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The importance of nutrition-sensitive fisheries management: Women's dietary diversity in Marovo Lagoon, Solomon Islands

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Abstract

Feeding a growing global population is one of the most significant challenges currently facing society. Global malnutrition rates remain high, and tackling this problem in the context of global population growth and ecosystem declines will require concerted effort across many sectors. Fish has been suggested as key to addressing high rates of malnutrition in the South Pacific region, given that it is a rich source of highly bioavailable micronutrients and is common in traditional diets. Unfortunately, there are predictions that fish catch in this region may decline by more than 20% in the coming decades, threatening food and nutritional security.

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Women are key to breaking the cycle of malnutrition and play important roles in small-scale coastal fisheries in the South Pacific. This study assessed women's dietary diversity and the importance of fresh fish to women's diets in a rural coastal community in Marovo Lagoon, Solomon Islands, over four sampling periods. We found that women's dietary diversity in the community was low (mean MDD-W = 3.03 ± 0.06) and that fresh fish was consumed by more than 70% of the women surveyed in three of the four sampling periods. Our results showed some seasonal differences in dietary diversity, highlighting the importance of sampling across seasons to better capture true nutrition. We consider these results in the context of community-based fisheries management and argue for the need to improve fisheries management by including consideration of women's fishing and promoting the importance of fish to human health.

Keywords
malnutrition, fish, Pacific Islands, dietary quality, food systems, nutrition-sensitive fisheries, gender

Introduction

Achieving global food and nutritional security is one of the greatest challenges facing humanity. Intertwined with this is the challenge of sustainably managing fish stocks for nutritional security. Global marine fishery resources continue to decline (Food and Agriculture Organization of the United Nations [FAO], 2020), and it is predicted that 11% of the global population is likely to experience deficiencies in zinc, iron, or vitamin A owing to global declines in fish landings (Golden et al., 2016). An additional 19% will likely experience deficiencies in vitamin B_{12}, omega-3 fatty acids, and other micronutrients (Golden et al., 2016). Nearly one billion people are currently food insecure (FAO, International Fund for Agricultural Development [IFAD], & World Food Programme [WFP], 2013). Concerningly, progress on reducing rates of global malnourishment has been slow, with 149 million children under five years of age affected by stunting and 45 million experiencing wasting in 2020, while 768 million people were undernourished (FAO, IFAD, UNICEF, WFP, & World Health Organization [WHO], 2021). Micronutrient deficiencies are a leading cause of infant mortality, responsible for 50% of child deaths under the age of five years in Africa (Development Initiatives, 2017). Nutritional deficiencies are also a major cause of developmental issues, which affect lives and livelihoods, leading to lost productivity and reductions in gross domestic product (International Food Policy Research Institute [IFPRI], 2016).

The Pacific Islands Countries and Territories (PICTs) experience some of the highest rates of malnutrition in the world (Bogard et al., 2021; Development Initiatives, 2020). Fish[1] has been suggested as key to addressing many of the nutritional challenges facing the PICTs, given that it is a rich source of bioavailable micronutrients and fatty acids (Golden et al., 2016; Hicks et al., 2019). However, climate change and overfishing threaten marine resource sustainability (Ford et al., 2017; MacNeil et al., 2015; Pauly & Zeller, 2016; Western and Central Pacific Fisheries Commisson [WCPFC], 2004), and fish declines pose a significant risk to food and nutritional security (Mellin et al., 2022). Predictions indicate that fish catch potential will decline by more than 20% in the South Pacific by the year 2050 (Golden et al., 2016; Pauly & Zeller, 2016), which will have major implications for population health in the region. Globally, fish accounts for about 17% of animal-source protein intake (FAO, 2016), but for the PICTs, consumption rates for fresh fish can be as high as 110kg per year in some countries, accounting for around 90% of total protein intake (Bell et al., 2009). Current estimates for inshore fisheries in the Pacific indicate that approximately 70-80% of catch is for subsistence purposes, while only about 20% reaches the commercial market, further highlighting the important contribution fish makes to household diets (Lambeth et al., 2002). Many marine resources are common in diets in coastal communities in the PICTs, including finfish, crustaceans, and marine molluscs, all of which have different nutritional compositions and thus provide a rich

[1] The term "fish" is used in this paper to refer to a broad range of marine resources, including teleost fish, sharks and rays, molluscs, crustaceans, and other marine invertebrates, but excluding turtles, marine mammals, and marine plants.

source of a range of micronutrients important to human health (Hicks et al., 2019).

Solomon Islands lies in the South Pacific on the eastern edge of the Coral Triangle, the center of global marine biodiversity (Foale et al., 2013; Veron et al., 2009). It comprises an archipelago of nearly 1,000 islands (Johannes & Lam, 1999; McCarter et al., 2018), and is considered one of the world's least developed countries, scoring low on a number of the United Nations' development indicators (Department of Economic and Social Affairs [DESA], 2021; United Nations Development Programme [UNDP], 2014). Most of the population lives in coastal villages, with 94% living within 5 km of the coast (Foale et al., 2010). Traditional diets consist primarily of fish and starchy root crop vegetables (Albert et al., 2020; Anderson et al., 2013; Govan et al., 2013). Aquatic foods are the second most consumed food group in Solomon Islands, after roots and tubers (Farmery et al., 2020). As with many PICTs, Solomon Islands suffers from high rates of malnutrition, and in recent years there has been an increased consumption of imported foods, such as rice and noodles, that are of low nutritional value (Albert & Bogard, 2015; Albert et al., 2020; Anderson et al., 2013).

