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Requirements for Enhancing Conversion Factor Information

WCPFC-SC14-2018/ST-WP-05
(Previously ST-IP-05)

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1. INTRODUCTION

1. The Thirteenth WCPFC Scientific Committee Meeting (SC13) (under the Statistics and Data Theme) directed the Scientific Services Provider (SPC) to conduct a review of the status and determine the future requirements for conversion factor data to assist the scientific work of the Commission. SC13 provided the following relevant recommendations.

R1. SC13 recommended that the Scientific Services Provider conduct a gaps analysis and compile the requirements for enhancing conversion factor information required for future WCPFC work and present this information to SC14, including a proposal for how the gaps can be addressed.

R2. SC13 recommended that the Scientific Services Provider be tasked with designing and co-ordinating the systematic collection of representative samples of length measurements of bycatch species.

R3. SC13 recommended that the Scientific Services Provider be tasked with a project to design and co-ordinate the systematic collection of length:length, length:weight and weight:weight data on all species to better inform bycatch estimation.

R4. SC13 recommended that the currently implemented procedure to convert from weight to numbers, and vice versa, should be reviewed by the Scientific Services Provider to ensure that resulting estimates are appropriate and report to SC14.

2. In regards to recommendation R4 in the previous paragraph, a description of the current methodology to estimate catch in weight or number (where missing in purse seine observer data) is provided in **ANNEX 1**, for SC14's review and consideration.

3. The rationale behind the need to improve conversion factor data is mainly for the species which are partly processed at-sea, changes in how fish are processed over time, and the generally small datasets for some species. Estimates of bycatch species are collected through the WCPFC Regional Observer Programme (ROP) in units of number, weight or both. In order to convert from numbers to weight, and vice versa, (when catch in one unit only is recorded) it is necessary to have information on both the size of caught individuals, and appropriate length:weight relationships for the species in question. This conversion between numbers and weight allows analyses of bycatch data to use the full observer dataset, rather than a subset with a consistent unit of measurement, thereby maximising the utility of the bycatch data recorded by observers. Furthermore, bycatch length data allows for consideration of the life-stages of individuals. This information could be of particular interest when considering bycatches of species of special interest (SSIs).

4. Conversion factor data for the main oceanic tuna species are available and appear to satisfy most of the requirements for WCPFC stock assessments and related analyses at this stage. However, there is potentially more tuna species size data that can be used, if certain conversion factor data were available, for example, a conversion factor to produce usable lengths for frozen longline bigeye and yellowfin tuna available to transshipment monitoring (observer) staff (see Figure 1).

5. This paper presents a preliminary compilation of conversion factors data available for the WCPFC key species and suggests a process to review the information to identify gaps, and prioritize work (**ANNEX 2**), which can inform the draft plan for Project 90 on better data for conversion factors (**ANNEX 3**).

2. SOURCES of CONVERSION FACTOR DATA

6. The categories of conversion factor data required for WCPFC are:

- length/weight formulae (to determine average weight and catch in numbers and weight in observer data)
- Processed weight to whole weight (to convert longline processed weight to whole weight), noting the range of processed states involved (Annex 2, Table 1), and
- Length to standardized Length conversions (to convert lengths that are not standard, to the standard lengths used in stock assessments). For example, processed longline tuna at unloading may have the tail cut off and so an upper jaw (snout) to the anterior base of the second dorsal fin measurement can be taken, and converted to the standardized length (upper jaw – caudal fork) using the appropriate conversion factor (if available).

7. There are a variety of sources of conversion factor data available to the WCPFC, including (but not restricted to):

- Morphometric data collected during SPC tagging cruises
- Conversion factor data collected by observers and port samplers and compiled by SPC
- Conversion factor data produced through studies by several WCPFC member countries (e.g. Japan, USA, Australia and New Zealand)
- Conversion factors from studies outside our region and available in the literature
- FAO conversion factors (http://www.fao.org/cwp-on-fishery-statistics/handbook/capture-fisheries-statistics/conversion-factors/en/), and
- EU conversion factors (https://ec.europa.eu/fisheries/cfp/control/conversion_factors_en).

