of data collected by the observers. The mortality rates of the different species and stocks were estimated from data from the sampled trips using two different ratios, mortality per dolphin set and mortality per ton of yellowfin and skipjack caught (later mortality per ton of yellowfin caught) in sets made on dolphin-associated fish. The former was then multiplied by the total number of dolphin sets made by the fleet and the latter by the total tonnage of yellowfin and skipjack caught (later total tonnage of yellowfin caught) in sets made on dolphin-associated fish by the fleet to obtain the mortality estimates. The total number of dolphin sets and the total tonnage of yellowfin and skipjack caught with those sets, in turn, were estimated with an algorithm based on the information contained in the logbook records (IATTC Bull., 18 (3)). To minimize bias it was necessary to stratify the data before making the estimates, as explained above. For mortality estimation, however, the data have been stratified by vessel flag, as well as by area. Since 1992, when the coverage of the fleet became nearly 100 percent, the total mortalities of dolphins of all species and stocks combined have been calculated by summing the mortalities recorded by all the observers and adjusting the sums upward to compensate for the lack of data for a few trips. However, because not all the dolphins that are recorded as having died are identified to species and stock, the mortalities for the individual species and stocks are estimated, rather than calculated. The problems associated with estimation of the mortalities of dolphins are discussed in the IATTC Annual Reports, especially those for 1984 (pages 47-63), 1985 (pages 45-47), 1986 (pages 41-43), and 1988 (pages 40-48).

Estimates of the abundances of the populations of the dolphins encircled by purse-seine vessels fishing for tunas in the EPO and their mortalities due to the fishery are shown in Table 3. The estimates of abundance were obtained from pooled data for research vessel surveys conducted during 1986-1990, and the mortality data are for 1994-1998. The abundances did not change much over this time span, so the use of abundance and mortality data for different years does not invalidate the inferences that can be drawn from the data. The average mortality rates for all species combined were 0.043, 0.034, 0.026, 0.031, and 0.020 percent for 1994, 1995, 1996, 1997, and 1998, respectively. For individual stocks the rates ranged from zero for southern common dolphins in 1994 and 1995 to 0.144 percent for northeastern spotted dolphins in 1995. Smith (1983) estimated the net reproductive rates of spotted and spinner dolphins to be 2 to 6 percent per year. There is no information on the net reproductive rates of common dolphins, but these rates are probably about the same as those for spotted and spinner dolphins. With reproductive rates of 2 to 6 percent, the gains to the population due to reproduction exceed the losses to it due to incidental fishing mortality.

The distributions of the various stocks of dolphins vary with time. Recent studies show strong correlations between certain oceanographic variables and the distributions of dolphins (Reilly and Fiedler, 1994; Fiedler and Reilly, 1994). The IATTC staff has recently begun to incorporate oceanographic data into its procedures for estimating the abundance of dolphins to attempt to reduce the variances of its estimates (IATTC Ann. Rep., 1994: page 50).

***Attempts to reduce the mortality of dolphins***

The mortalities of dolphins due to fishing could be reduced or eliminated by (1) eliminating purse-seining for tunas, (2) eliminating purse-seining for tunas associated with dolphins, (3) developing methods for separating the tunas from the dolphins prior to setting the net, so the dolphins are not encir-

cled, or (4) developing methods for separating the tunas from the dolphins after both are encircled, and then releasing the latter unharmed.

***Eliminating purse-seining for tunas***

There have been no serious proposals for eliminating purse-seining for tunas.

***Eliminating purse-seining for tunas associated with dolphins***

The International Dolphin Conservation Act of 1992 (U.S. Public Law 102-523), passed on October 26, 1992, stated that "It is the policy of the United States to ... eliminate the marine mammal mortality resulting from the intentional encirclement of dolphins and other marine mammals in tuna purse seine fisheries. It called for the United States to enter into international agreements to establish a moratorium, beginning in 1994 and ending in 1999, on the encirclement of dolphins associated with tunas. This law did not take effect, however, as no other nations agreed to establish such a moratorium.

***Developing methods for separating the tunas from the dolphins prior to setting the net***

One of the objectives of the tuna- and dolphin-tracking experiments, conducted by the IATTC staff and institutions in Costa Rica, Mexico, and the United States and described in the subsection entitled ***Interactions between dolphins and tunas***, is to determine whether the tuna-dolphin bond loosens or breaks under certain conditions, and, if so, whether the tuna would be vulnerable to capture by purse-seine gear at such times.

***Developing methods for separating the tunas from the dolphins after both are encircled***

The fishermen have done the most to develop methods to release dolphins that have been encircled in the net unharmed. The principal developments have been the practice of backing down, first used in 1958, and incorporation of "dolphin safety panels" into the nets, beginning in 1971. Backing down is described in Appendix 11**.** The dolphin safety panel is a section of smaller-meshed webbing incorporated into the net immediately beneath the corkline in the area corresponding to the backdown channel. Dolphins seldom become entangled in the safety panel, which facilitates their escape from the net (Barham *et al*., 1977). During the backdown swimmers, divers, and fishermen in inflatable rafts assist the dolphins in escaping from the net.

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The IATTC staff has played a role in the reduction of dolphin mortality associated with the purse-seine fishery primarily by development and testing of new or improved fishing technology, by assisting in the alignment of the dolphin safety panel and inspecting dolphin-saving gear during trial sets, and by conducting seminars at which staff members pass information on techniques for minimizing dolphin mortality developed by the most skillful and experienced vessel captains to other fishermen.

With regard to testing of new or improved fishing technology, the staff's efforts thus far have been concentrated on FADs, modification of purse-seine nets, and high-intensity floodlights to improve illumination of the backdown channel at night.

It was thought that tunas might be attracted to FADs in sufficient quantities that they would serve as an alternative to fishing for dolphin-associated tunas. Anchored FADs were deployed for a short period in the area between 9°N and 16°N and 101°W and 115°W, and several attracted small tunas (IATTC Internal Rep., 14). It was concluded that a much larger program would have to be undertaken to determine fully their potential (IATTC Ann. Rep., 1981: pages 65-66). Experiments were subsequently undertaken with drifting FADs deployed between 9°N and 11°N and 121°W and 124°W (IATTC Ann. Rep., 1991: pages 30-33; 1992: page 57). Some of the FADs attracted tunas, but most of these were about the same size as those attracted to flotsam.

The IATTC staff also experimented with the use of a device similar to an otter-trawl board to prevent collapse of the backdown channel. The results of these experiments, however, were not encouraging (IATTC Ann. Rep., 1982: page 71).

In 1981 the IATTC staff began testing the feasibility of reducing dolphin mortality at night by illuminating the backdown channel with high-intensity floodlights to facilitate the removal of dolphins (IATTC Ann. Rep., 1983: pages 65-66). Subsequently, initiation of sets late in the day has been prohibited by most nations. Nevertheless, most vessels carry floodlights for use when problems during setting cause operations to continue after sundown.

***Interactions between dolphins and tunas***

The reason for the close bond between yellowfin and dolphins in the EPO is not well understood, but judging from its persistence and strength it is obvious that at least one of these animals obtains some benefit from their close association. Until recently it was thought that the most likely explanation for their relationship is that dolphins are more adept at finding food than are yellowfin because of the dolphins' ability to find prey by echolocation, so yellowfin that accompany dolphins may discover prey that they might otherwise miss. During 1992 and 1993 staff members of the IATTC, in cooperation with staff members of the NMFS, the PNAAPD, the University of Hawaii, and the Universidad Nacional de Costa Rica, conducted studies of the relationship between spotted dolphins and yellowfin tuna by simultaneously releasing dolphins with radio transmitters and tunas with sonic transmitters from the same aggregations. It was believed that the information obtained by simultaneously tracking both species would be valuable in two ways. First, the study of yellowfin tuna and spotted dolphin movements and interactions, in conjunction with food-habits studies conducted by the IATTC and the NMFS, described below, would help to establish the dynamics of the tuna-dolphin bond and the extent, if any, to which it is food-based. Second, it might be determined whether the bond loosens or breaks under certain conditions, and, if so, whether the tuna would be vulnerable to capture by purse-seine gear at such times. The results indicate that the two species often feed at different times, at different depths, and sometimes on different prey. The spotted dolphins appear to feed primarily at dusk, night, and during the early morning on epipelagic and mesopelagic fishes and cephalopods. The yellowfin appear to feed throughout the daylight hours in the mixed layer on epipelagic fishes, cephalopods, and crustaceans and, to a lesser degree, at night on epipelagic and mesopelagic cephalopods. In general, the results suggest that feeding on shared prey species may not be the primary cause for the association, and that other causes should be explored. The data also hinted, but did not prove, that the tuna-dolphin association weakened at night (IATTC Ann. Rep., 1994: pages 51-52).

In 1993 the IATTC, in cooperation with the NMFS, initiated a study of the food habits and trophic dynamics of co-occurring yellowfin tuna, dolphins, and other large predators caught in interspecific aggregations by tuna purse-seine vessels in the EPO. The stomach contents of yellowfin and dolphins caught together in the same purse-seine sets were compared with those of yellowfin and other predators caught when not associated with dolphins, *i.e*. those caught while associated with floating objects and those caught in unassociated schools in the same areas and at the same times. In addition, analyses of stable carbon and nitrogen isotopes in the tissues of tunas, dolphins, and other large predators were conducted to determine the extent of trophic overlap among these (IATTC Ann. Rep., 1994: pages 31-32).

***Studies of the ecological effects of the fisheries for tunas***

The food web of the tropical and subtropical waters of the EPO is complicated. The most important large predators, other than man, are tunas, dolphins, sharks, and billfishes. When the fisheries for tunas and billfishes began, early in the twentieth century, the selective removal of these undoubtedly had ecological repercussions. During the 1960s, when the mortalities of dolphins amounted to several hundred thousand animals per year (Wade, 1995: Table 4), this must have affected most or all of the other organisms in the food web. Later, during the late 1980s and the 1990s, when the mortalities of dolphins were much less, the effects mentioned in the previous sentence must have begun to reverse.

Tunas are caught mostly by purse seines, longlines, and baitboats in the EPO.

As mentioned above, there are three principal modes of fishing with purse seines: fishing for tunas associated with dolphins, fishing for tunas associated with floating objects, and fishing for tunas in unassociated schools. (A fourth mode, night-fishing, is employed only for Pacific bluefin and several species of non-tunas.) The fish caught by the first mode are nearly all yellowfin, most of them in the size range that produces the maximum yield per recruit, whereas those caught by the second and third modes consist of yellowfin, skipjack, bigeye, and other species, most of which are smaller than the fish caught in association with dolphins. When tunas are caught in association with dolphins large numbers of dolphins are encircled in the net, but virtually all of these are released alive. It has been suggested (Myrick and Perkins, 1995) that the stress of encirclement may be harmful to the dolphins, but the evidence for this is equivocal (Edwards, 1996). Sharks are frequently caught with dolphin-associated schools of tunas, and billfishes and sea turtles are occasionally caught as well. The sea turtles are usually released alive. When tunas are caught in association with floating objects large amounts of fish with little or no market value, including very small yellowfin, black skipjack, bullet and/or frigate tuna, sharks, billfishes, dolphinfish (*Coryphaena* spp.), wahoo (*Acanthocybium solandri*), triggerfish (Balistidae), *etc*., and also a few sea turtles and marine mammals, are caught IATTC Ann. Rep., 1998: pages 89-90). The sea turtles and marine mammals are usually released alive, but the most of the fish, with the possible exception of some of the sharks, do not survive capture and handling. Even the yellowfin that are of marketable size are considerably smaller, on average, than those caught in association with dolphins, and the yield per recruit of yellowfin obtainable from a fishery directed exclusively at tunas associated with floating objects is much less than that obtainable from a fishery directed exclusively at tunas associated with dolphins (Joseph, 1994; Punsly *et al*., 1994). When tunas are caught in unassociated schools the situation is intermediate between those for the first and second modes, *i.e*. the yellowfin caught are smaller than those caught in dolphin-associated schools, but larger than those caught in schools associated with floating objects, and the catches of unmarketable fish (about 2 percent of the total weight of the catch) are greater than those in dolphin-associated schools (less than 1 percent), but less than those in schools associated with floating objects (nearly 20 percent) (Hall, 1998).

During the late 1970s and early 1980s, when the purse-seine fleet directed a lesser proportion of its effort toward dolphin-associated tunas, the catches and CPUEs of yellowfin were less than during the preceding and following years (IATTC Ann. Rep., 1998: Tables 3 and 14). If the fishery for tunas associated with dolphins were supplanted by fisheries for tunas associated with floating objects and tunas in unassociated schools the loss of yellowfin would be partially mitigated by greater catches of skipjack, but in 1991 and 1992 the CPUEs of yellowfin and skipjack combined were considerably greater for vessels fishing for tunas associated with dolphins than for those fishing for tunas not associated with dolphins (Joseph, 1994: Table 5).

The ecological effects of the removal of large amounts of unmarketable fish associated with floating objects or unassociated schools of tuna are unknown, so the IATTC staff is gathering information with which to evaluate these effects (IATTC Ann. Rep., 1998: pages 89-90; Hall, 1996 and 1998).

Longlines catch bigeye, yellowfin, and albacore tuna, billfishes, sharks, and a few other species of fish. In addition, they occasionally catch seabirds, sea turtles, and marine mammals. The billfishes and sharks caught by longline vessels based in the Far East are retained and sold. Billfishes other than swordfish caught by longline vessels based in California cannot legally be sold, however, and not all the sharks caught by California- and Hawaii-based vessels are marketable (Edward H. Everett, IATTC, personal communication; Ito *et al*., 1998). The yellowfin caught by longline vessels are considerably larger, on average, than those in dolphin-associated schools caught by purse seiners. The loss to the population due to natural mortality exceeds the gain to it by growth for yellowfin of that size, so if only longline fishing for tunas were permitted the catches of that species would be less than they are now.

Baitboats catch yellowfin, skipjack, and bigeye tuna, plus small amounts of unmarketable tunas (undersized yellowfin, black skipjack, and bullet and/or frigate tuna), dolphinfish, and wahoo. The sizes of yellowfin caught by baitboats are comparable to those of yellowfin caught by purse seiners on schools of fish associated with floating objects, so if only baitboat fishing for tunas were permitted the catches of yellowfin would be considerably less than they are now. This loss of yellowfin might be partially mitigated by greater catches of skipjack. However, prior to the switch from baitboat to purse-seine fishing during the late 1950s and early 1960s, the maximum catch of yellowfin, skipjack, and bigeye combined by surface gear was 161 thousand mt in 1950 (IATTC Ann. Rep., 1963: Table 1), whereas the greatest catch after the switch was 470 thousand mt in 1997 (IATTC Ann. Rep., 1998: Table 3). Most of the unmarketable fish caught by baitboats are released alive, so the capture of these has virtually no effect on the offshore ecosystem. The catches of large amounts of baitfish could affect the ecological balances of the estuaries they inhabit, however.

In 1998 the IATTC staff began working on a modeling approach to evaluate the ecological implications of various purse-seine fishing methods. The *Ecopath* model (IATTC Ann. Rep., 1998: pages 37-38), which creates a mass balance of trophic exchanges for entire ecosystems based on estimates of biomass for many species and trophic levels, and uses the principles of energetics and trophic transfer, is being used in these studies. It provides input to *Ecosim*, which incorporates the principles of population dynamics into the higher trophic levels and the consequent feedback for all trophic levels.

## MEASURES TAKEN FOR MANAGEMENT OF TUNAS AND DOLPHINS

The resolutions for management adopted by the IATTC are not enforced by that organization. Rather, it is the responsibility of each member or cooperating state to enact and enforce measures pertaining to vessels under its jurisdiction that conform with the resolutions. The national measures have sometimes been more complicated than those called for in the resolutions. For example, during the 1970s the United States had different rules for different types and sizes of its vessels that were subject to the resolutions for the conservation of yellowfin adopted at the IATTC meetings, but the small-vessel allowances were not exceeded and the incidental catches of yellowfin, exclusive of those allowances, were not more than the 15-percent limits described below.

### *Measures taken for achieving average maximum sustainable yields of tunas*

The IATTC staff presents its assessments of the various stocks of tunas at the IATTC meetings. If management is needed the staff makes general recommendations in this regard. The recommendations have been discussed at the IATTC meetings and, in most cases, at IGMs, as discussed in the section entitled ***Meetings***. If agreement on actions in response to the recommendation is reached an IATTC resolution incorporating that action is adopted. Each individual nation is then responsible for implementing and enforcing the measures adopted.

#### *Yellowfin tuna*

The need to limit the catch of this species was first apparent in 1961, but the governments of the countries concerned were not able to implement measures for management until 1966. Management measures to restrict the catches of yellowfin were in effect each year of the 1966-1979 period. During the 1980-1997 period the nations involved in the fishery agreed on limits on the catches of yellowfin, but management measures were not implemented. Fortunately, there was not enough fishing effort to reach the limits during most of those years. The fishing effort increased during the mid-1990s, however, and restriction of the catch of yellowfin commenced again in 1998. A brief history and description of the yellowfin management program is given below. The measures for management were fairly complicated, especially during the late 1970s so, for the sake of brevity, this account has been somewhat simplified. The reader who needs detailed information can obtain this from the IATTC's Annual Reports, using this report only as a guide.

### *1966-1979*

The management measures recommended by the IATTC staff prior to 1998 applied only to yellowfin. Management of this fishery was originally based principally upon the production model described in the section entitled **RESEARCH**. Measures for management were first proposed at the 14th meeting of the IATTC (September 14, 1961). It was recommended that the catch quota for 1962 be 83,000 st (75,296 mt) of yellowfin. This quota was to apply to the entire EPO (undefined at that time) and to all countries on a first-come, first-served basis. Nations that were not members of the IATTC were to be asked to cooperate with these conservation measures. It was believed at that time that the level of catch which the population at the end of 1961 would be able to sustain would be about 79 thousand mt, but a lower quota was recommended to increase the population to the level which would support the maximum sustained yield (then believed to be about 79 thousand mt if the recruitment is density dependent or about 86 thousand mt if it is density independent). When the measures for management were imposed the vessels at sea were to be allowed to continue to fish without restriction until their current trips were completed. When the catch during 1962, plus the expected amount of fish to be taken by vessels at sea at the closure date, amounted to 74,600 st (67,676 mt) the restricted period was to begin. Any vessel departing after that time was to be permitted to fish for skipjack and other species, with its incidental catch of yellowfin not to exceed 15 percent of the weight of its total catch for the trip. The total incidental catch of yellowfin was expected to be about 8,400 st (7,620 mt) (IATTC Ann. Rep., 1961: pages 18-20).

Management measures could not be implemented in 1962, nor in the following years prior to 1966, when such measures were finally begun for the first time, with a quota of 79,300 st (71,940 mt) for the CYRA (Figure 1). (At that time the fishery was conducted only within about 250 nm of the mainland and in the vicinity of a few offshore islands and banks.) Management measures were then imposed each year thereafter until 1980. New features were added from time to time, providing for special allowances to be taken by vessels experiencing certain economic hardships, *etc*., but the measures still consisted primarily of an overall quota for the CYRA, to be taken on a first-come, first-served basis.

At the IATTC's 20th meeting (April 2-5, 1968) a quota of 93,000 st (84,368 mt) of yellowfin for that year was recommended and adopted, but by May it was apparent that, due to the fact that the range of the fishery had expanded, the stock could support a greater catch, so the quota was raised to 106,000 st (96,162 mt) (IATTC Ann. Rep., 1968: pages 6-7). The Convention states that the objective of the IATTC is to maintain the stocks "at a level which will permit maximum sustained catches year after year," which had been interpreted by the staff to mean that it would not be acceptable to recommend overfishing to verify that a stock would react as predicted to levels of fishing higher than yet experienced. However, because the apparent abundance of yellowfin was remaining at higher levels than expected, and there was reason to believe that a larger stock was available due to a westward expansion of the fishing area, it was requested in 1968 that the staff prepare a study on how the maximum sustainable yield of yellowfin might be established empirically by experimenting with greater catches to determine the effects on the apparent abundance. Complying with this request, it was recommended that the quotas be 120,000 st (108,862 mt) for 1969, 1970, and 1971, but that if the CPUE (standardized to Class-3 purse-seine days) should fall to less than 3 st (2.7 mt) per day the fishery would be immediately curtailed. The quotas thereafter were based largely upon whether the preceding year's quota resulted in an increase or decrease in the CPUE. (Of course, as described earlier, the staff has devoted considerable effort toward obtaining a fuller understanding of the population dynamics of the fish, so that if the fishery were again subjected to management (as was the case beginning in 1998) the management scheme would be much less empirical.) The area of the fishery continued to expand during 1969 and 1970, and the CPUEs remained high during those years. For 1971 a quota of 140,000 st (127,006 mt), plus two increments of 10,000 st (9,072 mt) each, was adopted. It was agreed that the Director, at his discretion, could later add one or both of the increments. When he did this he based his decision primarily upon CPUE data, of course. The reason for bypassing the Commissioners in this decision was that, because of the large size of the fleet (Table 2), only a few days' difference in the closure date could have changed the total year's catch by several thousand tons, and

it would not have been feasible for the Commissioners to act sufficiently quickly for the closure date to be set at the proper time. In 1972 and the years thereafter two to five such increments were specified, and the amounts of the increments differed somewhat from year to year. Both increments were added to the quota in 1972, but none in the other years.

For 1962 it was first specified that the incidental catch of yellowfin by a vessel was not to exceed 15 percent of "its catch" (IATTC Ann. Rep., 1961: page 20), and then this was changed to "its tuna catch" (IATTC Ann. Rep., 1962: page 15). For 1963 and 1964 "its catch" was again specified, but in 1965 and 1966 the expression "its catch of other tuna species" was employed (IATTC Ann. Rep., 1965: page 40; IATTC Ann. Rep., 1966: page 52). For 1967 the allowance was changed to 15 percent yellowfin "among its catch of all marketable species" (IATTC Ann. Rep., 1967: page 57); for 1968 the other species which could be included for this purpose were defined as, "skipjack, bigeye tuna, bluefin tuna, albacore tuna, billfishes and sharks" (IATTC Ann. Rep., 1968: page 49). Bonito was added to this list beginning in 1969 (IATTC Ann. Rep., 1969: page 47) and black skipjack beginning in 1974 (IATTC Ann. Rep., 1974: page 14). It was agreed that during 1967 the 15-percent incidental catch of yellowfin by small vessels making daily trips could be accumulated for periods up to 2 weeks instead of being applied to each trip (IATTC Ann. Rep., 1967: page 57). For 1968 and following years it was left to the government of each nation to restrict the fishery in such a way that the catch of yellowfin by vessels subject to restriction did not exceed 15 percent of the total catch of the species specified above, with the exception of the special allowances discussed below (IATTC Ann. Rep., 1968: page 49).

The special allowance for small vessels was begun in 1969. In that year these were defined as vessels with fish-carrying capacities of not more than 300 st (272 mt), and the allowance was 4,000 st (3,629 mt) for each member or cooperating state. The small vessels which otherwise would have been subject to the 15-percent limit were permitted to fish without restriction after the closure date until the total catch by such vessels during the restricted period was 4,000 st; thereafter they were permitted to fish subject to the same restrictions as the larger vessels, *i.e*. the 15-percent limit. During 1970 through 1975 small vessels were defined as those with fish-carrying capacities of not more than 400 st (363 mt), and the allowance was set at 6,000 st (5,443 mt) for each nation. In 1976, in the case of Panama, it was agreed that the 6,000-st allowance for small vessels should apply to vessels up to 600 st (544 mt) of fish-carrying capacity. In 1977 three nations were given special consideration regarding the provision of a special allowance for small vessels. It was agreed that: (1) in the case of Costa Rica, the 6,000-st (5,443-mt) allowance could be taken by its vessels of up to 1,100 st (998 mt) of fish-carrying capacity; (2) in the case of Nicaragua, up to 4,000 of its 6,000-st (3,629 of its 5,443-mt) allowance for small vessels could be taken by two of its vessels with fish-carrying capacities up to 1,800 st (1,633 mt) each; and (3) in the case of Panama, up to 3,000 st (2,722 mt) of its 6,000-st (5,443-mt) allowance for small vessels could be taken by its vessels of more than 400 st (363 mt) of fish-carrying capacity. In 1978, in the case of Costa Rica, the special allowance for small vessels was increased to 7,500 st (6,804 mt) and applied to all of its vessels regardless of size. In the case of Nicaragua and Panama, it was agreed that the 6,000-st (5,443-mt) allowance for small vessels would apply to all the vessels of each of those countries. In 1979, the last year of the 1966-1979 period of yellowfin management, it was decided that the special allowance of 6,000 st (5,443 mt) for small vessels would apply to all the vessels of both Nicaragua and Panama.

The special allowance for member and cooperating states that have tuna canneries, but insignificant tuna catches (not more than 1,000 st (907 mt)), began in 1970. No mention of canneries was made in the resolution for 1979. The vessels of such nations were permitted to fish without restriction.

The special allowance for newly-constructed vessels of developing states which were IATTC members began in 1971 at a level of 2,000 st (1,814 mt), including unrestricted catches. This allowance increased gradually over the years, reaching 26,500 st (24,040 mt) in 1978. (For 1979, the last year of the 1966-1979 period of yellowfin management, this special allowance was eliminated.) The qualifying vessels that would otherwise have been subject to the 15-percent yellowfin limit were permitted to fish without restriction until the allowance was reached, and thereafter were subject to the 15-percent limit. For

the 1974-1978 period, these special allowances were reduced by the extent to which the catch by all vessels not subject to restriction of the nation in question exceeded 6,000 st (5,443 mt).

Finally, a special allowance for U.S. vessels chartered for research on the reduction of dolphin mortality began in 1977 and continued through 1979. Such vessels were allowed to catch a total of up to 1,000 st (907 mt) of yellowfin tuna during the closed season.

Since it was possible to anticipate the approximate closure date, and since vessels at sea at this time were not subject to restriction until the current trip was completed, during the late 1960s a large portion of the fleet arrived in port shortly before the beginning of the restricted period with the intention of quickly unloading and returning to sea to make one more unrestricted trip. This caused considerable logistic problems, however, so in 1970 a "grace period" of 10 days was established. Vessels that arrived in port prior to the closure date and returned to sea before the end of the grace period were not subject to restriction on that trip. The grace period was extended to 30 days in 1971 and thereafter.

Beginning in 1973 it was agreed to open a portion of the CYRA to unrestricted fishing on an experimental basis. This was done to encourage fishing in this little-exploited area, which was believed to contain fish that mix relatively little with those of the rest of the CYRA and were thus underutilized. In succeeding years other such areas were established. The boundaries of these experimental areas and the periods of years during which they were open are shown in Figure 1.

A summary of the measures for management and other pertinent data for 1962-1979 is given in Table 4. The quotas, authorized increments, and catches of yellowfin during the 1967-1999 period are listed in Table 5.

As the fish-carrying capacities of the total fleet and of the average vessel increased (Table 2), it became increasingly difficult to select a closure date that would result in a final catch that was near the quota. During the first period of yellowfin management, from 1966 through 1979, the catch could be divided into three categories: that obtained prior to the closure date; that obtained after the closure date by vessels not subject to restriction (vessels which were at sea on the closure date which continued to fish without returning to port after that date and vessels which were in port prior to the closure date and which departed before the end of the grace period); and that obtained after the closure date by vessels subject to restriction (special allowances and 15-percent incidental catch). The closure date was based upon data obtained during the period of first-category catch. During the 1966-1973 period the first-category catch shrank from 80 to 30 percent of the total, while those of the second and third categories increased from 15 to 50 percent and from 5 to 20 percent, respectively. For example, in 1973 it was announced on February 27 that the closure date would be March 8, but on the former date the preliminary estimate of the catch up to that time was only 41 thousand mt. The catch for the rest of the year, exclusive of that in the experimental area (Figure 1), would have had to be 77 thousand mt to fulfill the quota. Considering the many factors that could affect the catch in the second and third categories, it is easy to see how difficult it was to set the closure date. In 1971, for example, skipjack appeared suddenly off northern South America during the second quarter of the year, and many vessels on their last unrestricted trips fished for skipjack instead of for yellowfin, thus decreasing the catch of yellowfin in the second category. The result was that the total catch was 24 thousand mt less than the quota.

***1998-2000***

Regulations to restrict the catch of yellowfin were adopted again in 1998. At the 61st meeting of the IATTC (June 10-12, 1998) a resolution that called attention to the need for management of yellowfin in the EPO was adopted. It stated that, since “yellowfin in the area west of the … CYRA … and east of 150°W are of such a size that limiting the catches in that area is currently not necessary,” the quota would apply only to the CYRA. The quota was set at 210,000 mt, with options for the Director to increase it by up to three increments of 15,000 mt each. By October the Director had decided that one increment should be added, making the quota 225,000 mt, and a resolution to that effect was adopted at the 62nd meeting of

the IATTC (October 15-17, 1998). Since all Class-6 vessels had observers aboard, these vessels were to cease fishing for yellowfin in the CYRA on a date to be designated by the Director. After that date, until January 1, 1999, each vessel would be limited to a 15-percent incidental catch of yellowfin. Purse seiners and baitboats without observers aboard that were at sea on the closure date could continue to fish without restriction until they returned to port to unload. For any subsequent trips commenced in 1998 each boat would be limited to a 15-percent incidental catch of yellowfin. If a trip extended into 1999 the 15-percent rule would continue to apply until the vessel came to port to unload. The closure date that was subsequently announced was November 26, 1998.

Regulations for yellowfin were in effect again in 1999. A "restricted period," which began on the date at which the catch of yellowfin in the CYRA reached 240,000 mt (October 14) and ended at midnight on December 31, was established at the 65th meeting of the IATTC (October 4-10, 1999). Purse seiners and baitboats were required to refrain from fishing for yellowfin in two areas, one off Baja California and the other off northern South America, during the restricted period. In addition, it called for prohibition of all purse-seine fishing for yellowfin in the CYRA after 265,000 mt of yellowfin had been caught, or beginning on December 2, 1999, whichever came first. The regulations concerning the 15-percent allowance for incidentally-caught yellowfin, and fishing after the closure date by vessels with and without observers aboard were the same as in 1998. The closure date that was subsequently announced was November 23, 1999.

The regulations for 2000, established at the 66th meeting of the IATTC (June 12 and 14-15, 2000), were the same as those for 1999, except that the period during which purse-seine fishing for yellowfin would be prohibited in the CYRA would begin on December 1, rather than on December 2 (unless 265,000 mt of yellowfin were caught before that date). The catch of yellowfin in the CYRA did not reach 240,000 mt.

***Bigeye tuna***

The rapidly increasing catches of bigeye by surface gear during the mid 1990s are obviously a matter of concern. The possible effects of the purse-seine fishery on the longline fishery are discussed on pages 60-61 of the IATTC Annual Report for 1997. At the time that that report was written there was insufficient information, particularly on natural mortality rates, to come to definite conclusions. Nevertheless, a resolution was passed at the 61st meeting of the IATTC (June 10-12, 1998) calling for cessation of making purse-seine sets on schools of tunas associated with floating objects during 1998 after 45,000 mt of bigeye had been caught in the EPO by surface gear. This resolution mentions the FAO "Code of Conduct for Responsible Fisheries" and the United Nations "Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks," both of which are more conservative, from the point of view of avoiding overfishing, than the IATTC Convention. The catch of bigeye by the surface fishery during 1998 was less than 45,000 mt, so there were no restrictions on sets on floating objects during that year. A similar regulation for bigeye was adopted for 1999, but the limit was 40,000 mt, instead of 45,000 mt. The limit was judged to have been reached on November 8, 1999, and vessels were prohibited from making sets on fish associated with floating objects in the EPO from that date till the end of the year. In 2000, in accordance with a resolution adopted at the 66th meeting of the IATTC (June 12 and 14-15, 2000), a similar ban was imposed from September 15 through December 15.

***Fish-aggregating devices***

A resolution adopted at the 62nd meeting of the IATTC (October 15-17, 1998) (1) prohibited the use of tender vessels (non-fishing vessels which deploy, maintain, repair, and pick up FADs in the EPO, (2) prohibited the "transshipment of tuna on the high seas by purse-seine vessels fishing for tunas in the EPO," and (3) stated that the number of FADs a fishing vessel could carry would be limited. The limits

were to be "decided through consultation among the Parties, based on recommendations of the Working Group."

***Bycatches***

At the 66th meeting of the IATTC (June 12 and 14-15, 2000) a resolution was adopted to "implement, as of 1 January 2001, a one-year pilot program to require all purse-seine vessels to first retain on board and then land all bigeye, skipjack, and yellowfin tuna caught, except fish considered unfit for human consumption for reasons other than size, in order to provide a disincentive to the capture of these small fish."

***Fleet size***

A resolution adopted at the 62nd meeting of the IATTC (October 15-17, 1998) established limits, for 1999, on the fish-carrying capacities of the purse-seine fleets of individual nations, ranging from 499 mt for Honduras to 49,500 mt for Mexico. It was agreed that the 1999 limits would not set a precedent for succeeding years.

***Measures taken for the conservation of dolphins***

***National legislation***

Legislation for the conservation of dolphins that associate with tunas in the EPO was first enacted by the United States, and those laws have had a greater effect on the fishery for tunas in that area than have those of any other nation. The MMPA of 1972 specified that "it shall be the immediate goal that the incidental kill or serious injury of marine mammals permitted in the course of commercial fishing operation be reduced to insignificant levels approaching a zero mortality and serious injury rate." This law applied only to vessels under U.S. jurisdiction, of course. Additional restrictions were added in subsequent years. U.S. Public Law 101-627 was enacted on November 28, 1990. Section 901 of that law, which sets forth requirements for labeling tuna as "dolphin-safe," is entitled the Dolphin Protection Consumer Information Act. Most of the other nations that are adjacent to the eastern Pacific Ocean, or in which vessels that fish for tunas in the EPO with surface gear are registered, have laws for the conservation of dolphins. The AIDCP, which came into effect on January 1, 2000, requires that all nations that ratify it, or that agree to apply it provisionally, do whatever is necessary to meet its objectives, which include "progressively reduc[ing] incidental dolphin mortalities in the tuna purse-seine fishery in the [EPO] to levels approaching zero." This obliges them to have legal measures to ensure that the objectives of the AIDCP are met.

***International Dolphin Conservation Program***

***Arrangements***

In 1972 vessels registered in the United States made up 77 percent of the fish-carrying capacity of the purse-seine fleet of the EPO. Accordingly, when the MMPA of 1972 was passed it seemed reasonable to expect that the mortality of dolphins due to fishing would decrease. During the following 20 years, however, many U.S. vessels left the EPO to fish in the WPO, and many others were re-registered in other nations. Also, during this period many new vessels were built with the intention of registering them in nations other than the United States. As the fleets of the other nations increased in size, most or all of those nations passed laws for the reduction or elimination of mortalities of dolphins due to fishing.

During the mid-1970s, as the numbers of purse-seine vessels registered in nations other than the United States increased, it became apparent that the tuna-dolphin problem could not be resolved without the participation of fishermen of those nations. Accordingly, the IATTC's responsibilities were broadened in 1976 to address this problem, and it initiated the research program described in the subsection entitled ***Tuna-Dolphin Program***.

