MINUTES OF THE 57TH MEETING OF THE INTER-AMERICAN TROPICAL TUNA COMMISSION

La Jolla, California, USA

October 21-23, 1996

Agenda Item 1 - Opening of the meeting

The meeting was called to order on October 21, 1996, at 10:00 a.m., by Dr. James Joseph, Director of the Inter-American Tropical Tuna Commission (IATTC). He called for nominations for Chairman of the meeting. The representative of Costa Rica nominated the United States, and this was seconded by the representative from Venezuela. All were in agreement, and Dr. Michael Tillman of the United States offered that Mr. Brian Hallman of the U.S. Department of State serve as Chairman. Mr. Hallman welcomed everyone to the meeting, and called for introductions. Representatives of the governments of Costa Rica, France, Japan, Panama, the United States, Vanuatu, and Venezuela introduced themselves, as did observers from Canada, Colombia, Ecuador, El Salvador, Mexico, the Republic of China, the Russian Federation, Spain, the European Community, the Great Lakes Fishery Commission, the International Commission for the Conservation of Atlantic Tunas, the International Whaling Commission, the Organización Latinoamericana de Desarrollo Pesquero (OLDEPESCA), the American Cetacean Society, the Center for Marine Conservation, the Earth Island Institute, the Fishermen's Coalition, the Fundación para la Defensa de la Naturaleza, Greenpeace International, the Humane Society International, the Red Mexicana de Acción Frente al Libre Comercio, and the Whale and Dolphin Conservation Society. The attendees are listed in Appendix 1.

Agenda Item 2 - Adoption of agenda

After a brief discussion, the provisional agenda was adopted without change (Appendix 2).

The representative of Costa Rica suggested that the IATTC meeting be temporarily adjourned and that the Intergovernmental Meeting be convened. All were in agreement, so the IATTC meeting was adjourned at 10:20 a.m.

The IATTC meeting was reconvened on October 22, 1996, at 10:55 a.m.

Agenda Item 3 - Review of current tuna research

Mr. Hallman turned the floor over to Dr. Joseph, who made a few general remarks about the IATTC's Tuna-Billfish Program. He said that this program includes research on the ecosystem, so it should be of interest to those who are concerned principally with marine mammals, as well as to those who are interested primarily in tunas and billfishes. The IATTC staff includes representatives of many nations, and most of the observers on tuna boats are citizens of the nations in which the vessels they accompany are registered. The IATTC has offices and/or laboratories in Ecuador, Mexico, Panama, the United States, and Venezuela. Scientists from other countries frequently spend extended periods at the IATTC headquarters in La Jolla; currently Dr. Alain Fonteneau of the Institut Français de Recherche Scientifique pour le Développement en Coopération (ORSTOM) and Dr. Pilar Pallarés of the Instituto Español de Oceanografía are working in La Jolla. Several IATTC staff members are faculty members of various universities.

Dr. Joseph then introduced Dr. Richard B. Deriso, head of the IATTC's Tuna-Billfish Program.

Dr. Deriso first discussed the spawner-recruitment relationship for yellowfin tuna. Spawning occurs in virtually all areas of the eastern Pacific Ocean (EPO) in which the sea-surface temperatures exceed 25° to 26°C (77° to 79°F). There are two cohorts of yellowfin in the EPO, the May cohort, consisting of fish recruited to the fishery in May, and the November cohort, consisting of fish recruited to the fishery in November. There was less spawning in the EPO during the late 1970s and early 1980s than during the previous or subsequent periods, but the survival of the larvae and/or early juveniles was greater during the late 1970s and early 1980s, so the recruitment did not decrease during that period. Nevertheless, it would be prudent to maintain a relatively high biomass of spawners to ensure that recruitment is adequate. Yellowfin mature at about 2 years of age, when they weigh about 35 pounds (16 kg). The capture of fish less than 2 years of age should be minimized. (Even if there is no relationship between the biomass of spawners and subsequent recruitment at present levels of abundance of spawners, yield-per-recruit analyses show that greater catches can be realized if smaller fish are not caught.)

