

# Using COVID-19 travel bans to precipitate a digital transition in coastal fisheries science

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## Introduction

Collecting scientifically robust data to understand and sustainably manage coastal fisheries across the Pacific requires sustainable and well-designed scientific monitoring programmes – an outcome that has proven to be a difficult objective, given the limited capacity of many coastal fisheries agencies across the Pacific Islands region.

Severe COVID-19-related economic downturns and subsequent job losses have caused coastal communities across the Pacific to rely more heavily on food and income derived from the sea, which in turn has increased the already substantial pressures on coastal fisheries resources (Bennett et al. 2020; Steenbergen et al. 2020; Wale and LMMA Network 2020; Davila et al. 2021). Coastal fisheries agencies, already struggling to obtain data and make effective management decisions in a timely manner pre-COVID, are now facing an even greater crisis of information deficiency.

The complete cessation of travel due to COVID, which forced an almost total shift to online delivery of information between the Pacific Community (SPC) and its member countries, has in turn created the conditions for coastal fisheries departments to embrace the efficiencies of using e-data systems to collect, store, analyse and report on the status of their fisheries.

Accordingly, staff from the Coastal Fisheries Science and Data units within SPC's Fisheries, Aquaculture and Marine Ecosystems (FAME) Division have invested significant time and resources to develop an e-data system that has evolved based on feedback from regional meetings and workshops. Such a system will provide much improved efficiencies and facilitate more timely and effective management of already strained fisheries.

SPC has already begun training and implementing the e-data system across multiple countries, and will seek to provide this opportunity to all interested member countries at a mutually agreeable time. It is envisaged that successful uptake of the e-data system across the broader region will:

- 1) ensure delivery of capacity development and technical assistance that will provide specific capability for Pacific Island coastal fisheries agencies to assess the impacts of the COVID-19 pandemic;
- 2) help SPC's member countries transition away from human resource-heavy, inefficient conventional data collection methods to more efficient e-data collection methods; and
- 3) provide a regionally consistent approach to scientific data collection on coastal fisheries, which will enable local, national and regional approaches to dealing with declining coastal fisheries resources.

## Implementation and results

The core application of the e-data collection framework is called "Ikasavea", an Android-based application for both on-line and offline use, which can be installed on phones or tablets.<sup>3</sup> Data collected using the suite of e-tools that Ikasavea provides was entered directly into the app in the field, which has streamlined efficiencies across monitoring programme data chains.

FAME's Coastal Science and Database teams have provided training and technical assistance to participating SPC member countries to help them transition to e-data systems and gain significant improvements in their coastal fisheries landing (creel) and market monitoring programmes. Training in this system has so far been undertaken with Fiji, Kiribati, New Caledonia and Samoa, with invitations to be extended to all interested members over the next 12 months.

Together, these countries provide a contrasting range of coastal fisheries work with which to demonstrate the effectiveness and broad applicability of our e-data system. For example, landing (creel) surveys carried out across Abemama and Onotoa atolls in Kiribati predominantly capture subsistence fisheries, whereas markets across Fiji, particularly in Suva, are driven largely by the commercial coastal fisheries sector and products purchased for household consumption, and Samoa has a combination of the two (Fig. 1).

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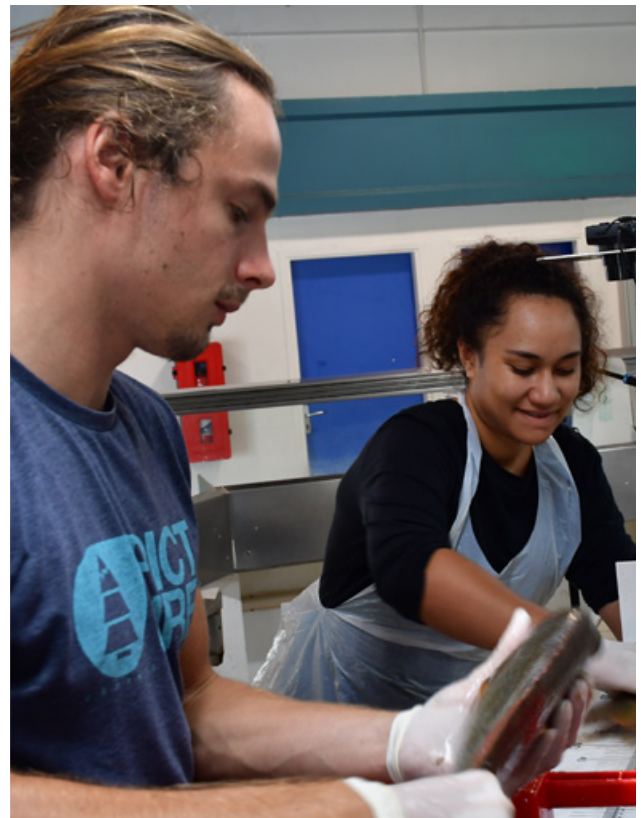


Figure 1. Samoa, SPC, and Wallis and Futuna fisheries technical officers measuring and weighing fish and invertebrates sold at markets.

