

## A fruitful collaboration continues in the Philippines



A whole white tagged fish retrieved at the Soccsargen Federation of Fishing and Allied Industries, Inc. for biological sample collection. (image: © Caroline Sanchez, SPC)

*Over the past decade, the Pacific Community (SPC) has worked closely with the Philippines' Bureau of Fisheries and Aquatic Resources (BFAR) and established a close collaborative arrangement with Soccsargen Federation of Fishing and Allied Industries, Inc. (SFFAII) on port-based biological sampling and tag recovery in General Santos, Philippines. A key aspect of this collaboration involves obtaining high-quality data on lengths and weights from tunas captured by the Philippines' industrial and artisanal fisheries, and deriving from these data, accurate conversion factors that relate length to weight. Reliable conversion factors (CFs) underpin the models SPC uses to assess the status of tuna stocks across the western and central Pacific Ocean (WCPO), and the work programme in the Philippines is contributing substantially in this regard.*

Notably, during late 2019 and early 2020, port sampling efforts involving SPC, SFFAII and BFAR staff working together in General Santos led to the collection of length-weight data for very small (i.e. < 30 cm fork length) yellowfin, bigeye and skipjack tunas captured by local purse-seine and ring net fisheries. This is the first time that length-weight measurements have been systematically recorded for such a large sample of juvenile tunas; measurements that have allowed SPC scientists to develop new CFs specific to juveniles for each species under Western and Central Pacific Fisheries Commission (WCPFC) Project 90. Under the same partnership, length-weight information is being collected for large (i.e. > 100 cm fork length) yellowfin and bigeye tunas captured in the Philippines' handline fishery.

In addition, SPC is working with SFFAII on the logistics of collecting important "gilled and gutted" and whole weight CF data from these same handline-caught tunas. Such data are difficult to obtain elsewhere throughout the WCPO due to the nature of the fishing gear used, the at-sea processing systems in place, and the requirements of the markets that support these fisheries.

As a direct result of the Philippines' port sampling work, new CFs for length-weight have been derived for skipjack, yellowfin and bigeye, with a series of CFs relating various key measures of fish length (e.g. fork length, total length, pectoral fin to second dorsal fin length) derived for larger yellowfin and bigeye. These CFs have now been added to

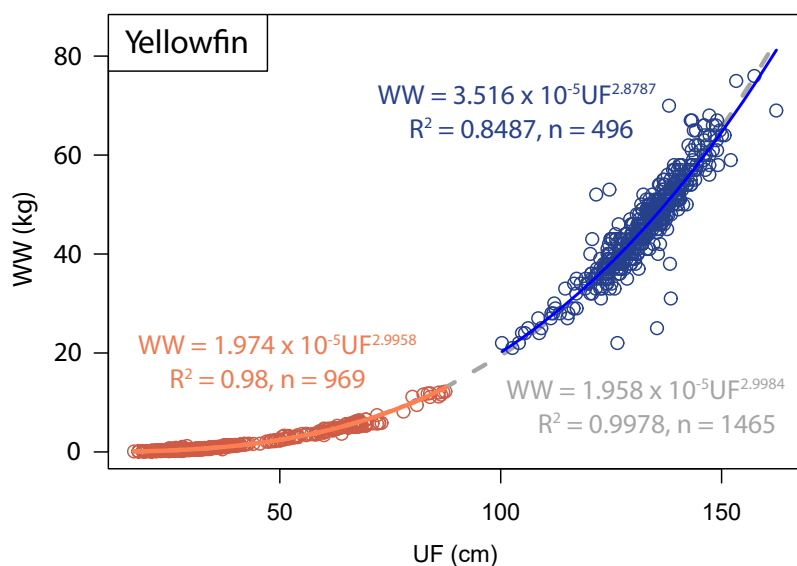


Figure 1. New length-weight conversion factors for yellowfin tuna sampled from the Philippines' ring net, purse-seine and handline fisheries in late 2019 and early 2020. Orange circles are small fish in their 1<sup>st</sup> or 2<sup>nd</sup> year of life; blue circles are larger individuals. Curves, lines and equations relating fork length (UF) and whole weight (WW) are plotted for small and large fish separately, and for all fish combined (grey dashed lines and text). n = sample size; R<sup>2</sup> = describes the strength of the relationship between length and weight.

a publicly available database developed and maintained by SPC,<sup>1</sup> an extract of which is presented in Table 1. This database serves as an evolving repository of CFs for both target and bycatch species captured by commercial fisheries across the WCPO, and is accessed regularly by SPC and external scientists for biological studies and stock assessment inputs.

Despite ongoing COVID-19 restrictions, in-port collection of length-weight data continues in General Santos, with all sampling targets and project milestones achieved to date. A new contract has recently been signed for extension of this important inter-agency collaboration, which also includes work components on tuna tag recovery and general biological sampling.

