ISC3/PLEN/08

Report of the Second Meeting of the ISC Pacific Bluefin Tuna Working Group Interim Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC)

January 28-30, 2002
Nagasaki, Japan

Report of the Second Meeting of
the ISC Pacific Bluefin Tuna Working Group

Merca Tsukimachi Hall
Nagasaki, Japan
January 22, 2002

OPENING OF THE MEETING

The second meeting of the ISC Pacific Bluefin Tuna Working Group was held at the Merca Tsukimachi Hall in Nagasaki, Japan on January 22, 2002. Mr. H. Yamada from the National Research Institute of Far Seas Fisheries (NRIFSR) in Japan welcomed participants. Dr. N. Miyabe from NRIFSF served as the chairperson for this Working Group meeting. Rapporteurs for the meeting were Mr. K. Uosaki (NRIFSF) and Dr. P. Crone from the National Marine Fisheries Service, Southwest Fisheries Science Center (United States).

Twenty-eight participants, from the United States (U.S.), Inter-American Tropical Tuna Commission (IATTC), Japan, Chinese Taipei, Republic of Korea (Korea), and Russia, participated in the meeting (see Appendix 1). No participants from the People's Republic of China or Mexico attended this meeting. A total of 16 papers were contributed to the meeting, including 14 Documents and 2 Information Papers (see Appendix 3).

PURPOSE OF THE MEETING

The Chairperson asked Mr. Yamada to give a summary presentation of the last ISC Pacific Bluefin Working Group meeting, which was held in Shimizu, Japan, in December 2000. After Mr. Yamada's brief presentation, the Chairperson presented the purpose of this meeting. He said it would be premature to discuss and examine the stock status at this time, given only one year had passed since the last meeting. Therefore, he suggested that the participants should concentrate on reviewing progress made since then and make any changes or improvements in the ongoing studies, as well as associated time schedules. If necessary, recommendations could be developed in order to better prepare for the next assessment, which will take place within a year or so. Participants agreed with the Chairperson's suggestions and adopted the slightly modified Agenda (Appendix 2).

REVIEW OF PACIFIC BLUEFIN TUNA FISHERIES

Chinese Taipei (Document 14)

A description of Chinese Taipei's longline fishery for Pacific bluefin tuna was presented by Dr. C.-C. Hsu. Pacific bluefin tuna are harvested by a traditional and seasonal small-scaled longline fleet that primarily operates in waters of the southwestern Ocean. The annual production was not significant before 1996, and has varied from about 2,000 to 3,000 mt since 1997. Nearly all of the Pacific bluefin tuna were harvested from waters off Chinese Taipei and landed mainly at the domestic fishing ports of Tungkang and Suao. Recently, about 40 to 50% of the Pacific bluefin tuna are exported to Japan sashimi markets and the rest locally consumed. The small-scale longline fleet landed 3,089 mt of bluefin tuna in 1999, 2,780 mt in 2000, and 2,429 mt in 2001.

The engine power of these longline vessels ranged from 125 to 850 hp, in which 500 hp vessels were the most common, followed by 300 to 350 hp vessels, and finally, 600 to 650 hp vessels. Crew sizes ranged in size from 5 to 9 individuals, with 7 to 8 individuals being the most common crew size for fishing trips. The duration of each trip ranged from 1 to 19 days, with the majority of the trips spanning 4 to 9 days, and an average trip taking 7 days.

The fishing season for this fleet is from April to July each year, when fish are typically aggregated for spawning in southwestern waters of the Ocean and thus, more easily targeted by the vessels. Estimated (nominal) catch-per-unit-effort in 1999 was relatively high at about 1.3 fish (224.1 kg) per 1,000 hooks.

The vast majority (95%) of the bluefin tuna catch is typically composed of mature fish. General analysis of catch-at-age indicated that major age-classes were 8-yr old fish in 1993, 6 yr in 1994-95, 7 yr in 1996, 8 yr in 1997, 7 yr in 1998-99, and 8 yr in 2000-01.

Discussion: Participants asked Dr. C.-C. Hsu for explanations why purse-seine vessels no longer harvest bluefin tuna off Chinese Taipei. Dr. Hsu stated that the fishery moved to tropical waters. The Working Group discussed issues surrounding how age compositions were derived, particularly, questions concerning whether age-composition shifts to younger fish beginning in 1996 were real or possibly, due to changes in statistical methods used to convert sizes to ages. Dr. C.-C. Hsu explained that conversions were based on a growth model, i.e., annual age distributions were derived strictly according to a length-at-age relationship. The Group suggested that the actual size-based 'limits' that were used for respective age classes be presented in future documentation. Additionally, it was suggested that the Working Group should explore the merits and drawbacks of adopting more formal, standardized size-to-age conversion methods that are used by researchers from the different nations of the Group.

Japan (Documents 10 and 3)

Ms. M. Takahashi presented descriptions of Japan's estimation procedures for bluefin tuna catches in the Ocean. Estimates of bluefin tuna catch by Japanese fisheries in the Ocean in 1952-00 were based on official statistics (Norin-tokei), research project (RJB), and other supplementary data. Catch of bluefin tuna was estimated from Norin-tokei data for the years 1952-93 and RJB data for 1994-00 for the majority of the fisheries. However, for the longline fishery, the coverage of RJB was insufficient and thus, this fishery was based on Norin-tokei statistics.

Mr. H. Yamada provided a description of Japan's offshore purse-seine fisheries. Japenese offshore purse-seiners have two fishing grounds around Japan. One is in waters off eastern Japan. The other operates in the western Sea of Japan to the East China Sea and since 1981, have caught adult fish in the summer and primarily juveniles in the spring. Recently, these purse-seine fisheries have landed nearly equivalent amounts of bluefin tuna.