The development of Electronic Monitoring (EM) also presents an opportunity to collect larger volumes of L:L conversion factor data. In particular using an appropriate EM tool, EM Analysts could rapidly collect multiple length measurements from each fish measured rather than a single length as is currently done.

2. GAPS IN CONVERSION FACTOR DATA

8. Over the years, the Scientific Service Provider has compiled various conversion factor data as the need required, but without dedicated resources to adequately address all perceived gaps. Table 1–17 in ANNEX 2 shows the conversion factors codes used by SPC and a preliminary compilation of conversion factor data for the WCPFC key species. The right-hand column in Tables 3–17 for each key species is reserved to indicate priority work using one, two and three asterisks ('*') for increasing priority, but these assignments have yet to be considered (see Section 4 below).

9. In addition to the WCPFC Key species, conversion factors data are required for the following categories:

A. Species of special interest, that are not in the WCPFC key species list;
B. Commercially important bycatch species;
C. Other bycatch species

3. PROPOSED WORK FOR CONVERSION FACTOR DATA COLLECTION

10. The following is a list of preliminary work to be considered which will inform the design of Project 90 (to improve the conversion factor data available for WCPFC work):

i. Identify the priority gaps in conversion factor data for the WCPFC key tuna species. For example, determining a suitable length (anterior base of second dorsal fin to caudal fork) and a conversion factor for processed frozen tuna (Figure 1);
ii. Identify the priority gaps in conversion factor data for the WCPFC key shark species;

iii. Expand the conversion factors to cover the WCPFC key shark species for groups: mako, thresher and hammerhead shark;
iv. Identify the priority gaps in conversion factor data for the WCPFC key billfish species;
v. Produce a list of SSIs (excluding key shark species) that require conversion factor data;
vi. Produce a list of commercially important bycatch species (not covered in the items above);
vii. Produce a list of the remaining bycatch species that require conversion factor data;
viii. Include more information on source of data for each conversion factor (e.g. reference of study, sample size, R^2, minimum/maximum size of sample, etc.) in tables of conversion factors which will inform the need for more data collection;
ix. Prioritize this list so that the most important work is achieved, and
x. Explore the use of EM tools to capture multiple length measurements from fish e-measured by EM Analysts.

Figure 1. Photograph illustrating gilled-and-gutted processing conducted by Japanese distant-water freezer vessels.
Note the removal of the gill covers and tail.
(Photo courtesy of Fabrice Bouyé, OFP; from Langley et al., 2006).

4. RECOMMENDATIONS

11. SC14 is invited to review, consider and approve the list of proposed work items outlined in Section 4 within the draft work plan outlined in ANNEX 3 (Project 90).

12. If required, we recommend a SC14 small working group convene, discuss and assign the specific priorities to address the current gaps in conversion factors, referring to the Tables in ANNEX 2, the list in Section 4 and the draft plan in ANNEX 3.

REFERENCES

Kohler, N.E., J.G. Casey and P.A. Turner, 1995, Length-weight relationships for 13 species of sharks from the western North Atlantic. Fishery Bulletin, 93 (2); 412–418, tabs 1–3

Langley, A., H. Okamoto, P. Williams, N. Miyabe and K. Bigelow 2006. A summary of the data available for the estimation of conversion factors (processed to whole fish weights) for yellowfin and bigeye tuna. ME IP-3, WCPFC-SC2, Manila, Philippines, 7–18 August 2006.

Seki, T., Taniuchi, T., Nakano, H. and Shimizu, M. 1998 Age, growth and reproduction of the oceanic whitetip shark from the Pacific Ocean. Fisheries Science 64, 14-20.

ANNEX 1 – Estimation of catch/weight in purse seine observer data

Estimation of species catch in number and weight in purse seine observer data

Observers onboard purse seine vessels are trained to obtain estimates of both catch in weight and number for each species taken in the set, but the practicalities of determining both mean that often only one unit of catch can be obtained; that is observers may record catch by weight, catch by number, or both. For example, it is impractical to record the catch in number of the target tuna species (skipjack tuna), therefore the observer usually determines catch in weight only through the recording of each brail volume and the collection of species composition data (visual estimation and sampling). Likewise, it is often easier (and more appropriate) to record the catch in number only for SSIs, for example, key shark species, marine turtles and marine mammals.