Dr. Deriso then said that it has long been believed that spawning of skipjack tuna in the EPO is minimal, but recent pilot studies by the IATTC staff indicate that significant spawning of skipjack 50 cm or greater in length takes place in many parts of the EPO in which the sea-surface temperatures are greater than 25°C. Accordingly, a full-scale program to assess the spawning of skipjack, similar to the program previously carried out for yellowfin tuna, has recently been initiated.

He next discussed some of the IATTC's billfish studies. Hook-rate data (catches per hundred or per thousand hooks) for the longline fishery are used as indices of the abundance of tunas and billfishes. After the mid-1970s there was a shift to deeper-fishing longlines. Since bigeye tuna are more abundant at greater depths and most other species are more abundant at lesser depths, this shift made it appear as if there had been changes in the abundance of the various species, whereas such was not necessarily the case. Mr. Michael G. Hinton is working on models which take into account depths of hooks and other variables in the calculation of indices of abundance of billfishes. He has found bands of greater abundance of blue marlin north and south of the equator in the entire Pacific Ocean and bands of greater abundance of swordfish north and south of the equator in the EPO.

Dr. Deriso then introduced Dr. Robert J. Olson, who is in charge of the IATTC's early life history studies.

Dr. Olson said that studies of the eggs, larvae, and early juveniles of tunas are made in La Jolla and at the IATTC's Achotines Laboratory in Panama. Because of their easy availability, work was first concentrated on black skipjack, and a great deal was learned about their early life history. Much of this information will be useful in studies of yellowfin tuna, the species of greatest interest. 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 Achotines Laboratory. The objectives of the project are: (1) to culture adult yellowfin tuna to supply larvae for research on early life history; (2) to produce food organisms for larval and juvenile tunas; and (3) to culture broodstock snappers (Lutjanidae), corvina-like fishes (Sciaenidae), and food organisms for their larvae and juveniles. Yellowfin have been captured by hook and line and placed in tanks. Their survival rate has been high, and they have actively feeding and growing at rates exceeding those of wild fish. In October 1996 they commenced to spawn. Spawning occurred at about 7:30 p.m., and about 30 percent of the eggs hatched within about 24 hours. This is the first time that yellowfin have spawned in tanks, although they have spawned in floating pens in Japan. It is anticipated that the availability of yellowfin eggs and larvae will make it possible to learn considerably more about the early life history of this species in the near future.

Dr. Olson then said that Dr. Masato Iizawa of the Fisheries and Aquaculture International Co., Ltd., Tokyo, Japan, arrived at the Achotines Laboratory in mid-September 1996, and will remain there until early November. Dr. Iizawa is working with a biologist from Panama's Departamento de Recursos Marinos and staff members of the Achotines Laboratory on spawning of captive rose snappers and corvina. Both species have been induced to spawn. Larvae of rose snappers have survived for up to 1 week, and larvae of corvina have survived for up to 2 weeks and have been induced to feed.

Mr. Hallman asked if there were any questions on Agenda Item 3. There were none, so he turned the floor over to Dr. Joseph for discussion of the next two agenda items.

Agenda Item 4 - The 1995 fishing year

Dr. Joseph stated that the surface catches of all species of tunas combined in the EPO in 1995 totaled about 445 thousand short tons, making 1995 the best year on record. The EPO catches are a significant part of the world catches of tunas, which have totaled about 3.5 million short tons in recent years. The catches of skipjack in the EPO were the greatest since 1979 and the surface catches of bigeye in the EPO were the greatest on record. He displayed slides showing the weekly capacities of tuna boats at sea and the cumulative capacities at sea during 1994, 1995, and 1996 (to date), and also a slide showing the sizes of the fleets of the various nations involved in the fishery during 1995. He then displayed slides showing the catches of yellowfin and skipjack during 1994, 1995, and 1996 (to date), and commented about the increased catches of bigeye by purse seiners during 1994, 1995, and 1996. He next displayed slides showing the geographical distributions of the catches of yellowfin and skipjack during 1980-1994, 1995, and 1996 and a slide showing the annual catches of yellowfin, skipjack, bigeye, and bluefin from 1960 through 1995.