### *Agreement for the Conservation of Dolphins ("1992 La Jolla Agreement")*

At the 50th meeting of the IATTC (June 16-18, 1992), a resolution regarding the conservation of dolphins in the EPO was passed by its member states. In addition, during a recess of the IATTC meeting, the 24th IGM, involving representatives of Colombia, Costa Rica, Ecuador, Mexico, Nicaragua, Panama, Spain, the United States, Vanuatu, and Venezuela, was held. At this meeting, the 1992 La Jolla Agreement (Appendix 8) was adopted. This agreement is virtually identical to the resolution adopted at the 50th IATTC meeting. The only differences between the resolution and the Agreement are that (1) the Agreement includes Colombia, Ecuador, Mexico, and Spain, which were not members of the IATTC at that time and (2) does not include France and Japan, which are members of the IATTC. The objectives of the Agreement are "(1) progressively reducing dolphin mortality in the EPO fishery to levels approaching zero through the setting of annual limits and (2), with a goal of eliminating dolphin mortality in this fishery, seeking ecologically sound means of capturing large yellowfin tunas not in association with dolphins while maintaining the populations of yellowfin tuna in the EPO at a level which will permit maximum sustained catches year after year, and to limit and, if possible, eliminate the mortality of dolphins in the fishery of the EPO." The Agreement called for the following overall limits on the mortalities of dolphins (DMLs) caused by the fishery for tunas in the EPO: 1993, 19,500; 1994, 15,500; 1995, 12,000; 1996, 9,000; 1997, 7,500; 1998, 6,500; 1999, <5,000. Each government agreed to submit annually to the IATTC a list of vessels for "which such government has reasonable cause to believe will set on tunas associated with dolphins in the EPO" during the forthcoming year. The DML for individual vessels is determined by dividing the overall DML for the year by the number of vessels expected to fish for tunas associated with dolphins during that year.

In addition, the Agreement established two subsidiary bodies, the IRP and the SAB. The principal duties of the IRP are to review the performances, as reported by observers, of vessels with DMLs, to identify possible infractions of the Agreement and to inform the respective governments of possible infractions committed by vessels under their jurisdictions. In addition, among other things, it makes recommendations to the various governments for standardized sanctions for fishing captains and vessel owners and for minimum standards for fishing gear. The principal duties of the SAB are to provide advice to the Director of the IATTC concerning research directed at reducing or eliminating the mortality of dolphins caused by the fishery for tunas in the EPO.

At the 25th IGM (June 9-10, 1993) a resolution specifying additional details as to how the International Dolphin Conservation Program was to operate was passed.

In 1993 106 vessels were allocated DMLs, and the individual DML was 183 dolphins. The total mortality of dolphins caused by the fishery for tunas was 3,601 animals, considerably less than the overall DML of 19,500 dolphins. Because of this it was agreed at the 26th IGM (October 26-27,1993) that the overall DML for 1994 would be reduced from 15,500 to 9,300 dolphins and that the overall DMLs for subsequent years would be reviewed annually. At the 28th IGM (October 20-21, 1994) the overall DML for 1995 was reduced from 12,000 to 9,300 animals.

At the 31st IGM (October 20-21, 1996) Mexico announced that it would suspend its participation in the International Dolphin Conservation Program, but made it clear that suspension of participation is different from outright withdrawal, and that Mexico would continue to "act in a manner consistent with internationally accepted standards for environmental use" (IATTC Annual Report for 1996: Appendix 2). At the 33rd IGM (June 4, 1997) Mexico presented a statement (IATTC Annual Report for 1997: Appendix 3) declaring that, because of the "progress made over the past several months by the U.S. Administration and Congress towards enactment of legislation to implement the Declaration of Panama," Mexico intended to cautiously move back toward full participation in the 1992 La Jolla Agreement.

The 1992 La Jolla Agreement was superceded by the AIDCP on January 1, 2000.

### *International Review Panel*

The IRP was established by the 1992 La Jolla Agreement. It originally consisted of nine members, of which five were representatives of governments with vessels participating in the fishery, two were representatives of environmental organizations, and two were representatives of the fishing industry. The most recent (and final) version of the 1992 La Jolla Agreement (Appendix 8) stated that the IRP would consist of five or more representatives of the parties to the Agreement (governments), three representative of environmental organizations, and three representatives of the tuna industry. Only the government representatives were entitled to vote. Members of the IATTC staff served as a secretariat to the IRP.

The IRP held one meeting in 1992 and three during each year of the 1993-2000 period (Appendix 7). At these meetings it reviewed cases in which the observers' records indicated apparent non-compliance with the provisions of the 1992 La Jolla Agreement or the AIDCP. If the Panel identified a case as a possible infraction, the IATTC staff informed the government under whose jurisdiction the vessel in question operated of the Panel's decision, and the government was to report back to the IRP on any actions taken. The IRP then informed all the governments of the action taken in each case by means of an annual report.

### *Scientific Advisory Board*

The SAB was established by the 1992 La Jolla Agreement. It met on April 14-15, 1993 (Appendix 7). As no members of the SAB had been appointed, interested persons, including fishermen, gear experts, fishery biologists, and marine mammalogists were invited to attend that meeting. Thirty-nine people, including six IATTC employees, were at the meeting. The meeting was a fruitful one, as there was general agreement as to which approaches to the problem were most likely to produce useful results. It was agreed that the next meeting would be held after about eight members had been appointed to the SAB. Due to lack of funds, however, a second meeting had not been scheduled as of late 2000, nor had any members been appointed to the SAB.

### *Agreement on the International Dolphin Conservation Program*

A binding agreement, the Agreement on the International Dolphin Conservation Program (AIDCP) (Appendix 9), was adopted at the 35th IGM (February 2-7, 1998). This was signed in Washington, D.C., USA, by representatives of Colombia, Costa Rica, Ecuador, Mexico, Nicaragua, Panama, the United States, and Venezuela on May 21, 1998 (and later by representatives of Honduras, Vanuatu, and the EU), and it was to go into effect as soon as it was ratified by four signatories. It was ratified by the United States on July 21, 1998, by Panama on December 23, 1998, by Ecuador on February 9, 1999, and by Mexico on February 15, 1999, and thus came into force on February 15, 1999. Subsequently it was ratified by Costa Rica, El Salvador, Honduras, Nicaragua, and Venezuela, and Colombia, the EU, and Vanuatu have given formal notification that they intend to apply the agreement provisionally. This Agreement replaced the 1992 La Jolla Agreement on January 1, 2000. The principal differences between the AIDCP and the 1992 La Jolla Agreement are that: (1) the AIDCP is binding, whereas the 1992 La Jolla Agreement is not; (2) the AIDCP establishes mortality limits for individual stocks of dolphins, whereas the 1992 La Jolla Agreement calls for a single dolphin mortality limit (DML) for all species combined; (3) the AIDCP includes, as one of its objectives, "avoiding, reducing and minimizing bycatch and discards of juvenile tunas and non-target species," whereas the 1992 La Jolla Agreement does not mention bycatches and discards; (4) the AIDCP provides for "certification for fishing captains and crews," whereas the 1992 La Jolla Agreement does not; (5), the AIDCP provides for "the establishment of a system for the tracking and verification of tuna harvested with and without mortality or serious injury of dolphins," whereas the 1992 La Jolla Agreement does not; and (6) the AIDCP applies to the area bounded by the coastline of the Americas, 40°N latitude, 150°W longitude, and 40°S latitude, whereas the 1992 La Jolla Agreement applies to "the eastern Pacific Ocean." The transition from the 1992 La Jolla Agreement

to the AIDCP was discussed at the 38th IGM (March 15-16, 1999) and at the first Meeting of the Parties to the AIDCP, held on June 11 and July 22-23, 1999.

The IRP and the SAB were carried over, with a few changes, from the 1992 La Jolla Agreement to the AIDCP. The organization and functions of the IRP are specified in Annex VII of the AIDCP (Appendix 9). The AIDCP states (Annex III, Paragraph 1) that the SAB may, in addition to its duties assigned earlier, "develop or recommend" "Minimum Estimated Abundances" for the various stocks of dolphins for the purpose of establishing per-stock, per-year dolphin mortality limits.

## RELATIONS WITH OTHER ORGANIZATIONS

Throughout the IATTC's existence its staff has maintained close working relationships with various international, national, intranational, and non-governmental organizations, and with educational institutions, throughout the world. This is particularly important because of the international distribution of the tuna and billfish resources and the international nature of the fisheries. Such inter-agency cooperation is likewise necessary if the staff is to stay abreast of the rapid developments taking place in fisheries science and oceanography. A few of the staff's activities along these lines are described below.

### *International organizations*

The IATTC staff has worked closely with the United Nations (UN) and three of its subsidiaries, FAO, the United Nations Educational, Scientific, and Cultural Organization (UNESCO), and the UNEP, especially on UN Special Fund projects executed by FAO in the nations bordering the EPO. Several staff members have been granted short leaves of absence to work or consult for FAO (see, for example, Klawe (1980)), and others have served on FAO committees and working parties, particularly the FAO Expert Panel for the Facilitation of Tuna Research (now defunct). Also, one IATTC staff member was granted a 1-year leave of absence to work for a UN Special Fund project in Venezuela and another was granted a leave of absence for more than a year to work for the Indo-Pacific Tuna Development and Management Programme (IPTP) (now the Indian Ocean Tuna Commission (IOTC)), a subsidiary of FAO. Partial funding for four of the five courses on marine mammalogy taught at universities in Latin America (see below) was received from the UNEP.

The relationship of the IATTC's staff to that of the International Commission for the Conservation of Atlantic Tunas (ICCAT) has been close since the formation of the latter organization in 1970. IATTC staff members have served on ICCAT committees, and there has been considerable informal exchange of information and ideas among staff members and representatives of member nations of ICCAT studying tunas of the Atlantic Ocean.

Cooperation with the Skipjack Survey and Assessment Programme, the Tuna and Billfish Assessment Programme, and the Oceanic Fisheries Programme of the South Pacific Commission (now the Secretariat of the Pacific Community; SPC) has also been quite close. For example, the IATTC and the SPC conducted a joint tagging program in the central Pacific in 1979-1980 (IATTC Spec. Rep., 3), and an IATTC staff member prepared a report on longline catches of tunas and billfishes within the 200-nm economic zones of the member countries of the SPC (Klawe, 1978).

Other international organizations with which the IATTC's staff has carried out cooperative work include the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS), the Comisión Permanente del Pacífico Sur (CPPS), the Commission for the Conservation of Southern Bluefin Tuna (CCSBT), the Fundación para la Pesca Sostenida y Responsable de Túnidos (FUNDATUN) the International Whaling Commission (IWC), the Organización Latinoamericana de Desarrollo Pesquero (OLDEPESCA), the Organización del Sector Pesquero y Acuícola del Istmo Centroamerica (OSPESCA), the Organization of American States (OAS), and the Programa Regional de Apoyo al Desarrollo de la Pesca en el Istmo Centroamericano (PRADEPESCA). Staff members of the IATTC prepared synopses of biological data on eight species of scombrids for the CPPS (IATTC Spec. Rep., 2), and for many years the IATTC staff prepared reports on the condition of the dolphin stocks of

the EPO for the IWC's annual reports (see, for example, Anganuzzi and Buckland, 1994; Lennert and Hall, 1996).

***National organizations***

The IATTC's staff has maintained close working relationships with national fisheries and fisheries-related organizations of most of the member states of the IATTC and the non-member states that exploit tunas and billfishes of the EPO.

The headquarters of the IATTC is located in a building owned by the U.S. government, and IATTC staff members working in other nations have frequently been stationed at the offices of national fisheries organizations. This encourages cooperation between IATTC staff members and those of the host nations, which is necessary if the IATTC's work is to be performed as efficiently as possible.

Fisheries statistics and oceanographic and meteorological data collected by various national governments are frequently made available to the IATTC staff. For example, data on the Japanese longline catches in the EPO by species, area, and time are made available for joint analysis by employees of the IATTC and the NRIFSF.

Most of the IATTC staff's oceanographic research has been accomplished by means of cooperative ventures with other organizations, including government agencies of Chile, Colombia, Costa Rica, Ecuador, France, Mexico, Panama, Peru, Spain, the United Kingdom, and the United States. One example of this is the EASTROPAC study carried out during 1967-1969 by the governments of Chile, Ecuador, Mexico, Peru, and the United States, and the IATTC.

As mentioned in the subsection entitled ***Finance***, an agreement was reached in 1993 by the Overseas Fishery Cooperation Foundation (OFCF) of Japan, the government of the Republic of Panama, and the IATTC to undertake a joint five-year project, funded mostly by the OFCF, at the IATTC's Achotines Laboratory. The project encompasses research on the feasibility of culturing adult yellowfin tuna to supply larvae, the production of food organisms for larval and juvenile tunas, and the culturing of broodstock snappers and/or corvina-like fishes and production of food organisms for their larvae and juveniles. In November 1999 it was agreed, in principle, that the project would receive funding through March 2001.

Much of the IATTC's Tuna-Dolphin Program involves cooperation with governmental organizations of various nations. Since 1978 the IATTC staff has been training observers, most of whom are selected by the governments in which the vessels are registered, for placement aboard tuna vessels to collect data on abundance, mortality, and other aspects of the biology of dolphins. In addition, these observers have collected samples of gonads of yellowfin and skipjack tuna, recorded data on the incidental catches of species other than tunas and dolphins, recorded information on floating objects and the fauna and flora associated with them, *etc*. Data collected by the observer programs of the United States (now discontinued), Mexico, Venezuela, and Ecuador have been or will be furnished to the IATTC staff for analysis. Tracking studies of dolphins and tunas have been carried out cooperatively with scientists from the NMFS, the PNAAPD, the University of Hawaii, and the Universidad Nacional de Costa Rica. Staff members of the IATTC and the NMFS are currently studying the food of yellowfin tuna, dolphins, and associated predators to learn more about their relationships with one another.

IATTC staff members have served on various national committees, including several of the National Academy of Sciences-National Research Council (Francis *et al*., 1992; Magnuson *et al*., 1994a and 1994b; Deriso *et al*., 1998), the NMFS, the President's Science Advisory Council, the Smithsonian Institution, and the Advisory Board of the National Oceanographic Data Center, all of the United States, and the Junta de Planificación of Ecuador.

### *Other organizations*

#### *California*

During the 1930s and 1940s research on tunas in the EPO was carried out by the CDFG. During the 1950s, as the IATTC became involved in research on tropical tunas, the CDFG shifted its emphasis to albacore and Pacific bluefin. During the late 1960s and the 1970s the CDFG reduced and then ceased its research on bluefin, and the IATTC became active in research on this species. During the periods of transition personnel of the CDFG cooperated fully with those of the IATTC, and its data on length frequencies and tagging were made available to the IATTC.

#### *Educational institutions*

The headquarters of the IATTC is in a U.S. government building that, in turn, is on the campus of Scripps Institution of Oceanography (SIO) of the University of California. The IATTC staff has had a very close working relationship with SIO, particularly in oceanographic research, since the inception of the IATTC. The library and computer facilities there have been extremely helpful to the staff in its work. Several staff members have served also as staff members of SIO, or have taught courses there, and other staff members have taken graduate courses there.

The IATTC staff has also worked cooperatively with scientists of many other universities in various nations, particularly those in countries bordering the EPO. For example, courses in marine mammalogy have been taught by IATTC staff members at universities in Argentina, Ecuador, Mexico, Uruguay, and Venezuela. Also, staff members of the Centro Interdisciplinario de Ciencias Marinas (CICIMAR), Instituto Politécnico Nacional, La Paz, Mexico, the Universidad de Oriente, Cumaná, Venezuela, the NMFS, and the IATTC have been involved in a joint study of the trophic interactions of yellowfin tuna, dolphins, and associated predators in the EPO. In addition, scientists from the University of Hawaii and the Universidad Nacional de Costa Rica were involved in the tracking studies of dolphins and tunas mentioned previously.

#### *Non-governmental organizations*

Private business enterprises have cooperated fully with the IATTC since its inception in the early 1950s. The IATTC's research is heavily dependent upon data on the total catches of tunas in the EPO furnished by canneries and other fish-handling facilities in many nations. In addition, staff members are permitted to sample fish and collect tag return information at these facilities. The IATTC's research is also dependent on detailed logbook data, which are furnished by the vessel owners almost without exception. Also, vessel owners have frequently permitted staff members to go to sea on their vessels to tag tunas and collect samples and data of various types. In addition, as mentioned previously, funding for the IATTC's Tuna-Dolphin Program has been received from private business enterprises. In return, the IATTC often furnishes information to businessmen, especially owners and operators of fishing vessels, provided doing so does not violate the confidential nature of the data. Also, IATTC employees have participated in the development of equipment and techniques for releasing dolphins unharmed from purse seines, and frequently inspect the nets and other equipment to determine whether they are working properly. Experiments with anchored and drifting FADs are mentioned in the subsection entitled ***Attempts to reduce dolphin mortality***. The anchored FADs were deployed by a U.S.-flag purse seiner and the drifting FADs by a Mexican-flag purse seiner.

Representatives of Avatún, S.A., of Venezuela, the American Tunaboat Association of the United States, Atunes Enlatados del Caribe, S.A. (ATUNEC, S.A.) of Colombia, the Cámara Nacional de Enladadores de la Pesca (CAVENPESCA) of Venezuela, the Cámara Nacional de la Industria Pesquera (CANAINPES) of Mexico, the Cámara Nacional de Pesquería of Ecuador, Sardimar, S.A., of Costa Rica, and the United States Tuna Foundation have served on the IRP, described above.

Many environmental groups have taken an interest in the IATTC's Tuna-Dolphin Program and supported it. Representatives of the Center for Marine Conservation, the Fundación para la Defensa de la Naturaleza (FUDENA), Greenpeace International, the Whale and Dolphin Conservation Society, and the World Wildlife Fund have also served on the IRP.

## PUBLICATIONS

The prompt and complete publication of research results is one of the most important elements of the IATTC's program of scientific investigations. By this means the member states, the scientific community, and the public at large are informed of the findings of the IATTC staff. The publication of basic data, methods of analysis, and the conclusions therefrom affords an opportunity for critical review by other scientists, ensuring the soundness of the conclusions reached by the IATTC staff, and enlists the interest of other scientists in the IATTC's research.

Each of the IATTC's Annual Reports includes a summary of the research, summaries of the IATTC meetings, and a short report on administration and finances for the year.

The bulk of the staff's scientific work is published in its Bulletin series. At the end of 2000 146 issues of this series had been published.

About 500 other reports, some scientific and others of a popular or semi-popular nature, have been published in books, outside scientific journals, and trade journals.

The Special Report series, of which the present report is an example, includes reports that are not suited to the above-described purposes of the IATTC's Bulletin or other report series. At the end of 2000 12 of these had been published.

The Internal Report series is produced primarily for the convenience of IATTC staff members. It contains reports of various types, some of which will eventually be modified and published in the Bulletin series or in outside journals. Others are methodological reports of limited interest or reports of research that yielded negative or inconclusive results. At the end of 2000 25 of these had been published.

The Data Report series includes very lengthy maps and listings of biological, meteorological, oceanographic, or catch and effort statistical data. These are distributed to a limited number of scientists and persons involved in the tuna industry who need the data in their original form. Ten of these had been printed at the end of 2000.

IATTC staff members have translated 26 scientific papers and 1 book from various languages to English or Spanish. The translations of scientific papers have been produced primarily for use by staff members, but copies have been distributed to workers in other organizations. The translation of the book (IATTC Spec. Rep., 6) has been widely distributed in Spanish-speaking countries.

The publications in the IATTC Bulletin, Special Report, Internal Report, and Data Report series are listed in Appendix 6.

## ACKNOWLEDGEMENTS

Information used in this report was received from Drs. James Joseph and Michael G. Hinton. Valuable suggestions for its improvement were received from Drs. Joseph, Hinton, Robin L. Allen, Richard B. Deriso, Martín A. Hall, and Robert J. Olson, and Messrs. David A. Bratten, Patrick K. Tomlinson, and Nicholas J. Webb. Mr. Webb translated the English version to Spanish.

## LITERATURE CITED

Anganuzzi, A. A., and S. Buckland. 1994. Relative abundance of dolphins associated with tuna in the eastern Pacific Ocean: analysis of 1992 data. Inter. Whaling Comm., Rep., 44: 361-366.

Armstrong, W. A., and C. W. Oliver. 1995. Recent use of fish aggregating devices in the eastern tropical Pacific tuna purse-seine fishery: 1990-1994. U.S. Nat. Mar. Fish. Serv., Admin. Rep., LJ-95-14: iii, 47 pp.

Barbieri, M. A., C. Canales, V. Correa, M. Donoso, A. González Casanga, B. Leiva, A Montiel, and E. Yáñez. 1998. Development and present state of the swordfish, *Xiphias gladius*, fishery in Chile. U.S. Nat. Mar. Fish. Serv., NOAA Tech. Rep. NMFS 142: 1-10.

Barbieri, M. A., F. Naranjo, E Yañez, M. Farías, G. Danneri, and P. Rojas. 1987. La pesquería artesanal del atún aleta larga en la zona de Valparaiso y el satélite NOAA. Inves. Mar., Valparaiso [Chile], 15: 41-61.

Barham, E. G., W. K. Taguchi, and S. B. Reilly. 1977. Porpoise rescue methods in the yellowfin purse seine fishery and the importance of Medina panel mesh size. Mar. Fish. Rev., 39 (5): 1-10.

Barrett, I., O. Sosa-Nishizaki, and N. Bartoo (editors). 1998. Biology and fisheries of swordfish, *Xiphias gladius*. U.S. Nat. Mar. Fish. Serv., NOAA Tech. Rep. NMFS, 142: v, 276 pp.

Bartoo, N., and T. J. Foreman. 1994. A review of the biology and fisheries for north Pacific albacore (*Thunnus alalunga*). FAO Fish. Tech. Pap., 336 (2): 173-187.

Bayliff, W. H. 1988. Integrity of schools of skipjack tuna, *Katsuwonus pelamis*, in the eastern Pacific Ocean, as determined from tagging data. U.S. Nat. Mar. Fish. Serv., Fish. Bull., 86 (4): 631-643.

Buckland, S. T., D. R. Anderson, K. P. Burnham, and J. L. Laake. 1993. Distance Sampling: Estimating Abundance of Biological Populations. Chapman and Hall, London: xii, 446 pp.

Calkins, T. P., and W. L. Klawe. 1963. Synopsis of biological data on black skipjack *Euthynnus lineatus* Kishinouye 1920. FAO, Fish. Rep., (2): 130-146.

Carey, F. G., and R. J. Olson. 1982. Sonic tracking experiments with tunas. Inter. Comm. Cons. Atlan. Tunas, Coll. Vol. Sci. Pap., 17 (2): 458-466.

Carroz, J. E. 1965. Establishment, structure, functions and activities of international fisheries bodies. II - Inter-American Tropical Tuna Commission (IATTC). FAO, Fish. Tech. Pap., 58: ii, 30 pp.

Childers, J., and F. R. Miller. 1998. Summary of the 1997 U.S. north and south Pacific albacore troll fisheries. U.S. Nat. Mar. Fish. Serv., Admin. Rep., LJ-98-06: iii, 45 pp.

Deriso, R., T. Quinn, J. Collie, R. Hilborn, C. Jones, B. Lindsay, A. Parma, S. Saila, L. Shapiro, S. J. Smith, and C. Walters. 1998. Improving Fish Stock Assessments. National Academy Press, Washington, D.C.: x, 177 pp.

Drouin, Michel, and Brad Warren. 2000. FAD fracas. Pacif. Fishing, 21 (8): 23-25.

Edwards, E. 1996. Summary of reviewer's comments on adrenal color paper by Myrick and reviewers' recommendations for future research. memorandum to Michael Tillman, U.S. Nat. Mar. Fish. Serv., La Jolla, California, June 21, 1996.

Fiedler, P. C., and S. B. Reilly. 1994. Interannual variability of dolphin habitats in the eastern tropical Pacific. II. Effects of abundances estimated from tuna vessel sightings, 1975-1990. U.S. Nat. Mar. Fish. Serv., Fish. Bull., 92 (2): 451-463.

Francis, R. C., F. T. Awbrey, C. A. Goudey, M. A. Hall, D. M. King, H. Medina, K. S. Norris, M. K. Orbach, R. Payne, and E. Pikitch. 1992. Dolphins and the tuna industry. National Academy Press, Washington, D.C.: xii, 176 pp.

Graves, J. E., S. D. Ferris, and A. E. Dizon. 1984. Close genetic similarity of Atlantic and Pacific skipjack tuna (*Katsuwonus pelamis*) demonstrated with restriction endonuclease analysis of mitochondrial DNA. Mar. Biol., 79 (3): 315-319.

Graves, J. E., and J. R. McDowell. 1994. Genetic analysis of striped marlin (*Tetrapturus audax*) population structure in the Pacific Ocean. Canad. Jour. Fish. Aquatic Sci., 51 (8): 1762-1768.

Graves, J. E., and J. R. McDowell. 1995. Inter-ocean genetic divergence of istiophorid billfishes. Mar. Biol., 122 (2): 193-203.

Greenough, J. W., and J. Joseph. 1986. International management of the highly migratory tunas and billfishes. *In* Hinman, K. A. (coordinator) and R. H. Stroud (editor), Multi-jurisdictional Management of Marine Fisheries, Proceedings of the Eleventh Annual Marine Recreational Fisheries Symposium, Tampa, Florida, May 1-2, 1986. National Coalition for Marine Conservation, Inc., Savannah, Georgia: 121-138.

Greenough, J. W., and B. K. Rothschild. 1989. Billfish management in the Pacific and Indian Oceans. *In* Stroud, R. H. (editor), Planning the Future of Billfishes: Research and Management in the 90s and Beyond. Proceedings of the Second International Billfish Symposium, Kailua-Kona, Hawaii, August 1-5, 1988, Part 1: Fishery and Stock Synopses, Data Needs and Management, National Coalition for Marine Conservation, Inc., Savannah, Georgia: 293-311.

Haig-Brown, Alan. 2000. Too much tuna, too little marketing. Pacif. Fishing, 21 (8): 23-26, 65.

Hall, M. A. 1996. On bycatches. Rev. Fish Biol. Fish., 6 (3): 319-352.

Hall, M. A. 1998. An ecological view of the tuna-dolphin problem: impacts and trade-offs. Rev. Fish Biol. Fish., 8 (1): 1-34.

Hampton, J., and K. Bailey. 1993. Fishing for tunas associated with floating objects: a review of the western Pacific fishery. South Pacif. Comm., Tuna and Billfish Assessment Programme, Tech. Rep., 31: x, 48 pp.

Hanan, D. A., D. B. Holts, and A. L. Coan, Jr. 1993. The California drift gill net fishery for sharks and swordfish, 1981-82 through 1990-91. Calif. Dept. Fish Game, Fish Bull., 175: 95 pp.

Hinton, M. G., and R. B. Deriso. 1998. Distribution and stock assessment of swordfish, *Xiphias gladius*, in the eastern Pacific Ocean from catch and effort data standardized on biological and environmental parameters. U.S. Nat. Mar. Fish. Serv., NOAA Tech. Rep. NMFS, 142: 161-179.

Hinton, M. G., R. G. Taylor, and M. D. Murphy. 1997. Use of gonad indices to estimate the status of reproductive activity of female swordfish, *Xiphius gladius*: a validated classification method. U.S. Nat. Mar. Fish. Serv., Fish. Bull., 95 (1): 80-84.

Holt, R. S., T. Gerodette, and J. B. Cologne. 1987. Research vessel survey design for monitoring dolphin abundance in the eastern tropical Pacific. U.S. Nat. Mar. Fish. Serv., Fish. Bull., 85 (3): 435-446.

Ito, Russell Y., Robert A. Dollar, and Kurt E. Kawamoto. 1998. The Hawaii-based longline fishery for swordfish, *Xiphias gladius*. U.S. Nat. Mar. Fish. Serv., NOAA Tech. Rep. NMFS, 142: 77-88.

Joseph, J. 1989. Strategies for successful management. *In* Stroud, R. H. (editor), Planning the Future of Billfishes: Research and Management in the 90s and Beyond. Proceedings of the Second International Billfish Symposium, Kailua-Kona, Hawaii, August 1-5, 1988, Part 1: Fishery and Stock Synopses, Data Needs and Management, National Coalition for Marine Conservation, Inc., Savannah, Georgia: 293-311.

Joseph, J. 1994. The tuna-dolphin controversy in the eastern Pacific Ocean: biological, economic, and political impacts. Ocean Devel. Inter. Law, 25 (1): 1-30.

Joseph, J., and J. W. Greenough. 1979. International Management of Tuna, Porpoise, and Billfish--Biological, Legal, and Political Aspects. University of Washington Press, Seattle and London: xv, 253 pp.

Joseph, J., W. L. Klawe, and C. J. Orange. 1974. A review of the longline fishery for billfishes in the eastern Pacific Ocean. U.S. Nat. Mar. Fish. Serv., Spec. Sci. Rep., Fish., 675 (2): 309-331.

Klawe, W. L. 1978. Estimates of catches of tunas and billfishes by the Japanese, Korean and Taiwanese longliners from within the 200 mile economic zone of the member countries of the South Pacific Commission. South Pacif. Comm., Occas. Pap., 10: 41 pp.

Klawe, W. L. 1980. Long-line catches of tunas within the 200-mile economic zones of the Indian and western Pacific Oceans. FAO, Indian Ocean Programme, Develop. Rep., 48: vi, 86 pp.

Lennert, C., and M. A. Hall. 1996. Estimates of incidental mortality of dolphins in the eastern Pacific Ocean tuna fishery in 1994. Inter. Whaling Comm., Rep., 46: 555-558.

Magnuson, J. J., D. L. Alverson, C. A. Black, G. M. Brown, Jr., W. Burke, P. K. Dayton, J. J. Dykstra, J. Joseph, C. Meacham, W. J. Merrill, Jr., D. Olson, T. J. Quinn II, and B. J. Rothschild. 1994a. Improving the Management of U.S. Marine Fisheries. National Academy Press, Washington, D.C.: x, 62 pp.

Magnuson, J. J., B. A. Block, R. B. Deriso, J. R. Gold, W. S. Grant, T. J. Quinn II, S. B. Saila, L. Shapiro, and E. D. Stevens. 1994b. An Assessment of Atlantic Bluefin Tuna. National Academy Press, Washington, D.C.: xvii, 148 pp.

Margulies, D. 1993. Assessment of the nutritional condition of larval and early juvenile tuna and Spanish mackerel (Pisces: Scombridae) in the Panama Bight. Mar. Biol., 115 (2): 317-330.

Mullen, A. J. 1994. Effects of movement on stock assessment in a restricted-range fishery. Canad. Jour. Fish. Aquatic Sci., 51 (9): 2027-2033.

Myrick, A. C., and P. C. Perkins. 1995. Adrenocortical color darkness and correlates as indicators of continuous acute premortem stress in chased and purse-seine captured male dolphins. Pathophysiology, 2 (4): 191-204.

Nakamura, I. 1985. An annotated and illustrated catalogue of marlins, sailfishes, spearfishes and swordfishes known to data. FAO Fish. Synop., 125 (5): iv, 65 pp.

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

Olson, R. J., and A. J. Mullen. 1986. Recent developments for making gastric evacuation and daily ration determinations. Environ. Biol. Fishes, 16 (1-3): 183-191.

Olson, R. J., and V. P. Scholey. 1990. Captive tunas in the tropical marine research laboratory: growth of late-larval and early-juvenile black skipjack *Euthynnus lineatus*. U.S. Nat. Mar. Fish. Serv., Fish. Bull., 88 (4): 821-828.

Punsly, R. G., P. K. Tomlinson, and A. J. Mullen. 1994. Potential tuna catches in the eastern Pacific Ocean from schools not associated with dolphins. U.S. Nat. Mar. Fish. Serv., Fish. Bull., 92 (1): 132-143.

Quinn, T. J., II, and R. B. Deriso. 1999. Quantitative Fish Dynamics. Oxford University Press, New York and London: xv, 542 pp.

Reilly, S. B., and P. C. Fiedler. 1994. Interannual variability of dolphin habitats in the eastern tropical Pacific. I. Research vessel surveys, 1986-1990. U.S. Nat. Mar. Fish. Serv., Fish. Bull., 92 (2): 434-450.

Rothschild, B. J. 1965. Hypotheses on the origin of exploited skipjack tuna (*Katsuwonus pelamis*) in the eastern and central Pacific Ocean. U.S. Fish Wild. Serv., Spec. Sci. Rep., Fish., 512: iii, 20 pp.

Sakagawa, G. D. 1988. Stock structure of blue marlin, *Makaira nigricans*, populations. Indo-Pacif. Tuna Develop. Manag. Prog. (GEN/13): 116-121.

Schaefer, K. M. 1984. Swimming performance, body temperatures and gastric evacuation times of the black skipjack, *Euthynnus lineatus*. Copeia, 4: 1000-1005.

Schaefer, K. M. 1991. Geographic variation in morphometric characters and gill-raker counts of yellowfin tuna, *Thunnus albacares*, from the Pacific Ocean. U.S. Nat. Mar. Fish. Serv., Fish. Bull., 89 (2): 289-297.

Schaefer, K. M. 1996. Spawning time, frequency, and batch fecundity of yellowfin tuna, *Thunnus albacares*, near Clipperton Atoll in the eastern Pacific Ocean. U.S. Nat. Mar. Fish. Serv., Fish. Bull., 94 (1): 98-112.

Schaefer, K. M. 2001. Assessment of skipjack tuna (*Katsuwonus pelamis*) spawning in the eastern Pacific Ocean. U.S. Nat. Mar. Fish. Serv., Fish. Bull., 99 (2): 343-350.

Scoles, D. R., and J. E. Graves. 1993. Genetic analysis of the population structure of yellowfin tuna, *Thunnus albacares*, in the Pacific Ocean. U.S. Nat. Mar. Fish. Serv., Fish. Bull., 91 (4): 690-698.

Smith, T. D. 1983. Changes in size of three dolphin (*Stenella* spp.) populations in the eastern tropical Pacific. U.S. Nat. Mar. Fish. Serv., Fish. Bull., 81 (1): 1-13.

Squire, J. L., Jr. 1974. Migration patterns of Istiophoridae in the Pacific Ocean as determined by cooperative tagging programs. U.S. Nat. Mar. Fish. Serv., NOAA Tech. Rep. NMFS SSRF-675 (2): 226-237.

Squire, J. L. 1987. Striped marlin, *Tetrapturus audax*, migration patterns and rates in the northeast Pacific Ocean as determined by a cooperative tagging program: its relation to resource management. Mar. Fish. Rev., 49 (2): 26-43.

Squire, J. L., Jr., and D. V. Neilson. 1983. Results of a tagging program to determine migration rates and patterns for black marlin, *Makaira indica*, in the southwest Pacific Ocean. U.S. Nat. Mar. Fish. Serv., NOAA Tech. Rep. NMFS SSRF-772: iii, 19 pp.

Stevenson, M. R. 1981. Seasonal variations in the Gulf of Guayaquil, a tropical estuary (in English and Spanish). Ecuador, Inst. Nac. Pesca, Bol. Sci. Tec., 4 (1): 133 pp.

Talbot, G. B, and P. G. Wares. 1975. Fishery for Pacific billfish off Southern California and Mexico. Amer. Fish. Soc., Trans., 104 (1): 1-12.

Wade, P. R. 1995. Revised estimates of incidental kill of dolphins (Delphinidae) by the purse-seine tuna fishery in the eastern tropical Pacific, 1959-1972. U.S. Nat. Mar. Fish. Serv., Fish. Bull., 93 (2): 345-354.

Wade, P. R., and T. Gerodette. 1993. Estimates of cetacean abundance and distribution in the eastern tropical Pacific. Inter. Whaling Comm., Rep., 43: 477-493.

Ward, R. D., N. G. Elliott, B. H. Innes, A. J. Smolenski, and P. M. Grewe. 1997. Global population structure of yellowfin tuna, *Thunnus albacares*, inferred from allozymic and mitochondrial DNA variation. U.S. Nat. Mar. Fish. Serv., Fish. Bull., 97 (3): 566-575.