However, in order to provide a consistent dataset for end-users who may require only catch in number, or only catch in weight, the missing catch must be estimated to ensure as complete data as possible are available. The methodology requires the estimation of average weight data for each species encountered at various levels of stratification; once determined, the estimated average weight values are applied to observer records with catch in weight only or catch in number only, to determine the missing catch value.

The regional observer database includes fields for the original observer-recorded catch (in weight and number) and separate, additional fields for the estimated average weight, the estimated catch (in weight and number) and an indicator for methodology used to estimate average weight for this record (which will depend on information available for that record).

The method for the estimation of average weight by species will use the most accurate data available and steps through the following table in descending order, until there is sufficient information available to determine the estimate of average weight which is used to determine the missing catch in weight or number; the indicator value is also stored in that record.

Methodology Indicator	Description
1	The observer has recorded both CATCH IN WEIGHT and CATCH IN NUMBER, so the AVERAGE WEIGHT is determined from these fields and no estimation of CATCH IN WEIGHT or NUMBER is required (i.e. the observer's values are used).
2	CATCH IN WEIGHT or CATCH IN NUMBER is missing. The estimate of AVERAGE WEIGHT is determined from the length sample data **from that SET** for that SPECIES (if it exists).
3	CATCH IN WEIGHT or CATCH IN NUMBER is missing. The estimate of AVERAGE WEIGHT is determined from the length sample data **over MONTH/YEAR and SET TYPE** for that SPECIES (if it exists).
4	CATCH IN WEIGHT or CATCH IN NUMBER is missing. The estimate of AVERAGE WEIGHT is determined from the length sample data **over QUARTER/YEAR and SET TYPE** for that SPECIES (if it exists).
5	CATCH IN WEIGHT or CATCH IN NUMBER is missing. The estimate of AVERAGE WEIGHT is determined from the length sample data **over YEAR and SET TYPE** for that SPECIES (if it exists).
6	CATCH IN WEIGHT or CATCH IN NUMBER is missing. The estimate of AVERAGE WEIGHT is determined from the length sample data **over YEAR only** for that SPECIES (if it exists).
7	CATCH IN WEIGHT or CATCH IN NUMBER is missing. The estimate of AVERAGE WEIGHT is determined from the length sample data **over the entire database** for that SPECIES (if it exists).
8	CATCH IN WEIGHT or CATCH IN NUMBER is missing. The estimate of AVERAGE WEIGHT is an arbitrary average weight assigned to this species based on an understanding of the size of the animal likely to be encountered in the purse seine fishery.

Estimates of numbers and weights are determined using standard conversion factors (length/weight formulae) where they exist. Where length/weight formulae do not exist, a substitute or proxy length/weight formula for that species will be used. For example, if there are no length/weight formula available for a certain shark species, but the morphology of that shark species resembles another shark species which has a length/weight formula, then this length/weight formula will be used as a proxy/substitute to determine an estimated average weight.

This estimation process is undertaken over the entire observer database on a regular basis, so over time, any new length/weight formulae or refinements in the methodology will be reflected and better estimates produced.

Users of the data can choose to include/exclude data by simply referring to the estimation method indicator in the database.

Figures 2 and 3 below provides an indication of the level of catch data estimated for a selected species (in this case, Silky shark and Oceanic whitetip shark).

