SCIENTIFIC COMMITTEE
SIXTEENTH REGULAR SESSION

ELECTRONIC MEETING
11 – 20 August 2020

Project 90 update: Better data on fish weights and lengths for scientific analyses

WCPFC-SC16-2020/ST-IP-06

J. Macdonald, P. Williams, C. Sanchez, E. Schneiter, M. Ghergariu, M. Hosken, A. Panizza, T. Park

Oceanic Fisheries Programme, Pacific Community (SPC), Nouméa, New Caledonia

TABLE OF CONTENTS

1. INTRODUCTION

Project 90 addresses objectives emerging from discussions at the Thirteenth Regular Session of the Scientific Committee of the WCPFC (SC13) regarding regional estimates of purse seine and longline bycatch (Peatman et al. 2017; 2018a, b), and the need for accurate conversion factor (CF) data for targeted and bycatch species.

Following these discussions, SC13 recommended that the WCPFC Scientific Service Provider be tasked with:-

i) designing and co-ordinating the systematic collection of representative samples of length measurements of bycatch species; and
ii) 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.

The following year (2018), the Fifteenth Regular Session of the WCPFC (Anon. 2018) approved Project 90 to be conducted over three years (2019-2021). Williams and Smith (2018) detail the rationale behind Project 90, with the draft plan for the project documented in ANNEX 3 of that report, and the agreed plan documented in ANNEX 1 of the first-year progress report presented to SC15 (SPC-OFP 2019).

SC15 recommended that the Scientific Services Provider proceed to coordinate the activities proposed for Project 90 over the period (August 2019 to July 2020) as listed in Annex 2 of SPC-OFP (2019), and report on progress to SC16. Accordingly, this paper provides an update of Project 90 activities in the 12 months since SC15, and outlines planned activities for the final year of the project.

2. PROJECT 90 WORK TO DATE

2.1 Overview

Table A1 in ANNEX 1 reports progress on Project 90 up to July 1 2020. In summary, the key work conducted to date has involved:-

i) the establishment, refinement and regular updating of CF database tables;
ii) scoping and gap analysis (within SPC) to determine the priority areas for collecting CF data under Project 90;
iii) establishment of an open and ongoing dialogue with CCMs regarding data requirements for generating accurate CFs;
iv) development and refinement of a web-based tool for accessing the CF database, available, with login, at: https://www.spc.int/ofp/preview/species_conv_factor.php?partitionpage=&page=1 (see ANNEX 2, Figure A1 for a preview).
v) Commencement of fieldwork in the Philippines during early 2020, targeted towards the systematic collection of CF data for WCPFC species, under Activity 3.2 (see ANNEX 1, Table A1).

Table A1 in ANNEX 1 also sets out what SPC aimed to achieve under Project 90 in the 12 months since SC15 (red text), and what of this has been achieved (underlined red text). Further, we outline work still to do during the next phase of the project (green text).

2.2 In detail

1. Since the 2019 update to SC15 (SPC-OFP 2019), considerable progress has been made under Activities 1.2 and 1.5 (see ANNEX 1, Table A1), with conversion factor database tables updated, corrected and quality-checked, and several new Length–Length and Length–Weight entries added for sharks, billfish and tunas.

2. Notably, a total of 58 new CFs have been added for sharks: mako (n=18), thresher (n=1), hammerhead (3), blue shark (n=32), porbeagle (n=2) and whale sharks (n=2) (see ANNEX 2, Tables A2, A3). These CFs were drawn largely from papers by Francis (2006, 2013), Nakano and Seki (2003) and Clarke et al. (2015) and references therein. Additionally, five new Length–Length or Length–Weight CFs have been added for striped marlin from the southwest Pacific (from Kopf et al. 2011). Metadata for each CF (i.e. study reference and area,

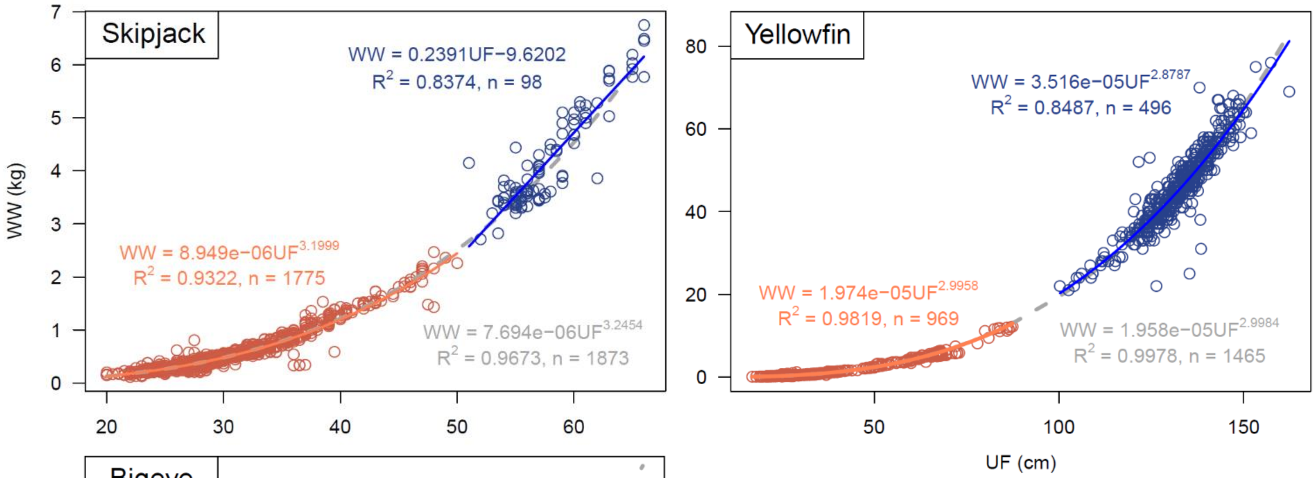
sample size, R^2 for relationships, size range of fish measured) have been updated for existing entries where possible (n=71), and included for all new entries (n=78) (see green text in ANNEX 2, Tables A2, A3).

3. Port sampling work commenced in the Philippines in late 2019, in partnership with SOCSKSARGEN Federation of Fishing & Allied Industries (SFFAII) and the Bureau of Fisheries and Aquatic Resources ministry (BFAR). Calipers and measuring boards were prepared and purchased in the Philippines, and a weight scale with ± 1 g precision was chosen to support collection of length and weight measurements. Training was provided to field staff, and project evaluation undertaken four months after implementation.

4. Through this field work, and for the first time, length and weight data were collected for very small tunas captured by Philippines' fisheries, under Activity 3.2 (see ANNEX 1, Table A1). Port sampling by SPC, SFFAII and BFAR staff target mainly (presumed) young-of-the-year (YOY) and age 1 skipjack, yellowfin and bigeye tuna fished in ring net and purse seine sets made between December 2019 and May 2020. In addition, length and weight data were recorded for larger (i.e. > 100 cm UF) yellowfin and bigeye tuna caught in the handline fishery between February and May 2020. Despite continuing COVID-19 restrictions, in-port collection of length and weight data remains ongoing, with weekly targets achieved to date (see ANNEX 2, Figure A2 for images from this work).

5. New Length–Weight (UF:WW) CFs were derived for small and larger skipjack, yellowfin and bigeye measured during the abovementioned Philippines' port sampling work, with Length–Length (SD:UF, PS:UF, PS:SD) CFs derived for large yellowfin and bigeye. These 15 CFs have been added to the database and are presented in ANNEX 2, Tables A2 and A3 for comparison with existing CFs for these species drawn primarily from longline-observer and tagging-cruise records. The new UF:WW relationships are presented graphically in Figure 1.

6. SPC is also working with SFAAII on the logistics of collecting important gilled and gutted (GG) and whole weight (WW) CF data from large yellowfin and bigeye tuna taken by handline vessels (for example, to ensure the required sampling avoids any disruptions to the processing system).



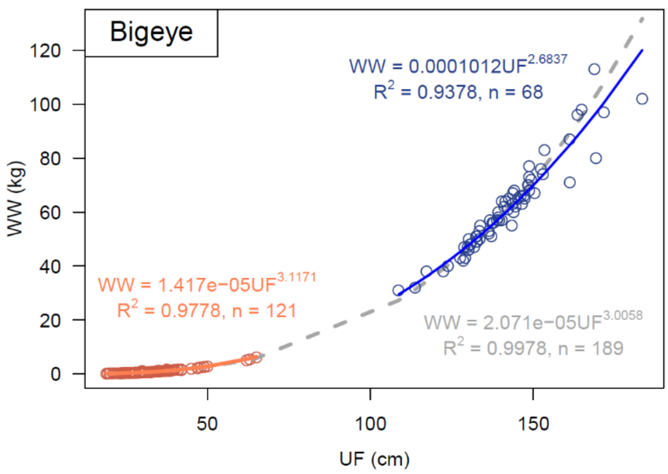


Figure 1. Length–Weight (UF:WW) CFs for skipjack, yellowfin and bigeye port sampled from Philippines' ring net, purse seine and/or handline fisheries between December 2019 and May 2020. Orange circles denote measurements from small (presumed YOY and age 1) fish; blue circles are larger individuals. Curves, lines and equations represent best model fits to the data, plotted for small and large fish separately, and for all fish combined (grey dashed lines and text). n = sample size.

7. SPC notes, however, that the ongoing COVID-19 situation has delayed plans for establishing the collection of important CF data through several Pacific Islands national observer programmes, and we hope these initiatives can proceed as soon as COVID-19 restrictions are lifted.

8. A new Length–Length CF for whale sharks, first proposed by Rohner et al. (2011) and updated by Rohner et al. (2015), has been included in ANNEX 2, Tables A2, A4. This CF relates total length (TL) to 'BP', a measurement of the flank between the 5th gill slit and the origin of the 1st dorsal fin (named 'BP1' in Rohner et al. 2011).

9. Whilst substantial edits and additions have been made to ANNEX 2, Tables A2 and A3 in the current report, SPC notes that:-

- i) the population of CF data tables is ongoing;
- ii) work on enhancing the data, including further detail on sources of information and general quality control, continues;
- iii) the web-based tool for disseminating CF data is considered a prototype and will be improved upon in the future.
- iv) refinement of a 'confidence' score for assessing the reliability of each CF is underway. This would be added as a column in the CF database as an adjunct to the current 'Main' field, which indicates which CF factor is considered best to use for each CF relationship, by species.

10. Lastly, following recent discussions at SPC on the status of the species 'range check' tables – tables that define likely length and weight ranges per species, and flag outliers entered in the observer and logsheet data – SPC notes that some further work is required. Given the close links between the range checking work and Project 90 activities, SPC suggests that this work sit under the auspices of Project 90 for the next reporting period. Specific tasks would entail:-

- i) adding 'Source' and 'Comments' fields to the range check tables to allow retrospective tracing of range check additions; and
- ii) adding new range check values for certain fields, primarily for non-tuna species.

