



## Why they must be counted: Significant contributions of Fijian women fishers to food security and livelihoods

Alyssa Thomas<sup>a</sup>, Sangeeta Mangubhai<sup>a,\*</sup>, Margaret Fox<sup>a</sup>, Semisi Meo<sup>b</sup>, Katy Miller<sup>c</sup>, Waisea Naisilisili<sup>a</sup>, Joeli Veitayaki<sup>d</sup>, Salote Waqairatu<sup>b,e</sup>

<sup>a</sup> Wildlife Conservation Society, Fiji Country Program, 11 Ma'afu Street, Suva, Fiji

<sup>b</sup> Conservation International, 3 Ma'afu Street, Suva, Fiji

<sup>c</sup> Vatuvara Foundation, 18 Ackland Street, Suva, Fiji

<sup>d</sup> University of the South Pacific, Alafua Campus, Apia, Samoa

<sup>e</sup> Australian Centre for Pacific Islands Research, University of the Sunshine Coast, QLD, Australia

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### ABSTRACT

Worldwide, small-scale fisheries (SSF) are an important source of food and livelihoods for rural communities and contribute substantially to national economies. Women play crucial roles in these fisheries, yet their contributions are largely *invisible*, often *ignored* and *unrecognized*. We conducted household and focus group surveys to examine the role of indigenous Fijian (*iTaukei*) women in SSF, documenting fishing practices and contributions to household food security and income. Our results reinforced several traditional views, such as *iTaukei* women preferentially fishing closer to their villages; but also challenged other assumptions with women fishing a wider range of habitats (from inland rivers to the open ocean) and species than previously described, and many using a boat and fishing with men. In addition to gleaning for invertebrates and seaweed, women also caught over 100 species of fish. Women fished primarily for subsistence, emphasizing their significant contribution to household food security. Although almost half of the women sold part of their catch to supplement household incomes, they also engaged in other income earning livelihoods, and therefore were not solely dependent on fisheries. Of concern was the high targeting of nursery areas for fish and invertebrate species by women fishers, and species with low spawning potential ratios. Given the level of engagement in, and contributions to fisheries, the inclusion of *iTaukei* women fishers in fisheries planning and management is critical for ensuring the sustainability of SSF in Fiji. Furthermore, empowering women for full participation in fisheries and lifting them out of poverty requires a re-consideration of traditional gender norms in rural communities, which are already shifting and evolving.

### 1. Introduction

Small-scale fisheries (SSF) provide an estimated 90% of the employment in the marine fisheries sector, and are a key source of food and employment for over 200 million people around the world (FAO, 2016). Over half the seafood catch in developing countries is from SSF, and 90–95% of that catch is for local consumption (FAO, 2015; The World Bank, 2012). However, the numbers of fishers and the importance of fish to coastal households are poorly quantified and often hidden (The World Bank, 2012; Worm et al., 2009). Globally, women account for an annual catch of ~2.9 million tons of seafood a year and an estimated 2.1 million women participate in SSF (Harper et al., 2020). However, women fishers' contributions to national economies have routinely been

overlooked due to their dominance in the informal economy, which is normally unrecorded (Chen, 2000; Kronen, 2007) and missing from official statistics (Salmi and Sonck-Rautio, 2018).

In the Pacific Islands, fish provide 50–90% of the animal protein intake in rural communities and 40–80% in urban centers (Pacific Community, 2008). Fisheries are a key source of livelihoods (Bell et al., 2009; Teh et al., 2009), and women in the Pacific have a fundamental role in food and nutritional security: ~25% of small-scale fishers are women (Harper et al., 2020), and their catches account for 56% of SSF landings (Harper et al., 2013). Historically, women's involvement in fisheries was mainly at the subsistence level, although an increasing number are selling at least some of their catch (Rohe et al., 2018; Vunisea, 2014). Marine invertebrates, such as crustaceans, shellfish and

\* Corresponding author.

E-mail addresses: [smangubhai@gmail.com](mailto:smangubhai@gmail.com), [smangubhai@wcs.org](mailto:smangubhai@wcs.org) (S. Mangubhai).

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sea cucumbers, form a significant portion of those women's catch (Chapman, 1987; Harper et al., 2013; Valmonte-Santos et al., 2016).