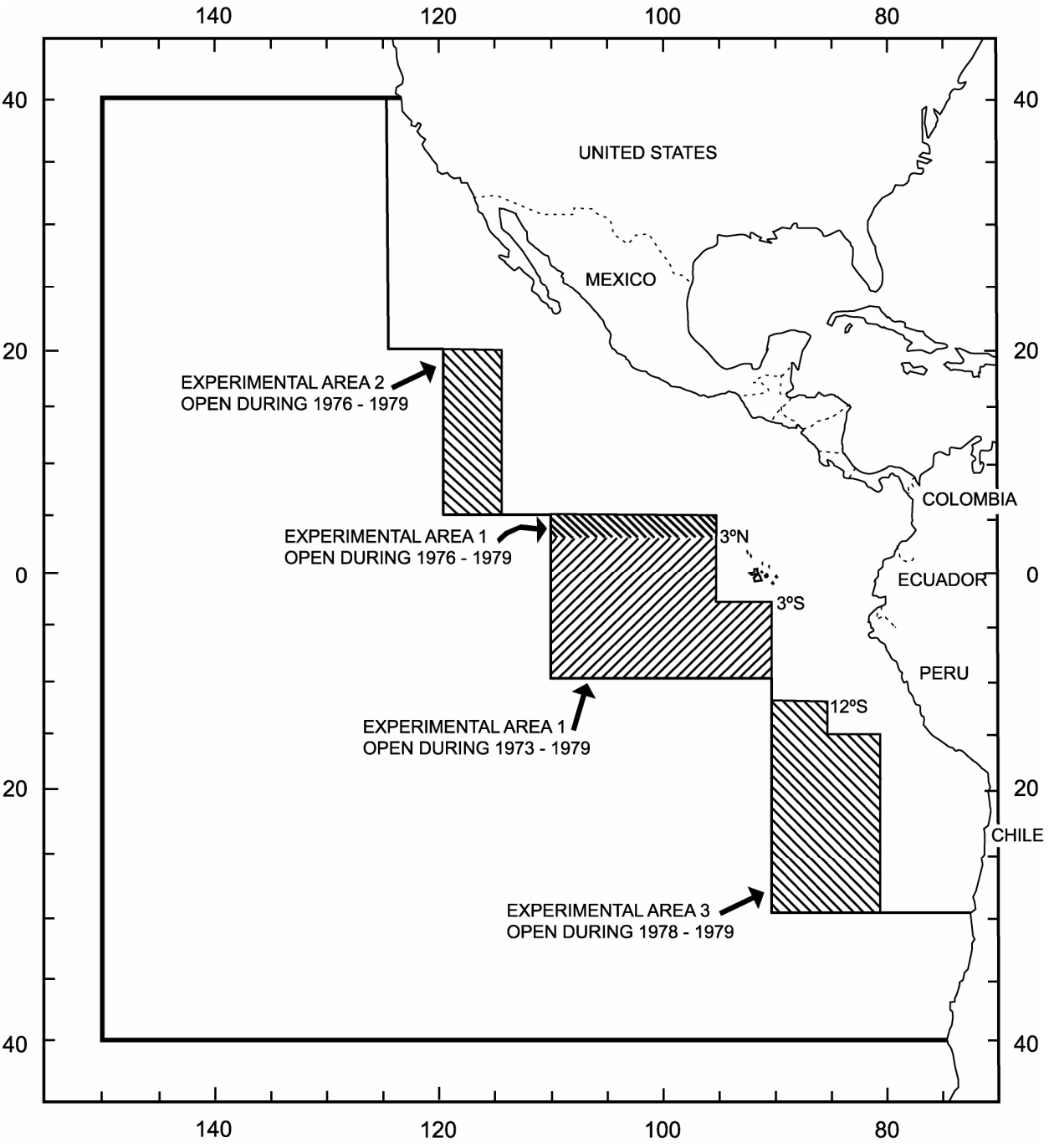


**FIGURE 1.** The eastern Pacific Ocean (EPO), as defined by the Agreement on the International Dolphin Conservation Program (area inside the heavy lines). The area inside the lighter lines is the Commission's Yellowfin Regulatory Area (CYRA), and the shaded areas are the experimental areas described in the text.

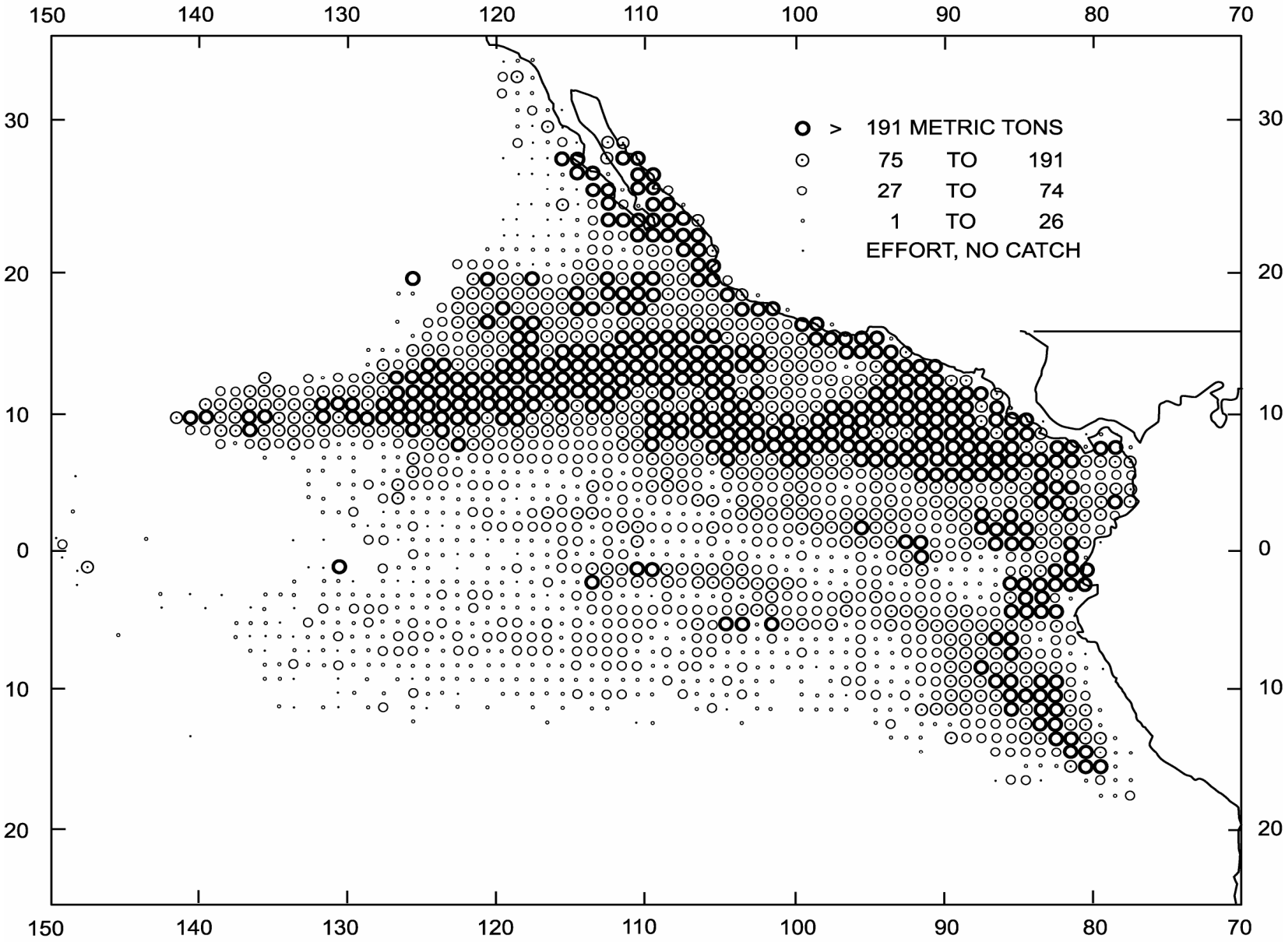


**FIGURE 2.** Average annual catches of yellowfin tuna in the EPO during 1980-1994 1984-1998 for all purse-seine trips for which usable logbook data were obtained. The averages were calculated only for 1-degree areas for which three or more years of data were available.

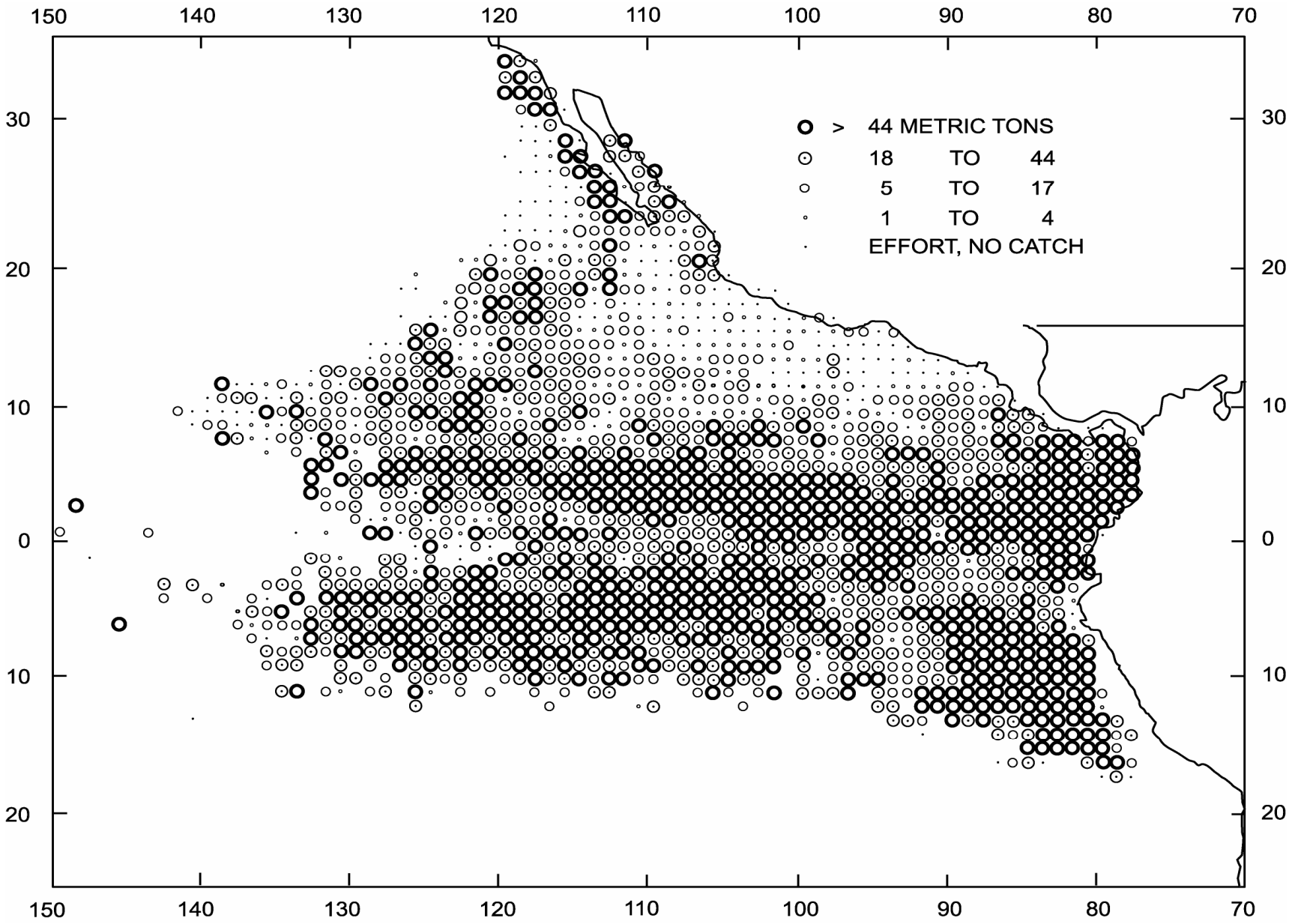


**FIGURE 3.** Average annual catches of skipjack tuna in the EPO during 1980-1994 1984-1998 for all purse-seine trips for which usable logbook data were obtained. The averages were calculated only for 1-degree areas for which three or more years of data were available.

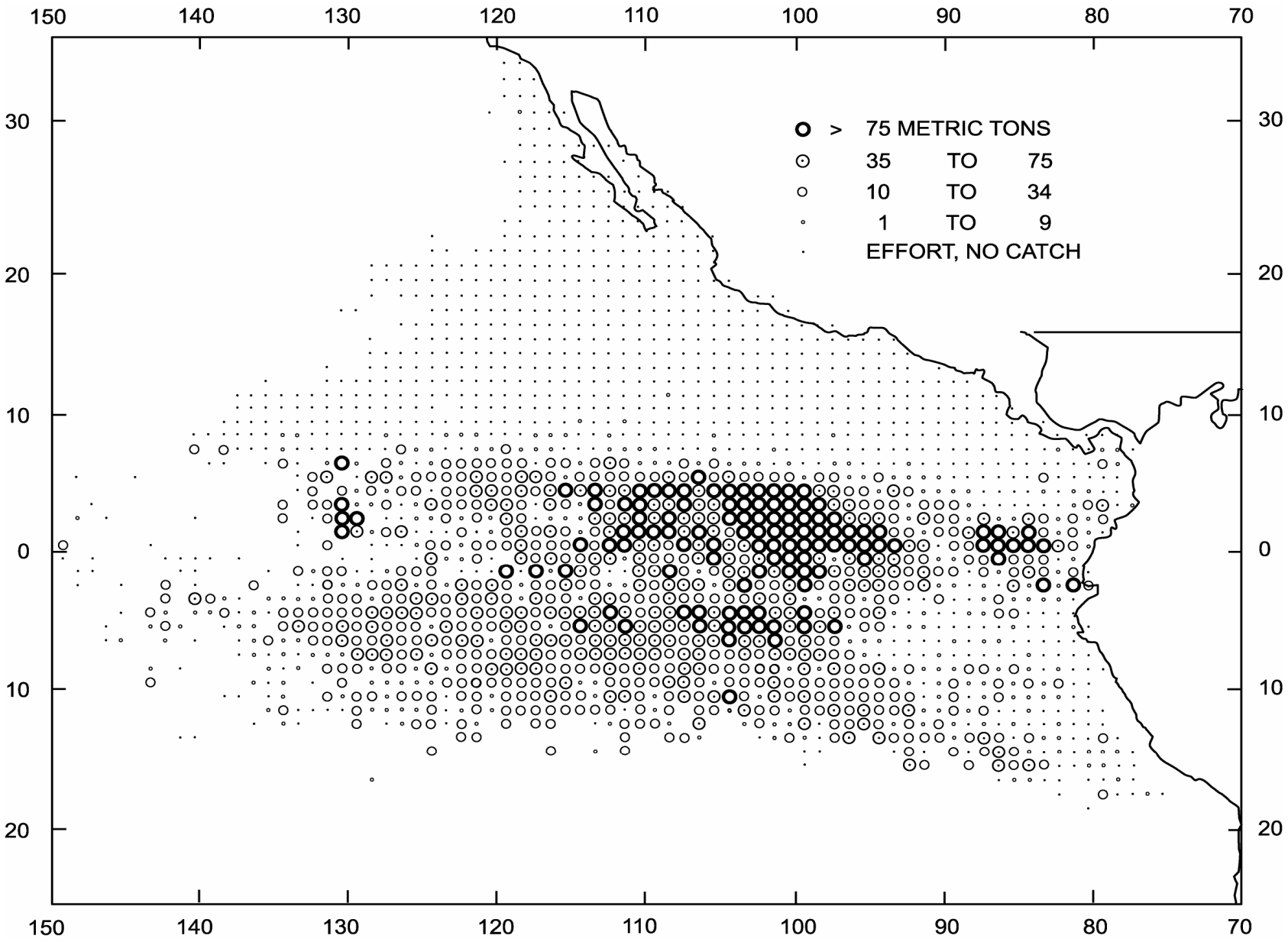


**FIGURE 4.** Average annual catches of bigeye tuna in the EPO during 1994-1998 for all purse-seine trips for which usable logbook data were obtained. The averages were calculated only for 1-degree areas for which two or more years of data were available.

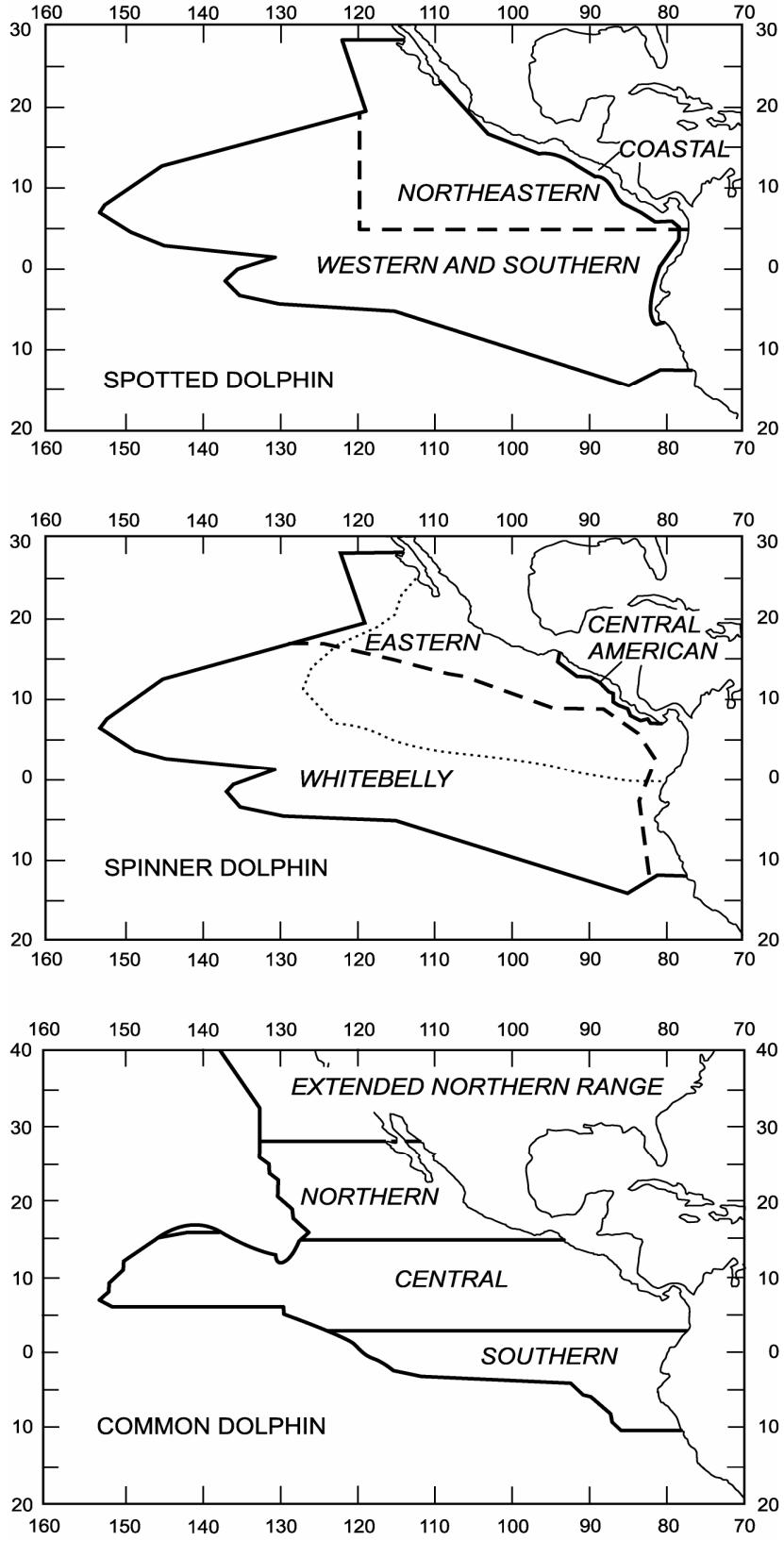


**FIGURE 5.** Average distributions, as defined by the U.S. National Marine Fisheries Service, of the stocks of spotted, spinner, and common dolphins in the EPO.

**TABLE 1.** Recommended and actual budgets, in U.S. dollars, of the IATTC, and assessments for the observer program. The 1951-1952 through 1975-1976 fiscal years extended from July 1 through June 30, while those subsequent to that for 1975-1976 extended from October 1 through September 30.

| Fiscal year | Recommended | Actual | Assessments for observer program |
|---|---|---|---|
| 1951-1952 | 332,000 | 59,770 | |
| 1952-1953 | 423,152 | 58,100 | |
| 1953-1954 | 412,575 | 110,000 | |
| 1954-1955 | 225,000 | 115,455 | |
| 1955-1956 | 367,202 | 198,290 | |
| 1956-1957 | 379,912 | 352,725 | |
| 1957-1958 | 352,700 | 352,700 | |
| 1958-1959 | 352,725 | 352,700 | |
| 1959-1960 | 388,345 | 372,700 | |
| 1960-1961 | 386,870 | 373,947 | |
| 1961-1962 | 412,762 | 384,000 | |
| 1962-1963 | 535,680 | 363,000 | |
| 1963-1964 | 624,835 | 412,818 | |
| 1964-1965 | 617,183 | 421,110 | |
| 1965-1966 | 658,590 | 458,744 | |
| 1966-1967 | 823,403 | 459,983 | |
| 1967-1968 | 859,992 | 437,702 | |
| 1968-1969 | 898,590 | 431,177 | |
| 1969-1970 | 1,087,084 | 447,930 | |
| 1970-1971 | 1,196,835 | 479,596 | |
| 1971-1972 | 1,168,314 | 491,898 | |
| 1972-1973 | 1,255,725 | 535,114 | |
| 1973-1974 | 1,271,517 | 581,500 | |
| 1974-1975 | 1,324,437 | 789,947 | |
| 1975-1976 | 1,490,437 | 960,027 | |
| 1976-1977 | 1,128,950 | 1,128,950 | |
| 1977-1978 | 1,798,058 | 1,725,498 | |
| 1978-1979 | 1,870,651 | 1,716,605 | |
| 1979-1980 | 2,126,647 | 1,995,784 | |
| 1980-1981 | 2,258,360 | 2,133,503 | |
| 1981-1982 | 2,460,615 | 1,799,643 | |
| 1982-1983 | 2,632,860 | 1,901,114 | |
| 1983-1984 | 2,638,359 | 2,300,395 | |
| 1984-1985 | 2,718,180 | 2,448,511 | |
| 1985-1986 | 2,992,567 | 2,753,320 | |
| 1986-1987 | 3,149,400 | 2,887,134 | |
| 1987-1988 | 3,303,192 | 2,814,394 | |
| 1988-1989 | 3,525,454 | 2,846,010 | |
| 1989-1990 | 3,525,000 | 2,936,380 | |
| 1990-1991 | 3,706,020 | 3,204,882 | |
| 1991-1992 | 4,403,307 | 3,173,180 | 61,539 |
| 1992-1993 | 4,423,824 | 3,016,731 | not available |
| 1993-1994 | 4,743,000 | 3,015,762 | 724,341 |
| 1994-1995 | 4,865,250 | 3,227,025 | 997,959 |
| 1995-1996 | 4,866,767 | 3,227,000 | 1,077,000 |
| 1996-1997 | 4,998,530 | 3,477,142 | 1,103,925 |
| 1997-1998 | 4,547,388 | 4,179,854 | 1,383,292 |
| 1998-1999 | 4,553,226 | 4,067,680 | 2,157,149 |
| 1999-2000 | 4,701,333 | 4,392,475 | 1,497,891 |

**TABLE 2.** Numbers and capacities (in metric tons) of purse seiners (PS; including bolicheras (small purse seiners with limited ranges)) and baitboats (BB) of all nations fishing for tunas in the eastern Pacific Ocean. The vessel size classes, based on fish-carrying capacity, are as follows: 1, <51 short tons (st) (46 metric tons (mt)); 2, 51-100 st (46-91 mt); 3, 101-200 st (92-181 mt); 4, 201-300 st (182-272 mt); 5, 301-400 st (273-363 mt); 6, >400 st (363 mt).

| Gear | Size class | 1955 | | 1960 | | 1965 | | 1970 | | 1975 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. | Cap. | No. | Cap. | No. | Cap. | No. | Cap. | No. | Cap. |
| PS | 1 | 15 | 340 | 16 | 376 | 18 | 403 | 0 | - | 8 | 201 |
| | 2 | 12 | 1021 | 5 | 404 | 12 | 876 | 13 | 956 | 24 | 1750 |
| | 3 | 51 | 5683 | 56 | 7204 | 39 | 5564 | 24 | 3599 | 33 | 4657 |
| | 4 | 2 | 445 | 32 | 7166 | 43 | 9994 | 33 | 7621 | 25 | 6001 |
| | 5 | 0 | - | 16 | 5040 | 29 | 9063 | 27 | 8467 | 17 | 5517 |
| | 6 | 0 | - | 2 | 839 | 22 | 12818 | 65 | 40599 | 146 | 130535 |
| | Total | 80 | 7489 | 127 | 21029 | 163 | 38717 | 162 | 61242 | 253 | 148661 |
| BB | 1 | 13 | 403 | 45 | 971 | 81 | 1778 | 22 | 711 | 44 | 1236 |
| | 2 | 11 | 694 | 9 | 585 | 9 | 576 | 12 | 777 | 30 | 1902 |
| | 3 | 46 | 6450 | 29 | 4014 | 14 | 1787 | 10 | 1269 | 27 | 3355 |
| | 4 | 71 | 16003 | 16 | 3502 | 4 | 818 | 4 | 836 | 1 | 223 |
| | 5 | 31 | 9562 | 15 | 4645 | 1 | 281 | 1 | 308 | 0 | - |
| | 6 | 11 | 4745 | 3 | 1542 | 0 | - | 0 | - | 0 | - |
| | Total | 183 | 37856 | 117 | 15259 | 109 | 5241 | 49 | 3903 | 102 | 6716 |

| Gear | Size class | 1980 | | 1985 | | 1990 | | 1995 | | 1999 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. | Cap. | No. | Cap. | No. | Cap. | No. | Cap. | No. | Cap. |
| PS | 1 | 11 | 241 | 4 | 103 | 2 | 65 | 0 | - | - | - |
| | 2 | 18 | 1246 | 22 | 1565 | 18 | 1296 | 19 | 1337 | 9 | 757 |
| | 3 | 32 | 3836 | 18 | 2026 | 17 | 1975 | 25 | 3105 | 26 | 3754 |
| | 4 | 25 | 5079 | 10 | 1982 | 6 | 1144 | 19 | 4024 | 18 | 4092 |
| | 5 | 20 | 5958 | 6 | 1874 | 6 | 1844 | 11 | 3334 | 13 | 4293 |
| | 6 | 164 | 135914 | 117 | 99248 | 123 | 105238 | 101 | 84378 | 137 | 135814 |
| | Total | 270 | 152276 | 177 | 106798 | 172 | 111563 | 175 | 96179 | 203 | 148710 |
| BB | 1 | 16 | 431 | 6 | 146 | 8 | 191 | 5 | 143 | 2 | 81 |
| | 2 | 17 | 1039 | 8 | 540 | 6 | 400 | 10 | 700 | 5 | 412 |
| | 3 | 9 | 935 | 10 | 1127 | 8 | 847 | 5 | 539 | 7 | 911 |
| | 4 | 4 | 751 | 1 | 182 | 0 | - | 0 | - | 0 | - |
| | 5 | 0 | - | 0 | - | 0 | - | 0 | - | 0 | - |
| | 6 | 0 | - | 0 | - | 0 | - | 0 | - | 0 | - |
| | Total | 46 | 3156 | 25 | 1995 | 22 | 1438 | 20 | 1383 | 14 | 1404 |

**TABLE 3.** Estimates of the abundances of the populations of the dolphins encircled by purse-seine vessels fishing for tunas in the EPO, based on pooled data for research vessel surveys conducted during 1986-1990 (Wade and Gerodette, 1993), and their mortalities due to the fishery (IATTC Ann. Rep., 1994: Table 16; 1995: Table 12; 1996: Table 34; 1997: Table 36; 1998: Table 34; 1999: in preparation).

| Stock | Abundance | 1994 | | 1995 | | 1996 | | 1997 | | 1998 | | 1999 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mortality | Percent | Mortality | Percent | Mortality | Percent | Mortality | Percent | Mortality | | | Percent |
| Northeastern spotted | 730,900 | 934 | 0.128 | 1,057 | 0.145 | 818 | 0.112 | 984 | 0.135 | 298 | 0.041 | 358 | 0.049 |
| Western and southern spotted | 1,298,400 | 1,226 | 0.094 | 740 | 0.057 | 545 | 0.042 | 780 | 0.060 | 341 | 0.026 | 253 | 0.019 |
| Eastern spinner | 631,800 | 743 | 0.118 | 677 | 0.107 | 450 | 0.071 | 391 | 0.062 | 422 | 0.067 | 363 | 0.057 |
| Whitebelly spinner | 1,019,300 | 619 | 0.061 | 422 | 0.041 | 447 | 0.044 | 498 | 0.049 | 249 | 0.024 | 192 | 0.019 |
| Northern common | 476.300 | 101 | 0.021 | 9 | 0.002 | 77 | 0.016 | 9 | 0.002 | 261 | 0.055 | 85 | 0.018 |
| Central common | 406,100 | 151 | 0.037 | 192 | 0.047 | 51 | 0.013 | 14 | 0.003 | 172 | 0.042 | 34 | 0.008 |
| Southern common | 2,210,900 | 0 | 0.000 | 0 | 0.000 | 30 | 0.001 | 58 | 0.003 | 33 | 0.001 | 1 | 0.000 |
| Other dolphins | 2,802,300 | 321 | 0.011 | 177 | 0.006 | 129 | 0.005 | 170 | 0.006 | 101 | 0.004 | 62 | 0.002 |
| Total | 9,576,000 | 4,095 | 0.043 | 3,274 | 0.034 | 2,547 | 0.027 | 3,004 | 0.031 | 1,877 | 0.020 | 1,348 | 0.014 |

**TABLE 4.** Summary of regulations for yellowfin tuna in the eastern Pacific Ocean during 1966-1979. The catch data include catches by both surface and subsurface gear. Data for the longline fishery were not available for 1998, so the averages for 1993-1997 were substituted.

| Year | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quota (short tons x 1000) | 79.3 | 84.5 | 93 | 120 | 120 | 140 | 120 | 130 | 175 | 175 | 175 | 175 | 175 | 175 |
| Authorized increments to quota (short tons x 1000) | 0 | 0 | 13 | 0 | 0 | 2 x 10 | 2 x 10 | 3 x 10 | 2 x 10 | 2 x 10 | 2 x 10 | 20 + 15 | 20 + 15 | 20 + 15 |
| Safeguard proviso for closure due to low CPUE) (short tons per day) | - | - | - | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Allowance for incidentally-caught yellowfin during closed season (percent)[1] | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Special allowances, small vessels of each nation (short tons x 1000) | - | - | - | 4 | 6 | 6 | 6 | 6 | 6 | 6 | 6[2] | 6[3] | 6[4] | 6[5] |
| Special allowances, new vessels of each developing nation (short tons x 1000) | - | - | - | - | - | 2 | 2 | 6 | 8 | 10 | 13 | 13 | 26.5 | - |
| Special allowances, each member and cooperating nation with canneries and small catches (short tons x 1000) | - | - | - | - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Special allowances, U.S. vessels chartered for dolphin research (short tons x 1000) | - | - | - | - | - | - | - | - | - | - | - | 1 | 1 | 1 |

**TABLE 4.** (continued)

| Year | | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Closure date | | Sep. 15 | Jun. 24 | Jun. 18 | Apr. 16 | Mar. 23 | Apr. 9 | Mar. 5 | Mar. 8 | Mar. 18 | Mar. 13 | Mar. 27 | Jul. 7 | May 6 | Jul. 21 |
| Grace period (days) | | 0 | 0 | 0 | 0 | 10 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| Catch (short tons x 1000) | CYRA (excluding experimental areas) | 91.5 | 90 | 114.5 | 126.9 | 142.6 | 113.9 | 152.5 | 167.6 | 187.7 | 174.3 | 182.1 | 177.4 | 167.9 | 188.4 |
| | Experimental areas | - | - | - | - | - | - | - | 10.2 | 3.9 | 2.1 | 28.6 | 31.5 | 14.8 | 6.5 |
| | Total CYRA | 91.5 | 90 | 114.5 | 126.9 | 142.6 | 113.9 | 152.5 | 177.8 | 191.6 | 176.4 | 210.7 | 203.0 | 183.4 | 195.0 |
| | Outside CYRA | 0 | 0 | 1.2 | 19.2 | 30.7 | 22.8 | 44.8 | 49.5 | 41 | 47.5 | 50.7 | 17.9 | 16.0 | 15.2 |

[1] For 1966 and 1967 each vessel with permission to fish only for other species was allowed to land up to 15 percent by weight of yellowfin among its catch of all marketable species taken on any fishing trip made after the closure of the fishery. For all succeeding years the percentage allowed was determined by each nation under which such vessels were registered under the provision that the aggregate of the incidental catch of yellowfin by the vessels of each nation could not exceed 15 percent of the combined total catch taken by these vessels during the period they were permitted to fish inside the CYRA.

[2] For Panama this allocation applied to vessels of up to 600 short tons capacity.

[3] For Costa Rica this allocation applied to vessels of up to 1,100 short tons capacity; for Nicaragua up to 4,000 short tons of this allocation applied to two vessels of up to 1,800 short tons capacity; for Panama up to 3,000 short tons of this allocation applied to vessels of more than 400 short tons capacity.

[4] For Costa Rica this allocation was 7,500 short tons, and applied to all its vessels; for Nicaragua and Panama this allocation applied to all the vessels of each nation.

[5] For Nicaragua and Panama this allocation applied to all the vessels of each nation.