3. RECOMMENDATIONS

1. SC16 is invited to review and comment on the progress made on Project 90 activities at this stage.
2. SPC notes that Project 90 has been selected as a topic for discussion in the online forum in the lead up to SC16, and we look to this forum to table and enhance the priorities and activities proposed in ANNEX 1, Table A1, and Section 2 above.
3. We ask SC16 to note that 2021 represents the final year of Project 90 in its current form, with an indicative 2021 budget of USD 20,000.

4. REFERENCES

Anon. 2018. Report of the Fifteenth Regular Session of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean. Honolulu, Hawaii, USA, 10–14 December 2018. Western and Central Pacific Fisheries Commission, Pohnpei, Federated States of Micronesia.

Clarke, S., Coehlo, R., Francis, M., Kai, M., Kohin, S., Liu, K-M., Simpendorfer, C., Tovar-Avila, J., Rigby, C. and Smart, J. 2015. Report of the Pacific Shark Life History Expert Panel Workshop, 28-30 April 2015; SC11-EB-IP-13. Eleventh Regular Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission, Pohnpei, Federated States of Micronesia, 6-15 August 2015.

Francis, M.P. 2006. Morphometric minefields—towards a measurement standard for chondrichthyan fishes. Environ. Biol. Fish. 77, 407–421.

Francis, M.P. 2013. Commercial catch composition of highly migratory elasmobranchs. New Zealand Fisheries Assessment Report 2013/68. 79 p.

Kopf, R.K., Davie, P.S., Bromhead, D. and Pepperell, J.G. 2011. Age and growth of striped marlin (*Kajikia audax*) in the Southwest Pacific Ocean. ICES J. Mar. Sci. 68, 1884–1895.

Nakano, H. and Seki, M.P. 2003. Synopsis of biological data on the blue shark, *Prionace glauca* Linnaeus. Bull. Fish. Res. Agency 6, 18–55.

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., Allain, V., Caillot, S., Park, T., Williams, P., Tuiloma, I., Panizza, A., Fukofuka, S. and Smith, N. 2018a. 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.

Peatman, T., Bell, L., Allain, V., Caillot, S., Williams, P., Tuiloma, I., Panizza, A., Tremblay-Boyer, L., Fukofuka, S. and Smith, N. 2018b. 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.

Rohner, C.A., Richardson, A.J., Marshall, A.D., Weeks, S.J. and Pierce, S.J. 2011. How large is the world's largest fish? Measuring whale sharks Rhincodon typus with laser photogrammetry. J. Fish Biol. 78, 378–385.

Rohner, C.A., Richardson, A.J., Prebble, C.E.M., Marshall, A.D., Bennett, M.B., Weeks, S.J., Cliff, G., Wintner, S.P. and Pierce, S.J. 2015. Laser photogrammetry improves size and demographic estimates for whale sharks. PeerJ 3, e886. DOI 10.7717/peerj.886.

SPC-OFP 2019. Project 90 update: Better data on fish weights and lengths for scientific analyses. SC15 ST-WP-05. Fifteenth Regular Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission. Pohnpei, Federated States of Micronesia, 12-20 August 2019.

Williams, P.G. and Smith, N. 2018. Requirements for enhancing conversion factor information. SC14 ST-IP-05. Fourteenth Regular Session of the Scientific Committee of the Western and Central Pacific Fisheries Commission. Busan, Republic of Korea, 8-16 August 2018.

ANNEX 1 – Progress on Project 90 as at 1 July 2020

Table A1. Breakdown by activity and current status

Red text details what SPC set out to achieve in the 12 months since SC15, what of this has been achieved to date (underlined red text), and how this has been achieved (*italicized red text*). Other new work completed is shown in green text, and work anticipated over the coming 12 months in underlined green text.

Activity #	Activity description	Progress as at 1 July 2020
1.1	Identify the priority gaps in conversion factor data for the WCPFC key tuna species, key shark species, and key billfish species	i. Length–Weight (UF:WW) (see ANNEX 2) data for oceanic tunas less than 30 cm. ii. Weight–Weight (WF:WW) (see ANNEX 2) for adult yellowfin and bigeye tuna to provide a better understanding in weight loss between fresh/ice and (flash) frozen tuna. iii. Length–Length conversion factor data (SD:UF; PS:UF – see ANNEX 2) for adult yellowfin and bigeye tuna from the longline or handline fisheries (to obtain conversion factors that could be applied to frozen fish without tails). iv. The following conversion factor data to be collected from WCPFC key shark species, where relevant:- o Length–Weight (at least, obtaining UF:WW and TL:WW of individual shark); o Length–Length measurements (combinations of UF, TL, SD and PC of individual shark); o Weight–Weight measurements (where possible and with permission, at least WW:TT, WW:FN). v. The following shark species/fishery combination are to be targeted for data collection: o Blue shark in the longline fishery; o Silky shark in the purse seine fishery (only dead individuals can be sampled before they are discarded); o Oceanic whitetip shark in the purse seine fishery (only dead individuals can be sampled before they are discarded); o Mako shark (at species level) in the longline fishery; o Thresher shark (at species level) in the longline fishery; o Hammerhead shark (at species level) in the longline fishery; o Whale shark : Length–Length (PD:TL; PD:UF; only dead individuals noting 'best handling practices' should avoid mortalities; also, the challenges in obtaining measurements of large individuals will require some innovative thought (e.g. the potential for observers using laser measurement devices). Length–Weight conversion factors for whale shark are very important, but considered unrealistic at this stage. vi. For billfish species, Length–Length and Length–Weight conversion factor data for south Pacific swordfish and striped marlin (broken down by sex) have been identified as priorities, noting that conversion factor data for other billfish species will be collected as the opportunity arises.
1.2	Expand the conversion factors to cover the WCPFC key shark species for groups: mako, thresher and hammerhead shark, after gap analysis against existing conversion factors	i. The conversion factor (CF) database has been established, and some of the available conversion factor data entered (e.g. data compiled and presented in Clarke et al. 2015). ii. A web-based system to enter conversion factor data has been established and a prototype system for viewing and disseminating data conversion factor data has been established (see ANNEX 2, Figure A1). iii. Continue research to populate the CF database top resolve the gaps in 'Source' and 'Comments' fields of current records. The 'Comments' field will potentially contain the most important information – where samples came from and ranges of samples, and so consider expanding the CF database to have more defined searchable fields, particularly if the CF database is to be used to help define gaps. *Updates to 'Sample information', 'Source' and 'Comments' columns have been made for 45 existing entries for these shark groups, with information drawn largely from Nakano and Seki (2003), Francis (2006, 2013), Clarke et al. (2015) and references therein.*

Activity #	Activity description	Progress as at 1 July 2020
		Refinement of a 'confidence' score for assessing the reliability of each CF is underway. This would be added as a column in the CF database as an adjunct to the current 'Main' field, which indicates which CF factor is considered best to use for each CF relationship, by species. iv. Further conversion factor information to be added, as it becomes available through Project 90, or submitted to the WCPFC, or identified through literature searches (for example). *22 new CFs for mako, thresher and hammerhead sharks have been added, with a total of 58 new CFs added for all shark species combined.* *A new Length–Length CF for whale sharks has been added based on measurements of the flank between the 5th gill slit and the origin of the 1st dorsal fin. This measurement is now coded 'BP' in the database (see Rohner et al. 2011, 2015 for details).* SPC recommends that purse seine observers should now attempt to collect BP measurements for whale sharks where practicable.
1.3	Produce a list of species of special interest (SSIs, excluding key shark species) that require conversion factor data	i. The following conversion factor data to be collected from the SSIs (excluding key shark species) where possible:- o Manta/Mobulids : Length–Weight (TW:WW; only dead individuals noting 'best handling practices' should avoid mortalities; also, the challenges in weighing/measuring large individuals will require some thought). o Marine mammals : Length–Length (CF measurements to be determined; only dead individuals noting 'best handling practices' should avoid mortalities; also, the challenges in obtaining measurements of large individuals will require some innovative thought (e.g. the potential for observers using laser measurement devices). Length–Weight conversion factors for marine mammals are very important, but considered unrealistic at this stage. ii. No other priorities proposed at this stage, acknowledging that compiling interactions in numbers is generally preferred, and the weights of most non-shark SSIs are rarely required.
1.4	Produce a list of commercially important bycatch species (not covered in the items above)	i. The following conversion factor data to be collected from mahi mahi, wahoo and opah in the longline fishery, as the initial priority:- o Length–Weight: (UF:WW); o Weight–Weight: (GG:WW; GX:WW; FW:WW); o Length–Length: (UF:PF).
1.5	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.	i. The conversion factor database has been established. ii. Updates have been made to the 'Sample information', 'Source' and 'Comments' columns for a total of 71 existing CFs for shark and billfish species, with this metadata included for all new CF entries (n=78) (see ANNEX 2, Tables A2, A3).
1.6	Produce a list of the remaining bycatch species that require conversion factor data.	i. Length–Weight (UF:WW, TL:WW) for common bycatch that are typically discarded at sea, or are kept for crew consumption (but not generally commercially viable), including: barracuda species, lancetfish species, pomfret species.
1.7	Produce standard protocols for conversion factor data collection to be collected by observers and port samplers.	i. The protocols and conversion factor data collection forms exist for observers, but have yet to be reviewed and updated to cater for the data collection requirements under Project 90 Activities 1.1 through 1.6. ii. The protocols and conversion factor data collection forms for port samplers have yet to be designed and established.
2.1	Explore the use of EM tools to capture multiple length measurements from fish e-measured by EM Analysts.	i. One CCM currently generating data from an E-Monitoring (EM) system has been informally approached to collect Length–Length conversion factor data (using the EM digital measuring tool) from bigeye and yellowfin tuna to compare with existing conversion factor formulae for these species.