However, traditional notions of who is a 'fisher' and what counts as fishing mean that those who go out to sea to catch fish from a vessel, using specialized gear, and who are seen and counted (mostly men) are labelled fishers; but those who harvest seafood, especially invertebrates and seaweed close to shore (mostly women) are not counted as fishers (Harper et al., 2020; Kleiber et al., 2014). These societal norms, shaped by cultural and social expectations of women, contribute to an underestimate of fishing pressure in coastal regions and the undervaluing of the economic and societal benefits provided by women fishers (Kleiber, 2014; Siles et al., 2019).

There is still a lack of accurate, visible and accessible information on women in the fisheries sector (Gopal et al., 2020; Harper et al., 2020), and their unique needs or perspectives are not routinely incorporated into fisheries management and policy decisions (Salmi and Sonck-Rautio, 2018; Siles et al., 2019; Weeratunge et al., 2010). Overlooking the contributions of women fishers repeats this cycle and continues to marginalize them. Most fisheries policies are 'gender blind' (FAO, 2017; Gopal et al., 2020), which translates into insufficient funding for women in the sector; in turn further marginalizing and undervaluing their work and contributions. A study of fisheries policy instruments and strategies in the Pacific found "gender commitments are often diluted and expressed through narrow and outdated strategies" that are inadequate to navigate complex gender dynamics and power relationships in the sector (Lawless et al., 2021). An understanding of gender roles and contributions is therefore both urgent and critical to manage SSF and move towards better coastal management (de la Torre-Castro et al., 2017; Gopal et al., 2020; Lawless et al., 2019).

Despite regional declarations and plans such as *A new song for coastal fisheries - pathways to change* (The Noumea Strategy, Pacific Community, 2015), SSF resources continue to decline, and projections forecast that by 2030 only six of the 22 Pacific Island countries will be able to meet recommended or current per capita fish consumption (Bell et al., 2009). Therefore, a paradigm shift in fisheries management is needed, with women playing an integral part (Pacific Community, 2015). In Fiji, the subsistence economy increased by 33% between 2002 and 2008, and is therefore of high importance to the country (Narsey, 2011). Furthermore, Williams (2019) argued that unpaid work and the household economy is one of three key research areas for gender and fisheries. A Pacific Community (2018) report noted that despite substantial research on women fishers, some knowledge gaps still remain on women's roles in both subsistence and commercial fisheries.

In response to these knowledge gaps, we surveyed fisheries-dependent communities across Fiji with the aim of better understanding and quantifying the role of *iTaukei* women fishers in the SSF sector, which includes both freshwater and marine fisheries. Specifically, we investigated: (1) the changing fishing patterns and habits of *iTaukei* women fishers; (2) *iTaukei* women's contributions to household food security; (3) livelihood-dependency on SSF; and (4) barriers *iTaukei* women face in fishing and selling marine and freshwater catches.

## 2. Materials and methods

### 2.1. Study context

Fiji's coastal population is heavily dependent on seafood for livelihoods and subsistence (Charlton et al., 2016; Gillett and Tauati, 2018; Selig et al., 2019). Bell et al. (2009) placed the per capita consumption rate at 20.7 kg (25.3 kg in rural areas), Gillett (2016) calculated 36.8 kg, and cited other studies that estimated rates of 44–62 kg per capita consumption. It has been estimated that 34–37 kg per year is needed for good nutrition (Bell et al., 2009). Fisheries contributed at least US\$64.1 million (1.8%) to Fiji's annual GDP in 2014 (Gillett, 2016). Just over half the population is urban and concentrated on the two main islands of Viti Levu and Vanua Levu. This research focused on Indigenous Fijian

(*iTaukei*) villages in 11 of the 14 provinces in Fiji.

Under law, *iTaukei* people hold access rights to their fishing grounds (*qoliqoli*) extending from the foreshore to slightly beyond the fringing reef, through a system of both customary and statutory management (Clarke and Jupiter, 2010; Sloan and Chand, 2016). This gives *iTaukei* communities access rights to fisheries for subsistence purposes, but requires a license for commercial fishing. The Ministry of Fisheries has control over fishing methods, gear, prohibited areas or seasons, size or weight limits, and issuance of all commercial licenses (Sloan and Chand, 2016). Fiji is largely a patriarchal society with existing cultural hierarchies dominating and influencing decision-making at the village, district and provincial levels (Reddy, 2000). Women's access to resources and decision-making varies, with those originating from the village usually enjoying more privileges than women who have married into the village (Vunisea, 2014). Women are often not included in decision-making on natural resource management, and do not receive equal benefits from commercial fisheries in their customary fishing grounds (Pacific Community, 2018).