Discussion: Given the inherent difficulty in determining catch estimates of bluefin tuna archived within the Norin-tokei prefecture statistics data base (1952-94), it would be helpful to construct alternative estimated catch time series and thus, have some objective measure, albeit ad hoc, of the uncertainty surrounding these statistics. Thus, future stock assessments that are based on statistical models could incorporate formal sensitivity analysis with the catch data.

Republic of Korea (Document 6)

Dr. J. R. Koh presented a summary of Korea's Pacific bluefin tuna fisheries. Pacific bluefin tuna have been caught mainly as bycatch species by the purse-seine fishery and to a lesser degree, the trawl and set-net fisheries operating in Korean waters. In 2001, 33 purse-seine vessels and 4 trawl vessels operated in Korean waters. Annual catches of bluefin tuna increased roughly 27% from 2000 (794 mt) to 2001 (1,005 mt). The fisheries generally operate from January to July, with peak catches occurring from March to April.

In 2001, fishing grounds for bluefin tuna were primarily in waters off south Korea, near the Cheju Island and Tsushima Island, as well as the Yellow Sea. In 2000, the fisheries operated only in the South Sea of Korea.

Discussion: The Working Group expressed concern regarding how the catch time series was derived. Dr. J. R. Koh communicated that catch statistics were derived from logbook records obtained through a mandatory collection program. Unresolved discrepancies exist between Japanese fishery import records of Korean bluefin and catch estimated by Korean fishery monitoring programs. Dr. J. R. Koh stated that catch statistics would benefit from further scrutiny to ensure presented results are accurate.

United States (Document 9)

Dr. G. Sakagawa provided an overview of the United States' Pacific bluefin fisheries. Pacific bluefin tuna are not a major species exploited by U.S. fishermen. The annual catch of this species has varied substantially over the years, peaking at 15,920 mt in 1966 and generally declining since that time. Since 1984, the catch has ranged from 160 mt in 1991 to 4,740 mt in 1996. In 2000, the catch reached a recent record low of 530 mt.

Before 1999, most of the catch of bluefin tuna was taken by purse-seiners, particularly small vessels (<181 mt fish-holding capacity) based in southern California. These vessels were assisted by airplane ‘spotters’ to locate schools of Pacific sardine, northern anchovy, Pacific mackerel, and other coastal pelagic species. When bluefin tuna are available in coastal waters off southern California to Baja California, Mexico, they are easily located by aerial spotters and become a secondary target species for the purse-seine fleet. In 1999, 4 purse-seine vessels landed bluefin tuna, a decrease from 19 vessels that landed bluefin tuna in the previous year. Since 1998, the sport catch has been greater or comparable to the purse-seine catch, e.g., recreational anglers landed roughly 108 mt in 1999 and 220 mt in 2000.

Size-composition sampling has been conducted on purse-seine landings since 1952. Size compositions consisted primarily of fish between 60 and 100 cm (1- to 3-yr old fish). In 1999, the average weight of landed fish was 38 kg. In contrast, bluefin tuna harvested as incidental catch (55 mt in 1999) by Hawaii- and California-based longline fleets operating in the central Pacific Ocean were much larger, averaging 99.3 kg in 1999.

IATTC (No document)

Dr. M. Hinton presented a brief overview of Pacific bluefin tuna fisheries monitored by the IATTC. The principal fisheries that harvested Pacific bluefin tuna in the eastern Pacific Ocean were purse-seine and recreational fisheries operating from ports in California, U.S., and Baja California, Mexico. The IATTC Secretariat continues to compile catch and effort statistics from logbook programs and to obtain biological and length-frequency data from port sampling operations in Mexico and the U.S.

Russia (No document)

Dr. S. Leontiev presented a summary of Russia’s Pacific bluefin tuna fisheries. National purse-seine fisheries for tunas in the west Pacific Ocean stopped in 1992. From 1986-92, Russian purse-seine fisheries operated largely in the tropical Pacific Ocean. Up to 10 specially-equipped tuna purse-seine vessels participated in these fisheries, targeting yellowfin and skipjack tunas. Nevertheless, Russian research laboratories maintain continuous monitoring of the distribution and abundance of many tuna species, including bluefin, within Russia’s Exclusive Economic Zone.

Bluefin tuna typically concentrate during the summer months, in waters that range between 18° and 20°C. This species occurs sporadically as bycatch in drift-net fisheries off Primorie, South Kuril Island, and southeast Sakhalin. The weight of bluefin harvested from these waters ranges from 40 to 120 kg. Additionally, bluefin occur in catches of both longline and trap-net fisheries operating in waters off the Okhotsk-side of the South Kuril Islands, including the southeastern coast of Sakhalin.

Discussion: Dr. S. Leontiev communicated he is currently developing a document that present complete descriptions of his nation’s tuna fisheries, including bluefin, and he would make this report available at this year’s plenary session.

REVIEW OF LANDING DATA

The historical time series of bluefin tuna catches from the Ocean are summarized in Table 1 by nation and gear type (i.e., fishery).

Discussion: The Working Group re-emphasized the importance of collecting accurate catch statistics and subsequently, updating Table 1 in a timely fashion. The Group felt this issue was important not only for scientific purposes, but also for establishing an easily accessed summary of the bluefin fisheries of the Ocean that would be available to the public at large. In this context, it was suggested that the coordinator of the ISC Database System, who is appointed through the NRIFSF (see Report of the ISC Statistics Working Group), develop protocols for accomplishing this task.

