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Harmonised collection of small-scale domestic fisheries data

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Purpose

1. The purpose of this paper is to:

- highlight current objectives and recent advances in small-scale domestic fisheries data collection programs made by SPC's FAME Division;
- discuss the potential for harmonising data collection across FAME's small-scale domestic fisheries programs;
- highlight the trade-offs between standardised regional data collection and country-specific data collection; and
- invite Heads of Fisheries to discuss the advances and make recommendations for future directions for data collection in PICT small-scale domestic fisheries.

Background

2. Small-scale fisheries are critically important to food security and as a source of livelihood in Pacific Island countries and territories (PICTs). However, relative to the industrial tuna fishery, small-scale fisheries within PICTs are largely data poor. Such data limitations are well recognised: Leaders at the 47th Pacific Islands Forum identified that management of coastal fisheries resources continues to receive inadequate attention, and identified the need to better understand and improve the contribution of nearshore fisheries to food security. A lack of statistics on small-scale domestic fisheries catches was similarly identified as a major limitation in the recent Benefish study by Gillett (2016¹).
3. Through the activities of its Oceanic Fisheries Programme (OFP) and Coastal Fisheries Programme (CFP), SPC's FAME Division continues to support PICTs in the design and implementation of data collection strategies for small-scale domestic fisheries. Two of these strategies, namely OFP's Regional Artisanal Line-Fishery Monitoring programme (hereafter artisanal program) and CFP's creel survey program, share several commonalities: both are conducted at landing sites and are focused on fishers returning from fishing events.
4. With recent advances in technology, and a call by representatives from individual PICTs to explore the merging of the two data collection programs, a review of these programs is required to ensure FAME continues to support PICTs with data collection for their small-scale domestic fisheries in a manner that is cost-effective and efficient without compromising the ability to answer the monitoring objective the data collection was designed to address in the first instance.
5. This paper discusses the objectives and recent advances of FAME's artisanal and creel survey programs, the potential for harmonising both programs into a singular vehicle, and the importance of maintaining regional standardisation in data collection whilst ensuring FAME is flexible to the needs of individual PICTs.

What are the objectives of the individual data collection programs?

Artisanal program

6. The artisanal program is directed at small-scale vessels targeting tuna and other pelagic species with line-based fishing methods. The program mainly aims to:
 - provide artisanal pelagic annual catch estimates in line with the WCPFC Convention text that encourages coastal states to voluntarily submit this data, while noting that annual catch estimates are also used to report to Goal 4 of the Tuna Fishery Report Card (Roadmap for Fisheries);
 - assess the effect of the industrial fleet on artisanal catch rates, in line with the Heads of Fisheries (HoF) 7 support for on Issue-Specific National Reports (ISNR);
 - monitor catch and effort around FADs; and
 - broaden the range of data available for tuna stock assessments, and provide additional information on employment, trip economics and vessel safety.

¹ Gillett, R.D. (2016). Fisheries in the Economies of Pacific Island Countries and Territories. Pacific Community (SPC), Noumea, New Caledonia.

7. Through the collection of fishery dependant data and the inclusion of scaling factors including vessel trip counts and total vessel identification (registration) the program is strongly based around the collection of catch (by number and weight) and effort (hooks and lines) data.
8. The current artisanal programme started in 2010. In recent years, seven PICTs have implemented on-going monitoring across one or more sites, while recognising that good financial support from the WCPFC and Australian Aid was made available for employing data collectors in the early years. At this stage, four PICTs are close to providing annual catch estimates, although it is recognised that further refinement on these estimates is required and there are some limitations to producing annual catch estimates for PICTs with long coastlines such as Fiji, Papua New Guinea, and Solomon Islands.
9. The general advice from the completed ISNR 5.2 series noted a lack of available data from small-scale vessels to assess impacts of the industrial tuna fleet on artisanal catches and much of the work of the artisanal program has been driven by this requirement. Recent developments include advances in e-recording / e-reporting (discussed in Paragraphs 12 and 13), trials of small-scale vessel automatic identification system (AIS) units, exploring options to conduct e-monitoring of landing sites to capture a count of vessels, and gaining training accreditation under the Pacific Islands Regional Fishery Observer (PIRFO) umbrella.

