



Women's empowerment and participatory monitoring of small-scale fisheries in Timor-Leste

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Acronyms

CBFM	Community-based fisheries management
Covid-19	Coronavirus disease 2019
CPUE	Catch per unit effort
FADs	Fish aggregating devices
GMP	<i>Grupú Monitorizasaun Peskas</i> (Fisheries Monitoring Group)
LMMA	Locally managed marine area
MAP	<i>Ministeriu Agrikultura no Peskas</i> (Ministry of Agriculture and Fisheries)
NGO	Non-governmental organisation
ODK	Open Data Kit
SSF	Small-scale fisheries
WWF	World Wildlife Fund for Nature

Glossary

Administrative divisions - *suco* and *aldeia*: In Timor-Leste, there are 13 districts, which are divided into 65 administrative posts, further subdivided into 442 *sucos* and more than 2000 *aldeias*. *Sucos* are the smallest administrative division and comprise one or several *aldeias*. The term *suco* is typically equivalent to a village, whilst *aldeia* is a hamlet or sub-village grouping. *Sucos* range in size from 0.06km² to 212km², and in population from 135 to 10,000 inhabitants. Given that the size and population of a *suco* or *aldeia* can vary so much, this report will use the terms to refer to their administrative divisions, and use English terms to describe the nature of specific settlements.

Community: A group of people who share social ties, perspectives or activities in a particular place or setting. In the context of CBFM, “community” refers to resource users, people who are impacted by CBFM or who participate in it, and leaders or decision-makers. This includes people who live in the same area and are impacted by CBFM, but who do not actively participate in CBFM activities.

Community-based fisheries management (CBFM): A management approach where communities take a leading role in managing coastal areas and resources, with support or collaboration from external organisations, such as government or NGOs.

Catch per unit effort (CPUE): Is an indirect measure of the abundance of target fish stocks. This index is calculated by combining data on the amount of fishing effort (i.e. time at sea, number of fishing trips) and the amount of fish which is caught. In this report, CPUE is calculated as kilograms of fish caught per fisher per fishing trip.

Gleaning: A fishing method used in coastal areas which are exposed during low tide. Gleaners walk in the shallow water and collect fish, invertebrates and seaweed. People of all genders glean, but in some places (such as Timor-Leste) it is mostly done by women and children.

Grupu Monitorizasaun Peskas (GMP): A network of women’s fisheries monitoring groups established in 2018 through a community-led process.

Fish aggregating devices (FADs): FADs are man-made objects which are used to attract fish which live in the open ocean (pelagic species).

Fisheries reconstructions: Historic catches are estimated by interpolating various data sources to interpret information about fishing effort and associated catches. This is a widely used approach when accurate catch statistics are not available.

Locally managed marine areas (LMMAs): The LMMA Network's definition is "A locally managed marine area (LMMA) is an area of nearshore waters and its associated coastal and marine resources that is largely or wholly managed at a local level by the coastal communities, land-owning groups, partner organisations, and/or collaborative government representatives who reside or are based in the immediate area."

PeskAAS: Timor-Leste's automated analytics system for monitoring small-scale fisheries (SSF).

Small-scale fisheries (SSF): There is no specific definition of what constitutes small-scale fisheries, but they are usually characterised as dynamic, complex, labour intensive, multi-species, multi-gear fisheries. Small-scale fisheries are essential for food security, livelihoods and cultural identity around the world.

Tara Bandu: A custom-based regulatory mechanism, which is enacted through ritual practise. *Tara bandu* is used to control how humans interact with each other and their environment. Recently, it has been used to develop co-management arrangements for fisheries and coastal areas with local communities.

Xefi: Is a chief and each *suco* and *aldeia* has a *xefi*. The *suco* chief and *aldeia* chief are elected for terms of seven years.

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Executive summary

Introduction

Community-based fisheries management (CBFM) often takes place in environments that are data deficient [1,2]. Integrating community-based monitoring into CBFM is, therefore, essential to ensuring that management is informed by evidence. In addition, the contribution of women to fisheries and their involvement in fisheries management has often been overlooked and is poorly understood [3,4]. Women often occupy different parts of the small-scale fisheries (SSF) value chain [5–7], or fish in different ways from men [4,8]. As such, their perspective is essential in developing comprehensive and holistic fisheries management. Women's participation in fisheries management is necessary because it can contribute to sustainable and equitable resource use, which are both considered to be valuable end goals [9].

Small-scale fisheries are an important part of many people's livelihoods in Timor-Leste [10] but there are relatively little data available to inform sustainable management of this sector. There is a national fisheries monitoring programme, PeskaAS [11]. However, fisheries management is often implemented at the community level [12], making community-led fisheries monitoring relevant for management related decision-making. Despite the significant contribution of women to the fishery sector in Timor-Leste, as fishers and in post-harvest processing [10,13], their inclusion in fisheries management decision-making is limited, reflecting broader gender inequality.

To collect valuable catch monitoring data in Timor-Leste, a network of women's groups known as *Grupu Monitorizasaun Peskas* (GMP) was established in 2018 in five communities: Ilik-namu (Atauro), Fatumeta (Behau), and Ma'abat (Manatuto), Beto Tasi and Li'an-lidu, with the support of Blue Ventures¹. The all-women's group, GMP, conducts participatory fisheries monitoring by collecting fisheries catch data, to inform fisheries management, empower women as fishery data collectors, and provide access to learning opportunities within and beyond marine management.

This report presents the findings on fishing activities and catch composition from data collected by the GMP monitoring programme in three of the five communities - namely Ilik-namu (Atauro), Fatumeta (Behau), and Ma'abat (Manatuto). The monitoring activities provide baseline data and help to characterise the fisheries rather than identify trends in fish abundance or activity. The report also explores GMP's role within community-based fisheries management, examines potential opportunities to increase women's participation in fisheries management, and reflects on the power dynamics and social processes during the programme implementation. We also identify areas where further evaluation of the programme is needed and provide recommendations.

¹ Blue Ventures is an international non-governmental organisation (NGO) engaged in marine-conservation.

Methodology

The GMP network was established through a community-led process to provide catch data that could assist communities with managing their marine resources. Members of the GMP and local fishers co-designed the fisheries monitoring methods and the mobile-phone application for collecting data. In Ilik-namu, a GMP pilot group was established, followed by the establishment of the groups in Ma'abat and Fatumeta. Members were selected either by word of mouth or by direct invitation. Each group had a maximum of eight members at a given time, but since their inception, there have been a total of 53 members.

Data collection, analysis, and community feedback

The women's monitoring groups developed and refined a catch survey method using an adaptive co-design process. Each group received an initial training session that was followed by monthly or bi-monthly sessions. For each new monitoring group established, the original catch survey was refined and tailored to each group's priorities and local context (e.g. relevant target fish). To collect catch data, members of the *GMP* monitoring groups interviewed local fishers on their return from fishing activities using the catch survey and a smartphone app, called Open Data Kit (ODK) to record the interview and catch data. The survey focused on the fishers, the fishing grounds, gear choice, the catch composition and mass, and whether the fish would be sold. The survey could record up to three fishing locations (and corresponding habitats) as well as the fishers' primary, secondary and tertiary gear choice. Target species were identified, weighed, and photographed. The questions and response options were adapted to enable the data to be compared directly with the PeskaAS database, e.g. by including the same habitat or gear types. Most of the group members operated in pairs. Each monitoring group established their own monitoring schedule. The data were uploaded to the Blue Ventures Open Data Kit server and automatically published to a google sheet, where they could be reviewed, cleaned, and edited by Blue Ventures staff. These data were then analysed in Tableau Desktop. Catch per unit effort (CPUE) was calculated as the average total catch (in kilograms) brought in by one fisher from one fishing trip. The results of the fisheries monitoring are presented during community meetings to the wider community on a regular basis.

Preliminary Results

Since 2018, 820 catch surveys have been completed across Ilik-namu (Atauro), Fatumeta (Behau), and Ma'abat (Manatuto). Women and men predominantly fished alone or in small groups of two or three, although men also operated in larger groups, for example in Fatumeta and Ma'abat the largest fishing group consisted of 6 men, but in Ilik-namu the largest group was 71 men. Ilik-namu fishing trips are longer and thus require larger fishing vessels. Fishers in all three communities use a variety of fishing gears across multiple habitat types. More than one gear type was combined on 10.4% of fishing trips.

Across all three communities, gill nets were the most widely used gear (64.7% of trips) and were used in combination with a speargun for 11.6% of those trips. Mesh sizes of all fishing nets ranged from 1-3 inches, and for line-fishing between 1 to 36 hooks were used.

In Ilik-namu, seagrass and coral reefs (crest and outer reef) were the most visited habitats for fishing and gill nets and spearguns were the most widely used gear. Women only used gleaning (harvesting by hand or with spears and other tools), hand line or traps. In Fatumeta, the reef crest and drop off were the most visited habitats. Men and women were reported to use a variety of gear, but gill nets were the most commonly used ones. In Ma'abat, most fishing activities occurred in open water, where gill nets and hand lines were the most utilised gear. Women's fishing activities were least reported in Ma'abat. Overall, women's fishing activities were most common in the seagrass and reef crest. Habitats most frequently fished in were not the ones with the highest catch per unit effort (CPUE), although they made relatively high contributions to the total catch. When catches were combined across gears and habitats, particular fish families dominated the catch.

Discussion

The preliminary findings of the fisheries monitoring provide a useful characterisation of the fisheries and baseline data, and challenge some of the assumptions which have influenced fisheries management priorities in the past. The data collected by *Grupus Monitorisasi Peskas* are presented every six months in community meetings so that local leaders and fisheries managers can incorporate them into management decision making; for example, decisions about when to open and close certain areas within locally managed marine areas (LMMAs) to fishing. Preliminary findings also demonstrated the importance of octopus, which were initially perceived to be fairly insignificant during early community consultations. However, the extent to which these monitoring data can inform management is limited by the nature of the information collected during surveys. The data collected thus far provide a valuable foundation, but future versions of the catch monitoring methods could build on this to enable more meaningful recommendations to be made. For example, anecdotal evidence emphasises the contribution of women's fishing, but we recommend that monitoring surveys should be co-designed with gleaners to capture these activities more accurately. Despite these limitations, through this process we have also successfully identified opportunities for improving the programme activities and data collection methods further.

Initial evidence of increased women's participation in fisheries management is promising, but it is essential to focus beyond participation in fisheries monitoring and pursue broader social change to create meaningful gender transformation. Participation in fisheries monitoring must translate into greater decision-making power for women overall.

A gender transformative approach requires that community members outside the monitoring group be included, so that the barriers to participation, social norms, and power dynamics can be understood and challenged beyond the context of fisheries management.

Conclusion and recommendations

In conclusion, the benefits and impacts of participatory monitoring are multifaceted.

Community-led and owned data collection programmes, such as the *GMP*, can build knowledge, enable collective action, and empower local decision-makers. To do so, there must be a balance between the accessibility of data collection methods and the robustness of the results. Scientific approaches and local knowledge can be combined to establish effective management. Although monitoring creates an entry point into decision-making in fisheries management for women, a gender transformative approach requires us to move beyond monitoring and consider the broader social norms and power dynamics which influence women's empowerment and inclusion in fisheries management. *Grupu Monitorizasaun Peskas* has begun to create these benefits, but future development of the programme will need to take these recommendations into account. Although these recommendations are for Blue Ventures and *Grupu Monitorizasaun Peskas*, they may also provide valuable lessons for other community-based fisheries management initiatives.

The preliminary results presented here enable several recommendations to be made to improve the programme further, especially after Covid-19 restrictions are lifted. These recommendations fall into three themes: reliability of catch data, evidence-based decision-making, and gender.

Reliability of catch data:

1. Co-design a more relevant, comprehensive, and accurate gleaning catch survey with local women.
2. Improve automated data management and checking processes to increase data quality, and shorten processing time.
3. Conduct refresher training sessions to ensure data quality is not impacted by taking time-off due to the Covid-19 restrictions.

Evidence-based decision-making:

1. Consider local knowledge throughout community-based fisheries monitoring and management.
2. Strengthen the connection between monitoring data and evidence-based decision-making in management.
3. Conduct monitoring and evaluation to understand the impact of the programme, and the mechanisms underlying these changes.

Gender:

1. Utilise gender transformative approaches to impact social norms and power imbalances beyond the monitoring group [14].
2. Provide gender training for people participating in fisheries management, so that the monitoring programme can be developed, and fisheries management can become more gender-inclusive.