Activity #	Activity description	Progress as at 1 July 2020
		ii. This work will inform the feasibility of EM to collect certain Length–Length conversion factor data for other species.
3.1	Systematically collect representative samples of length measurements of bycatch species to support future estimation of catches in the WCPO	i. This activity is currently undertaken through observers, although it acknowledges the potential of EM to augment the available observer size data for bycatch species, particularly large individuals and live key shark species, which are difficult to measure.
3.2	Systematically collect Length–Length, Length–Weight and Weight–Weight conversion factor data of WCPFC key species and other species (non-shark SSIs and other bycatch species) to better inform future estimation of catches in the WCPO.	i. The collection of conversion factor data is included as an activity on SPC-led tagging cruises. ii. The following monitoring areas have been identified for conversion factor data collection in the first instance:- o A port with unloadings of both small oceanic tuna and large yellowfin tuna (for Activities 1.1–i and 1.1–iii); o Longline fisheries with observer coverage in three Pacific Island countries (for Activities 1.1–ii through 1.1–vi which are relevant to the longline fishery; Activity 1.4); o Purse seine fisheries with observer coverage in three Pacific Island countries (for Activities 1.1–iv through 1.1–v, which are relevant to the purse seine fishery; Activity 1.3). iii. Initial informal discussions have occurred with the relevant CCMs, but formal arrangements have yet to be established. *Partnerships have been forged with SOCSKSARGEN Federation of Fishing & Allied Industries (SFFAII) and the Bureau of Fisheries and Aquatic Resources ministry (BFAR) in the Philippines.* iv. The selection and testing of suitable equipment (e.g. motion compensating scales, where required) has yet to be undertaken. *The abovementioned scales were successfully trialed during the 2019 WP5 tagging cruise though FSM, and are currently housed in Noro, Solomon Islands.* SPC is seeking a new set of motion compensating scales, housed at SPC headquarters, Nouméa, to facilitate better engagement of local fishing companies in Project 90 activities, for example, the collection of much-needed data for deriving GG:WW CFs for longline-caught yellowfin and albacore tunas. v. Anticipate expanding the collection of conversion factor data, once a review of any issues/constraints with the initial data collection has been completed (i.e. in late 2020). vi. Pursue the potential for EM to obtain conversion factor (as per Activity 2.1). vii. Five published Length–Length or Length–Weight CFs for southwest Pacific striped marlin have been added to the database, with information drawn from Kopf et al. (2011). viii. Collection of new length and weight data on key tropical tunas derived from port sampling in the Philippines. Sampling targeted:- o small (i.e. < 40 cm UF) skipjack, yellowfin and bigeye tuna captured in ring net and/or manually-hauled purse seine sets made between December 2019 and May 2020; and o large (i.e. > 100 cm UF) yellowfin and bigeye captured by the handline fishery between February and May 2020. ix. Six new Length–Length (SD:UF, PS:UF, PS:SD) CFs have been added for large yellowfin and bigeye captured in the Philippines' handline fishery (ANNEX 2, Table A2). x. Nine new Length–Weight (UF:WW) CFs have been added for port sampled skipjack, yellowfin and bigeye tunas from the Philippines (see Figure 1), with three of these CFs derived using very small (presumed YOY and age 1) fish captured in the ring net and manually-handled purse seine fisheries (ANNEX 2, Table A3).

ANNEX 2 – Examples of work and outputs produced for Project 90 as at 1 July 2020

Table A2. Provisional Length–Length and Weight–Weight Conversion Factor data

New CF entries and updates added in this report are shown in green text.
Refer to Table A3 for measurement codes.
Length data are in cm; weight data are in kg.
Most references in the 'Source' column are cited in Nakano and Seki (2003), Francis (2006, 2013) and Clarke et al. (2015).
Data entry and quality checking ongoing.

Species	Convert from	Convert to	Main	Formula	Sex	Sample information		Source	Comments
						N	R squared		
ALB	GG	WW	Y	WW = 1.1 x (GG)		0	0	Processed catch from the Hawaii longline fishery	
ALB	GH	WW	Y	WW = 1.16 x (GH)		0	0	Processed catch from the Hawaii longline fishery	
ALB	GO	WW	Y	WW = 1.06 x (GO)		0	0	Processed catch from the Hawaii longline fishery	
ALB	GX	WW	Y	WW = 1.18 x (GX)		0	0	Processed catch from the Hawaii longline fishery	
ALV	TL	UF	Y	UF = 0.533 x (TL) - 1.2007		0	0	S. Kohin (pers. comm)	
ALV	TL	UF	A	UF = 0.5474 x (TL) + 7.0262		13	0.8865	Kohler et al. 1995 and references therein	Northwest Atlantic, range UF = 168-262 cm, range TL = 291-450 cm.
BET	GG	WW	Y	WW = 1.275 x (GG + RAND-0.5)^0.968		0	0	Langley et al. 2006	
BET	GG	WW	A	WW = 1.1782 x (GG)		3323	0.9886	Observer conversion factor data	
BET	GG	WW	A	WW = 1.16 x (GG)		0	0	Processed catch from the Hawaii longline fishery	
BET	GH	WW	Y	WW = 1.25 x (GH)		0	0	Processed catch from the Hawaii longline fishery	
BET	GO	WW	Y	WW = 1.06 x (GO)		0	0	Processed catch from the Hawaii longline fishery	
BET	GT	WW	Y	WW = 1.3264 x (GT + RAND-0.5)^0.969		0	0	Langley et al. 2006	
BET	GX	WW	Y	WW = 1.25 x (GX)		0	0	Processed catch from the Hawaii longline fishery	

Species	Convert from	Convert to	Main	Formula	Sex	Sample information		Source	Comments
						N	R squared		
BET	SD	UF	TBD	UF = 1.2816 x (SD)^1.088		68	0.9186	Philippines' port sampling collections, early 2020; from handline fishery.	Philippines EEZ. range = 61-92 cm SD.
BET	PS	UF	TBD	UF = 3.0655 x (PS) + 11.146		67	0.7185	Philippines' port sampling collections, early 2020; from handline fishery.	Philippines EEZ. range = 35-55 cm PS.
BET	PS	SD	TBD	SD = 1.4607 x (PS) + 13.259		67	0.7792	Philippines' port sampling collections, early 2020; from handline fishery.	Philippines EEZ. range = 35-55 cm PS.
BLM	EO	LF	Y	LF = 1.1111 x (EO)		0	0		
BLM	GG	WW	Y	WW = 1.2 x (GG)		19	0.7357	Observer conversion factor data	
BLM	GG	WW	A	WW = 1.2 x (GG)		0	0	Processed catch from the Hawaii longline fishery	
BLM	GH	WW	Y	WW = 1.433 x (GH)		0	0	Processed catch from the Hawaii longline fishery	
BLM	GO	WW	Y	WW = 1.15 x (GO)		0	0	Processed catch from the Hawaii longline fishery	
BLM	GX	WW	Y	WW = 1.45 x (GX)		0	0	Processed catch from the Hawaii longline fishery	
BLM	PF	LF	Y	LF = 1.29032 x (PF)		0	0	SPC conversion factor data	
BSH	FN	WW	Y	WW = 20 x (FN)		573	0	Francis 2013	New Zealand waters; considered reasonable for wet fin sets that include the whole tail.
BSH	WW	FN	TBD	FN = 0.0491 x (WW) + 0.174	M	144	0	Francis 2013	New Zealand waters
BSH	WW	FN	TBD	FN = 0.0453 x (WW) + 0.193	F	429	0	Francis 2013	New Zealand waters
BSH	WW	FN	TBD	FN = 0.0512 x (WW) + 0.620		120	0	Francis 2013	New Zealand waters
BSH	FN	WW	TBD	WW = 14.53 x (FN)		139	0	Baird 2009	Chartered Japanese SLL vessel.
BSH	SL	UF	Y	UF = 1.092 x (SL) + 0.745		12657	0	Francis & Duffy 2005	South Pacific
BSH	TL	SL	Y	SL = 0.762 x (TL) - 2.505		267	0.999	Nakano et al. 1985, cited in Nakano & Seki 2003	North Pacific, research driftnet sets
BSH	TL	SL	TBD	SL = 0.76 x (TL) - 1.95		187	0	McKinnell & Seki 1998, cited in Nakano & Seki 2003	North Pacific,

Species	Convert from	Convert to	Main	Formula	Sex	Sample information		Source	Comments
						N	R squared		
									Japanese commercial and Canadian experimental squid driftnet operations
BSH	SL	TL	TBD	TL = 1.31 x (SL) + 2.55		187	0	McKinnell & Seki 1998, cited in Nakano & Seki 2003	As above
BSH	EO	TL	TBD	TL = 1.35 x (EO) + 3.62		242	0	McKinnell & Seki 1998, cited in Nakano & Seki 2003	As above
BSH	TL	EO	TBD	EO = 0.70 x (TL) - 2.68		242	0	McKinnell & Seki 1998, cited in Nakano & Seki 2003	As above
BSH	SL	EO	TBD	EO = 1.03 x (SL) + 0.53		190	0	McKinnell & Seki 1998, cited in Nakano & Seki 2003	As above
BSH	EO	SL	TBD	SL = 0.97 x (EO) - 0.51		190	0	McKinnell & Seki 1998, cited in Nakano & Seki 2003	As above
BSH	TL	UF	Y	UF = 0.829 x (TL) - 1.122		0	0	NOAA SWFSC (unpublished data)	North Pacific
BSH	TL	UF	Y	UF = 0.838 x (TL) - 1.615		273	0	Francis & Duffy 2005	South Pacific
BSH	TL	UF	Y	UF = 0.8313 x (TL) + 1.39		572	0.9932	Kohler et al. 1995 and references therein	Western North Atlantic, range UF = 52-282 cm, range TL = 64-337 cm.
BSH	UF	SL	Y	SL = 0.9075 x (UF) + 0.3956		0	0	Kohler et al. 1995 and references therein	Western North Atlantic
BSH	TL	UF	TBD	UF = 0.78 x (TL) + 11.27	M	73	0.94	Hazin et al. 1991, cited in Nakano & Seki 2003	North Atlantic
BSH	TL	UF	TBD	UF = 0.73 x (TL) + 23.52	F	59	0.92	Hazin et al. 1991, cited in Nakano & Seki 2003	North Atlantic
BSH	TL	SL	TBD	SL = 0.74 x (TL) + 3.92	M	72	0.95	Hazin et al. 1991, cited in Nakano & Seki 2003	North Atlantic
BSH	TL	SL	TBD	SL = 0.63 x (TL) + 28.95	F	59	0.82	Hazin et al. 1991, cited in Nakano & Seki 2003	North Atlantic
BSH	TL	FS	TBD	FS = 0.22 x (TL) - 4.24	M	73	0.86	Hazin et al. 1991, cited in Nakano & Seki 2003	North Atlantic
BSH	TL	FS	TBD	FS = 0.16 x (TL) + 10.10	F	59	0.74	Hazin et al. 1991, cited in Nakano & Seki 2003	North Atlantic
BSH	UF	SL	TBD	SL = 0.93 x (FL) - 3.00	M	75	0.99	Hazin et al. 1991, cited in Nakano & Seki 2003	North Atlantic
BSH	UF	SL	TBD	SL = 0.88 x (FL) + 5.15	F	66	0.92	Hazin et al. 1991, cited in Nakano & Seki 2003	North Atlantic
BSH	UF	FS	TBD	FS = 0.28 x (UF) - 6.62	M	75	0.92	Hazin et al. 1991, cited in Nakano & Seki 2003	North Atlantic
BSH	UF	FS	TBD	FS = 0.23 x (FL) + 3.16	F	66	0.84	Hazin et al. 1991, cited in Nakano & Seki 2003	North Atlantic