Agenda Item 5 - Status of tuna stocks

Dr. Joseph displayed a slide showing the annual catches of yellowfin from 1960 through 1995, and commented about the periods of greater-than-average and less-than-average catches. Regulations were in effect for the surface fishery for yellowfin tuna in the Commission's Yellowfin Regulatory Area (CYRA) from 1966 through 1979, but after that the regulations were not enacted because agreement could not be reached on allocation of the catches among nations and gear types. Since then catch limits have been agreed upon at IATTC meetings (except in 1987, when the staff did not recommend a catch limit). Fortunately, due to the fact that the fleet size is less than it was during the 1970s, the catches have not exceeded the limits in most years since 1979. The lesser fleet size is due primarily to the fact that many of the vessels of the U.S. fleet have switched their operations to the western Pacific Ocean (and most of the others have changed ownership, and are now registered in other nations).

Yellowfin, in contrast to albacore and bluefin, do not often move great distances in the Pacific Ocean, but nevertheless there is considerable exchange of fish among the Exclusive Economic Zones of various nations and between the high seas and waters within 200 miles of land.

Indices of abundance are calculated from catch-per-unit-of-effort (CPUE) data. It is difficult to get unbiased indices of abundance when the methods of fishing are changing, so the IATTC staff has devoted a considerable amount of study to this problem. Indices of abundance are used in production models, discussed below.

Production models, age-structured models, and spawner-recruit models can be used for stock assessment of yellowfin.

Production models make use of data on the population of fish as a whole, rather than on individual fish. They make use of data on total catch, total effort, and catch-per-unit of effort (CPUE) data. Analyses of these data produce estimates of the relative population size and the level of fishing effort which will produce the maximum sustainable yield (MSY). In practice, if restriction of a fishery is necessary, this can be accomplished with limits on either fishing effort or catch. The IATTC has used two types of production models, the symmetrical model, in which the relationship between CPUE and effort is linear, and the asymmetrical model in which the relationship between CPUE and effort is nonlinear. With the symmetrical model the maximum catch can be obtained when the biomass of fish is at half its maximum. With asymmetrical models the maximum catches are obtainable at more or less than half the maximum biomass, depending on the shape of the curve expressing the relationship between catch and effort. He displayed a slide showing the symmetrical curve and the observed and predicted catches obtained with this model. Both the symmetrical and asymmetrical models, in recent years, have produced estimates of about 300 thousand to 350 thousand short tons for the MSY of yellowfin in the EPO.

Age-structured models make use of data on recruitment, growth, and mortality to determine how best to exploit a population of fish. He displayed a slide showing the decrease in numbers of fish of a cohort with time, the increase in average weight of the fish with time, and the increase and then decrease of the total weight of the fish

with time. When the fish of a cohort are young the total weight increases because the growth in weight of the individual fish is rapid, while the losses to the cohort due to natural mortality are moderate. Later, as the fish grow older, their growth rate becomes slower, while the natural mortality continues to be about the same or increases. Thus the losses to the total weight due to natural mortality at that time are greater than the gains due to growth, and there is a net loss to the total weight. Eventually the cohort disappears. The ideal way to obtain the maximum yield per recruit (YPR) from a cohort of fish would be to harvest the fish at the size at which the loss to the total weight by natural mortality exactly balances the gain to it by growth (the "critical size"). For yellowfin the critical size is about 70 pounds (32 kg). He explained that the goal of harvesting each fish at the critical size is not possible for yellowfin tuna, but that it can be approximately achieved. He next displayed a slide showing the average weights of fish caught by the purse-seine fishery during the 1967-1995 period. The average weights were greater during the 1967-1977 and 1984-1995 periods than during the 1978-1983 period. Then he displayed slides showing the relationships among size at entry, fishing effort, and yield per recruit with patterns of age-specific fishing mortality corresponding to the 1978-1982 and 1991-1995 periods. He pointed out that greater yields per recruit are obtainable when the fishery directs its effort toward larger fish.

Dr. Joseph next displayed a slide showing the average biomasses of all yellowfin and of large yellowfin (ages equal to or greater than 3 years) in the EPO during 1967 through 1995. The average biomasses were least during the late 1970s and early 1980s when the purse-seine fleet was directing most of its effort toward smaller fish. He said that no relationship between biomass of spawners and production of recruits had been observed, but that, as a matter of precaution, the spawning biomass should not be allowed to drop below those of the late 1970s and early 1980s.