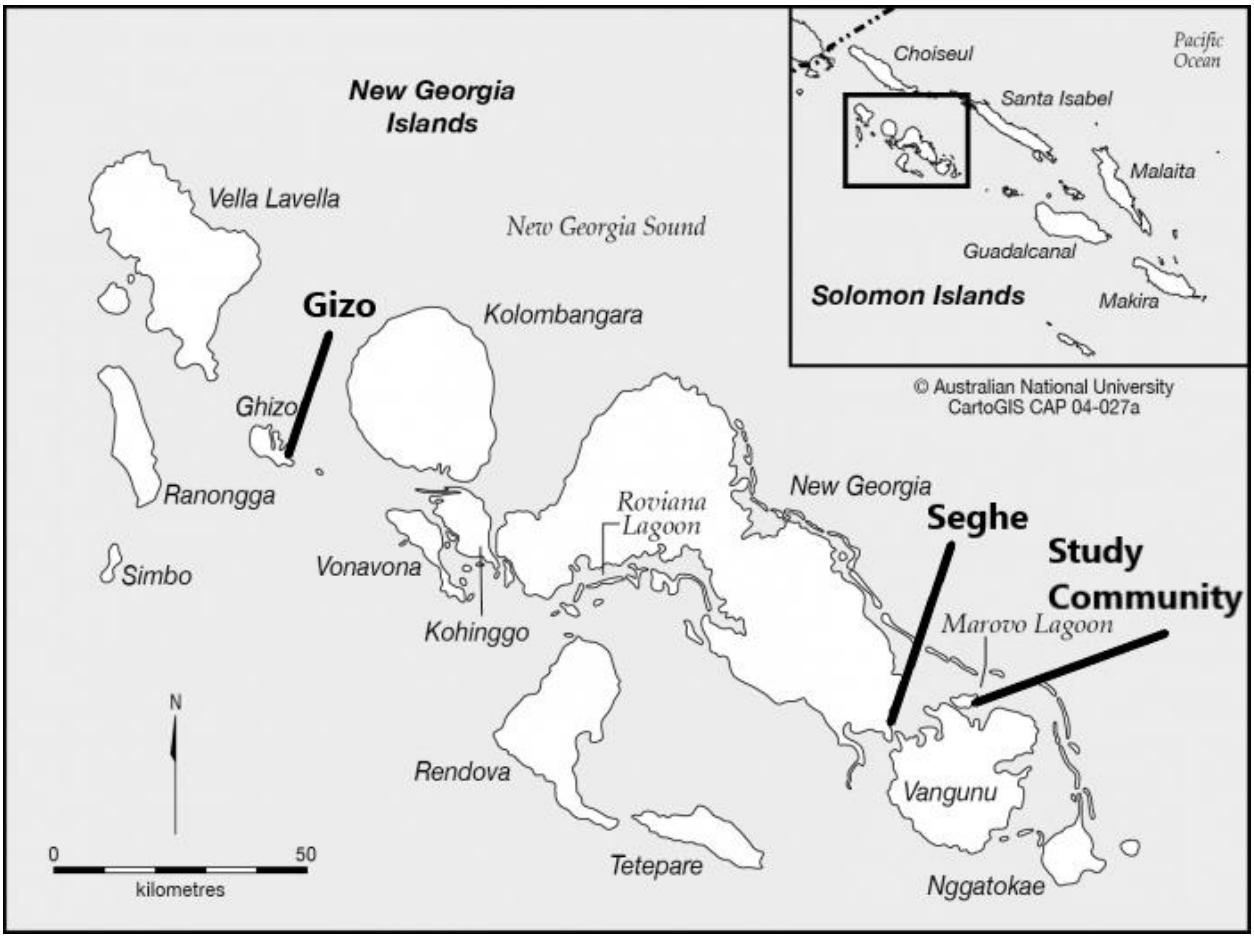
Women play key roles in ensuring that food security and nutritional needs are met for all household members (Andrew et al., 2019) and are largely responsible for all household duties (Lawless & Teioli, 2015), which includes providing food for the household. Previous studies have shown that there is a strong association between maternal and children's dietary diversity, suggesting that improving women's dietary quality can have flow-on effects for children and the household more broadly (Amugsi et al., 2015; Bonis-Profumo et al., 2021; Nguyen et al., 2013). Women are heavily involved in many aspects of the small-scale fisheries value chain (E. Bennett, 2005; Harper et al., 2020; Harper et al., 2013; Mangubhai et al., 2016; Vunisea, 2016; Weeratunge et al., 2010), and fish primarily for the purpose of feeding their families (Rabbitt et al., 2019; Thomas et al., 2021). Previous research suggests that women's fishing is important for household nutrition (Thomas et al., 2021); however, seldom are the impacts on women's access to fishing grounds considered in fisheries management actions (Aswani & Weiant, 2003; Westlund et al., 2017), which can have flow-on socio-cultural and health effects (Aswani et al., 2014; Thomas et al., 2018).

Here we investigate women's dietary diversity in a rural coastal community in Marovo Lagoon, Western Province, using the FAO's minimum dietary diversity of women (MDD-W) indicator (FAO & FHI 360, 2016), a proxy measure for community-level micronutrient adequacy, to understand the quality of women's diets and the relative importance of fresh fish and other seafoods. We consider this in the context of fisheries management and use these data to highlight the importance of nutrition-sensitive fisheries management for women and children's health in Solomon Islands.