Conversations with gender and fisheries experts in Fiji suggested that the contributions and fishing practices of men in Fiji are already well documented, while information on women fishers and their fisheries are both outdated and not as substantial. Although we recognize a narrow focus on women is not ideal (Mangubhai and Lawless, 2021), due to limited funding it was not possible to survey both men and women fishers without trading off geographic scope. Therefore, we chose to focus our study solely on women fishers.

Our study aimed to cover as many coastal provinces in Fiji as possible, and focused to some degree, on where there were existing projects and relationships between partner organizations and local communities. When selecting the villages, we considered multiple factors to ensure representation of freshwater vs. saltwater habitats, subsistence vs. commercial fishing, and larger vs. smaller islands. All but 16 villages were within 40 km of the coastline or ocean. Only inland villages that accessed rivers for fishing were selected for our study.

### 2.2. Questionnaire design and data collection

We designed our questionnaires through a review of existing socio-economic, fisheries and gender surveys developed by environment and development non-government organizations (NGOs). Drawing on these and the study objectives, we drafted the questionnaires and had them reviewed by organizational partners and several SSF experts.

We collected data on the five main fishing habitats accessed by women: freshwater, mangroves and mudflats, soft bottom, coral reefs, and open ocean. Freshwater habitat largely consisted of rivers and streams, but was considered by many women fishers to extend from the source down to the brackish waters at the mouth. This meant that some fish and invertebrates harvested in this habitat were saltwater species. We grouped mangroves and adjacent mudflat habitats together as these are largely intertidal habitats accessed by women. The soft bottom habitat includes sandflats and nearshore seagrass beds, which are largely subtidal. Coral reefs included reef flats, lagoonal, fringing and barrier reefs, and the open ocean habitat included waters beyond the coral reefs, often referred to as semi-pelagic or pelagic waters. Many of the women fishers considered the open ocean as the outer edge of coral reefs and into deeper waters between outlying islands and submerged reefs, and therefore some coral reef species were included in this habitat. For the purposes of our study, only women fishers that reported catching or selling at least one pelagic species were included under the open ocean habitat.

We tested the questionnaires at a rural fishing village on the main island of Viti Levu. No major issues were identified during the piloting. However, we used suggestions from the interviewers to fine tune the wording of questions and translation into the *iTaukei* language. We completed household surveys and focus groups in 113 villages across 11 provinces in Fiji between November 2017 and April 2018 (Fig. 1). The