1. Introduction

The *Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication* (SSF Guidelines) affirm the importance of community participation, gender equity, and monitoring in small-scale fisheries (SSF) management [15]. Since SSF are so diverse and dynamic, there is no specific definition of what constitutes SSF; usually characterised as complex, diverse, remote, labour intensive, multi-species, multi-gear fisheries [16–18]. They are difficult to monitor and as such often lack the data required to inform management [19]. As a result, they can be difficult to manage sustainably. Monitoring is therefore a key attribute of fisheries co-management success [20]. Community based fisheries management (CBFM) often takes place in environments where there is insufficient data [1,2] so integrating community-based monitoring into CBFM is essential to ensure that management is informed by evidence. In addition, the contribution of women to fisheries and their involvement in fisheries management has often been overlooked and is poorly understood [3,4]. Women often occupy different parts of the SSF value chain [5–7] or fish in different ways from men [4,8]. As such, their perspective is essential in developing comprehensive and holistic fisheries management. Women's participation in fisheries management is necessary because it can contribute to the interrelated aims of sustainable and equitable resource use, which are both considered to be valuable end goals [9].

Small-scale fisheries are an important part of many people's livelihoods in Timor-Leste [10], but there is relatively little data available to inform sustainable management of this sector. Timorese livelihoods tend to be quite diverse, with a strong agricultural component. For example, 79.6% of households grow crops, 87.2% raise animals, and 4.9% engage in fisheries [21]. However, coastal communities tend to rely heavily on SSF [22]. In Atauro, a small island off the north coast of Timor-Leste, 41% of households fish and more than half of these consider this their primary livelihood [22]. Unfortunately, reliable data on Timor-Leste's fisheries is scant, which makes managing this sector and safeguarding the livelihoods of coastal communities challenging. There is little historical catch data from Timor-Leste but fisheries reconstructions estimate that SSF contributions have increased from 2500t to 3500t between 1999 and 2009 [23].

There have been various efforts to establish national fisheries monitoring programmes [11,24] and document the names and classifications of fish species by fishers, which vary across the country [25]. PeskaAS, an automated analytics system for monitoring small-scale fisheries in Timor-Leste, was established in 2016 and adopted as the official national fisheries monitoring system in 2019 [11]. Although PeskaAS data are available online, at present, the data is stored and analysed by the *Ministeriu Agrikultura no Peskas* and WorldFish².

² WorldFish is an international, non-profit research and innovation organization working to reduce malnutrition, hunger, and poverty through sustainable aquaculture and fisheries.

No mechanism exists for local communities to easily access and interpret this data. A system for data that can be collected, understood, and used by fishing communities on a local scale is still needed. To make informed decisions at the community level, data from monitoring programmes must be regularly presented to decision makers in an accessible and useful way. Fisheries management is often implemented at the community level [12], so local-scale monitoring led by the community³ may be a more relevant method than PeskAAS for decision-making at this level. One of these community-scale management measures is *Tara Bandu*⁴. Women fulfil various roles within Timor-Leste's fisheries sector, including fishing and postharvest activities, such as fish processing and selling [10,13]. Recently, there have been efforts to document the nature and value of women's fishing activities in Timor-Leste [13,28,29]. Despite the valuable contribution that women's fishing activities make to food security and livelihoods, their role within the fisheries sector is often overlooked [13,22]. Awareness of women's fishing activities is an essential part of overcoming marginalisation of women within the fisheries sector [4], but increasing women's participation in management activities and decision-making is also needed. However, participation in CBFM is not necessarily enough to create long term change beyond the fisheries context. To ensure long-lasting women's empowerment, gender transformative approaches are needed to address the structural causes of inequality [7].

Participatory monitoring is one tool in CBFM which can enhance engagement [30], enabling people to make informed decisions, which can be an empowering process in itself [31]. Participatory monitoring can enable community members to respond to their own interests and concerns through several parts of the monitoring process; from collecting, analysing and understanding data, through to decision-making [32–35]. Just as women are overlooked in fisheries management, fisheries monitoring programmes often overlook gender dimensions of fisheries management [36]. Fisheries monitoring programmes involving women mainly focus on management of women's fishing activities, rather than capturing both women and men's fishing [37–39]. However, by working as data collectors within CBFM, women would have a voice in fisheries management decisions even if fisheries are male-dominated [40]. A concerted effort must be made to ensure that participatory monitoring programmes address the complexities of intra-community dynamics, so that women's participation can move beyond activity-specific participation, to a genuinely empowering or transformative process [41].

³ Discussion of CBFM requires a definition for the word "community", which is a widely used but fairly ambiguous concept in social science [48]. MacQueen et al. [49] define community as "a group of people with diverse characteristics who are linked by social ties, share common perspectives, and engage in joint action in geographical locations or settings" (pg. 1929). This report focuses on communities in the context of CBFM, so "community" here refers to resource users, people who are impacted by CBFM or who participate in it, and leaders or decision-makers. This includes people who do not actively participate in CBFM activities.

⁴ *Tara Bandu* is a custom-based mechanism which was and is used to regulate the relationship between people and nature [26]. The use of *Tara Bandu* for managing coastal fisheries is relatively recent but is becoming more widespread [12,27]. Typically *Tara Bandu* are implemented at the administrative unit of either *aldeia* or *suco* which vary significantly in size, so each community decides what scale of management is appropriate for them.

This report presents the findings from data collected by the *Grupu Monitorizasaun Peskas* (GMP) programme, a network of women's groups in Timor-Leste, established in 2018 with the support of Blue Ventures⁵. *Grupu Monitorizasaun Peskas* (hereafter GMP), conducts participatory fisheries monitoring in Ilik-namu (Atauro), Fatumeta (Behau), and Ma'abat (Manatuto), Beto Tasi and Li'an-lidu communities. The objectives of this programme are to collect fisheries catch data to inform fisheries management, as well as to increase community engagement and women's participation in fisheries management decision-making. The aim of this report is to share lessons and preliminary findings on fishing activities and catch composition from GMP. In addition, we explore GMP's role within community-based fisheries management and examine potential opportunities for increasing women's participation in fisheries management, and provide reflections on the power dynamics and social processes which occurred. This report will also identify areas in which further evaluation of the programme is needed and provide recommendations.

⁵ Blue Ventures is an international non-governmental organisation (NGO) engaged in marine-conservation.

2. Methodology

2.1. Fisheries monitoring groups

Blue Ventures is involved in fisheries monitoring activities in five communities (Ilik-namu, Fatumeta, and Ma'abat, Beto Tasi and Li'an-lidu) in Timor-Leste (Figure 1). The *Grupú Monitorizasaun Peskas* (GMP) programme consists of a network of women's groups located in each of these communities in an effort to increase women's participation in CBFM. The pilot group for GMP was set-up in Ilik-namu. Its set-up was done in parallel with a consultation process that took place within the community to determine whether community-based fisheries management should be implemented. Following the success of the Ilik-namu pilot group, four additional groups were established and operate within the GMP network (Figure 2a). Two of these groups were established in Fatumeta and Ma'abat where Blue Ventures was also involved in discussions on fisheries management. The Li'an-lidu group⁶ formed in 2020 after observing the neighbouring group in Fatumeta, while the Beto Tasi, Dili group formed in 2021, in conjunction with marine ecotourism activities being developed there. The initial goal of the groups was to provide catch data that could assist communities with managing their marine resources (Figure 3). An evaluation of the efficacy and accuracy of this theory of change (Figure 4), will be carried out at a later stage.

This report will focus on three (Ilik-namu, Ma'abat, and Fatumeta) of the five communities engaged in fisheries monitoring. At the time of writing the report, two communities (Beto Tasi & Li'an-lidu) were still undertaking training and therefore have not been included here. In the GMP programme, each community is defined by the geographical scale at which fisheries management is occurring. In Timor-Leste, many CBFM interventions are organised on a *suco* (village) or *aldeia* (sub-village) level.

Ilik-namu, Atauro

Ilik-namu consists of 93 households, covering 8.85 km², and is part of the village of Biqueli, along with one other *aldeia*, Pala (168 households, area of 5.90 km²) [21,42]. Fishing is the primary livelihood for the majority of households in Biqueli, which has the largest fleet in Timor-Leste, containing several large boats which can accommodate groups of up to 20 fishers [27]. Biqueli's relative wealth is the highest on Atauro [22]. However, it is one of the few communities on Atauro which have not yet implemented a locally managed marine area (LMMA). Coral reefs on Atauro are home to some of the greatest biodiversity in the world [43] but some limited surveys conducted near Ilik-namu in 2004 suggested that the abundance of reef fish may have been impacted by

⁶ The Li'an-lidu and Beto Tasi fisheries monitoring groups are currently undergoing training (which was interrupted by Covid-19 pandemic) so this report will only discuss the three groups which are actively conducting monitoring – Ilik-namu (Atauro), Fatumeta (Behau), and Ma'abat (Manatuto).

fishing pressure [44]. There is little data available on fish populations and reef health around Ilik-namu, but Blue Ventures has collected relevant monitoring data there since 2017 [45].

Blue Ventures began marine management consultations in Ilik-namu in 2017, which are ongoing. The consultation process revealed a lack of relevant catch data and the discussion in the meetings was often dominated by men. In 2017, a decision was made to pilot a community-based fisheries monitoring programme, as a primary goal. A secondary goal was to increase community engagement in marine management discussions and build the relationships between Blue Ventures and the community. From the onset, there was considerable support from the *xefi suco* (village chief), however some community leaders did not support the programme at first. In addition, several fishers were concerned that by participating in fisheries monitoring they were inadvertently supporting proposed fisheries management measures, such as *Tara Bandu*. However, regular data feedback meetings (see “co-design and community feedback” for more information) explained the value of fisheries monitoring, regardless of what management measures are in place, and fishers became more engaged in the programme. Although the monitoring programme operates within Ilik-namu, community members from both of the *aldeias* in Biqueli have been invited to participate in data feedback meetings because of the overlap in fishing grounds and the potential for fisheries management to be implemented in either *aldeia*.

Fatumeta (Behau), Manatuto

An LMMA was established in Fatumeta by the local community with the support of Blue Ventures in 2018 (Figure 1). Fatumeta is part of Ilimanu *aldeia* along with Li'an-lidu, a neighbouring community. Ilimanu includes 328 households, and is part of Uma Caduak *suco*, which contains 540 households [21]. Due to the large area covered by this *aldeia* (66.44 km² [42]), fisheries management and monitoring has been implemented on a sub-*aldeia* scale.

The LMMA was implemented using the mechanism of *Tara Bandu*, which has been used to establish fisheries co-management elsewhere in Timor-Leste [12]. The managed area covers 225 m² (Figure 2b) and includes a six-month closure targeting fast growing species such as octopus or cuttlefish (153 m²), and a two-year no-take zone (72 m²). Due to the impact of the Covid-19 pandemic the closed area of the LMMA was opened for fishing again on 15th September 2020.

Although the original intention was to establish monitoring prior to management, the community of Fatumeta implemented management rapidly following initial discussions and so monitoring was developed concurrently. A women's representative signed the *Tara Bandu* regulations and the role of the monitoring group was recognised as part of the management structure, alongside the *Tara Bandu* management group. The group members participated in a variety of activities associated with the *Tara Bandu*, see Discussion for more details.

Ma'abat, Manatuto

Ma'abat is one of the *sucos* which make up Manatuto town. Manatuto is the capital of the district of Manatuto, and is a town made up of five *sucos*. Ma'abat *suco* contains 117 households, and comprises two *aldeias*, Ma'abat (31 households) and Soraha (86 households) [21]. Implementing any fisheries management programmes in Manatuto town requires involvement of resource users and stakeholders from several *sucos*, even if the LMMA is within the jurisdiction of one *suco*.

Ma'abat previously had an active LMMA in Lamsana bay but it has since lapsed (for complex reasons beyond the scope of this report) and efforts are underway to revive the management activities. Lamsana bay was selected for marine management because it has ecological and cultural significance (it is considered sacred). Several reef fish species which have previously only been recorded in Indonesia have been recorded there, and the site exhibits high coral diversity, despite the relatively high level of sedimentation and litter there compared to other reefs in Timor-Leste, as well as a Crown-of-Thorns outbreak recorded in 2012 [43].

Blue Ventures became involved in marine management activities in Ma'abat in 2018. Although discussions about reviving the LMMA are ongoing, the complex history of the previous management implementation means that the LMMA has not yet been renewed. Fisheries monitoring was established in Ma'abat in 2019, with group members from Ma'abat and Soraha *aldeias*. The monitoring group members have participated in community meetings about fisheries management, as well as various community outreach activities.