He next described the staff's findings regarding the spawner-recruit relationship. The amount of spawning that takes place is directly proportional to the relative abundance of mature fish, and the recruitment is directly proportional to the relative abundance of recruits, so if indices of abundance of mature fish and recruits are available the spawner-recruit relationship can be determined. At least some of the individuals of a cohort must be allowed to spawn at least once before they are harvested. If spawning occurs well before the fish reach the critical size there is probably no danger from this standpoint, but if spawning does not occur until after the fish have reached the critical size, and the fishing effort is high, there is a possibility that the number of spawners would be so reduced that the recruitment in subsequent years would be reduced. Therefore a fishing strategy designed to produce the maximum YPR will not necessarily produce the maximum yield. There is no evidence that reduction in the numbers of spawners has caused reductions in recruitment of yellowfin. The recruitment of yellowfin has varied over the 1968-1995 period, being least during 1968-1975, intermediate during 1976-1984, and greatest during 1985-1995. Also the age-specific fishing mortalities have varied, with the fish being smaller, on average, during the 1970s and early 1980s than during subsequent years. He displayed slides showing the catches obtainable with various combinations of recruitment and age-specific fishing mortality. If the recruitment were to decrease to the levels of earlier years the MSY would also decrease.

He said that the catches of yellowfin will be greatest if there is above-average recruitment and the average weight of the fish caught is relatively high. If fishing for yellowfin associated with dolphins is abandoned in favor of fishing for tunas associated with floating objects the catches will decrease because of (1) decreased recruitment (due to the fact that fishing for tunas associated with floating objects must be pursued in an area smaller than that in which dolphin fishing takes place and, possibly, to decreased production of eggs and larvae from a population which contains relatively few mature fish) and (2) decreased average weight of the fish caught. He then displayed slides showing that (1) the yield per recruit is positively correlated with the average weight of fish in the catch and (2) the average weight of fish in the catch is greatest for dolphin schools, intermediate for free-swimming schools, and least for schools associated with floating objects. He also displayed a slide showing that 50 percent of the fish reach maturity at a length of about 103 cm (equivalent to about 50 pounds or 22 kg). He said that the 1996 catch of yellowfin in the CYRA would be about 270,000 short tons, and that the 1997 catch would probably be about the same, provided the effort remains at about the same level and is directed at the same types of schools of fish as during 1996.

Dr. Joseph concluded by saying that the resolutions adopted for regulation of the surface fishery for yellowfin in the EPO apply only to the CYRA. He stated that it is good that this is the case, as the fish caught west

of the CYRA are mostly near the critical size, whereas much greater proportions of these caught in the CYRA are considerably less than the critical size.

Mr. Hallman asked if anyone had questions for Dr. Joseph. No one had, and the meeting was adjourned at 12:35 p.m.

The meeting was reconvened at 2:50 p.m. Mr. Hallman turned the floor over to Dr. Joseph to continue his discussion of this topic. Dr. Joseph stated that skipjack tuna make up about half of the world and Pacific Ocean catches of tunas. As stated previously, the world catches of tunas amount to about 3.5 million short tons. The areas of the EPO in which skipjack are most abundant vary considerably from year to year. Skipjack in the EPO have usually been thought to be immigrants from the central Pacific Ocean which will return there to spawn, but recent information indicates that there may be considerable spawning of skipjack in the EPO. Skipjack are underfished in the EPO. They grow rapidly, but have a high rate of natural mortality, so setting minimum size limits, even if there were a practical way to avoid catching smaller fish, would not increase the catches in the EPO. Likewise, it seems unlikely that setting upper limits on the catches would bring about changes, *e.g*. increasing the recruitment or altering the age composition of the population, which would make possible greater catches in subsequent years.