Methods

This study was conducted in a rural village in Marovo Lagoon, Western Province, Solomon Islands (Figure 1). The village is located within a sheltered lagoon, and the community experiences minimal weather-related disruptions to their fishing and gardening activities. The dominant religion is United Church, which imposes few restrictions on the types of food community members can consume. The community is considered large for the locality, with approximately 100 households. It has good access to markets at the township of Seghe, the nearest administrative center (20 minutes by outboard motor [OBM]–powered canoe), as well as at the capital (Honiara) and provincial capital (Gizo; see Figure 1) via passenger and cargo ships that run twice weekly. Many of the youth in the community are employed at a nearby tourist resort, and the village receives semiregular visits from international tourists. There are also several canteens in the village that sell imported foods including noodles, rice, sugar, biscuits, and canned fish. The main sources of income for the village's residents are wage labor from resort and timber logging employment, local handicrafts, and sale of fish and garden produce at markets. Many members of the community are also engaged in the 'esky trade,' sending fish to Honiara via ship in large, insulated containers (eskies) for sale at large fish markets.

Figure 1. Map of the Western Province, Solomon Islands, Showing the Location of the Study Community and Nearby Provincial Hubs



Map sourced from CartoGIS Services, College of Asia and the Pacific, The Australian National University.

Women's Dietary Diversity Survey

We conducted quantitative surveys of food consumption with consenting adult women in the community in May 2017, October 2017, April 2018, and September 2018. These sampling periods broadly represent the autumn and spring months. We conducted 24-hour food recalls using an open recall method, and asked participants to detail all food and drinks they had consumed within the past 24 hours. A story method was employed after the open recall, and participants were asked to detail their activities within the previous 24 hours as a way of prompting participants to remember any food items they may have missed during the earlier recall sessions.

The food recall surveys were announced primarily through word of mouth. On each day that food recalls were conducted, the lead author and a local research assistant identified potential participants by walking through the village and inviting women to participate. Participation in the interviews was voluntary. Where women were willing to participate, they were read a participant information sheet which outlined their rights and responsibilities should they choose to participate and were then asked to sign an informed consent form. The food recall interviews were conducted in Solomon Islands Pijin, the national *lingua franca,* but local language names were used for all seafood items and many garden items. In total, 199 women ranging from 19 to 81 years of age were interviewed across the four sampling periods.

Dietary diversity was measured using the FAO's MDD-W indicator, a proxy measure of

micronutrient adequacy at a population level. The MDD-W indicator is calculated as the proportion of women who consumed five or more of the 10 food groups (FAO & FHI 360, 2016). As noted in Albert et al. (2020), the 10 food groups outlined in this global indicator of micronutrient adequacy may not accurately reflect micronutrient adequacy in Pacific Islander diets. Although the MDD-W indicator is designed to capture data on women of reproductive age (15–49 years), we elected to include women over the age of 49 in our surveys, as many older women in this community were the primary caregivers for young children (less than five years of age), and we were interested in understanding micronutrient adequacy in women caregivers, as ensuring nutritional adequacy in women is critical to breaking the cycle of malnutrition (Andrew et al., 2019). Food and drink items were categorized as per the MDD-W guidelines, with *The Pacific Islands food composition tables* (Dignan et al., 2004) and the Leafy Greens and Vegetables in Solomon Islands (French, 2010) guidelines used to assist in categorization of common local food items.

Results

Overall, dietary diversity was low, with just over 5% of women achieving the MDD-W by consuming at least five food groups across all sampling periods combined (mean MDD-W = 3.03 ± 0.06; Table 1). In three of the four sampling periods, less than 5% of women achieved the MDD-W, while 18.4% of women attained the MDD-W in the October 2017 sampling period (Table 1). Most women (42.1%) across the sampling periods consumed only three of the 10 food groups that make up the MDD-W. All women reported consuming food from the grains, white roots, tubers, and plantains category, predominantly cassava, sweet potato, and white rice. Over 80% of women reported consuming meat, poultry, and fish in three of the four sampling periods, with just over 65% of women consuming food items from this category during sampling in September 2018. Consumption of dark leafy greens was also high, ranging from 50–65% in the spring months, and 38–44% in the autumn months. Over 40% of respondents also reported consuming other fruits in all four sampling periods. Consumption of other vitamin A–rich fruit and vegetables was low in all sampling periods (2–13%), with similarly low consumption rates for other vegetables (2–6%). Consumption of nuts and seeds was low during the autumn months (2.8% in May 2017 and 7.4% in April 2018), but higher during the spring months (23.7% in October 2017 and 25% in September 2018). Consumption of eggs and dairy was very low, with 0–3% of respondents reporting consumption of either food type in each sampling period. No respondents reported consuming pulses in any sampling period.