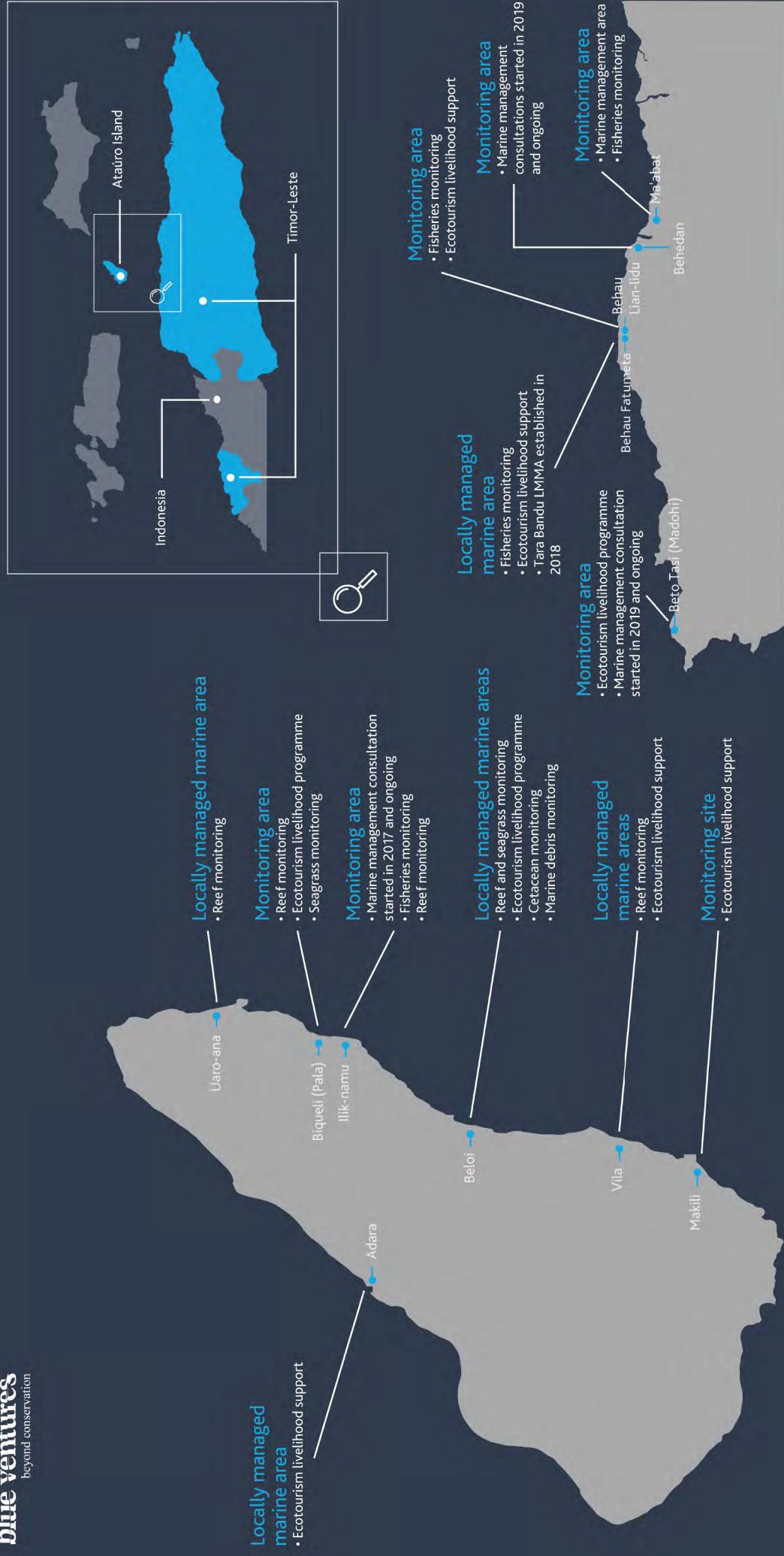


Figure 1: Map of Atauro and the northern coast of Timor-Leste showing Blue Ventures fisheries management and monitoring activities.

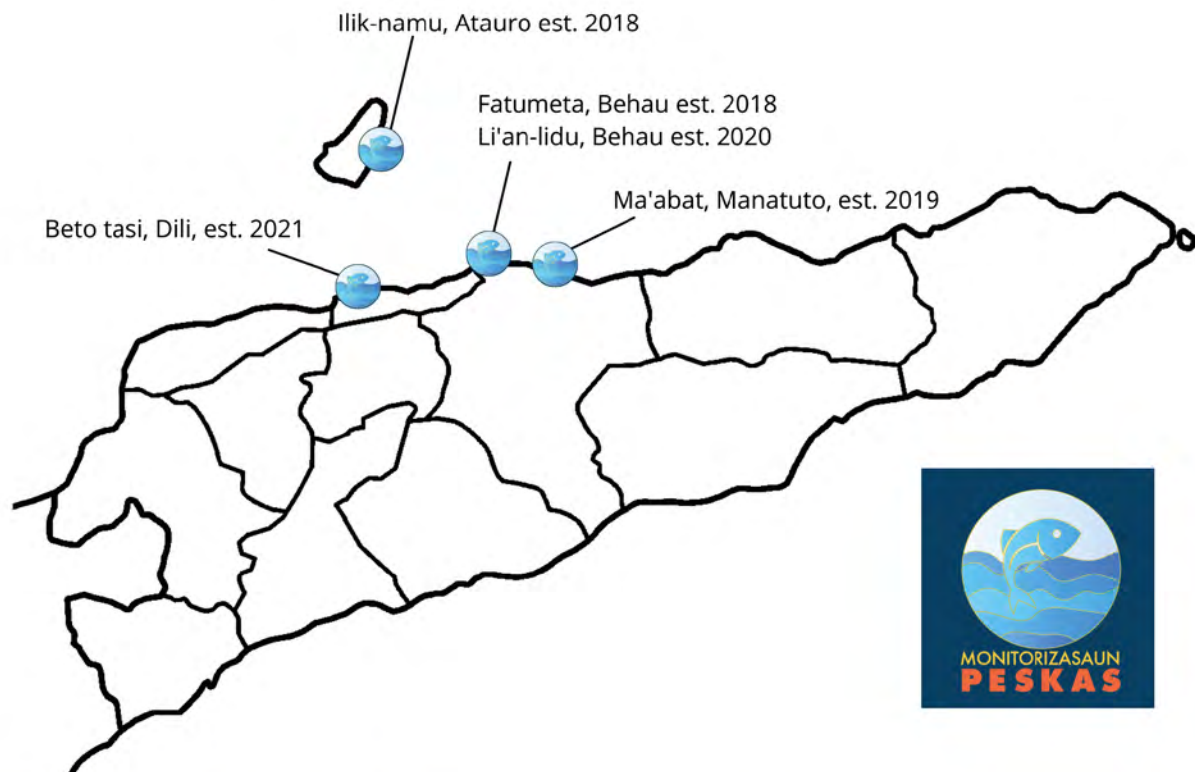
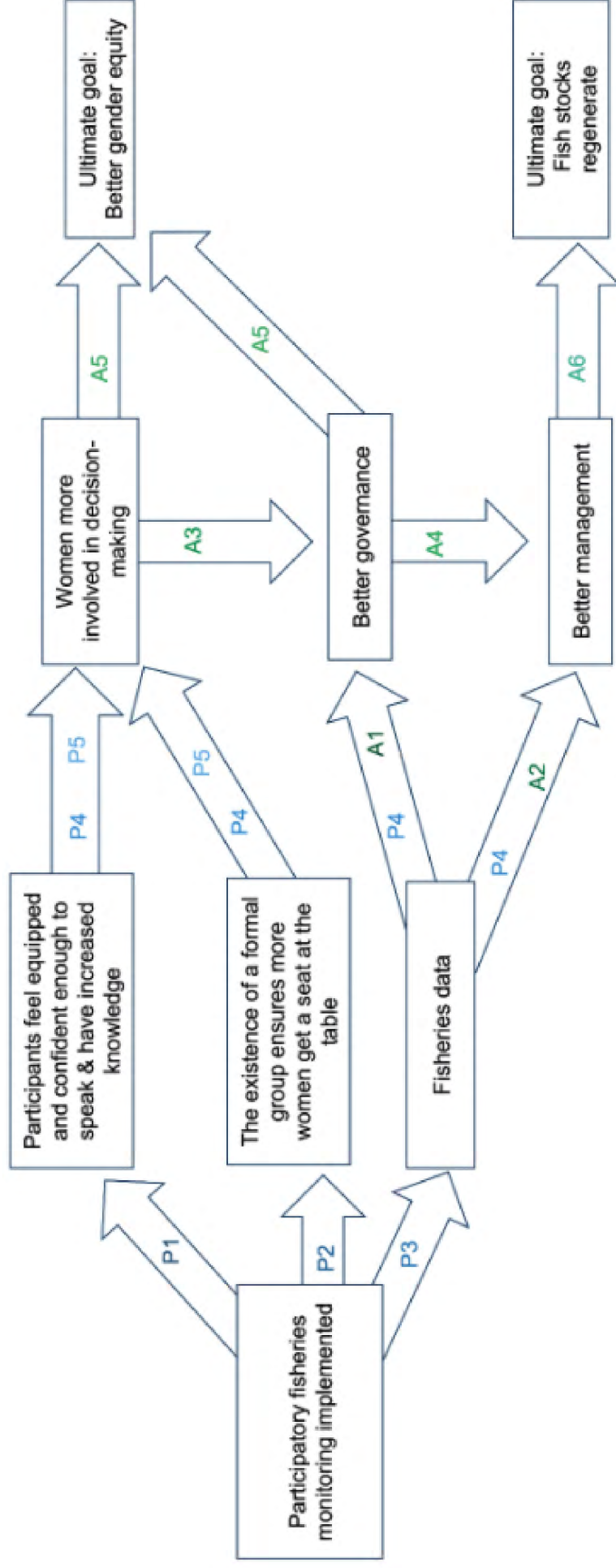


Figure 2a: Map of Timor-Leste (excluding Oecusse) showing the locations and establishment dates of Grupo Monitorizasaun Peskas groups.



Figure 2b: Map of the temporary closure and the no-take zone within the LMMA.



Preconditions

- P1: Training and subsequent activities effectively build relevant skills, knowledge, and confidence. Group members are dedicated and enthusiastic about the programme.
- P2: Social norms and support from community leaders enables women to form a monitoring group and be taken seriously by fishers and other stakeholders.
- P3: Group members can collect the data and enough fishers take part in interviews.
- P4: There is willingness to implement CBFM. CBFM meetings are conducted with enough members of the community and include marginalized people, such as women and youth.
- P5: Wider community and local leaders listen to what the GMP group has to say and incorporate this in future discussions surrounding resource use or CBFM.

Assumptions

- A1: Increased awareness leads to increased understanding and consensus, which results in CBFM being implemented with better governance.
- A2: Catch data means that management can be evidence-based and responsive to changes.
- A3: The wider variety of voices in CBFM improves decision-making and compliance.
- A4: Improved governance results in appropriate and effective management interventions being selected.
- A5: Women's involvement in decision-making results in more equitable regulations regarding resources and activities usually dominated by women, thus ensuring more equitable resource use. As these decisions lead to improved management, women will be taken more seriously and included in future discussions.
- A6: Effective management results in sustainable resource use.

Figure 3: Theory of change for women's community-based fisheries monitoring groups showing key preconditions (P) and assumptions (A).

2.2. Fisheries monitoring group membership

In all three communities, establishing *GMP* groups was discussed in community meetings being held as part of a broader discussion on implementing fisheries management measures. The prerequisites for participation were basic literacy and numeracy skills, speaking Tetun, and having the availability to conduct surveys according to the group's schedule. Obtaining familial support and permission to join the group was raised by several members, however this was not an official prerequisite. Each of the three women's groups had a maximum of eight members in each community. All groups had the support of key community leaders that were interested in marine management, such as the *xefi suco* (village chief) or *xefi aldeia* (sub-village chief), and these leaders were often involved in the participant selection process in various capacities.

The selection of group members was done either through word of mouth or direct invitation, predominantly by 'gate-keepers'. In Ilik-namu, women were invited to an introductory session where they could find out more about the GMP programme and decide if they wanted to join. In Fatumeta and Ma'abat, initial participants were selected via invitation from the *xefi suco* or *xefi aldeia*, as well as by sharing information about the group during CBFM community meetings. Women who attended the introductory sessions were then given the opportunity to choose to become members. The current membership base was composed of women who attended these introductory sessions or those who were later invited by existing members. Group membership changed during the course of the programme as several members left due to pregnancy, lack of availability, moving to a different village or change in employment or education status. In total the groups have had 53 members since the programme's inception, with a maximum of 24 members across 3 groups at any time.

Due to the evidence that mixed gender management groups may produce better conservation outcomes in certain contexts [9], during a training exchange the group members voted on whether to remain a women-only network or to include men in the programme. They voted unanimously to remain a women's-only network.

2.3. Data collection and community engagement

2.3.1. Catch monitoring survey

The GMP members collected data by interviewing local fishers as they return from fishing activities (Figure 4). A smartphone app called Open Data Kit (ODK), was used to conduct the interviews and record data.