Creel survey program

10. In 2011, following recommendations from PICTs and internal discussions to develop a strategy to better assess the status of inshore fisheries resources, FAME's CFP commissioned the development of a standardised creel and market survey program, which was conducted under a joint collaboration between CFP staff and external consultants. Field creel survey trials were conducted in ten PICTs, and a supporting regional database was developed. In 2016, a manual was finalised to guide PICTs in creel survey design and implementation, and an identification guide to the common finfish species observed in small-scale domestic catches was produced². A mobile application version of this guide has recently been developed, and will be released in 2017.
11. The creel survey program was designed to identify and address specific management questions posed by fisheries agencies regarding the status of stocks or the fishery as a whole. The approach focuses on collecting a minimum dataset, which could be scaled-up to permit more management questions to be addressed, over a longer time-series, or at additional sites, as resources allow. Examples of management questions answered by creel survey data include:
 - what/how much is caught (e.g. composition, total or average catch, by number or weight, in terms of total catch, or by individual families or species);
 - what is the size frequency distribution, the average size of species, or the proportion of fish³ below size-at-maturity, in the catch and are there changes in size over time;
 - what is the catch per unit effort (CPUE; in terms of total catch, or by individual families or species), and are there changes in CPUE over time;

² Moore, B. and Colas, B. (2016). Identification guide to the common coastal food fishes of the Pacific Islands region. Pacific Community (SPC), Noumea, New Caledonia.

³ 'Fish' is used throughout this paper in the broad sense to include fish and invertebrates.

- what is the distance travelled to fishing locations, and are there changes in distances travelled to catch fish over time; and
 - what prices are paid to fishers, what income is generated by the fishing trip and what form of livelihood does fishing provide.
12. The creel survey approach is modular, allowing individual fishery agencies to tailor the type of data collected (such as counts or lengths) to the specific management questions being addressed. Given the flexible approach used, the program is able to provide information over the wide range of fishing activities encountered in small-scale domestic fisheries in the Pacific, including line fishing, spearfishing, net fishing and reef gleaning, and for fishers fishing for finfish and invertebrates, with or without a boat.

Recent advances in electronic data collection

13. In January 2016, OFP's tuna data management team decided to develop a prototype mobile application to test whether mobile technology could provide a viable solution for artisanal tuna data collection across the region. By mid-February, a test version had been developed and was trialled in Nauru. Based on valuable advice from a local fisheries officer the application was refined and further developed.
14. In August 2016, the new application, now with the name of 'Tails', was made available to PICTs via the Google Play store for Android operating systems. By December, Tails had been used in five PICTs to record artisanal tuna catch data. During these five months, data from 1882 fishing trips had been entered using the Tails application. Tails has stimulated more efficient artisanal data collection and improved data quality by having one data entry event which includes built-in data quality control mechanisms on entry. There is also an option for e-reporting: users can send data directly to the database and reports can be returned – creating a rapid two-way communication.
15. To date, CFP has not trialled the use of mobile application technology for recording creel survey data. However, an e-recording system could be developed and trialled upon endorsement from Heads of Fisheries. As the creel approach, like any landing site survey, relies on fishers volunteering their time to assist, data recording approaches that provide the quickest way of data collection at the landing site without compromising data quality are considered the preferred approach.
16. Data collected through the creel survey program are currently entered in the office and stored on the local network, however a move to a web-based system for creel data storage is planned for 2017 for situations where a local server is not available or difficult to maintain.
17. While data collections tools have generated much recent interest, the FAME Division stresses that surveys for small-scale domestic fisheries should be driven by the management objectives the data collection program has been implemented to address. Utmost importance should be placed on sampling design considerations, training in species identification, and attention to detail in data entry, to ensure the chosen management questions are being answered.

Towards the harmonisation of the artisanal and creel survey programs

18. Despite the inherently different objectives of FAME's artisanal and creel survey programs, commonalities exist in the types of data collected that may allow for harmonisation of data collection and management systems (Appendix 1). The harmonisation of the two survey approaches potentially poses significant advantages (see Figure 1 on next page). For example, harmonisation could:
 - reduce duplication in data collection and thus avoid wasting resources (time and money) and avoiding survey fatigue;
 - provide consistency in how and what data are collected and analysed, thereby reducing confusion among fisheries officers regarding which form to use and how to fill it in;
 - reduce survey confusion among fishers and the general public by adopting a 'one team' approach;
 - allow data fields to be categorised and prioritised depending on their intended use; and
 - facilitate the development and maintenance of a common regional database system, which minimises development and maintenance costs.
19. Nevertheless, there are also limitations/risks associated with harmonising the artisanal and creel survey data collection programs (Figure 1), namely:
 - increased short-term costs associated with modifying existing sampling designs, data collection forms, data storage system and staff training, and increased costs associated with producing new support material such as manuals.
 - increased risk that surveys may strive to 'do too much', losing the ability to adequately address the management issue at hand. Care in developing and adhering to appropriate sampling design strategies, such as the selection of landing sites and the frequency and timing of data collection, is critically important.
20. In their current form, neither the data collected under the artisanal program nor the creel program is sufficient to meet the others' objectives (Appendix 1). Alterations to the survey forms (and supporting databases) may allow additional management questions to be addressed, however these would need field testing to ensure appropriateness.
21. Harmonising data collection across the various types of fishing activities observed in PICT small-scale domestic fisheries will require a broad suite of data fields, many of which may be redundant for the particular fishing event being surveyed (e.g. number of lines/hooks for a spearfishing event). There is a risk that redundant fields may cause confusion and inconsistency in data collection. Modular approaches such as that currently used in CFP's creel survey program, enabled by recent advances in technology (e.g. links to method-appropriate effort tables), may provide a solution to this, along with appropriate training.
22. Some contemplation should be given to the time and funding that has gone into developing the two existing survey approaches. Should the surveys be harmonised, development and field testing time will be required, along with requisite funding, before time series of data that will prove useful for management becomes available.

