

Annex 12

MULTI-SPECIES BIOLOGICAL SAMPLING PROGRAM PROPOSAL

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

13 July 2009
Kaohsiung, Taiwan

Project Title: ISC Multi-species Biological Sampling Program to Improve Stock Assessments for Highly Migratory Species Stocks in the North Pacific Ocean

Summary

Concerns about the biological parameters used in stock assessments of key HMS species of the North Pacific Ocean have been raised several times by the Species Working Groups of the ISC, the unique and distinctive scientific body responsible for assessments of the northern stocks of HMS in the Pacific Ocean. The data used to estimate these parameters are either 40 years old or very incomplete, and are recognized as important uncertainties in the stock assessments. The goal of this proposal is to address these concerns through a multi-year (3.5 years), multi-national cooperative sampling effort.

To facilitate this goal, specific objectives are: (1) To collect defined numbers of biological samples of the northern albacore, swordfish, striped marlin and blue marlin, (i) relating to sex-specific age, growth, longevity, and maturity studies; (ii) from all size ranges; and (iii) from all fleets catching the species; (2) To collect defined numbers of gonad samples of the Pacific bluefin tuna from Korean purse seine fishery and sex-specific size data of large bluefin tuna from Taiwanese longline fishery; and (3) To process the above collected biological samples so that they are ready for future analyses.

The outputs from this program will improve and advance stock assessments and scientific advice and recommendations to RFMOs on HMS in the North Pacific Ocean. It will also improve our ability to deliver on the reference point analysis requested by the NC. This is the first international level HMS biological sampling program covering all major fleets and the important HMS in the North Pacific. Partnering with commercial fishing fleets will enhance communication, collaboration and understanding of scientific needs for stock assessments. This integrated program also has the benefit of reduced effort and budget needs against standalone programs for each species. The total budget needed to achieve the goals of the proposed sampling program is estimated to be \$434,000 USD over 3 years.

Project Title: ISC Multi-species Biological Sampling Program to Improve Stock Assessments for Highly Migratory Species Stocks in the North Pacific Ocean

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Total Funding Request	\$ 434,000 USD
Year 1	\$ 260,400 USD
Year 2	\$ 86,800 USD
Year 3	\$ 86,800 USD

Project Location: North Pacific Ocean.

Start Date:

January 2010

End Date:

July 2013

Part 1. RELEVANCE AND PRIORITY

- 1. Overview:** Concerns have been raised several times by the Species Working Groups of the ISC regarding uncertainties in important biological parameters which affect the quality of the species stock assessments conducted by the ISC. A list of research needs was discussed at ISC8 and distilled into two common priorities for the ALBWG and BILLWG: (1) sex-specific age and growth data, and (2) maturity data. All WGs need sex-specific length and maturity data from the extremes of the size spectrum. However, existing age, growth and maturity data used by these Working Groups are 40 years old or incomplete and are recognized as significant uncertainties in current stock assessments. The proposed program is designed to address these concerns through a multi-year, multi-national cooperative effort.
- 2. Relevance to the North Pacific Highly Migratory Species Management:** The ISC has completed two full stock assessments on North Pacific albacore in 2006 and striped marlin in 2007 and reiterated concerns on the status of these two species and adopted recommendations regarding the reduction of fishing mortality rates for the two species at ISC7. Since its inception in 1995, ISC Species Working Groups have repeatedly noted that old biological are creating significant uncertainties in the stock assessments and resulting scientific advice and that expansive home ranges, lack of dense schooling behaviour, attainment of a large adult size, and the rarity of the small juveniles and largest adult sizes in fisheries have limited the ability of researchers to collect samples in numbers sufficient to investigate pertinent life history questions. These uncertainties are also affecting the ability of Working Groups to assess the utility of biological reference points for north stocks of HMS. A pan-North Pacific biological sampling and research program is urgently needed to reduce the uncertainties in future assessments.

3. Goals and Objectives:

The goal of this proposal is to improve the quality of stock assessments and scientific advice for northern stocks of HMS in the Pacific Ocean. To facilitate this goal, specific objectives are:

- (1) To collect defined numbers of biological samples of the northern albacore, swordfish, striped marlin and blue marlin, (i) relating to sex-specific age, growth, longevity, and maturity studies; (ii) from all size ranges; and (iii) from all fleets catching the species;
 - (2) To collect defined numbers of gonad samples of the Pacific bluefin tuna from Korean purse seine fishery and sex-specific size data of large fish from Taiwanese longline fishery; and
 - (3) To process the above collected biological samples ready for future analyses.
- 4. Context:** There are increasing pressures on RFMOs to develop and implement conservation and management measures for HMS in the Pacific Ocean consistent with scientific advice since the UNFSA was adopted in 1995. The ISC is the unique and distinctive scientific body responsible for assessments of the northern stocks of HMS in the Pacific Ocean. Although the ISC is an intergovernmental body to which major coastal nations belong, it accomplishes its goals through in-kind member contributions and does not have a budget or permanent Secretariat support.

Part 2. TECHNICAL IMPLEMENTATION DETAILS

- 5. Materials and Methods:** This proposal focuses on a size-stratified sampling strategy, ensuring that fish from all parts of the size range are collected and sampled. However, the program was developed based on country-gear combinations (i.e., fleets), thus assuming that because some of the fleets fish at different times of the year and in different areas, for different parts of the resource, there will be de facto spatial and temporal stratification. The size range by fleets, estimated costs, type of biological data needed, and coordinators, for each species, are identified. Targeting of fleets for samples was based on the size range of their catch and the number of samples from each length bin required. Spreading the sampling across different fleets has the benefit of securing at least some part of the samples in the event that other fleets could not obtain samples or did not fish. The resulting sampling requirements for all the fleets are shown in Table 1. Two categories of size-stratified sampling recommendations are provided 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.