**TABLE 5.** Quotas, catches, and catches per day of fishing (CPDFs) (unregulated Class-6 purse seiners) for yellowfin in the EPO. The quotas and catches are expressed in thousands of metric tons and the CPDFs in metric tons per day. The quotas apply only to the Commission's Yellowfin Regulatory Area (CYRA).

| | CYRA | | EPO | | | |
|---|---|---|---|---|---|---|
| Year | Quota | Surface catch | Surface catch | Longline catch | Total catch | CPDF |
| 1968 | 84.4 | 100.9 | 102.0 | 16.5 | 118.5 | 14.9 |
| 1969 | 108.9 | 111.4 | 128.9 | 18.0 | 146.9 | 16.5 |
| 1970 | 108.9 | 127.8 | 155.6 | 14.0 | 169.6 | 13.3 |
| 1971 | 127.0 + (2 x 9.1)[1] | 102.2 | 122.8 | 8.0 | 130.8 | 9.5 |
| 1972 | 108.9 + (2 x 9.1)[1] | 136.5 | 177.1 | 16.3 | 193.4 | 14.1 |
| 1973 | 117.9 + (3 x 9.1)[1] | 160.3 | 205.3 | 12.9 | 218.1 | 12.1 |
| 1974 | 158.8 + (2 x 9.1)[1] | 173.2 | 210.4 | 10.0 | 220.3 | 9.8 |
| 1975 | 158.8 + (2 x 9.1)[1] | 158.8 | 202.1 | 13.4 | 215.5 | 8.8 |
| 1976 | 158.8 + (2 x 9.1)[1] | 190.2 | 236.3 | 15.9 | 252.3 | 9.7 |
| 1977 | 158.8 + (18.1 + 13.6)[1] | 182.7 | 198.8 | 12.4 | 211.2 | 7.8 |
| 1978 | 158.8 + (18.1 + 13.6)[1] | 166.0 | 180.6 | 10.6 | 191.2 | 6.7 |
| 1979 | 158.8 + (18.1 + 13.6)[1] | 175.9 | 189.7 | 10.3 | 200.0 | 5.9 |
| 1980 | 149.7 + (total of 40.8)[2] | 132.0 | 159.4 | 13.2 | 172.6 | 5.3 |
| 1981 | 149.7 + (3 x 13.6)[2] | 157.7 | 181.8 | 8.4 | 190.2 | 6.0 |
| 1982 | 145.1 + (2 x 13.6)[2] | 106.9 | 125.1 | 9.8 | 134.8 | 5.1 |
| 1983 | 154.2 + (2 x 13.6)[2] | 82.0 | 94.3 | 10.3 | 104.6 | 5.5 |
| 1984 | 147.0 + (2 x 13.6)[2] | 128.6 | 145.1 | 10.5 | 155.5 | 9.6 |
| 1985 | 157.9 + (18.1 + 9.1)[2] | 192.5 | 217.0 | 12.6 | 229.6 | 13.1 |
| 1986 | 158.8 + (2 x 13.6)[2] | 228.1 | 268.3 | 22.5 | 290.8 | 17.1 |
| 1987 | None | 248.2 | 272.2 | 18.9 | 291.1 | 14.0 |
| 1988 | 172.4 + (2 x 27.2)[2] | 267.6 | 288.4 | 13.1 | 301.5 | 13.4 |
| 1989 | 199.6 + (2 x 27.2)[2] | 242.3 | 289.4 | 16.7 | 306.0 | 12.4 |
| 1990 | 181.4 + (5 x 18.1)[2] | 226.5 | 273.3 | 30.0 | 303.3 | 12.6 |
| 1991 | 190.5 + (4 x 18.1)[2] | 219.5 | 239.1 | 25.4 | 264.5 | 13.6 |
| 1992 | 190.5 + (4 x 18.1)[2] | 221.3 | 239.8 | 16.1 | 255.9 | 14.2 |
| 1993 | 226.8 + (4 x 22.7)[2] | 213.3 | 232.1 | 24.6 | 256.6 | 13.1 |
| 1994 | 226.8 + (4 x 22.7)[2] | 197.1 | 219.3 | 24.7 | 244.0 | 12.0 |
| 1995 | 213.2 + (3 x 18.1)[2] | 196.2 | 223.8 | 16.9 | 240.7 | 11.9 |
| 1996 | 213.2 + (3 x 18.1)[2] | 218.0 | 250.1 | 11.9[4] | 262.0[4] | 12.7[4] |
| 1997 | 220.0 + (3 x 15.0)[2] | 213.3 | 256.8 | 15.2[4] | 273.0[4] | 11.8[4] |
| 1998 | 210.0 + (3 x 15.0)[1,3] | 238.4 | 266.2 | 14.6[4] | 280.8[4] | 10.2[4] |
| 1999 | 225.0 + (3 x 15.0)[1,3] | 268.7[4] | 298.3[4] | 14.9[4] | 313.2[4] | 12.3[4] |

[1] indicates increments to be added at the discretion of the Director
[2] approved, but not implemented
[3] only one of the three increments was implemented
[4] preliminary estimates

## APPENDIX 1

## CONVENTION BETWEEN THE UNITED STATES OF AMERICA AND THE REPUBLIC OF COSTA RICA FOR THE ESTABLISHMENT OF AN INTER-AMERICAN TROPICAL TUNA COMMISSION

The United States of America and the Republic of Costa Rica considering their mutual interest in maintaining the populations of yellowfin and skipjack tuna and of other kinds of fish taken by tuna fishing vessels in the eastern Pacific Ocean which by reason of continued use have come to be of common concern, and desiring to cooperate in the gathering and interpretation of factual information to facilitate maintaining the populations of these fishes at a level which will permit maximum sustained catches year after year, have agreed to conclude a Convention for these purposes and to that end have named as their Plenipotentiaries:

The President of the United States of America:
James E. Webb, Acting Secretary of State
Wilbert M. Chapman, Special Assistant to the Under Secretary of State

The President of the Government of Costa Rica:
Mario A. Esquivel, Ambassador Extraordinary and Plenipotentiary of Costa Rica
Jorge Hazera, Counselor of the Embassy of Costa Rica

who, having communicated to each other their full powers, found to be in good and due form, have agreed as follows:

### ARTICLE I

1. The High Contracting Parties agree to establish and operate a joint Commission, to be known as the Inter-American Tropical Tuna Commission, hereinafter referred to as the Commission, which shall carry out the objectives of this Convention. The Commission shall be composed of national sections, each consisting of from one to four members, appointed by the Governments of the respective High Contracting Parties.

2. The Commission shall submit annually to the Government of each High Contracting Party a report on its investigations and findings, with appropriate recommendations, and shall also inform such Governments, whenever it is deemed advisable, on any matter relating to the objectives of this Convention.

3. Each High Contracting Party shall determine and pay the expenses incurred by its section. Joint expenses incurred by the Commission shall be paid by the High Contracting Parties through contributions in the form and proportion recommended by the Commission and approved by the High Contracting Parties. The proportion of joint expenses to be paid by each High Contracting Party shall be related to the proportion of the total catch from the fisheries covered by this Convention utilized by that High Contracting Party.

4. Both the general and annual program of activities and the budget of joint expenses shall be recommended by the Commission and submitted for approval to the High Contracting Parties.

5. The Commission shall decide on the most convenient place or places for its headquarters.

6. The Commission shall meet at least once each year, and at such other times as may be requested by a national section. The date and place of the first meeting shall be determined by agreement between the High Contracting Parties.

7. At its first meeting the Commission shall select a chairman and a secretary from different national sections. The chairman and the secretary shall hold office for a period of one year. During succeeding years, selection of the chairman and the secretary from the national sections shall be in such a manner that the chairman and the secretary will be of different nationalities, and as will provide each High Contracting Party, in turn, with an opportunity to be represented in those offices.

8. Each national section shall have one vote. Decisions, resolutions, recommendations, and publications of the Commission shall be made only by a unanimous vote.

9. The Commission shall be entitled to adopt and to amend subsequently, as occasion may require, by-laws or rules for the conduct of its meetings.

10. The Commission shall be entitled to employ necessary personnel for the performance of its functions and duties.

11. Each High Contracting Party shall be entitled to establish an Advisory Committee for its section, to be composed of persons who shall be well informed concerning tuna fishery problems of common concern. Each such Advisory Committee shall be invited to attend the non-executive sessions of the Commission.

12. The Commission may hold public hearings. Each national section also may hold public hearings within its own country.

13. The Commission shall designate a Director of Investigations who shall be technically competent and who shall be responsible to the Commission and may be freely removed by it. Subject to the instruction of the Commission and with its approval, the Director of Investigations shall have charge of:

(a) the drafting of programs of investigations, and the preparation of budget estimates for the Commission;
(b) authorizing the disbursement of the funds for the joint expenses of the Commission;
(c) the accounting of the funds for the joint expenses of the Commission;
(d) the appointment and immediate direction of technical and other personnel required for the functions of the Commission;
(e) arrangements for the cooperation with other organizations or individuals in accordance with paragraph 16 of this Article;
(f) the coordination of the work of the Commission with that of organizations and individuals whose cooperation has been arranged for;
(g) the drafting of administrative, scientific and other reports for the Commission;
(h) the performance of such other duties as the Commission may require.

14. The official languages of the Commission shall be English and Spanish, and members of the Commission may use either language during meetings. When requested, translation shall be made to the other language. The minutes, official documents, and publications of the Commission shall be in both languages, but official correspondence of the Commission may be written, at the discretion of the secretary, in either language.

15. Each national section shall be entitled to obtain certified copies of any documents pertaining to the Commission except that the Commission will adopt and may amend subsequently rules to ensure the confidential character of records of statistics of individual catches and individual company operations.

16. In the performance of its duties and functions the Commission may request the technical and scientific services of, and information from, official agencies of the High Contracting Parties, and any international, public, or private institution or organization, or any private individual.

**ARTICLE II**

The Commission shall perform the following functions and duties:

1. Make investigations concerning the abundance, biology, biometry, and ecology of yellowfin (*Neothunnus*) and skipjack (*Katsuwonus*) tuna in the waters of the eastern Pacific Ocean fished by the nationals of the High Contracting Parties, and the kinds of fishes commonly used as bait in the tuna fisheries, especially the anchoveta, and of other kinds of fish taken by tuna fishing vessels; and the effects of natural factors and human activities on the abundance of the populations of fishes supporting all of these fisheries.

2. Collect and analyze information relating to current and past conditions and trends of the populations of fishes covered by this Convention.

3. Study and appraise information concerning methods and procedures for maintaining and increasing the populations of fishes covered by this Convention.

4. Conduct such fishing and other activities, on the high seas and in waters which are under the jurisdiction of the High Contracting Parties, as may be necessary to attain the ends referred to in subparagraphs 1, 2, and 3 of this Article.

5. Recommend from time to time, on the basis of scientific investigations, proposals for joint action by the High Contracting Parties designed to keep the populations of fishes covered by this Convention at those levels of abundance which will permit the maximum sustained catch.

6. Collect statistics and all kinds of reports concerning catches and the operations of fishing boats, and other information concerning the fishing for fishes covered by this Convention, from vessels or persons engaged in these fisheries.

7. Publish or otherwise disseminate reports relative to the results of its findings and such other reports as fall within the scope of this Convention, as well as scientific, statistical, and other data relating to the fisheries maintained by the nationals of the High Contracting Parties for the fishes covered by this Convention.

**ARTICLE III**

The High Contracting Parties agree to enact such legislation as may be necessary to carry out the purposes of this Convention.

**ARTICLE IV**

Nothing in this Convention shall be construed to modify any existing treaty or convention with regard to the fisheries of the eastern Pacific Ocean previously concluded by a High Contracting Party, nor to preclude a High Contracting Party from entering into treaties or conventions with other States regarding these fisheries, the terms of which are not incompatible with the present Convention.

**ARTICLE V**

1. The present Convention shall be ratified and the instruments of ratification shall be exchanged at Washington as soon as possible.

2. The present Convention shall enter into force on the date of exchange of ratifications.

3. Any government, whose nationals participate in the fisheries covered by this Convention, desiring to adhere to the present Convention, shall address a communication to that effect to each of the High Contracting Parties. Upon receiving the unanimous consent of the High Contracting Parties to adherence, such government shall deposit with the Government of the United States of America an instrument of adherence which shall stipulate the effective date thereof. The Government of the United States of America shall furnish a certified copy of the Convention to each government desiring to adhere thereto. Each adhering government shall have all the rights and obligations under the Convention as if it had been an original signatory thereof.

4. At any time after the expiration of ten years from the date of entry into force of this Convention any High Contracting Party may give notice of its intention of denouncing the Convention. Such notification shall become effective with respect to such notifying government one year after its receipt by the Government of the United States of America. After the expiration of the said one year period the Convention shall be effective only with respect to the remaining High Contracting Parties.

5. The Government of the United States of America shall inform the other High Contracting Parties of all instruments of adherence and of notifications of denunciation received.

IN WITNESS WHEREOF the respective Plenipotentiaries have signed the present Convention.

DONE at Washington, in duplicate, in the English and Spanish languages, both texts being equally authentic, this 31st day of May, 1949.

FOR THE UNITED STATES OF AMERICA:
James E. Webb
W. M. Chapman

FOR THE REPUBLIC OF COSTA RICA:
Mario A. Esquive
Jorge Hazera

## APPENDIX 2

## DECLARATION ON STRENGTHENING THE OBJECTIVES AND OPERATION OF THE CONVENTION ESTABLISHING THE INTER-AMERICAN TROPICAL TUNA COMMISSION

**[30th Intergovernmental Meeting]**

The Governments of Belize, Colombia, Costa Rica, Ecuador, United States of America, Honduras, Mexico, Panama, Vanuatu and Venezuela, meeting in the Panama City, Republic of Panama on October 4, 1995 express the need to initiate, as soon as possible, under the auspices of the IATTC, in light of the commitments and objectives of the "Panama Declaration", negotiations for the formulation of a new binding instrument under the following principles, *inter alia*:

a) Incorporation of the principles of the Law of the Sea as reflected in the United Nations Convention on the Law of the Sea, 1982, in particular, the rights and obligations related to the conservation and management of living marine resources as recognized in that Convention;

b) Interpretation and application in a manner consistent with the relevant provisions of the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks;

c) Operation of the tuna fishery of the EPO shall be managed consistent with the concepts of sustainable development and the ecosystem approach; in particular, to adopt measures based on the best scientific evidence available, for the conservation and sustainable use of the tuna species;

d) Incorporation of measures to ensure the long-term protection of dolphins;

e) Incorporation of democratic decision-making processes in order to ensure the conservation and sustainable use of the regulated species;

f) Adoption of a new equitable system of allocating financial contributions;

g) Development the mechanisms for enhanced public participation and transparency, according to procedures to be adopted for such purpose; and

h) Promotion of international cooperation in order to foster the development of national research capabilities on ecosystems, fishing practices, and gear technology.

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## APPENDIX 3

## DECLARATION OF PANAMA

### [30th Intergovernmental Meeting]

The Governments of Belize, Colombia, Costa Rica, Ecuador, France[1], Honduras, Mexico, Panama, Spain[1], United States of America, Vanuatu and Venezuela, meeting in Panama City, Republic of Panama on October 4, 1995, hereby reaffirm the commitments and objectives of the La Jolla Agreement of (1) progressively reducing dolphin mortality in the eastern Pacific Ocean (EPO) fishery to levels approaching zero through the setting of annual limits and (2) with a goal of eliminating dolphin mortality in this fishery, seeking ecologically sound means of capturing large yellowfin tunas not in association with dolphins.

Recognizing the strong commitments of nations participating in the La Jolla Agreement and the substantial successes realized through multilateral cooperation and supporting national action under that Agreement, the Governments meeting in Panama, including those which are, or have announced their intention to become, members of the Inter-American Tropical Tuna Commission (IATTC), announce their intention to formalize by January 31, 1996, the La Jolla Agreement as a binding legal instrument which shall be open to all nations with coastlines bordering the EPO or with vessels fishing for tuna in this region. This shall be accomplished by adoption of a binding resolution of the IATTC or other legally binding instrument. The adoption of the IATTC resolution or other legally binding instrument, that utilizes to the maximum extent possible the existing structure of the IATTC, is contingent upon the enactment of changes in United States law as envisioned in Annex I to this Declaration. The binding legal instrument shall build upon the strengths and achievements of the La Jolla Agreement, the working groups established under it, and the actions of the Governments participating in that Agreement. This binding legal instrument shall consist of the La Jolla Agreement, its appendices, and the decisions of the governments under that Agreement as modified to achieve the objectives and commitments contained herein.

The Governments meeting in Panama agree that in concluding, adopting, and implementing this binding legal instrument, they will:

Commit to the conservation of ecosystems and the sustainable use of living marine resources related to the tuna fishery within the EPO. Adopt conservation and management measures that ensure the long-term sustainability of tuna stocks and other stocks of living marine resources in the EPO. Such measures shall be based on the best scientific evidence, including that based on a precautionary methodology, and shall be designed to maintain or restore the biomass of harvested stocks at or above levels capable of producing maximum sustainable yield, and with the goal to maintain or restore the biomass of associated stocks at or above levels capable of producing maximum sustainable yield. These measures and methodology should take into consideration, and account for, natural variation, recruitment rate, natural mortality rate, population growth rate, individual growth rate, population parameters K and r, and scientific uncertainty.

Commit, according to their capacities and in coordination with the IATTC, to the assessment of the catch and bycatch of juvenile yellowfin tuna and other stocks of living marine resources related to the tuna fishery in the EPO and the establishment of measures to, *inter alia*, avoid, reduce and minimize the bycatch of juvenile yellowfin tuna and bycatch of non-target species, in order to ensure the long-term sustainability of all these species, taking into consideration the interrelationships among species in the ecosystem.

Commit in the exercise of their national sovereignty to enact and enforce this instrument through domestic legislation and/or regulation, as appropriate.

Adopt cooperative measures to ensure compliance with this instrument, building upon decision IGM 6/93, Appendix IV, "Guiding Principles Respecting Relationships between States Both Party and Non-Party to the Agreement," taken by the nations participating in the La Jolla Agreement Working Group in Vanuatu in June 1993, and advance the work of the Working Group on Compliance, building upon decision IGM 6/93, Appendix V, "Options for Action Against Nations Not Complying With the Agreement." (Annex II)

[1] Spain and France support the commitments of this Declaration under reservation because of legislation related to fisheries of the European Union.

Enhance the practice of reviewing and reporting on compliance with this instrument, building upon past practices under the La Jolla Agreement.

Establish a per-stock per-year cap of between 0.2% of the Minimum Estimated Abundance ($N_{min}$) (as calculated by the U.S. National Marine Fisheries Service or equivalent calculation standard) and 0.1% of $N_{min}$, but in no event shall the total annual mortality exceed 5000 consistent with the commitments and objectives stated in the preamble above. In the year 2001, the per-stock, per-year cap shall be 0.1% of $N_{min}$.

Conduct in 1998 a scientific review and assessment of progress toward the year 2001 objective, and consider recommendations as appropriate. Up to the year 2001, in the event that annual mortality of 0.2% of $N_{min}$ is exceeded for any stock, all sets on that stock and on any mixed schools containing members of that stock shall cease for that fishing year. Beginning in the year 2001, in the event that annual mortality of 0.1% of $N_{min}$ for any stock is exceeded, all sets on that stock and on any mixed schools containing members of that stock shall cease for that fishing year. In the event that annual mortality of 0.1% of $N_{min}$ is exceeded for either Eastern Spinner or Northeastern Spotted dolphin stocks, the governments commit to conduct a scientific review and assessment and consider further recommendations.

Establish a per-vessel maximum annual DML consistent with the established per-year mortality caps.

Establish a system that provides incentives to vessel captains to continue to reduce dolphin mortality, with the goal of eliminating dolphin mortality in the EPO.

Establish or strengthen National Scientific Advisory Committees (NATSAC), or the equivalent, of qualified experts, operating in their individual capacities, which shall advise their respective governments on mechanisms to facilitate research, and on the formulation of recommendations for achieving the objectives and commitments contained herein, or strengthen existing structures in order to conform with the requirements delineated herein. Membership to NATSACs shall include, *inter alia*, qualified scientists from the public and private sector and NGOs. The NATSACs shall:

1. Receive and review data, including data provided to national authorities by the IATTC;

2. Advise and recommend to their governments measures and actions that should be undertaken to conserve and manage the stocks of living marine resources of the EPO;

3. Make recommendations to their governments regarding research needs, including ecosystems, fishing practices, and gear technology research, including the development and use of selective, environmentally safe and cost-effective fishing gear; and the coordination and facilitation of such research;

4. Conduct scientific reviews and assessments by the year 1998 regarding progress toward the year 2001 objective stated above, and make appropriate recommendations to their governments concerning these reviews and assessments, as well as additional assessments in the year 2001 as provided above;

5. Consult other experts as needed;

6. Assure the regular and timely full exchange of data among the parties and the NATSACs on catch of tuna and associated species and bycatch, including dolphin mortality data, for the purposes of developing conservation and management recommendations to their governments as well as recommendations for enforcement and scientific research while not violating the confidentiality of business-confidential data;

7. Establish procedures to, *inter alia*, hold public meetings and maintain the confidentiality of business-confidential data.

Reports of the NATSACs, including of their cooperative meetings, shall be available to the parties and the public.

The NATSACs shall cooperate, through regular and timely meetings, including at a minimum in conjunction with the meetings of the IATTC, in the review of data and the status of stocks, and in the development of advice for achieving the objectives and commitments contained herein.

Promote transparency in their implementation of this Declaration, including through public participation as appropriate.

As soon as possible, the nations of the Intergovernmental Group convened under the auspices of the IATTC will initiate discussions related to formulation of a new, permanent, binding instrument.

[Robert S. Goldson]
FOR THE GOVERNMENT OF BELIZE

[Clifford Bonilla Smith]
FOR THE GOVERNMENT OF COLOMBIA

[Alvaro Moreno Gomez]
FOR THE GOVERNMENT OF COSTA RICA

[Gustavo Gonzalez Cabal]
FOR THE GOVERNMENT OF ECUADOR

[André Stell]
FOR THE GOVERNMENT OF FRANCE

[Yolanda Rodríguez de Cwú]
FOR THE GOVERNMENT OF HONDURAS

[Carlos Camacho]

FOR THE GOVERNMENT OF MEXICO

[Nitzia R. de Villarreal]
[Armando Martínez Valdés]
FOR THE GOVERNMENT OF PANAMA

[Jésus Miranda de Larra y Onís]
FOR THE GOVERNMENT OF SPAIN

[Brian S. Hallman]
FOR THE GOVERNMENT OF THE UNITED STATES

[Anthony N. Tillett]
FOR THE GOVERNMENT OF VANUATU

[Miriam De Venanzi]
FOR THE GOVERNMENT OF VENEZUELA

**ANNEX I**

Envisioned changes in United States law:

1. Primary and Secondary Embargoes. Effectively lifted for tuna caught in compliance with the La Jolla Agreement as formalized and modified through the processes set forth in the Panama Declaration.

2. Market Access.[2] Effectively opened to tuna caught in compliance with the La Jolla Agreement as formalized and modified through the processes set forth in the Panama Declaration with respect to States to include: IATTC Member States and other States that have initiated steps, in accordance with Article 5.3 of the IATTC Convention, to become members of that organization.

3. Labeling. The term "dolphin safe" may not be used for any tuna caught in the EPO by a purse seine vessel in a set in which a dolphin mortality occurred as documented by observers by weight calculation and well location.

**ANNEX II**

**Appendix IV.**

**Guiding Principles respecting relationships between States both Party and Non-Party to the Agreement**

The Parties to the Agreement incorporate into the Agreement a guiding principle that no Party shall act in a manner that assists non-parties to avoid compliance with the objectives of the Agreement.

When a coastal state that is a Party issues a license to engage in fishing in its Exclusive Economic Zone portion of the eastern Pacific Ocean (EPO), either directly or through a licensing agreement, to a vessel of a non-party, the license should be subject to the provisions of the Agreement.

The Parties should consider prohibiting persons under their jurisdiction from assisting in any way vessels of noncomplying Parties or non-parties operating in the fishery.

Any state whose vessels are conducting purse-seine tuna-fishing operations in the EPO should be invited to join the Agreement. The Parties should draw the attention of any state that is not a party to the Agreement to any activity undertaken by its nationals or vessels which, in the opinion of the Parties, affects the implementation of the objectives of the Agreement.

[2] Spain maintains a reservation on point number 2 of the Annex “Market Access,” pending further review.

**Appendix V.**

**A. Options for Action With Respect to Nations Party to the Agreement**

Diplomatic actions:

- Collective representation to the non-complying nation. This would constitute a communication emanating from plenary meeting of the participating nations after consultation with the non-complying nation.
- Diplomatic communication. Each participating nation, acting individually or in concert with other nations, would undertake a diplomatic demarche to the noncomplying nation.

Public opinion actions:

- Dissemination of information regarding the non-compliance of the nation to the public through appropriate media, *e.g*., a press conference.

Operational restrictions:

- Denial of access to the Exclusive Economic Zones of nations party to the agreement for fishing operations by tuna fishing vessels of the non-complying nation. The scope of this action would have to be determined by the International Review Panel (IRP) by defining what constitutes a tuna-fishing vessel, *i.e*., vessels covered by the Agreement, or other tuna-fishing vessels as well. This action should not restrict freedom of navigation or other rights of vessels under international law.
- Restriction of access to ports and port servicing facilities for tuna fishing vessels of the non-complying nation. This would not apply to vessels in distress.
- Refusal of logistical support and/or supplies to tuna-fishing vessels of the non-complying nation.
- Reduction of Dolphin Mortality Limits (DMLs) to all vessels of the non-complying Party by specified percentages. DMLs would be restored immediately upon a determination that the nation is in compliance.

Economic sanctions:

- Trade measures. The Working Group discussed at length trade measures against non-complying nations. These might include embargoes or other restrictions on the imports of, for example, tuna, other fish products, other marine products, or other products.
- The consideration of such measures was recognized to be an extremely delicate and evolving policy issue for which few guidelines exist in international law. The Working Group noted ongoing discussions concerning this issue in other international fora. In light of these considerations, the Working Group agreed that trade measures should receive further review by the Parties prior to making any recommendation in this respect.
- Fines (monetary penalties). The Working Group considered that the IRP should identify procedures for imposing fines, including defining the value of the fines (this could be based on a percentage of the amount of the commercial value of the catch), and the destination of the fines (*e.g*., an international trust fund) as issues that the Parties should discuss. The Working Group noted that there apparently is no precedent for such fines.

**B. Options for Action With Respect to Nations Not Party to the Agreement**

Diplomatic actions:

- Collective representation to the non-party. This would constitute a communication emanating from a plenary meeting of the participating nations after consultations with the non-party.
- Diplomatic communication. Each participating nation, acting individually or in concert with other nations, would undertake a diplomatic demarche to the non-party

Public opinion actions:

- Dissemination of information regarding the non-compliance of the non-party to the public through appropriate media*, e.g*., a press conference.

Operational restrictions:

- Restriction of access to ports and port servicing facilities for tuna-fishing vessels of the non-party.
- The scope of this action would have to be determined by the IRP by defining what constitutes a tuna-fishing vessel*, i.e*., solely vessels covered by the Agreement, or other tuna-fishing vessels as well. This action should not restrict freedom of navigation and other rights of vessels under international law, and particularly would not apply to vessels in distress.
- Refusal of logistical support and/or supplies to tuna fishing vessels of the non-party nation.
- Prohibiting nationals from assisting in any way vessels of the non-party operating in the fishery.

Economic sanctions:

- The Working Group noted that economic sanctions with respect to non-parties call into consideration all the issues raised above with respect to the imposition of such sanctions on Parties, and noted that the imposition of such sanctions with respect to non-parties involves additional complex legal considerations. The Working Group recommends that the Parties consider whether such sanctions against non-parties are an appropriate means of promoting compliance with the objectives of the Agreement and whether they are consistent with international law.

## APPENDIX 4

## PROTOCOL TO AMEND THE 1949 CONVENTION ON THE ESTABLISHMENT OF AN INTER-AMERICAN TROPICAL TUNA COMMISSION

The Contracting Parties to the 1949 Convention on the Establishment of an Inter-American Tropical Tuna Commission have agreed as follows:

### Article I

1. In Article I, paragraphs 1, 6, 7, 8, 12 and 15, the references to "national section" and "national sections" shall be changed to read "section" and "sections".

2. In Article I, paragraph 1, the phrase "Governments of the respective High Contracting Parties" shall be changed to read "the respective High Contracting Parties".

3. In Article I, paragraph 2, the phrase "the Government of each High Contracting Party" shall be changed to read "each High Contracting Party", and the phrase "such Governments" shall be changed to read "such High Contracting Parties".

4. Article I, paragraph 12, shall be changed to read as follows:

> "12. The Commission may hold public hearings. Each section also may hold public hearings within its own territory."

5. In Article II, paragraphs 1 and 7, the phrase "nationals of the High Contracting Parties" shall be changed to read "nationals under the jurisdiction of each High Contracting Party".

6. Article III shall be changed to read as follows:

> "The High Contracting Parties agree to take such internal measures as may be necessary to carry out the purposes of this Convention."

7. Article V, paragraph 3, shall be changed in its entirety to read as follows:

> "Any government or regional economic integration organization (constituted by states that have transferred to such organizations competence over matters within the purview of this Convention, including the competence to enter into agreements in respect of those matters) which have jurisdiction over nationals who participate in the fisheries covered by this Convention, desiring to adhere to the present Convention, shall address a communication to that effect to each of the High Contracting Parties. Upon receiving the unanimous consent of the High Contracting Parties to adherence, such government or regional economic integration organization shall deposit with the Government of the United States of America an instrument of adherence which shall stipulate the effective date thereof. In the case that a regional economic integration organization adheres to this Convention, each of its member states is barred from becoming a party (or continuing to be a party) to the Convention unless the member state represents a territory which lies outside the territorial scope of the treaty establishing the regional economic integration organization and provided that such member state's participation be limited to representing only the interests of its territories. The Government of the United States of America shall furnish a certified copy of the Convention to each government and regional economic integration organization desiring to adhere thereto. Each adhering government and regional economic integration organization shall have all the rights and obligations under the Convention as if it had been an original signatory thereof."

8. In Article V, paragraph 4, the phrase "notifying government" shall be changed to read "notifying government or regional economic integration organization".

### Article II

1. This Protocol shall be open for signature, at Guayaquil, Ecuador, on June 11, 1999 by all States that are High Contracting Parties to the Convention and thereafter shall remain open for signature at Washington.

2. This Protocol shall be subject to ratification, acceptance, approval or accession, in accordance with the domestic laws and procedures of each Party.

3. The original of this Protocol shall be deposited with the Government of the United States of America,

which shall communicate certified copies thereof to all High Contracting Parties to the Convention.

4. This Protocol shall enter into force on the thirtieth day following the date upon which all High Contracting Parties to the Convention have indicated their consent to be bound, as provided in paragraph 2.

5. The Government of the United States of America shall inform all High Contracting Parties to the Convention of all signatures, all instruments of ratification, acceptance, approval or accession received and of the date upon which this Protocol enters into force.

6. Following entry into force of this Protocol, any States or regional integration economic organizations, adhering to the Convention shall adhere to the Convention as amended by this Protocol.

## APPENDIX 5

These rules were adopted at the 4th meeting of the IATTC, held on August 13, 1952. The IATTC changed its fiscal year (Rule X), beginning with that for 1976-1977, from July 1-June 30 to October 1-September 30, in accordance with a similar change at the same time by the U.S. government (IATTC Ann. Rep., 1976: page 15). Rule XIII was added to the Rules of Procedure at the 48th meeting of the IATTC (San José, Costa Rica, September 17-20, 1990). The original Rules XIII, XIV, and XV became Rules XIV, XV, and XVI, respectively, at that time.

## INTER-AMERICAN TROPICAL TUNA COMMISSION

### Rules of Procedure

### Representation

**Rule I**

A High Contracting Party to the Convention between the United States of America and the Republic of Costa Rica for the Establishment of an Inter-American Tropical Tuna Commission signed at Washington, May 31, 1949 (hereafter referred to as the Convention) shall have the right to appoint from one to four members. The member or members from each High Contracting Party shall be considered a national section.

**Rule II**

Advisory Committees established by the High Contracting Parties in conformity with Section II, Article I of the Convention shall be invited to attend the non-executive sessions of the Commission. Each national section shall keep the Secretary of the Commission currently informed concerning the members of its advisory committees. Members of advisory committees invited to attend non-executive sessions of the Commission may, at the discretion of the Chairman, address such sessions but shall not be entitled to vote.

### Voting

**Rule III**

Each national section shall have one vote. The vote may be cast by any member of such national section.

**Rule IV**

All decisions, resolutions, recommendations, and other official actions of the Commission shall be taken only by a unanimous vote of all of the High Contracting Parties to the Convention. Votes shall be taken by a show of hands, or by a roll call, as in the opinion of the chairman appears to be most suitable.

**Rule V**

Between meetings of the Commission or in case of an emergency, a vote of the High Contracting Parties may be obtained by mail, or other means of communication.

### Chairman and Secretary

**Rule VI**

At its first meeting the Commission shall select a chairman and a secretary from different national sections. The chairman and secretary shall hold office for a period of one year. During succeeding years, selection of the chairman and the secretary from the national sections shall be in such a manner that the chairman and the secretary will be of different nationalities, so as to provide each High Contracting Party annually, in turn, with an opportunity to be represented in those offices.

**Rule VII**

The duties of the chairman shall be:

(a) To set the time and place of regular and special meetings upon consultation with the other Commissioners.

(b) To preside at all meetings of the Commission.

(c) To decide a11 questions of order raised at the meetings of the Commission, subject to the right of any Commissioner to request that any ruling by the chairman shall be submitted to the Commission for decision by vote.

(d) To call for votes and to announce the result of the vote to the Commission.

(e) To take such other actions on behalf of the Commission as may be specifically assigned by decision of the Commission.

(f) To approve the official minutes of all meetings of the Commission.

**Rule VIII**

The duties of the secretary shall be:

(a) To sign official communications directed to the High Contracting Parties, with the previous approval of the Chairman in each case.

(b) To receive and transmit to other Commissioners communications from the High Contracting Parties.

(c) To maintain official files and records of actions taken under (a) and (b) above.

(d) To perform such other duties as may be assigned by decision of the Commission.

## Director of Investigations

**Rule IX**

The duties of the Director of Investigations shall be:

(a) The performance of the functions set forth in Article I, Section 13 of the Convention.

(b) The preparation of an agenda for regular and special meetings of the Commission.

## Fiscal Year

**Rule X**

The Fiscal Year of the Commission shall be from October 1 to September 30.

## Headquarters

**Rule XI**

The headquarters of the Commission shall be at San Diego, California. Field headquarters and laboratories shall be at such locations as are determined by the Commission.

## Meetings

**Rule XII**

The Commission shall meet at least once a year, and at such other times as may be requested by a national section, at its headquarters or such other place as may be designated by the Chairman after consultation with the Commission.

**Rule XIII**

Observers may attend all regular and special meetings of the Commission, in accordance with the following procedures:

1. Invitations will be sent to -

- All non-member states with coastlines bordering the Convention area or whose nationals participate in the fisheries covered by this Convention.
- Intergovernmental organizations which have regular contact with the IATTC, or whose work is of interest to the IATTC, and vice versa.

2. Any organization not mentioned above which has legitimate interest in the work of the Commission may send observers to the meetings, subject to prior approval by the member countries. Requests for invitations shall be sent to the Director of Investigations for submission to IATTC members for consideration at least 120 days prior to a subject meeting. The Director of Investigations shall issue such invitations 60 days prior to the meeting, provided no objection has been made by any IATTC member in writing, explaining the reason for such objection. Any such objection shall be discussed at an executive session of the Commission immediately prior to the meeting in question.

   If the Commission holds a meeting with less than 120 days notice, the Director of Investigations shall have greater flexibility concerning the timing of the sending of the invitations.

3. The observers may, with the authorization of the Chairman, and provided no member objects, take the floor at Commission meetings.

4. The overall number of observers referred to in Paragraph 2 shall not be so large as to hinder the work of the Commission.

5. The circulation of documents by observers is subject to prior approval of the Chairman.

## Language of the Commission

**Rule XIV**

The official languages of the Commission shall be English and Spanish, and members of the Commission may use either language during meetings. When requested, translation shall be made to the other language. The minutes, official documents, and publications of the Commission shall be in both languages, but official correspondence of the Commission may be written, at the discretion of the Secretary, in either language.

## Documents

**Rule XV**

Upon request, the Commission shall provide each national section with certified copies of any documents pertaining to it.

Records of statistics of individual catches and individual company operations shall be treated as being confidential.

## Amendments to Rules of Procedure

**Rule XVI**

These rules of procedure may be amended from time to time as deemed necessary by the Commission, and in accordance with the voting procedure noted in Rules III and IV above.

## APPENDIX 6

## PUBLICATIONS OF THE INTER-AMERICAN TROPICAL TUNA COMMISSION

In addition to the publications listed here, IATTC staff members have published about 500 papers, articles, and chapters in outside scientific and trade journals and books.

### BULLETINS

Unless otherwise noted, the Bulletins are printed in English and Spanish.

VOLUME 1

1 HOWARD, GERALD V. 1954. A study of populations of the anchoveta, *Cetengraulis mysticetus*, based on meristic characters (in English with summary in Spanish).

2 SCHAEFER, MILNER B. 1954. Some aspects of the dynamics of populations important to the management of the commercial marine fisheries (in English).

3 SCHAEFER, MILNER B. 1955. Algunos aspectos de la dinámica de las poblaciones y su importancia para la administración de pesquerías marinas comerciales (in Spanish).

4 SCHAEFER, MILNER B. 1955. Morphometric comparison of yellowfin tuna from southeast Polynesia, Central America, and Hawaii.

5 PETERSON, CLIFFORD L. 1956. Observations on the taxonomy, biology, and ecology of the engraulid and clupeid fishes in the Gulf of Nicoya, Costa Rica.

