A novel participatory catch monitoring approach: The Vanuatu experience

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This paper presents the preliminary experiences of implementing a participatory catch monitoring programme in Vanuatu. The monitoring programme utilises a mixed-methods approach, involving photo identification combined with qualitative and quantitative surveys. It was designed to be efficient, inclusive, and implementable with domestic resources and capacity. It puts local participation front and centre to strengthen and foster people's engagement in fisheries management. As such, the programme attaches itself to larger sets of ongoing activities under community-based fisheries management practices. Although preliminary, the findings of the first round of data collection reveal highly diverse catches and new fishing techniques, and have facilitated community discussions wherein previous anecdotal evidence of management impact were both supported and challenged.

Introduction

Healthy and productive coastal fisheries resources are critical for Vanuatu (Hickey 2008; Raubani et al. 2017), not only for coastal communities but also for urban and inland populations. Given that Vanuatu is exceptionally disaster-prone (Day et al. 2019), fish are also an important fallback food source, as experienced during COVID-19 and Tropical Cyclones Pam and Harold in 2015 and 2020, respectively (Eriksson et al. 2017; Steenbergen et al. 2020).

To sustainably harness coastal fisheries for the health and wellbeing of all ni-Vanuatu, Vanuatu's National Roadmap for Coastal Fisheries 2019–2030 sets out the pathways for development in the coastal fisheries sector (Vanuatu Fisheries Department 2019). Implementation falls under the coordination of the Vanuatu Fisheries Department (VFD), and the roadmap clearly articulates that community-based fisheries management (CBFM) is the primary approach to ensure the sustainable management of coastal fisheries. One of the central directives under the roadmap is to generate consistent and reliable data on coastal fisheries. Furthermore, in recognising that local management starts with active participation, it is critical to generate data in ways that strengthens local motivation to manage resources. In this context, a community-based catch monitoring approach is being piloted under one of VFD's bilateral coastal fisheries programmes, the Pathways Project.

The community-based catch monitoring approach contributes to VFD's directive to integrate catch monitoring for better evidence-based management in communities and fits with existing initiatives, including community solar freezer monitoring, tailored revisions to the Tails catch monitoring mobile application designed by the Pacific Community (SPC),[4] and fish market monitoring. To address the need for relevant data, the new approach captures both quantitative and qualitative aspects of fishing practices to ensure the inclusion of a broad range of catch types. This allows for data from fishing-active people in communities who too often are not adequately included in fishery monitoring, mainly women. The community-based dimension integrates mechanisms for local participation and for closer engagement between communities and fisheries authorities as such relationships and dialogues are imperative for decentralised fisheries management to work. The approach, moreover, allows results and recorded changes to be fed into local management decision-making. Beyond the community level, the sampling methods have been designed to be complementary with and in support of broader national monitoring innovations, and is deliberate in that it will allow for the uptake of lessons learned into national data systems such as Tails+.

We present preliminary findings of the first round of data collection and reflect on opportunities and challenges of this approach. Our description draws on the outline of the method in the companion article (Andrew et al. 2020).

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[4] Tails is a tablet application which facilitates the collection of tuna, deep bottom snapper and reef fish catch data from small scale fishers and allows for the data to be uploaded to a central database for analysis (for more information see https://oceanfish.spc.int/en/ofpsection/data-management/spc-members/dd/505-tails-application). Tails+ refers to the amended version of Tails that makes it suitable to address needs of the Vanuatu coastal fisheries context.
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Implementation of the community catch monitoring modality in Vanuatu

Data were collected by enumerator teams across five sites simultaneously. Each team was made up of a VFD observer and a recruited community member. VFD's fisheries observer unit is large and has a significant portion of staff on standby waiting for deployment. In agreement with VFD, 10 observers were invited to participate in the programme (double the amount needed per round to ensure enough observers would be available for any round).

All enumerators (both VFD and community recruits) were trained in Port Vila before travelling to communities for the first time. The training involved a thorough run-through of the objectives, procedures and tools. Scenario role playing was done to familiarise enumerators with the sampling protocol, but also to agree on standardised ways to address potential challenges in the field. In subsequent data rounds, the five VFD catch monitors will have a refresher and they, in turn, will train their community counterparts.