Data for the autumn (May 2017 and April 2018) and spring (October 2017 and September 2018) months were combined to investigate sea-

Table 1. Minimum Dietary Diversity of Women (MDD-W) in the Study Community Across the Four Sampling Periods

	2017		2018		
	May	October	April	September	Overall
Number of women (*n*)	36	38	81	44	199
% attaining MDD-W	2.8	18.4	4.9	2.3	5.0
Mean MDD-W (st error)	2.94 (0.16)	3.18 (0.18)	2.96 (0.09)	3.07 (0.14)	3.03 (0.06)
% consumed 1 food group	5.6	2.6	3.7	4.5	4.0
% consumed 2 food groups	27.8	31.6	21	22.7	24.6
% consumed 3 food groups	36.1	23.7	55.6	36.4	41.7
% consumed 4 food groups	27.8	31.6	14.8	34.1	24.6
% consumed 5 food groups	2.8	15.8	4.9	2.3	4.5
% consumed 6 food groups	0	2.6	0	0	0.5

sonal influences on women's diets. The mean MDD-W score in spring (September/ October) was higher than the mean MDD-W in autumn (Figure 2). Radar graphs show the percentage of women consuming each of the different food groups in the autumn and spring months (Figures 3a and 3b, respectively), and show a higher proportion of women consuming nuts and seeds in the spring months, which is the driver of the higher MDD-W scores in these months compared to the autumn months.

Consumption of fresh seafood was high, with over 70% of women consuming fresh seafood in three of the four sampling periods (Figure 4). We did not combine the data for May/April and September/October for this variable, as events within the community impacted data collection in one of the four sampling periods. In September 2018, there were two deaths in the village during the sampling period. Local customs require a period of two to three days of mourning following the death of a community member, and fishing is not permitted during this time. This factor is the likely driver of the significant decline in fresh fish consumption seen in Figure 4, with only 31.3% of women consuming fresh seafood during this sampling period.

We also examined consumption rates of the different food items that make up the 'meat, poultry and fish' category. As respondents had provided local species names for seafood consumed, we were able to assign food items in this category to six broad groups: reef fish, pelagic fish (which we define as fish species that are not generally associated with nearshore habitats), invertebrates (including clams, oysters, marine crabs, and coconut crabs), marine

Figure 2. Mean and Range of the Minimum Dietary of Women (MDD-W) Scores for the Autumn (May/April) and Spring (September/October) Months

The box represents the 25th–75th percentile of responses, the whiskers represent the range of responses, and the X represents the mean. Note that the 5 is an outlier in the May/April dataset.

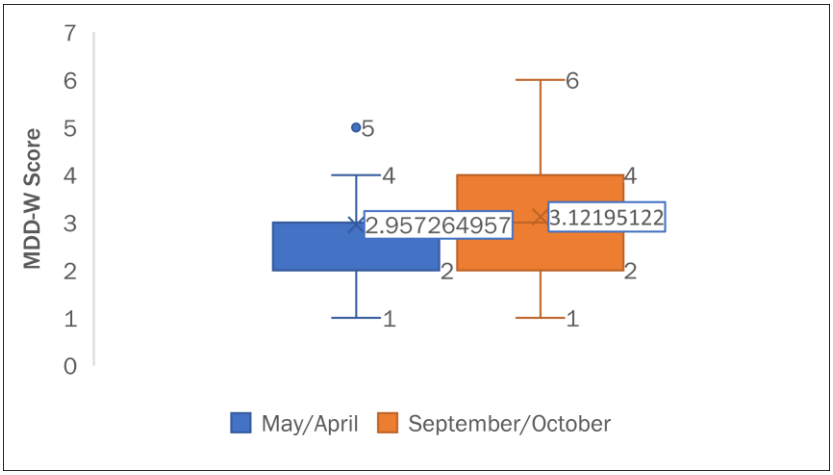
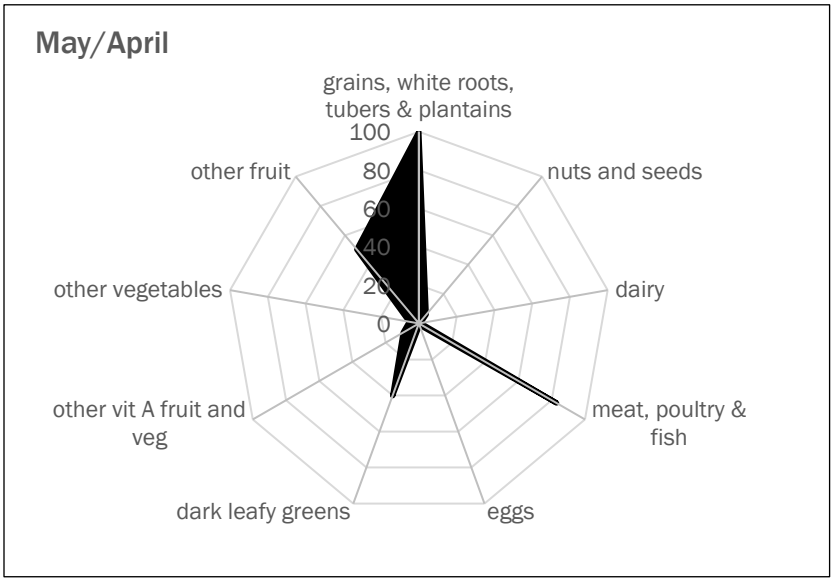


Figure 3a. Proportion of Women Consuming Food Items from Each of the 10 Food Groups That Make Up the Minimum Dietary Diversity of Women Indicator (MDD-W) in the Autumn Months (May/April)

The axis from the centre to the outer degree represents the proportion of respondents who consumed each food group.[a]

