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| Title:          | Suite of tools for coastal fisheries and aquaculture: access, usage and support |
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Summary/short description/key points:

Various online and offline database modules have been developed by SPC FAME Coastal Fisheries and Aquaculture Programme (CFAP) and the Oceanic Fisheries Programme (OFP) and are applicable for a range of coastal data needs. This paper outlines CFAP supported survey tools, and their purposes, the tools available for data entry and analysis, as well as other supported databases, such as REEFLEX. It also provides guidance on when they could be used and on how to obtain training and support.

Recommendations and Outcomes:

We encourage members to:

- **Note** the various CFAP and OFP electronic data collection tools and databases
- **Share** experiences and progress in using these tools in current member work programmes
- **Review** current science and management programmes and how these e-data tools can assist standardising and storing data collection
- **Identify** Key fisheries science and management reporting areas and how these tools can assist

## Suite of tools for coastal fisheries and aquaculture: access, usage, and support

### *Data collection with a purpose*

1. While there is consensus that more data is needed for coastal fisheries and aquaculture development, conservation and management, there are many reasons for collecting data and the methodologies must be tuned to what you are trying to assess, monitor or manage.
2. In the ideal world, we would know at any point in time the available stock and recruitment status of species for a given area, every fish or invertebrate caught would be accounted for and associated with fishing effort and catch use. We would have socio-economic information about fishers, related households, and marine product consumers, as well as a full picture of the community, compliance to regulations, monetary and non-monetary value of fisheries, contribution to gross domestic product (GDP), trade and value chain information.
3. For aquaculture we would be able to gather data for every farm on growth and mortality, feeds inputs and environmental factors at any stage of production from spawning to harvest, but also have information on costs and commercial circuits, gender and socio-economic data for people involved in the farm, production sale, and quantity kept for personal consumption. We would also acquire data for all activities related to aquaculture such as hatcheries, production and price of feed, pond equipment maintenance, and so on.
4. Unfortunately obtaining exhaustive information to answer all the necessary questions at any time would require a huge effort including an army of surveyors and sustained (and trusted) self-reporting e-data from the marine resource users and general population. With the limited time and workforce available, we need to prioritise the questions we want to answer and select the best methodology that can provide the information sought.
5. Is the focus on the marine resources, or on the people depending on the resources? Would periodical snapshots provide enough information to show the trends? Is reporting needed only on data collected, or also on monitoring/survey effort (for example the number of inspections conducted)? Are there other potential uses of the dataset with minimal additional effort (for example, to conduct gender and social inclusion analyses).
6. We need to limit the survey scope in space and time depending on the staff and financial resources available, but also ensure that in doing so we will get both enough and representative data to conduct the analysis within the context of the chosen scope. We might also need additional side data for extrapolation purpose (for example, to estimate total yearly production or stock, raise figures for a larger area or population, etc.).
7. The various tools developed by FAME CFAP and OFP are designed for a range of data needs which are detailed in, along with their usage. Yet keep in mind tools are not a panacea and alone will not solve a lack of usable data from poorly designed surveys in coastal fisheries (similarly having a hammer; is useful but not sufficient to build a house). Once the questions for the survey are articulated you would need to choose the type of survey and sampling design, train surveyors, implement the survey and extract and analyse data to answer the survey questions, which usually are tailored to specific fisheries management objectives (e.g., maintaining a proportion of the population above size-at-maturity).

*Coastal data collection tools*

8. FAME provides data entry and reporting tool for coastal fisheries-related data through two web sites: [Coastal Fisheries Applications<sup>1</sup>](#) (CFA) and [TUFMAN 2<sup>2</sup>](#) in tandem with the mobile applications Ikasavea and TAILS for offline data entry. Access to these tools is restricted to authorised users and is managed by type of survey, user and authority for access to data. In addition, the [FAME data policy<sup>3</sup>](#) provides the overarching data governance for the handling of data, ownership, security, data sharing, integration, and dissemination.
  
9. Field surveys in water or on land can be fisheries independent and intend to provide a direct assessment of status of resources, such as underwater counts of fishes and invertebrates, benthic photo quadrats or coconut crab surveys. Underwater surveys are generally snapshot surveys used for specific invertebrate fisheries (trochus, sea cucumber, green snail, giant clam), or for a rapid assessment of indicator fish species. These types of surveys are served by the CFA online Field-surveys website which replaces the legacy Reef Fisheries Integrated Database (RFID) that was used in the past for underwater surveys.