Once permission to visit was obtained and dates were finalised, teams travelled to communities and held meetings to explain the purpose of the catch monitoring and how it related to the existing CBFM work in the community. Subsequent data collection rounds will use this initial community meeting to also present back data findings from the previous round of data collection. Data collection lasted up to 14 consecutive days with a minimum target of 10 days, and depended, in part, on fight schedules. All "catch events" encountered were recorded, including gleaning excursions. This involved collecting data from women, men and youth. When confronted with multiple fish landings at once, priority was given to fishing that took place within the defined territory in the CBFM plan.

On completion of the data collection, the monitoring team debriefed with community leaders in order to reflect on activities and get feedback. On return from the field the Port Vila-based coordinating team transcribed data and curated the photographs before sending them to the University of Wollongong for image processing. Templates for more detailed feedback to communities and to VFD have been developed and used to standardize reporting.

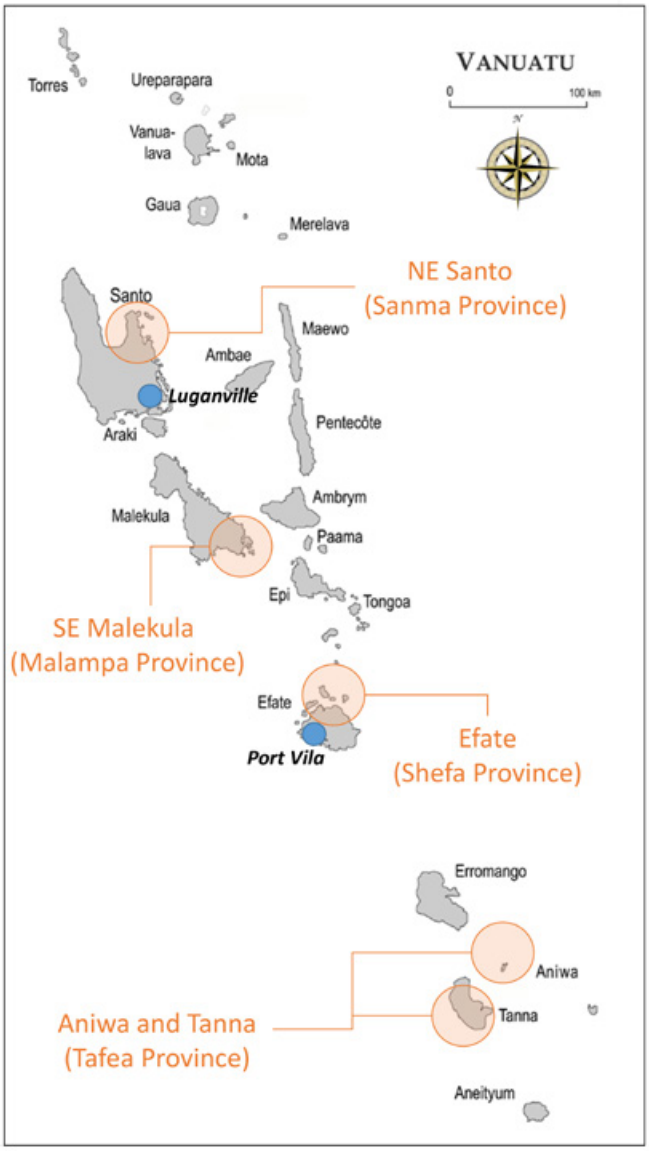

Figure 1. The catch monitoring sites in Vanuatu.

Site selection and sampling

Five sites were selected with relatively even geographical spread and were active fishing communities with which VFD has ongoing collaborative arrangements under the Pathways Project. From south to north these included two communities in Tafea Province (on Aniwa and south Tanna), one in Shefa Province (on north Efate), one in Malampa Province (southeast Malekula) and one in Sanma Province (northeast Santo). The sites range in their remoteness, with the outer island community sites being the least connected by telecommunications and/or to markets or administrative centres. Communities on larger islands with capitals (Santo and Efate) were the most connected (Fig. 1). Fishing activity differed among sites, being market-driven in some places and subsistence-driven in others. This translated to varying types of fishing gear used and habitats targeted.