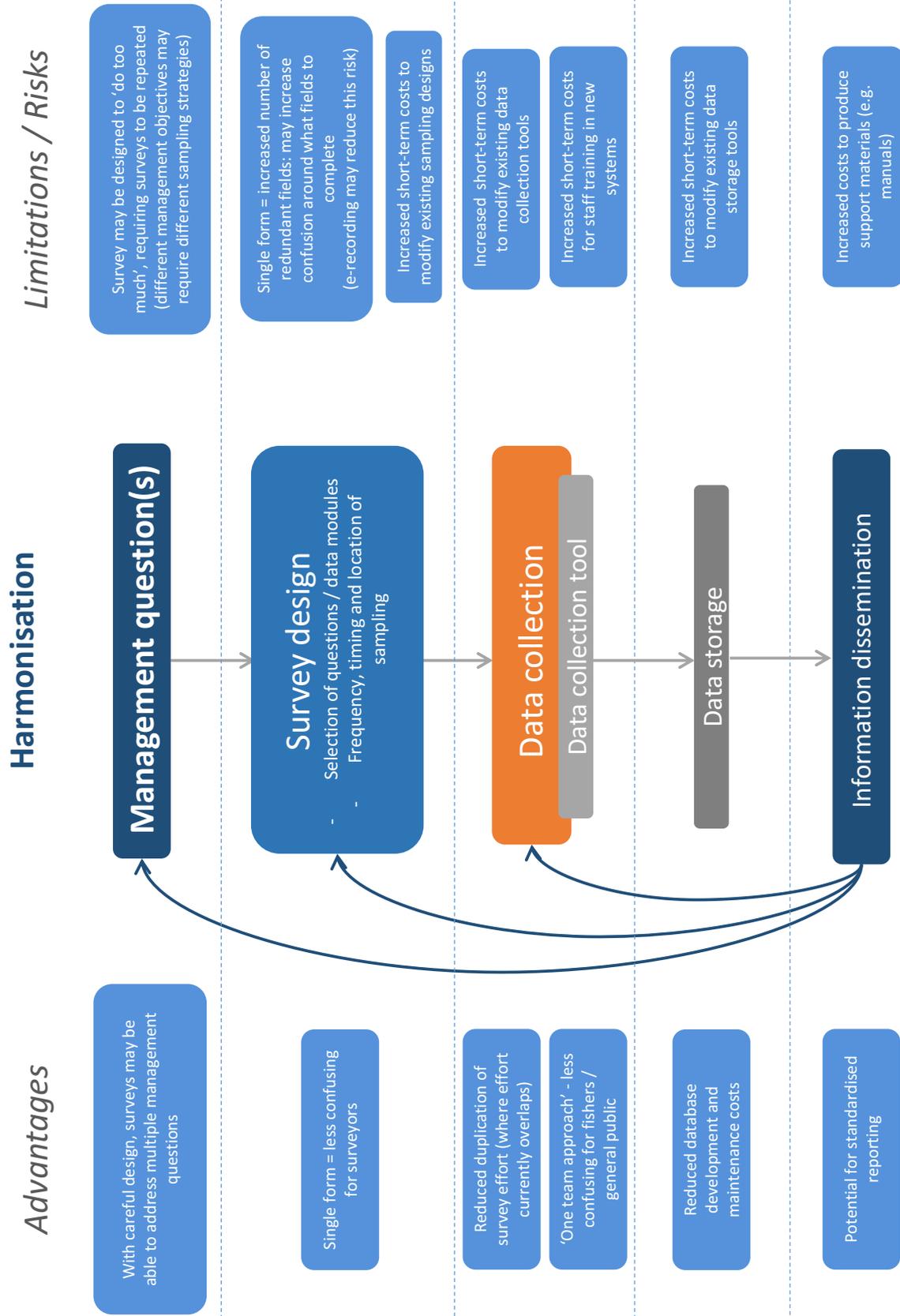


Figure 1. The advantages and limitations/risks associated with harmonising the artisanal and creel survey data collection programs.