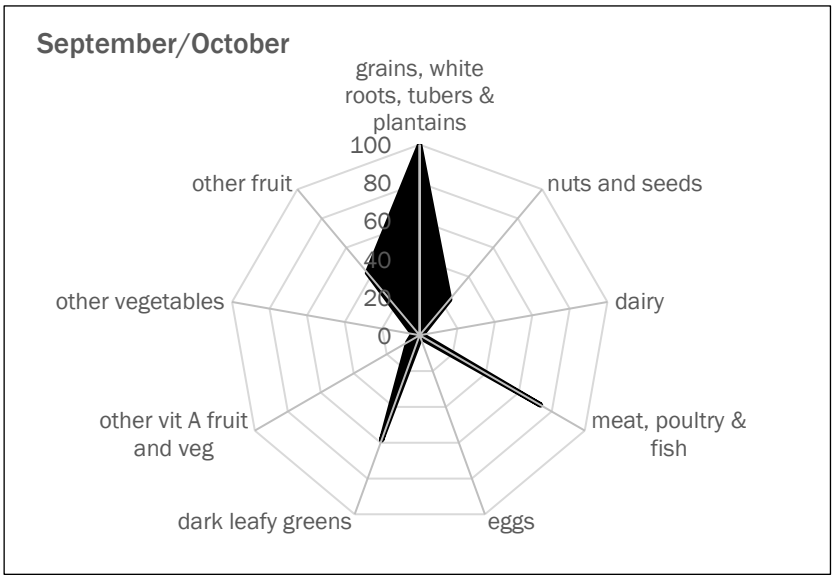


[a] Note that the 'pulses' food category has been excluded, as foods from this category were not consumed during any sampling period.

turtles, canned tuna, and other meats (which included both fresh meat such as chicken, and tinned meats such as Spam). When the spring (September/October) and autumn (May/April) months were combined and compared, the consumption of reef fish was more than double that of the consumption of pelagic fish species in both periods (48.7% vs 19.7% in autumn, and 39.4% vs 13.4% in spring; Figure 5a). Consumption of invertebrates was more than three times higher in autumn than it was in spring (15.4% vs 3.7%), while turtle meat consumption was low across both seasons. Consumption rates of both meat products and canned tuna were higher in September/October compared to May/April; Figure 5b shows that in the September 2018 sampling period, canned tuna accounted for 50% of all the meat, poultry and fish consumption. As noted above, the two deaths in the village during this sampling period prohibited most community members from accessing fresh seafood, which could explain the higher consumption of canned tuna during this sampling period.

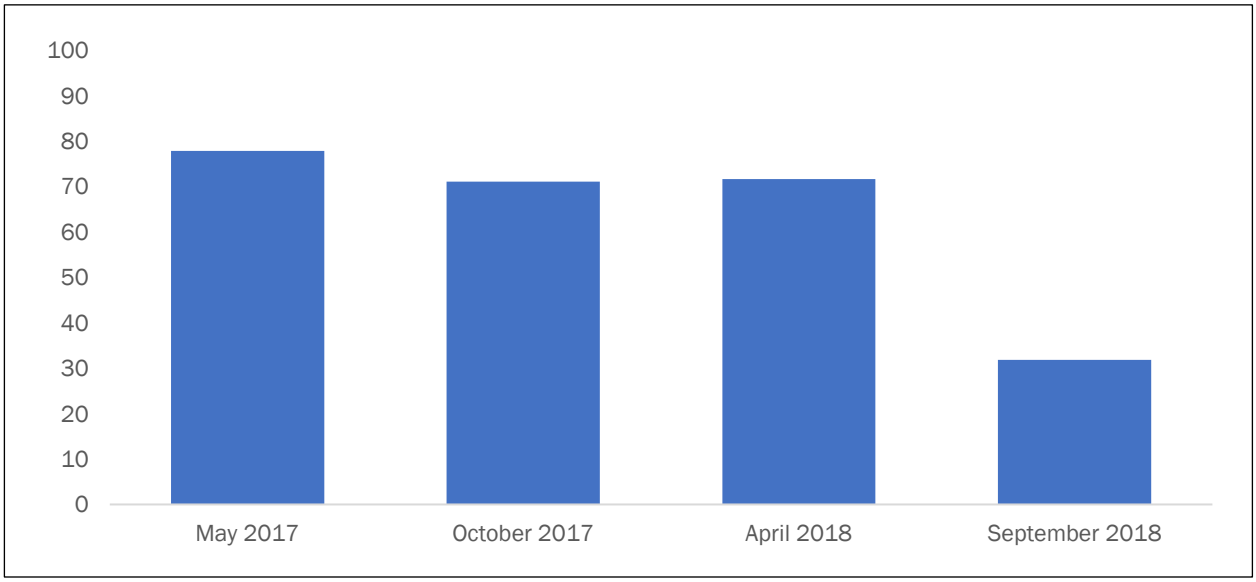
Figure 3b. Proportion of Women Consuming Food Items from Each of the 10 Food Groups That Make Up the Minimum Dietary Diversity of Women Indicator (MDD-W) in the Spring Months (September/October)

The axis from the center to the outer degree represents the proportion of respondents who consumed each food group.[a]



[a] Note that the 'pulses' food category has been excluded, as foods from this category were not consumed during any sampling period.