Northern bluefin tuna are not abundant anywhere, but they are still a valuable resource. They are caught in the EPO with purse seines, in the western Pacific with trolling gear, purse seines, traps, *etc*., and on the high seas with longlines. There appears to one stock of northern bluefin in the Pacific Ocean. Spawning takes place only in western Pacific. Variable numbers of the juveniles migrate to the EPO, where some of them are caught by the purse-seine fishery off Baja California and Southern California. Staff members of the IATTC and the National Research Institute of Far Seas Fisheries of Japan have cooperated in studies of this species. Large numbers of tagged fish released off Japan have been recaptured in the EPO, and lesser numbers of tagged fish released in the EPO have been recaptured in the western Pacific Ocean. Application of age-structured models indicates that the catches of bluefin could be increased if harvesting of age-0 or age-0 and age-1 fish could be reduced or eliminated. These are based on rough estimates of natural mortality and inadequate knowledge of age-specific distributions of catches by area and season, however.

Dr. Joseph then introduced Dr. Robin L. Allen, Assistant Director of the IATTC, for discussion of bigeye and swordfish.

Dr. Allen said that bigeye tuna are more abundant in the EPO than in most other areas. Longlines account for most of the catches of bigeye in the EPO, and nearly all of these are large fish. Because nearly all longline-caught fish are sold for high-grade *sashimi* and *sushi*, their value is extremely high. Longline catches are reported as numbers of fish, rather than as weights, and average weights estimated by different workers are not the same. A world bigeye workshop will take place in La Jolla in November 1996, and some of these differences may be resolved at that time. Purse-seine fishermen began fishing more for tunas associated with floating objects in offshore equatorial waters in late 1993, and this fishery increased the catches of bigeye by the surface fishery to record levels in 1994 and 1995. Most of these fish are smaller than those taken by the longline fishery; in fact some of them have had to be discarded at sea because they were unmarketable. Removal of small to medium fish by the surface fishery decreases the amount of larger fish available to the longline fishery, and it is important to ascertain the magnitude of this decrease.

He displayed slides showing the distributions of longline and surface catches of bigeye in the EPO in recent years, and noted that there are two areas of greater-than-average longline CPUEs, one south of 5°N and one north of 20°N and west of 125°W. He pointed out that almost nothing is known of the stock structure of bigeye in the Pacific Ocean, but that genetic analyses which may contribute to a solution to this problem are currently in progress in Australia.

Dr. Allen summarized production modeling and cohort analyses which had been carried out by the IATTC staff to attempt the ascertain the status of bigeye with respect to fishing\the effect that fishing has had on bigeye. Production modeling, based on data for the EPO, indicates that the effort has been less than that which corresponds to the MSY. These estimates are not very reliable, however, because of lack of knowledge about the

stock structure of bigeye and lack of data on catch and CPUE on the overfishing side of the curve. If the surface fishery continues at its 1994-1996 level, production models may no longer be applicable due to the difference in ages and sizes of the fish exploited by the two fisheries. Cohort analyses indicate that the surface fishery would have a considerable effect on the longline fishery if the coefficient of natural mortality is 0.4, but a much lesser effect if it is 0.6 and almost no effect if it is 0.8. Obviously, there is a need for more precise estimates of this parameter.

Dr. Allen then summarized recent work on assessment of swordfish in the EPO performed by the IATTC staff. He displayed a slide showing the distributions of CPUEs of swordfish in the EPO. Because almost nothing is known about the stock structure of this species in the Pacific Ocean, stock assessment is problematical. Production modeling, using data for 1962-1987, has recently been performed by the IATTC staff. This work will be redone in the near future, using data for 1962-1992. He acknowledged that the swordfish in the EPO may belong to the same stock as those west of 150°W, which could make the results of the production modeling invalid, or nearly so.

Mr. Hallman asked if there were any questions. The representative of the United States noted that there are two areas of greater-than-average CPUEs of bigeye in the EPO, and asked about the stock structure of bigeye. Dr. Joseph said that knowledge of the stock structure of bigeye is lacking, but that he hopes that the work currently being pursued in Australia will shed some light on this problem. He said that the IATTC staff was concerned about the effect of the surface fishery on the longline fishery. He stated that the IATTC convention specified that the staff was to attempt to find ways to maintain the populations of fish covered by the convention at levels which would permit the "maximum sustained catch," but that the greater value of longline-caught fish should nevertheless be kept in mind. The representative of the United States said that he agreed, and that he thought that the world workshop on bigeye which will be held in November is a good idea.

