

Annex 8

REPORT OF THE BIOLOGICAL RESEARCH TASK FORCE WORKSHOP

International Scientific Committee for Tuna and Tuna-like Species
in the North Pacific Ocean

28-30 May 2009
Busan, Korea

1.0 INTRODUCTION

A meeting of the Biological Research Task Force (BRTF) of the International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean was held at the National Fisheries Research and Development Institute in Busan, Korea, 28-30 May 2009. Ten (10) participants from Canada, Chinese Taipei, Japan, Korea, and United States participated in the meeting (Appendix 1). Shui-Kai Chang (Chinese-Taipei) chaired the meeting.

A provisional agenda was developed and circulated prior to the meeting. This agenda was revised by the Chair and was adopted by the participants with the addition of Item 10 (Appendix 2). No working papers or other papers were submitted or presented prior to or during the meeting. John Holmes (Canada) and Ai Kimoto (Japan) served as rapporteurs.

The Chair provided introductory remarks, reminding the participants that the BRTF was charged by the ISC8 plenary with developing a sampling plan for highly migratory species (HMS) focusing on two priorities: (1) sex-specific age and growth, and (2) maturity data. Albacore (ALB), swordfish (SWO), striped marlin (STM), and blue marlin (BUM) are the key species for this planning process. Pacific bluefin (PBF) research needs are similar, but the existing sampling programs need to be expanded to acquire sex-specific length and maturity data. The BRTF was encouraged to take a results-oriented approach during the meeting in order to determine what is needed, how to get it, and to estimate the costs of obtaining the necessary fish and data. As a consequence, an extensive justification of the sampling design is not provided in this report.

The Chair noted that both the ALBWG and BILLWG research plans developed during intersessional workshops identified the need for size-stratified information. Although spatial and temporal stratification are important, in light of the tight timeline for the BRTF reporting, the Chair suggested that the participants focus only on size-stratified sampling, ensuring that fish from all parts of the size range are collected and sampled. This approach was accepted by the meeting participants and the Chair handed out hard copies of spreadsheets (one for each species) prepared earlier showing size range by country and gear combinations (i.e., fleets), estimated costs, data needed, and coordinators (Tables 1-5). The approach was to use these spreadsheets to determine which fleets to target for samples based on the size range of their catch and to recommend the number of samples from each length bin required. Discussion for each species was structured around the eight categories of information shown in Appendix 3.

2.0 BRTF GOALS AND OBJECTIVES (ISC8)

John Holmes provided a brief review of the rationale for the establishment of the BRTF by ISC8. ISC working groups have identified biological research needs at various times during intersessional workshops and some, such as PBFWG, have even developed and implemented plans to get the necessary data and research. Working groups were asked to present a brief seminar on priority research needs that would improve stock assessments at ISC8. A lengthy list of research needs was compiled and discussed at ISC8 and these needs were distilled into two common priorities for the ALBWG and BILLWG: (1) sex-specific age and growth data, and (2) maturity data. Data currently used by both groups are at least 40 years old or do not exist. The PBFWG research needs differed in that they focused on sex-specific length and maturity data from the extremes of the size spectrum. A strategic investment in a multi-species data collection is clearly warranted and the BRTF was established to design a program to meet this goal. By necessity, this program will be a multi-year, multi-national cooperative effort. The BRTF will report at the ISC9 plenary session in July 2009 in Kaohsiung, Taiwan.

3.0 BRTF WORKSHOP SUMMARY

The BRTF provides two categories of size-stratified sampling recommendations using 10 cm length bins for each species. Target samples represent the minimum number of samples (fish) necessary to produce scientifically defensible results and conclusions and the projected sample sizes are the sample sizes that the BRTF believes are achievable after considering the mix of fleets available for sampling. Both the target and projected samples represent the number of fish that need to be sampled over the three-year period recommended by the BRTF. For all species, except albacore, projected sample sizes are greater than the target samples sizes, recognizing that an iterative review process will be necessary to adjust sampling after implementation as new information concerning fleet capabilities to obtain and deliver samples is compiled. For example, there is a clear need for samples of fish from the small and large ends of the size spectrum for each species discussed. However, fish in the smallest and largest size categories are typically rare in existing catches so the likelihood of collecting sufficient numbers of these fish from the targeted fleets will not be known until sampling is implemented. It may not be possible to obtain samples for small and/or large fish for some species.