REVIEW OF CPUE TRENDS

Status of CPUE indices for Pacific bluefin tuna (*Table 2*)

Catch-effort data are commonly utilized to derive catch-per-unit-effort (CPUE) statistics and subsequently, used as relative indices of population abundance in stock assessments. In an effort to summarize the status of CPUE indices currently available for Pacific bluefin tuna, Mr. K. Yokawa developed a table that presents the nation, fishery, primary target age, availability of index, type of index, quality of data, availability of size data, coverage of size data, and period of the time series (Table 2).

Nominal CPUE from the Japanese troll fishery (Document 5)

Mr. H. Yamada presented results from nominal CPUE analysis for the Japanese troll fishery. The troll fishery targets young bluefin tuna, with landings from this fishery that have varied between roughly 900 to 3,500 mt over the last decade. That is, the CPUE index derived from troll fishery data was evaluated as an index of recruitment abundance. In this study, catch and effort data were analyzed from the troll fishery that operates in northeastern waters of the East China Sea for 1980-00. Effort data were defined in nominal terms only, i.e., based on the number of vessels that made landings of bluefin tuna in each day. In summary, few differences were observed in recruitment abundance from the CPUE analysis and those generated from the VPA.

Discussion: The Working Group discussed the inherent difficulties associated with defining actual fishing effort for bluefin tuna when developing such indices from fishermen logbook records, e.g., questions remain about how fishing effort was actually incorporated in this analysis, particularly, for situations when there was no bluefin catch recorded, but potentially, fishing effort exerted. The Group recommended that researchers begin further evaluation of these data, particularly, standardization methods.

Nominal CPUE from the Japanese set-net fishery (Document 7)

Mr. H. Yamada presented preliminary analysis that addressed nominal CPUE analysis for the Japanese set-net fishery. The set-net fishery operates along coastal waters of Japan. Set-nets operate as fixed (passive-capture) gear, and configurations and deployment have remained largely consistent over the years. Thus, biases associated with changes in catchability due to changes in gear technology were not expected to influence estimation of CPUE for this fishery. Catch-effort data from the Japanese set-net fishery were collected during 1971-99. Catch was defined as the annual tonnage of bluefin landed. Catch was further partitioned into two categories, i.e., deeper sets (>27 m in depth) generally harvest larger fish (>20 kg in size), while sets made in shallower water generally harvest smaller fish (<20 kg). Units of effort were defined as the number of licenses granted on an annual basis. The CPUE estimates were generated for both size classes (large and small fish), as well as for two coastal fisheries (Pacific coast and Sea of Japan coast). Findings indicated the following: CPUE trends were similar for 'small' fish between the two fisheries, with 4-7 yr cycles observed that ranged from 0.5 to 4.0 mt/set; and CPUE trends for 'large' fish were also similar between the two coastal fisheries, with roughly 0.2-0.3 mt/set observed during the late 1980s, rising to a peak in 1993 (roughly, 1.5 mt/set), and subsequently, dropping to catch rates observed during the late 1980s.

Discussion: The Working Group suggested that researchers obtain further information regarding these set-net fisheries, including species composition of the catches by season, finer-scale measures of catch and effort (e.g., catch by set). Although assumptions regarding constant catchability seem reasonable for this fishery, researchers were encouraged to pursue standardization methods to corroborate or refute this hypothesis and if possible, incorporate oceanographic data in this analysis.

Standardized CPUE from the Japanese distant-water and offshore longline fisheries (Document 11)

Mr. K. Yokawa derived standardized CPUE indices (1953-01) for the Japanese distant-water and offshore longline fisheries that target spawning aggregations of Pacific bluefin tuna around the southwestern islands of Japan (Ryukyu Islands) during the spring and early summer. This research entailed updating a previously derived CPUE time series that was used as a tuning index in a VPA conducted in 2000. The basic model was a generalized linear model of log-transformed catch rate as a function of four main effects (year, month, sub-area, and gear type) and an interaction term based on year and month. Results were fairly sensitive to alternative additive constants that were applied to each CPUE record to allow log transformations of '0 catch' days (i.e., effort exerted, but no catch). That is, in the previous analysis conducted in 2000, the constant term was a very small value (0.1); however, recent investigations suggested that a more robust constant was a relatively larger value (1.0). The CPUE trend generated in this study indicated that spawning stock biomass peaked from 1960-65 and has remained relatively low since this time; however, since 1993, catch rates have showed slight increases from those observed during the 1980s and early 1990s. The CPUE trends documented in this study generally mimic those determined in previous studies conducted during the late 1990s.

Discussion: The Working Group suggested that inclusion of temporal-spatial interaction terms, as well as oceanographic parameters may help interpretation of this CPUE trend. In this context, multivariate statistical techniques, such as regression trees, may prove useful as alternative techniques to the classical GLM standardization methods.

Standardized CPUE from the Japanese coastal longline fishery (Document 12)

Mr. K. Yokawa presented results from preliminary analysis of catch-effort logbook data collected from the Japanese coastal longline fleet that targets spawning aggregations of Pacific bluefin tuna. This logbook data collection program has been underway since 1994, with annual coverage rates generally above 80%. Proportion-positive catch information from individual sets was used in this standardization method, which was based on a delta-lognormal model and binomial distribution theory. The model included factors for year, area, and month, and interaction terms for area and month, and year and month. Data used in this analysis covered most of the spawning area/season blocks for Pacific bluefin tuna in nearshore waters of Japan. Information about targeting behavior of fishermen could not be obtained from the logbook data. The CPUE trend estimated from this analysis was generally similar to that derived from the GLM approach for the Japanese distant-water and offshore longline fisheries.

Discussion: The Working Group recognized that it would be helpful to develop similar estimates of CPUE for the major coastal longline fishery operating in these waters (i.e., the Chinese Taipei longline fishery), which could then be compared/contrasted with results from this study.