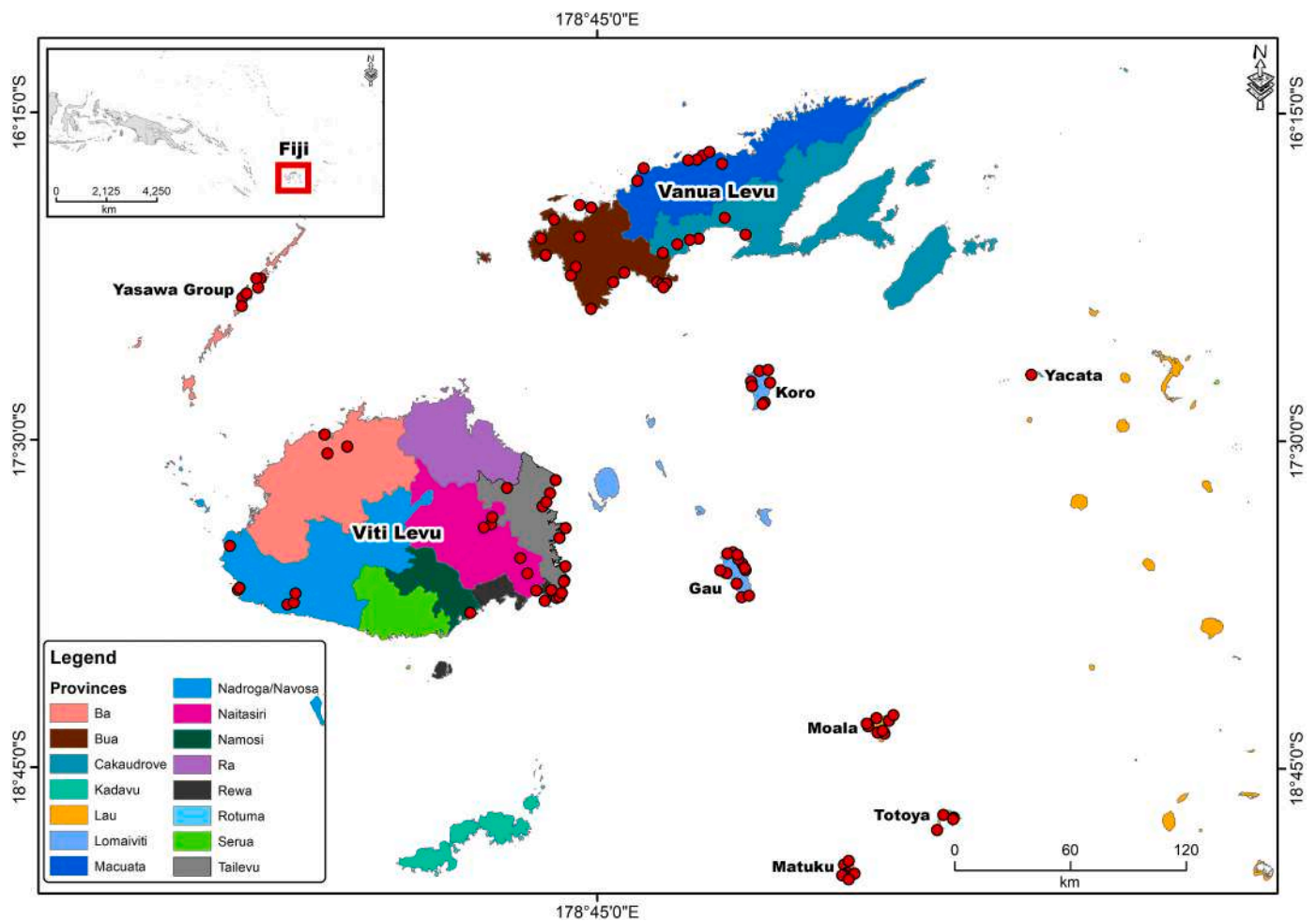


Fig. 1. Map of the provinces and villages (red circles) surveyed. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

trained interviewers (both women and men) conducted both the household surveys and focus group discussions in the *iTaukei* language. Household interviews (lasting 30–45 min) of rural women fishers made up the main part of this study. The women selected the location, usually their house or the village hall, with the aim of ensuring privacy and the respondent's comfort. We obtained traditional consent at the village level and individually with the women, prior to beginning the survey. Interviewers informed the women fishers that participation was voluntary, they could stop the survey at any time, and/or choose not to answer a specific question without consequence.

Within each village, we made an attempt to survey as many women as possible using a convenience sample; all women fishers who were available and willing to participate within a 5–6 hour time window were interviewed. The household survey was designed to gather information on general fishing practices, species targeted in different habitats, fishing gear use and access, post-harvest processing, fisheries consumption and sales, and fisheries dependence. Women were asked to name the top three species of fish and top three species of invertebrates/seaweeds (e.g. sea cucumbers, crustaceans, shellfish, marine algae) they usually caught, including the units (e.g. pieces, heaps, bundles), with the understanding that there were often variations. We also conducted focus group discussions (composed solely of women fishers) in order to complement and verify information gathered from the household questionnaire. These discussions also gave the women a chance to respond to questions that were better answered at the village level (e.g. challenges faced by *iTaukei* women fishers). The focus group discussions lasted 40–50 minutes and normally took place in the village hall. We

used a convenience sample to maximize the number of participants.