The multi-species program recommended by the BRTF is designed to collect and process samples for a 3-year period. The costs presented for each species reflect the fixed costs of obtaining the data and samples from the targeted fisheries and processing the samples for subsequent analysis. These fixed costs are categorized as field (costs to support personnel in the field collecting data and samples, e.g., transferring fish from field to lab), processing (laboratory costs to prepare samples for age analysis or maturity analysis, e.g., prepare and mount otoliths), miscellaneous (for species coordinators to perform quality control and computer hardware, software, data management, related supplies, etc.), and fish costs. Fish are often the largest cost component since whole animals or parts of animals (head, gonads) will have to be purchased from fishermen to enable the destructive sampling that is needed to obtain sex, otoliths, dorsal fin rays and gonad tissue. The costs to purchase fish shown in this document are likely

underestimated, as they are based on an average value regardless of fish size. The variable costs associated with analysis of the samples (analysis costs) were not estimated by the BRTF because they depend on the agencies willing to do this research, the level of in-kind support, and extra staffing necessary to achieve the goals. Although no estimates are provided here, the BRTF notes that there will be costs that agencies/countries will have to plan for as the sampling plan is implemented. All cost estimates are given in U.S. dollars (USD).

4.0 ALBACORE WORKING GROUP RESEARCH NEEDS

The Albacore working group recognized aging and maturity as significant uncertainties in the current stock assessment. In the current assessment, an age-length key is used to convert size composition data into age composition so that catch-at-age matrices can be generated as input data to the model. Furthermore, the von Bertalanffy growth equation does not fit well to the Suda (1969) weight-length relationship currently used by the ALBWG. Because ageing is a major uncertainty in the stock assessment, the WG may use catch-at-length rather than catch-at-age as input data for the next stock assessment using Stock Synthesis 3. This approach will reduce the impact of aging uncertainty, but getting updated age and growth data is still important. Additionally, differences in South Pacific and North Pacific albacore growth curves have been noted, with the South Pacific curve assuming longer longevity than the North Pacific growth curve. New growth data will address this issue as well.

The BRTF reviewed the details of fisheries that currently catch albacore. There are a several major fisheries including Canadian troll, Japanese distant-water longline, pole-and-line and purse seine, Taiwanese distant-water longline, and the USA sport and troll fisheries. The Japanese purse seine, gillnet, set net and troll, Korean longline, Mexican purse seine, Taiwanese coastal and offshore longline, and the USA longline and pole-and-line are minor albacore fisheries. Korean fleets operate in sub-tropical areas, and their data will be checked and updated. Fork lengths of albacore harvested by all fisheries range between 40 and 130 cm, except the Japanese gillnet fishery which may capture fish as small as 20 cm. The available sizes in each fishery are shown in Table 1.

The ALB sampling plan targets 80 fish per 10 cm length bin for a total target sample of 960 fish. The BRTF projected sample sizes include 20 individuals in each 10 cm bin between 20 and 30 cm, and 80 individuals in each 10 cm bin between 40 cm and 130 cm for a total 840 fish. The projected sample is substantially less than the target sample because only one fishery appears to catch fish in the two smallest size bins (20 and 30 cm). These small fish are caught occasionally by Japanese gillnet fishery, but are rare in other fisheries. The ability to collect these small fish on a consistent basis is unknown at this time. One option is to put a "bounty" on small fish so that other fisheries will retain them. Some discussion focused on the fact that the USA LL fishery out of Hawaii may also pick up the small sized-fish, but they do not appear in the size-frequency data from this fleet because they are not retained. Checking the observer data may confirm this hypothesis, and if true, then samples can be collected from this fishery as well.

Detailed sample requirements for each fishery and an ISC contact person for each fishery were identified and are shown in Table 1. Samples are preferably collected by quarter, but these

logistical details will be left to the ALBWG and species coordinator to work out. A species coordinator will be selected at the July 2009 Albacore working group meeting.

The ALBWG needs samplers to record the position and time of capture of fish, fork length, total weight, and gonad weight by sex, and remove otoliths, the whole first dorsal fin ray, gonad tissue (preferably whole), and muscle tissue for biological samples. The gonad tissue should be fixed in buffered 4% formaldehyde (10% Formalin), or if not available, then the tissue should be frozen, although this procedure is inferior to fixation for the maturity/fecundity analyses. If the gonad is sub-sectioned, a standard procedure showing where and what to slice needs to be developed by the ALBWG. The muscle tissue will be obtained for DNA, lipid and other analyses.