These interview questions focus on the fishers, the fishing grounds (locations, Figure 5, and habitats, Figure 6), gear choice, the catch composition and mass, and whether the fish would be sold, (Figure 7). The habitat categories (mangroves, seagrass, reef crest, drop off, outer reef, open water) of the various fishing grounds are shown in Figure 6. However, these habitats did not occur in all of the communities' fishing grounds. The survey could record up to three fishing locations (and corresponding habitats) as well as the fishers' primary, secondary and tertiary gear choice. The questions and response options were adapted to enable the data to be compared directly with the PeskaAS database, e.g. by including the same habitat or gear types. Target species that were identified by the data collectors and fishers (listed in Figure 7), were identified to family level, weighed, and photographed.

The family groupings are guided by colloquial names, rather than taxonomic accuracy. The ways of classifying and naming fish vary throughout Timor-Leste, and these do not necessarily correspond to scientific classifications [25]. For example, fusiliers are often referred to as bainar but bainar mutin can be used to refer to scad, such as *Decapterus* spp (Carangidae), or *Rastrelliger* sp (Scombridae) [10]. Due to the different classifications used by different communities and the local languages, scad are also called salar, ikan layan, mawui, mana'i, and bainar mutin. Due to the likelihood of scad being combined with fusiliers in earlier surveys, we decided to group these fish for analysis. However, they will be analysed separately in the future.

Photographing the fish alongside a tape measure enabled the length of the fish to be measured digitally at a later stage, so this could be used for validation of the data or for subsequent analysis. Remaining fish were weighed all together and recorded as "other". The data was entered into a form in the ODK app and uploaded directly to the server. Most of the group members operated in pairs because it is easier to have one person entering the data and the other taking the photographs and weighing the catch.

A smartphone, phone credit, and transport budget are provided to fulfil the monitoring activities, but the group members take part on a voluntary basis. All equipment was provided by the programme so there was no need for the members to own their own smartphone. In addition to using the smartphones to collect data, Whatsapp groups are used to coordinate group activities, ask questions, and provide updates.



Figure 4: A data collector interviews a fisher about her catch and collects data by photographing and weighing the fish.

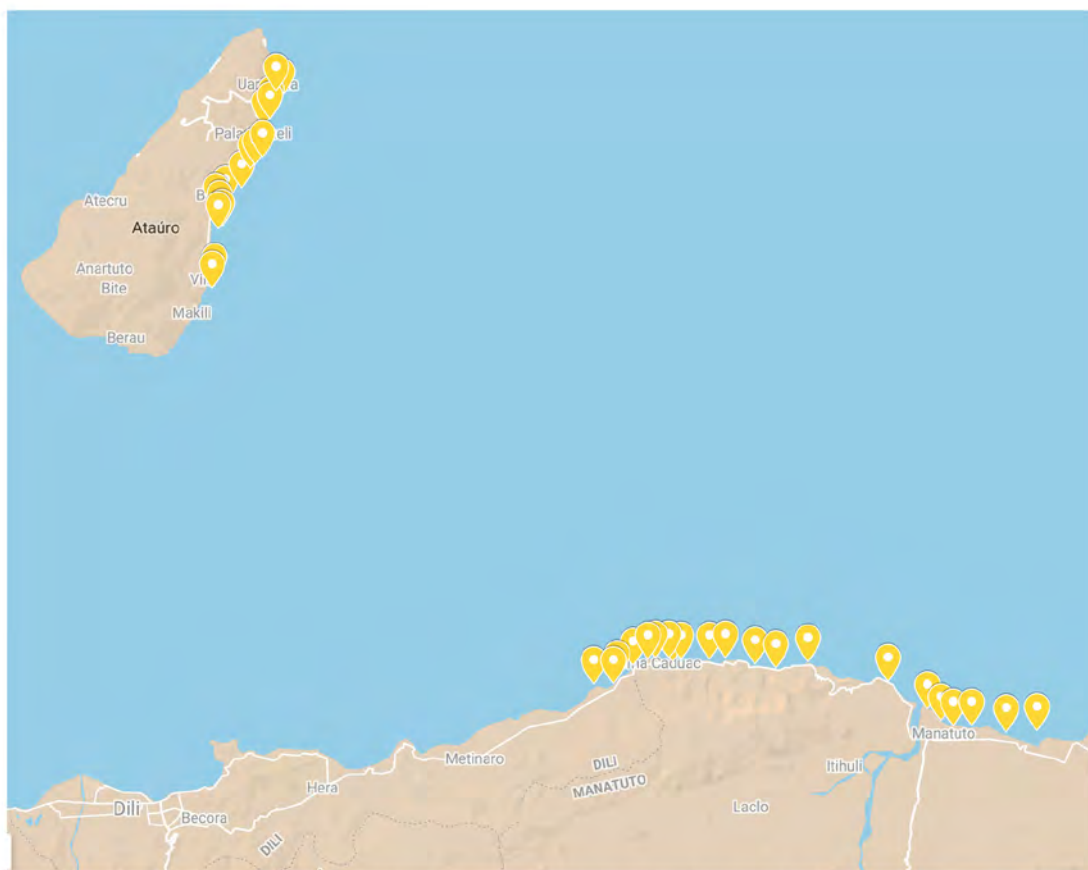


Figure 5: Fishing locations included in the survey by group members and fishers.

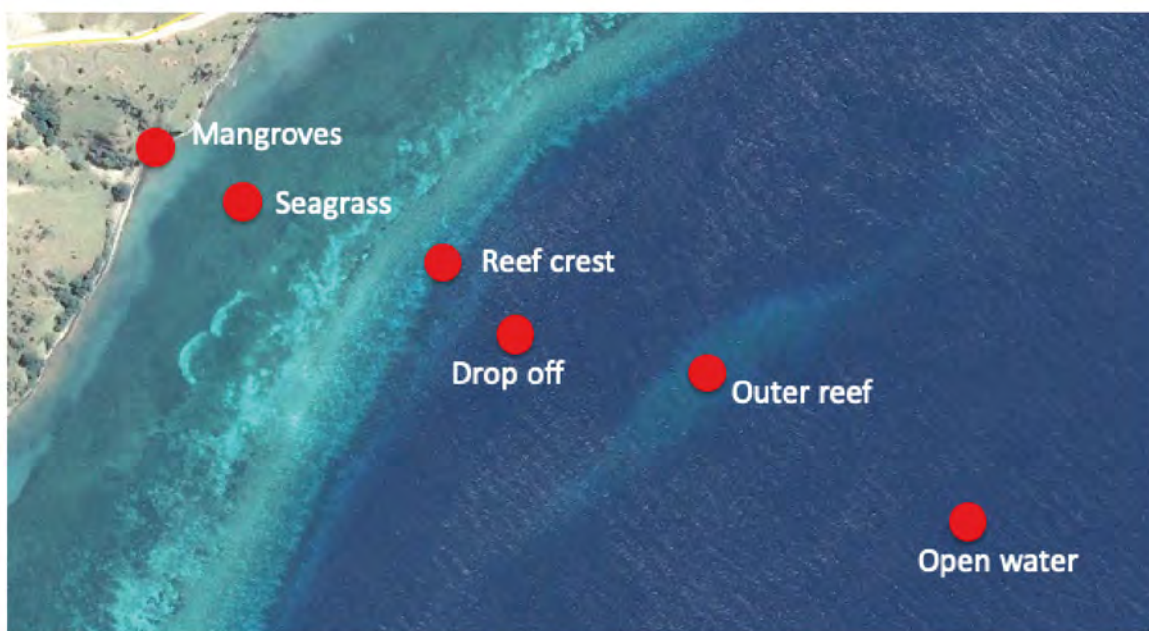


Figure 6: Fishing ground habitat choices are mangroves, seagrass, reef crest, drop off, outer reef, open water and traditional or modern Fish Aggregating Devices (FADs). These habitats do not occur in every community's fishing grounds. These habitat names are provided in local languages in the ODK form to avoid confusion.

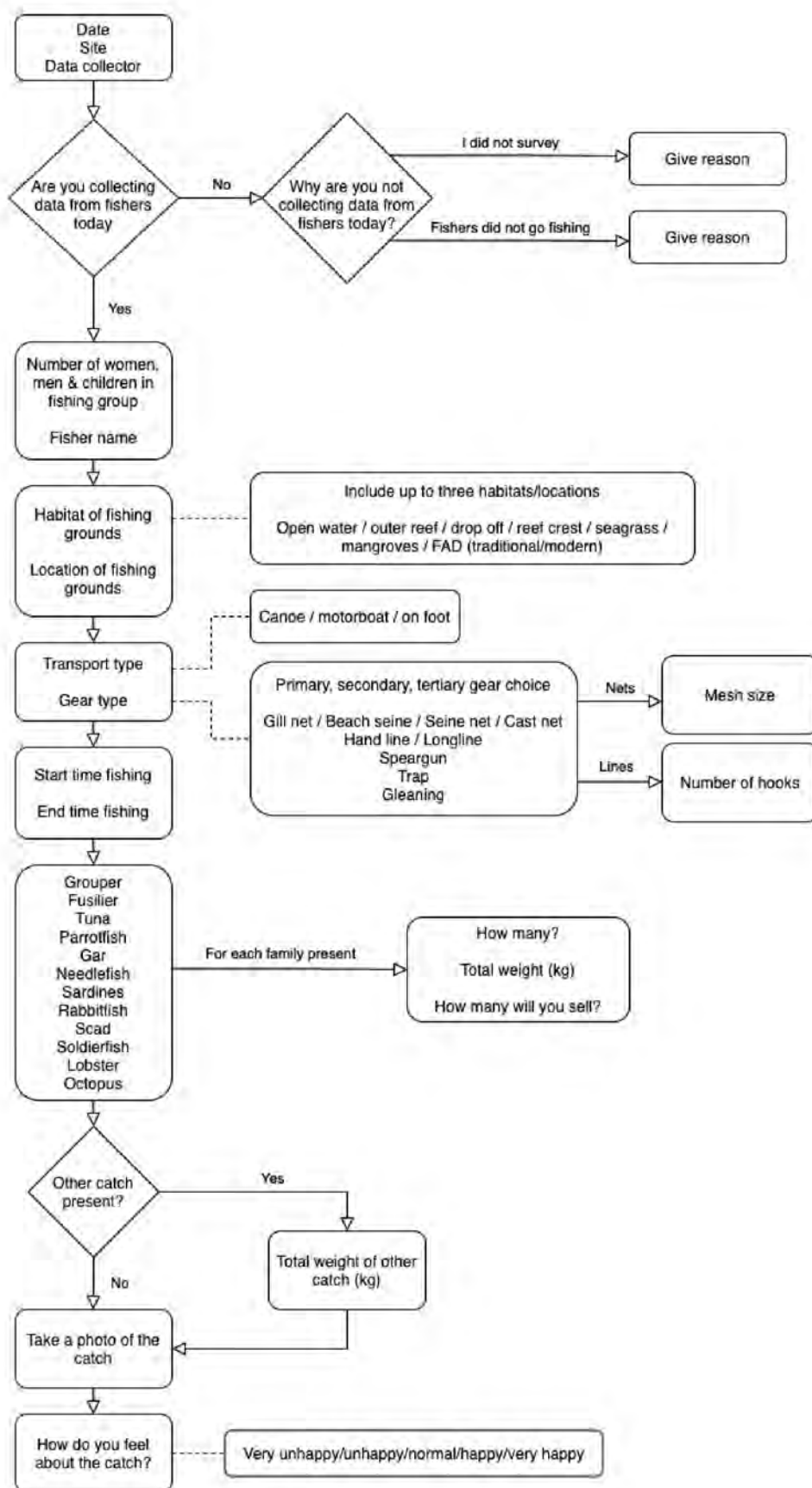


Figure 7: Flow chart showing the data collected in the ODK form. Rounded rectangles indicate the information being sought, diamonds indicate binary choice questions, dotted lines indicate response options.

2.3.2. Monitoring effort

The monitoring effort has varied considerably since GMP was established in 2018 (Table 1). In 2018 two groups were established and they provided a total of 123 data entries (86 catch surveys). In 2019 a third group, Ma'abat, began collecting data and together they conducted 445 catch surveys (626 data entries total). The number of catch surveys was determined by the level of fishing activity in each community, as well as the capacity of each monitoring group to do data collection. Data were entered according to the survey schedule so the discrepancy between the number of data entries and catch surveys reflects the days when data collectors were unable to conduct catch surveys for personal reasons (i.e. illness or family commitments), or because fishing activities were not taking place, e.g. due to rough seas or cultural activities. Due to the restrictions caused by the Covid-19 pandemic, monitoring effort and fishing activities declined in 2020, resulting in a total of 429 data entries, of which only 289 were catch surveys. The GMP members produced an average of 34.7 data entries per person per annum in 2019, and 24.8 in 2020.