Species	Convert from	Convert to	Main	Formula	Sex	Sample information		Source	Comments
						N	R squared		
BSH	SL	FS	TBD	FS = 0.30 x (SL) - 4.96	M	84	0.93	Hazin et al. 1991, cited in Nakano & Seki 2003	North Atlantic
BSH	SL	FS	TBD	FS = 0.23 x (SL) + 6.80	F	69	0.81	Hazin et al. 1991, cited in Nakano & Seki 2003	North Atlantic
BSH	TL	UF	TBD	UF = 0.8203 x (TL) - 1.061		62	0.9993	Castro and Mejuto 1995, cited in Nakano & Seki 2003	North Atlantic
BSH	UF	TL	TBD	TL = 1.2158 x (UF) + 1.716		62	0.9993	Castro and Mejuto 1995, cited in Nakano & Seki 2003	North Atlantic
BTH	SL	TL	Y	TL = 1.92 x (SL) - 4.96	F	16	0.991	White 2007	Indian Ocean, eastern Indonesia
BTH	SL	TL	Y	TL = 1.7 x (SL) + 192.31	M	16	0.939	White 2007	Indian Ocean, eastern Indonesia
BTH	SL	TL	Y	TL = 1.81 x (SL) + 15.3	F	177	0.90	Liu et al. 1998	Northeast Taiwanese waters
BTH	SL	TL	Y	TL = 1.76 x (SL) + 15.1	M	68	0.88	Liu et al. 1998	Northeast Taiwanese waters
BTH	TL	UF	Y	UF = 0.5598 x (TL) + 17.666		56	0.8944	Kohler et al. 1995 and references therein	Western North Atlantic, range UF = 100-228 cm, range TL = 155-371 cm.
BTH	TL	UF	TBD	UF = 0.4882 x (TL) + 37.9566		69	0.8577	Kohler et al. 1995 and references therein	Western North Atlantic
BTH	UF	TL	Y	TL = 1.62 x (UF) + 164.74	M	13	0.909	White 2007	Indian Ocean, eastern Indonesia
BTH	UF	TL	Y	TL = 1.56 x (UF) + 26.3	M	68	0.81	Liu et al. 1998	Northeast Taiwanese waters
BTH	UF	TL	Y	TL = 1.75 x (UF) - 3.2	F	13	0.984	White 2007	Indian Ocean, eastern Indonesia
BTH	UF	TL	Y	TL = 1.69 x (UF) + 13.3	F	177	0.89	Liu et al. 1998	Northeast Taiwanese waters
BUM	EO	LF	Y	LF = 1.1111 x (EO)		0	0		
BUM	GG	WW	Y	WW = 1.2605 x (GG)		103	0.9855	Observer conversion factor data	
BUM	GG	WW	A	WW = 1.25 x (GG)		0	0	Processed catch from the Hawaii longline fishery	
BUM	GH	WW	Y	WW = 1.47 x (GH)		0	0	Processed catch from the Hawaii longline fishery	

Species	Convert from	Convert to	Main	Formula	Sex	Sample information		Source	Comments
						N	R squared		
BUM	GO	WW	Y	WW = 1.15 x (GO)		0	0	Processed catch from the Hawaii longline fishery	
BUM	GX	WW	Y	WW = 1.54 x (GX)		0	0	Processed catch from the Hawaii longline fishery	
BUM	PF	LF	Y	LF = 1.22714 x (PF)		0	0	SPC conversion factor data	
DOL	GG	WW	A	WW = 1.11 x (GG)		0	0		
DOL	GH	WW	A	WW = 1.54 x (GH)		0	0		
DOL	GO	WW	A	WW = 1.06 x (GO)		0	0		
DOL	GX	WW	A	WW = 1.56 x (GX)		0	0		
EUB	UF	TL	Y	TL = 1.31 x (UF) + 3.1		263	0.996	Stevens & Lyle 1989	Northern Australian waters
FAL	FN	WW	Y	WW = 20 x (FN)		0	0		
FAL	SL	TL	Y	TL = 1.32 x (SL) + 2.08		84	0.99	Oshitani et al. 2003	Range = 48-148 cm
FAL	SL	TL	Y	TL = 1.31 x (SL) + 3.64		469	0.98	Joung et al. 2008	
FAL	SL	UF	Y	UF = 1.09 x (SL) + 1.1		469	0.99	Joung et al. 2008	
FAL	SL	UF	Y	UF = 1.03 x (SL) + 1.09		362	0.98	Oshitani et al. 2003	Range = 48-184 cm
FAL	UF	TL	Y	TL = 1.21 x (UF) + 2.36		469	0.98	Joung et al. 2008	
MAK	FN	WW	Y	WW = 20 x (FN)		17	0	Francis 2013	New Zealand waters, rough estimate only for wet fin sets that include the whole tail, as few data available.
MLS	GG	WW	Y	WW = 1.17884 x (GG + RAND-0.5)^0.9984		0	0	Langley et al. 2006	
MLS	GG	WW	A	WW = 1.23 x (GG)		0	0	Processed catch from the Hawaii longline fishery	
MLS	GG	WW	A	WW = 1.2314 x (GG)		21	0.9378	Observer conversion factor data	
MLS	GH	WW	Y	WW = 1.37 x (GH)		0	0	Processed catch from the Hawaii longline fishery	
MLS	GO	WW	Y	WW = 1.15 x (GO)		0	0	Processed catch from the Hawaii longline fishery	
MLS	GX	WW	Y	WW = 1.11 x (GX)		0	0		
MLS	LF	EO	Y	EO = 0.862069 x (LF)		0	0	SPC conversion factor data	

Species	Convert from	Convert to	Main	Formula	Sex	Sample information		Source	Comments
						N	R squared		
MLS	LF	EO	TBD	EO = 0.834 x (LF) + 36.61		301	0.95	Kopf et al. 2011	Southwest Pacific Ocean; samples collected between 2006 and 2009, mostly between 150E and 170W, 10N and 35S.
MLS	LF	EO	TBD	EO = 0.838 x (LF) + 23.75	F	136	0.96	Kopf et al. 2011	As above.
MLS	LF	EO	TBD	EO = 0.827 x (LF) + 49.83	M	159	0.94	Kopf et al. 2011	As above.
MLS	PF	LF	Y	LF = 1.17946 x (PF)		0	0	SPC conversion factor data	
OCS	FN	WW	Y	WW = 20 x (FN)		0	0		
OCS	SL	TL	Y	TL = 1.397 x (SL)		0	0	Seki et al 1998 (estimated from Bass et al. 1973)	
OCS	UF	TL	Y	TL = 1.13477 x (UF) + 12.5374		0	0	ICCAT 2014	
PBF	GG	WW	A	WW = 1.18 x (GG)		0	0		
PBF	GH	WW	A	WW = 1.41 x (GH)		0	0		
PBF	GO	WW	A	WW = 1.09 x (GO)		0	0		
PBF	GX	WW	A	WW = 1.52 x (GX)		0	0		
POR	TL	UF	Y	UF = 0.8896 x (TL) + 0.3369		5726	0	Francis 2013	New Zealand waters, most data from fish less than 200 cm UF.
POR	SL	UF	TBD	UF = 1.1068 x (SL) + 2.1096		12485	0	Francis 2013	New Zealand waters, most data from fish less than 200 cm UF.
POR	FN	WW	TBD	WW = 20 x (FN)		55	0	Francis 2013	New Zealand waters, rough estimate only for wet fin sets that include the whole tail, as few data available.

Species	Convert from	Convert to	Main	Formula	Sex	Sample information		Source	Comments
						N	R squared		
PTH	SL	TL	Y	TL = 2.05 x (SL) + 101.71	M	85	0.980	White 2007	Indian Ocean, eastern Indonesia
PTH	SL	TL	Y	TL = 1.93 x (SL) + 2.34	F	281	0.84	Liu et al. 1999	Northwest Pacific
PTH	SL	TL	Y	TL = 1.89 x (SL) + 2.33	M	204	0.85	Liu et al. 1999	Northwest Pacific
PTH	SL	TL	Y	TL = 1.7362 x (SL) + 18.044	M	0	0	Romero-Caicedo 2014	
PTH	SL	TL	Y	TL = 1.98 x (SL) + 195.58	F	105	0.943	White 2007	Indian Ocean, eastern Indonesia
PTH	UF	TL	Y	TL = 1.85 x (UF) + 123.12	M	62	0.968	White 2007	Indian Ocean, eastern Indonesia
PTH	UF	TL	Y	TL = 1.72 x (UF) + 333.359	F	95	0.873	White 2007	Indian Ocean, eastern Indonesia
RHN	SL	TL	Y	TL = 1.2182 x (SL) + 33.036		41	0.98	Rohner et al. 2011. Extension of the equation presented in Wintner 2000, increasing number of measurements to 41. with published records taken from Uchida 1983, Beckley et al. 1997, Wintner 2000 and Capapé et al. 2001, and unpublished records provided by S.P. Wintner and G. Cliff pers. Comm).	Southern Mozambique
RHN	BP	TL	TBD	TL = 4.902 x (BP) + 72.579		37	0.92	Rohner et al. 2015. Extension of the relationship of Rohner et al. 2011, based on (n=27). This relationship was updated with the addition of 14 live sharks, and exclusion of 4 data points from outside study region (i.e. total sample size to n=37).	Southern Mozambique and Tanzania, range TL = 420–990 cm, data collected between 2010 and 2013. 'BP': a measurement of the flank between the 5th gill slit and the origin of the 1st dorsal fin (BP1 in Rohner et al., 2011).

Species	Convert from	Convert to	Main	Formula	Sex	Sample information		Source	Comments
						N	R squared		
RHN	SL	TL	Y	TL = 1.252 x (SL) + 20.308		21	0.986	Wintner 2000 (combining data with Beckley et al. 1997 for adults relationships	For adults, range SL = 254-780 cm.
RHN	SL	UF	Y	UF = 1.106 x (SL) + 7.919		7	0.996	Wintner 2000 (combining data with Beckley et al. 1997 for adults relationships)	For adults, range SL = 422-770 cm.
RHN	UF	TL	Y	TL = 1.063 x (UF) + 26.491		8	0.975	Wintner 2000 (combining data with Beckley et al. 1997 for adults relationships)	For adults, range SL = 473-850 cm.
RHN	SL	TL	TBD	TL = 1.306 x (SL) + 1.226		9	0.989	Wintner 2000 (combining data from Bass et al. 1975, Wolfson 1983 and Change et al. 1997 for embryos relationships)	For embryos, range SL = 26-48 cm.
SFA	GG	WW	A	WW = 1.12 x (GG)		0	0		
SFA	GH	WW	A	WW = 1.52 x (GH)		0	0		
SFA	GO	WW	A	WW = 1.08 x (GO)		0	0		
SFA	GX	WW	A	WW = 1.56 x (GX)		0	0		
SKJ	GG	WW	Y	WW = 1.14 x (GG)		0	0		
SKJ	GH	WW	Y	WW = 1.33 x (GH)		0	0	Processed catch from the Hawaii longline fishery	
SKJ	GO	WW	Y	WW = 1.09 x (GO)		0	0	Processed catch from the Hawaii longline fishery	
SKJ	GX	WW	Y	WW = 1.35 x (GX)		0	0	Processed catch from the Hawaii longline fishery	
SMA	SL	UF	Y	UF = 1.1 x (SL) + 0.766		999	0	Kohler et al. 1995 and references therein	Western North Atlantic, range = 61-346 cm
SMA	TL	SL	Y	SL = 0.816 x (TL) + 0.784		1240	0	Joung & Hsu 2005	North Pacific, range = 80-375 cm
SMA	TL	SL	Y	SL = 0.84 x (TL) - 2.13		131	0	Semba et al. 2009	North Pacific
SMA	TL	UF	Y	UF = 0.89 x (TL) + 0.952		1236	0	Joung & Hsu 2005	North Pacific, range = 80-375 cm
SMA	TL	UF	Y	UF = 0.913 x (TL) - 0.397		2177	0	Wells et al. 2013	North Pacific
SMA	TL	UF	Y	UF = 0.911 x (TL) + 0.821		399	0	Kohler et al. 1995 and references therein	Western North Atlantic, range UF = 70-346 cm