Ensuring institutional embeddedness

Implementation was guided by VFD's Coastal Fisheries Division in order to aid its integration into the national programme. The implementation plan was co-designed to ensure that: 1) it complemented other data monitoring initiatives, 2) data access and sharing arrangements were in place, and 3) activities were streamlined to make the best use of shared resources (e.g. using VFD fishery observers to lead the enumerator teams).

Preliminary findings and discussion

Characterising fisheries

In total, 132 people – 33 women, 98 men, and one respondent whose gender was not noted – were interviewed using the qualitative survey forms (each of these was only filled out once), while 194 and 42 fish catch landings were recorded by men and women, respectively. Catch photos collected during fieldwork allowed identification and measurement of 3497 fish from 262 species and belonging to 116 genera and 45 families (Table 1). These data start to allow characterisation of communities' diverse fisheries.

The catches recorded in each community differed in quantity, diversity, and the most commonly harvested species. However, to account for seasonality and contextual anomalies during data collection, several rounds of data collection will be necessary. On Aniwa, for example, data collection partially coincided with the island's annual custom fishing period when fishing practices follow strict customary rules. Women spend all their time tending the yam crops and do not fish or glean. Catches, therefore, involved few reef species. Instead, mostly deep-bottom and pelagic species were recorded because men continued to fish offshore.[5] The Aniwa site was also the only site to record flying fish (Exocoetidae), which reflects not only oceanic conditions but also the customary night fishing carried out during this period.

In contrast, fishers of the southeast Malekula site, who supply important quantities of reef fish to local and urban markets, rely more heavily on coastal and fringing reefs for their catches. This is reflected in the tremendous diversity of catches (Table 1 and Fig. 2). Catches recorded at the Tanna site were small and caught in the immediate coastal zone, indicative of the primarily subsistence fishing done here (Fig. 3). Tanna was the only site where hawkfish (Cirrhitidae) and damselfish (Pomacentridae) made up a significant proportion of landings (Table 1). It will be interesting to observe whether the new tar-sealed road that is soon to open will change the species mix to more market-driven fish.

Surveys picked up unusual fishing methods that are often not included in standardised catch monitoring programmes but which are critical to inform local management. At the Tanna site, data collection coincided with neap tides and fishing using spears and machetes to kill fish driven into rock pools at night (Fig. 4). Other fishers caught fish and invertebrates by hand while free diving at night.

Localising the use of data by having fishers and fisheries officers understand the diversity of species being harvested and the methods used, helps to identify key species that warrant specific management. The catch monitoring programme can, therefore, contribute to strengthening community-led management by helping to establish local baselines, flagging issues that warrant more in-depth investigation, and gauging whether management interventions are effective.

Table 1. A breakdown of the catch diversity within and between the five sites during round 1.

	Islands of community sites				
	Aniwa	southeast Malekula	Efate	Tanna	northeast Santo
No. fish	174	1946	504	429	411
No. families	19	33	23	18	13
No. species	45	191	81	43	46
Three most prevalent families	Flying fish (Exocoetidae; n = 40)	Emperors (Lethrinidae; n = 410)	Goatfish (Mullidae; n = 94)	Wrasses (Labridae; n = 277)	Herrings, shads, sardines (Clupeidae; n = 223)
	Soldierfish, squirrelfish (Holocentridae; n = 32)	Soldierfish, squirrelfish (Holocentridae; n = 309)	Emperors (Lethrinidae; n = 83)	Hawkfish (Cirrhitidae; n = 62)	Parrotfish (Scaridae; n = 72)
	Bigeyes (Priacanthidae; n = 14)	Wrasses (Labridae; n = 302)	Halfbeaks (Hemiramphidae; n = 75)	Damselfish (Pomacentridae; n = 27)	Surgeonfish (Acanthuridae; n = 49)

[5] Custom fishing on Aniwa involves men fishing for pelagic species at night. During the day some men continued their deep-bottom fishing.