Table 1: Data collection of the three monitoring groups from 2018-2020. If the data collectors were scheduled to do a survey but were unable to complete the survey, they documented the reason (e.g. Covid restrictions, community activities or illness).

	Ilik-namu, Atauro			Fatumeta, Behau			Ma'abat, Manatuto	
	2018	2019	2020	2018	2019	2020	2019	2020
Catch surveys	44	168	143	42	53	64	224	82
No catch data	24	90	93	13	49	10	42	37

2.3.3. Co-design and community feedback

An adaptive co-design process was used to develop and refine the catch survey method. The co-design process was conducted in conjunction with group training sessions and community meetings. Several training sessions were held at the start of each new group and then every 1-2 months (depending on Covid-19 restrictions). Each group established their own monitoring schedule, based on the geographic area they are aiming to cover and the time they have available. Given the programme aims, certainty of the data was prioritised over the level of detail. For example, it was decided to identify fish to family level instead of species level. Fish were only identified if they were target families which were identified by the group members and fishers as being the most important. The survey was refined after each new group was established to ensure that the target fish families remained relevant, and the monitoring continued to address the priorities of local community members.

Prior to February 2019 the target families were fusilier, grouper, lobster, octopus, parrotfish and tuna. Given the different target families in Fatumeta and Ma'abat, gar, scad, needlefish, rabbitfish, sardines and soldierfish were added. During these discussions, the group members and fishers decided which fishing locations should be included in the form, see Figure 4. The group members also decided that they preferred an app with words instead of icons, and the questions were translated from Tetun into local languages as needed. Some of the response options were modified to make them compatible with the categories used in the PeskAAS database, for example habitats and gear choices.

The results of the fisheries monitoring are presented during community meetings to the wider community on a regular basis. Usually, these meetings are open to people from the communities that participate in the monitoring or management activities, but sometimes larger meetings are held. For example, several sessions have been held which were open to all Atauro *Tara Bandu* committee members. These sessions are used as an opportunity to discuss implications for management and to obtain feedback for refining the data collection. These sessions also show recognition of the communities' ownership of the data, build trust, improve data validation and provide necessary contextual information for interpreting the data [46]. The participation of fishers and the support of community leaders are essential for data collection, so feedback sessions allow them to see where the data end up and how they can utilise them within their own community. This is an important part of ensuring their continued support for the programme.

The results of monitoring are presented as posters, which can be displayed in the *sede suco* (village office) after the session, and as spoken presentations, (Figure 8). These methods are often combined with videos and 360° virtual reality headsets which are used to show people what the coral reef habitat looks like in Timor-Leste, see Figure 8B. These methods help people to develop a more holistic understanding of fisheries management, by considering the habitats which support their fisheries. More information on our participatory and adaptive approach to data feedback can be found in Blue Ventures toolkit on community engagement with data [46].



Figure 8: A) a poster showing data about fishing activities is presented to a group of fishers in Ma'abat, Manatuto, B) The xefi suco (village chief) views coral reefs using a virtual reality headset, whilst waiting to begin a data feedback meeting.

2.4. Analysis

The data was uploaded to the Blue Ventures Open Data Kit server when the data collectors had internet access. These data were automatically published to a google sheet, where they could be reviewed and edited by Blue Ventures staff. These data were then cleaned in Tableau Prep Builder and analysed in Tableau Desktop. The data were cleaned to remove errors and to combine data from multiple form versions accurately. For example, duplicate surveys were often uploaded when the internet signal was poor. Catch Per Unit Effort (CPUE) was calculated as the average total catch (in kilograms), brought in by one fisher, in one fishing trip. Given the restrictions on fishing activities that were in place during the Covid-19 pandemic in 2020, it was not appropriate to associate changes in CPUE or the level of fishing activity with changes in the fish stocks. As such, this report serves to provide a baseline and characterisation of the fisheries rather than identify any trends in fish abundance or activity.

3. Preliminary results

3.1. Characterising fisheries

Although the goal of the GMP is to develop a long-term fisheries monitoring programme which will enable resource users to identify changes within their fisheries, the preliminary findings reported here are only sufficient to characterise the fisheries and provide a baseline for future analysis. Since 2018, 820 catch surveys have been completed across the three communities. However, there is limited data on seasonality because data was only collected throughout the entirety of 2019. In 2018, the groups were still undertaking training and in 2020 the Covid-19 restrictions limited fishing and data collection activities.

3.1.1. Habitat and gear choice

Gear selection is based on a variety of factors, such as the target fish species and fishing grounds. Habitat choice and gear selection are correlated because certain gears are selected for use in particular habitats. For example, cast nets were almost always deployed on foot, so they were mainly reported in the seagrass.

Not all of the habitats are present at each site, for example mangroves and outer reefs (this refers to barrier reefs beyond the fringing reef crest, as shown in Figure 6) are not easily accessible from all of the communities so the number of trips to those habitats is very low (Figure 9)⁷. Fishers in all three communities use a variety of fishing gears across multiple habitat types. More than one gear type was combined on 10.4% of trips. Across all three communities, gill nets were the most widely used gear (64.7% of trips) and were used in combination with a speargun for 11.6% of those trips (Figure 9). Mesh sizes of all fishing nets ranged from 1-3 inches, and in line fishing, the number of hooks used were between 1-36 hooks. Women and men predominantly fished alone or in small groups of two or three. However, men did also operate in larger groups. In Fatumeta and Ma'abat the largest fishing group consisted of 6 men, but in Ilik-namu, the maximum number of men was 71. This was due to the larger fishing vessels and longer fishing trips.

The fishing activities in Ilik-namu are the most varied, with fishing activities taking place fairly consistently across all available habitat types and several gears being commonly used (Figure 9). Seagrass and coral reefs (crest and outer reef, Figure 7) are the most visited habitats for fishing. In Ilik-namu, the most widely used gears are gill net and speargun⁸, and many fishers also report using compressors in conjunction with these gears. 37% of fishing trips in Ilik-namu involved compressors. Men reported using all the gear types, but women only used gleaning (harvesting by hand or with spears and other tools), hand line or traps. In Fatumeta, the reef crest and drop off are the most visited habitats, and gill nets are the most common gear, (Figure 9). Men used all forms of nets as well as longline, hand line, spearguns and gleaning, but women only reported using beach seines, seine nets, gleaning and speargun.

In Ma'abat, most fishing activities occur in open water, with the reef crest being the second most frequented habitat. In open water, gill nets and hand lines are the most utilised gears but at the reef crest seine nets are the primary gear. Women's fishing activities were least reported in Ma'abat. Overall, women's fishing activities were most common in the seagrass and reef crest, but they also utilise fishing grounds in the open water and drop off areas.

3.1.2. Catch per unit effort and total reported catch

The most frequented habitats for fishing trips (Figure 9) are not the ones with the highest catch per unit effort (CPUE), although they do make relatively high contributions to the total catch (Figure 10). Low catches in certain habitats which receive many visits may be an indicator of overfishing, but it may also be a reflection of variations in fishing strategy.

⁷ The response options for habitat and gear choice were designed to be comparable with the PeskaAS database. However, future iterations of the survey will ensure the habitats and gears selected during gleaning will be included.

⁸ The widespread use of spearguns in Ilik-namu compared with the other locations, could be due to the lack of saltwater crocodiles in Atauro, making these fishing activities much safer than elsewhere in Timor-Leste.

For example, if fishers have certain areas that they target when they have limited time or only want a small amount of fish. More detailed analysis is needed to explore this issue further.

In Fatumeta the reef crest is the source of almost 40% of the catch, but the CPUE is highest in the open water⁹. In Ilik-namu and Ma'abat the open water contributes the highest proportion of the surveyed catch. The CPUE in Ilik-namu is highest in the open water but in Ma'abat it is highest on the reef crest. The high CPUE and percentage of total catch in the open water in Ilik-namu, is due to the large catches of fusiliers and scad. Ma'abat has the greatest reliance on one habitat type, with over 60% of trips targeting the open water (Figure 10). Pelagic, coral reef (reef crest and outer reef) and seagrass ecosystems contribute considerably to the total reported catch (Figure 10), but the relative importance of these habitats varies depending on the topography and fishing activities in each community. These findings reinforce the importance of taking a holistic approach and including different ecosystems in fisheries management, rather than limiting management measures to coral reefs.

Gill nets, followed by spearfishing were the most commonly used fishing gear with the highest percentage of reported catch across all three communities. (Figure 11). In Fatumeta long lines (16.5 kg/trip/fisher), cast nets (10.7 kg/trip/fisher) and spearguns (6.2 kg/trip/fisher) had the highest CPUE. The CPUE of cast nets was high because of their effective use for catching sardines in the seagrass. In Ilik-namu the CPUE was less variable between the different gears but seine nets (4.2 kg/trip/fisher), spearguns (3.8 kg/trip/fisher) and gill nets (3.4 kg/trip/fisher) had the highest CPUE. In Ma'abat, the CPUE for gill nets (2.6 kg/trip/fisher) was marginally higher than other gear, although they all had relatively consistent CPUE. CPUE increased each year in Fatumeta (Figure 12). In Atauro and Manatuto, CPUE was highest in 2019, but dropped in 2020, as did the number of fishing trips. It is likely that these changes are the result of the Covid restrictions, which limited the use of fishing techniques requiring large groups and/or fishing grounds which require longer trips [47].

3.1.3. Catch composition

When catches are combined across gears and habitats, particular families dominate the catch. Fusilier and scad were combined due to issues with naming and classification, for more details see the section on challenges and limitations. Overall, fusilier and scad made up almost 50% of the catch, (Figure 13). This finding emphasises the importance of considering fisheries management interventions which apply to pelagic species, rather than only focusing on local closures of coral reef fishing grounds.

⁹ It is likely that fishers prefer fishing on the reef despite the lower CPUE, because it is more accessible in small boats and the certainty of catching something is high.

The second most dominant category is the non-target families. Due to the survey methodology, it is not possible to determine whether there are particular families dominating this unspecified catch. However, discussions with data collectors and fishers in the three communities suggest this is unlikely. The findings shown in Figure 13 are fairly consistent with fisher knowledge that has been published previously, and that data suggests that snapper, flying fish, and trevally could be useful additions to the target families list used in this programme [10]. Octopus contributes almost 10% of the catch, and reef fishes such as parrotfish and rabbitfish are the next most prevalent. This suggests that local scale management interventions can still have a considerable impact on catches in the future.

Fusiliers and scad are the most dominant target family in the reported catch in Fatumeta and Ilik-namu (Figure 14), although Fatumeta also had a high proportion of non-target families present. In Ma'abat, rabbitfish and non-target families were the biggest catches. Ma'abat has the highest proportion of catch which was not identified to family level (Figure 14).