Species	Convert from	Convert to	Main	Formula	Sex	Sample information		Source	Comments
						N	R squared		
SMA	TL	UF	TBD	UF = 0.9286 x (TL) - 1.7101		199	0.9972	Kohler et al. 1995 and references therein	Western North Atlantic, range UF = 65-338 cm, range TL = 70-368 cm
SMA	TL	UF	Y	UF = 0.905 x (TL) + 1.345	F	5542	0	Cerna & Licandeo 2009	Southeast Pacific off chile, range = 75-330 cm TL
SMA	TL	UF	Y	UF = 0.894 x (TL) + 2.912	M	5149	0	Cerna & Licandeo 2009	Southeast Pacific off Chile, range = 76-285 cm TL. Note: Southeast Pacific FL vs. TL regressions (by separate sex) listed in Cerna & Licandeo 2009 have very large sample sizes. May be applicable to the Southwest Pacific stock.
SMA	UF	SL	Y	SL = 0.91 x (UF) - 0.95		130	0	Semba et al 2009	North Pacific, ranges 57-187 cm both sexes
SMA	TL	UF	TBD	UF = 0.90 x (TL) - 0.06		1245	0	Hsu 2003, cited in Clarke et al. 2015	North Pacific
SMA	TL	SL	TBD	SL = 0.82 x (TL) + 0.01		1245	0	Hsu 2003, cited in Clarke et al. 2015	North Pacific
SMA	UF	TL	TBD	TL = 1.085 x (UF) + 3.17		130	0.9953	Francis 2006	South Pacific. Data sourced from New Zealand recreational fisheries. Measurements made on shore by scientists using

Species	Convert from	Convert to	Main	Formula	Sex	Sample information		Source	Comments
						N	R squared		
									measuring tape. Range TL = 95-379 cm; range UF = 85-356 cm.
SMA	SL	TL	TBD	TL = 1.196 x (SL) + 4.43		136	0.9949	Francis 2006	As above, but range SL = 76-314 cm.
SMA	TL	UF	TBD	UF = 0.918 x (TL) - 1.96		130	0.9953	Francis 2006	As above, but range UF = 85-346 cm; range TL = 95-379 cm.
SMA	SL	UF	TBD	UF = 1.097 x (SL) + 2.09		129	0.9988	Francis 2006	As above, but range SL = 76-314 cm.
SMA	TL	SL	TBD	SL = 0.832 x (TL) - 2.77		136	0.9949	Francis 2006	As above, but range TL = 95-379 cm.
SMA	UF	SL	TBD	SL = 0.911 x (UF) - 1.69		129	0.9988	Francis 2006	As above, but range SL = 76-314; range UF = 85-346 cm.
SMA	UF	TL	TBD	TL = 1.077 x (UF) + 1.97		253	0.9901	Francis 2006	South Pacific. Data sourced from tuna longline vessels in New Zealand waters. Measurements made at sea by fisheries observers using calipers. Range TL = 80-330 cm; range UF = 70-297 cm.
SMA	TL	UF	TBD	UF = 0.919 x (TL) - 0.19		253	0.9901	Francis 2006	As above.
SMA	SL	UF	TBD	UF = 1.097 x (SL) + 1.06		854	0.9966	Francis 2006	As above, but range UF = 61-333 cm; range SL = 55-304 cm.

Species	Convert from	Convert to	Main	Formula	Sex	Sample information		Source	Comments
						N	R squared		
SMA	UF	SL	TBD	SL = 0.908 x (UF) – 0.43		854	0.9966	Francis 2006	As above.
SPK	SL	TL	Y	TL = 1.39 x (SL) + 74.19		146	0.99	Harry et al. 2011	Eastern Australian waters, between 2005 and 2010.
SPK	UF	TL	Y	TL = 1.2533 x (UF) + 3.472		24	0.98	Piercy et al. 2010	Samples from Gulf of Mexico and northwest Atlantic Ocean
SPK	UF	TL	Y	TL = 1.29 x (UF) + 3.58		261	0.994	Stevens & Lyle 1989	Northern Australian waters
SPK	UF	TL	Y	TL = 1.29 x (UF) + 49.01		146	0.99	Harry et al. 2011	Eastern Australian waters, between 2005 and 2010.
SPL	UF	TL	Y	TL = 1.296 x (UF) + 0.516		1488	0.99	Piercy et al. 2007	US waters, NW Atlantic Ocean and the Gulf of Mexico
SPL	UF	SL	TBD	SL = 0.918 x (UF) – 0.365		709	0.99	Piercy et al. 2007	US waters, NW Atlantic Ocean and the Gulf of Mexico
SPL	UF	TL	Y	TL = 1.3 x (UF) + 15.38		522	0.99	Harry et al. 2011	Eastern Australian waters, between 2005 and 2010.
SPL	SL	TL	TBD	TL = 1.43 x (SL) + 15.49		522	0.99	Harry et al. 2011	Eastern Australian waters, between 2005 and 2010.
SPL	UF	TL	TBD	TL = 1.3 x (UF) + 1.28		454	0.994	Stevens & Lyle 1989	Northern Australian waters
SPN	FN	WW	Y	WW = 20 x (FN)		0	0		
SPZ	TL	UF	Y	UF = 0.84 x (TL) + 12.72		257	0.95	Coelho et al. 2011	Eastern equatorial Atlantic

Species	Convert from	Convert to	Main	Formula	Sex	Sample information		Source	Comments
						N	R squared		
SSP	GG	WW	A	WW = 1.11 x (GG)		0	0		
SSP	GH	WW	A	WW = 1.32 x (GH)		0	0		
SSP	GO	WW	A	WW = 1.05 x (GO)		0	0		
SSP	GX	WW	A	WW = 1.33 x (GX)		0	0		
SWO	EO	LF	Y	LF = 1.1111 x (EO)		0	0		
SWO	FW	WW	Y	WW = 1.5269 x (FW)		683	0	Observer conversion factor data	
SWO	GG	WW	Y	WW = 1.3717 x (GG + RAND-0.5)		0	0	Langley et al. 2006	
SWO	GG	WW	A	WW = 1.14 x (GG)		0	0	Processed catch from the Hawaii longline fishery	
SWO	GG	WW	A	WW = 1.2551 x (GG)		10	0.9834	Observer conversion factor data	
SWO	GH	WW	Y	WW = 1.39 x (GH)		0	0	Processed catch from the Hawaii longline fishery	
SWO	GO	WW	Y	WW = 1.09 x (GO)		0	0	Processed catch from the Hawaii longline fishery	
SWO	GX	WW	Y	WW = 1.45 x (GX)		0	0	Processed catch from the Hawaii longline fishery	
SWO	PF	LF	Y	LF = 1.31579 x (PF)		0	0	SPC conversion factor data	
WAH	GG	WW	A	WW = 1.1 x (GG)		0	0		
WAH	GH	WW	A	WW = 1.22 x (GH)		0	0		
WAH	GO	WW	A	WW = 1.15 x (GO)		0	0		
WAH	GX	WW	A	WW = 1.23 x (GX)		0	0		
YFT	GG	WW	Y	WW = 1.1893 x (GG + RAND-0.5)^0.972		0	0	Langley et al. 2006. The use of "rand" is explained in this reference.	
YFT	GG	WW	A	WW = 1.12 x (GG)		0	0	Processed catch from the Hawaii longline fishery	
YFT	GG	WW	A	WW = 1.1561 x (GG)		9596	0.9863	Observer conversion factor data	
YFT	GH	WW	Y	WW = 1.22 x (GH)		0	0	Processed catch from the Hawaii longline fishery	
YFT	GO	WW	Y	WW = 1.06 x (GO)		0	0	Processed catch from the Hawaii longline fishery	
YFT	GT	WW	Y	WW = 1.2988 x (GT + RAND-0.5)^0.968		0	0	Langley et al. 2006	
YFT	GX	WW	Y	WW = 1.23 x (GX)		0	0	Processed catch from the Hawaii longline fishery	
YFT	SD	UF	TBD	UF = 3.951 x (SD)^0.8369		396	0.8516	Philippines' port sampling collections, early 2020; from handline fishery.	Philippines EEZ. range = 49-78 cm SD.

Species	Convert from	Convert to	Main	Formula	Sex	Sample information		Source	Comments
						N	R squared		
YFT	PS	UF	TBD	UF = 11.385 x (PS)^0.6619		396	0.6122	Philippines' port sampling collections, early 2020; from handline fishery.	Philippines EEZ. range = 31-50 cm PS.
YFT	PS	SD	TBD	SD = 3.9757 x (PS)^0.7597		396	0.6632	Philippines' port sampling collections, early 2020; from handline fishery.	Philippines EEZ. range = 31-50 cm PS.

Table A3. Provisional Length–Weight Conversion Factor data

New CF entries and updates added in this report are shown in green text.
Refer to Table A4 for measurement codes.
Length data are in cm; weight data are in kg.
Most references in the 'Source' column are cited in Nakano and Seki (2003), Francis (2006, 2013) and Clarke et al. (2015).
Data entry and quality checking ongoing.

Species	Convert from	Convert to	Main	Formula	Sex	Sample information		Source	Comments
						N	R squared		
ABU	UF	WW	A	WW = 1.64e-005 x (UF)^3.142		35	0	Bohnsack & Harper 1988	
AGS	UF	WW	A	WW = 0.000118 x (UF)^2.075		0	0	Pauly et al. 1996	
ALB	UF	WW	Y	WW = 1.43e-005 x (UF)^3.1		0	0	Williams et al. 2012	
ALB	UF	WW	A	WW = 2.97125e-005 x (UF)^2.90141		8891	0.889	Observer conversion factor data	
ALM	UF	WW	A	WW = 1.94e-005 x (UF)^2.96		96	0		
ALN	UF	WW	A	WW = 2.19e-006 x (UF)^3		71	0	Bohnsack & Harper 1988	
ALS	SL	WW	A	WW = 3.04e-006 x (SL)^3.243		0	0	Kulbicki et al. 1993	
ALV	TL	WW	A	WW = 0.0001879 x (TL)^2.519		0	0	Kohler et al. 1995 and references therein	Western North Atlantic
ALV	UF	WW	Y	WW = 0.00018821 x (UF)^2.5188		88	0.8795	Kohler et al. 1995 and references therein	Western North Atlantic, range WW = 54-211 kg, range UF = 154-262 cm.
AMB	UF	WW	A	WW = 5.029e-005 x (UF)^2.809		30	0	Bohnsack & Harper 1988	
AML	TL	WW	A	WW = 8.77e-006 x (TL)^3.05		54	0	Letourneur et al. 1998	
ASA	UF	WW	A	WW = 3.5e-006 x (UF)^2.79		0	0	Annala 1994	
AVR	UF	WW	A	WW = 2.549e-005 x (UF)^2.87		77	0	Letourneur et al. 1998	
BAC	UF	WW	A	WW = 2.49e-006 x (UF)^3.245		0	0	Kulbicki et al. 1993	
BAR	UF	WW	A	WW = 0.0005 x (UF)^2.062		0	0	Species *Platax orbicularis* used	
BAT	UF	WW	A	WW = 4.25e-005 x (UF)^2.975		0	0		
BET	UF	WW	Y	WW = 3.195e-005 x (UF)^2.9113		0	0	Campbell 2011	
BET	UF	WW	A	WW = 2.34684e-005 x (UF)^2.97575		802	0.9343	Regional Observer data	
BET	UF	WW	TBD	WW = 1.417e-005 x (UF)^3.1171		121	0.9778	Philippines' port sampling collections, late 2019 to early 2020.	Philippines EEZ. Small