### 2.3. Data analysis

Data analysis was done primarily in Microsoft Excel Version 15.32 and SPSS Version 23.0. For Chi Square tests, a Fisher's Exact test was used when the expected count of a cell was less than 5. A standardized residual (Std. Residual) of  $\pm 1.9$  was considered the minimum value for significance. For women who did not report a weekly income, the monthly total was divided by four to provide an approximate weekly income for the purposes of this study. Preliminary data analysis showed that the top species for each habitat did not vary much between the ranks; most likely because the women were asked to name the top three in any order. Therefore, the ranks were ignored and instead treated as equal.

Our survey contained one set of questions on fishing strategies that was asked for each habitat. Data were then combined to show overall trends among *iTaukei* women fishers. Species caught were given in local names, which local staff matched to a scientific name using their local knowledge, and species identification guides. However, in some instances the number of local names was not the same as the number of scientific names. For example, sometimes the local name was not known to the researchers and the scientific name was marked as 'unknown'. For some species, different provinces had different local names. Several species of fish and invertebrates also had different local names for the juvenile of that species (e.g. the juvenile thumbprint emperor is known as *pipiji*, while the adult is called *kabatia*). Finally, some local names (e.g.

ulavi) also referred to multiple species (e.g. parrotfish), and were therefore identified to genus (e.g. *Scarus*, *Hipposcarus*, *Chlorurus*) or family level (e.g. Scaridae). In calculating the minimum number of species being harvested, each local name identified at the species level was counted as one. A local name that was identified as a single genera or family was also counted as one. Local names identified as two different genera (e.g. *Scarus* and *Chlorurus*) were also only counted as one. The true number of species caught is therefore higher, but the numbers presented still provide a sense of the diversity of fish, invertebrates and seaweed caught by iTaukei women fishers.

#### 2.4. Dataset summary

We completed a total of 1239 household surveys and 97 focus groups. The age of the women fishers ranged from 18 to 88, and averaged 47 years old. Forty-six percent of the women were from the village where they were interviewed, 30% were from another village in that province, and 25% were from another province in Fiji. The women had lived in their villages from 1 to 80 years; and 50% had lived in their respective village for 31 or fewer years. Marital status varied: 81% of women were married, 10% widowed, 7% single, and 2% separated or divorced. Education levels were generally low: 21% had completed primary school, 17% secondary school, and 11% had some primary school education. Tertiary education was rare, only 2% had completed it, and <1% had no education.

### 3. Results

#### 3.1. Fishing motivations and practice

Most women had multiple motivations for fishing, although subsistence was the most common reason (99%). For 43% of women, fishing was also a source of income. However, 'cultural events' was actually the second most common motivation (64%) for women to go fishing, followed by social activities (48%). Only 3% of women mentioned fishing for church obligations. We asked women to select their primary fishing motivation (i.e. only one option allowed), for which 83% percent chose food to feed their families. Income generation was second, at 14%. Only 3% of respondents listed social, cultural or church events as their primary motivation. During the focus group discussions, we asked women if their village benefited from women fishing, to which 95% of the focus groups responded in the affirmative. Only a few villages answered the follow up question on why or why not; but for those that did, a source of food and/or income were cited as the benefit(s) of women fishing. Finally, 59% of the women said that at least one male member of their household also fished.

We asked women fishers to estimate the proportion of their catch used for three purposes: food, sale, and to give away. If applicable, the woman then answered the same question about the catch from the male fisher(s) in her household. Overall, responses showed that on average women estimated more of their catch (70% vs. 62%) was for subsistence when compared to men ( $t(1947) = -5.99, p < .001, d = .15$ ). Women also sold less (37% vs. 43%) of their catch ( $t(932) = 3.33, p = .001, d = .11$ ) compared to men. There was no significant difference between women and men in terms of the percentage (19%) of catch given away. During focus group discussions we also asked the women about the provision of fish to local primary and/or secondary schools. Those who replied in the affirmative were then asked who harvested the fish (men, women, or both). Overall, 73% of the villages provided fish to the local school(s). Both women and men were responsible for harvesting fish; and the division of labor ranged from 100% provided by women to 100% provided by men, and varied between villages. However, on average 55% of the fish was believed by the respondents to be caught by women and 45% by men.