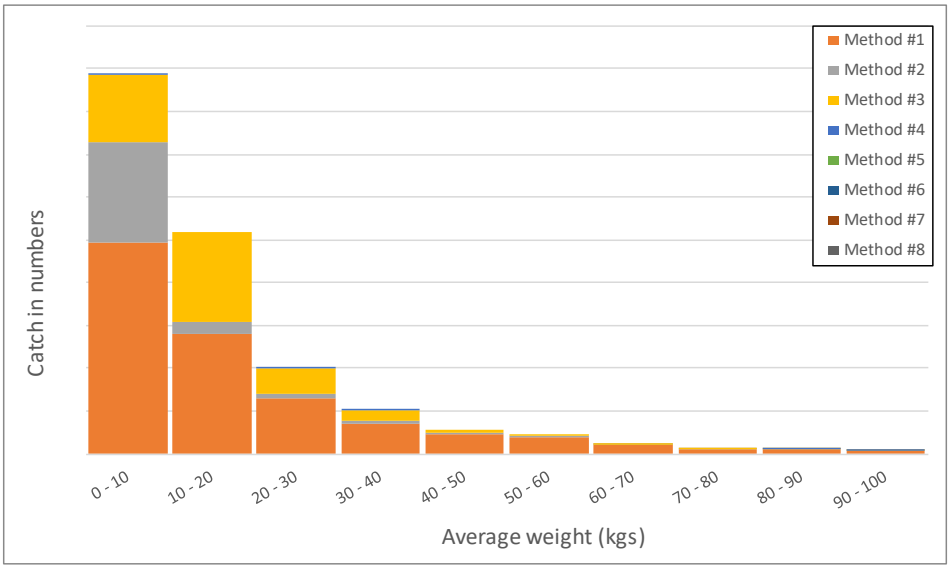

Figure 2. Frequency of Silky shark catch (in numbers) by average weight size class and average weight estimation method. (Source: Regional observer database)

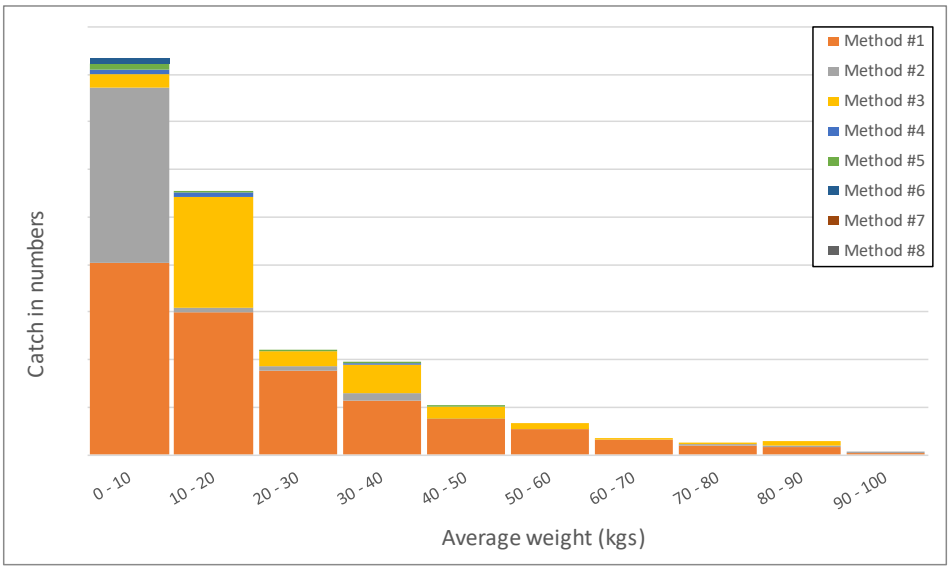

Figure 3. Frequency of Oceanic whitetip shark catch (in numbers) by average weight size class and average weight estimation method. (Source: Regional observer database)

ANNEX 2 – Preliminary compilation of conversation factor data available to the WCFPC

Table 1. Measurement codes used by SPC

Type	Code	Measurement Description
Length	AN	Anal fin length
	BL	Bill to fork in tail
	CC	Curved Carapace Length
	CK	Cleithrum to anterior base caudal keel
	CW	Carapace width
	CX	Cleithrum to caudal fork
	EO	Posterior eye orbital to caudal fork
	EV	Posterior eye orbital to vent
	FF	1st dorsal to fork in tail
	FS	1st dorsal to 2nd dorsal
	GI	Girth
	LF	lower jaw to fork in tail
	PC	Nose - anterior tail portion (sharks)
	PF	Anterior base of pectoral fin to fork in tail
	PS	Anterior base of pectoral fin to 2nd dorsal
	SC	Straight Carapace Length
	SD	Upper jaw to anterior base of 2nd dorsal
	SL	Tip of snout to end of caudal peduncle
	TH	Body Thickness (Width)
	TL	tip of snout to end of tail
	TW	total width (tip of wings - rays)
	UF	upper jaw to fork in tail
	US	Upper jaw to 2nd dorsal fin
Weight	FN	Weight of all fins (sharks)
	FW	Fillets weight
	LW	Loin weight
	GF	Gilled, gutted, headed, flaps removed
	GG	Gilled and gutted weight
	GH	Gutted and headed weight
	GO	Gutted only (gills left in)
	GT	Gilled, gutted and tailed
	GX	Gutted, headed and tailed
	TT	Trunk weight
	WW	Whole weight