TAGGING RESEARCH AND OTHER STUDIES

Estimation of mortality (Document 4)

Ms. M. Takahashi presented research that addressed estimation of mortality, both natural (*M*) and fishing (*F*), based on conventional tagging experiments conducted in waters around Japan during the 1980s. The analysis assumed annual and seasonal variation in fishing mortality, but considered no spatial structure. The estimation was based on the method of maximum likelihood. Research results indicated average rates of natural mortality of age 0-1 fish were substantially higher than documented in previous studies, with estimated rates between 1.6 and 1.8. Researchers communicated that sensitivity analysis provided some insight into reasons that led to these findings, including: the study focused strictly on juveniles; emigration behavior of the fish; inaccurate tag-reporting and/or tag-shedding rates.

Discussion: The Working Group expressed concern regarding the extremely high estimated rates of natural mortality and strongly recommended further tag-related experiments, as well as sensitivity analysis to corroborate or refute the presented results (see Recommendations for Future Work).

Experiments of pop-up tagging and ultrasonic tracking (Documents 1 and 2)

Dr. K. Yano presented results from experiments using pop-up archival satellite tagging methods and ultrasonic telemetry aboard the *R/V* Shoyo-maru. In the experiment, three large Pacific bluefin tuna were released with pop-up tags off Ishigaki Island and subsequently, data (e.g., temperature, depth, light level) were successfully retrieved from two fish that moved southwards. Results from the two fish indicated the following: linear distance of travel was 963 km and 5,443 km; swimming speeds were 3.76 km/hr and 5.30 km/hr; and temperature ranged from 19.1-31.4°C and 9.0-30.7°C.

Ultrasonic tracking results showed the following regarding tracking periods and actual distance of movements for each of the fish: for one of the fish, 256 hr and 1,357 km; and for the other fish, 168 hr and 1,001 km. Further, for one of the fish, the depth of swimming remained largely at 20 m during the day and two peaks of 20m and 90-100 m during the night. The other fish was shown to frequently explore a wider range in depth during the day (i.e., 20-30 m, 220-240 m, and 420 m), as well as during the night (20-30 m and 100-120 m).

For one of those fish, both an ultrasonic transmitter and pop-up tag was attached. The migration route estimated by the pop-up tag was evaluated using the ultrasonic tracking data; there was considerable difference between results generated by the two tracking devices.

Discussion: The Working Group cautioned that estimates of geolocation generated from data archived i.e., temperature, depth, and light level in pop-up tags can be subject to variation and thus, encouraged Dr. Yano to improve estimation methods for geolocation in order to obtain uncertainty bounds around correct estimates.

Long-term variation of Pacific bluefin tuna around Japan (Document 8)

Mr. H. Yamada presented information regarding the long-term variation of Pacific bluefin tuna based on qualitative information presented in historical literature, as well as estimates generated from quantitative results generated from Virtual Population Analysis (VPA). In the first ISC Pacific Bluefin Tuna Working Group, the population size of Pacific bluefin was estimated using a tuned-VPA based on data for the time period 1960-98. The VPA was conducted in 2001 using updated catch at age information and indices of abundance for an extended time series from 1952 to 1998. Estimates of population size from the recent VPA indicated considerable variation over the latter half of the 20th Century. In this study, the VPA estimates were used along with information gleaned from historical manuscripts, in efforts to generally evaluate stock fluctuations of this species in the context of a very long time scale. The evaluation indicated that the VPA-based fluctuation observed over the last 50 years maybe part of a natural, ecological-based cycle that characterizes the Ocean and its biological resources.

Discussion: The Working Group generally discussed possible reasons for these long-term shifts in population size, including correlations with fluctuations in abundance of pelagic forage species that represent prey for bluefin tuna.

STOCK ASSESSMENT

Significant progress was made in 2001 regarding development of time series data, catch-at-age analysis, and migration studies, which are all research areas that provide useful information when conducting formal stock assessments. The research generally involved developing indices of relative abundance (CPUE) and updating catch-at-age matrices for Japanese bluefin tuna fisheries, including troll, set-net, and coastal, distant-water, and offshore longline (see Review of CPUE Trends). Additionally, tagging research provided valuable information concerning the movement patterns associated with this species (see Tagging Research and Other Studies). However, no stock assessments were presented at this meeting.

RECOMMENDATIONS FOR FUTURE WORK

Recommendations made by the Working Group are presented under four broad headings: Fisheries Statistics; Species Nomenclature; Directed Studies; and Stock Assessment.

Fisheries Statistics

As stated above, it is imperative that each nation strive to provide updated, accurate time series of annual catch estimates (Table 1) in accordance with agreed to policies. However, in general, Pacific bluefin tuna fisheries' statistics are not completely satisfactory and therefore, should be improved in accordance with issues discussed during the Statistics Working Group. Readers should consult that Group's meeting Report for specific recommendations concerning bluefin tuna, as well as broader comments applicable to all monitored species that are currently harvested by fisheries in the Ocean.

Species Nomenclature

The Working Group generally discussed problems and confusion related to using different scientific names when referring to bluefin tuna that inhabit the Pacific Ocean. The Group decided to use *"Thunnus orientalis"* as the scientific name based on personal communication with B. Collette. This communication briefly summarized current taxonomic and genetic information. The Group agreed to use "Pacific bluefin tuna" as the common name for *T. orientalis*.

Directed Studies

The Working Group recommended that the following study areas receive further attention, in efforts to provide additional insight into bluefin tuna biology and ecology, which ultimately, will assist stock assessments conducted in the future:

1. There is a need for scientific experiments concerning tag-recovery reporting rates, tag-shedding rates by juvenile fish, and emigration rates of tagged juvenile fish to ensure estimates of mortality (both natural and fishing) are accurately determined. It is important that future mortality-related research focus on adult, as well as juvenile fish. Estimates from tagging analysis conducted in 2001 should be interpreted with caution, until more thorough review of the methods is conducted.