The analysis of age, growth, and reproduction will be a cooperative effort between agencies from Canada, Chinese Taipei, Japan, and the USA. There are no standardized techniques for the age and growth studies so it will be necessary for the ALBWG to establish these methods prior to beginning the analysis.

The estimated total fixed cost to collect and process the samples required by the ALBWG is \$111,000 (Table 1). The field cost is based on a rate of \$35 per fish to collect the data and ship fish from the field to the laboratory. Processing costs are based on a rate of \$20 per fish sample. The collection of biological samples (gonad tissue, otoliths, first dorsal fin) will damage fish and reduce their value to the fishery. As a result, fish will have to be bought for sampling at an estimated cost of \$40 per fish.

4.0 BILLFISH WORKING GROUP RESEARCH NEEDS

Common characteristics of the billfish species that are the focus of the BRTF include a presumed expansive home range, lack of dense schooling behavior, attainment of a large adult size, apparent longevity, rarity of available juveniles and largest adult sizes, and their inability to be propagated or survive in captivity. These biological characteristics have limited the ability of researchers to collect desired samples in numbers sufficient to investigate pertinent life history questions. Furthermore, there is structure to the swordfish stock across the North Pacific Ocean so it is important to assess these objectives separately in eastern, central, and western areas. Major uncertainties in the stock assessment revolve around the growth curves, which need an update, and pooling of length data by sex. Billfishes are sometimes processed at sea -- head, fins, and/or viscera are removed then the remaining carcass is stowed is either frozen or put on ice prior to arrival at port -- which adversely affects the acquisition of sex-specific sampling information.

4.1 Swordfish

The objectives of the BILLWG sampling for swordfish include (1) age, growth and longevity estimates in the eastern, central, and western north Pacific Ocean, and (2) sex-specific estimates of age at 50% maturity in the same areas.

The BRTF reviewed the details of fisheries currently reporting catches of swordfish (Table 2). Major fisheries include the Japanese distant-water, coastal and offshore longline fleets, the Japanese training vessel gillnet catch, the Taiwanese coastal and offshore longline fleets, and the

U.S.A. Hawaii-based longline fleet. Minor swordfish catches are reported by the Japanese harpoon and set net fisheries, the Korean longline fishery, the Mexican longline and gillnet fishery, the Taiwanese distant-water longline fishery, and the USA gillnet and harpoon fisheries. Korean data will be checked and updated. Eye fork length of all fisheries ranges from 70 cm to 280 cm, and the size composition of catches are shown in Table 2.

The species coordinator for all billfish will be Robert Humphreys from NOAA/NMFS PIFSC. The BRTF recommended a target of 60 individuals in each 10 cm length bin between 70 cm and 280 cm for a total target sample of 1,320 fish. The projected sample based on a review of the fisheries is 1,430 fish, reflecting higher samples in the length bins between 130 and 250 cm. The details of sample sizes and the contact point in each fishery are shown in Table 2. Samples by sex should be collected equally, but female samples are more important.

Samplers need to record position and time of capture of fish, eye fork length, sex, and depending on the country, a photo should be taken to confirm species identification. Otoliths, whole first dorsal fin, gonad tissue, and muscle tissue for DNA will be collected for biological samples. The gonad tissue should be fixed in buffered 4% formaldehyde (10% Formalin). Freezing is an alternative, but is an inferior method of preservation for subsequent histological analysis. The analysis of age, growth, and reproduction should be a cooperative effort between agencies from Chinese Taipei, Japan, and the USA.

The estimated total fixed costs to collect and process the swordfish samples required by the BILLWG is \$114,000 (Table 2). The total cost to buy the parts of the fish needed for sampling (head, dorsal fin) was estimated assuming an average cost of \$20 per fish. For fish less than 100 cm in length caught in the Japanese coastal and offshore longline fisheries, the whole fish will have to be purchased.

4.2 Striped Marlin

The objectives of the BILLWG sampling for striped marlin include (1) age, growth and longevity estimates in the eastern, central, and western north Pacific Ocean, and (2) sex-specific estimates of age at 50% maturity in the same areas. The BILLWG recognized that the existing biological data for striped marlin are old and limited and that there is a need to obtain new data from the western, central and eastern Pacific Oceans. Obtaining samples from the Mexican sport fishery is critical as this is a targeted fishery operating in the eastern north Pacific Ocean.