Table 2. Standard measurement units

LENGTH	CM	Centimetres	
WEIGHT	KG	Kilograms	KG = Pounds (lbs) x 0.453592

Table 3. Conversion factors for Skipjack tuna

SKIPJACK TUNA – *Katsuwonus pelamis*			
Conversion factor	Formula	Source	Priority work
Length to Weight			
UF to WW	$0.0000086386 \times UF^{3.217400}$	Length/weight data available to SPC.	
Length to Length			
PF to UF	N/A		
Weight to Weight			
GG to WW	GG x 1.14	Processed catch from the Hawaii longline fishery	
GH to WW	GH x 1.33		
GO to WW	GO x 1.09		
GX to WW	GX x 1.35		

Table 4. Conversion factors for Yellowfin tuna

YELLOWFIN TUNA – *Thunnus albacares*			
Conversion factor	Formula	Source	Priority work
Length to Weight			
UF to WW	$0.0000251200 \times UF^{2.939600}$	Length/weight data available to SPC.	
Length to Length			
SD to UF	SD x 1.84128	SPC Tagging morphometric data N=976	***
PS to UF	N/A		***
Weight to Weight			
GG to WW	$1.1893 \times (GG+rand()-0.5)^{0.972}$	Langley et al. (2006). The use of "rand()" is explained in this reference.	
GG to WW	GG x 1.1561	Observer conversion factor data (N=9596)	
GG to WW	GG x 1.12	Processed catch from the Hawaii longline fishery	
GT to WW	$1.2988 \times (GG+rand()-0.5)^{0.968}$	Langley et al. (2006)	
GH to WW	GH x 1.22	Processed catch from the Hawaii longline fishery	
GO to WW	GO x 1.06		
GX to WW	GX x 1.23		
LW to WW	N/A		**

Table 5. Conversion factors for Bigeye tuna

BIGEYE TUNA – *Thunnus obesus*			
Conversion factor	Formula	Source	Priority work
Length to Weight			
UF to WW	$0.0000197290 \times UF^{3.024700}$	Length/weight data available to SPC.	
Length to Length			
SD to UF	SD x 1.77999	SPC Tagging morphometric data N=83	***
PS to UF	N/A		***
Weight to Weight			
GG to WW	$1.2750 \times (GG+rand()-0.5)^{0.960}$	Langley et al. (2006)	
GG to WW	GG x 1.1782	Observer conversion factor data (N=3323)	
GG to WW	GG x 1.16	Processed catch from the Hawaii longline fishery	
GT to WW	$1.3264 \times (GG+rand()-0.5)^{0.969}$	Langley et al. (2006)	
GH to WW	GH x 1.25	Processed catch from the Hawaii longline fishery	
GO to WW	GO x 1.06		
GX to WW	GX x 1.25		
LW to WW	N/A		**

Table 6. Conversion factors for Albacore tuna

ALBACORE TUNA – *Thunnus alalunga*			
Conversion factor	Formula	Source	Priority work
Length to Weight			
UF to WW	0.0000297125 x UF $^{2.901412}$	Length/weight data available to SPC.	
Length to Length			
PS to UF	N/A		
Weight to Weight			
GG to WW	GG x 1.10	Processed catch from the Hawaii longline fishery	
GH to WW	GH x 1.16		
GO to WW	GO x 1.06		
GX to WW	GX x 1.18		
LW to WW	N/A		