6 SCHAEFER, MILNER B., and CRAIG J. ORANGE. 1956. Studies of the sexual development and spawning of yellowfin tuna (*Neothunnus macropterus*) and skipjack (*Katsuwonus pelamis*) in three areas of the eastern Pacific Ocean, by examination of gonads.

7 SHIMADA, BELL M., and MILNER B. SCHAEFER. 1956. A study of changes in fishing effort, abundance, and yield for yellowfin and skipjack tuna in the eastern tropical Pacific Ocean.

VOLUME 2

1 BROADHEAD, GORDON C. 1957. Changes in the size structure of the yellowfin tuna population of the tropical eastern Pacific Ocean from 1947 to 1955.

2 ALVERSON, FRANKLIN G., and BELL M. SHIMADA. 1957. A study of the eastern Pacific fishery for tuna baitfishes, with particular reference to the anchoveta (*Cetengraulis mysticetus*).

3 ORANGE, CRAIG J., MILNER B. SCHAEFER, and FRED M. LARMIE. 1957. Schooling habits of yellowfin tuna (*Neothunnus macropterus*) and skipjack (*Katsuwonus pelamis*) in the eastern Pacific Ocean as indicated by purse seine catch records, 1946-1955.

4 HOLMES, ROBERT W., MILNER B. SCHAEFER, and BELL M. SHIMADA. 1957. Primary production, chlorophyll, and zooplankton volumes in the tropical eastern Pacific Ocean.

5 HENNEMUTH, RICHARD C. 1957. An analysis of methods of sampling to determine the size composition of commercial landings of yellowfin tuna (*Neothunnus macropterus*) and skipjack (*Katsuwonus pelamis*).

6 SCHAEFER, MILNER B. 1957. A study of the dynamics of the fishery for yellowfin tuna in the eastern tropical Pacific Ocean.

7 SHIMADA, BELL M. 1958. Geographical distribution of the annual catches of yellowfin and skipjack tuna from the eastern tropical Pacific Ocean from vessel logbook records, 1952-1955.

8 HARDER, WILHELM. 1958. The intestine as a diagnostic character in identifying certain clupeoids (Engraulidae, Clupeidae, Dussumieriidae) and as a morphometric character for comparing anchoveta (*Cetengraulis mysticetus*) populations.

9 HOWARD, GERALD V., and ANTONIO LANDA. 1958. A study of the age, growth, sexual maturity, and spawning of the anchoveta (*Cetengraulis mysticetus*) in the Gulf of Panama.

VOLUME 3

1 BERDEGUE A., JULIO. 1958. Biometric comparison of the anchoveta, *Cetengraulis mysticetus* (Günther), from ten localities of the eastern tropical Pacific Ocean.

2 SCHAEFER, MILNER B., YVONNE M. M. BISHOP, and GERALD V. HOWARD. 1958. Some aspects of upwelling in the Gulf of Panama.

3 CROMWELL, TOWNSEND. 1958. Thermocline topography, horizontal currents and "ridging" in the eastern tropical Pacific.

4 ALVERSON, FRANKLIN G. 1959. Geographical distribution of yellowfin tuna and skipjack catches from the eastern tropical Pacific Ocean, by quarters of the year, 1952-1955.

5 CROMWELL, TOWNSEND, and EDWARD B. BENNETT. 1959. Surface drift charts for the eastern tropical Pacific Ocean.

6 HENNEMUTH, RICHARD C. 1959. Morphometric comparison of skipjack from the central and eastern tropical Pacific Ocean.

7 CHATWIN, BRUCE M. 1959. The relationships between length and weight of yellowfin tuna (*Neothunnus macropterus*) and skipjack tuna (*Katsuwonus pelamis*) from the eastern tropical Pacific Ocean.

8 BROADHEAD, GORDON C. 1959. Morphometric comparisons among yellowfin tuna, *Neothunnus macropterus*, from the eastern tropical Pacific Ocean.

9 SUND, PAUL N., and JAMES A. RENNER. 1959. The Chaetognatha of the EASTROPIC expedition, with notes as to their possible value as indicators of hydrographic conditions.

10 SIMPSON, JOHN G. 1959. Identification of the egg, early life history and spawning areas of the anchoveta, *Cetengraulis mysticetus* (Günther), in the Gulf of Panama.

VOLUME 4

1 BERNER, LEO, JR. 1959. The food of the larvae of the northern anchovy *Engraulis mordax*.

2 HENNEMUTH, RICHARD C. 1959. Additional information on the length-weight relationship of skipjack tuna from the eastern tropical Pacific Ocean.

3 GRIFFITHS, RAYMOND C. 1960. A study of measures of population density and of concentration of fishing effort in the fishery for yellowfin tuna, *Neothunnus macropterus*, in the eastern tropical Pacific Ocean, from 1951 to 1956.

4 PETERSON, CLIFFORD L. 1960. The physical oceanography of the Gulf of Nicoya, Costa Rica, a tropical estuary.

5 BENNETT, EDWARD B., and MILNER B. SCHAEFER. 1960. Studies of physical, chemical, and biological oceanography in the vicinity of the Revilla Gigedo Islands during the "Island Current Survey" of 1957.

6 ALVERSON, FRANKLIN G. 1960. Distribution of fishing effort and resulting tuna catches from the eastern tropical Pacific by quarters of the year, 1951-1958.

7 BROADHEAD, GORDON C., and CRAIG J. ORANGE. 1960. Species and size relationships within schools of yellowfin and skipjack tuna, as indicated by catches in the eastern tropical Pacific Ocean.

VOLUME 5

1 HENNEMUTH, RICHARD C. 1961. Size and year class composition of catch, age and growth of yellowfin tuna in the eastern tropical Pacific Ocean for the years 1954-1958.

2 BARRETT, IZADORE, and GERALD V. HOWARD. 1961. Studies of age, growth, sexual maturity and spawning of populations of anchoveta (*Cetengraulis mysticetus*) of the coast of the eastern tropical Pacific Ocean.

3 BJERKNESS, JACOB. 1961. "El Niño" study based on analysis of ocean surface temperatures 1935-57.

4 SUND, PAUL N. 1961. Some features of the autoecology and distributions of Chaetognatha in the eastern tropical Pacific.

5 SCHAEFER, MILNER B., BRUCE M. CHATWIN, and GORDON C. BROADHEAD. 1961. Tagging and recovery of tropical tunas, 1955-1959.

6 ORANGE, CRAIG J. 1961. Spawning of yellowfin tuna and skipjack in the eastern tropical Pacific, as inferred from studies of gonad development.

VOLUME 6

1 HENNEMUTH, RICHARD C. 1961. Year class abundance, mortality and yield-per-recruit of yellowfin tuna in the eastern Pacific Ocean, 1956-1959.

2 PETERSON, CLIFFORD L. 1961. Fecundity of the anchoveta (*Cetengraulis mysticetus*) in the Gulf of Panama.

3 CALKINS, THOMAS P. 1961. Measures of population density and concentration of fishing effort for yellowfin and skipjack tuna in the eastern tropical Pacific Ocean, 1951-1959.

4 KLIMA, EDWARD F., IZADORE BARRETT, and JOHN E. KINNEAR. 1962. Artificial fertilization of the eggs, and rearing and identification of the larvae of the anchoveta, *Cetengraulis mysticetus*.

5 MARTIN, JOHN WILSON. 1962. Distribution of catch-per-unit-of-effort and fishing effort for tuna in the eastern tropical Pacific Ocean by months of the year, 1951-1960.

6 BARRETT, IZADORE, and ANNE ROBERTSON CONNOR. 1962. Blood lactate in yellowfin tuna, *Neothunnus macropterus*, and skipjack, *Katsuwonus pelamis*, following capture and tagging.

7 BROADHEAD, GORDON C. 1962. Recent changes in the efficiency of vessels fishing for yellowfin tuna in the eastern Pacific Ocean.

8 BAYLIFF, WILLIAM H., and EDWARD F. KLIMA. 1962. Live-box experiments with anchovetas, *Cetengraulis mysticetus*, in the Gulf of Panama.

9 KLAWE, WITOLD L. 1963. Observations on the spawning of four species of tuna (*Neothunnus macropterus*, *Katsuwonus pelamis*, *Auxis thazard* and *Euthynnus lineatus*) in the eastern Pacific Ocean, based on distribution of their larvae and juveniles.

VOLUME 7

1 FORSBERGH, ERIC D. 1963. Some relationships of meteorological, hydrographic, and biological variables in the Gulf of Panama.

2 BERRY, FREDERICK H., and IZADORE BARRETT. 1963. Gillraker analysis and speciation in the thread herring genus *Opisthonema*.

3 SMAYDA, THEODORE J. 1963. A quantitative analysis of the phytoplankton of the Gulf of Panama. I. Results of the regional phytoplankton surveys during July and November, 1957 and March, 1958 (in English with summary in Spanish).

4 JOSEPH, JAMES. 1963. Fecundity of yellowfin tuna (*Thunnus albacares*) and skipjack (*Katsuwonus pelamis*) from the eastern Pacific Ocean.

5 ALVERSON, FRANKLIN G. 1963. The food of yellowfin and skipjack tunas in the eastern tropical Pacific Ocean.

6 BAYLIFF, WILLIAM H. 1963. The food and feeding habits of the anchoveta, *Cetengraulis mysticetus*, in the Gulf of Panama.

VOLUME 8

1 JOSEPH, JAMES. 1963. Contributions to the biology of the engraulid *Anchoa naso* (Gilbert & Pierson, 1898) from Ecuadorian waters.

2 BENNETT, EDWARD B. 1963. An oceanographic atlas of the eastern tropical Pacific Ocean, based on data from EASTROPIC expedition, October-December 1955.

3 BAYLIFF, WILLIAM H. 1963. Observations on the life history and identity of intraspecific groups of the anchoveta, *Cetengraulis mysticetus*, in Montijo Bay and Chiriqui Province, Panama.

4 DAVIDOFF, EDWIN B. 1963. Size and year class composition of catch, age and growth of yellowfin tuna in the eastern tropical Pacific Ocean, 1951-1961.

5 CALKINS, THOMAS P. 1963. An examination of fluctuations in the "concentration index" of purse-seiners and baitboats in the fishery for tropical tunas in the eastern Pacific, 1951-1961.

6 ALVERSON, FRANKLIN G. 1963. Distribution of fishing effort and resulting tuna catches from the eastern tropical Pacific Ocean, by quarters of the year, 1959-1962.

7 DIAZ, ENRIQUE L. 1963. An increment technique for estimating growth parameters of tropical tunas, as applied to yellowfin tuna (*Thunnus albacares*).

8 BROADHEAD, GORDON C., and IZADORE BARRETT. 1964. Some factors affecting the distribution and apparent abundance of yellowfin and skipjack tuna in the eastern Pacific Ocean.

9 FORSBERGH, ERIC D., and JAMES JOSEPH. 1964. Biological production in the eastern Pacific Ocean.

VOLUME 9

1 BAYLIFF, WILLIAM H. 1964. Some aspects of the age and growth of the anchoveta, *Cetengraulis mysticetus*, in the Gulf of Panama.

2 JOSEPH, JAMES, FRANKLIN G. ALVERSON, BERNARD D. FINK, and EDWIN B. DAVIDOFF. 1964. A review of the population structure of yellowfin tuna, *Thunnus albacares*, in the eastern Pacific Ocean.

3 SUND, PAUL N. 1964. The Chaetognatha of the waters of the Peru region.

4 BARRETT, IZADORE, and ANNE ROBERTSON CONNOR. 1964. Muscle glycogen and blood lactate in yellowfin tuna, *Thunnus albacares*, and skipjack, *Katsuwonus pelamis*, following capture and tagging.

5 WYRTKI, KLAUS. 1965. Surface currents of the eastern tropical Pacific Ocean.

6 SUDA, AKIRA, and MILNER B. SCHAEFER. 1965. General review of the Japanese tuna long-line fishery in the eastern tropical Pacific Ocean 1956-1962.

7 SMAYDA, THEODORE J. 1965. A quantitative analysis of the phytoplankton of the Gulf of Panama. II. On the relationship between $C^{14}$ assimilation and the diatom standing crop (in English with summary in Spanish).

VOLUME 10

1 FINK, BERNARD D. 1965. Estimations, from tagging experiments, of mortality rates and other parameters respecting yellowfin and skipjack tuna.

2 FORSBERGH, ERIC D., and WILLIAM W. BROENKOW. 1965. Oceanographic observations from the eastern Pacific Ocean collected by the R/V *Shoyo Maru*, October 1963-March 1964.

3 BAYLIFF, WILLIAM H. 1965. Length-weight relationships of the anchoveta, *Cetengraulis mysticetus*, in the Gulf of Panama.

4 SUDA, AKIRA, and MILNER B. SCHAEFER. 1965. Size-composition of catches of yellowfin tuna in the Japanese long-line fishery in the eastern tropical Pacific east of 130°W.

5 CHAPMAN, DOUGLAS G., BERNARD D. FINK, and EDWARD B. BENNETT. 1965. A method for estimating the rate of shedding of tags from yellowfin tuna.

6 DAVIDOFF, EDWIN B. 1965. Estimation of year class abundance and mortality of yellowfin tuna in the eastern tropical Pacific.

7 BENNETT, EDWARD B. 1965. Currents observed in Panama Bay during September-October 1958.

8 CALKINS, THOMAS P. 1965. Variation in size of yellowfin tuna (*Thunnus albacares*) within individual purse-seine sets.

VOLUME 11

1 BENNETT, EDWARD B. 1966. Monthly charts of surface salinity in the eastern tropical Pacific Ocean.

2 KUME, SUSUMU, and JAMES JOSEPH. 1966. Size composition, growth and sexual maturity of bigeye tuna, *Thunnus obesus* (Lowe), from the Japanese long-line fishery in the eastern Pacific Ocean.

3 KUME, SUSUMU, and MILNER B. SCHAEFER. 1966. Studies on the Japanese long-line fishery for tuna and marlin in the eastern tropical Pacific Ocean during 1963.

4 BAYLIFF, WILLIAM H. 1966. Population dynamics of the anchoveta, *Cetengraulis mysticetus*, in the Gulf of Panama, as determined by tagging experiments.

5 SMAYDA, THEODORE J. 1966. A quantitative analysis of the phytoplankton of the Gulf of Panama. III. General ecological conditions, and the phytoplankton dynamics at 8°45'N, 79°23'W from November 1954 to May 1957 (in English with summary in Spanish).

VOLUME 12

1 BENNETT, EDWARD B. 1966. Influence of the Azores High on sea level pressure and wind, and on precipitation, in the eastern tropical Pacific Ocean.

2 BJERKNESS, JACOB. 1966. Survey of El Niño 1957-58 in its relation to tropical Pacific meteorology.

3 SCHAEFER, MILNER B. 1967. Fishery dynamics and present status of the yellowfin tuna population of the eastern Pacific Ocean.

4 KLAWE, WITOLD L., and MAKOTO PETER MIYAKE. 1967. An annotated bibliography on the biology and fishery of the skipjack tuna, *Katsuwonus pelamis*, of the Pacific Ocean.

5 BAYLIFF, WILLIAM H. 1967. Growth, mortality, and exploitation of the Engraulidae, with special reference to the anchoveta, *Cetengraulis mysticetus*, and the colorado, *Anchoa naso*, in the eastern Pacific Ocean.

6 CALKINS, T. P., and B. M. CHATWIN. 1967. Geographical distribution of yellowfin tuna and skipjack catches in the eastern Pacific Ocean, by quarters of the year, 1963-1966.

7 MIYAKE, MAKOTO PETER. 1968. Distribution of skipjack in the Pacific Ocean, based on records of incidental catches by the Japanese longline tuna fishery.

VOLUME 13

1 JOSEPH, JAMES, and T. P. CALKINS. 1969. Population dynamics of the skipjack tuna (*Katsuwonus pelamis*) of the eastern Pacific Ocean.

2 KUME, SUSUMU, and JAMES JOSEPH. 1969. The Japanese longline fishery for tunas and billfishes in the eastern Pacific Ocean east of 130°W, 1964-1966.

3 PELLA, JEROME J., and PATRICK K. TOMLINSON. 1969. A generalized stock production model.

VOLUME 14

1 DAVIDOFF, EDWIN B. 1969. Variations in year-class strength and estimates of the catchability coefficient of yellowfin tuna, *Thunnus albacares*, in the eastern Pacific Ocean.

2 FORSBERGH, ERIC D. 1969. On the climatology, oceanography and fisheries of the Panama Bight.

3 STEVENSON, MERRITT R. 1970. On the physical and biological oceanography near the entrance of the Gulf of California, October 1966-August 1967.

4 KLAWE, W. L., J. J. PELLA, and W. S. LEET. 1970. The distribution, abundance and ecology of larval tunas from the entrance to the Gulf of California.

VOLUME 15

1 FINK, BERNARD D., and WILLIAM H. BAYLIFF. 1970. Migrations of yellowfin and skipjack tuna in the eastern Pacific Ocean as determined by tagging experiments, 1952-1964.

2 WILLIAMS, F. 1970. Sea surface temperature and the distribution and apparent abundance of skipjack (*Katsuwonus pelamis*) in the eastern Pacific Ocean, 1951-1968.

3 CALKINS, T. P., and B. M. CHATWIN. 1971. Geographical catch distribution of yellowfin and skipjack tuna in the eastern Pacific Ocean, 1967-1970, and fleet and total catch statistics, 1962-1970.

4 BAYLIFF, WILLIAM H. 1971. Estimates of the rates of mortality of yellowfin tuna in the eastern Pacific Ocean derived from tagging experiments.

5 BAYLIFF, WILLIAM H., and LARS M. MOBRAND. 1972. Estimates of the rates of shedding of dart tags from yellowfin tuna.

6 BAYLIFF, WILLIAM H. 1973. Materials and methods for tagging purse seine- and baitboat-caught tunas.

VOLUME 16

1 BAYLIFF, WILLIAM H., and BRIAN J. ROTHSCHILD. 1974. Migrations of yellowfin tuna tagged off the southern coast of Mexico in 1960 and 1969.

2 SHINGU, CHIOMI, PATRICK K. TOMLINSON, and CLIFFORD L. PETERSON. 1974. A review of the Japanese longline fishery for tunas and billfishes in the eastern Pacific Ocean, 1967-1970.

3 FRANCIS, ROBERT C. 1974. TUNPØP, a computer simulation model of the yellowfin tuna population and the surface tuna fishery of the eastern Pacific Ocean.

4 PELLA, JEROME J., and CHRISTOPHER T. PSAROPULOS. 1975. Measures of tuna abundance from purse-seine operations in the eastern Pacific Ocean, adjusted for fleet-wide evolution of increased fishing power, 1960-1971.

5 MILLER, FORREST R., and R. MICHAEL LAURS. 1975. The El Niño of 1972-1973 in the eastern tropical Pacific Ocean.

6 STEVENSON, MERRITT R., and HELEN R. WICKS. 1975. Bibliography of El Niño and associated publications.

VOLUME 17

1 CALKINS, THOMAS P. 1975. Geographical distribution of yellowfin and skipjack tuna catches in the eastern Pacific Ocean, and fleet and total catch statistics, 1971-1974.

2 KNUDSEN, PHYLLIS FARRINGTON. 1977. Spawning of yellowfin tuna and the discrimination of subpopulations.

3 THOMAS, WILLIAM H. 1977. Nutrient-phytoplankton interrelationships in the eastern tropical Pacific Ocean.

4 FRANCIS, ROBERT C. 1977. TUNPØP: a simulation of the dynamics and structure of the yellowfin tuna stock and surface fishery of the eastern Pacific Ocean.

5 SUZUKI, Z., P. K. TOMLINSON, and M. HONMA. 1978. Population structure of Pacific yellowfin tuna.

6 BAYLIFF, WILLIAM H. 1979. Migrations of yellowfin tuna in the eastern Pacific Ocean as determined from tagging experiments initiated during 1968-1974.

7 WILD, A., and T. J. FOREMAN. 1980. The relationship between otolith increments and time for yellowfin and skipjack tuna marked with tetracycline.

VOLUME 18

1 ORANGE, CRAIG J., and THOMAS P. CALKINS. 1981. Geographical distribution of yellowfin and skipjack tuna catches in the eastern Pacific Ocean, and fleet and total catch statistics, 1975-1978.

2 CALKINS, T. P. 1982. Observations on the purse-seine fishery for northern bluefin tuna (*Thunnus thynnus*) in the eastern Pacific Ocean.

3 PUNSLY, RICHARD G. 1983. Estimation of the number of purse-seiner sets on tuna associated with dolphins in the eastern Pacific Ocean during 1959-1980.

4 ALLEN, ROBIN, and RICHARD PUNSLY. 1984. Catch rates as indices of abundance of yellowfin tuna, *Thunnus albacares*, in the eastern Pacific Ocean.

5 SCOTT, MICHAEL D., WAYNE L. PERRYMAN, and WILLIAM G. CLARK. 1985. The use of aerial photographs for estimating school sizes of cetaceans.

6 WILD, A. 1986. Growth of yellowfin tuna, *Thunnus albacares*, in the eastern Pacific Ocean based on otolith increments.

VOLUME 19

1 MIYABE, NAOZUMI, and WILLIAM H. BAYLIFF. 1987. A review of the Japanese longline fishery for tunas and billfishes in the eastern Pacific Ocean, 1971-1980.

2 SCHAEFER, KURT M. 1987. Reproductive biology of black skipjack, *Euthynnus lineatus*, an eastern Pacific tuna.

3 PUNSLY, RICHARD. 1987. Estimation of the relative annual abundance of yellowfin tuna, *Thunnus albacares*, in the eastern Pacific Ocean during 1970-1985.

4 BAYLIFF, WILLIAM H. 1988. Growth of skipjack, *Katsuwonus pelamis*, and yellowfin, *Thunnus albacares*, tunas in the eastern Pacific Ocean, as determined from tagging data.

5 SCHAEFER, KURT M. 1989. Morphometric analysis of yellowfin tuna, *Thunnus albacares*, from the eastern Pacific Ocean.

6 FORSBERGH, ERIC D. 1989. The influence of some environmental variables on the apparent abundance of skipjack tuna, *Katsuwonus pelamis*, in the eastern Pacific Ocean.

VOLUME 20

1 BAYLIFF, WILLIAM H., YOSHIO ISHIZUKA, and RICHARD B. DERISO. 1991. Growth, movement, and attrition of northern bluefin tuna, *Thunnus thynnus*, in the Pacific Ocean, as determined by tagging.

2 PUNSLY, RICHARD G., and RICHARD B. DERISO. 1991. Estimation of the abundance of yellowfin tuna, *Thunnus albacares*, by age groups and regions within the eastern Pacific Ocean.

3 SCHAEFER, KURT M. 1992. An evaluation of geographic and annual variation in morphometric characters and gill-raker counts of yellowfin tuna, *Thunnus albacares*, from the Pacific Ocean.

4 PUNSLY, RICHARD, and HIDEKI NAKANO. 1992. Analysis of variance and standardization of longline hook rates of bigeye (*Thunnus obesus*) and yellowfin (*Thunnus albacares*) in the eastern Pacific Ocean during 1975-1987.

5 NAKANO, HIDEKI, and WILLIAM H. BAYLIFF. 1992. A review of the Japanese longline fishery for tunas and billfishes in the eastern Pacific Ocean, 1981-1987.

6 TOMLINSON, PATRICK K., SACHIKO TSUJI, and THOMAS P. CALKINS. 1992. Length-frequency estimation for yellowfin tuna (*Thunnus albacares*) caught by commercial fishing gear in the eastern Pacific Ocean.

7 WEXLER, JEANNE B. 1993. Validation of daily growth increments and estimation of growth rates of larval and early-juvenile black skipjack, *Euthynnus lineatus*, using otoliths.

8 CALKINS, THOMAS P., MINEO YAMAGUCHI, and NAOZUMI MIYABE. 1993. Some observations on bigeye tuna (*Thunnus obesus*) caught by the surface and longline fisheries for tunas in the eastern Pacific Ocean.

9 BAYLIFF, WILLIAM H. 1993. Growth and age composition of northern bluefin tuna, *Thunnus thynnus*, caught in the eastern Pacific Ocean, as estimated from length-frequency data, with comments on trans-Pacific migrations.

VOLUME 21

1 WILD, A. 1994. An evaluation of length-frequency sampling procedures and subsequent data analysis for purse seine-caught yellowfin tuna in the eastern Pacific Ocean.

2 FOREMAN, TERRY. 1996. Estimates of age and growth, and an assessment of ageing techniques, for northern bluefin tuna, *Thunnus thynnus*, in the Pacific Ocean.

3 LAUTH, ROBERT R., and ROBERT J. OLSON. 1996. Distribution and abundance of larval Scombridae in relation to the physical environment in the northwestern Panama Bight.

4 HINTON, MICHAEL G., and HIDEKI NAKANO. 1996. Standardizing catch and effort statistics using physiological, ecological, or behavioral constraints and environmental data, with an application to blue marlin (*Makaira nigrican*s) catch and effort data from Japanese longline fisheries in the Pacific.

5 SCHAEFER, KURT M. 1998. Reproductive biology of yellowfin tuna (*Thunnus albacares*) in the eastern Pacific Ocean.

6 UOSAKI, KOJI, and WILLIAM H. BAYLIFF. 1999. A review of the Japanese longline fishery for tunas and billfishes in the eastern Pacific Ocean, 1988-1992.

7 SCHAEFER, KURT M. 1999. Comparative study of some morphological features of yellowfin (*Thunnus albacares*) and bigeye (*Thunnus obesus*) tunas.

8 WATTERS, GEORGE, and RICHARD DERISO. 2000. Catch per unit of effort of bigeye tuna: a new analysis with regression trees and simulated annealing

**SPECIAL REPORTS**

There are separate English and Spanish versions of Numbers 1 and 5. Number 4 is printed in both English and Spanish. Numbers 2, 3, 7, and 8 are printed in English only, and Number 6 is printed in Spanish only.

1 BAYLIFF, WILLIAM H. 1975. Organization, functions, and achievements of the Inter-American Tropical Tuna Commission.

2 BAYLIFF, WILLIAM H. (editor). 1980. Synopses of biological data on eight species of scombrids.

3 BAYLIFF, WILLIAM H., and GARY A. HUNT. 1981. Exploratory fishing for tunas and tuna tagging in the Marquesas, Tuamotu, Society, Pitcairn, and Gambier Islands.

4 HAMMOND, P. S. (editor). 1981. Report on the workshop on tuna-dolphin interactions.

5 PETERSON, CLIFFORD L., and WILLIAM H. BAYLIFF. 1985. Organization, functions, and achievements of the Inter-American Tropical Tuna Commission.

6 LEATHERWOOD, STEPHEN, RANDALL R. REEVES, WILLIAM F. PERRIN, and WILLIAM E. EVANS. 1988. Ballenas, delfines y marsopas del Pacífico nororiental y de las aguas árticas adyacentes: una guía para su identificación.

7 DERISO, RICHARD B., and WILLIAM H. BAYLIFF (editors). 1991. World meeting on stock assessment of bluefin tunas: strengths and weaknesses.

8 BAYLIFF, WILLIAM H. (compiler). 1993. An indexed bibliography of papers on tagging of tunas and billfishes.

9 DERISO, RICHARD B., WILLIAM H. BAYLIFF, and NICHOLAS J. WEBB (editors). 1998. Proceedings of the First World Meeting on Bigeye Tuna.

10 MIZUNO, KEISUKE, MAKOTO OKAZAKI, HIDEKI NAKANO, and HIROSHI OKAMURA. 1999. Estimating the underwater shape of tuna longlines with micro-bathythermographs.

11 SCOTT, MICHAEL D., WILLIAM H. BAYLIFF, CLERIDY E. LENNERT-CODY, and KURT M. SCHAEFER (compilers). 1999. Proceedings of the International Workshop on the Ecology and Fisheries for Tunas Associated with Floating Objects.

12 2001. Symposium on world tuna fisheries: commemorating the 50th anniversary of the establishment of the Inter-American Tropical Tuna Commission.

**INTERNAL REPORTS**

Except for Number 5, which is printed in English and Spanish, these are printed only in English.

1 PSAROPULOS, CHRISTOPHER T. (editor). 1966. Computer program manual.

2 DIAZ, ENRIQUE L. 1966. Growth of skipjack tuna, *Katsuwonus pelamis*, in the eastern Pacific Ocean.

3 BAYLIFF, WILLIAM H. 1967. Procedures for estimating the parameters of the Schaefer yield model for yellowfin tuna.

4 BAYLIFF, WILLIAM H., and CRAIG J. ORANGE. 1967. Observations on the purse-seine fishery for tropical tunas in the eastern Pacific Ocean.

5 PELLA, JEROME J., and PATRICK K. TOMLINSON. 1970. Use of GENPROD on small data sets.

6 ORANGE, CRAIG J. 1971. Distribution of catch, effort and catch per unit of effort within geographical zones adjacent to the coastline of nations and islands bordering the eastern Pacific Ocean, 1959-1970.

7 BAYLIFF, WILLIAM H. 1973. Observations on the growth of yellowfin tuna in the eastern Pacific Ocean derived from tagging experiments.

8 BAYLIFF, WILLIAM H. 1974. Further estimates of the rates of mortality of yellowfin tuna in the eastern Pacific Ocean derived from tagging experiments.

9 PSAROPULOS, CHRISTOPHER T. 1975. Mathematical techniques and computer programs used to calculate biomass indices of tunas.

10 BAYLIFF, WILLIAM H. 1976. Estimates of the rates of mortality of skipjack tuna in the eastern Pacific Ocean derived from tagging experiments.

11 KLAWE, WITOLD L. 1978. World catches of tunas and tuna-like fishes in 1975.

12 BAYLIFF, WILLIAM H., and THOMAS P. CALKINS. 1979. Information pertinent to stock assessment of northern bluefin tuna, *Thunnus thynnus*, in the Pacific Ocean.

13 ALLEN R., R. FRANCIS, and R. PUNSLY. 1981. Comparisons of the efficiency of purse seine nets of different designs in releasing dolphins.

14 GUILLEN, RAFAEL, and DAVID A. BRATTEN. 1981. Anchored raft experiment to aggregate tunas in the eastern Pacific Ocean.

15 HAMMOND, P. S. 1981. Some problems in estimating the density of dolphin populations in the eastern tropical Pacific using data collected aboard tuna purse seiners.

16 ALLEN, ROBIN L. 1981. Dolphins and the purse seine fishery for yellowfin tuna.

17 SCHAEFER, KURT M. 1982. Length-weight relationship of the black skipjack, *Euthynnus lineatus*.

18 BAYLIFF, WILLIAM H. 1984. Migrations of yellowfin and skipjack tuna released in the central portion of the eastern Pacific Ocean, as determined by tagging experiments.

19 MUHLIA MELO, ARTURO F. 1986. A study of the size composition of yellowfin tuna, by area and time, in the eastern Pacific Ocean.

20 FORSBERGH, ERIC D. 1987. Rates of attrition, cohort analysis, and stock production models for skipjack tuna, *Katsuwonus pelamis*, in the eastern Pacific Ocean.

21 FORSBERGH, ERIC D. 1988. A review of the question of subpopulations of skipjack tuna, *Katsuwonus pelamis*, in the Pacific Ocean, and of possible migration routes.

22 FONTENEAU, ALAIN. 1992. A comparative study of yellowfin tuna in the eastern Pacific and in the eastern Atlantic.

23 BAYLIFF, WILLIAM H. 1993. Abundance of bluefin tuna, *Thunnus thynnus*, in the eastern Pacific Ocean.

24 JOSEPH, JAMES, WILLIAM H. BAYLIFF, and MICHAEL G. HINTON. 1994. A review of information on the biology, fisheries, marketing and utilization, fishing regulations, and stock assessment of swordfish, *Xiphias gladius*, in the Pacific Ocean.

25 PUNSLY, RICHARD G., and PAUL C. FIEDLER. 1996. Purse seiner catch rates of yellowfin tuna >7.5 kg, with and without dolphins, in the eastern Pacific Ocean..

**TECHNICAL REPORT**

This report has an abstract in Spanish.

STEVENSON, MERRITT R., FORREST R. MILLER, and ROBERT W. WAGNER. 1974. Design of an inexpensive programmable antenna tracking system.

**DATA REPORTS**

Numbers 1-5 and 8 are printed in English and Spanish, and the others in English only.

KLAWE, W. L. 1958. Date collected on tuna spawning survey cruise July 1-20, 1957.

SUND, PAUL N. no date. A temperature atlas of the Gulf of Panama 1955-1959.

KLAWE, W. L., and SUZANNE HESTER. 1962. Source list of seeds of Leguminosae prepared for immunogeneticists working with phyto-hemagglutinins.

1 ANONYMOUS. 1966. Oceanographic observations in the Gulf of Guayaquil, 1962-1964. Part 1. Physical and chemical.

2 ANONYMOUS. 1968. Oceanographic observations in the Gulf of Guayaquil, 1962-1964. Part 2. Biological, chemical and physical.

3 LEET, W. S., and M. R. STEVENSON. 1969. Oceanographic observations for the Mazatlan project: October 1966-August 1967.

4 STEVENSON, M. R., and F. R. MILLER. 1971. Oceanographic and meteorological observations for Project Little Window: March 1970.

5 STEVENSON, MERRITT R., FORREST R. MILLER, and PAUL E. LA VIOLETTE. 1972. Oceanographic, meteorological, satellite and aircraft observations for Project Little Window 2: May 1971.

6 ALLEN R. L., D. A. BRATTEN, J. L. LAAKE, J. F. LAMBERT, W. L. PERRYMAN, and M. D. SCOTT. 1980. Report on estimating the size of dolphin schools, based on data obtained during a charter cruise of the M/V *Gina Anne*, October 11-November 25, 1979.

7 KANE, WILLIAM P. 1983. Report on the electrophoretic and morphometric studies conducted at the Inter-American Tropical Tuna Commission from 1969 to 1978.

8 HINTON, MICHAEL G., and GAYLE VER STEEG. 1994. Statistics of the eastern Pacific Ocean tuna fishery, 1979 to 1992.

9 OWEN, R. W. 1997. Oceanographic atlas of habitats of larval tunas in the Pacific Ocean off the Azuero Peninsula, Panama.

10 WATTERS, GEORGE M. 1999. Geographical distributions of effort and catches of tunas by purse-seine vessels in the eastern Pacific Ocean during 1965-1998 (in English and Spanish).

## APPENDIX 7

## MEETINGS

IATTC, intergovernmental, IRP, and SAB meetings and described in the text.