The BRTF reviewed the details of existing fisheries currently reporting catches of striped marlin (Table 3), including the Japanese distant-water, offshore, and coastal longline, gillnet, troll, harpoon, training vessel longline, and sport fisheries, Korean longline fishery, Mexican sport fishing, Taiwanese distant-water, coastal and offshore longline fisheries, and USA longline, and Hawaiian troll and handline fisheries. Purse seine catch of large animals from the eastern Pacific have been reported to the IATTC, but the country of origin is not clear at this time. The Korean data need to be checked and updated. The range of eye fork lengths over all fisheries is between 60 and 300 cm, and the available size ranges of each fishery are shown in Table 3.

The species coordinator will be Robert Humphreys from NOAA/NMFS PIFSC. The BRTF recommended target sample sizes ranging from 5 to 30 individuals in each 10 cm bin between 60 cm and 300 cm for a total target sample of 485 fish and projected sampling of 510 fish (Table 3). The estimated total fixed cost to collect and process striped marlin samples is \$140,000.

4.3 Blue Marlin

The objectives of the BILLWG sampling for blue marlin include (1) age, growth and longevity estimates in the eastern, central, and western north Pacific Ocean, and (2) sex-specific estimates of age at 50% maturity in the same areas. The BILLWG recognized the biological data for blue marlin are limited and there is no reliable growth curve currently available. The BRTF proposal has a north Pacific focus, but Pacific blue marlin is likely a pan-Pacific stock and the sampling design may need to reflect this characteristic in the future.

The BRTF reviewed the details of existing fisheries currently reporting catches of blue marlin (Table 4). The largest catches occurred in the Japanese sport, training vessel longline, and troll fisheries, the Mexican sport fishery, the Taiwanese distant-water, coastal and offshore longline fisheries, and the USA longline and Hawaii-based troll and handline fisheries. Smaller catches have been reported by the Japanese distant-water, offshore, and coastal longline fisheries. Some Korean longline data may be available, but they will need to be checked and updated first. Eye fork length of blue marlin caught by all fisheries ranges between 60 cm and 380 cm, and the available size in each fishery is shown in Table 4.

The species coordinator for blue marlin also will be Robert Humphreys from NOAA/NMFS PIFSC. The BRTF recommended target sample sizes ranging from 5 to 30 individuals per length bin between 60 cm and 380 cm for a total target sample of 575 fish. Projected sample sizes ranged between 5 and 35 fish per length bin for a total projected sample of 645 fish. The detailed of sample sizes and the contact point for each fishery are shown in Table 4. The estimated total fixed cost to collect and process blue marlin samples is \$140,000.

5.0 PACIFIC BLUEFIN WORKING GROUP RESEARCH NEEDS

The PBFWG has made progress recently in updating information on the age and growth of Pacific bluefin tuna, but new information has highlighted two additional research needs. First, the proportion of males increases with size in the landings of the Japanese longline fleet operating on the spawning grounds around Nansei Islands. This observation may be the result of either sexually dimorphic growth or natural mortality, but further research is needed to address these hypotheses. Japan has implemented an extended sampling programs to obtain the necessary length and sex-specific data. However, the Taiwanese longline fleet also catches large spawners from the spawning grounds adjacent to Nansei Islands, so the collection of sex-specific length data from these catches would greatly aid this investigation. The PBFWG recognized the practical difficulty of implementing this kind of program on the Taiwanese longline fleet since the fish are processed at sea to remove the gills and/or viscera prior to freezing the carcass. Second, the Korean purse seine fleet has caught relatively small bluefin in the Sea of Japan / East China Sea in recent years, but are large enough to be mature. In order to investigate the spatio-temporal

distribution of spawning grounds in this area, sampling of the gonads from the Korean purse seine catches would be beneficial.

The BRTF reviewed the Taiwanese coastal and offshore longline fisheries and the Korean purse seine fishery. Fork lengths of fish caught by these fisheries range between 60 cm and 290 cm. The special needs of the PBFWG are a maturity study on fish >90 cm in the Korean purse seine catch and estimates of sex ratio by size for fish >200 cm in the Taiwanese offshore longline fishery (Table 5).

The coordinator for these Pacific bluefin projects will be Yukio Takeuchi from National Research Institute of Far Seas Fisheries, Japan. The BRTF recommended a target sample of 20 individuals per 10 cm bin between 90 cm and 150 cm for a total 140 fish (the projected sample is identical) from the Korean purse seine fishery. No target or projected sample sizes are recommended for the Taiwanese offshore longline fishery because it will be difficult to collect sex information from these high-valued fish. However, the BRTF encourages Taiwanese scientists to collect sex data by size using any possible means, including buying the gonads of the fish. The details of sample sizes and the contact point in each fishery are shown in Table 5. The estimated total fixed cost for bluefin sampling is \$36,000. The fish costs are for buying gonads from both the Korean and Taiwanese fleets.