Figure 2. A catch from the southeast Malekula site, comprising nine species from five families, including five species of soldierfish/squirrelfish (Holocentridae), one species of emperors (Lethrinidae), one of goatfish (Mullidae), one of parrotfish (Scaridae), and one of groupers (Serranidae).

Figure 3. A catch from the Tanna site, where fishing predominantly supplies subsistence demand. Note that fish are small (grid squares measure 10 cm x 10 cm) and only four species from two fish families were present, including one species of hawkfish (Cirrhitidae) and three of wrasses (Labridae).

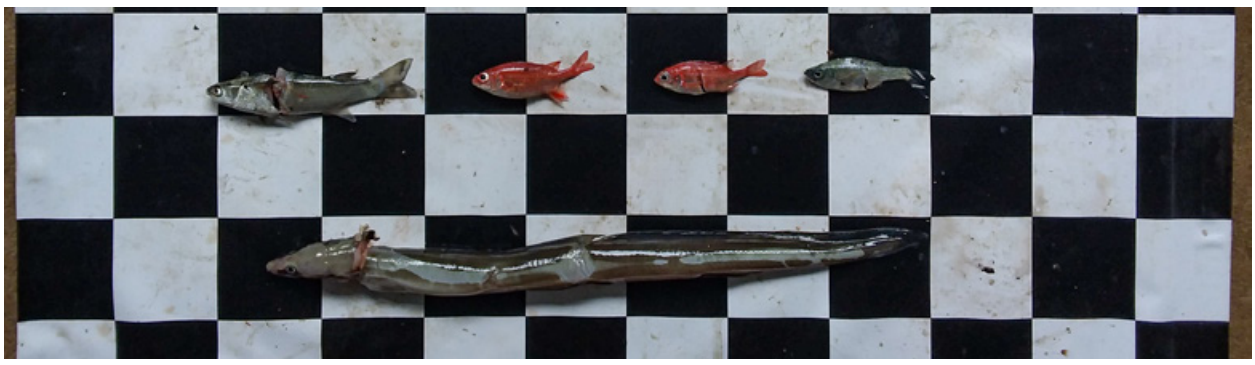

Figure 4. Fish caught at the Tanna site during neap tide fishing, showing slashes on each fish.

Figure 5. The only tuskfish (*Choerodon* sp.) reported among fish caught at the southeast Malekula site in round one of data collection (n = 1946). Fishers suggested that this fish's reappearance after 10 years of absence, could be a result of the tabu area established three years prior.

Greater community engagement

Participation was high, as evidenced by the focused and informed discussion about fisheries practices and management before, during and after data collection. Teams noted that the catch monitoring training was critical to ensuring enumerator teams confidently translated important, but often technical, methodological details to fishers and community leaders. Given that scientific concepts and fisheries management jargon are often new to community members, the close engagement of the enumerators with the respective community fisher associations, regular training refreshers, and the feedback of the findings cumulatively helped people understand why such monitoring is beneficial.

Community members were very interested to see the results, emphasising that the sharing of data proved to be a primary motivator for participation. The catch photos in particular generated a lot of discussion about the changes people experienced in their fisheries and what should be done. One catch photo from the southeast Malekula site included a species of tuskfish (*Choerodon* sp.) that fishers had not seen in 10 years (Fig. 5). In sharing the photographs during discussions, fishers made specific note of this fish and reflected on the improving state of the reef and whether their fisheries management measures contributed to that. The photos were anonymised to enable sharing among fishers otherwise reluctant to engage.

Greater community engagement also allows for scrutiny and scepticism within the community to be addressed openly. During a presentation of initial results to the fishers association in southeast Malekula, for example, some fishers were concerned about how the data would be used afterwards, "*you are collecting these data, and some of us are asking if those data will lead to the government setting quotas on our fishing*". Discussions that followed clarified that in order for management, let alone fisheries legislation, to ensure long-term productivity, any potentially restrictive measures needed to be evidence based, fair and relevant to the local context. To make a case for such measures requires reliable data. From this discussion, an agreement was reached whereby data could only be used by external parties with explicit permission from the community.