Species	Convert from	Convert to	Main	Formula	Sex	Sample information N	R squared	Source	Comments
									fish, range = 19-65 cm UF.
BET	UF	WW	TBD	WW = 1.012e-004 x (UF)^2.6837		68	0.9378	Philippines' port sampling collections, late 2019 to early 2020.	Philippines EEZ. Larger fish, range = 109-183 cm UF.
BET	UF	WW	TBD	WW = 2.071e-005 x (UF)^3.0058		189	0.9978	Philippines' port sampling collections, late 2019 to early 2020.	Philippines EEZ. All fish combined, range = 19-183 cm UF.
BIS	UF	WW	A	WW = 4e-006 x (UF)^3.259		1104	0	Letourneur 2000	
BLM	LF	WW	A	WW = 6.614e-005 x (LF)^2.61109		19	0.742	Regional Observer data	
BLM	PF	WW	A	WW = 6.6e-006 x (PF)^3.361		108	0	Speare 2003	East Australia
BLT	UF	WW	A	WW = 1.004e-005 x (UF)^3.13		744	0	Uchida 1981	
BOX	UF	WW	A	WW = 3.7e-007 x (UF)^3.27		0	0	Formula for Aphanopus carbo used	
BRO	TL	WW	A	WW = 1.04e-005 x (TL)^2.9		0	0	Torres 1991	
BSH	FL	WW	A	WW = 3.17e-006 x (FL)^3.131		4529	0.9521	Kohler et al. 1995 and references therein	Western North Atlantic, range WW = 1-174 kg, range UF = 52-288 cm.
BSH	SL	WW	Y	WW = 2.3279e-006 x (SL)^3.294	F	148	0.994	Nakano et al. 1985	
BSH	SL	WW	Y	WW = 3.293e-006 x (SL)^3.225	M	2910	0.993	Nakano 1994	
BSH	SL	WW	Y	WW = 5.388e-006 x (SL)^3.102	F	2890	0.992	Nakano 1994	
BSH	TL	WW	Y	WW = 5.009e-006 x (TL)^3.054		0	0	NOAA SWFSC (unpub data)	
BSH	TL	WW	Y	WW = 2.57e-005 x (TL)^3.05		150	0.849	Harvey 1989	
BSH	TL	WW	Y	WW = 3.838e-006 x (TL)^3.174	M	285	0.997	Nakano et al. 1985	
BSH	TL	WW	?	WW = (4.018e-006 x (TL)^3.134)/2.20462262		0	0	Strasburg 1958, cited in Nakano & Seki 2003	North Pacific
BSH	TL	WW	?	WW = 0.392e-006 x (TL)^3.41	M	17	0.999	Stevens 1975, cited in Nakano & Seki 2003	Atlantic Ocean
BSH	TL	WW	?	WW = 0.131e-005 x (TL)^3.20	F	450	0.968	Stevens 1975, cited in Nakano & Seki 2003	Atlantic Ocean
BSH	TL	WW	?	WW = 3.1841e-006 x (TL)^3.1313		4529	0.976	Castro 1983, cited in Nakano & Seki 2003	Atlantic Ocean

Species	Convert from	Convert to	Main	Formula	Sex	Sample information		Source	Comments
						N	R squared		
BSH	UF	WW	?	WW = 1.377e-007 x (FL)^3.672	M	37	0.95	Hazin et al. 1985, cited in Nakano & Seki 2003	Atlantic Ocean
BSH	UF	WW	?	WW = 5.677e-006 x (FL)^2.928	F	60	0.83	Hazin et al. 1985, cited in Nakano & Seki 2003	Atlantic Ocean
BSH	TL	WW	?	WW = 9.94e-004 x (TL)^2.0005	M	260	0	Draganik and Pelczarski 1984, cited in Nakano & Seki 2003	Atlantic Ocean
BSH	TL	WW	?	WW = 7.95e-004 x (TL)^2.0473	F	31	0	Draganik and Pelczarski 1984, cited in Nakano & Seki 2003	Atlantic Ocean
BSH	UF	WW	Y	WW = 1e-006 x (UF)^3.23		44	0.91	Joung et al. 2011	
BSH	UF	WW	Y	WW = 1.57761e-006 x (UF)^3.282	M	1666	0.942	Ayers et al. 2004	New Zealand waters, longline bycatch in 2000-01 and 2001-02.
BSH	UF	WW	Y	WW = 6.36796e-007 x (UF)^3.485	F	3053	0.948	Ayers et al. 2004	New Zealand waters, longline bycatch in 2000-01 and 2001-02.
BSK	TL	WW	A	WW = 4.93e-006 x (TL)^3		2	0		
BTH	SL	WW	Y	WW = 6.87e-005 x (SL)^2.769	F	421	0.88	Liu et al. 1998	Northeast Taiwanese waters
BTH	SL	WW	Y	WW = 9.93e-005 x (SL)^2.685	M	187	0.83	Liu et al. 1998	Northeast Taiwanese waters
BTH	TL	WW	Y	WW = 3.73e-005 x (TL)^2.57	M	65	0.80	Liu et al. 1998	Northeast Taiwanese waters
BTH	TL	WW	Y	WW = 9.1069e-006 x (TL)^3.0802		55	0.9059	Kohler et al. 1995 and references therein	Western North Atlantic, range WW = 11-170 kg, range UF = 100-228 cm.
BTH	TL	WW	Y	WW = 1.02e-005 x (TL)^2.78	F	175	0.90	Liu et al. 1998	Northeast Taiwanese waters
BUM	LF	WW	A	WW = 4.221e-005 x (LF)^2.71359		103	0.781	Regional Observer data	
BWA	UF	WW	A	WW = 1.499e-005 x (UF)^3.041		78	0		

Species	Convert from	Convert to	Main	Formula	Sex	Sample information		Source	Comments
						N	R squared		
CCL	TL	WW	A	WW = 7.13e-006 x (TL)^3.01		0	0	Torres 1991	
CCP	FL	WW	A	WW = 1.0885e-005 x (FL)^3.0124		1548	0.9385	Kohler et al. 1995 and references therein	Western North Atlantic, range WW = 1-104 kg, range UF = 44-201 cm.
CEO	UF	WW	A	WW = 2.4e-006 x (UF)^3.346		33	0	Coull et al. 1989	
CNT	UF	WW	A	WW = 5.979e-005 x (UF)^2.817		0	0	Formula for *Canthidermis sufflamen* used	
COM	UF	WW	A	WW = 1.059e-005 x (UF)^2.94		0	0	Torres 1991	
CRF	UF	WW	A	WW = 4.14e-005 x (UF)^2.85		47	0	Schroeder 1982	
CXR	UF	WW	A	WW = 6.459e-005 x (UF)^2.748		98	0	Bohnsack & Harper 1988	
CXS	UF	WW	A	WW = 3.18e-005 x (UF)^2.93		24	0	Schroeder 1982	
DGX	TL	WW	A	WW = 3.95e-006 x (TL)^3.004		279	0		
DOL	UF	WW	A	WW = 1.899e-005 x (UF)^2.688		9799	0	Palko et al. 1982	
DUS	FL	WW	A	WW = 3.24e-005 x (FL)^2.786		247	0.9649	Kohler et al. 1995 and references therein	Western North Atlantic, range WW = 5-270 kg, range UF = 79-287 cm.
ETA	UF	WW	A	WW = 2.16e-005 x (UF)^2.95		1814	0	Brouard and Grandperrin 1984	
ETC	UF	WW	A	WW = 4.109e-005 x (UF)^2.758		1283	0	Pakoa 1998	
EUB	TL	WW	Y	WW = 2.71e-004 x (TL)^3.56		178	0.975	Stevens & Lyle 1989	Northern Australian waters
FAL	UF	WW	A	WW = 1.5406e-005 x (UF)^2.9221		85	0.9720	Kohler et al. 1995 and references therein	Western North Atlantic, range WW = 4-88 kg, range UF = 73-212 cm.
FAL	TL	WW	Y	WW = 2.92e-006 x (TL)^3.15		469	0	Joung et al. 2008	p<0.01
FIP	UF	WW	A	WW = 3e-007 x (UF)^3.158		43	0	Letourneur et al. 1998	
FIT	UF	WW	A	WW = 3e-007 x (UF)^3.158		0	0	Species *Fisturaria petimba* used	

Species	Convert from	Convert to	Main	Formula	Sex	Sample information N	Sample information R squared	Source	Comments
FLF	UF	WW	A	WW = 4.06e-005 x (UF)^2.792		0	0	Species *Cantherhinus dumerili* used	
FRI	UF	WW	A	WW = 1.79e-006 x (UF)^3.334		160	0	Uchida 1981	
GAG	FL	WW	A	WW = 1.81e-005 x (FL)^2.72		0	0	Annala 1994	
GBA	UF	WW	A	WW = 4.11e-006 x (UF)^3.083		10	0	Bohnsack & Harper 1988	
GEM	UF	WW	A	WW = 3.4e-006 x (UF)^3.22		0	0	Annala 1994	
GLT	UF	WW	A	WW = 3.9e-005 x (UF)^2.84		69	0	Schroeder 1982	
GRN	UF	WW	A	WW = 6e-006 x (UF)^2.85		0	0	Annala 1994	
HER	UF	WW	A	WW = 4.97e-006 x (UF)^3.192		0	0	Coull et al. 1989	
KAW	UF	WW	A	WW = 2.999e-005 x (UF)^2.908		0	0	van der Elst & Adkin 1991	
LOB	UF	WW	A	WW = 4.28e-005 x (UF)^2.84		0	0	Torres 1991	
MAC	UF	WW	A	WW = 3.8e-006 x (UF)^3.21		0	0	Coull et al. 1989	
MAK	TL	WW	A	WW = 1.2e-006 x (TL)^3.46		0	0		
MAK	UF	WW	?	log10WW = 2.847 x log10 (UF) - 4.622		1016	0.955	Ayers et al. 2004	New Zealand waters, longline bycatch in 2000-01 and 2001-02.
MAS	UF	WW	A	WW = 3.46e-006 x (UF)^3.227		216	0	Gonçalves et al. 1997	
MIL	UF	WW	A	WW = 7.3e-006 x (UF)^3.251		96	0	Letourneur et al. 1998	
MLS	LF	WW	A	WW = 0.0022 x (LF)^1.9555		12	0.5876	Regional Observer data	
MLS	UF	WW	Y	WW = 1.012e-010 x (UF)^3.55	Both	214	0.93	Kopf et al. 2011	Southwest Pacific Ocean; samples collected between 2006 and 2009, mostly between 150E and 170W, 10N and 35S.
MLS	UF	WW	?	WW = 4.171e-011 x (UF)^3.67	F	120	0.95	Kopf et al. 2011	As above.
MLS	UF	WW	?	WW = 1.902e-009 x (UF)^3.16	M	89	0.89	Kopf et al. 2011	As above.
MOX	UF	WW	A	WW = 4.54e-005 x (UF)^3.05		13	0	Coull et al. 1989	