Figure 4. Percentage of Women Who Consumed Fresh Seafood During the Sampling Periods



Discussion

To break the intergenerational cycle of malnutrition, it is critical that women are able to meet their nutritional needs through diets that provide a diversity of micro- and macronutrients (Andrew et al., 2019). Women's diets in the study community were nutritionally inadequate, with only 5% of women overall meeting the minimum dietary diversity threshold for micronutrient adequacy, following the minimum-dietary diversity for women (MDD-W) guidelines (FAO & FHI 360, 2016). This is consistent with the results of studies in

Figure 5a. Combined Data Showing the Percentage of Women Consuming Different Animal-Source Proteins in May/April Compared to September/October

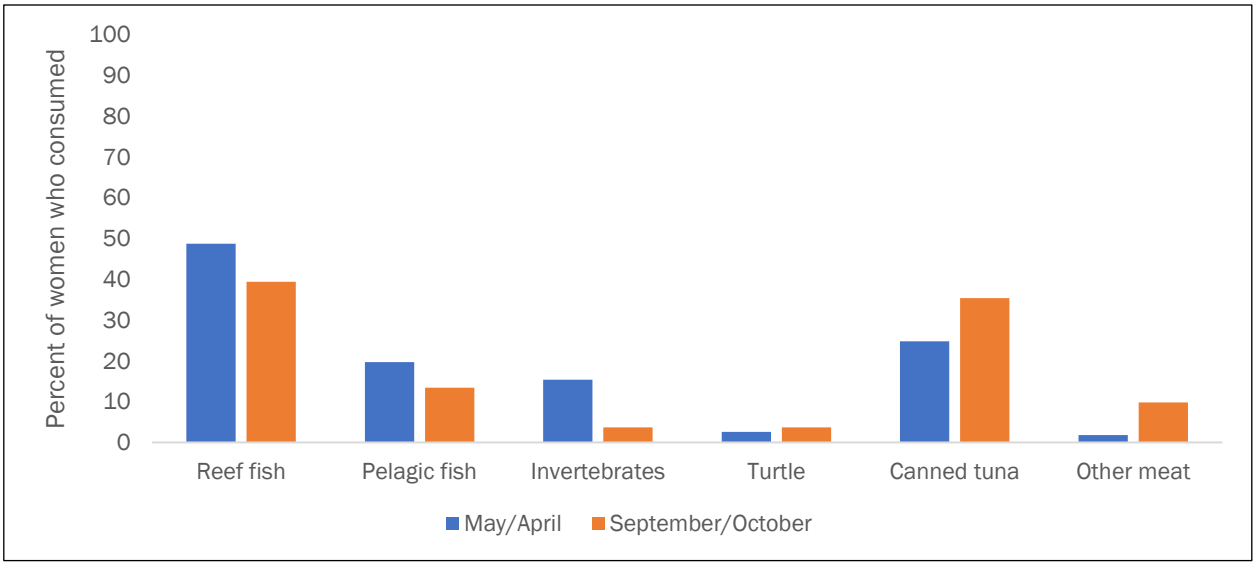
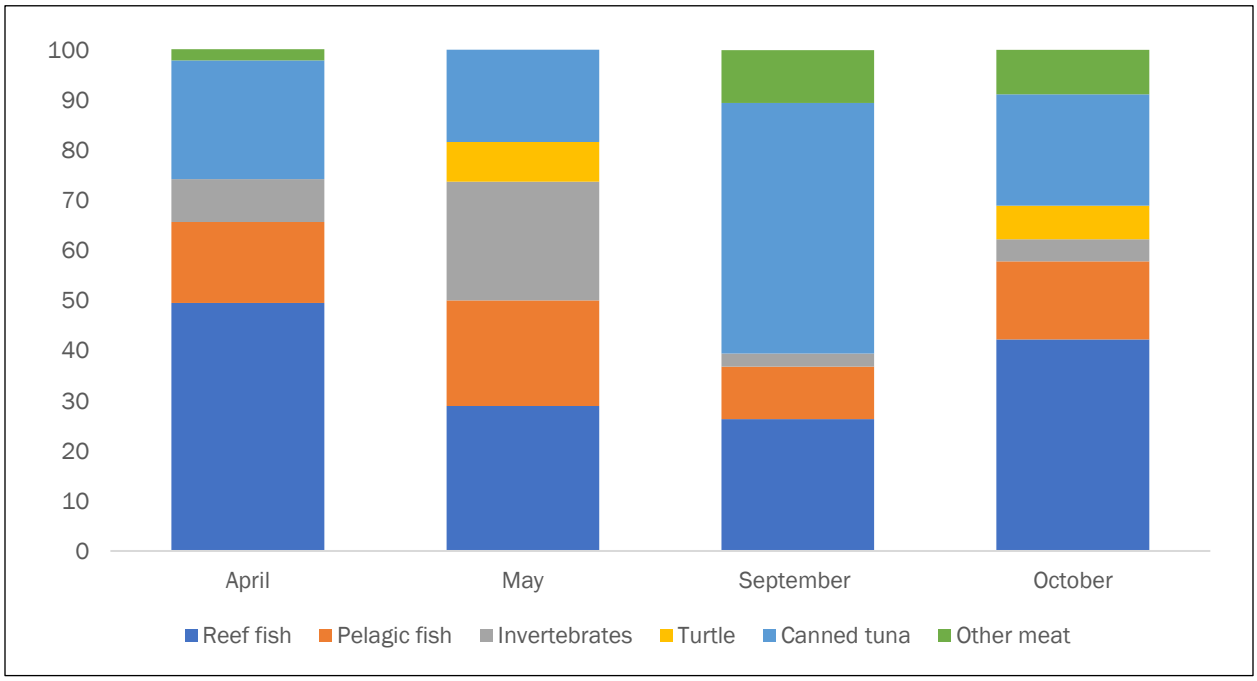