6.0 BUDGET PROPOSAL

The estimated total fixed cost to complete all of the field sampling and processing for albacore, swordfish, striped and blue marlins and Pacific bluefin is \$541,000 over three years (Table 6). Cost sharing among species was discussed and agreement was reached that there were likely some savings that could be made with respect to field and miscellaneous costs, principally associated with the coordinator costs for the Billfish species. The field costs shown in Tables 1-5 represent the costs if sampling for each species was a stand-alone program conducted in isolation from the others. However, if more than one species is sampled simultaneously, then some reduction in costs is probably achievable. The field and miscellaneous costs for billfish, especially striped and blue marlin also could be shared. If all cost sharing among species is implemented, then the projected budget is reduced to \$434,000 over three years. Annual costs to conduct the program proposed by the BRTF, assuming approximately 60% of the expenditures occur in the first year, are estimated to be \$260,400 in Year 1, \$86,800 in Year 2, and \$86,800 in Year 3 (Table 6).

7.0 OTHER MATTERS

The Chair noted three additional issues: (1) sharing credit during publication among authors and also with individuals responsible for collecting samples, ageing and analyzing tissues, (2) the time frame for program implementation, and (3) the need for a coordinator for the whole integrated program who can look for lessons from similar programs run by RFMOs. The BRTF recommended that the Chair raise these points at the plenary.

8.0 REPORT PREPARATION AND ADOPTION

A draft of the report was reviewed by the BRTF prior to adjournment of the meeting. BRTF participants approved adoption of the report, pending final revisions and editorial changes.

9.0 ACKNOWLEDGEMENTS

BRTF participants collectively thanked their hosts (National Fisheries Research and Development Institute and staff) for their hospitality and overall meeting arrangements, which served as the foundation for meaningful scientific discussion and a successful meeting. The Chair expressed his thanks to John Holmes, the Vice-Chair and the rapporteur, for his excellent work and assistance.

10.0 ADJOURNMENT

The BRTF meeting was adjourned at 12:00 on 29 May 2009. The chair (Shui-Kai Chang) thanked all of the participants for their attendance and contributions and finally, stressed to National Coordinators and Species WG Chairs the need to maintain ongoing communication concerning scientific data collection and research results.

Table 1. Size-stratified sampling design for albacore, *Thunnus alalunga*. Shading indicates size range captured by a fleet.

Fleet	Fork length bins (cm)													Fleet Contact	
	20	30	40	50	60	70	80	90	100	110	120	130	140		150
CAN-LTN				40	40										John Holmes
JPN-DWLL							40	20	40	20	20	20			Hideo Nakano
JPN-PL			40	40											Hideo Nakano
JPN-PS															Hideo Nakano
JPN-GN	20	20													Hideo Nakano
JPN-SN															Hideo Nakano
JPN-LTN															Hideo Nakano
KOR-LL															
MEX-PS															
TWN-DWLL							40	40	20						TBD
TWN-OSLL								20	20						TBD
USA-LL										60	60	60			Gerard DiNardo
USA-RG															
USA-PL															
USA-LTN			40	40	40	40									John Childers
Target Samples	80	80	80	80	80	80	80	80	80	80	80	80	80	80	Total Samples
Projected Samples	20	20	80	80	80	80	80	80	80	80	80	80	80	80	960
Cost Components															
Field															\$ 30,000
Processing															\$ 17,000
Miscellaneous															\$ 30,000
Fish															\$ 34,000
TOTAL															\$ 111,000

Table 1. Continued.

Data Needs	Date & latitude/longitude of capture	Fork length (cm) Total weight Sex Gonad weight	Otoliths First dorsal fin (whole) Gonad (whole) or tissue subsample Muscle/tissue samples for DNA etc.
Coordinator	To Be Determined at July 2009 meeting	<ol style="list-style-type: none"> 1. Develop sampling SOP 2. Coordinate and monitor implementation of sampling & analyses 	
Analysis	Age/growth: CAN/JPN/TWN/USA Reproductive: JPN/TWN/USA		
SOP for Sampling	Need standardized procedures for sample storage & delivery, extraction & preparation of samples, estimation protocols, materials (e.g., water-resistant sample labels)		
Sample storage	Gonad – 10% buffered formalin; alternatively frozen but inferior to immediate fixation Otoliths/dorsal fins – dried in appropriate labelled containers (vials + envelopes) Samples to be delivered by fleet contacts to appropriate lab for analysis.		