Species	Convert from	Convert to	Main	Formula	Sex	Sample information		Source	Comments
						N	R squared		
OCS	FL	WW	A	WW = 1.7e-005 x (FL)^2.98		32	0	Claro & Garcia-Arteaga 1994	
OCS	SL	WW	Y	WW = 5.076e-005 x (SL)^2.761	F	128	0	Seki et al. 1998	
OCS	SL	WW	Y	WW = 3.0778e-005 x (SL)^2.86	M	133	0	Seki et al. 1998	
OCS	TL	WW	Y	WW = 1.66e-005 x (TL)^2.819		188	0	Chen 2006, in Liu & Tsai 2011	
OCS	TL	WW	Y	WW = 1.405e-007 x (TL)^3.72		17	0	Stevens 1984	
ORY	UF	WW	A	WW = 3.299e-005 x (UF)^3.003		0	0		
PIL	UF	WW	A	WW = 5.94e-006 x (UF)^3.077		2913	0	Dorel 1985	
POA	UF	WW	A	WW = 1.09e-006 x (UF)^3.609		0	0		
POR	UF	WW	A	WW = 1.4823e-005 x (UF)^2.964		15	0.9437	Kohler et al. 1995 and references therein	Western North Atlantic, range WW = 19-143 kg, range UF = 106-227 cm.
POR	UF	WW	Y	WW = 2.14891e-005 x (UF)^2.924		2457	0	Ayers et al. 2004	New Zealand waters, longline bycatch in 2000-01 and 2001-02.
PTH	SL	WW	Y	WW = 0.000225 x (SL)^2.533		2165	0	Liu unpub. data, cited in Liu et al. 2006	p<0.05
PTH	SL	WW	Y	WW = 0.000159 x (SL)^2.613	F	405	0.81	Liu et al. 1999	Northwest Pacific
PTH	SL	WW	Y	WW = 0.000196 x (SL)^2.562	M	247	0.83	Liu et al. 1999	Northwest Pacific
PTH	TL	WW	Y	WW = 3.98e-005 x (TL)^2.52	M	168	0.82	Liu et al. 1999	Northwest Pacific
PTH	TL	WW	Y	WW = 4.61e-005 x (TL)^2.494	F	230	0.80	Liu et al. 1999	Northwest Pacific
PTH	TL	WW	Y	WW = 4e-007 x (TL)^3.217		9	0.976	White 2007	Indian Ocean, eastern Indonesia
RIB	UF	WW	A	WW = 2.4e-006 x (UF)^3.37		113	0		
RRU	UF	WW	A	WW = 1.35e-005 x (UF)^2.92		0	0	Kulbicki et al. 1993	
RSA	UF	WW	A	WW = 1.19e-005 x (UF)^3		0	0	Federizon 1993	
RSS	UF	WW	A	WW = 1.789e-005 x (UF)^2.973		0	0	van der Elst and Adkin 1991	
RUS	UF	WW	A	WW = 1.46e-005 x (UF)^2.948		16	0	Letourneur et al. 1998	
SBF	UF	WW	A	WW = 2.649e-005 x (UF)^2.94		0	0		
SFA	LF	WW	A	WW = 1.19e-006 x (LF)^3.2208		0	0		

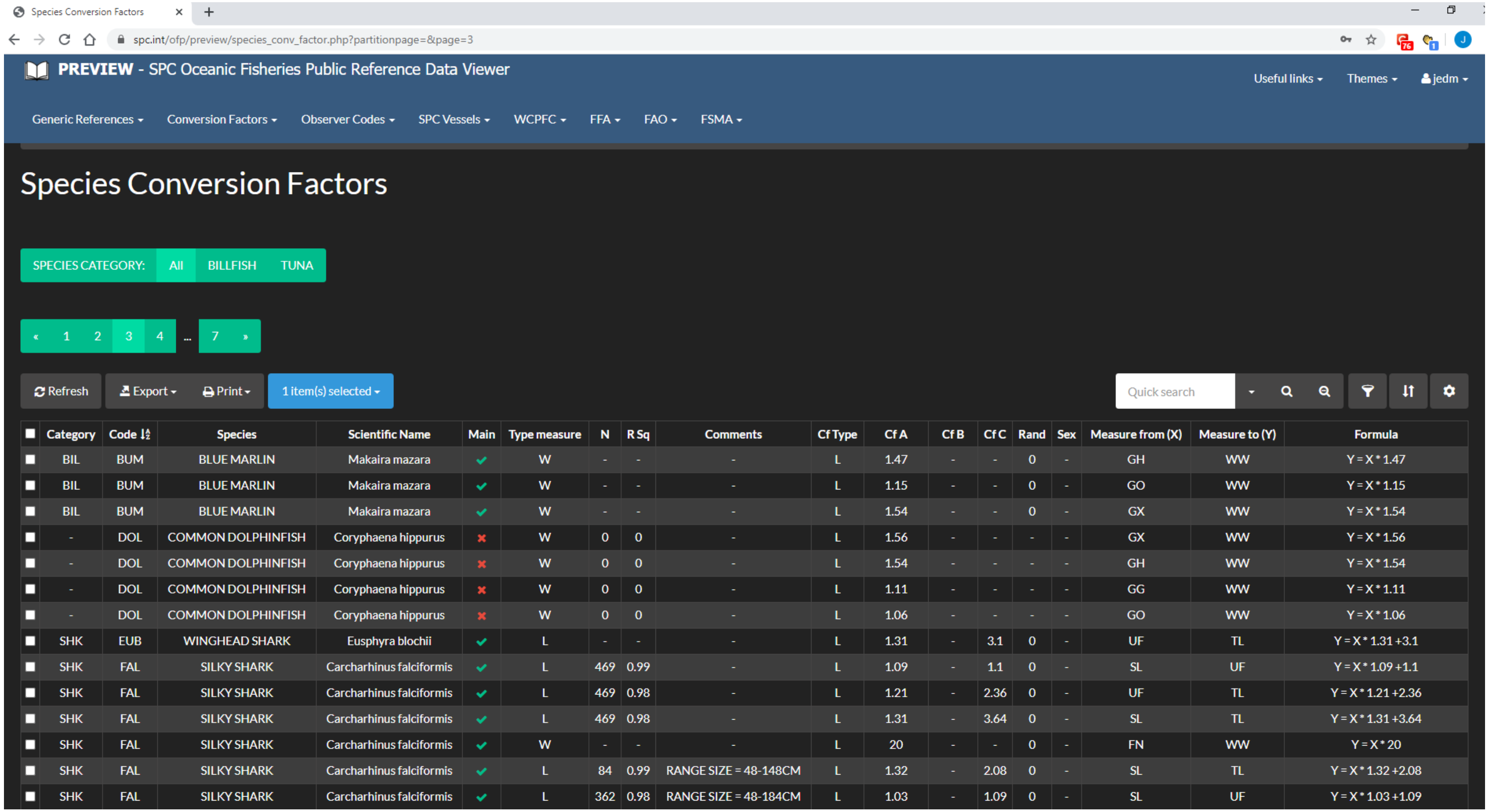
Species	Convert from	Convert to	Main	Formula	Sex	Sample information		Source	Comments
						N	R squared		
SFS	UF	WW	A	WW = 3e-007 x (UF)^3.19		40	0		
SKJ	UF	WW	A	WW = 1.3033e-005 x (UF)^3.044		0	0	Determined by data collected by SPC	
SKJ	UF	WW	TBD	WW = 8.949e-006 x (UF)^3.1999		1775	0.9322	Philippines' port sampling collections, late 2019 to early 2020.	Philippines EEZ. Small fish, range = 20-50 cm UF.
SKJ	UF	WW	TBD	WW = 0.2391 x (UF) - 9.6202		98	0.8374	Philippines' port sampling collections, late 2019 to early 2020.	Philippines EEZ. Larger fish, range = 51-66 cm UF.
SKJ	UF	WW	TBD	WW = 7.694e-006 x (UF)^3.2454		1873	0.9673	Philippines' port sampling collections, late 2019 to early 2020.	Philippines EEZ. All fish combined, range = 20-66 cm UF.
SMA	TL	WW	Y	WW = 1.1e-005 x (TL)^2.95		612	0	Joung & Hsu 2005	North Pacific, range = 80-345 cm TL
SMA	TL	WW	Y	WW = 2.8e-005 x (TL)^2.771	M	807	0	Chang & Liu 2009	North Pacific
SMA	UF	WW	Y	WW = 5.2432e-006 x (UF)^3.141		2081	0.9587	Kohler et al. 1995 and references therein	Western North Atlantic, range WW = 2-531 kg, range UF = 65-338 cm.
SMA	UF	WW	Y	WW = 2.38781e-005 x (UF)^2.847		1016	0	Source unknown, documented in Clarke et al. 2015	South Pacific
SMA	UF	WW	Y	WW = 1.103e-005 x (UF)^3.009		0	0	NOAA SWFSC (unpub data)	North Pacific
SMA	TL	WW	?	WW = 1.9e-005 x (TL)^2.847	F	1137	0	MSc thesis 2006, cited in Clarke et al. 2015	North Pacific
SMA	TL	WW	?	WW = 9.1e-006 x (TL)^2.98		612	0	Hsu 2003, cited in Clarke et al. 2015	North Pacific
SMA	SL	WW	?	WW = 4.62e-005 x (SL)^2.77	M	1147	0	Su et al. 2017	North Pacific; based on fishery-independent data from the US, longline data provided by Japan, and from measurements on longline-