2. The Working Group also strongly recommended that archival-type tagging be continued in order to obtain objective information on migratory behavior of bluefin tuna, which will help corroborate or refute stock structure assumptions commonly employed in assessment models.

3. Although age determination of this species, as well as tuna species in general, continues to be problematic, the Working Group recommended that age and growth research be continued. In this context, the Group noted the need to develop sound experimental designs for obtaining needed data (hard parts and/or size data).

Stock Assessment

The Working Group noted that a substantial amount of work needs to be conducted in 2002-03 in support of stock assessment of Pacific bluefin tuna, including:

1. Follow-up work regarding critical examination of catch-effort data and subsequently, standardization methods for applicable CPUE indices (e.g., Japanese troll and set-net fisheries). If possible and when appropriate, such methods should include habitat preference of Pacific bluefin tuna, oceanographic effects, targeting strategy of fishermen, and time-space interactions, especially incorporation of accumulated data from archival tag study. Researchers should begin investigations of all fisheries that have available catch-effort statistics and consider age-specific, along with age-aggregated, abundance indices for fisheries with applicable data. This will require both biological (size- and age-composition data) and logbook (CPUE data) information in an effort to evaluate age-class trends over time. The CPUE indices will be most useful for inclusion in deterministic models (see 2 below), but will also be helpful when constructing effort time series for use in fully integrated statistical models (see 3 below), as well as for comparing with assessment-based estimates of population abundance.

2. Continue work using Virtual Population Analysis (VPA); however, the Working Group strongly recommended that construction of a population-wide catch-at-age matrix warrants further, rigorous evaluation (see Tagging Research and Other Studies, as well as the first meeting Report of the ISC Bluefin Tuna Working Group, November 30-December 1, 2000). Table 1 should serve as the foundation for construction of the catch-at-age matrix.

3. Begin development of an integrated, statistical model for Pacific bluefin tuna as soon as possible. This work will be accomplished by scientists from IATTC (R. Deriso

and M. Hinton), NMFS-Honolulu Laboratory (P. Kleiber), NMFS-La Jolla Laboratory (R. Conser and P. Crone), and NRIFSF (H. Yamada), led by H. Yamada. Candidate modeling software for accomplishing this task will include MULTIFAN-CL and ASCALA. It is important to note that this research will be a collaborative effort that will involve input from all members and contributors to the ISC.

OTHER BUSINESS

The Working Group noted that the use of *T. orientalis* will have implications for trade documentation schemes currently in place.

CLOSING OF THE MEETING

The meeting was adjourned on January 22, 2002. The Chairperson thanked participants and recommended that the Work Group’s next meeting time and place be in accordance with decisions regarding the next general session of the ISC. Following two reviews by ISC participants, the final version of this Report was adopted on January 26, 2002. The final version was submitted to the Plenary session of the ISC on January 28, 2002.

APPENDIX 1: List of Participants

Chinese-Taipei

Chien-Chung Hsu
Institute of Oceanography
National Taiwan University
Taipei
Taiwan
hsucc@ccms-ntu.edu.tw
Phone: 886-2-23622987
Fax: 886-2-23661198

Chi-Lu Sun
Institute of Oceanography
National Taiwan University
Taipei
Taiwan
chilu@ccms-ntu.edu.tw
Phone: 886-2-23629842
FAX: 886-2-23629842

Shyh-Bin Wang
Overseas Fisheries Development Council of the Republic of China (Taiwan)
w096054@ofdc.org.tw
Phone: 886-2-27381522
Fax: 886-2-27384329

IATTC

Robin Allen
Inter-American Tropical Tuna Commission
Scripps Institution of Oceanography
8604 La Jolla Shores Drive
La Jolla, CA 92037-1508
U.S.A.
rallen@iattc.org
Phone: 1-858-546-7100
Fax: 1-858-546-7133

Michael G. Hinton
Inter-American Tropical Tuna Commission
Scripps Institution of Oceanography
8604 La Jolla Shores Drive
La Jolla, CA 92037-1508
U.S.A.
mhinton@iattc.org
Phone:1-858-546-7033
Fax: 1-858-546-7133

Japan

Hitoshi Fujita
Coastal and Offshore Fisheries Division
Fisheries Agency
Government of Japan
1-2-1, Kasumigaseki, Chiyoda-Ku
Tokyo, 100-8907
Japan
hitoshi_fujita@nm.maff.go.jp
Phone: 81-3-5510-3307
FAX: 81-3-3501-1019

Hideki Kato
Resources and Environment Division
Fisheries Agency
Government of Japan
1-2-1, Kasumigaseki, Chiyoda-Ku
Tokyo, 100-8907
Japan
hideki_kato@nm.maff.go.jp
Phone: 81-3-3501-5098
Fax: 81-3-3592-0759

Takeharu Kosuge
Ishigaki Tropical Station
Seikai National Fisheries Research Institute
Fukai Ota 148-446, Ishigaki, Okinawa 907-0451
Japan
kosuge@fra.affrc.go.jp
Phone: 81-9808-8-2571
Fax: 81-9808-8-2573

Ryota Matsuda
International Affairs Division
Fisheries Agency
Government of Japan
1-2-1, Kasumigaseki, Chiyoda-Ku
Tokyo, 100-8907
Japan
ryota_matsuda@nm.maff.go.jp
Phone: 81-3-3591-1086
Fax: 81-3-3502-0571