Agenda Item 6 - Review of tuna-dolphin research and extension programs

Mr. Hallman turned the floor over to Dr. Joseph, who introduced Dr. Martín A. Hall, head of the IATTC's Tuna-Dolphin Program.

Dr. Hall first acknowledged the contributions of the various governments, the fishing industry, the observers on the vessels, and many others to the success of the Tuna-Dolphin Program. He displayed slides showing indices of abundance of the eight stocks of dolphins which are most often encircled by purse seines. He emphasized that calculation of indices of abundance is difficult for various reasons, especially the fact that the distributions of the various stocks vary from year to year. For example, the abundance of northern common dolphins appears to have decreased precipitously since the early 1980s. Actually, however, surveys made by the U.S. National Marine Fisheries Service indicate that the center of abundance of this stock has moved northward, so that a much greater portion of the stock is north of the range of the purse-seine fishery for tunas than was previously the case. He said that, due to the long life spans and low reproductive rates of dolphins, the increases in dolphin abundance due to decreased mortalities caused by fishing would be slow and prolonged.

Dr. Hall said that the mortalities due to fishing would probably be less than 3,000 in 1996, and that credit for this was due to the conscientious efforts of the fishermen. He mentioned some of the factors, such as condition of the fishing gear, skill and motivation of the captain and crew, environmental conditions, and regulations, which affect the mortalities of dolphins.

Dr. Hall then introduced Mr. David A. Bratten, a scientist with the Tuna-Dolphin Program, who discussed the IATTC's gear program. Mr. Bratten said that one of the major features of the gear program is the extension program, which sponsors seminars at which fishermen and vessel managers discuss the latest safety gear and techniques, conducts trial sets, during which the alignment of the vessel's safety panel is checked and other safety gear is inspected, and monitors the testing of new types of safety gear. Most of the information about gear performance come from the observer programs of Mexico, the United States (discontinued in early 1995), and the IATTC. A large proportion of the mortalities of dolphins occurs in a relatively few sets during which the gear malfunctions or the net collapses. The annual percentages of sets with major gear malfunctions remained more-or-less constant between about 8 and 12 percent, from 1986 to 1995, but the mortalities per set in such sets had

decreased from about 25 to about 1 during that period. The percentages of sets during which the net collapsed decreased from about 30 to about 10 percent, while the mortalities per set decreased from about 23 to about 1 during the above-mentioned period. In summary, the first line of defense against mortalities is having the right safety gear, the second is avoiding risky situations, such as fishing in areas where the currents are strong, and the third is making proper use of all safety gear and techniques.

Mr. Hallman then announced, at 5:30 p.m., that the meeting was adjourned for the day.

The meeting was reconvened by Mr. Hallman on October 23, 1996, at 9:35 a.m.

Mr. Hallman turned the floor over to Dr. Hall, who introduced Dr. Michael D. Scott, a scientist with the IATTC's Tuna-Dolphin Program. Dr. Scott said that yellowfin tuna and dolphins associate with one another much more frequently in the EPO than in other oceans. Most people think that the tunas are attracted to the dolphins, rather than *vice versa*. It has been hypothesized that the association facilitates feeding for one or both species, that the association provides protection from predation for one or both species, or that the dolphins provide a rallying point for large tunas, just as floating objects provide a rallying point for small tunas. Recent studies suggest some degree of niche separation between the spotted dolphins and yellowfin tuna. The data suggest 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 tuna 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. It should be emphasized, however, that both species are thought to be generalist predators on a wide range of prey species. An earlier study by the IATTC staff showed that yellowfin tuna and spotted dolphins formed larger groups after midday, resulting in greater average catches of tuna per set. Nevertheless, the stomach contents of the dolphins indicated that the dolphins fed little, if at all, during the afternoon. This suggested 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.

Mr. August Felando, an independent consultant, commented on some observations on dolphin feeding made by tuna fishermen, and Dr. Scott reiterated that the IATTC data indicate that dolphins feed mostly at night.