As annual tuna tagging campaigns continue under the auspices of the Pacific Tuna Tagging Programme (PTTP), the collection of reliable information on recovered tags helps optimise the use of these data in stock assessments and tuna fisheries management measures. The efforts of SFFAI and BFAR personnel onboard vessels, both at the market and at the canneries to locate and return all tags with complete information, is critical to the success of this work. Equally important in this context is SFFAI's ongoing engagement with the fishing industry and management agencies in publicising the PTTP and promoting tag recovery activities. The location of SFFAI's office within the General Santos Fish Port Complex further encourages stevedores, local fishermen, and crew from foreign vessels unloading in General

<sup>1</sup> Accessible here with a login: [www.spc.int/ofp/preview/login.php](http://www.spc.int/ofp/preview/login.php)



Collection of biological samples from juvenile yellowfin (left), bigeye (middle), and skipjack tuna (right) and (< 20 cm fork length) captured by ring net in Philippines' waters. The yellow circle highlights the sagittal otoliths that measure < 4 mm in length, taken from a yellowfin of 15.5 cm fork length. (images: © Caroline Sanchez, SPC)



Table 1. Examples of provisional length-weight conversion factors drawn from the conversion factor database. Species codes are as follows. ABU = sergeant-major (*Abudefduf saxatilis*); AGS = spotted sardinella (*Amblygaster sirm*); ALB = albacore tuna (*Thunnus alalunga*); ALN = scribbled leatherjacket filefish (*Aluterus scriptus*); ALS = silvertip shark (*Carcharhinus albimarginatus*); ALV = thresher shark (*Alopias vulpinus*). Formula, describes the modelled relationship between length (UF = fork length; SL = standard length; TL = total length) and whole weight (WW) for a given species. n = sample size. R2 = describes the strength of the relationship between length and weight. Source, is the data source used to fit the relationship. Note that there can be several CFs per species, reflecting different datasets used, and times and regions of data collection. Note also that data entry and quality checking is ongoing.

| Species | Convert from (cm) | Convert to (kg) | Formula                                      | Sample information |                | Source                                    | Comments  |
|---------|-------------------|-----------------|--|--------------------|----------------|---|---|
|         |                   |                 |  | n                  | R <sup>2</sup> |   |   |
| ABU     | UF                | WW              | $WW = 1.64 \times 10^{-5} \times UF^{3.142}$ | 35                 | 0              | Bohnsack and Harper 1988                  |   |
| AGS     | UF                | WW              | $WW = 1.18 \times 10^{-4} \times UF^{2.075}$ |                    |                | Pauly et al. 1996                         |   |
| ALB     | UF                | WW              | $WW = 1.43 \times 10^{-5} \times UF^{3.100}$ |                    |                | Williams et al. 2012                      |   |
| ALB     | UF                | WW              | $WW = 2.97 \times 10^{-5} \times UF^{2.901}$ | 8891               | 0.89           | Fisheries observer data                   |   |
| ALN     | UF                | WW              | $WW = 2.19 \times 10^{-6} \times UF^{3.000}$ | 71                 |                | Bohnsack and Harper 1988                  |   |
| ALS     | SL                | WW              | $WW = 3.04 \times 10^{-6} \times SL^{3.243}$ |                    |                | Kulbicki et al. 1993                      |   |
| ALV     | TL                | WW              | $WW = 1.87 \times 10^{-4} \times TL^{2.519}$ |                    |                | Kohler et al. 1995 and references therein | Western North Atlantic  |
| ALV     | UF                | WW              | $WW = 1.88 \times 10^{-4} \times UF^{2.519}$ | 88                 | 0.88           | Kohler et al. 1995 and references therein | Western North Atlantic, range WW = 54–211 kg, range UF = 154–262 cm |



Port sampling in General Santos, Philippines, during early 2020. Activities focused around obtaining accurate tuna length and weight measurements under the collaborative partnership between Socskargen Federation of Fishing and Allied Industries, Inc., the Bureau of Fisheries and Aquatic Resources and the Pacific Community. (images: © SFFAI)

Santos to report their tags and to bring whole tagged fish to the SFFAII office so that biological samples can be collected. To date, 270 tags have been recovered in this manner, 11% of these left within the whole fish – a scenario that maximises scientific benefits for tag-finder efforts.

With regard to general biological sampling, data derived from otoliths, muscle tissue, dorsal spines, gonads, stomachs and livers collected by port samplers in General Santos are needed to support studies on growth rates, stock structure, reproductive biology, movements and diets of tuna, bill-fishes, mahi-mahi and wahoo across the region. SPC uses these data in combination with the aforementioned length-weight data, tagging data, observer data and logsheet data to conduct stock assessments. SFFAII has played a key role in ensuring that the sampling programme continues, even under current challenges presented by COVID-19, and that the samples themselves and metadata associated with them are complete and of high quality.

The success of the partnership between SPC, SFFAII and BFAR is based on the strong ties that have been built up among the organisations over many years. It is a truly collaborative effort, and its continuation is essential to delivering the best scientific advice for the management of the region's important tuna resources.

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