Naozumi Miyabe
National Research Institute of Far Seas Fisheries
Orido 5-7-1, Shimizu 424-8633
Japan
miyabe@fra.affrc.go.jp
Phone: 81-543-36-6045
Fax: 81-543-35-9642

Yoshiko Narisawa
Far seas Fisheries Division
Fisheries Agency
Government of Japan
1-2-1, Kasumigaseki, Chiyoda-Ku
Tokyo, 100-8907
Japan
yoshiko_yokota@nm.maff.go.jp
Phone: 81-3-3502-2443
FAX: 81-3-3591-5824

Miki Ogura
National Research Institute of Far Seas Fisheries
Orido 5-7-1, Shimizu 424-8633
Japan
ogura@affrc.go.jp
Phone: 81-543-36-6032
FAX: 81-543-35-9642

Toshikatsu Maeda
Japan Purse Seiner's Association
11-3 3 Chome, Nagahama
Chuo-Ku Fukuoka 810-0072
Japan
Phone: 81-092-711-6261
Fax: 81-092-711-6265

Makoto P. Miyake
Scientific Adviser
Japan Tuna
p.m.miyake@gamma.ocn.ne.jp
Phone: 81-422-46-3917
FAX: 81-422-43-7089

Hiroaki Okamoto
National Research Institute of Far Seas Fisheries
Orido 5-7-1, Shimizu 424-8633
Japan
okamoto@affrc.go.jp
Phone: 81-543-36-6044
Fax: 81-543-35-9642

Mio Takahashi
National Research Institute of Far Seas Fisheries
Orido 5-7-1, Shimizu 424-8633
Japan
m.takahashi@affrc.go.jp
Phone: 81-543-36-6035
Fax: 81-543-35-9642

Shozo Takahashi
Federation of North Pacific District Purse Seine
Fisheries Co-operative Associations of Japan
Sankaido Bldg. 2F, 9-13, 1 Chome,
Akasaka Minato-Ku, Tokyo
Japan
Phone: 81-3-3585-7941
Fax: 81-3-3589-3149

Toshiyuki Tanabe
National Research Institute of Far Seas Fisheries
Orido 5-7-1, Shimizu 424-8633
Japan
katsuwo@affrc.go.jp
Phone: 81-543-36-6033
Fax: 81-543-35-9642

Koji Uosaki
National Research Institute of Far Seas Fisheries
Orido 5-7-1, Shimizu 424-8633
Japan
uosaki@affrc.go.jp
Phone: 81-543-36-6033
FAX: 81-543-35-9642

Yuji Uozumi
National Research Institute of Far Seas Fisheries
Orido 5-7-1, Shimizu 424-8633
Japan
uozumi@fra.affrc.go.jp
Phone: 81-543-36-6037
FAX: 81-543-35-9642

Harumi Yamada
National Research Institute of Far Seas Fisheries
Orido 5-7-1, Shimizu 424-8633
Japan
hyamada@fra.affrc.go.jp
Phone: 81-543-36-6034
Fax: 81-543-35-9642

Kazunori Yano
Ishigaki Tropical Station
Seikai National Fisheries Research Institute
Fukai Ota, 148-446, Ishigaki, Okinawa 907-0451
Japan
sharkky@fra.affrc.go.jp
Phone: 81-9808-8-2571
Fax: 81-9808-8-2573

Kotaro Yokawa
National Research Institute of Far Seas Fisheries
Orido 5-7-1, Shimizu 424-8633
Japan
yokawa@affrc.go.jp
Phone: 81-543-36-6035
Fax: 81-543-35-9642

Korea

Jeong Rack Koh
National Fisheries and Research Development Institute (NFRDI)
Busan, Korea
jrkoh@nfrdi.re.kr
Phone: 82-51-720-2321
Fax: 82-51-720-2337

Russia

Sergei Leontiev
107140 Krasnoselskaya 17, Moscow
Russia
leon@vniro.ru
Phone & Fax: 7-095-264-9465

United States

Keith Bigelow
Southwest Fisheries Science Center
2570 Dole Street
Honolulu, HI 96822-2396, U.S.A
Keith.bigelow@noaa.gov
Phone: 1-808-983-5388
FAX: 1-808-983-2902

Raymond P. Clarke
NOAA/NMFS
Pacific Island Area Office
1601 Kapiolani Blvd., Suite 1100
Honolulu, HI 96814-4700, U.S.A.
Raymond.Clarke@noaa.gov
Phone; 1-808-973-2935 ext. 205
FAX; 1-808-973-2941

Ray Conser
NOAA/NMFS
Southwest Fisheries Science Center
P.O. Box 271, La Jolla, CA 92038, U.S.A.
rconser@ucsd.edu
Phone: 1-858- 546-5688
Fax: 1-858- 546-5656

Paul Crone
NOAA/NMFS
Southwest Fisheries Science Center
P.O. Box 271, La Jolla, CA 92038, U.S.A.
pcrone@ucsd.edu
Phone: 1-858-546-7069
FAX: 1-858-546-5653

Pierre Kleiber
NOAA/NMFS
Southwest Fisheries Science Center
2570 Dole Street
Honolulu, HI 96822-2396,U.S.A
Pierre.kleiber@noaa.gov
Phone: 1-808-983-5399
FAX: 1-808-983-2902

R. Michael Laurs
Director Honolulu Laboratory
NOAA/NMFS
Southwest Fisheries Science Center
2570 Dole Street, Honolulu, HI 96822-2396
U.S.A
Mike.laurs@noaa.gov
Phone: 1-808-983-5303
FAX: 1-808-983-2901

Gary Sakagawa
NOAA/NMFS
Southwest Fisheries Science Center
P.O. Box 271, La Jolla, CA 92038, U.S.A.
Gary.Sakagawa@noaa.gov
Phone: 1-858-546-7177
FAX: 1-858-546-5653