The multi-species program recommended and costed 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. All cost estimates are given in U.S. dollars (USD).

6. Project Benefits: The outputs will improve and advance stock assessments and scientific advice and recommendations to RFMOs on HMS in the North Pacific and it will improve our ability to deliver on the reference point analysis requested by the Northern Committee of WCPFC (NC). This is the first international level HMS biological sampling program covering all major fleets and the important HMS in the North Pacific. Partnering with commercial fishing fleets will enhance communication, collaboration and understanding of scientific needs for stock assessments. This integrated program also has the benefit of reduced effort and budget needs against standalone programs.

7. Schedule:

	2010				2011				2012				2013		
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	July
Program Coordination	■														
Sampling/processing procedures developed	■	■													
Sample collection in the field		■	■	■	■	■	■	■	■	■	■	■	■	■	
Annual progress review					■			■				■			
Data & sample processing			■	■	■	■	■	■	■	■	■	■	■	■	
Program completion; final report preparation														■	■

8. Key Personnel:

Overall program coordinator: TBD

Species coordinators: Albacore – John Holmes; Swordfish, striped marlin and blue marlin – Robert Humphreys; Pacific bluefin – Yukio Takeuchi

Part 3. COST EFFECTIVENESS

9. Costs:

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)
	ALB	PBF	SWO	STM	BUM		
Field ^A	\$ 30,000	\$ 12,000	\$ 40,000	\$ 40,000	\$ 40,000	\$ 162,000	\$ 80,000

Proc. ^B	\$ 17,000	\$ 6,000	\$ 25,000	\$ 40,000	\$ 40,000	\$128,000	\$128,000
Misc. ^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

^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.

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

10. Cost Sharing: Sampling may be conducted through national observer and port sampling programs, and these costs will be covered by the implementing countries.

11. Cost Effectiveness: The estimated total fixed cost to complete all of the field sampling and processing for albacore, swordfish, striped and blue marlin and Pacific bluefin is \$541,000 over three years. The above cost estimates 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 with respect to field and miscellaneous costs, principally associated with the coordinator costs for the Billfish species. 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, 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 1. Sampling requirements for the different country x gear (fleets).

Country x Gear	Species	Fork length of fish																																					Sum	Fleet Contact
		20	30	40	50	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	310	320	330	340	350	360	370	380		
CAN-LTN	ALB			40	40																																		80	John Ho Imes
JPN-DWLL	ALB					40	20	40	20	20	20																												160	Hideo Nakano
JPN-OSLL	SWO					20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	15	15	15	15	15							415	Kotaro Yokawa	
	STM										5	5	5	5	10	10	10	10																					55	Kotaro Yokawa
JPN-PL	ALB			40	40																																	80	Hideo Nakano	
JPN-Train Ves (GN)	SWO										10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	120	Kotaro Yokawa	
	BUM										5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	65	Kotaro Yokawa	
Japan-GN	ALB	20	20																																			40	Hideo Nakano	
	STM										5	5	5	5	5	5	5	5	5																			35	Kotaro Yokawa	
JPN-SP	STM																																							Kotaro Yokawa
	BUM																																							Kotaro Yokawa
JPN-LTN	ALB																																							Hideo Nakano
	BUM										5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	65	Kotaro Yokawa	
KOR-PS	PBF									20	20	20	20	20	20	20																							140	Joon-Taek Yoo
MEX-SP	STM																																						70	Michel Dreyfus
	BUM																																						80	Michel Dreyfus
TWN-DWLL	ALB					40	40	20																															100	S.Y. Yeh, C.Y. Chen
	SWO																																						135	C.L. Sun, S.P. Wang
	STM																																						115	C.L. Sun, S.P. Wang
	BUM																																						35	C.L. Sun, S.P. Wang
TWN-OSLL	ALB																																						40	S.Y. Yeh, C.Y. Chen
	SWO																																						275	C.L. Sun, S.P. Wang
	STM																																						95	C.L. Sun, S.P. Wang
	BUM																																						130	C.L. Sun, S.P. Wang
	PBF																																							C.C. Hsu
USA-LL	ALB																																						180	Gerard Di Nardo
	SWO																																						295	Robert Humphreys
	STM																																						100	Robert Humphreys
	BUM																																						180	Robert Humphreys
USA-GN	SWO																																					140	Robert Humphreys	
JSA LTN&HL (Hawaii)	STM																																					40	Robert Humphreys	
	BUM																																						90	Robert Humphreys
USA-LTN	ALB					40	40	40	40																														160	John Childers

Data/Samples	logbook	measures	biological samples	sample storage
Date		Fork Length or Eye Fork Length (cm)	otolith/fin rays (1st dorsal)	Buffered 4% formaldehyde (10% Formalin) for gonad tissue (first choice)
Lat/Long		Total weight	Preferably whole gonad tissue (frozen);	95% ethanol, DMSO for muscle tissue
		Gonad weight	but if subsectioned, then procedure needed for where and what to slice is needed	
		Sex	Muscle/tissue samples for DNA/lipid, etc. analyses	
		Photo for identification, depending on species and country		

 Albacore (ALB)	 Swordfish (SWO)	 Striped Marlin (STM)	 Blue Marlin (BUM)	 Pacific Bluefin (PBF)
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