The importance of maintaining regional standardisation in small-scale domestic fisheries data collection whilst remaining flexible to individual PICT needs

23. Recent experiences to assess the status of both offshore and inshore fisheries resources demonstrate substantial benefits of adopting a standardised approach to small-scale fisheries data collection across the Pacific region. These include:
 - providing consistency in how and what data are collected and analysed;
 - facilitating the development and maintenance of a common database system, thereby minimising development and maintenance costs;
 - allowing data fields to be categorised and prioritised depending on their intended use;
 - facilitating comparisons of fisheries among PICTs, allowing the development of regional reference limits, or informing key areas of interest for future programs; and
 - allowing PICTs to get their work recognised, and ensuring more long-term support for projects especially if there are changes in national staff or well-defined time limits for outside (e.g. NGO) involvement.
24. Regional standardisation can be a powerful tool in terms of supplying field tested resources to PICTs either in terms of equipment (forms, tablets, measuring devices) and/or technical advice. Asking a regional organisation to set up country-specific monitoring can be costly in terms of the time required to establish the sampling design, test the module and provide feedback and analysis skills.
25. Regional harmonisation of tuna data forms is currently achieved through the Tuna Fishery Data Collection Committee (DCC), which, after starting out in 1995, is endorsed by the Forum Fisheries Committee and is well recognised by many stakeholders working in the science, compliance and industry sectors of tuna fisheries domain (data forms are available at <http://www.spc.int/oceanfish/en/data-collection/241-data-collection-forms>).
26. To overcome the issues of often short-lived data collection projects in coastal fisheries, and the multitude of different agencies and organisations working in the area, and noting the need to achieve consistency in long-term data sets, a DCC-type forum should be considered by HOF that encompasses all small-scale domestic fisheries in order to curate a set of minimum data standards.
27. The Tuna Fishery DCC itself offers a workable example that a small-scale domestic fisheries DCC could model itself on. Alternatively, consideration could be given to creating a similar process in another forum. Wide participation from PICTs, CROP agencies and NGOs will be required in establishing and sustaining a regional small-scale fisheries DCC.
28. At the same time, it is important that SPC maintains an ability to respond to individual PICT needs. In small-scale domestic fisheries there is a need to provide some level of flexibility to allow for localised variations in data collection to answer specific on-going management questions; something that is captured in the current modular approach of the creel survey program but unavailable in the artisanal program. In a scenario where the programs were harmonised, a similar system of modules and customisation would allow flexibility and control over the resulting survey, whilst still adhering to a set of minimum data standards to answer common management questions.

Recommendations

29. Heads of Fisheries are invited to:

- note the progress made by SPC's FAME Division in small-scale domestic fisheries data collection, including e-recording tools, and data management;
- discuss and provide recommendations for future data collection requirements within PICT small-scale domestic fisheries;
- support the harmonisation and modularisation of FAME's artisanal and creel survey programs, and for the need to maintain critical regional standards;
- provide support for further Tails advances and for CFP to trial the development and implementation of e-recording approaches for small-scale fisheries data collection;
- provide recommendations on the need and format of a DCC-like vehicle that encompasses all small-scale domestic fisheries within PICTs; and
- promote the use of SPC standardised survey approaches, data collection, and data management systems for other in-country projects focusing on small-scale domestic fisheries.

Appendix 1. Commonalities among types of data collected in the artisanal and creel survey programs, and the major limitations of each program to capture data to meet the core management objectives of the other.

Commonalities	Major limitations to meeting the core monitoring objectives of the other program	
	Artisanal program	Creel survey program
<p>Both programs collect data on:</p> <ul style="list-style-type: none"> - Basic information on fishers - Areas fished - Boat power - Trip costs - Catch (total number and total weight by species) - Lengths of individual fish - Type of boat used, safety gear (although differences occur between programs in how frequently these data are collected). 	<p>Designed for surveying line fishers using a boat; no fields exist for non-boat based trips.</p> <p>Effort for non-line fishing activities (e.g. spearfishing) limited to number of hours fished. Number of people fishing is not asked (number of crew is asked, however not all crew necessarily fish).</p> <p>Species recorded on 'sampling' form (ART-5) by FAO code (not all coastal fish / invertebrates have species-specific FAO codes).</p> <p>Surveyors can only record number of fish (unsuitable where individual counts are not possible e.g. baskets of <i>Anadara</i>, bottles/jars of giant clams, trochus).</p>	<p>FAD fishing events and resulting catch not adequately recorded (catches are grouped by method used on the trip, rather than by fishing event (fishing location + method)).</p> <p>Creel program lacks an associated vessel activity log, which is used in the artisanal program to provide a scaling factor to produce total annual catch estimates (scaling in the creel survey program is achieved via other approaches e.g. HIES).</p> <p>Lacks field to collect information on shark interaction (a new addition to the artisanal forms approved by the DCC in Dec 2016).</p>