The fishery for yellowfin was regulated from 1966 through 1979 and, as the size of the fleet increased (Table 2), it became necessary to make recommendations for regulations before the beginning of the year. Accordingly, beginning in 1972, the annual meetings were switched from March or April to October or November. At the 43rd meeting, after it had become apparent that it was unlikely that the fishery for yellowfin would be regulated in the near future, it was decided that future annual meetings would be held during the northern spring. Since a review of the fishery for 1985 and recommendations for 1986 were presented at the 43rd meeting, no meeting was held in 1986, and the 44th meeting was held in 1987. The 3rd meeting of the IATTC was a special meeting. It was subsequently decided that this meeting should not have been numbered, and that the 4th through 17th meetings should have been designated the 3rd through 16th meetings, which explains why there are two 17th meetings listed below. (The special meeting of January 14-15, 1991, is called a "technical meeting" on page 8 of the IATTC Annual Report for 1991.)

| Year | IATTC meetings | | | Intergovernmental meetings | | |
|---|---|---|---|---|---|---|
| | No. | Location | Dates | No. | Location | Dates |
| 1950 | 1 | San Diego, USA | Jul. 18 | | | |
| 1951 | 2 | San Jose, Costa Rica | Feb. 1 | | | |
| 1951 | 3 | San Diego, USA | Sep. 1 | | | |
| 1952 | 4 | San Jose, Costa Rica | Aug. 13 | | | |
| 1953 | 5 | San Diego, USA | Aug. 14 | | | |
| 1954 | 6 | San Jose, Costa Rica | Aug. 11 | | | |
| 1955 | 7 | Panama, RP | Jul. 14 | | | |
| 1956 | 8 | San Diego, USA | Jul. 30 | | | |
| 1957 | 9 | San Jose, Costa Rica | Mar. 12 | | | |
| 1958 | 10 | Panama, RP | Feb. 11 | | | |
| 1959 | 11 | San Pedro, USA | Feb. 5 | | | |
| 1960 | 12 | San Jose, Costa Rica | Feb. 23-24 | | | |
| 1961 | 13 | Panama, RP | Feb. 23-24 | 1 | Panama, RP | |
| 1962 | 14 | Long Beach, USA | Sep. 14 | | | |
| 1962 | 15 | Quito, Ecuador | May 16-18 | | | |
| 1963 | | | | 2 | San Jose, Costa Rica | Nov. 7-8 |
| 1964 | 16 | Panama, RP | Apr. 16-17 | 3 | Panama, RP | |
| 1965 | 17 | San Diego, USA | Mar. 18-19 | 4 | San Diego, USA | Mar. 20 |
| 1966 | 17 | Mexico City | Mar. 23-24, 26 | 5 | Mexico City | Mar. 25-26 |
| 1967 | 18 | Guayaquil, Ecuador | Apr. 19-20 | | | |
| 1968 | 19 | San Jose, Costa Rica | Apr. 4-6 | 6 | San Jose, Costa Rica | Apr. 6-7 |
| 1969 | 20 | Panama, RP | Apr. 2-5 | 7 | Panama, RP | Apr. 4-5 |
| 1970 | 21 | San Diego, USA | Mar. 18-19, 22 | 8 | San Diego, USA | Mar. 19-22 |
| 1971 | 22 | Ottawa, Canada | Apr. 22-23, 25 | 9 | Ottawa, Canada | Apr. 23-24 |
| 1971 | 23 | San Jose, Costa Rica | Jan. 5-7. 20 | 10 | San Jose, Costa Rica | Jan. 7-11, 18-20 |
| 1972 | 24 | Mexico City | Feb. 20 | 10 (cont.) | Mexico City | Feb. 16-20 |
| 1972 | 26 | Tokyo, Japan | Jan. 6-7, 13 | 11 | Tokyo, Japan | Jan. 7-13 |
| 1972 | 27 | Panama, RP | Nov. 7-8, 11 | 12 | Panama, RP | Nov. 8-11 |
| 1972 | 28 | San Diego, USA | Dec. 20 | 13 | San Diego, USA | Dec. 17-20 |
| 1973 | 29 | Washington, USA | Nov. 12-14, 16 | 14 | Washington, USA | Nov. 12-16 |
| 1973 | | | | 14 (cont.) | Washington, USA | Dec. 6-8 |
| 1974 | | | | 15 | Mexico City | Jan. 29- Feb. 1 |
| 1974 | 30 | Ottawa, Canada | Oct. 28-29, 31 | 16 | Ottawa., Canada | Oct. 30-31 |
| 1975 | 31 | San Diego, USA | Mar. 3, 5 | 17 | San Diego, USA | Mar. 4-5 |
| 1975 | 32 | Paris, France | Oct. 13-14, 17 | 18 | Paris, France | Oct. 15-17 |

| Year | IATTC meetings | | | Intergovernmental meetings | | |
|---|---|---|---|---|---|---|
| | No. | Location | Dates | No. | Location | Dates |
| 1975 | 32 (cont.) | Washington, USA | Dec. 18 | 19 | Washington, USA | Dec. 15-19 |
| 1976 | 33 | Managua, Nicaragua | Oct. 11-14 | 20 | Managua, Nicaragua | Oct. 13-14 |
| 1977 | 34 | San Diego, USA | Jun. 27-29 | | | |
| 1977 | 35 | Mexico City | Oct. 17-18 | 21 | Mexico City | Oct. 18-20 |
| 1978 | 35 (cont.) | San Diego, USA | Jan. 26 | 21 (cont.) | San Diego, USA | Jan. 25-26 |
| 1978 | 36 | Tokyo, Japan | Oct. 16-18 | 22 | Tokyo, Japan | Oct. 18 |
| 1979 | 37 | Panama, RP | Oct. 22-23 | 22 | | |
| 1980 | 38 | Washington, USA | Oct. 28-29 | | | |
| 1981 | 39 | Paris, France | Oct. 19-21 | | | |
| 1982 | 40 | La Jolla, USA | Oct. 19-21 | | | |
| 1983 | | | | 23 | La Jolla, USA | Apr. |
| 1983 | 41 | Ottawa, Canada | Oct. 19-20 | | | |
| 1984 | 42 | La Jolla, USA | Oct. 16-18 | | | |
| 1985 | 43 | Tokyo, Japan | Oct. 15-16 | | | |
| 1987 | 44 | Panama, RP | May 5-7 | | | |
| 1988 | 45 | La Jolla, USA | Mar. 8-10 | | | |
| 1989 | 46 | Paris, France | May 10-12 | | | |
| 1990 | 47 | Washington, USA | Jun. 26-28 | | | |
| 1990 | 48 | San Jose, Costa Rica | Sep. 17-20 | | | |
| 1991 | | La Jolla, USA | Jan. 14-15 | | La Jolla, USA | Jan. 16-18 |
| 1991 | 49 | Tokyo, Japan | Jun. 18-20 | | | |
| 1992 | | La Jolla, USA | Apr. 21-23 | | | |
| 1992 | 50 | La Jolla, USA | Jun. 16-18 | 24 | La Jolla, USA | Jun. 17-18 |
| 1993 | 51 | Port Vila, Vanuatu | Jun. 8-10 | 25 | Port Vila, Vanuatu | Jun. 9-10 |
| 1993 | 52 | La Jolla, USA | Oct. 26-27 | 26 | La Jolla, USA | Oct. 26-27 |
| 1994 | 53 | Cumaná, Venezuela | Jun. 7-8 | 27 | Cumaná, Venezuela | Jun. 8 |
| 1994 | 54 | La Jolla, USA | Oct. 20 | 28 | La Jolla, USA | Oct. 20-21 |
| 1995 | 55 | La Jolla, USA | Jun. 13-15 | 29 | La Jolla, USA | Jun. 14-15 |
| 1995 | 56 | Panama, RP | Oct. 3 | 30 | Panama, RP | Oct. 3-4 |
| 1996 | 57 | La Jolla, USA | Oct. 21-23 | 31 | La Jolla, USA | Oct. 21-22 |
| 1997 | | | | 32 | Santa Marta, Colombia | Feb. 21 |
| 1997 | 58 | San Jose, Costa Rica | Jun. 3-5 | 33 | San Jose, Costa Rica | Jun. 4 |
| 1997 | 59 | La Jolla, USA | Oct. 28-31 | 34 | La Jolla, USA | Oct. 28-31 |
| 1998 | 60 | La Jolla, USA | Feb. 7 | 35 | La Jolla, USA | Feb. 2-7 |
| 1998 | 61 | La Jolla, USA | Jun. 10-12 | 36 | La Jolla, USA | Jun. 11 |
| 1998 | 62 | La Jolla, USA | Oct. 15-17 | 37 | La Jolla, USA | Oct. 17 |
| 1999 | | | | 38 | Miami, USA | Mar. 15-16 |
| 1999 | 63 | Guayaquil, Ecuador | Jun. 8-10 | 39 | Guayaquil, Ecuador | Jun. 11 |
| 1999 | 64 | La Jolla, USA | Jul. 21-22 | 39 (cont.) | La Jolla, USA | Jul. 22 |
| 1999 | 65 | La Jolla, USA | Oct. 4-10 | | | |
| 2000 | 66 | San Jose, Costa Rica | Jun. 12, 14-15 | | | |
| 2000 | 67 | La Jolla, USA | Oct. 26 | | | |

| Year | IRP meetings | | | SAB meetings | | |
|---|---|---|---|---|---|---|
| | No. | Location | Dates | No. | Location | Dates |
| 1992 | 1 | La Jolla, USA | Oct. 15-16 | | | |
| 1993 | 2 | La Jolla, USA | Jan. 27-29 | | | |
| | | | | 1 | San Diego, USA | Apr. 14-15 |
| 1993 | 3 | La Jolla, USA | May 31-Jun. 2 | | | |
| 1993 | 4 | La Jolla, USA | Oct. 28-29 | | | |
| 1994 | 5 | Ensenada, Mexico | Jan. 26-27 | | | |
| 1994 | 6 | Cumaná, Venezuela | Jun. 4-6 | | | |
| 1994 | 7 | La Jolla, USA | Oct. 17-19 | | | |
| 1995 | 8 | Ensenada, Mexico | Jan. 23-24 | | | |
| 1995 | 9 | La Jolla, USA | Jun. 11-13 | | | |
| 1995 | 10 | Panama, RP | Oct. 1-2 | | | |
| 1996 | 11 | Ensenada, Mexico | Jan. 25-26 | | | |
| 1996 | 12 | La Jolla, USA | Aug. 28-29 | | | |
| 1996 | 13 | La Jolla, USA | Oct. 19 and 21 | | | |
| 1997 | 14 | Santa Marta, Colombia | Feb. 18-19 | | | |
| 1997 | 15 | Puntarenas, Costa Rica | Jun. 1-2 | | | |
| 1997 | 16 | La Jolla, USA | Oct. 27 | | | |
| 1998 | 17 | La Jolla, USA | Feb. 7 | | | |
| 1998 | 18 | La Jolla, USA | Jun. 8-9 | | | |
| 1998 | 19 | La Jolla, USA | Oct. 13-14 | | | |
| 1999 | 20 | Ensenada, Mexico | Jan. 25-26 | | | |
| 1999 | 21 | Guayaquil, Ecuador | Jun. 4-5 | | | |
| 1999 | 22 | Ensenada, Mexico | Oct. 1-2 | | | |
| 2000 | 23 | San Jose, Costa Rica | Jan. 24-25 | | | |
| 2000 | 24 | San Jose, Costa Rica | Jun. 7-8 | | | |
| 2000 | 25 | La Jolla, USA | Oct. 27 | | | |

## APPENDIX 8

The Agreement for the Conservation of Dolphins ("the 1992 La Jolla Agreement") was amended four times. At the 26th intergovernmental meeting a revised paragraph was substituted for the original first paragraph of Appendix III, and a revised paragraph was substituted for the original Part III of Appendix II. At the 29th intergovernmental meeting a sentence was added at the end of Paragraph 5. At the 32nd intergovernmental meeting a second revised paragraph was substituted for the previous revised paragraph that constituted Part III of Appendix II. At the 33rd intergovernmental meeting Part III of Appendix II was further amended. The amended version of the agreement follows.

### AGREEMENT FOR THE CONSERVATION OF DOLPHINS

### [24th Intergovernmental Meeting]

*The governments listed in Appendix I recall and reaffirm* the resolution adopted during a Special Meeting of the Inter-American Tropical Tuna Commission (IATTC) held in La Jolla, California, on April 21-23, 1992, to adopt a multilateral program with the objectives of (1) progressively reducing dolphin mortality in the eastern Pacific Ocean (EPO) fishery to levels approaching zero through the setting of annual limits and (2), with a goal of eliminating dolphin mortality in this fishery, seeking ecologically sound means of capturing large yellowfin tunas not in association with dolphins while maintaining the populations of yellowfin tuna in the EPO at a level which will permit maximum sustained catches year after year, and to limit and, if possible, eliminate the mortality of dolphins in the fishery of the EPO as follows:

| Year | Limit | Percentage of best estimate of current populations of spotted, spinner, and common dolphins |
|---|---|---|
| 1993 | 19,500 | 0.30 |
| 1994 | 15,500 | 0.24 |
| 1995 | 12,000 | 0.19 |
| 1996 | 9,000 | 0.14 |
| 1997 | 7,500 | 0.11 |
| 1998 | 6,500 | 0.10 |
| 1999 | <5,000 | <0.08 |

The IATTC further resolved to establish a Review Panel to review and report on the compliance of the international fleet with the mortality limits set forth above, and make recommendations as appropriate, and to establish within the IATTC an Advisory Board of technical specialists from the international communities of scientists, government agencies, environmental groups, and the fishing industry, to assist the Director of the IATTC in efforts to coordinate, facilitate, and guide research.

Therefore:

*The governments listed in Appendix I agree that*:

1. Each government that is a party to this Agreement ("the participating governments") shall, on or before October 1, 1992, provide to the Director of the IATTC a list of purse-seine vessels of carrying capacity greater than 400 short tons under its jurisdiction which such government has reasonable cause to believe will set on tunas associated with dolphins in the EPO in 1993 and for each of which the government wishes to have a Dolphin Mortality Limit (DML) assigned for that year.

2. The Review Panel to be established in accordance with the Resolution of April 1992, whose duties, functions, and responsibilities are defined in Appendix II, shall, by November 1, 1992, assign a DML to each vessel that it determines to be "qualified" for a DML in accordance with Paragraph 1 ("qualified vessels"). For 1993, each DML shall be equivalent to 19,500 divided by the total number of qualified vessels.

3. A participating government may thereafter adjust the DMLs of its qualified vessels either upward or downward, provided that no vessel is assigned an adjusted DML in excess of 15 percent above the original DML and that the collective DMLs for that nation's fleet do not exceed that nation's collective

DMLs prior to adjustment. Any such adjustment shall be made prior to December 1, 1992. Each government shall notify the IATTC of any such adjustments on or before December 15, 1992. DMLs that are assigned as of December 1, 1992, shall be applied during 1993.

4. Any vessel assigned a DML for 1993 which does not utilize any of its DML by June 1, 1993, or which leaves the fishery, shall lose its right to utilize its DML for the remainder of the year. The IATTC shall maintain records of all such unutilized DMLs.

5. Each participating government shall, on or before April 1, 1993, provide to the Director of the IATTC the names of purse-seine vessels which were not assigned a DML under Paragraph 2 and to which it wishes to have a DML assigned for the last six months of 1993. All such vessels which are qualified shall be assigned DMLs by the Director of the IATTC, after consultation with the voting members of the Review Panel, as soon as possible after June 1, 1993. The DML shall be calculated by dividing the sum of the unutilized DMLs by the total number of such applications, provided that the DML for any such vessel shall not exceed one-half of the DML calculated in accordance with Paragraph 2. The Director of the IATTC, after consultation with and agreement by the voting members of the Review Panel, may also use information on the fleet's projected annual dolphin mortality to provide second half DMLs if this use is reasonably expected not to cause the overall fleet quota for that year to be exceeded.

6. For any vessel exceeding its DML during 1993, the amount of its excess shall be deducted from the DML assigned to that vessel during 1994 and, if the excess in 1993 exceeds the 1994 DML, then such excess shall be deducted from the DMLs subsequent to 1994, as appropriate.

7. Only vessels operating under the jurisdiction of participating governments or under the jurisdiction of the governments of IATTC member countries are eligible for DMLs.

8. Compliance with the total EPO dolphin mortality limits for the years 1994 through 1999 shall be ensured through the mechanisms set forth above for 1993, with any necessary modifications.

9. The participating governments shall review and assess the 1993 compliance mechanisms prior to July 1, 1993.

10. Measures shall be taken with respect to management of individual stocks of dolphins in accordance with Appendix III.

11. The Scientific Advisory Board of technical experts to coordinate, facilitate, and guide research in accordance with the Resolution of April 1992 shall be established and operate as outlined in Appendix IV.

12. The participating governments shall require purse-seine vessels of carrying capacity greater than 400 short tons under their jurisdiction which operate in the EPO to carry an observer during each fishing trip in 1993. At least 50 percent of the observers shall be from the observer program of the IATTC.

13. The participating governments shall permit observers to collect all pertinent information necessary to achieve the objectives of this Agreement.

14. The participating governments shall require observers to inform the fishing captain of the vessel upon which he is observing when the DML is reached and when fishing by that vessel for yellowfin tuna in association with dolphins should cease.

15. The participating governments shall require that a vessel shall cease fishing on dolphins in the EPO when its DML has been reached.

*The participating governments recommend* that all IATTC member countries and other states party to this Agreement work diligently to achieve the objectives of this Agreement and particularly strive to undertake measures to insure that states not currently party to this Agreement, but which have vessels capable of and intending to fish for tunas in association with dolphins in the eastern Pacific Ocean subscribe to the Agreement.

## APPENDICES

**Appendix I.**

Colombia, Costa Rica, Ecuador, Mexico, Nicaragua, Panama, Spain, the United States of America, Vanuatu, Venezuela.

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**Appendix II.**

### THE REVIEW PANEL

**I. OBJECTIVES**

This Review Panel is established as recommended by the Resolution approved at the Special Meeting of the IATTC held on April 21-23, 1992, to review and report on the compliance of the international fleet with the mortality limits set forth and to make recommendations as appropriate.

**II. FUNCTIONS AND RESPONSIBILITIES**

The Review Panel shall:

1. Compile each year a list of vessels qualified for Dolphin Mortality Limits (DML) and assign DMLs for each year from 1993 through 1999.
2. Review all trips made in the eastern Pacific Ocean by purse-seine vessels of fish-carrying capacity greater than 400 short tons.
3. Identify all infractions of agreements concerning dolphin mortality, including this Agreement, and a Resolution passed at the 50th Meeting of the IATTC.
4. Inform the governments which are parties to such agreements or the Resolution of the 50th Meeting of infractions by vessels under their jurisdiction.
5. Receive from governments party to the Resolution of the 50th Meeting or this Agreement and whose vessels fish for tunas in association with dolphins in the eastern Pacific Ocean information concerning their actions in response to reported infractions for the purposes of monitoring compliance.
6. Recommend to all such governments a standardized certification system for fishing captains and maintain a list of those who have received adequate training and who are abiding by the goals of the Resolution of the 50th Meeting or this Agreement.
7. Recommend to all such governments a set of sanctions for individual fishing captains, vessel owners, and observers which are consistent with the goals of the Resolution of the 50th Meeting or this Agreement, appropriate for the infractions, and standardized among countries.
8. Recommend to all such governments minimum standards for fishing gear, update these following technological advances, and maintain a list of vessels which carry all the equipment needed to reduce dolphin mortality and which have performed the required procedures to maintain the vessel and the gear in good working condition.
9. Recommend to all such governments actions to be taken in order to ensure compliance with the Resolution of the 50th Meeting or this Agreement by any nation not a party to either that is conducting fishing operations in a manner inconsistent with the Resolution of the 50th Meeting or this Agreement.
10. Publish an Annual Report which would:
    a) Review the operation of the program and recommend actions to the such governments for modifications and updates in enforcement consistent with the goals of the Resolution of the 50th Meeting or this Agreement.
    b) Summarize all the identified infractions and the action taken.

**III. COMPOSITION OF THE PANEL**

The Review Panel will be composed of five or more representatives of governments and six representatives of non-governmental organizations. Of these, three shall be representatives of environmental organizations and three of the tuna-fishing industry. The six representatives shall be appointed by the member governments. Any government that is party to the 1992 Agreement for the Conservation of Dolphins and that either has at least one vessel of carrying capacity greater than 400 short tons fishing under its flag in the eastern Pacific Ocean or is a member of the Inter-American Tropical Tuna Commission may become a member of the Panel. [SEE ALSO APPENDIX 17] The government representatives shall be voting members, and the non-governmental representatives shall be non-voting members. The IATTC will provide a non-voting Secretariat for the Panel.

**IV. OPERATION OF THE PANEL**

The Panel shall adopt rules of procedure for its operations at its first meeting. After each meeting a report of infractions and related matters shall be made available to the public. The Panel will prepare an annual report on its activities. The proceedings of the Panel will not be public, and its members shall not divulge any information concerning individual vessels and operators derived from review forms or from the proceedings of the Panel. Information concerning compliance with the terms of the Agreement will be made public by means of the Panel's Reports.

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**Appendix III.**

Protective measures for each individual stock of dolphins should be taken as follows:

i) If the incidental mortality of any stock exceeds 2% of the most current estimate of absolute abundance (CEAA), but is less than 4% of the CEAA of that stock, a warning will be issued to all fleets;

ii) If the incidental mortality of any stock exceeds 2% of the CEAA but is less than 4% in two consecutive years, all sets on that stock, whether in herds which contain only individuals of that stock or in mixed herds, would be banned for a year.

iii) If the incidental mortality of any stock reaches or exceeds 4% of the CEAA in a given year, a complete ban on setting on that stock would be imposed for the following year.

iv) If the incidental mortality of any stock exceeds 6% of the CEAA, the ban on sets would remain in force for three years; for 8%, four years; and for 10%, five years.

It is proposed that the CEAA for the dolphin stocks of the EPO presented by Wade and Gerrodette to the IWC in 1992, based on NMFS research vessel data for the period 1986-1990, be used for all these calculations until the signatory nations agree on an updated set of figures. Such updates could result from the analysis of data from future research cruises, from calibration of indices of relative abundance with estimates of absolute abundance, or from improvements in the analytical methodology applied to currently available data. The 2% value for maximum net annual recruitment should also be changed if better estimates become available.

**BACKGROUND**

In recent years, incidental mortality for all stocks of dolphins involved in the fishery has been decreasing, and as of 1991 the mortality rates of all stocks are less than 1% of the most recent estimates of their average absolute abundances for 1986-1990. The most conservative estimate of the maximum net annual recruitment rate for dolphins is 2%, so incidental mortality rates below this level should not jeopardize the recovery of the stocks.

The incidental mortalities of the various stocks of dolphins in the EPO in 1991 (based on mortality per set) were as follows:

| Stock | Population abundance[1] | Incidental mortality | Percent mortality |
|---|---|---|---|
| Northeastern spotted | 738,100 | | |
| Western and/or southern spotted | 1,299,300 | | |
| All spotted (except coastal) | 2,037,400 | 13,991 | 0.69 |
| Eastern spinner | 632,700 | 5,879 | 0.93 |
| Whitebelly spinner | 1,020,100 | 2,974 | 0.29 |
| Northern common | 477,000 | 161 | 0.03 |
| Central common | 415,600 | 3,182 | 0.77 |
| Southern common | 2,211,500 | 115 | 0.01 |
| Other dolphins | 2,729,100 | 990 | 0.04 |
| All | 9,523,400 | 27,292 | 0.29 |

1 Wade and Gerrodette (submitted to the International Whaling Commission, 1992)

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**Appendix IV.**

**THE SCIENTIFIC ADVISORY BOARD**

The Inter-American Tropical Tuna Commission, at its Special Meeting held in La Jolla, California, on April 21-23, 1992, reached agreement on a multilateral program with the objectives of (1) progressively reducing dolphin mortality in the EPO fishery to levels approaching zero through the setting of annual limits and (2), with a goal of eliminating dolphin mortality in this fishery, seeking ecologically sound means of capturing large yellowfin tunas not in association with dolphins while maintaining the populations of yellowfin tuna in the EPO at a level which will permit maximum sustained catches year after year.

Based on a recommendation from the IATTC scientific staff, the participating governments approve the establishment of a Scientific Advisory Board of technical specialists to assist the Director in matters regarding research to (a) modify current purse-seine technology to make it less likely to cause dolphin mortality and (b) seek alternative means of capturing large yellowfin tuna.

The functions and responsibilities of the Board shall be to:

1) Meet at least once each year.
2) Review plans, proposals, and programs of the Commission to seek to meet objectives (1) and (2), as noted in paragraph 1 of this document.
3) Provide advice to the Director concerning the design, facilitation, and guidance of research to achieve objectives (1) and (2) noted in Paragraph 1 of this document.
4) Assist the Director in locating sources of funding to conduct such research.
5) Recommend to the Director any other measures and actions that could be taken to facilitate achieving the objectives of the dolphin conservation program defined in the Resolution of the Special Meeting of the IATTC held in La Jolla on April 21-23, 1992.

The Board will consist of no more than 10 members, selected from the international community of scientists, fishing gear experts, the fishing industry, and environmentalists. The members will be selected by the Director on the basis of their technical expertise, and subject to approval by the Commission and the participating governments.

The secretariat for the Board will be provided by the IATTC.

## APPENDIX 9

This version of the Agreement includes amendments made to Annex IV(III)2, Annex IV(III)3, and Annex VIII(2)b by the Fourth Meeting of the Parties to the Agreement on the International Dolphin Conservation Program, which took place in La Jolla, California, USA on October 28 and 30, 2000.

### AGREEMENT ON THE INTERNATIONAL DOLPHIN CONSERVATION PROGRAM

### PREAMBLE

The Parties to this Agreement,

**Aware that**, in accordance with the relevant provisions of international law, as reflected in the United Nations Convention on the Law of the Sea (UNCLOS) of 1982, all States have the duty to take, or to cooperate with other States in taking, such measures as may be necessary for the conservation and management of living marine resources;

**Inspired** by the principles contained in the Rio Declaration on Environment and Development of 1992, as well as the wish to implement the principles and standards of the Code of Conduct for Responsible Fisheries adopted by the FAO Conference in 1995;

**Stressing** the political will of the international community to contribute to enhancing the effectiveness of fisheries conservation and management measures, through the Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas, adopted by the FAO Conference in 1993;

**Taking note** that the 50th General Assembly of the United Nations, pursuant to resolution A/RES/50/24, adopted the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Stocks and Highly Migratory Fish Stocks ("the United Nations Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks");

**Reaffirming** the commitments established in the La Jolla Agreement of 1992 and in the Declaration of Panama of 1995;

**Emphasizing** the goals of eliminating dolphin mortality in the purse-seine tuna fishery in the eastern Pacific Ocean and of seeking ecologically sound means of capturing large yellowfin tunas not in association with dolphins;

**Considering** the importance of the tuna fishery as a source of food and income for the populations of the Parties and that conservation and management measures must address those needs and take into account the economic and social impacts of those measures*;*

**Recognizing** the dramatic reduction of incidental dolphin mortality achieved through the La Jolla Agreement;

**Convinced** that scientific evidence demonstrates that the technique of fishing for tuna in association with dolphins, in compliance with the regulations and procedures established under the La Jolla Agreement and reflected in the Declaration of Panama, has provided an effective method for the protection of dolphins and rational use of tuna resources in the eastern Pacific Ocean;

**Reaffirming** that multilateral cooperation constitutes the most effective means for achieving the objectives of conservation and sustainable use of living marine resources;

**Committed** to ensure the sustainability of tuna stocks in the eastern Pacific Ocean and to progressively reduce the incidental dolphin mortalities in the tuna fishery of the eastern Pacific Ocean to levels approaching zero; to avoid, reduce and minimize the incidental catch and the discard of juvenile tuna and the incidental catch of non-target species, taking into consideration the interrelationship among species in the ecosystem;

Have agreed as follows:

### ARTICLE I. DEFINITIONS

For the purposes of this Agreement:

1. "Tuna" means the species of the suborder Scombroidei (Klawe, 1980), with the exception of the genus Scomber.

2. “Dolphins” means species of the family Delphinidae associated with the fishery for yellowfin tuna in the Agreement Area.
3. “Vessel” means a vessel that fishes for tuna with purse seines.
4. “Parties” means the States or regional economic integration organizations which have consented to be bound by this Agreement and for which this Agreement is in force.
5. “Regional economic integration organization” means a regional economic integration organization to which its member States have transferred competence over matters covered by this Agreement, including the authority to make decisions binding on its member States in respect of those matters;
6. “IATTC” means the Inter-American Tropical Tuna Commission.
7. “La Jolla Agreement” means the instrument adopted at the Intergovernmental Meeting held in June, 1992.
8. “International Dolphin Conservation Program” means the international program established pursuant to this Agreement based on the La Jolla Agreement, as formalized, modified and enhanced in accordance with the Declaration of Panama.
9. “On-Board Observer Program” means the program defined in Annex II.
10. “Declaration of Panama” means the Declaration signed in Panama City, Republic of Panama, on October 4, 1995.
11. “Director” means the Director of Investigations of the IATTC.

**ARTICLE II. OBJECTIVES**

The objectives of this Agreement are:

1. To progressively reduce incidental dolphin mortalities in the tuna purse-seine fishery in the Agreement Area to levels approaching zero, through the setting of annual limits;
2. With the goal of eliminating dolphin mortality in this fishery, to seek ecologically sound means of capturing large yellowfin tunas not in association with dolphins; and
3. To ensure the long-term sustainability of the tuna stocks in the Agreement Area, as well as that of the marine resources related to this fishery, taking into consideration the interrelationship among species in the ecosystem, with special emphasis on, *inter alia*, avoiding, reducing and minimizing bycatch and discards of juvenile tunas and non-target species.

**ARTICLE III. AREA OF APPLICATION OF THE AGREEMENT**

The area of application of this Agreement (“the Agreement Area”) is defined in Annex I.

**ARTICLE IV. GENERAL MEASURES**

The Parties shall, within the framework of the IATTC:

1. Take measures to ensure the conservation of ecosystems as well as conservation and management measures to ensure the long-term sustainability of tuna stocks and other stocks of living marine resources associated with the tuna purse-seine fishery in the Agreement Area, based on the best scientific evidence available, and apply the precautionary approach, consistent with the relevant provisions of the FAO Code of Conduct for Responsible Fisheries and the United Nations Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks. Such measures shall be designed to maintain or restore the biomass of harvested stocks at or above levels capable of producing maximum sustainable yield, and with the goal of maintaining or restoring the biomass of associated stocks at or above levels capable of producing maximum sustainable yield; and,
2. Take measures, according to their capacities, to assess the catch and bycatch of juvenile yellowfin tuna and other stocks of living marine resources related to the purse-seine tuna fishery in the Agreement Area and establish measures in accordance with Article VI to, *inter alia*, avoid, reduce and minimize the bycatch of juvenile yellowfin tuna and bycatch of non-target species, in order to ensure long-term sustainability of all these species, taking into consideration the interrelationships among species in the ecosystem.

## ARTICLE V. INTERNATIONAL DOLPHIN CONSERVATION PROGRAM

Pursuant to the International Dolphin Conservation Program and in consideration of the objectives of this Agreement, the Parties shall, *inter alia*:

1. Limit total incidental dolphin mortality in the purse-seine tuna fishery in the Agreement Area to no more than five thousand annually, through the adoption and implementation of relevant measures, which shall include:
    a. The establishment of a system that provides incentives to vessel captains to continue to reduce incidental dolphin mortality, with the goal of eliminating dolphin mortality in this fishery;
    b. The establishment within the framework of the IATTC of a system of technical training and certification for fishing captains and crews on the gear and its use, as well as the techniques for the rescue and safety of dolphins;
    c. Within the framework of the IATTC, the promotion and support of research to improve gear, equipment, and fishing techniques, including those used in the fishery for tunas associated with dolphins;
    d. The establishment of an equitable system for the assignment of dolphin mortality limits (DMLs), consistent with the per-year dolphin mortality caps, in accordance with Annexes III and IV;
    e. Requiring their respective vessels that have been assigned a DML, or that otherwise operate in the Agreement Area, to comply with the operational requirements set forth in Annex VIII;
    f. The establishment of a system for the tracking and verification of tuna harvested with and without mortality or serious injury of dolphins, based on the elements set forth in Annex IX;
    g. The exchange of scientific research data collected by the Parties pursuant to this Agreement on a full and timely basis; and
    h. The conduct of research for the purpose of seeking ecologically sound means of capturing large yellowfin tunas not in association with dolphins;
2. Establish per-stock per-year dolphin mortality caps, and review and assess the effects of these caps, in accordance with Annex III; and
3. Review the measures at a Meeting of the Parties.

## ARTICLE VI. SUSTAINABILITY OF LIVING MARINE RESOURCES

Pursuant to Article IV, the Parties commit to develop and implement, within the framework of the IATTC, measures to ensure the long-term sustainability of living marine resources associated with the purse-seine tuna fishery in the Agreement Area, taking into consideration the interrelationships among species in the ecosystem. To this end, the Parties shall*, inter alia*:

1. Develop and implement a program for assessing, monitoring and minimizing bycatch of juvenile tuna and non-target species in the Agreement Area;
2. To the maximum extent practicable, develop and require the use of selective, environmentally safe and cost-effective fishing gear and techniques;
3. Require that their vessels operating in the Agreement Area release alive incidentally caught sea turtles and other threatened or endangered species, to the maximum extent practicable; and
4. Request the IATTC to initiate investigations to assess whether the fishing capacity of vessels fishing in the Agreement Area poses a threat to the sustainability of tuna stocks and other living marine resources associated with the fishery and, if so, examine possible measures and recommend their adoption whenever appropriate.

## ARTICLE VII. IMPLEMENTATION AT THE NATIONAL LEVEL

Each Party shall adopt, in accordance with its laws and procedures, the necessary measures to ensure the implementation of and compliance with this Agreement including, as appropriate, the adoption of relevant laws and regulations.

## ARTICLE VIII. MEETING OF THE PARTIES

1. The Parties shall meet periodically to consider matters pertaining to the implementation of this Agreement and to make all decisions relevant thereto.
2. The ordinary Meeting of the Parties shall take place at least once a year, preferably in conjunction with the IATTC meeting.
3. The Parties may also hold extraordinary meetings when deemed necessary. These meetings shall be convened at the request of any Party, provided that such request is supported by a majority of the Parties.
4. The Meeting of the Parties shall be held when a quorum is present. Quorum is reached when a majority of the Parties are present. This rule shall also apply to meetings of subsidiary organs established under this Agreement.
5. The meetings shall be held in Spanish and English, and the documents of the Meeting of the Parties shall be produced in both these languages.

## ARTICLE IX. DECISION MAKING

All decisions made by the Parties at meetings convened pursuant to Article VIII shall be by consensus.

## ARTICLE X. SCIENTIFIC ADVISORY BOARD

The functions of the Scientific Advisory Board, established pursuant to the La Jolla Agreement, shall be those set forth in Annex V. The Scientific Advisory Board shall be composed and shall operate in accordance with the provisions of Annex V.

## ARTICLE XI. NATIONAL SCIENTIFIC ADVISORY COMMITTEES

1. Each Party shall, in accordance with its laws and procedures, establish a National Scientific Advisory Committee (NATSAC) of qualified experts, operating in their individual capacities, from the public and private sectors, and from non-governmental organizations including, *inter alia*, qualified scientists.
2. The functions of the NATSACs shall be, *inter alia*, those set forth in Annex VI.
3. The Parties shall ensure that the NATSACs shall cooperate through regular and timely meetings in the review of data and the status of stocks, and in the development of advice for achieving the objectives of this Agreement. Such meetings shall take place at least once a year in conjunction with the ordinary Meeting of the Parties.

## ARTICLE XII. INTERNATIONAL REVIEW PANEL

The functions of the International Review Panel (IRP), established pursuant to the La Jolla Agreement, shall be those set forth in Annex VII. The IRP shall be composed and shall operate in accordance with the provisions of Annex VII.

## ARTICLE XIII. ON-BOARD OBSERVER PROGRAMS

The On-Board Observer Program established pursuant to the La Jolla Agreement shall operate in accordance with Annex II.

## ARTICLE XIV. ROLE OF THE IATTC

Envisioning that the IATTC shall have an integral role in coordinating the implementation of this Agreement, the Parties shall*, inter alia*, request the IATTC to provide Secretariat support and to perform such other functions as are set forth in this Agreement or are agreed upon pursuant to this Agreement.

## ARTICLE XV. FINANCING

The Parties shall contribute to the expenses necessary to achieve the objectives of this Agreement, through the establishment and collection of vessel fees, the level of which shall be determined by the Parties, without prejudice to other voluntary financial contributions.

## ARTICLE XVI. COMPLIANCE

1. Each Party shall ensure with respect to vessels under its jurisdiction effective compliance with the measures set

forth in this Agreement or adopted pursuant thereto. In particular, each Party shall ensure, through, *inter alia,* an annual certification and inspection program, that vessels subject to its jurisdiction comply with:

a. the operational requirements established in Annex VIII; and

b. the on-board observer requirements established in Annex II.