Dr. Joseph then turned the floor over to Dr. Hall to discuss the IATTC bycatch studies.

Dr. Hall first displayed a slide showing the effects of fishing on the ecosystem. Not all animals which are caught are marketable, not all marketable fish which are caught are purchased by fish processors, and not all parts of the fish which are purchased are edible. Fishing mortality, one of the basic parameters necessary for stock assessment, has traditionally been estimated from landings data. In many cases other mortalities, such as fish discarded at sea, mortalities of fish not retained by the gear, and unreported catches, are ignored. Also, fishing may affect the ecosystem in various ways, which can be harmful or beneficial to organisms which are not taken the fishery. For example, dragging a net over the bottom may damage the habitat of some bottom-dwelling species, or unmarketable fish discarded at sea by fishing vessels may provide food for birds which otherwise would not be able to catch the fish.

Dr. Hall said that the IATTC staff began collecting data on bycatches in purse-seine sets on a large scale in 1993. The coverage has ranged from 47 percent in 1993 to 77 percent in 1995. Discards of all species of tunas made up 0.5 to 1.7 percent of the catches in sets on schools associated with dolphins, 3.3 to 6.6 percent of the catch in sets on free-swimming schools, and 15.1 to 25.2 percent of the catch in sets on schools associated with floating objects. The bycatches of billfishes, sharks, and most other large fish were greatest in sets made on floating objects and least on sets made on dolphins. The greatest catches of manta rays and sting rays were made in sets on free-swimming schools, however. The discards of undersized yellowfin were greatest in sets made on floating objects and least in sets made on dolphins. The following "equation," comparing the bycatches in sets on dolphins to those in sets on floating objects, has been calculated by the IATTC staff; 1 dolphin + 0.1 sailfish + 0.1 manta ray = 15,620

small tunas + 328 mahi-mahi + 190 wahoo + 7.6 rainbow runners + 20.7 sharks and rays + 0.8 billfishes + 4.3 other large fish + 422 triggerfishes + 800 other small fish + 0.04 sea turtles. In other words, diversion of enough effort from dolphin fishing to fishing on floating objects to save 1 dolphin, *etc.*, would result in the loss of 15,620 small tunas, *etc*. He listed the following features of ecologically-sound fishing: (1) optimum distribution of ages, sizes, and sexes in the catches of the target species; (2) a harvest which allows adequate reproduction; (3) a harvest which minimizes the loss of genetic diversity; (4) minimum waste of the target species; (5) minimum physical disturbance of the habitat; (6) minimum pollution and production of debris; (7) minimum expenditure of energy; (8) minimum bycatches; (9) minimum "subsidies" to any species.

Mr. Hallman asked if there were any questions. The representative of the United States asked how habitat could be lost through fishing activities, and Dr. Hall said that bottom trawls could destroy shelter or nesting sites for various species. The representative of Costa Rica asked if there was anything available on bycatches that he could distribute to the members of the fishing association to which he belonged, and Dr. Hall said that he would provide him with reprints of his most recent paper on bycatches. The representative from Panama asked about the effects of bycatches of sharks in purse seines on the artisanal fisheries for sharks. Dr. Hall said that the effects could be severe, as sharks have long life spans and low rates of reproduction. He emphasized, however, that the effects cannot be properly evaluated without more knowledge of the biology of the various species of concern. He remarked that the fishery for tunas associated with dolphins has become one of the "cleanest" fisheries in the world. Mr. Hallman asked if the numbers of sets made on floating objects have been increasing in recent years, and Dr. Hall replied affirmatively.

Agenda Item 7 - Review of International Dolphin Conservation Program

Mr. Hallman said that he thought that this agenda item had already been covered in Agenda Item 4 of the Intergovernmental Meeting, but asked if anyone had any additional comments on this subject. Dr. Joseph emphasized that, in view of the statement made by the Mexican delegation during the Intergovernmental Meeting, caution should be exercised with regard to the preliminary estimate of 2,600 to 3,000 for the mortality of dolphins during fishing operations in 1996.