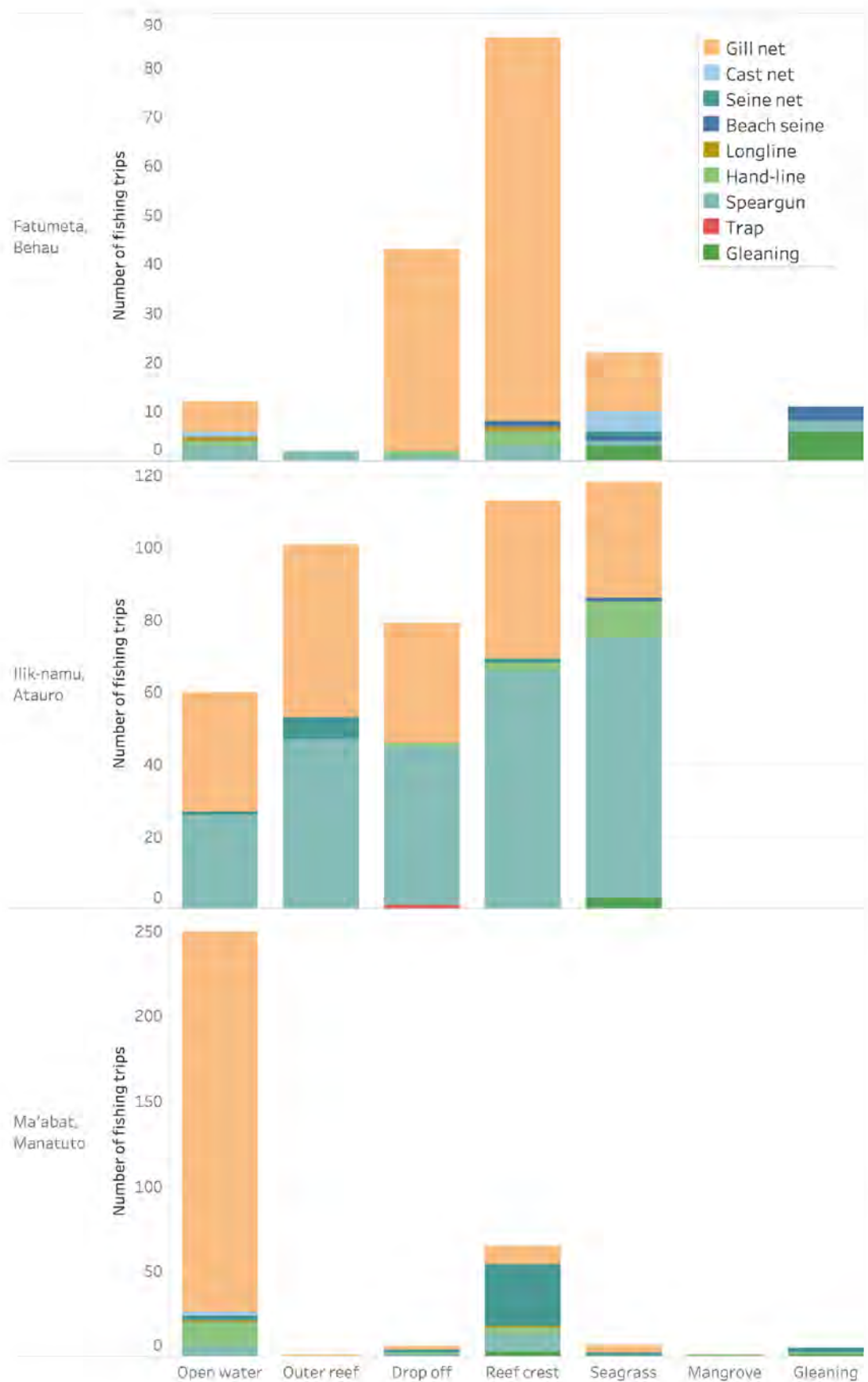


Figure 9: Use of different fishing gears at different habitats in each community.

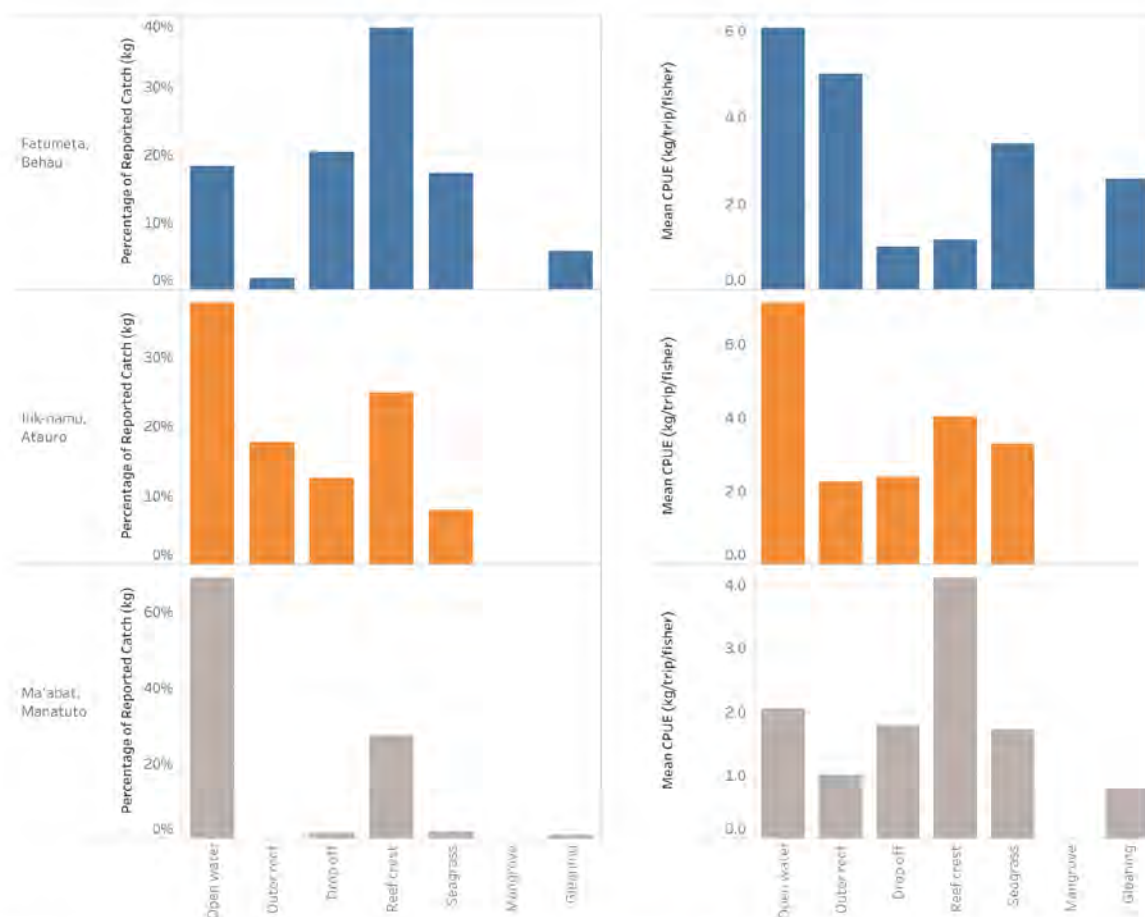


Figure 10: The percentage of the total reported catch caught in each habitat in the three communities, and the mean CPUE (kg per fisher per trip) within each habitat for each community.

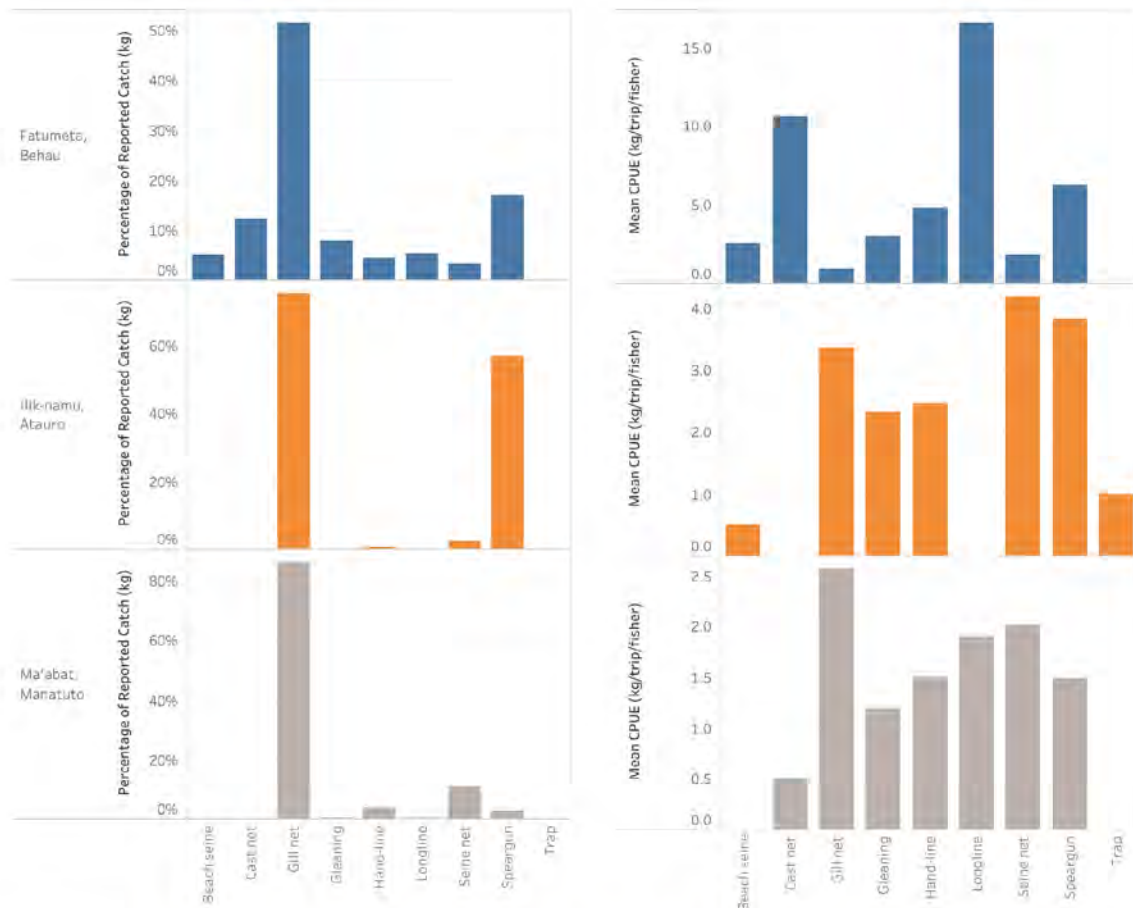


Figure 11: The percentage of the total reported catch caught with each gear in the three communities, and the mean CPUE (kg per fisher per trip) for each gear for each community.

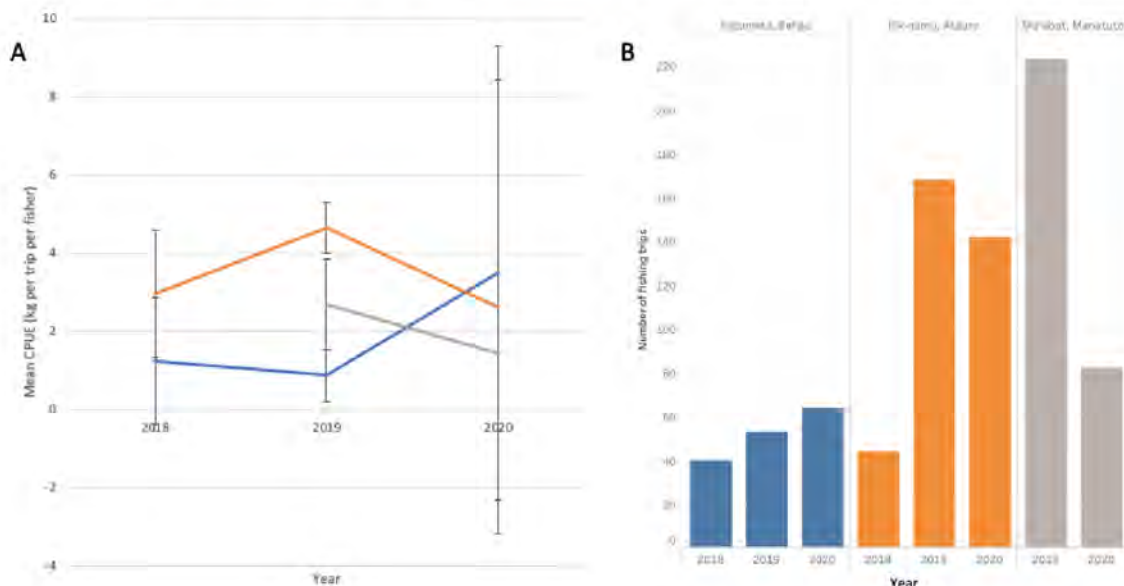


Figure 12: A- Mean CPUE and standard deviation (kg per trip per fisher) and B -number of fishing trips surveyed in Fatumeta (blue), Ilik-namu (orange) and Ma'abat (grey). Management was implemented in Fatumeta in 2018 but Ilik-namu and Ma'abat do not have LMMAs.