Figure 5b. Contribution of Different Animal-Source Proteins to Women's Diets Across the Four Sampling Periods (Percentage of Animal-Source Protein Consumption by Category)



other communities in Solomon Islands (Albert et al., 2020; Horsey et al., 2019; Iese et al., 2021), indicating that the country is facing a widespread nutritional crisis. Although overall dietary diversity was low, it was higher in the spring months (September/October) than in the autumn (April/May). Increased dietary diversity in the spring months was driven largely by consumption of ngali nuts (*Canarium spp.*), which local seasonal calendars show are in season from July through October (Jones et al., 2014). This seasonal difference highlights the importance of assessing dietary diversity throughout the year, rather than at a single timepoint, to better capture the impacts of local seasonal changes in food availability, particularly in rural areas. Sampling at different times of the year paints a clearer picture of true nutrition, and allows for inclusion of seasonal foods, such as ngali nuts, that may play important roles in women's nutrition that would be missed if sampling only occurred outside of their fruiting season. Importantly, survey responses indicated that most main meals consisted largely of a marine food item, rice or starchy root crop vegetable, and a dark leafy green. Almost all consumption of fruit, other vegetables (excluding dark leafy greens and starchy root crops), and nuts was incidental consumption that occurred while women were travelling through the village to their gardens or to visit friends and relatives. This has important ramifications for strategies that aim to increase dietary diversity in these rural communities, and policymakers should consider the importance of incidental consumption as part of a holistic approach to encouraging increased dietary diversity.

Dietary diversity is unquestionably important, but fish is likely to play a large role in addressing malnutrition in Solomon Islands (Albert & Bogard, 2015). Unfortunately, overfishing and the impacts of climate change are already negatively affecting food and nutritional security globally. One study found that the undernourishment of around 20 million people in the year 2000 could have been avoided had overfishing not occurred (Srinivasan et al., 2010), highlighting the need for effective and nutrition-sensitive fisheries management policies. In Solomon Islands, most of the population live in rural, coastal villages (Foale et al., 2010) with limited land for farming fish or animal livestock. Fish is a rich source of highly bioavailable nutrients (Allison, 2011; Bogard, Farook et al., 2017; Bogard, Marks et al., 2017; Hicks et al., 2019), which is not easily replaced by any other animal food source. It is also the only animal source food that is protective against chronic disease (Bogard et al., 2019; Jayedi & Shab-Bidar, 2020). Although aquaculture has been proposed as a way of addressing the shortfall in wild-caught fish (Bell et al., 2009; FAO, 2020; Fiorella et al., 2021; Weeratunge et al., 2011), farmed fish are often less nutritious than their wild-caught counterparts (Bogard, Farook et al., 2017; Bogard, Marks et al., 2017; Fiorella et al., 2021). Thus, while aquaculture may bolster food supply, it might not address rates of malnutrition, particularly micronutrient inadequacies, and will not resolve the issue of overfishing. It is therefore critical that we reverse the decline of wild-capture fisheries and bring a nutrition lens to management strategies if we are to tackle malnutrition.

Our results show that women consume large amounts of fish and other marine foods, with reef fish accounting for the majority of marine food types consumed. While there has been much focus on the use of pelagic fish, such as tuna, to address food security concerns in the Pacific (Bell, Albert, Amos et al., 2018; Bell, Albert, Andréfouët et al., 2015; Bell, Allain et al., 2015; Bell, Cisneros-Montemayor et al., 2018; Bell et al., 2009; Bell et al., 2013; Pilling et al., 2015), pelagic fisheries tend to be the domain of men (Chapman, 1987; De la Torre-Castro et al., 2017; Kleiber et al., 2015; Kronen, 2002; Kronen & Vunisea, 2009), who have different motivations for their fishing and are often fishing to sell their catch for cash income (Rohe et al., 2018). We found that pelagic fish, primarily caught by men, were consumed at about half the rate of reef fish, highlighting the importance of reef fish to household nutrition.

Women generally fish closer to the shore than men (Kleiber et al., 2014, 2015; Rabbitt et al., 2019; Thomas et al., 2021), primarily because of limitations on their time owing to their caring responsibilities (G. Bennett et al., 2014; Kleiber et al., 2018; Lawless et al., 2019; Vunisea, 2008). Management actions that restrict women's access to nearby reefs, making them travel further to fish, would

likely lower household consumption of fresh fish, as it is unlikely that the deficit would be compensated by pelagic fish caught by men.

More likely, a decline in reef fish availability would see an increase in consumption of tinned meat, including tuna, which is high in saturated fats and salt (Golden et al., 2016; Kawarazuka & Béné, 2010; Thomas et al., 2021). This is reflected in our data for September 2018, which showed a spike in the consumption of tinned tuna when the supply of fresh fish was reduced owing to cultural mourning practices. A reduction in women's fishing would likely have negative flow-on effects for women and children's nutrition, given that women's catch goes primarily to household food consumption (Harper et al., 2013, 2020; Rabbitt et al., 2019; Thomas et al., 2018, 2021).