Challenges

Achieving adequate gender representation was difficult in the first round of data collection. The catch monitoring teams consisted of two males at each site, and this

significantly reduced the willingness of women to participate. Capturing women's contributions to fishing is often overlooked, despite the fact that the fish and invertebrates women gather are more likely to be eaten within the community than larger reef and pelagic fish species caught by men in boats, which are often sold at markets (see Andrew et al. 2020 for further details on challenges associated to capturing and measuring invertebrates). So, from a food and nutrition security perspective it is imperative to capture women's catches, and equally so from a fisheries management perspective. Management measures, such as tabu areas, are usually established within immediate coastal zones of a village. This disproportionately limits gleaning and fishing activities of women compared with offshore fishing by men. In the interest of striving for equity, better understanding is required about how women use coastal areas and the importance of that to food, culture and livelihoods in a community. To address this, a woman catch monitor will be recruited in subsequent data rounds.

With regards to recruiting community members as part of data collection teams, a person's social standing, formal role and relationships in a community determines their ability to be an objective data collector. As experienced at one site, following discussion with leaders, it was decided to appoint the community's authorised fisheries officer, a formal position responsible for local monitoring and enforcing national regulations. Unsurprisingly, fishers did not treat the appointed catch monitor any differently than his official role – they hid their catch in fear of potential enforcement action. Reflecting on this, the way people interact with a community catch monitor is likely to be based far more on their familiar role in the community, than on any new title. The catch monitor in that community has since been replaced following community discussion.

Impacts of COVID-19 and the programme's response

While not completely immune to COVID-19, using national staff to carry out data collection activities has made the programme relatively resilient. In implementing the second round of data collection in April 2020, an initial delay was experienced when the Vanuatu government declared a state of emergency. Once domestic travel eased, however, the programme resumed and was able to function independent of outside involvement. Collaborative data management, analysis and exchange involving international bilateral programme partners is also still possible through internet and phone.

The programme offers means to institutionalise community-based capacity for monitoring, which can catalyse a complete transition in the long-term to local data collection with minimal fisheries officer involvement on the ground. Integrating innovative technology may, over time, allow community enumerators to independently gather data and submit them digitally. A monitoring programme such as this one could then continue largely uninterrupted even during complete lockdowns.

Conclusion

Engaging fishers in management and monitoring of coastal fisheries in Vanuatu is a persistent challenge (Tavue et al. 2016; Raubani et al. 2019). Fishers often request evidence of whether, and how, their management measures are improving local fisheries. Preliminary implementation of the community catch monitoring programme has contributed to continual engagement between VFD and communities. This stands to strengthen collaboration and frequent interaction, which cumulatively can enhance people's understanding and participation in fisheries management. Data from the first round of collection have already shown promise in demonstrating which interventions contribute to enhancing productivity.

The method's design aimed to improve efficiency, inclusiveness and participation, and sought to function around and build national capacity. It does not require the presence of international fish and invertebrate taxonomy experts. Moreover, the time taken to collect data was drastically reduced, thus shifting the burden of time and resourcing typically associated with catch monitoring away from communities and fishers, and instead placed them with better-equipped stakeholders such as VFD. The speed at which data are collected means that monitors can move faster onto the next fisher, thus improving response rates and survey coverage. Finally, minimal handling of fish meant the freshness of fishers' catches was not compromised, an important consideration for participating fishers.

The strength of this monitoring programme is that it puts local participation front and centre. Its efficiency makes it ideal to characterise community fisheries and gauge the impact of management interventions. The data collected not only will benefit the communities where it is collected, but will also to fit into Vanuatu's national strategy for coastal fisheries. The extremely diverse species-level data, for example, may usefully inform decision-making regarding which species are likely to require regulation, regular stock assessments or other interventions. This catch monitoring programme offers useful insights and innovations for VFD to incorporate into existing data programmes.

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