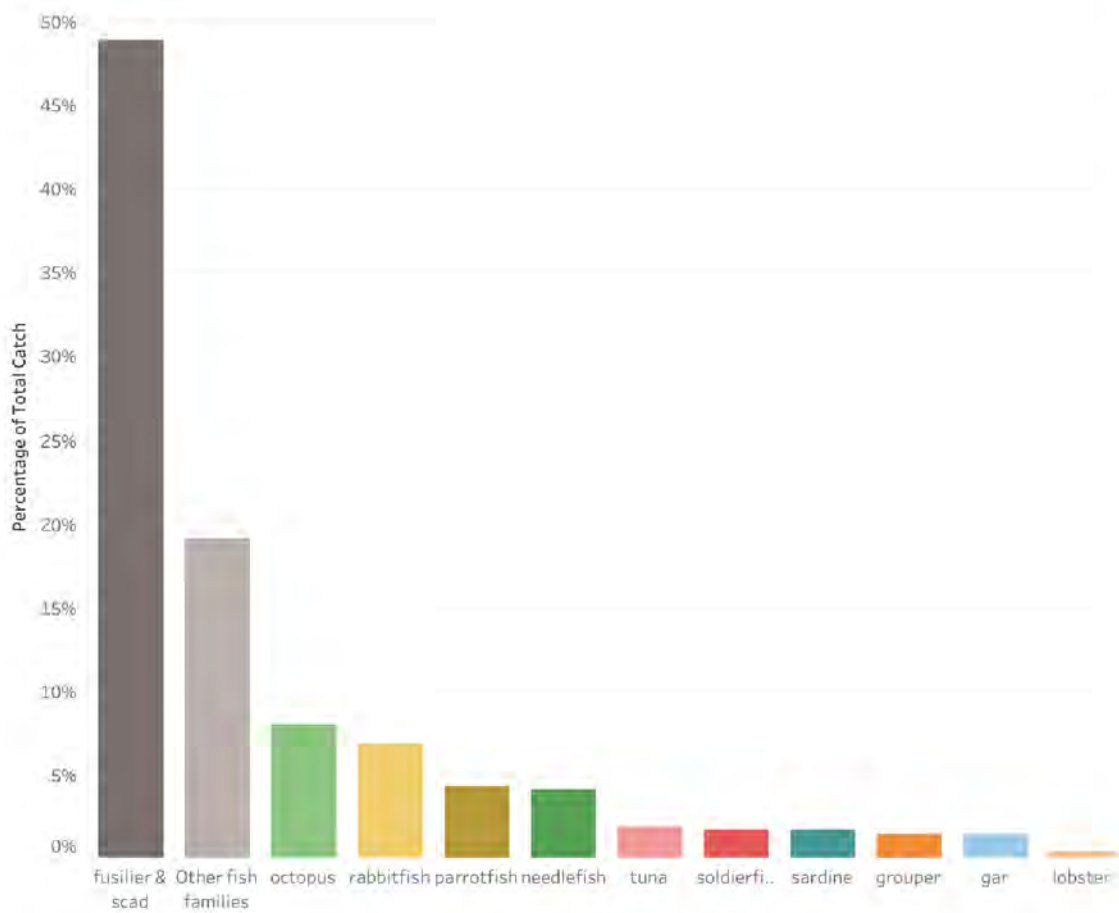


Figure 13: Percentage of total reported catch (kg) made up of target and non-target fish families.

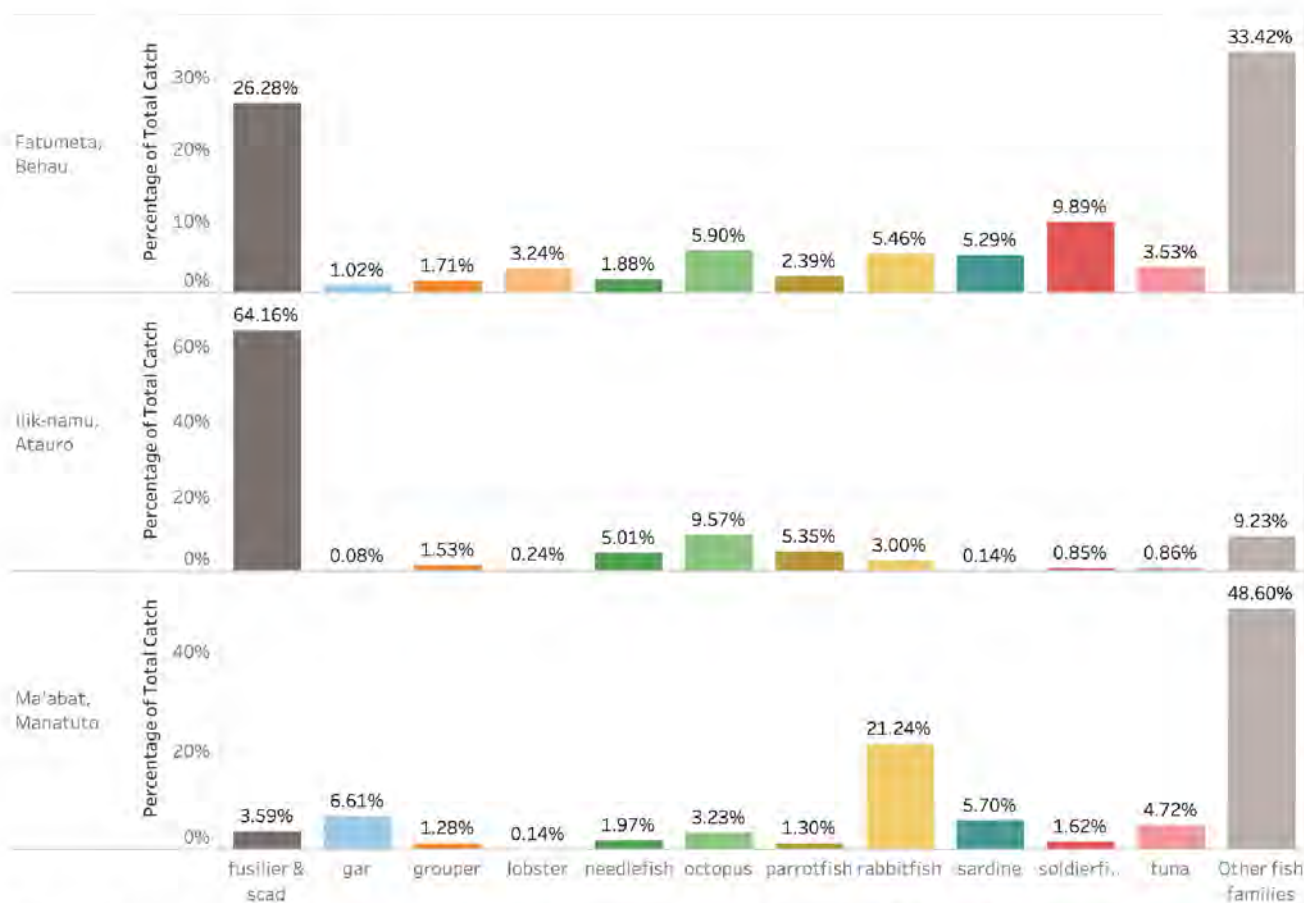


Figure 14: Percentage of total reported catch (kg) made up of target and non-target fish families within each community.

4. Discussion

4.1. Monitoring data and implications for management

Data feedback sessions create an opportunity to discuss different aspects of marine management and identify areas of concern. Monitoring data enables communities to characterise their fisheries, which can challenge assumptions and perceptions. These insights can then be used to inform marine management. For example, during the consultations in Ilik-namu octopus was not considered to be a very important fishery. However, monitoring results show that it is significant for many fishers, with some primarily targeting octopus. In Fatumeta the decision was made to implement closures on two time scales, with one area targeting fast growing species such as octopus, and the other aimed at reef fish. The monitoring results suggest that a similar strategy could be appropriate for Ilik-namu, despite this option being dismissed initially. The data from the monitoring programme helps to quantify the relative importance of different target fish families and this can be used when selecting management priorities in the future.

Just as the data can be used to identify priorities for management, monitoring results also allow evaluation of management measures. In Ilik-namu and Ma'abat monitoring was implemented during initial discussions about implementing an LMMA. In these cases, there is potential for existing data to provide a baseline for evaluating future management. In contrast, the community of Fatumeta had already decided to implement a temporary closure when the monitoring group there was established. As a result, there was not sufficient data to make a direct comparison before and after the management was implemented. However, a decision was made to open the area to fishing during the Covid-19 lockdown period so the data can be used to identify fishing trends while the management has been in place and afterwards. The situation in Fatumeta shows how other factors are being used to make management decisions. Although livelihood concerns and other social issues are valid factors in decision-making, it is hoped that data from monitoring can also be used to inform future decisions about when to open and close the fishing areas.

The meetings are also an opportunity to identify gaps in the monitoring or management. For example, fishers in Atauro raised concerns about sea urchins (*Diadema* sp.) which they observed to be overgrazing seagrass meadows and, as a result, impacting the habitat available for juvenile fish. In Manatuto, a high percentage of the catch was not identified because it was not part of the target families in the survey. This was discussed during a community meeting, but fishers did not identify additional families which should be included. They stated that there were no other species which they considered particularly significant, so total catch was the most interesting aspect of the data for them. However, it was agreed that additional species or families of interest could be included in the future.

In several communities, people discussed the fact that fishers from several communities are targeting the same fishing grounds. Therefore, it was suggested that consultations and feedback about marine management should be extended beyond the communities, or administrative units, which are implementing the management interventions. For example, fishers from several nearby communities use fishing grounds that are managed by the Fatumeta *Tara Bandu* management group, so it is important that they understand the management measure in place. Another example is that fishers from Manatuto all fish in the same areas but the management being proposed is under the jurisdiction of Ma'abat *suco*, so it is important to ensure that people from other parts of Manatuto are informed and have the opportunity to voice their opinions, otherwise this can become a source of conflict. In contrast, some people have raised concerns about compliance by fishers from other locations. The findings from the monitoring programme are useful, but the discussions that take place at data feedback meetings are also an opportunity to integrate local knowledge and fishers observations into management decision-making.

4.2. Creating pathways for women's participation in CBFM

According to the theory of change (Figure 3), there are several aspects of the programme which may contribute to the goal of improving gender equity. Firstly, the programme creates opportunities for learning and capacity building. Secondly, the monitoring group role within CBFM provides an entry point for women to participate in other management activities. Thirdly, it is hoped that increased diversity of voices in decision-making will result in improved governance, resulting in more equitable decisions. Although a more thorough evaluation of the programme is needed to understand the social processes which are occurring, we will report some activities which relate to these three topics.

Learning and capacity building has been integral to the programme design from the beginning. In addition to the training required to learn how to conduct catch surveys, training sessions have also focussed on communication, leadership, public speaking, and teamwork skills. They have also covered more fisheries specific topics such as marine conservation, understanding the perspectives of different stakeholders and data literacy. These training sessions are often integrated into the regular meetings with Blue Ventures staff, which also provide an opportunity to address any issues regarding the catch data. However, exchanges between the *GMP* groups, or between *GMP* and other CBFM groups have also been a valuable tool for peer-to-peer learning, relationship building and peer support. The Ilik-namu group, which is the longest running group, also attended first aid and emergency obstetrics training with another organisation and participated in the Timor-Leste Food Innovation Exchange with Agora Food Studio (Table 2). Although these activities often include technical learning objectives, the importance of building confidence as individuals and as a team cannot be underestimated.

Several group members have stated that the opportunity to learn new things is what attracted them to participating in the programme originally. An Ilik-namu group member stated, *“we want to learn about new things, help our community and keep developing in the future. We were surprised when this opportunity came along but doing this work makes us happy.”*

Table 2: Events and exchanges involving Grupu Monitorizasaun Peskas, excluding regular group meetings.

Date	Activity	Participants	External partners
	First aid & emergency obstetrics training	Ilik-namu GMP	Australian universities & NGOs at Barry's Place
10/8/18	Exchange in Fatumeta - initial training for Fatumeta group and additional skill development for Iliknamu group	Ilik-namu and Fatumeta GMP	
17-18/9/18	Food Innovation Exchange (TL-FIX) in Biqueli	Ilik-namu GMP, Atauro Homestay Association, community groups	Agora Food Studio
15/10/18	Women Fishers Forum	Representatives from Ilik-namu and Fatumeta GMP	MAP & Worldfish
14/11/18	Coral Triangle homestay exchange in Beloi	Members of Ilik-namu GMP	73-ltd & WWF
16/10/2019 & 30/10/19	Community-based Ecotourism Workshop	Fishers, Ilik-namu GMP, Atauro Homestay Association members	Prof Karen Edyvane
4-6/07/2019	GMP Exchange in Atauro	All fisheries monitoring groups	Marie Stopes
7-8/11/2019	Movie night & data sharing meeting	Ma'abat GMP, fishers, community members and leaders	
30/1/2020 7/2/2020	Data literacy training: Fatumeta Ilik-namu	Ilik-namu and Fatumeta GMP	
18/9/2020	Beto Tasi Homestay visit Atauro	Representatives of Iliknamu GMP	
9-11/12/2020	Workshop to establish Beto Tasi & Li'an-lidu monitoring groups	Fatumeta, Li'an-lidu & Beto Tasi GMP	
18/12/2020	Covid impact infographic sharing with community - Biqueli	Local leaders from Atauro, Iliknamu GMP, various community groups	
24-26/2/2021	Fisheries management exchange in Beto Tasi, including data literacy training	All fisheries monitoring groups, fisheries management groups, homestay associations, local leaders	
1/3/2021	Manatuto community meeting	Ma'abat GMP, community members, local leaders, students	MAP, NGOs working locally

GMP groups participate in other aspects of CBFM in various ways. For example, they regularly participate in community meetings and data feedback sessions where they speak about their work and survey results are presented. Group members are regularly speaking with fishers about the programme and sharing information about monitoring or learning from the fishers directly. Through the programme, the members have learned more about fisheries management options and become passionate about implementing them in their communities, for example a participant from Ilik-namu said, *“the older generation don't want the Tara Bandu because they are thinking about today, we young people want the Tara Bandu because we are thinking about the future”*. Another woman said, *“Having CBFM is important because I want my children and grandchildren to always have fish like I can see in the sea now. I don't want it to be lost in the future.”*

In Fatumeta, where the community has implemented a *Tara Bandu* for fisheries management, the group members helped to make markers for the managed area and the role of the group was recognised in the management structure, alongside the management group. The regulations were signed by a women's representative but not a representative from the monitoring group. The Ilik-namu group took part in the pre-consultations for the National Fisheries Strategy in Biqueli, see Figure 15A, ensuring that there was an entire focus group discussion about women's perspectives. Representatives of the Fatumeta and Ilik-namu groups also participated in the Women Fishers Forum in Dili on the 15th of September 2018 (Figure 15B), and Blue Ventures staff gave a presentation about the programme. The programme has also been presented at the Timor-Leste Studies Association conference and international conferences in Thailand (7th Global Symposium on Gender in Aquaculture and Fisheries) and South Africa (ICT4Fisheries in Practice, a conference about using information and communications technology within the fisheries sector).