2. In respect of violations, each Party, taking into consideration the recommendations of the IRP, shall apply, consistent with its national laws, sanctions of sufficient gravity as to be effective in securing compliance with the provisions of this Agreement and of measures adopted pursuant thereto and to deprive offenders of the benefits accruing from their illegal activities. Such sanctions shall, for serious offenses, include refusal, suspension or withdrawal of the authorization to fish.

3. The Parties shall establish incentives for the captains and crews of vessels, with the view to enhancing compliance with this Agreement and its objectives.

4. The Parties shall adopt cooperative measures to ensure compliance with this Agreement, building on decisions that have been taken under the La Jolla Agreement.

5. Each Party shall promptly inform the IRP of enforcement actions it has taken pursuant to this Agreement, and the results thereof.

### ARTICLE XVII. TRANSPARENCY

1. The Parties shall promote transparency in the implementation of this Agreement, including through public participation, as appropriate.

2. Representatives from intergovernmental organizations and representatives from non-governmental organizations concerned with matters relevant to the implementation of this Agreement shall be afforded the opportunity to take part in meetings of the Parties convened pursuant to Article VIII as observers or otherwise, as appropriate, in accordance with the guidelines and criteria set forth in Annex X. Such intergovernmental organizations and non-governmental organizations shall have timely access to relevant information, subject to procedural rules on access to such information that the Parties may adopt.

### ARTICLE XVIII. CONFIDENTIALITY

1. The Meeting of the Parties shall establish rules of confidentiality for all bodies given access to information pursuant to this Agreement.

2. Notwithstanding any confidentiality rules which may be adopted in accordance with paragraph 1 above, any persons with access to such confidential information may disclose such information in connection with legal or administrative proceedings, if requested by a competent authority of the Party concerned.

### ARTICLE XIX. COOPERATION WITH OTHER ORGANIZATIONS OR ARRANGEMENTS

The Parties shall cooperate with subregional, regional and global fishery conservation and management organizations and arrangements with the goal of promoting the achievement of the objectives of this Agreement.

### ARTICLE XX. SETTLEMENT OF DISPUTES

1. The Parties shall cooperate in order to prevent disputes. Any Party may consult with one or more other Parties about any dispute related to the interpretation or application of the provisions of this Agreement to reach a solution satisfactory to all as quickly as possible.

2. If a dispute is not settled through such consultation within a reasonable period, the Parties in question shall consult among themselves as soon as possible in order to settle the dispute through any peaceful means they may decide upon in accordance with international law.

### ARTICLE XXI. RIGHTS OF STATES

No provision of this Agreement may be interpreted in such a way as to prejudice or undermine the sovereignty, sovereign rights or jurisdiction exercised by any State in accordance with international law, as well as its position or views with regard to matters relating to the law of the sea.

## ARTICLE XXII. NON-PARTIES

1. The Parties shall encourage all States and regional economic integration organizations referred to in Article XXIV of this Agreement that are not Parties to become Parties to this Agreement or to adopt laws and regulations consistent with it.
2. The Parties shall cooperate, in accordance with this Agreement and international law, to deter vessels flying the flags of States that are not Parties from carrying out activities that undermine the effectiveness of this Agreement. To this end, the Parties shall, *inter alia*, call to the attention of non-Parties such activities by their vessels.
3. The Parties shall exchange information among themselves, either directly or through the Director, with respect to activities of vessels flying the flags of non-Parties that undermine the effectiveness of this Agreement.

## ARTICLE XXIII. ANNEXES

The Annexes form an integral part of this Agreement and, unless expressly provided otherwise, a reference to this Agreement includes a reference to the Annexes relating thereto.

## ARTICLE XXIV. SIGNATURE

This Agreement is open for signature at Washington from May 21, 1998, until May 14, 1999 by States with a coastline bordering the Agreement Area and by States or regional economic integration organizations which are members of the IATTC or whose vessels fish for tuna in the Agreement Area while the Agreement is open for signature.

## ARTICLE XXV. RATIFICATION, ACCEPTANCE OR APPROVAL

This Agreement is subject to ratification, acceptance or approval by the Signatories in accordance with their domestic laws and procedures.

## ARTICLE XXVI. ACCESSION

This Agreement shall remain open to accession by any State or regional economic integration organization that meets the requirements in Article XXIV, or is otherwise invited to accede to the Agreement on the basis of a decision by the Parties.

## ARTICLE XXVII. ENTRY INTO FORCE

1. This Agreement shall enter into force upon deposit of the fourth instrument of ratification, acceptance, approval or accession with the Depositary.
2. After the date referred to in paragraph 1, with respect to each state or regional economic integration organization that meets the requirements of Article XXVI, the Agreement will enter into force for each state or regional economic integration organization upon deposit of its instrument of ratification, acceptance, approval or accession.

## ARTICLE XXVIII. RESERVATIONS

No reservations may be made to this Agreement.

## ARTICLE XXIX. PROVISIONAL APPLICATION

1. This Agreement shall be applied provisionally by a State or regional economic integration organization which consents to its provisional application by so notifying the Depositary in writing. Such provisional application shall become effective from the date of receipt of the notification.
2. Provisional application by a State or regional economic integration organization shall terminate upon the entry into force of this Agreement for that State or regional economic integration organization or upon notification by that State or regional economic integration organization to the Depositary in writing of its intention to terminate provisional application.

## ARTICLE XXX. AMENDMENTS

1. Any Party may propose an amendment to this Agreement by providing to the Depositary the text of a proposed amendment at least sixty days in advance of a Meeting of the Parties. The Depositary shall provide a copy of

this text to all other Parties.

2. Amendments to this Agreement that are adopted by consensus at a Meeting of the Parties shall enter into force on the date on which all Parties have deposited instruments of ratification, acceptance or approval with the Depositary.
3. Unless the Parties decide otherwise, the Annexes to this Agreement may be amended, by consensus, at any Meeting of the Parties. Unless otherwise agreed, amendments to an Annex shall enter into force for all Parties upon adoption.

### ARTICLE XXXI. WITHDRAWAL

Any Party may withdraw at any time after twelve months from the date on which this Agreement entered into force with respect to that Party by giving written notice of withdrawal to the Depositary. The Depositary shall inform the other Parties of the withdrawal within 30 days of receipt of such notice. The withdrawal shall become effective six months after receipt of such notice.

### ARTICLE XXXII. DEPOSITARY

The original texts of this Agreement shall be deposited with the Government of the United States of America, which shall send certified copies thereof to the Signatories and the Parties thereto, and to the Secretary General of the United Nations for registration and publication, pursuant to Article 102 of the Charter of the United Nations.

IN WITNESS WHEREOF, the undersigned plenipotentiaries, having been duly authorized by their respective Governments, have signed this Agreement.

DONE AT Washington, D.C., on this twenty first day of May, 1998, in English and Spanish, both texts being equally authentic.

## Annex I

### AGREEMENT AREA

The Agreement Area comprises the area of the Pacific Ocean bounded by the coastline of North, Central, and South America and by the following lines:

a. The 40°N parallel from the coast of North America to its intersection with the 150°W meridian;

b. The 150°W meridian to its intersection with the 40°S parallel;

c. And the 40°S parallel to its intersection with the coast of South America.

## Annex II

### ON-BOARD OBSERVER PROGRAM

1. The Parties shall maintain an On-Board Observer Program in accordance with the provisions of this Annex. As a component of this Program, each Party may also maintain its own national observer program, in accordance with the provisions of this Annex.

2. Each Party shall require its vessels with a carrying capacity greater than 363 metric tons (400 short tons) and that operate in the Agreement Area, to carry an observer during each fishing trip in the Agreement Area. At least 50 percent of the observers on the vessels of each Party shall be IATTC observers; the remainder may be from the Party's national observer program, based on criteria set forth in this Annex as well as any other criteria established by the Meeting of the Parties.

3. All observers must:

   a. have completed the technical training required by the guidelines that the Parties establish;

   b. be a national of one of the Parties or a member of the scientific staff of the IATTC;

   c. be capable of performing the duties set forth in paragraph 4 of this Annex; and

   d. be included in a list of observers maintained by the IATTC or, if part of a national observer program, by the Party maintaining such program.

4. The duties of the observers shall be, *inter alia*:

   a. to gather all pertinent information on the fishing operations of the vessel to which the observer is assigned as is necessary for implementation of this Agreement;

   b. to make available to the captain of the vessel to which the observer is assigned all measures established by the Parties pursuant to this Agreement;

   c. to make available to the captain of the vessel to which the observer is assigned the record of dolphin mortality of that vessel;

   d. to prepare reports on information gathered in accordance with this paragraph, and provide the vessel captain with the opportunity to include in such reports any information the captain might deem to be relevant;

   e. to provide such reports to the Director or the pertinent national program, to be used in accordance with Annex VII, paragraph 1, of this Agreement; and

   f. to perform such other functions as agreed by the Parties.

5. The observers shall:

   a. except to the extent required under paragraphs 4(d) and 4(e) of this Annex, treat as confidential all information with respect to the fishing operations of the vessels and of the vessel owners, and accept this requirement in writing as a condition of appointment as an observer;

   b. comply with requirements established in the laws and regulations of the Party which exercises jurisdiction over the vessel to which the observer is assigned, insofar as such requirements are not incompatible with the provisions of this Annex;

c. refrain from issuing or endorsing any certificate or other documentation relating to the fishing operations of the vessel, except as may be approved by the Parties; and

d. respect the hierarchy and general rules of behavior which apply to all vessel personnel, provided such rules do not interfere with the duties of the observers described in this Annex and with the obligations of vessel personnel set forth in paragraph 6 of this Annex.

6. The responsibilities of the Parties and vessel captains regarding observers shall include the following, *inter alia*:

   a. Observers shall be allowed access to vessel personnel and to the gear and equipment specified in Annex VIII;

   b. Upon request, observers shall also be allowed access to the following equipment, if present on the vessel to which they are assigned, in order to facilitate the carrying out of their duties set forth in paragraph 4:

      i. satellite navigation equipment;

      ii. radar display viewing screens when in use;

      iii. high-powered binoculars including during the chase and encirclement of dolphins to facilitate identification, except when in use by vessel personnel; and

      iv. electronic means of communication;

   c. Observers shall have access to the vessel working deck during net and fish retrieval and to any specimen, alive or dead, that is brought aboard the vessel during a set in order to collect biological samples in accordance with the On-Board Observer Program or as otherwise required by competent national authorities as part of a national observer program;

   d. Observers shall be provided accommodations, including lodging, food, and adequate sanitary facilities equal to those of the crew;

   e. Observers shall be provided with adequate space on the bridge or pilothouse for clerical work, as well as space on deck adequate for carrying out observer duties; and

   f. The Parties shall ensure that captains, crew, and vessel owners do not obstruct, intimidate, interfere with, influence, bribe, or attempt to bribe an observer in the performance of his or her duties.

7. The Parties shall:

   a. ensure that any observers from their respective national programs collect information in the same manner as is required for IATTC observers; and

   b. provide to the Director copies of all raw data collected by observers from their respective national programs in a timely manner upon the conclusion of the trip during which the data were collected, along with summaries and reports comparable to those provided by IATTC observers.

8. In a timely manner after each trip observed by an IATTC observer, the Director, in a manner consistent with any applicable confidentiality requirements, is requested to provide to the Party under whose jurisdiction the vessel fished, copies of all raw data, summaries, and reports pertaining to the trip.

9. Notwithstanding other provisions of this Annex, if the Director determines that the placement of an observer from the On-Board Observer Program is not practical, a vessel subject to the jurisdiction of a Party that fishes in the Agreement Area without setting on dolphins may use a trained observer from another international program, provided such program is approved by the Parties, to collect pertinent information for the On-Board Observer Program, and to confirm to the Director that such vessel does not set on dolphins.

10. Observers from the On-Board Observer Program may be assigned to vessels of non-Parties at the discretion of the Director, provided the vessel and the vessel captain comply with all the requirements of this Annex, and all other applicable requirements of this Agreement. The Director is requested to inform the Parties of any such assignment in a timely manner.

11. Fees

   a. The Parties shall establish the amount of the annual vessel fees to cover the costs of the On-Board

Observer Program. The fees shall be calculated on the basis of the carrying capacity of each vessel or any other standard specified by the Parties.

b. At the time a Party submits to the Director the list of vessels under Annex IV to this Agreement, it shall also submit payment, in U.S. dollars, for the fees established under paragraph 11(a) of this Annex, specifying which vessels the payment covers.

c. No observer shall be assigned to a vessel for which the fees, as required under paragraph 11(b) of this Annex, have not been paid.

## Annex III

### PER-STOCK, PER-YEAR DOLPHIN MORTALITY CAPS

1. The Parties shall establish, at a meeting convened pursuant to Article VIII of this Agreement, a per-stock, per-year dolphin mortality cap for each stock of dolphins, determined by the Meeting of the Parties, based on the best available scientific evidence, of between 0.2 percent and 0.1 percent of the Minimum Estimated Abundance ($N_{min}$) as calculated by the U.S. National Marine Fisheries Service or equivalent calculation standard as might be developed or recommended by the Scientific Advisory Board but in no event shall the total annual incidental dolphin mortality exceed five thousand, consistent with the provisions of this Agreement. In the year 2001 and thereafter, the per-stock, per-year cap shall be 0.1 percent of $N_{min}$.

2. The Parties shall conduct in 1998, or as soon as possible thereafter, a scientific review and assessment of progress toward the year 2001 objective, and consider recommendations as appropriate. Up to the year 2001, in the event that annual mortality of 0.2 percent of $N_{min}$ is exceeded for any stock of dolphins, all sets on that stock and on any mixed schools containing members of that stock shall cease for that year. Beginning in the year 2001, in the event that annual mortality of 0.1 percent of $N_{min}$ is exceeded for any stock of dolphins, all sets on that stock and on any mixed schools containing members of that stock shall cease for that year. In the event that annual mortality of 0.1 percent of $N_{min}$ is exceeded for either eastern spinner or northeastern spotted dolphin stocks, the Parties shall conduct a scientific review and assessment and consider further recommendations.

3. For purposes of this Agreement, the Parties shall use the current estimate of absolute abundance for the dolphin stocks of the eastern Pacific Ocean presented by Wade and Gerrodette to the International Whaling Commission in 1992, based on U.S. National Marine Fisheries Service research vessel data for the period 1986-1990, until the Parties agree on an updated set of figures. Such updates could result from the analysis of data from future research cruises and indices of abundance and other relevant scientific data from the Parties, the IATTC and other scientific organizations.

4. The Parties shall establish a system, based on real-time observer reporting, to ensure effective implementation and compliance with the per-stock, per-year dolphin mortality cap.

5. Within six months of the entry into force of this Agreement, the Parties shall establish a system for the allocation of the per-stock per-year dolphin mortality cap for each stock for the ensuing year and years thereafter. This system shall provide for the distribution of the mortality limits in Paragraph 1 of this Annex among vessels of the Parties which are eligible for Dolphin Mortality Limits, in accordance with Annex IV. When establishing this system, the Parties shall consider the best available scientific evidence on the distribution and abundance of the stocks in question, and other variables which the Meeting of the Parties shall define at a later date.

## Annex IV

### DOLPHIN MORTALITY LIMITS (DMLS)

**I. Assignment of DMLs**

1. Each Party shall provide to the Meeting of the Parties, through the Director, prior to October 1 of each year, a list of vessels under its jurisdiction of carrying capacity greater than 363 metric tons (400 short tons) that have requested a full-year DML for the following year, indicating those other vessels that are likely to be operating in the Agreement Area in the following year, and vessels that have requested a second-semester DML for the following year.

2. The IRP shall, by November 1 of each year, or later if agreed by the IRP, provide to the Meeting of the Parties a

list of qualified applicant vessels eligible to receive a DML. For purposes of this Agreement, a vessel shall be considered qualified if:

a. it has been certified by the relevant national authorities to be in possession of all of the dolphin safety gear and equipment required in Annex VIII;

b. its captain and crew have received approved training in dolphin release and rescue techniques comparable to a standard established by the Meeting of the Parties;

c. it is over 363 metric tons (400 short tons) carrying capacity in size;

d. it has a captain considered qualified due to his or her prior record of performance; and

e. the vessel is not deemed to be disqualified under Section II of this Annex.

3. A vessel shall not be considered qualified under paragraph 2 if, on the date of the request pursuant to paragraph 1 of this Annex, the vessel is operating under the jurisdiction of a Party whose applicable laws and regulations prohibit vessels under its jurisdiction from fishing for tuna in association with dolphins; nor shall DMLs be assigned to any Party in order to provide permits for fishing in the Agreement Area to vessels flying the flag of another State whose applicable laws and regulations prohibit vessels under its jurisdiction from fishing for tuna in association with dolphins.

4. 98 percent, or such other unreserved portion as the Parties might determine, of the overall dolphin mortality limit for the fishery (five thousand, or such other lower limit as the Parties might determine) shall be used to calculate into an average individual vessel DML (ADML) and distributed among the Parties for the succeeding year, as set forth in paragraph 5 of this Section.

5. The ADML shall be calculated by dividing the unreserved portion of the overall DML for the fishery established under paragraph 4 by the total number of qualified vessels requesting full-year DMLs. The distribution of DMLs among Parties shall be determined by multiplying the ADML by the number of qualified vessels requesting full-year DMLs and operating under the jurisdiction of each Party.

6. The remaining two percent, or such other portion as the Parties might determine, of the overall DML for the fishery shall be maintained as a separate Reserve DML Allocation (RDA), to be managed at the discretion of the Director. Any Party may request that the Director assign DMLs from such RDA to vessels fishing under its jurisdiction which do not normally fish for tuna in the Agreement Area but which may, from time to time, desire to participate in the fishery in the Agreement Area on a limited basis, provided that such vessels and their captains and crews meet the operational and training requirements set forth in Annex VIII of this Agreement and that the requirements set forth in paragraphs 2 and 3, of this Section are met. Any accidental mortalities caused by vessels operating in the Agreement Area under the jurisdiction of any of the Parties that have not requested DMLs for their fleet shall also be deducted from this RDA.

7. No DML shall be assigned to a vessel which has been determined by the Parties to have engaged in a pattern of violations, as confirmed through enforcement actions taken against such vessel by the Party under whose jurisdiction it operates, which diminish the effectiveness of the International Dolphin Conservation Program.

8. The individual Parties with qualified vessels that will be fishing for tuna in association with dolphins shall manage their DMLs in a responsible manner, provided that no individual vessel shall receive a total annual DML in excess of the DML established for 1997 by the IRP, and reported in the Minutes of the 14$^{th}$ Meeting of the IRP, held on February 19-20, 1997, under the La Jolla Agreement. No Party shall allocate to the total of its qualified vessels a greater number of DMLs than those that such Party has been allocated under Sections I and III of this Annex. No initial assignment of DMLs may result in any vessel receiving a DML in excess of the ADML unless its performance in reducing dolphin mortalities, as measured by the IRP based upon the previous two years' data, is better than the average performance of the international fleet as a whole. No initial assignment of DMLs may result in any vessel receiving a DML in excess of the ADML if, during the previous year, it has committed any of the infractions identified in Section III, paragraph 4 of this Annex, subject to the conditions established pursuant to that paragraph.

9. Should the total mortalities of the fleet of any Party meet or exceed the total amount of DML distributed to it pursuant to this Annex, fishing for tuna in association with dolphins shall cease for all vessels operating under the jurisdiction of that Party.

10. Each Party shall, no later than February 1 of each year, notify the Director of the initial allocation of its distributed DML among its fleet. No vessel may begin fishing for tunas associated with dolphins until the Director receives such notification.

**II. Utilization of DMLs**

1. Any vessel which is assigned a full-year DML and does not set on dolphins prior to April 1 of that year, or which is assigned a second-semester DML and does not set on dolphins by December 31 of that year, or which is assigned a per-trip DML from the RDA and does not set on dolphins during that trip, unless as a result of *force majeure* or extraordinary circumstances, as agreed by the IRP, shall lose its DML and may not set on dolphins for the remainder of that year. Any such vessel that loses its DML on two consecutive occasions shall not be eligible to receive a DML for the following year.
2. Within six months following entry into force of this Agreement, the IRP, in cooperation with the scientific staff of the IATTC, shall develop and recommend a system by which to measure DML utilization in order to deter frivolous requests for DMLs. Such recommended system shall be presented for consideration by the Meeting of the Parties.

**III. Use of forfeited or unutilized DMLs**

1. After April 1 of each year, any DMLs which the Director determines will not be utilized pursuant to Section II or which have otherwise been forfeited shall be reallocated to the Parties consistent with this Section.
2. No later than April 15 of each year, the full-year DMLs assigned to those vessels that have not utilized them, pursuant to Section II, or have otherwise forfeited them, shall be redistributed among the Parties by the Director, consistent with the formula established pursuant to Section I, paragraph 5, but after first adjusting such formula as set forth in subparagraphs (a), (b) and (c) below. Such additional DMLs may be reallocated by the individual Parties among qualified vessels under the jurisdiction of such Party, subject to limitations and conditions set forth in paragraphs 3, 4, 5, 6 and 7 of this Section.
    a. In performing the reallocation, any vessels that may have lost or otherwise forfeited DMLs under this paragraph, and any vessels requesting second-semester DMLs after the deadline set forth in Section I, paragraph 1, shall not be considered.
    b. Prior to establishing the number of DMLs available for reallocation under this Section, adjustment shall be made by subtracting from such number any observed dolphin mortalities caused by those vessels that lost their DMLs under Section II, paragraph 1.
    c. Prior to establishing the number of DMLs available for reallocation under this Section, the Director shall deduct one third of the ADML calculated pursuant to Section I, paragraph 5, for allocation to each vessel requesting a second-semester DML prior to the deadline established pursuant to Section I, paragraph 1. Such second-semester DMLs shall be allocated by the Director to the Parties proportionately, based upon the jurisdiction of respective Parties over vessels covered under this subparagraph. The second-semester DMLs assigned to such vessels by the Parties under whose jurisdiction they operate shall not exceed one-third of the ADML calculated pursuant to Section I, paragraph 5. Such vessels may not begin setting on dolphins before July 1 of that year.
3. Any Party may adjust the DMLs of its qualified vessels which meet the criteria set forth in Section I, paragraph 2, of this Annex either upward or downward, provided that no vessel is assigned an adjusted DML in excess of 50 percent above its initial DML, unless its performance in successfully reducing dolphin mortalities, as measured by the IRP, is in the upper 60 percent of the performance of the international fleet as a whole, as determined by the IRP, based upon the prior year's data. A Party making such an adjustment shall so notify the Director no later than May 5, and no such adjustment shall take effect until the Director has been notified.
4. No vessel may have its initial DML adjusted upward by any Party if the IRP had determined, and the Party with jurisdiction over the vessel concurs, that during that year or the previous year:
    a. the vessel fished without an observer;
    b. the vessel set on dolphins without a DML;
    c. the vessel set on dolphins after reaching its DML;

d. the vessel knowingly set on a banned dolphin stock;

e. the captain, crew, or the vessel owner committed any of the actions described in Annex II, Paragraph 6(f) of this Agreement;

f. the vessel made a sanctionable night set; or

g. the vessel used explosives during any phase of a fishing operation involving dolphins.

For infractions described in (a), (b), (c), (d), (f), and (g), a Party will be deemed to have provided such concurrence if it does not object to the IRP within six months of a referral of a possible violation from the IRP. For the infraction described in (e), a Party will be deemed to have provided such concurrence if it does not object to the IRP within 12 months of such referral.

5. No vessel may be eligible to receive an additional allocation of DML by a Party unless it has on board all of the required dolphin safety gear and equipment throughout the year; and no such upward allocation may be made for a vessel which has exceeded its initial DML prior to April 1, unless due to force majeure or extraordinary circumstances, as agreed by the Meeting of the Parties, in consultation with the IRP.

6. For any vessel exceeding its DML, as it may be adjusted pursuant to this Annex, during a given year, the amount of such excess, plus an additional 50 percent of that amount, unless the IRP recommends otherwise, shall be deducted from DMLs assigned to that vessel by a Party under whose jurisdiction the vessel operates over subsequent years in a manner prescribed by the IRP.

7. If at any time a vessel meets or exceeds its DML, as it may be adjusted pursuant to this Annex, that vessel shall immediately cease all fishing for tuna in association with dolphins.

## IV. Implementation

1. The Parties shall ensure that in the implementation of the DML system established by this Annex, the per-stock, per-year dolphin mortality caps, as specified in Annex III, are not exceeded.

2. In cases involving unusual or extraordinary circumstances not foreseen in this Annex, the Parties, as recommended by the IRP, may take such measures as are necessary, consistent with the provisions of this Annex, in order to implement the DML system.

3. If the mortality in any given year increases above levels which the IRP considers to be significant, the IRP shall recommend that the Parties hold a meeting to review and identify the causes of mortality and formulate options to address such causes.

## Annex V

### SCIENTIFIC ADVISORY BOARD

1. The Parties shall maintain the Scientific Advisory Board of technical specialists established pursuant to the La Jolla Agreement to assist the Director in matters regarding research to

   a. modify current purse-seine technology to make it less likely to cause dolphin mortality and

   b. seek alternative means of capturing large yellowfin tuna.

2. The functions and responsibilities of the Board shall be to:

   a. Meet at least once each year;

   b. Review plans, proposals, and research programs of the IATTC to seek to meet the objectives set forth in paragraph 1 above;

   c. Provide advice to the Director concerning the design, facilitation, and guidance of research to achieve the objectives set forth in paragraph 1 above; and

   d. Assist the Director in locating sources of funding to conduct such research.

3. The Board will consist of no more than 10 members, no more than two of whom shall be from any one country, selected from the international community of scientists, fishing gear experts, the fishing industry, and environmentalists. The members will be proposed by the Director on the basis of their technical expertise, and

each one will be subject to approval by the Parties.

## Annex VI

### NATIONAL SCIENTIFIC ADVISORY COMMITTEES

1. The functions of the National Scientific Advisory Committees (NATSACs), established in accordance with Article XI of this Agreement, shall be, inter alia, to:
   a. Receive and review relevant data, including data provided to national authorities by the Director;
   b. Advise and recommend to their governments measures and actions that should be undertaken to conserve and manage stocks of living marine resources in the Agreement Area;
   c. Make recommendations to their governments regarding research needs, including research concerning ecosystems, the effects of climatic, environmental and socioeconomic factors, the effects of fishing as well as on measures contemplated in this Agreement, fishing techniques and practices, and gear technology research, including the development and use of selective environmentally safe and cost-effective fishing gear; and the coordination and facilitation of such research;
   d. Conduct scientific reviews and assessments by the year 1998 or as soon as possible thereafter, regarding progress toward the year 2001 objective of achieving a per-stock, per-year cap of 0.1 percent $N_{min}$, and make appropriate recommendations to their governments concerning these reviews and assessments, as well as additional assessments in the year 2001 consistent with this Agreement;
   e. Ensure the regular and timely full exchange of data among the Parties and the NATSACs on catch of tuna and associated species and bycatch, including dolphin mortality data, for the purposes of developing conservation and management recommendations to their governments as well as recommendations for enforcement and scientific research while not violating the confidentiality of business confidential data;
   f. Consult with other experts as necessary for the purpose of gathering as much information as possible that might be useful for achieving the objectives of this Agreement; and
   g. Perform such other functions as their respective governments might assign to them.
2. Reports of the NATSACs, including of their cooperative meetings, shall be made available to the Parties and the public, in a manner consistent with any applicable confidentiality requirements.
3. The Director may convene, in addition to the meetings pursuant to Article XI, paragraph 3, meetings with the purpose of facilitating consultation among the NATSACs.
4. The functions of the meetings of the NATSACs shall be to:
   a. Exchange information;
   b. Review IATTC research to achieve the objectives of this Agreement; and
   c. Make recommendations to the Director concerning the future research program to achieve the objectives of this Agreement.
5. The NATSAC members from any Party who attend the meeting shall be designated by that Party.

## Annex VII

### INTERNATIONAL REVIEW PANEL

1. In compliance with Article XII of this Agreement, the International Review Panel (IRP) shall have the following functions:
   a. Each year compile a list of the vessels that qualify for DMLs as agreed in Annex IV;
   b. Analyze the reports submitted to the IRP, regarding all tuna-fishing trips made by vessels covered by this Agreement;
   c. Identify possible infractions, based on the list of possible infractions approved by the Meeting of the Parties;

d. Inform each Party, through the Director, of possible infractions committed by vessels flying its flag or operating under its jurisdiction, and receive from that Party information on the actions taken;

e. Maintain an updated report on the actions taken by the Parties to provide adequate training for fishing captains, and maintain a list of those fishing captains determined to be complying with established performance requirements, based on the information provided by each of the Parties;

f. Recommend to the Meeting of the Parties pertinent measures for achieving the objectives of this Agreement, in particular those related to the use of gear, equipment and fishing techniques, considering improvements in technologies, as well as the adoption of appropriate incentives for captains and crews to meet the objectives of this Agreement;

g. Prepare and provide the Meeting of the Parties an annual report on those aspects of the operation of the fleet relating to the implementation of this Agreement, including a summary of possible infractions identified and the actions taken by the Parties;

h. Recommend to the Parties ways to progressively reduce dolphin mortality incidental at the fishery in the Agreement Area; and

i. Perform other functions as assigned by the Meeting of the Parties.

2. The IRP shall be made up of representatives of the Parties ("governmental members"), three representatives of non-governmental environmental organizations with recognized experience in matters pertaining to this Agreement and with offices in the territory of a Party, and three representatives from the tuna industry that operates under the jurisdiction of any of the Parties in the Agreement Area ("non-governmental members").

3. The non-governmental members shall have a two-year term of membership, starting at the first meeting of the IRP immediately after their election.

4. The non-governmental members will be elected in accordance with the following procedure:

   a. Prior to the expiration of the term of a non-governmental member, the relevant non-governmental organizations may present candidates' nominations 60 days before the expiration of the term to the Director. A curriculum vitae should accompany each nomination. The current non-governmental members may be nominated for additional periods.

   b. Once the nominations are received, the Director shall transmit them in writing to the Parties within 10 days. The Parties should send their votes to the Director within 20 days of the transmittal of the nominations by the Director. In this election, the three nominees from each non-governmental sector who receive the most votes shall be elected; the nominee who receives the fourth largest number of votes shall be designated the alternate member. In the case of a tie, the Director should solicit a new vote from the Parties to determine the member and the alternate.

   c. If a non-governmental position becomes permanently vacant, because of death, resignation, or failure to participate in three consecutive meetings of the IRP, the alternate shall fill the position for the remainder of that position's term. The candidate who received the fifth largest number of votes in the elections referred to in paragraphs (a) and (b) shall be designated the alternate member. If additional vacancies occur, the Director shall inform the relevant non-governmental organizations so that new candidates may be submitted for an election process consistent with that described in paragraphs (a) and (b).

   d. Each alternate may attend the meetings of the IRP, but shall have no speaking rights if all the members of his/her respective sector are present.

5. The IRP shall hold at least three meetings a year, one of which will preferably be held on the occasion of the ordinary Meeting of the Parties.

6. The IRP may convene additional meetings at the request of at least two of the Parties, provided that a majority of the Parties support the request.

7. The IRP meetings shall be chaired by a Presider elected by the governmental members at the beginning of each meeting, who shall decide on matters of order. Any member shall have the right to ask that any decision made by the Presider be decided as specified in Paragraph 9 of this Annex.

8. The meetings shall be in Spanish and English, and IRP documents shall also be produced in both languages.

9. The decisions at the meetings of the IRP shall be adopted by consensus among the governmental members.

10. The following criteria shall be applied to attendance at IRP meetings:1

    a. There shall be no restrictions on the number of persons a Party can include in its delegation to an IRP meeting.

    b. Any IATTC member State or Signatory to this Agreement may be represented by an observer.

    c. Any State not a member of the IATTC and any State or regional economic integration organization not a signatory to this Agreement may be represented by an observer, with prior notification to IRP governmental members, unless any governmental member of the IRP objects in writing.

    d. The Director may invite representatives of intergovernmental organizations as observers, with prior notification to IRP members, unless any governmental member of the IRP objects in writing.

    e. In any cases referred to in (c) and (d) above, the Director shall not disclose the identity of the objecting Party.

    f. Each observer is limited to two delegates, but may bring more with the approval of two-thirds of the governmental members of the IRP.

11. In cases of urgency, and without prejudice to the provisions of paragraph 9 of this Annex, the IRP may take decisions by correspondence through a vote of the governmental members, under the following procedures:

    a. The proposal shall be circulated to all members of the IRP, in writing, with all pertinent documentation, at least fourteen days before the proposed effective date of the resolution, action, or measure; the votes shall be transmitted to the Director no less than seven days before the proposed effective date;

    b. The proposal shall be considered urgent unless a simple majority of the governmental members objects in writing; the proposal shall be accepted unless any governmental member objects in writing; and

    c. The Director shall circulate the proposal as well as the accompanying documentation, receive and count the votes, and inform the IRP members of the results of a vote as soon as the voting closes.

12. The Director will carry out the functions of the Secretary, which shall include:

    a. Assisting in the convening and organization of IRP meetings;

    b. Presenting information required by the IRP for carrying out its functions and responsibilities, including observer IRP forms and field data forms providing information on the activities of the vessels, dolphin mortality, and the presence, condition, and use of the dolphin safety equipment and gear;

    c. Preparing minutes of all meetings and draft special reports and documents dealing with the activities of the IRP;

    d. Providing to each Party, for its consideration, recommendations and information concerning possible infractions identified by the IRP for vessels under its jurisdiction;

    e. Distributing to the IRP information received from Parties on the actions taken on possible infractions identified by the IRP;

    f. Publishing the Annual Report of the IRP and making it available to the public, in accordance with the instructions given by the Meeting of the Parties;

    g. Presenting to the members of the IRP information received from the Parties referred to in Paragraph 1(e) of this Annex; and

    h. Carrying out other tasks necessary for the accomplishment of the IRP's functions, as assigned by the Parties.

13. The rules of procedure of the IRP may be modified by the Meeting of the Parties. Modifications may be recommended by the IRP.

14. The members of the IRP and any other participants invited to attend IRP meetings as observers shall treat all the information presented at such meetings in accordance with the provisions of confidentiality set forth in Article

XVIII of this Agreement.