Robert A. Skillman
NOAA/NMFS
Southwest Fisheries Science Center
2570 Dole Street, Honolulu, HI 96822-2396
U.S.A
Robert.Skillman@noaa.gov
Phone: 1-808-983-5345
FAX: 1-808-983-2902

Jerry Wetherall
NOAA/NMFS
Southwest Fisheries Science Center
2570 Dole Street, Honolulu, HI 96822-2396
U.S.A
Jerry.Wetherall@noaa.gov
Phone: 1-808-983-5386
FAX: 1-808-983-2902

APPENDIX 2: Agenda

Bluefin Tuna Working Group Meeting
Interim Scientific Committee for Tuna and Tuna-like Species
In the North Pacific

January 22 and 24, 2002
Nagasaki, Japan

1. Opening of meeting
    - Welcome and Introduction
    - Selection of chairperson and rapporteurs
    - Adoption of agenda
    - Tabling of document

2. Review of Research of the agreement at the 1st BFT-WG meeting
    - Review of the agreements at the 1st BFT-WG meeting
    - Fisheries Statistics Research
        - Chinese Taipei
        - Japan
        - Republic of Korea
        - United States
        - IATTC
    - Stock Abundance Indices
        - Japan
        - Others

3. Research recommendations

4. Future arrangement and report

5. Closing of meeting

APPENDIX 3: Document List

ISC BFT-WG/02/DOCUMENT #

1. *Results of pop-up satellite tagging for the movements in the spawning areas of Pacific bluefin tuna*
   K. Yano, H. Yamada and T. Kosuge
2. *Diurnal swimming patterns of the Pacific bluefin tuna in the spawning areas of the southern Ryukyu Islands using ultrasonic telemetry*
   K. Yano, H. Yamada and T. Kosuge
3. *The outline of the Japanese offshore purse seine fishery in the Sea of Japan*
   H. Yamada and Y. Yamazaki
4. *Updated preliminary analysis of mortality of juvenile Pacific bluefin tuna Thunnus orientalis using tag-recapture data*
   Y. Takeuchi and M. Takahashi
5. *Preliminary analysis on nominal CPUE of Japanese troll fishery for bluefin tuna*
   H. Yamada and D. Nishimura
6. *Fisheries of bluefin tuna in the waters off Korea*
   J. Koh, K. Choi and D. Ahn
7. *Preliminary analysis on nominal CPUE of Japanese set net fishery for bluefin tuna*
   H. Yamada
8. *Long-term variation of Pacific bluefin tuna around Japan*
   H. Yamada
9. *Bluefin tuna fisheries of the United States*
   G. T. Sakagawa and A. Coan, Jr
10. *Estimation of Japanese bluefin tuna catch by fishery in the north Pacific*
    M. Takahashi and H. Yamada
11. *Standardization of Pacific bluefin tuna CPUE caught by Japanese distant-water and offshore longliners in the spawning ground from 1953-2000*
    H. Matsunaga, H Shono and K. Yokawa
12. *Preliminary analysis of CPUE of Pacific bluefin tuna caught by Japanese coastal longliners in the spawning ground*
    K. Yokawa and H. Yamada
13. *Estimation of Pacific bluefin tuna catch-at-age by fishery for Japanese fisheries in the north Pacific*
    M. Takahashi and H. Yamada
14. *A description of bluefin fishery for Taiwanese longline fishery in the North Pacific*
    C. C. Hsu and H. C. Liu

ISC BFT-WG/02/INFORMATION PAPER #

1. *Report of the ISC bluefin tuna working group*
   ISC bluefin tuna working group
2. *Estimation of population size of Pacific bluefin tuna using tuning VPA*
   H. Yamada and Y. Taksuchi

Table 1. Catch of Pacific bluefin tuna by country and fishery.