Table 7. Conversion factors for Blue marlin

BLUE MARLIN – *Makaira mazara*			
Conversion factor	Formula	Source	Priority work
Length to Weight			
LF to WW	0.000042216 x LF $^{2.713587}$	SPC Conversion factor data	
Length to Length			
PF to LF	PF / 0.8149	SPC Conversion factor data	
EO to LF	EO / 0.9		
Weight to Weight			
GG to WW	GG x 1.2605	Observer conversion factor data (N=103)	
GG to WW	GG x 1.25	Processed catch from the Hawaii longline fishery	
GH to WW	GH x 1.47		
GO to WW	GO x 1.15		
GX to WW	GX x 1.54		
FW to WW	N/A		

Table 8. Conversion factors for Black marlin

BLACK MARLIN – *Makaira indica / Istiompax indica*			
Conversion factor	Formula	Source	Priority work
Length to Weight			
LF to WW	0.00000066 x LF $^{3.36100}$	SPC Conversion factor data	
Length to Length			
PF to LF	PF / 0.7750	SPC Conversion factor data	
EO to LF	EO / 0.9		
Weight to Weight			
GG to WW	GG x 1.2005	Observer conversion factor data (N=19)	
GG to WW	GG x 1.20	Processed catch from the Hawaii longline fishery	
GH to WW	GH x 1.43		
GO to WW	GO x 1.15		
GX to WW	GX x 1.45		
FW to WW	N/A		

Table 9. Conversion factors for Striped marlin

STRIPED MARLIN – *Tetrapturus audax / Kajikia audax*			
Conversion factor	Formula	Source	Priority work
Length to Weight			
LF to WW	$0.00220 \times LF^{1.955500}$	SPC Conversion factor data	
Length to Length			
LF to EO	LF x 0.862069	SPC Conversion factor data	
PF to LF	PF / 0.7309 * 0.862069	SPC Conversion factor data	
Weight to Weight			
GG to WW	$(GG+rand()-0.5)^{0.9984} \times 1.1788374$	Langley et al. (2006)	
GG to WW	GG x 1.2314	Observer conversion factor data (N=21)	
GG to WW	GG x 1.23	Processed catch from the Hawaii longline fishery	
GH to WW	GH x 1.37		
GO to WW	GO x 1.15		
GX to WW	N/A		
FW to WW	N/A		

Table 10. Conversion factors for Swordfish

SWORDFISH – *Xiphias gladius*			
Conversion factor	Formula	Source	Priority work
Length to Weight			
LF to WW	$0.000005470 \times LF^{3.174390}$	SPC Conversion factor data	
Length to Length			
PF to LF	PF / 0.7600	SPC Conversion factor data	
EO to LF	EO / 0.9		
Weight to Weight			
GG to WW	(GG+rand()-0.5) x 1.3717	Langley et al. (2006)	
GG to WW	GG x 1.2551	Observer conversion factor data (N=10)	
FW to WW	FW x 1.5269	Observer conversion factor data (N=683)	
GG to WW	GG x 1.14	Processed catch from the Hawaii longline fishery	
GH to WW	GH x 1.39		
GO to WW	GO x 1.09		
GX to WW	GX x 1.45		

Table 11. Conversion factors for Blue shark

BLUE SHARK – *Prionace glauca*			
Conversion factor	Formula	Source	Priority work
Length to Weight			
UF to WW	0.00000317 x UF $^{3.1310}$	Kohler, N.E. et al. (1995)	***
Length to Length			
UF to TL	N/A		
.. to TL	N/A	'..' refers to a suitable measurement to determine from the 'trunked' processing	***
.. to UF	N/A		
Weight to Weight			
TT to WW	N/A		***
FW to WW	N/A		***
FN to WW	FN x 20		

Table 12. Conversion factors for Silky shark

SILKY SHARK – *Carcharhinus falciformis*			
Conversion factor	Formula	Source	Priority work
Length to Weight			
UF to WW	0.00001539 x UF $^{2.922}$	Kohler, N.E. et al. (1995)	***
Length to Length			
UF to TL	N/A		
.. to TL	N/A	A measurement to determine from the trunk	***
.. to UF	N/A		
Weight to Weight			
TT to WW	N/A		***
FW to WW	N/A		***
FN to WW	FN x 20		