Feedback and evidence from the transitioning process in Samoa and elsewhere has seen improvements in the actual designs of their survey programmes and time savings through efficiencies in recording data using the Ikasavea application, instant transfer of these data to cloud-based storage, data consistency between surveys and surveyors, automated species identification, and rapid quality control of collected data.

Data collection programmes using an integrated electronic system enables managers to carry out quality control of collected data in near real-time and, as these programmes mature, key metrics to assess stocks can be generated and summarised with push-button efficiencies, enabling prompt reporting of trends. For example, in Samoa, data entered using the Ikasavea app was checked in near real-time, with follow-up training and discussions provided by fisheries managers to data collectors so that they could rectify errors quickly (Fig. 2).

So far biological indicators have been collected for various coastal fisheries species (Fig. 3) and the resulting information will be used to inform managers of for example, the percentage below minimum legal length or average price for these species (Table 1). Efficiencies driven by the e-data system in collecting the foundational metrics of fisheries data (e.g. catch species, length and abundance) will enable easy integration into higher-level data analysis and assessments so that models can be developed that will reflect how populations of key fisheries species are responding to fishing pressures, climate change and other local disturbances. Models based on length measurements taken from catches include, for example, proportion above length at maturity, length-based spawning potential ratio, length-based integrated mixed effects, and length-based Bayesian (for further reading and review of length-based metrics in fisheries see Chong et al. 2020). This capability is currently lacking for most coastal fisheries species across the region.

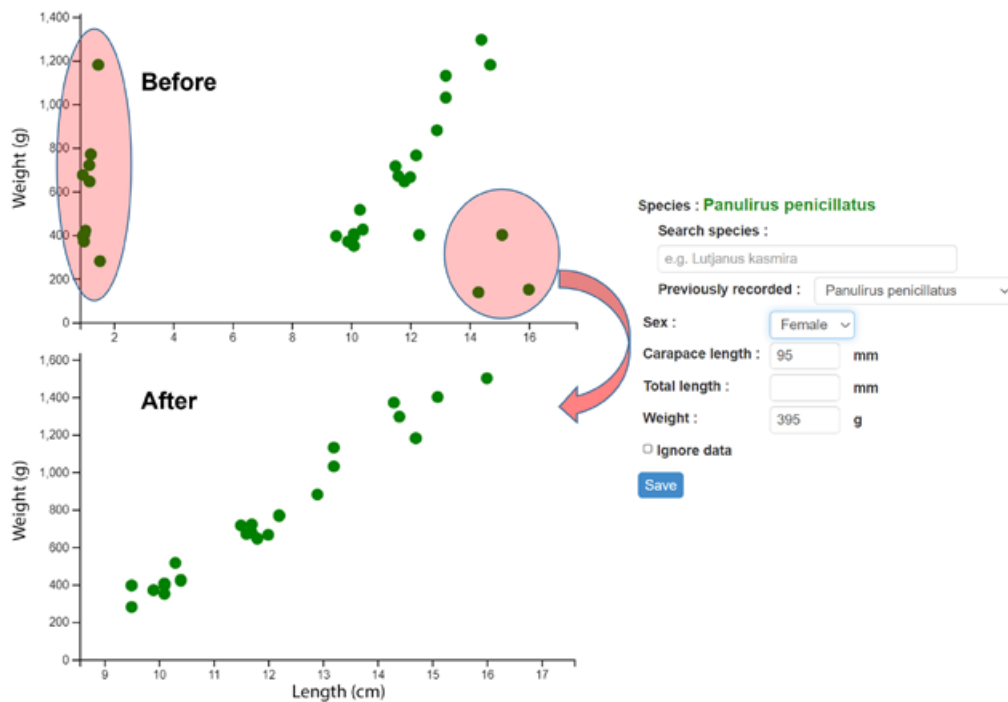


Figure 2. An example output showing before (top) and after (bottom) errors that are removed by using the data point description window (right). Red shading indicates that data were entered incorrectly.

Table 1. Example data showing proportion of catch below minimum legal size (based on length at maturity) collected on several coastal fisheries finfish species from various countries across the Pacific.