Year	Western Pacific states: Japan							Korean[*2]		Chinese Taipei		Sub Total	Eastern Pacific states: United States							Mexico	Sub Total[*1]	Total
	Purse Seine	Longline	Troll	Pole and Line	Set Net	Drift Net	Others	Purse seine	Trawl	Longline	Purse Seine		Pole and	Purse Seine	Longline	Troll	Gillnet	Other	Sport	Purse Seine		
1952	3,690	2,581	659	4,852	2,467	286	249					14,784									2,077	16,861
1953	4,189	1,998	2,175	3,049	2,205	9	49					13,674									4,468	18,142
1954	4,043	1,588	1,994	3,041	5,790	48	37					16,541									9,545	26,086
1955	10,561	2,099	2,026	2,839	3,484	15	62					21,086									6,240	27,326
1956	15,810	1,242	2,313	4,058	5,109	24	116					28,672									6,006	34,678
1957	15,971	1,490	1,720	1,795	4,246	14	21					25,258									9,267	34,525
1958	7,860	1,429	774	2,337	1,281	7	71					13,759									13,941	27,700
1959	9,108	3,667	589	586	1,645	1	19					15,615									6,925	22,540
1960	9,268	5,784	1,537	600	2,676	67	66					19,997									5,423	25,420
1961	8,120	6,175	2,485	662	3,631	19	60					21,152									8,135	29,287
1962	9,501	2,238	1,731	747	2,729	6	50					17,002									11,145	28,147
1963	8,677	2,104	3,067	1,256	4,240	18	112					19,473									12,272	31,745
1964	7,950	2,379	3,076	1,037	2,442	9	89					16,982									9,217	26,199
1965	10,173	2,062	1,803	831	2,477	52	160					17,558									6,888	24,446
1966	8,790	3,388	1,208	613	1,387	42	40					15,469									15,897	31,366
1967	5,750	2,099	2,796	1,210	2,993	39	195					15,082									5,888	20,970
1968	8,341	2,278	1,572	983	3,229	6	40					16,450									5,976	22,426
1969	2,876	1,366	1,978	721	2,253	32	23					9,248									6,926	16,174
1970	2,644	1,123	1,583	723	2,472	62	21					8,629									3,966	12,595
1971	3,559	757	2,600	938	1,534	35	7					9,428									8,360	17,788
1972	3,827	724	1,792	944	1,341	39	8					8,674									13,347	22,021
1973	2,001	1,158	3,089	526	2,823	309	50					9,956									10,744	20,700
1974	3,679	3,533	2,889	1,192	6,523	335	145					18,295									5,617	23,912
1975	4,308	1,558	1,908	1,401	2,408	676	69					12,328									9,583	21,911
1976	1,964	520	1,833	1,082	3,207	1,085	15					9,705									10,645	20,350
1977	3,960	712	3,070	2,256	2,419	884	28					13,330									5,473	18,803
1978	8,878	1,049	6,328	1,154	2,827	2,030	68					22,334									5,397	27,731
1979	12,266	1,223	5,158	1,250	5,021	1,541	75					26,534									6,117	32,651
1980	10,414	1,170	2,323	1,392	2,701	1,479	63					19,542								582	2,939	22,481
1981	22,091	796	2,456	754	2,130	2,130	15			179		30,551	0	874	0	10	4	0	6	238	1,132	31,683
1982	17,584	880	1,479	1,777	1,644	1,577	3	31		176		25,151	0	2,499	0	0	1	1	7	520	3,028	28,179
1983	13,272	707	2,606	356	962	807	30	13		157		18,911	66	754	0	0	3	0	21	214	1,058	19,969
1984	4,217	360	2,722	587	2,475	532	25	4		471		11,395	4	626	0	0	4	1	31	166	832	12,227
1985	3,820	496	2,904	1,817	2,678	728	37	1		210		12,691	3	3,243	0	0	6	1	55	676	3,984	16,675
1986	7,138	249	2,714	1,086	2,885	316	13	344		70		14,815	1	4,715	0	0	15	0	7	189	4,927	19,742
1987	7,962	346	1,352	1,565	2,085	258	3	89		365		14,026	0	821	0	0	2	0	21	119	963	14,989
1988	3,243	241	1,714	907	864	371	3	32		108	197	7,680	4	796	0	0	3	0	4	447	1,254	8,934
1989	5,422	440	1,593	754	823	173	4	71		205	259	9,744	8	1,008	0	0	3	0	70	57	1,146	10,890
1990	2,678	396	1,756	536	768	256	19	132		189	149	6,879	38	877	0	0	10	0	40	50	1,015	7,894
1991	8,522	285	3,015	286	1,734	236	26	265		342	-	14,711	0	100	0	0	4	0	57	9	170	14,881
1992	6,246	573	1,331	166	1,227	888	2	288		464	73	11,258	1	1,065	9	0	8	14	93	0	1,190	12,448
1993	5,753	857	895	68	899	159	3	40		471	1	9,146	5	467	45	0	31	24	114	0	686	9,832
1994	7,150	1,138	2,899	302	434	126	3	50		559	-	12,661	1	880	24	0	26	0	24	65	1,020	13,681
1995	16,668	769	3,449	427	1,281	110	12	821		335	-	23,872	1	689	27	0	17	0	166	11	911	24,783
1996	6,713	978	2,532	217	480	67	8	102		956	-	12,053	0	4,639	25	2	40	0	30	3,700	8,436	20,489
1997	11,585	1,383	1,611	77	311	109	10	1,054		1,814	-	17,954	2	2,189	25	1	56	0	90	327	2,690	20,644
1998	4,860	1,260	1,717	108	381	91	12	188		1,910	-	10,527	132	1,695	54	44	36	0	213	1	2,175	12,702
1999	14,238	1,155	1,596	124	377	59	213	256		3,089		21,107	2	113	55	1	18	2	397	2,327	2,915	24,022
2000	13,917	1,118	2,020	322	708	51	76	794	0	2,780		21,786	12	255	18	1	27	0	218	3,091	3,622	25,408
2001								995	10	2,429	*3											

*1: Subtotal of Eastern Pacific states from 1952 to 1980 were cited from IATTC statistics.
*2: Catch statistics of Korea derived from Japanese Import statistics from 1982-1999 (minimum estimates).
*3: Preliminary estimates.

Table 2. Recent status of CPUE index of Pacific bluefin tuna.

Country	Fishery	Primary Target Age	Index	Type of Index	Quality C&E data	Size Data	Coverage of Size data
Japan	Purse Seine (Pacific)	0-9	Y	Nominal	Limited	Y	<5%
	Purse Seine (Sea of Japan)	0-3	N	-	Limited	Y	<5%
		4-10+	N	-	Limited	N	-
	Offshore Longline	5+	Y	Standardized	Good	Y	>50%
	Coastal Longline	5+	Y	Standardized	Good (only 1994-)	Y	~10%
	Troll	0-2	Y	Nominal	No effort data	Y	<3%
	Pole and Line	0-1	N	-	Limited	Y	<5%
	Set Net	0-2	Y	Nominal	No effort data	Y	<20%
Korea	Purse Seine	0-1	N	-	Good (only 1999-)	Y	1-2%
	Trawl	No information	-		No effort data	N	
Chinese Taipei	Coastal Longline	5+	Y	Nominal	Good	Y	80%
USA	Purse Seine	4-8	Y	Standardized	Good	Y	20%
	Sport	4-8	N	-	No effort data	N	-
Mexico	Purse Seine	4-8	N	-	Good	?	?