## Annex VIII

### OPERATIONAL REQUIREMENTS FOR VESSELS

1. For the purposes of this Annex:
   a. "Strip" means a section of net that is approximately 6 fathoms deep.
   b. "Backdown" means the procedure for releasing captured dolphins by shifting the vessel's engine(s) into reverse during net retrieval, causing the net remaining in the water to form a channel, and the corkline at the apex of the channel to submerge.
   c. "Bunch" means a length of corkline gathered together.
   d. "Sack-up" means that part of the fishing process when the catch is concentrated near the surface for loading aboard the vessel.
2. Dolphin Safety Gear and Equipment Requirements

   A vessel with a carrying capacity of more than 363 metric tons (400 short tons) operating in the Agreement Area shall:
   a. Have a purse seine equipped with a dolphin safety panel (DSP) with the following characteristics:
      i. A minimum length of 180 fathoms (as measured before installation), except that the minimum length of the DSP in nets deeper than 18 strips must be determined in a ratio of 10 fathoms in length for each strip of net depth. The DSP must be installed so as to cover the backdown channel along the corkline, beginning at the outboard end of the last bow bunch pulled and continuing to at least two-thirds the distance from the apex of the backdown channel to the point where the net is secured at the stern. The DSP shall consist of small-mesh webbing not to exceed 1 ¼ inches (3.2 cm) stretched mesh, extending downward from the corkline to a minimum depth of two strips.
      ii. Each end shall be identified with a highly visible marker.
      iii. Any space between the corks or the corkline and the small mesh shall not exceed 1 3/8 inches (3.5 cm) in diameter.
   b. Have at least three operable speedboats equipped with towing bridles or posts, and tow lines;
   c. Have an operable raft suitable for the observation and rescue of dolphins;
   d. Have at least two operable facemasks suitable for underwater observation; and
   e. Have an operable long-range floodlight with a minimum output of 140,000 lumens.
3. Dolphin Protection and Release Requirements and Prohibitions

   A vessel with a carrying capacity of more than 363 metric tons (400 short tons) operating in the Agreement Area shall:
   a. Perform backdown during every set in which dolphins are captured, until it is no longer possible to remove live dolphins from the net by this procedure. At least one crewman shall be deployed during backdown to aid in the release of dolphins;
   b. Continue efforts to release any live dolphins remaining in the net after backdown, so that all live dolphins are released prior to the initiation of the sack-up procedure;
   c. Not sack-up or brail live dolphins;
   d. Avoid injuring or killing dolphins captured in the course of fishing operations;
   e. Complete backdown no later than thirty minutes after sunset, as determined by an accurate and reliable source approved by the Parties. A set that does not meet this requirement is termed a "night set";
   f. Not use any type of explosive during any phase of a fishing operation involving dolphins (underwater flares are not considered to be explosives);

g. Cease setting on dolphins when its DML has been reached;

h. Not intentionally set on dolphins if the vessel does not have a DML; and

i. Perform a periodic net alignment to ensure the proper location of the dolphin safety panel during the backdown procedure, based on criteria established by the IRP.

It is emphasized that the above requirements should not lead to crewmen being placed in situations that present unnecessary risks to their personal safety.

4. Exceptions

a. A vessel without a DML is exempt from the requirements of Paragraph 2 of this Annex and from the obligation of carrying out the backdown maneuver mentioned in Paragraph 3 of this Annex unless the Party with jurisdiction over that vessel determines otherwise.

b. Any such vessel that captures dolphins accidentally shall attempt to release the dolphins, using every means at its disposal, including aborting the set, and taking into consideration the requirements set forth in paragraph 3 of this Annex.

5. Treatment of Observers

Captains, crew, and other personnel shall comply with their responsibilities regarding the presence of observers aboard their vessels, as specified in Annex II, paragraph 6.

6. Vessels under 363 metric tons (400 short tons)

No vessel with a carrying capacity of 363 metric tons (400 short tons) or less may intentionally set on dolphins.

## Annex IX

### ELEMENTS OF A TUNA TRACKING AND VERIFICATION PROGRAM

1. Pursuant to Article V, paragraph 1(f), the Parties shall establish a program to track and verify tuna harvested by vessels in the Agreement Area, based on the following elements:

a. the use of weight calculation for the purposes of tracking tuna caught, landed, processed and exported;

b. additional measures to enhance current observer coverage, including the establishment of criteria for training and for improving monitoring and reporting capabilities and procedures;

c. the designation of well location, procedures for sealing holds, procedures for monitoring and certifying both above and below deck, or through equally effective methods;

d. the reporting, receipt, and database storage of radio and facsimile transmittals from vessels containing information related to the tracking and verification of such tuna;

e. the shore-based verification and tracking of such tuna throughout the fishing, transshipment, and canning process by means of On-board Observer Program trip records ;

f. the use of periodic audits and spot checks for caught, landed, and processed tuna products; and

g. the provision of timely access to relevant data.

2. Each Party shall implement this program in its respective territory, on vessels subject to its jurisdiction and in marine areas with respect to which it exercises sovereignty or sovereign rights and jurisdiction.

## Annex X

### GUIDELINES AND CRITERIA FOR THE PARTICIPATION OF OBSERVERS AT MEETINGS OF THE PARTIES

1. The Director shall invite to Meetings of the Parties convened pursuant to Article VIII intergovernmental organizations whose work is relevant to the implementation of this Agreement, as well as non-Parties whose participation may promote implementation of this Agreement.

2. Non-governmental organizations (NGOs) with recognized experience in matters pertaining to this Agreement shall be eligible to participate as observers in all Meetings of the Parties convened pursuant to Article VIII except meetings held in executive session or meetings of Heads of Delegation.

3. Any NGO desiring to participate as an observer in a Meeting of the Parties shall notify the Director of its desire to participate at least 50 days in advance of the Meeting. The Director shall notify the Parties of the names of such NGOs at least 45 days prior to the beginning of the Meeting.
4. If a Meeting of the Parties is held with less than 50 days notice, the Director shall have greater flexibility concerning the timing of the sending of the invitations.
5. An NGO desiring to participate as an observer may do so unless a majority of the Parties formally objects for cause in writing at least 30 days prior to the beginning of the meeting in question.
6. Any participating observer may:
   a. attend meetings, subject to paragraph 2 of this Annex, but not vote;
   b. make oral statements during the meetings upon the invitation of the chairman;
   c. distribute documents at the meeting, with the approval of the chairman; and
   d. engage in other activities, as appropriate and as approved by the chairman.
7. The Director may require NGO observers to pay reasonable fees, and to cover costs attributable to their attendance (*e.g.* copying expenses).
8. All observers admitted to a Meeting of the Parties shall be sent or otherwise provided the same documentation generally available to Parties, except documentation containing business-confidential data.
9. All observers admitted to a Meeting of the Parties shall comply with all rules and procedures applicable to other participants in the meeting.

FOR BELICE
POR BELICE

FOR THE REPUBLIC OF COLOMBIA
POR LA REPUBLICA DE COLOMBIA
[signed May 21, 1998]

FOR THE REPUBLIC OF COSTA RICA
POR LA REPUBLICA DE COSTA RICA
[signed May 21, 1998]

FOR THE REPUBLIC OF CHILE
POR LA REPUBLICA DE CHILE

FOR THE REPUBLIC OF ECUADOR
POR LA REPUBLICA DE ECUADOR
[signed May 21, 1998]

FOR THE REPUBLIC OF EL SALVADOR
POR LA REPUBLICA DE ELSALVADOR

FOR THE EUROPEAN UNION
POR LA UNION EUROPEA

FOR THE FRENCH REPUBLIC
POR LA REPUBLICA FRANCESA

FOR THE REPUBLIC OF GUATEMALA
POR LA REPUBLICA DE GUATEMALA

FOR THE REPUBLIC OF HONDURAS
POR LA REPUBLICA DE HONDURAS
[signed June 23, 1998]

FOR JAPAN
POR JAPON

FOR THE UNITED MEXICAN STATES
POR LOS ESTADOS UNIDOS DE MEXICO
[signed May 21, 1998]

FOR THE REPUBLIC OF NICARAGUA
POR LA REPUBLICA DE NICARAGUA
[signed May 21, 1998]

FOR THE REPUBLIC OF PANAMA
POR LA REPUBLICA DE PANAMA
[signed May 21, 1998]

FOR THE REPUBLIC OF PERU
POR LA REPUBLICA DE PERU

FOR SPAIN
POR ESPAÑA

FOR THE UNITED STATES OF AMERICA
POR LOS ESTADOS UNIDOS DE AMERICA
[signed May 21, 1998]

FOR THE REPUBLIC OF VANUATU
POR LA REPUBLICA DE VANUATU
[signed June 26, 1998]

FOR THE REPUBLIC OF VENEZUELA
POR LA REPUBLICA DE VENEZUELA
[signed May 21, 1998]

## APPENDIX 10

The Commission's Financial Regulations were formally approved and adopted at the IATTC's 40th meeting, held on October 19-21, 1982. Section 5.2 was amended at the IATTC's 62nd meeting, held on October 15-17, 1998. The amended version appears below.

## FINANCIAL REGULATIONS

### Section I - Applicability

1.1. These regulations shall govern the financial administration of the Inter-American Tropical Tuna Commission.

### Section II - Financial Year

2.1. The financial year shall be the period from October 1 to the following September 30, both dates inclusive.

### Section III - The Budget

3.1. The annual budget estimates shall be prepared by the Director of Investigations.

3.2. The estimates shall cover income and expenditures for the financial year to which they relate, and shall be stated in the currency of the country where the headquarters is located.

3.3. For comparative purposes, and as a matter of reporting on the prior year and current year operations, the annual budget estimates shall show actual income, expenditures, and changes in obligations for the prior year, together with estimates for the current year and for the coming (financial) year.

3.4. The annual budget estimates shall be divided into Sections (projects) corresponding to the organization and program and shall be accompanied by such information, annexes and explanatory statements as may be requested on behalf of the Commission, and such further annexes or statements as the Director of Investigations may deem necessary and useful.

3.5. The Director of Investigations shall submit at the regular annual meeting of the Commission, budget estimates for the two following financial years together with corresponding actual expenditures and changes in obligations for the prior year and estimates for the current year. The estimates shall be transmitted to all Commissioners at least sixty days prior to the opening of the regular annual meeting of the Commission.

3.6. After due consideration of the budget previously adopted for the next following financial year by the Commission at its preceding annual meeting, and of any differences between that and the amounts approved by the Member Governments, the Commission shall adopt a final budget for the following financial year at the annual meeting. At the same meeting the Commission shall consider the program and budget proposed by the Director of Investigations for the second following financial year, and shall adopt a budget therefor to be forwarded to the Member Governments for approval.

3.7. In preparing budget estimates for consideration of the Commission, the Director of Investigations shall fully take into account any unobligated funds carried over from previous years' contributions, and any other income, which may be available for expenditure in the year for which the budget estimates are prepared.

3.8. Supplementary estimates may be submitted by the Director of Investigations when and as he may deem necessary. After consultation with the Chairman, the Director of Investigations shall submit recommended assessments on the respective Contracting Parties to each national section for approval. Upon receipt by the Director of Investigations of each national section's approval thereof, the estimates and the assessments shall be deemed to have been adopted by the Commission and shall be submitted to the Contracting Parties for approval.

3.9. In the event that any Contracting Party or Parties should disapprove any budget adopted by the Commission, the Director of Investigations shall immediately notify each national section of the fact. The Director of Investigations, after consulting with the Chairman, shall recommend to each national section such revisions of the budget as seem desirable and such revisions of the respective Contracting Parties' assessments as may be necessary.

### Section IV - Publication of Budget

4.1. The budget of the Commission showing the projects proposed and the estimated cost of each, together with actual expenditures for the previous year, shall be printed in the annual report of the Commission.

## Section V - Appropriations

5.1. The appropriations voted by the Commissions to the extent they are received from the Contracting Parties, shall constitute an authorization to the Director of Investigations to incur obligations and make payments for the purposes for which the appropriations were voted and up to the amounts so voted.

5.2. The Director of Investigations is authorized to carry forward unobligated funds from one fiscal year to the next in the amount of 25 percent of the total budget to meet contingencies. When the amount of such unobligated funds exceed 25 percent the Director shall consult with the Commissioners to decide whether the excess funds should be used to fund special research projects or to credit the member countries in proportion to the amounts they were billed for in that fiscal year.

5.3. Transfer between appropriation Sections (projects) may be made by the Director of Investigations up to an amount equal to 20% of the original appropriations for any Section (project). Transfer between appropriation Sections (projects) in excess of this amount must be authorized by the Chairman of the Commission.

## Section VI - Provision of Funds

6.1. The appropriations shall be financed by contributions from the Contracting Parties, in accordance with Article 1, paragraph 3 of the International Convention for the Inter-American Tropical Tuna Commission. Pending the receipt of such contributions, the appropriations may be financed from any remaining unobligated funds from previous years' contributions or other receipts.

6.2. In the assessment of the contributions of the Contracting Parties, adjustments shall be made to the amounts of the appropriations approved by the Commission for the following financial year in respect of:

(a) Supplementary appropriations for which contributions have not previously been assessed on the Contracting Parties:

(b) Miscellaneous income from which credits have not previously been taken into account, and any adjustments in estimated miscellaneous income previously taken into account;

(c) Contributions resulting from the assessments of new Member States under the provisions of Regulation 6.8.

6.3. After the Commission has adopted the budget, the Director of Investigations shall:

(a) Transmit the relevant documents to the Contracting Parties;

(b) Inform the Contracting Parties of their commitments with respect to annual contributions;

(c) Request them to remit their contributions.

6.4. Contributions shall be payable by the Contracting Parties in the currency of the country in which the Headquarters of the Commission is located, except that the Commission may accept payment in the currencies in which it may be anticipated that expenditures of the Commission will be made from time to time, up to an amount established each year by the Commission in connection with the preparation of the annual budget.

6.5. Contributions shall be payable by the Contracting Parties as of the first day of the financial year to which they relate. As of the first day of the following financial year, the unpaid balance of such contributions shall be considered to be one year in arrears.

6.6. Payments made by a Contracting Party shall be credited to the contributions due in the order in which the Contracting Party was assessed.

6.7. The Director of Investigations shall submit to the regular annual meeting of the Commission a report on the collection of contributions.

6.8. New Member States shall be required to make a contribution for the year in which they become members. New Member States whose ratifications become effective during the first six months of a financial year shall be required to pay a full year's assessment. New Member States whose ratifications become effective during the last six months of a financial year shall be required to pay one-half year's assessment.

6.9. The assessment of contributions for Member States which withdraw from the Commission shall be based on the fraction of the financial year that the withdrawing state was a member of the Commission.

## Section VII - Funds

7.1. There shall be established a General Fund for the purpose of accounting for the income and expenditures of the Commission. The contributions paid by Contracting Parties under Regulation 6.1 and all miscellaneous income shall be credited to the General Fund.

## Section VIII - Other Income

8.1. All other income except:

(a) Contributions to the annual budget; and

(b) Refunds and direct expenditures made during the financial year shall be classed as miscellaneous income and credited to the General Fund.

## Section IX - Custody of Funds

9.1. The Director of Investigations shall designate the bank or banks in which the funds of the Commission shall be kept.

9.2. To the extent practicable, funds which may be held for some time shall be maintained in interest-bearing bank savings accounts.

## Section X - Internal Controls

10.1. The Director of Investigations shall:

(a) Establish detailed financial procedures in order to ensure effective financial administration and the exercise of economy;

(b) Cause all payments to be made on the basis of supporting vouchers and other documents which ensure that the services or goods have been received, and that payment has not previously been made;

(c) Designate the officers of the secretariat who may receive monies, incur obligations and make payments on behalf of the Commission;

(d) Maintain an internal financial control which shall provide for an effective current examination and/or review of financial transactions in order to ensure:

(i) The regularity of the receipt, custody and disposal of all funds and other financial resources of the Commission;

(ii) The conformity of obligations and expenditures with the appropriations or other financial provision voted by the Commission;

(iii) The economic use of the resources of the Commission.

10.2. No obligations shall be incurred until allotments or other appropriate authorizations have been made in writing under the authority of the Director of Investigations.

10.3. The Director of Investigations may, after full investigation, authorize the writing off of losses of accountable equipment, and other assets, provided that a statement of all such amounts written off shall be submitted to the Auditors with the annual accounts.

10.4. Tenders In writing for equipment, supplies, and other requirements shall be invited either by advertisement, or by direct request for quotation from at least three persons or firms able to supply the equipment, supplies, or other requirements if such exist, in connection with all purchases or contracts in excess of limits established by the Director of Investigations. For lesser amounts, but in excess of a limit established by the Director of Investigations, competition shall be obtained either by the above means or by telephone or personal inquiry. The foregoing rules, however, shall not apply in the following cases:

(a) Where equipment, supplies, or other, requisites are obtained from, or against contracts of vendors with, agencies of the governments of Member States and the equipment, supplies, and other requisites are thus furnished to the Commission at the same prices as apply to Government agencies.

(b) Where equipment, supplies or other requisites are obtained from, or against contracts of vendors with, the

University of California, which equipment, supplies, or other requisites are furnished to the Commission at the same prices, and on the same basis as they are furnished to research agencies of the University of California, under the provisions of the Co-operative Agreement between the Commission and the University of California.

(c) Where it has been ascertained that only a single supplier exists and that fact is so certified by the Director of Investigations or his authorized agent.

(d) In case of emergency, or where, for any other reasons, obtaining of competition would not be in the best interest of the economical use of the Commission's funds, and that fact is so certified by the Director of Investigations or his authorized agent.

## Section XI - The Accounts

11.1. The Director of Investigations shall maintain such accounting records as are necessary and shall submit to the Contracting Parties annual accounts showing for the financial year to which they relate:

(a) Outstanding obligations at the beginning and end of the year.

(b) Unobligated funds at the beginning and end of the year.

(c) The income and expenditures during the year.

(d) The status of appropriations, including:

(i) The original budget appropriations for the year.

(ii) The appropriations as modified by any transfers.

(iii) Credits, if any, other than appropriations voted by the Commission.

(iv) The amounts charged against those appropriations or other credits. He shall also give such other information as may be appropriate to indicate the current financial position of the Commission.

11.2. The annual accounts and accounting records of the Commission shall be presented in the currency of the country in which the Headquarters of the Commission is located; except that funds accounted for in other currencies may be shown in those currencies, with the rates of exchange, in terms of the currency of the country in which the Headquarters is located, at which they were acquired by the Commission.

11.3. The annual accounts shall be submitted by the Director of Investigations to the Auditors not later than sixty days following the end of the financial year.

## Section XII - External Audit

12.1. The accounts of the Commission shall be audited annually by a competent firm of public accountants selected by the Commission.

12.2. Having regard to the budgetary provisions for the audit, the Auditors shall perform such an audit as they deem necessary to certify:

(a) That the financial statements are in accord with the books and records of the Commission;

(b) That the financial transactions reflected in the statements have been in accordance with these Financial Regulations;

(c) That the monies on deposit and on hand have been verified by certificate received direct from the Commission's depositories of by actual count.

12.3. The Auditors shall be the sole judge as to the acceptance in whole or in part of the certifications by the Director of Investigations or his authorized agents and may proceed to such detailed examination and verifications as they choose of all financial records, including those relating to supplies, equipment and other contracts.

12.4. The Auditors may affirm by test the reliability of the internal audit, and may make such reports to the Commission with respect thereto as they may deem necessary.

12.5. The Auditors, in addition to certifying the correctness of the accounts, may make such observations as they deem desirable with respect to the efficiency of the financial procedures, the accounting system, the internal

financial controls, and in general, the financial consequences of administrative practices.

12.6. The Auditors shall have no power to disallow items in the accounts, but shall draw to the attention of the Commission for appropriate action any transaction concerning which they entertain doubt as to the validity or propriety.

12.7. The Auditors shall prepare a report on the accounts certified, and on any matters on which the Commission by resolution thereon may from time to time give specific instructions.

12.8. The Auditors shall submit their report to the Commission not later than six months following the end of the financial year to which the accounts relate.

## Section XIII - Bonding

13.1. The Director of Investigations and such other members of the staff as may be required shall be bonded by a reputable Bonding Company in such amount as may be determined by the Commission from time to time. The cost of the premium therefor shall be assumed by the Commission.

## Section XIV - General Provision

14.1. These regulations shall be effective as of the date of their approval by the Commission, and may be amended only by the Commission.

## APPENDIX 11

## FISHING GEAR AND METHODS

Fishing gear and methods are mentioned frequently in this report, so it is appropriate to describe briefly the principal types of gear and methods employed to catch tunas in the EPO.

***Baitboat***

Prior to about 1960, most of the yellowfin and skipjack tuna caught in the EPO were taken by baitboats (IATTC Bull., 1 (7)). Baitboat vessels and gear employed during the 1930s are described by Godsil (1938). Since then the boats and gear have been modernized, but the methods remain about the same. Briefly, after catching or purchasing a supply of live bait (usually sardines or anchovies) in inshore waters, the vessel proceeds to the fishing grounds and begins to search for fish. When fish are located, either visually or with a jig line that is towed behind the boat, live bait is thrown into the water to attract the fish to the stern of the vessel. Meanwhile, the fishermen station themselves in steel racks mounted just above the surface of the water at the port side and stern of the vessel and cast feathered jigs, attached with short lines to fiberglass poles, into the water. When a fish is hooked it is quickly brought aboard the vessel, and then the jig is immediately returned to the water. When the fish stop biting the fishermen leave the racks, put their poles away, store the fish in the wells of the vessel, and resume their search for fish. When the supply of bait is exhausted the vessel returns to inshore waters to catch or purchase more bait.

Technical developments made during the late 1950s (IATTC Spec. Rep., 2: 99) made purse seining a much more efficient method of catching tunas, and most of the larger baitboats were converted to purse seiners during 1959-1961.

***Purse seine***

Most of the tunas caught in the EPO are taken with purse seines. Purse-seine sets are made on three types of schools of tuna in this area. The fish are caught in association with dolphins, in association with floating objects, such as tree parts carried into the ocean by rivers, and in association only with other fish ("unassociated schools"). Nearly all of the fish caught in association with dolphins are yellowfin tuna. The yellowfin caught in association with floating objects or in unassociated schools are nearly always considerably smaller than those caught in association with dolphins. Purse seining for tunas, as it was practiced in the EPO during the late 1950s and early 1960s, is described by McNeely (1961). Subsequently, the lengths and depths of the nets have increased, and various modifications have been made to the gear and the methods of handling it to make setting and retrieving the net easier and safer and to reduce the mortalities of dolphins (Coe *et al*., 1984; Ben-Yami, 1994; Sainsbury, 1996). Briefly, a purse seine is a wall of synthetic netting about 1,500 m long and 180 m deep. One of the longer edges has plastic corks attached to it, and the other has a steel chain and steel rings attached to it. A steel cable, the "purse line," with one end attached to the winch, passes through the rings. When a school of tunas is sighted the vessel approaches the school. Then the net, with the skiff attached to one end of it, is released off the stern of the vessel in a circle around the fish. The corks cause one edge of the net to float, while the chain and rings cause the other edge to sink, so the net forms a circular wall around the fish at the port side of the vessel. Then the end of the net that is attached to the skiff is transferred to the vessel and attached to its port side and the free end of the purse line is connected to the winch. The skiff is then attached to the starboard side of the vessel with a tow line, after which it tows the vessel to the starboard to prevent it from drifting over the net. The bottom of the net is then closed by pulling the two ends of the purse line aboard with the winch. This is called "pursing," because it is similar to pulling the drawstring on an old-fashioned purse. When pursing is completed the tunas cannot escape from the net except by jumping or swimming over the corkline or swimming through holes that may be in the net. The net is pulled aboard the boat with a hydraulic "power block" attached to the end the boom. Crewmen, standing under the power block, stack the net on the stern of the boat in such a way that it will come smoothly off the stern at the beginning of the next set. When most of the net has been retrieved the fish are removed from it with a large dipnet, the "brailer," and stored in the wells of the boat. Then the rest of the net and the skiff are retrieved and the gear is prepared for the next set.

When a set is made on tunas associated with dolphins the procedure is more complicated (Coe and Sousa, 1972). Speedboats (usually five or six) with outboard engines are launched from the vessel. The speedboat drivers, acting on commands from the captain in the crow's nest of the vessel or in its helicopter, herd the dolphins into a relatively small area. Then the net is set around the dolphins and tuna, and the ends of the net and purse line are

transferred from the skiff to the vessel. The skiff is then attached to the starboard side of the vessel with a tow line, the bottom of the net is pursed, and the process of retrieving and stacking the net begins. When about two-thirds of the net is retrieved the portion of it that is adjacent to the port rail is tied to the boat and the "backdown" procedure, to remove the dolphins from the net, begins. During the backdown process the engine of the vessel is put into reverse so that the net, with the fish and dolphins in it, forms an elongated enclosure, the backdown channel. Most of the dolphins escape by swimming over the submerged corkline near the apex of the backdown channel. The ones that do not escape almost immediately are aided by men in rafts and/or one of the speedboats and by swimmers and divers who guide them to the apex of the backdown channel. Then most of the rest of the net is retrieved and the fish are removed from it as described above.

***Longline***

Longlines have been used to catch tunas and billfishes in the EPO primarily by fishermen of Japan, the Republic of Korea, and Taiwan. During the 1980s and 1990s, however, many vessels of western hemisphere nations, including Chile, Costa Rica, Ecuador, Mexico, and the United States, began fishing with longlines. Longline vessels and gear are described by Kanasashi (1960), Yoshida (1966), Suzuki *et al.* (1977), Bjordal and Løkkeborg (1996), and Sainsbury (1996). The gear is made up of "baskets," each of which consists of a main horizontal line about 250 to 800 m long with 4 to 15 branch lines, each with a wire leader and a baited hook. A typical set consists of about 200 or more baskets connected together, with a buoy at each connection, and a total of about 3,000 hooks. The hooks fish at depths of about 100 to 300 m. Squid and various species of fish are used for bait. Longline-caught fish, which are usually considerably larger than baitboat- or purse seine-caught fish, are usually sold to fresh-fish markets for high prices. Skipjack are rarely caught by longline gear.

***Trolling***

Trolling gear, which is used mainly to catch albacore, is described by Scofield (1956) and Sainsbury (1996). Lines with artificial lures are towed behind the vessel, and when a fish strikes one of the lures it is brought aboard the boat with the assistance of a hydraulically-powered gurdy.

***Gillnet***

Gillnets are used to catch swordfish off California and Baja California (Hanan *et al*., 1993) and Chile (Barbieri *et al*., 1998). A gillnet consists of a wall of fine, large-meshed synthetic netting with floats at the top and weights at the bottom to keep it vertical in the water (Sainsbury, 1996). Fish that swim into the net become entangled in its meshes. When the net is retrieved the fish are removed from it by the fishermen.

## LITERATURE CITED


Barbieri, M. A., C. Canales, V. Correa, M. Donoso, A. González Casanga, B. Leiva, A. Montiel, and E. Yáñez. 1998. Development and present state of the swordfish, *Xiphias gladius*, fishey in Chile. NOAA Tech. Rep. NMFS 142: 1-10.

Ben-Yami, M. 1994. Purse Seining Manual. Fishing News Books, Oxford, U.K.: x, 406 pp.

Bjordal, A., and S. Løkkeborg. 1996. Longlining. Fishing News Books, Oxford, U.K.: ix, 156 pp.

Coe, J. M., D. B. Holts, and R. W. Butler. 1984. The "tuna-porpoise" problem: NMFS dolphin mortality reduction research, 1970-81. Mar. Fish. Rev., 46 (3): 18-33.

Coe, J., and G. Sousa. 1972. Removing porpoise from a tuna purse seine. Mar. Fish. Rev., 34 (11-12): 15-19.

Godsil, H. C. 1938. The high seas tuna fishery of California. Calif. Dept. Fish Game, Fish Bull., 51 : 41 pp.

Hanan, D. A., D. B. Holts, and A. L. Coan, Jr. 1993. The California drift gill net fishery for sharks and swordfish, 1981-82 through 1990-91. Calif. Dept. Fish Game, Fish Bull., 175: 95 pp.

Kanasashi, Y. 1960. Longline fishing: deck design and equipment *In* Traung, J.-O. (editor), Fishing Boats of the World: 2, Fishing News (Books) Ltd., London: 73-83.

McNeely, R. L. 1961. The purse seine revolution in tuna fishing. Pacif. Fisherman, 59 (7): 27-58.

Sainsbury, J. C. 1996. Commercial Fishing Methods: an Introduction to Vessels and Gears, Third Edition. Fishing News Books, Oxford, U.K.: viii, 359 pp.

Scofield, W. L. 1956. Trolling gear in California. Calif. Dept. Fish Game, Fish Bull., 103: 45 pp.

Suzuki, Z., Y. Warashina, and M. Kishida. 1977. The comparison of catches by regular and deep tuna longline gears in the western and central equatorial Pacific. Far Seas Fish. Res. Lab., Bull., 15: 51-89.

Yoshida, H. 1966. Tuna fishing vessels, gear, and techniques in the Pacific Ocean. *In* Manar, T. A. (editor), Hawaii, Governor's Conference on Central Pacific Fishery Resources, Proc.: 67-89.

## GLOSSARY

### Abbreviations

| | |
|---|---|
| AIDCP | Agreement on the International Dolphin Conservation Program (Appendix 9) |
| AMSY | average maximum sustainable yield |
| ASCOBANS | Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas |
| BCF | U.S. Bureau of Commercial Fisheries |
| CCSBT | Commission for the Conservation of Southern Bluefin Tuna |
| CDFG | California Department of Fish and Game |
| CICIMAR | Centro Interdisciplinario de Ciencias Marinas (of the Instituto Politécnico Nacional of Mexico) |
| CPPS | Comisión Permanente del Pacífico Sur |
| CPUE | catch per unit of effort |
| CYRA | Commission's Yellowfin Regulatory Area |
| DML | dolphin mortality limit |
| EASTROPAC | eastern tropical Pacific (cruises conducted during 1967-1968) |
| EASTROPIC | eastern tropical Pacific (cruises conducted during 1955) |
| EPO | eastern Pacific Ocean |
| EU | European Union |
| FAD | fish-aggregating device |
| FAO | Food and Agriculture Organization (of the United Nations) |
| FSFRL | Far Seas Fisheries Research Laboratory (of Japan) |
| FUDENA | Fundación para la Defensa de la Naturaleza (Venezuela) |
| FUNDATUN | Fundación para la Pesca Sostenida y Responsable de Túnidos (Venezuela) |
| FWS | U.S. Fish and Wildlife Service |
| IATTC | Inter-American Tropical Tuna Commission |
| ICCAT | International Commission for the Conservation of Atlantic Tunas |
| IGM | Intergovernmental Meeting |
| IOTC | Indian Ocean Tuna Commission |
| IPTP | Indo-Pacific Tuna Development and Management Programme |
| IRP | International Review Panel |
| IWC | International Whaling Commission |
| MMPA | U. S. Marine Mammal Protection Act |
| mt | metric ton |
| nm | nautical mile |
| NMFS | U.S. National Marine Fisheries Service |
| NRFRL | Nankai Regional Fisheries Research Laboratory (of Japan) |
| NRIFSF | National Research Institute of Far Seas Fisheries (of Japan) |
| OAS | Organization of American States |
| OFCF | Overseas Fishery Cooperation Foundation (of Japan) |
| OLDEPESCA | Organización Latinoamericana de Desarrollo Pesquero |
| OSPESCA | Organización del Sector Pesquero y Acuícola del Istmo Centroamerica |
| PNAAPD | Programa Nacional de Aprovechamiento del Atún y Protección de Delfines (of Mexico) |
| PNOV | Programa Nacional de Observadores de Venezuela |
| PRADEPESCA | Programa Regional de Apoyo al Desarrollo de la Pesca en el Istmo Centroamericano |
| PROBECUADOR | Programa Nacional de Observadores Pesqueros de Ecuador |
| SAB | Scientific Advisory Board |
| SIO | Scripps Institution of Oceanography (of the University of California at San Diego) |
| SPC | *formerly* South Pacific Commission; *now* Secretariat of the Pacific Community |
| st | short ton |
| UN | United Nations |
| UNEP | United Nations Environmental Programme |
| UNESCO | United Nations Educational, Scientific, and Cultural Organization |
| WPO | western Pacific Ocean |
| 1992 La Jolla Agreement | Agreement for the Conservation of Dolphins (Appendix 8) |

**Common and scientific names**

| | |
|---|---|
| albacore tuna | *Thunnus alalunga* |
| anchoveta | *Cetengraulis mysticetus* |
| anchovy | Engraulidae |
| bigeye tuna | *Thunnus obesus* |
| black marlin | *Makaira indica* |
| black skipjack tuna | *Euthynnus lineatus* |
| blue marlin | *Makaira nigricans* or *M. mazara* |
| bullet tuna | *Auxis rochei* |
| colorado | *Anchoa naso* |
| common dolphin | *Delphinus delphis* and/or *D. capensis* |
| corvina | Sciaenidae |
| dolphinfish | *Coryphaena hippurus* and/or *C. equiselis* |
| herring | Clupeidae |
| frigate tuna | *Auxis thazard* |
| northern anchovy | *Engraulis mordax* |
| Pacific bluefin tuna | *Thunnus orientalis* |
| Pacific sardine | *Sardinops sagax* |
| sailfish | *Istiophorus platypterus* |
| shortbill spearfish | *Tetrapturus angustirostris* |
| sierra | *Scomberomorus sierra* |
| skipjack tuna | *Katsuwonus pelamis* |
| snapper | Lutjanidae |
| southern anchovy | *Engraulis ringens* |
| spinner dolphin | *Stenella longirostris* |
| spotted dolphin | *Stenella attenuata* |
| striped marlin | *Tetrapturus audax* |
| swordfish | *Xiphias gladius* |
| thread herring | *Opisthonema medirastre*, *O. berlangai*, *O. libertate*, and/or *O. bulleri* |
| triggerfish | Balistidae |
| wahoo | *Acanthocybium solandri* |
| yellowfin tuna | *Thunnus albacares* |

The IATTC's responsibilities are met with two programs, the Tuna-Billfish Program and the Tuna-Dolphin Program. The principal responsibilities of the Tuna-Billfish Program are (1) to study the biology of the tunas and related species of the eastern Pacific Ocean to estimate the effects that fishing and natural factors have on their abundance, (2) to recommend appropriate conservation measures so that the stocks of fish can be maintained at levels which will afford maximum sustainable catches, and (3) to collect information on compliance with Commission resolutions. The principal responsibilities of the Tuna-Dolphin Program are (1) to monitor the abundance of dolphins and their mortality incidental to purse-seine fishing in the eastern Pacific Ocean, (2) to study the causes of mortality of dolphins during fishing operations and promote the use of fishing techniques and equipment that minimize these mortalities, (3) to study the effects of different modes of fishing on the various fish and other animals of the pelagic ecosystem, and (4) to provide a secretariat for the International Dolphin Conservation Program.

An important part of the work of the IATTC is the prompt publication and wide distribution of its research results. The Commission publishes its results in its Bulletin, Special Report, and Data Report series, all of which are issued on an irregular basis, and its Stock Assessment Reports, which are published annually.

The Commission also publishes Annual Reports and Quarterly Reports, which include policy actions of the Commission, information on the fishery, and reviews of the year's or quarter's work carried out by the staff. The Annual Reports also contain financial statements and a roster of the IATTC staff.

Additional information on the IATTC's publications can be found in its web site.

La CIAT cumple sus obligaciones mediante dos programas, el Programa Atún-Picudo y el Programa Atún-Delfín. Las responsabilidades principales del primero son (1) estudiar la biología de los atunes y especies afines en el Océano Pacífico oriental a fin de determinar los efectos de la pesca y los factores naturales sobre su abundancia, (2) recomendar medidas apropiadas de conservación para permitir mantener los stocks de peces a niveles que brinden las capturas máximas sostenibles, (3) reunir información sobre el cumplimiento de las resoluciones de la Comisión. Las responsabilidades principales del segundo son (1) dar seguimiento a la abundancia de los delfines y la mortalidad de los mismos incidental a la pesca con red de cerco en el Océano Pacífico oriental, (2) estudiar las causas de la mortalidad de delfines durante las operaciones de pesca y fomentar el uso de técnicas y aparejo de pesca que reduzcan dicha mortalidad al mínimo, (3) estudiar los efectos de distintas mortalidades de pesca sobre los varios peces y otros animales del ecosistema pelágico, (4) proporcionar la Secretaría para el Programa Internacional para la Conservación de los Delfines.

La pronta publicación y amplia distribución de los resultados de investigación forman un aspecto importante de las labores de la Comisión, la cual publica los resultados en su serie de Boletines, Informes Especiales, e Informes de Datos, los cuales son emítidas en forma irregular, y sus Informes de Evaluación de Stocks, que son publicados anualmente.

La Comisión publica también Informes Anuales e Informes Trimestrales; éstos incluyen información sobre las labores de la Comisión, la pesquería, y las investigaciones realizadas en el año o trimestre correspondiente. Los Informes Anuales incluyen también un resumen financiero y una lista del personal de la CIAT.

Información adicional de las publicaciones de la CIAT puede ser encontrado en su sitio de internet.

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