Species	Minimum legal size (cm)	Percentage below legal size
<i>Naso unicornis</i>	30	14.20%
<i>Naso hexacanthus</i>	30	3.30%
<i>Naso brevirostris</i>	30	35.50%



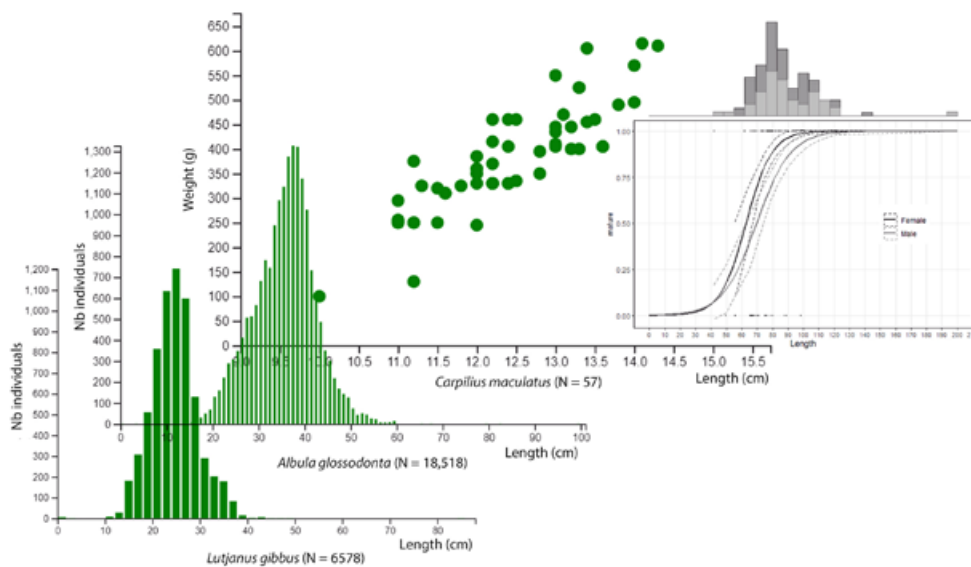


Figure 3. Example length frequency, length weight relationships, and length at maturity models for finfish and invertebrate species from various markets and landing sites across the Pacific.

Collecting scientifically robust data using electronic-based systems not only enables near real-time access to raw and summarised data, but also allows for rapid publication of graphics, plots and figures, thereby allowing managers to quickly interpret results and provide key information to policy-makers so that decisions can be more adaptive to changing stock status and, importantly, to the needs of communities that utilise these resources.

## Further work

Delivering an e-data platform to Pacific Island countries and territories that is relatively simple to use and requires minimal extra investment by coastal fisheries agencies will further enhance upskilling and capacity development in fisheries science and management. We anticipate the next steps in assisting member countries with transitioning their coastal fisheries monitoring programmes will include:

- ongoing training and support for uptake and effective use of e-data systems;
- integration of legacy (existing and previous) datasets into the e-data system; and
- ongoing work on reporting templates for delivering information to managers.

Streamlined efficiencies in data collection programmes within countries will free up much needed time and enable fisheries officers to focus on other areas of fisheries management – for example, education, compliance, and development of dedicated programmes to estimate the economic contribution of coastal fisheries to overall gross domestic product – all of which are currently limited.

## References

- Bennett N.J., Finkbeiner E.M., Ban N.C., Belhabib D., Jupiter S.D., Kittinger J.N., Mangubhai S., Scholtens J., Gill D. and Christie P. 2020. The COVID-19 pandemic, small-scale fisheries and coastal fishing communities. *Coastal Management* 48:336–347.
- Chong L., Mildenerberger T.K., Rudd M.B., Taylor M.H., Cope J.M., Branch T.A., Wolff M. and Stähler M. 2020. Performance evaluation of data-limited, length-based stock assessment methods. *ICES Journal of Marine Science* 77:97–108 (Available at <https://doi.org/10.1093/icesjms/fsz212>)
- Davila F., Crimp S. and Wilkes B. 2021. A systemic assessment of COVID-19 impacts on Pacific Islands’ food systems. *Human Ecology Review* 26:5–17.
- Steenbergen D.J., Neihapi P.T., Koran D., Sami A., Malverus V., Ephraim R. and Andrew N. 2020. COVID-19 restrictions amidst cyclones and volcanoes: A rapid assessment of early impacts on livelihoods and food security in coastal communities in Vanuatu. *Marine Policy* 121:104199.
- Wale J. and LMMA Network. 2020. COVID-19 impacts on fishing and coastal communities—Update #2: Russell Islands, Solomon Islands. Locally-Managed Marine Area Network. (Available at [lmmnetwork.org/wp-content/uploads/2020/08/LMMA-Network-and-Wale.-Covid-Update-2-Russell-Islands.-30.05.2020.pdf](https://lmmnetwork.org/wp-content/uploads/2020/08/LMMA-Network-and-Wale.-Covid-Update-2-Russell-Islands.-30.05.2020.pdf))