Figure 15A) Ilik-namu fisheries monitoring group participating in a focus group discussion at the Biqueli pre-consultation for the National Fisheries Strategy. Figure 15B) A representative of the Ilik-namu group presents at the Women Fishers Forum, Dili.

4.3. Challenges and limitations

The group members and Blue Ventures support staff have learned many lessons over the course of this programme. The skills and confidence which the *GMP* members possessed when they first joined the programme should not be considered a challenge or limitation because providing the necessary skills is an integral part of the programme design. Therefore, the challenges and limitations can be attributed to three areas; data collection, governance and local leadership, and impacts of Covid-19.

Many issues with the data collection or survey form could be resolved by receiving feedback from the group members, reviewing the data and editing the ODK forms accordingly. However, there are a few limitations or challenges which have not been as easy to resolve. Unfortunately, women's fishing activities are underrepresented in the results. There are few surveys with female fishers, but this is not consistent with anecdotal evidence from the data collectors or the academic literature, which shows the importance of gleaning and other fishing activities for Timorese women.

One reason for poor representation of gleaning is the lack of clarity about how to record it in the ODK form, and the fact that gleaning is often not considered to be a form of fishing. For example, “on foot” is listed as a transport type and gleaning is also listed within the habitat and gear choices, so activities that could be considered gleaning can be entered in several different ways, making it difficult to analyse. Furthermore, the survey schedule and questions were developed to primarily address non-gleaning activities and some of the questions are not relevant for gleaning, e.g. the only relevant target species is octopus.

An additional challenge is identifying and naming fish families. The form was updated to include local names and notes about classification as the target families changed. It is important to revisit this issue as new members and communities join the programme. Hunnam et al [25] have shown, through their work on sardines in Timor-Leste, that additional research is needed to achieve accurate naming and classification of fish species in monitoring programmes which rely on translating local fish names into English or scientific names. Rather than forcing data to be selected according to Western scientific classifications, it is more important to present data in ways that will be useful for those making management decisions.

The relationship with community leaders has been extremely important at each site. Having the support of *xefi aldeia* or *xefi suco* is essential when establishing the group so maintaining these relationships has been prioritised. However, if we totally rely on the *xefi* and they take an approach that is not in line with Blue Ventures values then this can cause problems. For example, the people who came to the first group meeting at one site were only there because the *xefi* told them to participate and they were not aware of the nature of the programme. In one community, a *xefi* was against the programme because he thought the group members were being paid, but he became more positive after he realised they are volunteers. Good communication is important to avoid misunderstandings and potential conflict. Working with the *xefi* can be valuable, but it is also important to have independent relationships in each community. Similarly, good relationships with fishers are essential to the smooth running of the programme. As a member of the Ilik-namu group explains in Figure 16, it takes some time to cultivate this relationship. Without these relationships, there is no way to translate the results of monitoring with the management decision-making process. Once community leaders and fishers were able to build a relationship with the programme and understand where the data are going, they are more engaged with the process. Furthermore, understanding data and how to use it can be a challenge for many people. As a result, data literacy training has been undertaken with monitoring groups and *Tara Bandu* management groups.

At the time of writing, July 2021, Timor-Leste is in lockdown due to the Covid-19 pandemic. As a result, fishing activities and monitoring surveys have been disrupted, and training activities have ceased. In order to keep skills fresh and communication open, the WhatsApp group chats were used to share support, updates, information related to Covid-19, and quizzes between the members (Figure 17). Some data collectors continue to conduct surveys with members of their own households. Interviews were conducted with some group members to collect data on the impact that the restrictions have had on their communities [47].

"Iha biban ida nee, hau hakarak konta historia ka esperensia tuir serbisu voluntariu iha CFM. Primeiro hetan informasaun husi CFM hau senti kontenti tebes tamba feto mos bele envolve iha atividade peska nian. Liu husi atividade nee bele aumenta hau nia Esperensia, kapasidade no valor nuudar feto iha sociedade nia leet.

Parte seluk mos hau senti tauk! Primeira vez hasoru malu/halo komunikasaun ho peskador banhira ami koleta dados. ho Razaun tamba peskador sira seidak hatene ami nia serbisu ida ne sai impaktu iha ami nia prezensa ho peskador sira.

Maibe ami nafatin esforsu hodi atinji ami nia objetivu.liu husi ami nia hamutuk, parsensia ho domin hakarak muda no desenvolve ami nia fatin ho Rikusoin nebe iha, ami koko hakbesik ba peskador sira atu esplika klaru atividade nebe ami hala'o lori benefisiu nebe diak.

No agora ami senti la tauk ona bainhira koleta dados tmba ami iha komunikasaun nebe diak ho comunidade sira hodi proteje ami nia Rikusoin.

Agradese ba Ekipa CFM iha hanoin no planu nebe diak."

"At this time, I would like to share my story and experience of volunteering in the CFM group. When I first heard about CFM, I felt happy because women can also be involved in fisheries activities. Through these activities I was able to gain new experiences, build my capacity and the value of women in society.

On the other hand, I was also feeling nervous the first time we approached fishermen to collect data. The reason was that the fishermen didn't know about our work yet and that impacted our relationship.

However, we continued striving to achieve our goals. Through our teamwork, patience, love and our hope to develop our place and resources, we tried to approach the fishermen to explain clearly about our activities and the benefits that they bring.

Now we are no longer nervous when we collect data because we have good communication with the community, which enables us to protect our resources.

Thanks to the CFM team for having good ideas and plans."

Figure 16: A fisheries monitoring group participant from Ilik-namu's experience of building a good relationship with fishers and gaining confidence as a data collector.

1. BAIBAIN IHA ODK IHA ONA OPSAUN KA PILIHAN RUA NE'E BE TULUN BA EKIPA CFM SIRA UZA HODI KOLEKTA INFORMASUN HUSI PESKADOR NE'E BE BAZEIA BA SITUASAUN KA KONDISAUN IHA FATIN KADA EKIPA NIAN.

EXEMPLU: ITA KOLEKTA DADUS HUSI ATIVIDADES PESKA OHIN?

OINSA MAK ITA ATU PREINSE/ISI INFORMASUN BA IHA ODK HUSI PESKADOR NE'E BE BA TASI MAIBE LA HETAN KA KAER IKAN?



2. IHA LORON IDA ITA KOLEKTA DADUS HUSI PESKADOR IDA. NIA KAER IKAN BAINAR BARAK LOS (200 LU) ENTAUN ITA LABELA SIRA IKAN SIRA HOTU HANESAN TEKNIKU BAIBAIN. MAIS OU MENUS NO TAMBA SA MAEKIPA SIRA SURA KA TETU IKAN NIA TODAN/KG NO HALO ESTIMASAUN WAINHIRA SIRA KOLEKTA DADUS KONA BA IKAN BARAK HUSI PESKADOR IDA NEE.

(HALO ESPLIKASAUN NO FO MOS EZEMPLU)

EZEMPLU: BALDE IDA IHA IKAN 35 IHA LARAN NO NIA TODAN MAK 7KG. MAIS OU MENUS BALDE 6 TAU KA SURA HAMUTUK NEE IKAN NUMERU HIRA NO TODAN HIRA?



4. FAVOR IDA IDENTIFIKA IKAN NE'E NIA NARAN?



5. HALO ESPLIKASAUN NO FO MOS EZEMPLU BALUN KONA BA REGRAS NO MUDANSA SIRA HUSI ESTADU EMERJENSIA NE'E BE IMPAKTU ATIVIDADES PESKA NIAN IHA KOMUNIDADE

EZEMPLU: PESKADOR, PEMBORONG/EMA NE'E BE SOSA IKAN, METI NO EMA NE'E BE HAMOS BUDU TASI



Figure 17: A sample of questions from a quiz circulated on Grupu Monitorizasaun Peskas WhatsApp group. Questions cover the following topics: how to record zero catch data, estimate large catches which cannot be counted individually, fish identification and impacts of the Covid-19 restrictions on fisheries activities.

5. Conclusion and programme recommendations

The *Grupu Monitorizasaun Peskas* programme illustrates the intrinsic and instrumental benefits provided through women's participation in fisheries monitoring. The groups have collected valuable catch monitoring data on fishing activities and catch composition. The catch data reveals insights into fishing activities which could inform community-based fisheries management in several communities. Although it is not possible to draw conclusions about the health of fish stocks, effects of local management or long-term trends yet, these data provide a baseline for future analysis.

The gendered aspects of this programme may have implications for community decision-making more broadly. Although preliminary success has led to two more groups being established, the programme is still in an early stage overall and the impacts of the Covid-19 pandemic have been significant. The preliminary results presented here enable several recommendations to be made, to improve the programme further after Covid-19 restrictions are lifted. These recommendations fall into three themes: reliability of catch data, evidence-based decision-making, and gender. Although these recommendations are for Blue Ventures and *Grupu Monitorizasaun Peskas*, they may also provide valuable lessons for other community-based fisheries management initiatives.

Reliability of catch data

1. To capture the significance of gleaning, a new survey form is needed. The questions should be more appropriate for gleaning activities and include fish families or species targeted by gleaners. We recommend that this be co-designed with community women's groups.
2. Data quality should be improved using automated data management and checking processes. Although there are already data checking processes in place, these can be improved to reduce the manual work this requires and make data available for use immediately.
3. Due to the restrictions caused by the Covid-19 pandemic, the monitoring activities and associated training have been delayed. Refresher training sessions and updates are needed to ensure that the survey form is still fit for purpose, group members feel safe and confident collecting data, and that the survey schedules are up to date and appropriate.

Evidence-based decision-making

1. Local knowledge should be considered throughout community-based fisheries monitoring and management. Although local knowledge was sought during co-design and via data feedback sessions, we believe incorporating local knowledge more often would aid in interpreting catch data and making management decisions which recognise the value of different knowledge.
2. The connection between monitoring data and management decision-making needs to be strengthened for the assumptions in our theory of change, to be met (Figure 3). If data is collected but not used to inform decisions, then the pathway to making resource use more sustainable (Figure 3) will not occur. Data feedback sessions are already held regularly with community members to share and discuss the results of the monitoring. Additional activities have already been developed to bridge the gap between data collection and evidence-based decision-making, i.e., data literacy training, but more progress is needed.
3. Monitoring and evaluation are required to ensure that this programme is effective. Firstly, the assumptions in our theory of change must be tested so that it can be determined whether the planned outcomes are achieved and where the shortcomings are. Furthermore, this report shares some anecdotal evidence regarding the social impacts of the programme, but a more robust and detailed analysis is needed.

Gender

1. This programme is unique because of the gender approach which underpins the programme design. However, as the programme grows and more Blue Ventures staff are involved in running or sharing information about the programme, it is important to continually revisit this approach and consider ways in which it influences women's participation and social relations within each community (positively or negatively). Therefore, we recommend that Blue Ventures staff participate in gender training which equips them to consider these issues in their work.

2. Similarly, we recommend gender training for the programme participants and other interested community members, i.e., family members or fishers. Discussing gender norms and the expectations surrounding community decision-making could play an important role in improving CBFM governance and transforming gender norms beyond the monitoring programme. Increasing women's participation in fisheries monitoring alone will not achieve this goal. In order for this programme to adopt a gender transformative approach it must seek to address social norms and power imbalances more broadly [14].

This programme is an example of how community-based fisheries management can be an opportunity to bring about social change. Our findings affirm the value of participatory monitoring and draw attention to the gendered aspects of CBFM. The catch data which this programme provides makes a valuable contribution to fisheries monitoring in Timor-Leste and the lessons learned from this programme may be relevant for CBFM globally.

6. References

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