Species	Convert from	Convert to	Main	Formula	Sex	Sample information		Source	Comments
						N	R squared		
									caught fish sold in a fish market in northeast Taiwan. Range = 57.2-313 cm SL.
SMA	SL	WW	?	WW = 3.4e-005 x (SL)^2.84	F	1561	0	Su et al. 2017	As above.
SNK	UF	WW	A	WW = 1.169e-005 x (UF)^2.82		0	0	Annala 1994	
SPD	UF	WW	A	WW = 2.13e-006 x (UF)^3.287		0	0	Kulbicki et al. 1993	
SPK	TL	WW	Y	WW = 1.23e-005 x (TL)^3.24		117	0.991	Stevens and Lyle 1989	Northern Australian waters
SPL	TL	WW	Y	WW = 2.82e-006 x (TL)^3.129	F	0	0	Chen et al. 1990	
SPL	TL	WW	Y	WW = 1.35e-006 x (TL)^3.252	M	0	0	Chen et al. 1990	
SPL	TL	WW	Y	WW = 3.99e-005 x (TL)^3.03		252	0.985	Stevens & Lyle 1989	Northern Australian waters
SPL	TL	WW	Y	WW = 2e-005 x (TL)^2.8	F	0	0	Anislado-Tolentino & Robinson-Mendoza 2001	
SPL	TL	WW	Y	WW = 1.05e-005 x (TL)^2.87	M	0	0	Anislado-Tolentino & Robinson-Mendoza 2001	
SPR	UF	WW	A	WW = 2.11e-006 x (UF)^3.475		0	0	Coull et al. 1989	
SPZ	TL	WW	Y	WW = 5.27e-007 x (TL)^3.42		46	0.972	Stevens 1984	Eastern Australian waters - New South Wales; records taken from sport fishing catches between 1979 and 1982. Range TL = 81-312 cm.
SRH	UF	WW	A	WW = 9.49e-006 x (UF)^3		868	0		
SSP	LF	WW	A	WW = 4.62e-006 x (LF)^3		0	0		
SWO	LF	WW	Y	WW = 4.797e-008 x (LF)^3.1921		0	0	Campbell 2011	Length code: LJFL
SWO	LF	WW	A	WW = 5.47e-006 x (LF)^3.17439		1965	0.9395	Regional Observer data	
TIG	UF	WW	A	WW = 2.5281e-006 x (UF)^3.2603		187	0.9550	Kohler et al. 1995 and references therein	Western North Atlantic, range WW = 5-499 kg, range

Species	Convert from	Convert to	Main	Formula	Sex	Sample information N	Sample information R squared	Source	Comments
									UF = 92-339 cm.
TRB	TL	WW	A	WW = 1.44e-006 x (TL)^3.382		20	0	Letourneur et al. 1998	
WAH	UF	WW	A	WW = 0.0008 x (UF)^1.9763		0	0		
WHA	UF	WW	A	WW = 2.419e-005 x (UF)^2.867		0	0	Annala 1994	
WSH	UF	WW	A	WW = 7.5763e-006 x (UF)^3.0848		125	0.9802	Kohler et al. 1995 and references therein	Western North Atlantic, range WW = 12-1554 kg, range UF = 112-493 cm.
YFT	UF	WW	Y	WW = 1.167e-006 x (UF)^3.0806		0	0	Campbell 2011	
YFT	UF	WW	A	WW = 1.908e-005 x (UF)^2.97762		329	0.9296	Regional Observer data	
YFT	UF	WW	TBD	WW = 1.974e-005 x (UF)^2.9958		969	0.9819	Philippines' port sampling collections, late 2019 to early 2020.	Philippines EEZ. Small fish, range = 17-87.5 cm UF.
YFT	UF	WW	TBD	WW = 3.516e-005 x (UF)^2.8787		496	0.8487	Philippines' port sampling collections, late 2019 to early 2020.	Philippines EEZ. Larger fish, range = 100-162 cm UF.
YFT	UF	WW	TBD	WW = 1.958e-005 x (UF)^2.9984		1465	0.9978	Philippines' port sampling collections, late 2019 to early 2020.	Philippines EEZ. All fish combined, range = 17-162 cm UF.
YTC	UF	WW	A	WW = 6.39e-005 x (UF)^2.61		0	0	Torres 1991	
YTL	UF	WW	A	WW = 6.35e-006 x (UF)^3.17		88	0	Pakoa 1998	

Table A4. Codes for length and weight measurements

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 : caudal peduncle)
	PD	Snout (or nose) to anterior base of 1st dorsal (shark : pre first dorsal length)
	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 (or snout or nose) to anterior base of 2nd dorsal (shark : pre second dorsal length)
	SL	Tip of snout to (posterior) end of caudal peduncle (also referred to as precaudal pit)
	TH	Body Thickness (Width)
	TL	tip of snout to end of tail (shark: tip of snout to posterior end of dorsal caudal lobe in natural position)
	TW	total width (tip of wings - rays)
	UF	upper jaw to fork in tail (sharks : tip of snout to caudal fork)
	US	Upper jaw to 2nd dorsal fin (redundant with "SD")
	BP	Measurement of the flank between the 5th gill slit and the origin of the 1st 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
	WF	Whole weight (frozen)
	WW	Whole weight (fresh)



Category	Code	Species	Scientific Name	Main	Type measure	N	R Sq	Comments	Cf Type	Cf A	Cf B	Cf C	Rand	Sex	Measure from (X)	Measure to (Y)	Formula
BIL	BUM	BLUE MARLIN	Makaira mazara	✓	W	-	-	-	L	1.47	-	-	0	-	GH	WW	Y = X * 1.47
BIL	BUM	BLUE MARLIN	Makaira mazara	✓	W	-	-	-	L	1.15	-	-	0	-	GO	WW	Y = X * 1.15
BIL	BUM	BLUE MARLIN	Makaira mazara	✓	W	-	-	-	L	1.54	-	-	0	-	GX	WW	Y = X * 1.54
-	DOL	COMMON DOLPHINFISH	Coryphaena hippurus	✗	W	0	0	-	L	1.56	-	-	-	-	GX	WW	Y = X * 1.56
-	DOL	COMMON DOLPHINFISH	Coryphaena hippurus	✗	W	0	0	-	L	1.54	-	-	-	-	GH	WW	Y = X * 1.54
-	DOL	COMMON DOLPHINFISH	Coryphaena hippurus	✗	W	0	0	-	L	1.11	-	-	-	-	GG	WW	Y = X * 1.11
-	DOL	COMMON DOLPHINFISH	Coryphaena hippurus	✗	W	0	0	-	L	1.06	-	-	-	-	GO	WW	Y = X * 1.06
SHK	EUB	WINGHEAD SHARK	Eusphyra blochii	✓	L	-	-	-	L	1.31	-	3.1	0	-	UF	TL	Y = X * 1.31 +3.1
SHK	FAL	SILKY SHARK	Carcharhinus falciformis	✓	L	469	0.99	-	L	1.09	-	1.1	0	-	SL	UF	Y = X * 1.09 +1.1
SHK	FAL	SILKY SHARK	Carcharhinus falciformis	✓	L	469	0.98	-	L	1.21	-	2.36	0	-	UF	TL	Y = X * 1.21 +2.36
SHK	FAL	SILKY SHARK	Carcharhinus falciformis	✓	L	469	0.98	-	L	1.31	-	3.64	0	-	SL	TL	Y = X * 1.31 +3.64
SHK	FAL	SILKY SHARK	Carcharhinus falciformis	✓	W	-	-	-	L	20	-	-	0	-	FN	WW	Y = X * 20
SHK	FAL	SILKY SHARK	Carcharhinus falciformis	✓	L	84	0.99	RANGE SIZE = 48-148CM	L	1.32	-	2.08	0	-	SL	TL	Y = X * 1.32 +2.08
SHK	FAL	SILKY SHARK	Carcharhinus falciformis	✓	L	362	0.98	RANGE SIZE = 48-184CM	L	1.03	-	1.09	0	-	SL	UF	Y = X * 1.03 +1.09

Figure A1. Screen shot of the web-based tool used to access the CF database (shown in PREVIEW mode).

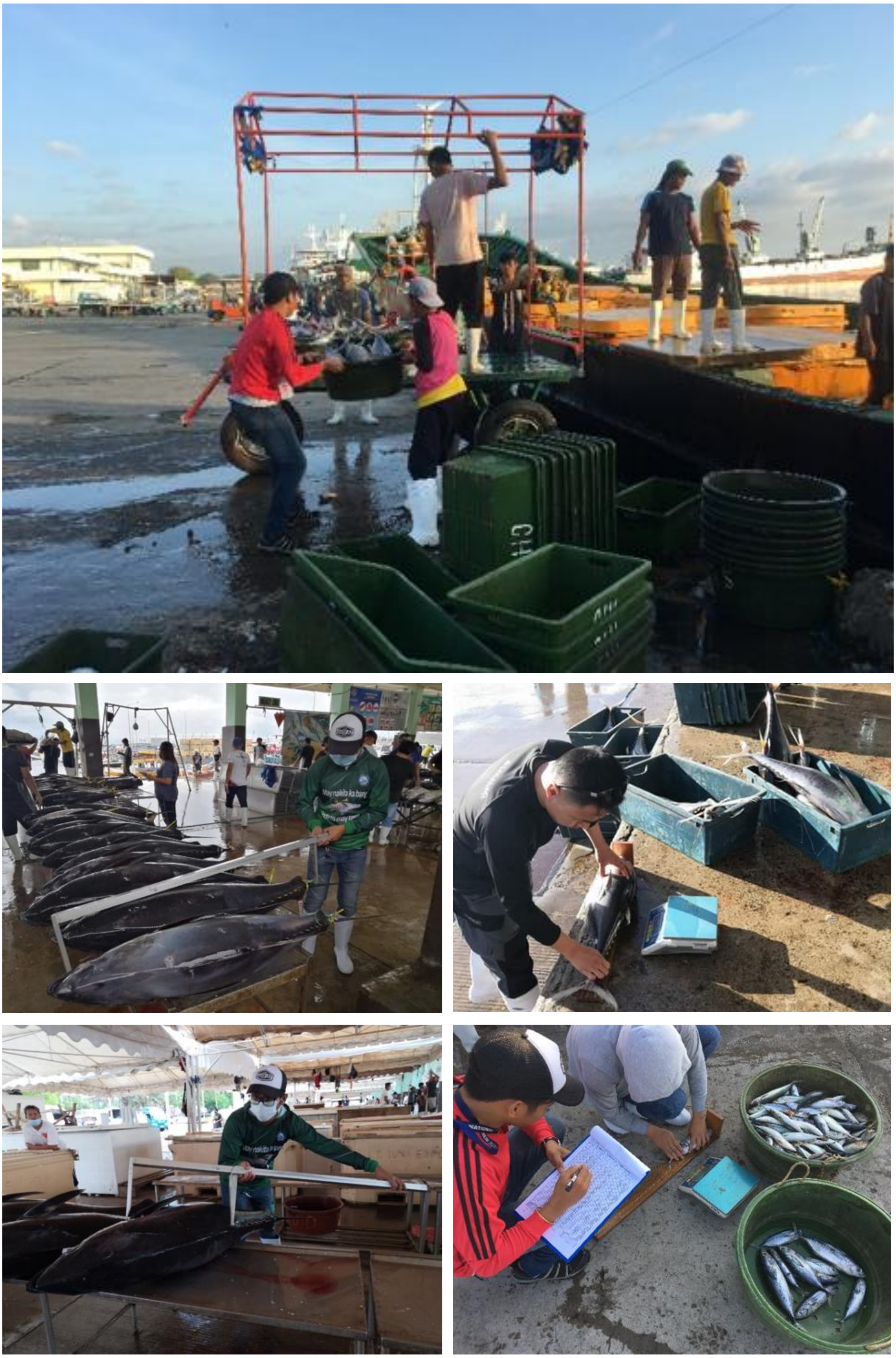


Figure A2. Port sampling and measurement of adult and juvenile (bottom-right panel) tunas captured in Philippines' fisheries (SFFAII, Philippines, 2020). Images courtesy of C. Sanchez.