Table 2. Size-stratified sampling design for swordfish, *Xiphias gladius*. Shading indicates size range captured by a fleet.

Fleet	Eye Fork Length Bins (cm)																				Fleet Contact			
	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260		270	280	
CAN-LTN																								Kotaro Yokawa
JPN-DWLL																								Kotaro Yokawa
JPN-CO&OS LL	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	15	15	15	15	15	15	Kotaro Yokawa	
JPN-Training																								Kotaro Yokawa
Vessel-GN																								
JPN-SN																								Kotaro Yokawa
JPN-HP																								Kotaro Yokawa
KOR-LL																								
MEX-LL & GN																								Michel Dreyfus
TWN-DWLL																								TBD
TWN-OSLL	20	20	20	10	10	10	10	10	10	10	10	10	10	10	10	10	10	15	15	15	15	15	TBD	
USA-LL	20	20	20	20	20	10	10	10	10	10	10	10	10	10	10	10	10	15	15	15	15	15	Robert Humphreys	
USA-GN																								Robert Humphreys
USA-HP																								
Target Samples	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	Total Samples	
Projected Samples	60	60	60	60	60	60	70	70	70	70	70	70	70	70	70	65	65	65	65	60	60	60	1320	
Cost Components																								
Field																								\$ 40,000
Processing																								\$ 25,000
Miscellaneous																								\$ 20,000
Fish																								\$ 29,000
TOTAL																								\$ 114,000

Table 2. Continued.

Data Needs	Date & latitude/longitude of capture	Eye Fork length (cm) Sex Photo for identification & length estimate (depending on the country)	Otoliths First dorsal fin (whole) Gonad tissue subsample Muscle/tissue samples for DNA etc.
Coordinator	Robert Humphreys	<ol style="list-style-type: none"> 1. Develop sampling SOP 2. Coordinate and monitor implementation of sampling & analyses 	
Analysis	Age/growth: JPN/TWN/USA Reproductive: JPN/TWN/USA		
SOP for Sampling	Need standardized procedures for sample storage & delivery, extraction & preparation of samples, estimation protocols, materials (e.g., water-resistant sample labels)		
Sample storage	Gonad – 10% buffered formalin; alternatively frozen but inferior to immediate fixation Otoliths/dorsal fins – dried in appropriate labelled containers (vials + envelopes) Samples to be delivered by fleet contacts to appropriate lab for analysis.		

Table 3. Size-stratified sampling design for striped marlin, *Tetrapturus audax*. Shading indicates size range captured by a fleet.

	Eye Fork Length Bins (cm)																								Fleet Contact			
	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290		300		
CAN-LTN																												
JPN-DWLL																											Kotaro Yokawa	
JPN-COLL																											Kotaro Yokawa	
JPN-GN																											Kotaro Yokawa	
JPN-PL																												
JPN-PS																												
JPN-LTN																												
JPN-HP																												
JPN-Training Vessel																												
JPN-SP																												
KOR-LL																												
MEX-SP																											Michel Dreyfus	
TWN-DWLL																											TBD	
TWN-OSLL																											TBD	
USA-LL																											Robert Humphreys	
USA-LTN & HL (Hawaii)																											Robert Humphreys	
Target Samples	10	10	30	30	30	30	30	30	30	30	30	30	30	15	15	15	15	15	15	15	15	10	5	5	5	5	Total Samples	
Projected Samples	10	10	30	25	25	25	30	35	35	40	40	40	30	15	15	15	15	15	15	15	15	10	5	5	5	5	485	
Projected Samples	10	10	30	25	25	25	30	35	35	40	40	40	30	15	15	15	15	15	15	15	15	10	5	5	5	5	510	
Cost Components																												
Field																												\$ 40,000
Processing																												\$ 40,000
Miscellaneous																												\$ 20,000
Fish																												\$ 40,000
TOTAL																												\$ 140,000

Table 3. Continued.