Throughout the Pacific, women are often either excluded from, or have limited agency in, fisheries management decisions for a variety of reasons, including both cultural norms and constraints on their time owing to their household responsibilities (Kleiber et al., 2018; Leisher et al., 2018; Rabbitt et al., 2022; Rohe et al., 2018; Vunisea, 2008). Most coastal fisheries in Solomon Islands remain under customary tenure (Walter & Hamilton, 2014; Warren-Rhodes et al., 2011) and are therefore managed at a community level under community-based fisheries management (CBFM) plans (Solomon Islands Ministry of Fisheries and Marine Resources [MFMR], 2019). Women's voices are often left out of CBFM decision-making (Rabbitt et al., 2022), including for decisions that affect women more than men (Rabbitt et al., 2022; Vunisea, 2008; Westerman & Benbow, 2013), such as *tabu* sites[2] being placed in women's fishing grounds (Rohe et al., 2018). There is a clear need for gender-sensitive CBFM strategies that actively seek to include the voices of all community members, to ensure equitable and sustainable resource use (Kleiber et al., 2015, 2018; Ogden, 2017; Rabbitt et al., 2022; Thomas et al., 2021). As we have stated above, there is also a clear need for nutrition-sensitive fisheries management (Albert & Bogard, 2015), which considers the important role that fish and other marine resources play in nutrition. Research to date has largely focused on these approaches in isolation, but our results highlight the need for an approach to fisheries management that considers the important contributions fish make to nutrition, the different ways that men and women engage in fisheries, and the different contributions of men's and women's fishing to household, and community, food and nutritional security.

Recommendations

Our results, and those of other studies (e.g., Albert et al., 2020), highlight the need to further research the nutritional value of traditional Pacific Island diets. Several studies in the Solomon Islands (Albert et al., 2020; Horsey et al., 2019; Iese et al., 2021) suggest that women are consistently not meeting the minimum dietary diversity indicator for micronutrient adequacy. Public health interventions are often aimed at encouraging Pacific Islanders to consume a more traditional diet, but that diet often includes fewer food groups than is required to meet the minimum dietary diversity set out by the MDD-W indicator. A more in-depth study of the nutritional breakdown of traditional Pacific Island foods is needed to better understand whether traditional diets are nutritionally adequate and whether the use of standardised indicators is appropriate in the Pacific Islands context. In addition, our research shows the importance of sampling at different timepoints; doing this allowed us to pick up on seasonal consumption of ngali nuts that we would have missed had we only sampled earlier in the year. Given that nuts are not the only seasonal food in Solomon Islands, ideally this work should be expanded to year-round dietary diversity sampling, making use of local seasonal calendars (Jones et al., 2014) to gain a clearer picture of women's nutrition.

Our results indicate that public health interventions highlighting the importance of eating a

[2] Implementing a *tabu* site (protected area) is common practice in CBFM in Solomon Islands, and these usually take the form of a periodically harvested closure. The period of closure differs significantly between communities and is often poorly aligned with the life history strategies of the species it aims to protect (Smallhorn-West et al., 2022).

varied diet and encouraging an increased consumption of fruits and vegetables are much needed to improve women's dietary quality in Solomon Islands. It is likely that women in rural and urban areas of Solomon Islands face very different challenges in accessing nutritious foods. For rural areas, the majority of the household diet is either grown or caught locally, and nutritious foods tend to be readily available. In urban areas, much of the food consumed is purchased in stores and larger markets, and thus women in these areas face cost pressures in accessing nutritious foods not faced by their rural counterparts. We suggest that women in rural and urban areas may benefit from targeted yet different public health interventions. Our study found low levels of fruit and nut consumption, despite an abundance of fruit and nuts available in the community. We recommend that in rural communities, public health campaigns should continue to focus on highlighting the importance of consuming a varied diet rich in fruits, nuts, and vegetables. Promoting the importance of dietary diversity for women's health should be a key focus of these campaigns. In addition to campaigns, public health authorities in urban areas should consider ways to increase the affordability of fresh foods, particularly fruits and vegetables, to bolster their consumption. Given that previous studies have shown a strong association between maternal (caregiver) and child dietary diversity (Amugsi et al., 2015; Bonis-Profumo et al., 2021; Nguyen et al., 2013), it is likely that such interventions would have the added benefit of improving health outcomes for children.

There is a clear need to bring a nutrition lens to fisheries management strategies for both wild-caught and farmed fish. Given the potential discrepancy in nutritional value between wild-caught and farmed fish (Bogard, Farook et al., 2017; Bogard, Marks et al., 2017; Fiorella et al., 2021), it would be useful to incorporate nutritional values for the range of fish (wild-caught and farmed; reef fish and pelagics) and invertebrates that women regularly consume to better understand the contributions of these different marine animal-source foods to women's nutrition. This information could then be used to inform more targeted public health campaigns and fisheries management strategies.

Conclusions

Fish has an important role to play in reducing the burden of malnutrition in Solomon Islands, and effective and equitable fisheries management will be key to realizing this potential. Our research found that women's diets in the study community are nutritionally inadequate and exhibit a heavy reliance on reef fish for nutritional security. We know that women's fishing contributes significantly to household nutritional security, as women's catch largely goes directly to feeding their families (Harper et al., 2013, 2020; Rabbitt et al., 2019; Thomas et al., 2021). There are clear links between gender and nutrition in the fisheries context, and community-based management plans need to approach management decisions in a way that is both gender- and nutrition-sensitive. This will require an understanding of the important role women's fishing plays in ensuring household nutritional security, and therefore an understanding of the potential consequences of management actions that lead to a reduction in women's fishing. Incorporating women's voices into fisheries management will result in more equitable access to resources and have positive flow-on effects for household nutrition. At a national level, it would be beneficial for policymakers working to address malnutrition to work collaboratively with those working toward sustainable use of marine resources, as one cannot succeed without the other. More research focusing on gender- and nutrition-sensitive approaches to fisheries management would bring a greater awareness to the interconnectedness of malnutrition and gender equity in the fisheries context and assist in progressing efforts to address both of these challenges.

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