| Module                        | Platform | Description   |
|-------------------------------|----------|---|
| Seagrass health surveys       | CFA      | Survey of seagrass species cover and sediments within 50 cm quadrats along a transect and mapping points. This type of survey is used as a baseline for mapping of seagrass areas and to assess damage after a cyclone or tsunami.  |
| Mangrove health surveys       | CFA      | Survey of mangrove species cover and health within 5 m quadrats around station point. This type of survey is used as a baseline for mangrove mapping and to assess health, damage, or recovery after a disturbance.   |
| Benthic photo quadrat surveys | CFA      | Survey conducted through 50 cm photo quadrats of benthic substrate (corals, seagrass, sediments) along a transect. These photos are usually analysed through point counts, but FAME is currently working on automatizing the analysis of these photos. Benthic surveys are conducted for habitat status in association with other resource surveys (fishes or invertebrates). |

<sup>1</sup> Coastal Fisheries Applications <https://www.spc.int/CoastalFisheries>

<sup>2</sup> TUFMAN 2 <https://www.spc.int/ofp/tufman2>

<sup>3</sup> FAME Data Policy: Governance of fisheries, aquaculture and marine ecosystems data provided to SPC by its members <https://purl.org/spc/digilib/doc/o4wf6>

| Module                          | Platform | Description  |
|---------------------------------|----------|--|
| Fish underwater visual census   | CFA      | Underwater count and estimated size of selected fish species along a 50 m belt transect. Underwater visual census is conducted to estimate density and biomass of target or indicator species. It is used to determine reef fish health status for long term monitoring or after a disturbance.  |
| Invertebrate underwater surveys | CFA      | Underwater count of selected invertebrate species along reef and soft benthos transects <sup>4</sup> . These surveys are often conducted to determine the health status of invertebrate fisheries (sea cucumbers, giant clams, trochus) and when possible (habitat map available and enough replicates) estimate a stock and total allowable catch (TAC) before the fishery is opened. |
| Coconut crab surveys            | CFA      | Bait survey conducted in the coconut crab habitat (primary and secondary forest 0-2 km from shore). These surveys are conducted to determine the health status and estimate stock of coconut crab in relation with a management plan.  |
| Mangrove crab surveys           |          | Bait survey conducted to determine health status of mangrove crab population and to test the selectivity of traps. A module will be added to the CFA web site.   |

10. Fisheries dependent surveys provide an assessment of fisheries production and landed species through catch quantity and sizes, and fishing effort when available. Data can be collected by surveyors at sale or landing points, recorded by fishers (using logbooks) or provided by community members. Each module has a statistical part with predefined queries and graphs that can be used at any time for reporting purpose.

| Module         | Platform     | Description  |
|----------------|--------------|--|
| Market surveys | Ikasavea/CFA | Market surveys provide information on catch sold at the market or at any selling point (shop, roadside) and intended to provide information on sellers, catch composition, sizes, and value. Fishing method and fishing ground information might be obtained when the vendor is the fisher. Market surveys are used to monitor evolution of sizes and price trends. Measurements and quantities can be recorded as |

<sup>4</sup> Pakoa K., Friedman K., Moore B., Tardy E., Bertram I. 2014. Assessing Tropical Marine Invertebrates: a manual for Pacific island resource managers. Noumea, New Caledonia: Secretariat of the Pacific Community. 118 p. <https://purl.org/spc/digilib/doc/pfi5w>

| Module                | Platform                          | Description   |
|-----------------------|-----------------------------------|---|
|                       |                                   | individual measurements and bundles using Ikasavea or through pictures that are uploaded and analysed automatically at later time.  |
| Landing/creel surveys | Ikasavea/CFA<br>TAILS/TUFMAN<br>2 | <p>Landing surveys provide information on fishers, fishing habits and catch associated with fishing events (fishing location and gear). Measurements and quantities can be recorded as individual measurements and bundles using Ikasavea or through pictures that are uploaded on CFA and analysed automatically at later time similarly to market surveys.</p> <p>TAILS/TUFMAN 2 is an alternative solution developed by OFP for landing data collection and information paper 4 provides more insight on compatibility, commonalities, and differences of the two tools.</p> |
| Fisher logbooks       | CFA                               | Fisher logbooks are filled by registered fishers and provide information on quantities by commodity and fishing effort, as well as some operational data such as fuel consumption/purchase and sales (returning logbooks is usually a condition to get fuel subsidies). Reports can be individualised for yearly feedback to registered fishers.  |
| Community surveys     | Ikasavea/CFA                      | <p>This module is developed as part of the ANCORS Pathways 2 project with the methodology proposed in the <a href="#">Catch monitoring manual for CBFM<sup>5</sup></a> in the Pacific Region.</p> <p>Community catch surveys use a simplified landing form and pictures of catch on a scaled and standardised mat. This type of survey provides information catch composition and sizes and shows changes before and after the establishment of a community-based fisheries management plan.</p> <p>The module is in development and will be available early 2023.</p>          |