Agenda Item 8 - Recommendations and resolutions for 1996

Mr. Hallman asked Dr. Joseph if he had a recommendation for catch limits on yellowfin tuna in the CYRA for 1996. Dr. Joseph said that he recommended limits for 1996 which were the same as those for 1995 (235 thousand tons, with three additions of 20 thousand tons each to be added at the discretion of the Director). He stated that it was almost certain that the upper limit would not be exceeded. He said that the present fleet size is appropriate for the amount of yellowfin available, but if more vessels enter the fishery the catch limits could be exceeded. Mr. Hallman asked the participants if they were in agreement with Dr. Joseph's recommendation. After a brief discussion, the resolution (Appendix 3) was adopted.

Agenda Item 9 - Recommended research program and budget for FY 1997-1998

Mr. Hallman turned the floor over to Dr. Allen. Dr. Allen said that the budget for 1997-1998 was described in detail in Background Paper 3. Table 1 of that Background Paper shows, for the first time, the contributions for the International Dolphin Conservation Program (IDCP). The recommended 1997-1998 budget (not including the contributions for the IDCP) is about $4.5 million, whereas that for 1996-1997 was about $5.0 million. The reduction is due largely to the fact that the budget calls for fewer staff members. The reduction in staff size is made possible by more efficient methods of data processing. There will be some shifts within the budget. For example, more money will be required to keep the Achotines Laboratory running efficiently, and some money should be spent on a bigeye tuna tagging program. In addition, money will be needed for in-grade salary increases and for salary increases to compensate for inflation. Mr. Hallman asked if there were any questions. Mr. Carlos Arbelaez of Seatrading International noted that the funds received were always substantially less than the funds recommended, and asked how the staff was able to adjust for this. Dr. Allen said that some staff positions had not been filled and some activities, such as meetings of the Scientific Advisory Board, had been cancelled. The representative of the United States asked about the status of changes in assessments on vessels to pay for the IDCP.

Dr. Allen said that this had been discussed at the 13th meeting of the International Review Panel, but that no changes had been made.

Agenda Item 10 - Place and date of next meeting

Mr. Hallman asked for suggestions concerning the place and date of the next meeting. The representative of Costa Rica said that the 57th meeting of the IATTC had originally been scheduled to take place in Costa Rica in June 1996, but that it was necessary to change the date and location of the meeting. He offered that Costa Rica serve as host for the 58th meeting. Representatives of all the other member nations supported this proposal. Mr. Hallman said that Dr. Joseph, after corresponding with the member nations, would announce dates which would be acceptable to all concerned.

Agenda Item 11 - Election of officers

Mr. Hallman said that it is customary for the host nation to provide the Chairman for the meeting, and that a decision as to whom that person would be could be made later.

Agenda Item 12 - Other business

Mr. Hallman asked if there was any other business.

The representative of Japan called attention to the Kyoto Declaration and Plan of Action on the Sustainable Contribution of Fisheries to Food Security (Appendix 4), and asked that the IATTC support this declaration. Mr. Hallman asked for comments. The representative of the United States said that his nation and three others had supported the Kyoto Declaration and Plan of Action, subject to the caveat that these would not affect the competency of, or change the current status in, other international organizations, including the International Whaling Commission. The representatives of the other nations stated that they supported the document, so Mr. Hallman announced that the consensus was that the IATTC endorsed it.

The representative of Panama said that William Marcelo Campoverde García, a member of the crew of the Vanuatu-flag purse seiner *Cabo de Hornos*, had lost his life while carrying out actions necessary for complying with the requirements of the IDCP. He suggested that it would be appropriate if Dr. Joseph sent a letter of condolence to his family. Everyone else agreed, and Mr. Hallman said that this should be considered to be a request that Dr. Joseph do this.

The representative of Costa Rica said that Mr. Carlos Díez, whose firm had performed the simultaneous interpretations at most of the IATTC meetings since the 1950s, had recently passed away. He expressed his condolences to his daughter, Cynthia, who was in attendance. Mr. Hallman said that he and many others had known Mr. Díez for many years, and that he was sure that everyone else held him in highest esteem and regretted his passing.

Agenda Item 13 - Adjournment

There being no further business under Agenda Item 12, Mr. Hallman declared the meeting closed at 11:25 a.m.