Data Needs	Date & latitude/longitude of capture	Eye Fork length (cm) Sex Photo for identification & length estimate (depending on the country)	Otoliths First dorsal fin (whole) Gonad tissue subsample Muscle/tissue samples for DNA etc.
Coordinator	Robert Humphreys	<ol style="list-style-type: none"> 1. Develop sampling SOP 2. Coordinate and monitor implementation of sampling & analyses 	
Analysis	Age/growth: JPN/TWN/USA Reproductive: JPN/TWN/USA		
SOP for Sampling	Need standardized procedures for sample storage & delivery, extraction & preparation of samples, estimation protocols, materials (e.g., water-resistant sample labels)		
Sample storage	Gonad – 10% buffered formalin; alternatively frozen but inferior to immediate fixation Otoliths/dorsal fins – dried in appropriate labelled containers (vials + envelopes) Samples to be delivered by fleet contacts to appropriate lab for analysis.		

Table 4. Continued.

Data Needs	Date & latitude/longitude of capture	Eye Fork length (cm) Sex Photo for identification & length estimate (depending on the country)	Otoliths First dorsal fin (whole) Gonad tissue subsample Muscle/tissue samples for DNA etc.
Coordinator	Robert Humphreys	<ol style="list-style-type: none"> 1. Develop sampling SOP 2. Coordinate and monitor implementation of sampling & analyses 	
Analysis	Age/growth: JPN/TWN/USA Reproductive: JPN/TWN/USA		
SOP for Sampling	Need standardized procedures for sample storage & delivery, extraction & preparation of samples, estimation protocols, materials (e.g., water-resistant sample labels)		
Sample storage	Gonad – 10% buffered formalin; alternatively frozen but inferior to immediate fixation Otoliths/dorsal fins – dried in appropriate labelled containers (vials + envelopes) Samples to be delivered by fleet contacts to appropriate lab for analysis.		

Table 5. Size-stratified sampling design for Pacific bluefin tuna, *Thunnus orientalis*. Shading indicates size range captured by a fleet.

Fleet	Fork Length Bins (cm)																				Fleet Contact																	
	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250		260	270	280	290													
KOR-PS				20	20	20	20	20	20	20																Joon-Taek Yoo												
TWN-COLL																										TBD												
Target Samples				20	20	20	20	20	20	20					*	*	*	*	*	*	*	*	*	*	*	Total Samples												
Projected Samples				20	20	20	20	20	20	20					*	*	*	*	*	*	*	*	*	*	*	140												
				20	20	20	20	20	20	20					*	*	*	*	*	*	*	*	*	*	*	140												
Cost Components																																						
Field																																						
Processing																																						
Miscellaneous																																						
Fish																																						
TOTAL																											\$ 36,000											
Data Needs	Date & latitude/longitude of capture										Fork length (cm)										Sex								Gonad tissue (Korean PS only)									
Coordinator	Yukio Takeuchi										1. Develop sampling SOP										2. Coordinate and monitor implementation of sampling & analyses																	
Analysis	Reproductive: JPN/TWN/KOR																																					
SOP for Sampling	Need standardized procedures for sample storage & delivery, extraction & preparation of samples, estimation protocols, materials (e.g., water-resistant sample labels)																																					
Sample storage	Gonad – 10% buffered formalin; alternatively frozen but inferior to immediate fixation Samples to be delivered by fleet contacts to appropriate lab for analysis.																																					

Table 6. Estimated budget for standalone species sampling programs, a cost-sharing budget for a multi-species sampling program, and a three-year expenditure plan. All cost estimates and expenditures are in USD.

Cost Component	Species					Total (Multiple Standalone)	Cost Sharing (multi-species program)
	Albacore	Pacific bluefin tuna	Swordfish	Striped Marlin	Blue Marlin		
Field ^A	\$ 30,000	\$ 12,000	\$ 40,000	\$ 40,000	\$ 40,000	\$162,000	\$ 80,000
Processing ^B	\$ 17,000	\$ 6,000	\$ 25,000	\$ 40,000	\$ 40,000	\$128,000	\$128,000
Miscellaneous ^C	\$ 30,000	\$ 5,000	\$ 20,000	\$ 20,000	\$ 20,000	\$ 95,000	\$ 70,000
Fish ^D	\$ 34,000	\$ 13,000	\$ 29,000	\$ 40,000	\$ 40,000	\$156,000	\$156,000
TOTAL	\$111,000	\$ 36,000	\$114,000	\$140,000	\$140,000	\$541,000	\$434,000

Three-year Expenditure Plan for a Multi-species Cost-Shared Sampling Program

	Year 1	Year 2	Year 3	Total
Field	\$ 48,000	\$ 16,000	\$ 16,000	\$ 80,000
Processing	\$ 76,800	\$ 25,600	\$ 25,600	\$128,000
Miscellaneous	\$ 42,000	\$ 14,000	\$ 14,000	\$ 70,000
Fish	\$ 93,600	\$ 31,200	\$ 31,200	\$156,000
TOTAL	\$260,400	\$ 86,800	\$ 86,800	\$434,000

^A Field costs include the costs to support personnel in the field collecting data and samples and transferring fish to the lab.