Table 13. Conversion factors for Oceanic whitetip

OCEANIC WHITETIP SHARK – *Carcharhinus longimanus*			
Conversion factor	Formula	Source	Priority work
Length to Weight			
UF to WW	0.000020166667 x UF $^{2.761}$	Seki et al. (1998)	***
Length to Length			
UF to TL	N/A		
.. to TL	N/A	A measurement to determine from the trunk	***
.. to UF	N/A		
Weight to Weight			
TT to WW	N/A		***
FW to WW	N/A		***
FN to WW	FN x 20		

Table 14. Conversion factors for Mako sharks

MAKO SHARKS – *Isurus spp.*			
Conversion factor	Formula	Source	Priority work
Length to Weight			
UF to WW	0.00000120 x TF $^{3.46000}$	N/A	***
Length to Length			
UF to TL	N/A		
.. to TL	N/A	A measurement to determine from the trunk	***
.. to UF	N/A		
Weight to Weight			
TT to WW	N/A		***
FW to WW	N/A		***
FN to WW	FN x 20		

Table 15. Conversion factors for Thresher sharks

THRESHER SHARKS – *Alopias spp.*			
Conversion factor	Formula	Source	Priority work
Length to Weight			
TL to WW	0.00001879 x TL $^{2.5190}$	*A. vulpinas* only. Kohler, N.E. et al. (1995)	***
Length to Length			
UF to TL	N/A		
.. to TL	N/A	A measurement to determine from the trunk	***
.. to UF	N/A		
Weight to Weight			
TT to WW	N/A		***
FW to WW	N/A		***
FN to WW	FN x 20		

Table 16. Conversion factors for Hammerhead sharks

HAMMERHEAD SHARKS – *Sphyrna spp.*			
Conversion factor	Formula	Source	Priority work
Length to Weight			
TL to WW	N/A		***
Length to Length			
UF to TL	N/A		
.. to TL	N/A	A measurement to determine from the trunk	***
.. to UF	N/A		
Weight to Weight			
TT to WW	N/A		***
FW to WW	N/A		***
FN to WW	FN x 20		

Table 17. Conversion factors for Porbeagle shark

PORBEAGLE SHARK – *Lamna nasus*			
Conversion factor	Formula	Source	Priority work
Length to Weight			
TL to WW	0.00001480 x TL $^{2.9640}$	Kohler, N.E. et al. (1995)	***
Length to Length			
UF to TL	N/A		
.. to TL	N/A	A measurement to determine from the trunk	***
.. to UF	N/A		
Weight to Weight			
TT to WW	N/A		***
FW to WW	N/A		***
FN to WW	FN x 20		

ANNEX 3 – Draft plan for a project to acquire better data to determine fish length/weight