<sup>5</sup> UOW. 2021. Catch Monitoring Manual for CBFM in the Pacific Region. Module A: Technical Manual for Catch Monitors. Australian National Centre for Ocean Resources and Security, University of Wollongong, Australia. <https://purl.org/spc/digilib/doc/chkpw>

11. Socio-economic surveys provide information on communities, their needs, and perceptions while in-situ and fisheries dependent surveys focus on marine resources and environment. They are complementary to establish fisheries and community-based management plans in context.

| Module                 | Platform         | Description  |
|------------------------|------------------|--|
| Socio-economic surveys | Ikasavea/CFA     | <p>The module implements <a href="#">standard</a><sup>6</sup> household and fisher survey forms and provides information on dependence of households on coastal fisheries for food and income as well as an insight on all fishing activities, whether it is for subsistence or income, seasonal or all year long.</p> <p>Household income and expenditure surveys run every 10 years by statistic departments are another source of similar information and public reports available on the Pacific Data Hub.</p> |
| Community surveys      | Ikasavea/CFA     | <p>Along with community catch survey, the fishing context form provides information on fishing habits and perceptions of fishers to establish or assess a community-based fisheries management plan.</p> <p>The module is in development and will be available early 2023.</p>   |
| Ad-hoc surveys         | Survey Solutions | <p>While the socio-economic surveys module provides standard forms and queries, it is sometimes necessary to run specific surveys to answer questions not covered by the standard form. CFAP can assist in the development of online/mobile forms using Survey Solutions and host the backend to manage enumerators and data. Analysis of the data is conducted separately, with or without assistance of FAME staff.</p>  |

12. Exports monitoring is used for commodities that are exported for enforcing licensing, quotas and restrictions associated with species listed under CITES such as corals, giant clams and some species of sea cucumbers.

<sup>6</sup> Kronen M., Stacey N., Holland P., Magron F., Power M. c2007. Socioeconomic fisheries surveys in Pacific Islands : a manual for the collection of a minimum dataset. Noumea, New Caledonia: Secretariat of the Pacific Community, . xi, 129 p.  
<https://purl.org/spc/digilib/doc/vdm6f>

| Module               | Platform | Description  |
|----------------------|----------|--|
| Export/CITES permits | CFA      | Export and CITES permits are established for every shipment and provide information on exporter, consignee and quantities intended to be shipped for a list of species or commodities. After export, the information must be complemented by a packing list that provides the actual quantities shipped. The export permit module is usually used for aquarium trade and coral exports but could be used for other commodities as well, for example sea cucumbers. |

13. Monitoring, Control and Surveillance (MCS) in coastal fisheries is growing activity and new reporting needs are emerging in the region. Online and offline tools for MCS are in their infancy and will evolve in the coming years.

| Module                               | Platform | Description   |
|--------------------------------------|----------|---|
| Monitoring, Control and surveillance | CFA      | The module records inspections, offenders, and infringement for MCS reporting purpose. The module will probably be extended depending on regional MCS needs and might be added to IkaSavea in the future for offline use. |

14. Other tools are available on the CFA web site, not directly linked to surveys and data entry but useful to scientists, surveyors, and fisheries officers in the context of their work.

| Module              | Platform | Description   |
|---------------------|----------|---|
| LearnFishID         | CFA      | This module provides self-training to registered users on species identification for several commodity groups (common coastal food fishes, deep bottom species, sea cucumbers, aquarium fish species, etc.). Training on species is often used as a refresher by surveyors before conducting underwater, market or landing surveys. |
| Species information | CFA      | This module collates available information on species of commercial interest to the region such as size at maturity, length/weight relationships etc. A module will be added for data entry and retrieval of biological sample related data.  |

| Module            | Platform | Description   |
|-------------------|----------|---|
| FADs calculations | CFA      | This tool provides a rope length calculator for anchored surface FADs. The module will be expanded with various calculation sheets for FAD & longline deployments.  |
| Data depository   | CFA      | The data repository provides metadata on available datasets and on-going surveys. It is partially superseded by the Pacific Data Hub.   |
| REEFLEX           | CFA      | This tool provides access to full text of acts and regulations, policies and plans by country and territory. It can also be used to search and compare management measures in force by marine species and type of regulation. Online-training and support materials are also available to assist fisheries agencies for the development of law and policies (see IP 8). |

### *Training and support on survey tools*

15. Training on resource or fisheries surveys includes introduction to methodology and sampling design, use of web modules and mobile applications for data entry and reporting, field work, support and feedback during data collection and finally support on data analysis. It can span over several months, involve several teams and must be requested through fame\_support@spc.int in advance so that it can be incorporated into yearly planning.
16. Most training would be provided by CFAP staff, but for some tools it also involves OFP staff (TAILS/TUFMAN2) and ANCORS Pathways team (Community surveys) for communities related to that project.