^B Processing costs are laboratory costs to prepare samples for age analysis or maturity analysis, e.g., prepare and mount otoliths.

^C Miscellaneous costs provide support for species coordinators to perform quality control and for computer hardware, software, data management, related supplies, etc.

^D Fish costs are the costs to purchase fish or gonads (Pacific bluefin) in order to perform the destructive sampling necessary to obtain sex, otoliths, dorsal fins and gonad tissue. These costs are based on average prices for fish.

Appendix 1

List of Meeting Participants

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Appendix 2

BIOLOGICAL RESEARCH TASK FORCE (BRTF) MEETING

Agenda

May 28 (Thursday), 0930 - 1000 – Registration

May 28 (Thursday), 1000 -

1. Opening of Biological Research Task Force (BRTF) Workshop
 - a. Welcoming Remarks
 - b. Introductions
2. Adoption of Agenda, Assignment of Rapporteurs and Numbering of Submitted Papers/Information
3. Summary of ISC8 Plenary report on ISC Biological Research Task Force Goals and objectives
4. Albacore Working Group Research Needs
 - a. Objectives
 - b. Sampling size/spatial/temporal strata, number of samples (fish) per strata
 - c. Existing sample programs (observer/port sampler/fishermen & what is sampled)
 - d. Gaps in existing programs
 - e. Options to close gaps (more observers, research vessels, charters, buy fish, etc.)
 - f. Coordinator and data/sample analyses (who, what, where, when)
 - g. Costs (to obtain samples and do necessary analyses)
 - h. Other matters
5. Billfish Working Group Research Needs

NOTE: Items a-g are required for each priority species

 - i. Objectives/species priorities
 - j. Sampling size/spatial/temporal strata, number of samples (fish) per strata
 - k. Existing sample programs (observer/port sampler/fishermen & what is sampled)
 - l. Gaps in existing programs
 - m. Options to close gaps (more observers, research vessels, charters, buy fish, etc.)
 - n. Coordinator and data/sample analyses (who, what, where, when)
 - o. Costs (to obtain samples and do necessary analyses)
 - p. Other matters

May 29 (Friday)

6. Billfish Working Group Research Needs (Continue)
NOTE: Items a-g are required for each priority species
 - a. Objectives/species priorities
 - b. Sampling size/spatial/temporal strata, number of samples (fish) per strata
 - c. Existing sample programs (observer/port sampler/fishermen & what is sampled)
 - d. Gaps in existing programs
 - e. Options to close gaps (more observers, research vessels, charters, buy fish, etc.)
 - f. Coordinator and Data/sample analyses (who, what, where, when)
 - g. Costs (to obtain samples and do necessary analyses)
 - h. Other matters

7. Discussion to identify commonalities for Albacore and Billfish Working Groups:

May 30 (Saturday)

8. Pacific Bluefin Working Group Research Needs (**if necessary**)
9. Possible Biological Research Needs for Bycatch Species
10. Other Matters relating to sampling and research
11. Report preparation and adoption
12. Adjournment of formal meeting

May 31 (Sunday)

13. Chang and Holmes to develop report structure for ISC9

Appendix 3

Information Required for Each Species

1. Sampling objectives
2. Number of samples (fish) required by 10 cm length bins
 - a. Size range collected by each fleet
 - b. Size strata in which comprises majority of fleet harvest
3. Data Needed
 - a. Measurements (fork length, eye fork length, weight, gonad weight)
 - b. Tissues and hard body parts to retain (otoliths, first dorsal fin, gonad tissue, muscle tissue)
4. Identification of ISC contact for each fleet and species sampling coordinator
5. Analysis – identify labs that may do analysis (e.g., aging, maturity)
6. Time frame for sampling
7. Fixed costs, which consist of field (costs to support someone in the field collecting data and samples, e.g., transferring fish from field to lab), processing (costs to prepare samples for analysis), miscellaneous (for species coordinators to perform quality control and computer hardware/software, data management, related supplies, etc.) and fish (costs to buy fish or gonads for sampling) components.
8. Other matters such as standard operating procedures for sampling and sample storage will be left to species coordinators to determine.