PROJECT 90. **Better data on fish weights and lengths for scientific analyses**	
#XX	
Project	**Better data on fish weights and lengths for scientific analyses**
Objectives	This project has three objectives The first is to • identify the priority gaps in conversion factor data for the WCPFC key tuna species, key shark species, and key billfish species • expand the conversion factors to cover the WCPFC key shark species for groups: mako, thresher and hammerhead shark • produce a list of species of special interest (SSIs, excluding key shark species) that require conversion factor data • produce a list of commercially important bycatch species (not covered in the items above) • include more information on source of data for each conversion factor (e.g. reference of study, sample size, R2, minimum/maximum size of sample, etc.) in tables of conversion factors which will inform the need for more data collection • produce a list of the remaining bycatch species that require conversion factor data, and • prioritize this list so that the most important work is achieved. The second is to: • explore the use of EM tools to capture multiple length measurements from fish e-measured by EM Analysts. The third is to: • systematically collect representative samples of length measurements of bycatch species support future estimation of fish bycatch in the WCPO; and • systematically collect length:length, length:weight and weight:weight data on all species to better inform future estimation of fish bycatch in the WCPO.
Note	Although these three objectives are distinct, they have been combined into a single project to avoid any possible duplication of effort and, as there will likely be combined tasking of observers and port-samplers, in future data collection arising from the project.
Rationale	Estimates of bycatch are currently collected through the ROP in units of number, weight or both. In order to convert from numbers to weight, and vice versa, it is necessary to have information on both the size of caught individuals, and appropriate length:weight relationships for the species in question. This conversion between numbers and weight allows analyses of bycatch data to use the full observer dataset, rather than a subset with a consistent unit of measurement, therefore maximising the utility of the bycatch data recorded by observers. Furthermore, bycatch length data allows for consideration of the life-stages of individuals. This information could be of particular interest when considering bycatches of SSIs. There are currently insufficient, or unrepresentative, length samples for species caught in purse seine and longline fisheries, with the exception of bigeye, yellowfin and bigeye in purse seine catches which are sampled through observer grab samples. This project would fill this data gap. Accordingly, this project addresses objectives arising from discussions at SC13 about the results of regional estimates of purse seine and longline bycatch (Peatman et al., 2017; Peatman et al., 2018a; Peatman et al., 2018b). As a result of the discussions in 2017, SC13 recommended that the Scientific Service Provider be tasked with: • designing and co-ordinating the systematic collection of representative samples of length measurements of bycatch species; and • a project to design and co-ordinate the systematic collection of length:length, length:weight and weight:weight data on all species to better inform bycatch estimation.
Assumptions	Achievement of the objectives is subject to the following assumptions: • sufficient data are available to support the sampling design analyses; • sampling designs can be developed which are statistically robust and would support future estimation of fish bycatch in the WCPO; • current observer equipment (e.g. calipers) is suitable for the length sampling protocols; • suitable and cost-effective equipment can be sourced for robust weight data collection; and • data collection can be integrated into existing sampling events in-port and at-sea.

PROJECT 90. **Better data on fish weights and lengths for scientific analyses**	
#XX	
Project	**Better data on fish weights and lengths for scientific analyses**
Scope	The proposed work programme comprises: • data compilation activities; • subsequent statistical analysis activities to design future sampling approaches; • evaluation of designs for practical field application; • trials of selected sampling approaches in the field along with trials of equipment required to complete the sampling designs; • finalisation of future sampling protocols; • development of associated training standards; • incorporation of training into trainer trainings and biological sampling trainings as required; • ongoing co-ordination of sample collection and data submission; and • reporting on designs and progress with implementation and data collection. It is intended that a preliminary report would be prepared for SC15 and a more comprehensive report for SC16 and a final report at SC17.
Timeframe	33 months (from January 2019 through September 2021)
Budget	2019 US$40,000 2020 US$20,000 2021 US$15,000 Note that this funding is intended to cover the work of the Scientific Services Provider in the design and co-ordination of this work. This will cover the analytical components identified in the scope of the project. It will also cover trials of methodologies identified at-sea and in-port. It does not cover the costs of CCMs in implementing the protocols or the purchase of related equipment. This will require co-funding or additional funding depending on the designs selected in the design and testing phase and may require additional requests for funding from SC15.
References	Peatman, T., Allain, V., Caillot, S., Williams, P., and Smith, N. 2017. Summary of purse seine fishery bycatch at a regional scale, 2003-2016. SC13-ST-WP-05. Thirteenth regular session of the Scientific Committee of the Western and Central Pacific Fisheries Commission. Rarotonga, Cook Islands, 9-17 August 2017. Peatman, T., Bell, L., Allain, V., Caillot, S., Williams, P., Tuiloma, I., Panizza, A., Tremblay-Boyer, L., Fukofuka, S., and Smith, N. 2018a. Summary of longline fishery bycatch at a regional scale, 2003-2017. SC13-ST-WP-02. Fourteenth regular session of the Scientific Committee of the Western and Central Pacific Fisheries Commission. Busan, Republic of Korea, 8-16 August 2018. Peatman, T., Allain, V., Caillot, S., Park, T., Williams, P., Tuiloma, I., Panizza, A., Fukofuka, S., and Smith, N. 2018b. Summary of purse seine fishery bycatch at a regional scale, 2003-2017. SC13-ST-IP-04. Fourteenth regular session of the Scientific Committee of the Western and Central Pacific Fisheries Commission. Busan, Republic of Korea, 8-16 August 2018.