Soft bottom (64%) and coral reefs (62%) were the habitats most frequently fished by the women (Fig. 2a). However, the habitats with the

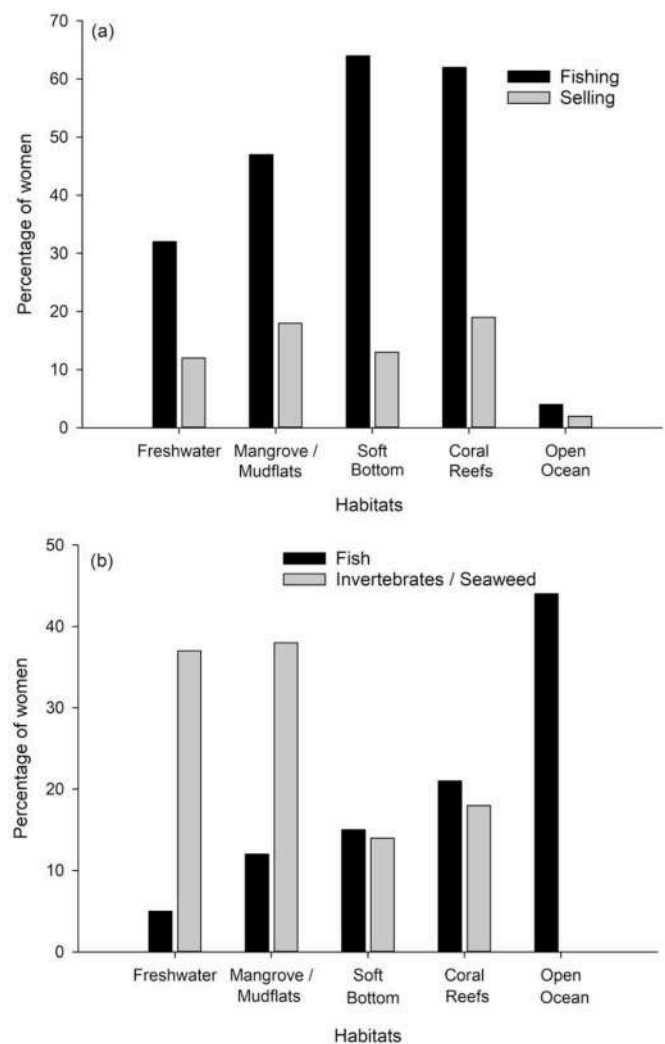


Fig. 2. (a) Percentage of women that fished and sold their catch from different habitats; (b) catch composition from different habitats.

highest percentage of women fishing to supplement household income were coral reefs (19%) and mangroves and mudflats (18%). The open ocean habitat had the lowest percentage of women both fishing and selling some of their catch (<5%). The focus group discussions also contained questions relating to habitats fished by the women. Almost all villages (84%) reported that men and women had access to the same fishing grounds. However, despite most having equal access opportunity, the women noted that there were still spatial differences in fishing effort. The men predominantly fished the open ocean area beyond the reef while the women focused on habitats closer to shore, harvesting invertebrates in the shallow water areas and fishing up to the coral reefs. Similarly, women in only 9% of the villages reported certain areas where only men or only women were allowed to fish. These exclusions were once again usually spatial or habitat-based, with women concentrating their fishing efforts closer to the village and men fishing out beyond the coral reefs. There was one village where women explained that customary beliefs were responsible for the differences.

Women's use of their harvested catch varied across the different habitats. For example, women were less likely ( $X^2(3) = 89.98, p < .001$ ) to catch fish for subsistence from mangroves and mudflats (*Std. Residual* = 7.1). They were also less likely to catch fish for sale ( $X^2(3) = 55.76, p < .001$ ) from freshwater habitats (*Std. Residual* = -4.8, Fig. 2b) but more likely to sell fish caught in the coral reef habitats (*Std. Residual* = 4.7). The use of harvested invertebrates and seaweed also varied for

both consumption ( $X^2(3) = 21.61, p < .001$ ) and sale ( $X^2(3) = 150.29, p < .001$ ). Women fishers were less likely to sell invertebrates and/or seaweed caught in soft bottom (*Std. Residual* = -5.7) and coral reefs (*Std. Residual* = -3.5) habitats, but more likely to sell this type of catch from freshwater (*Std. Residual* = 4.9) and mangroves and mudflats (*Std. Residual* = 6.7) habitats.

Gleaning for invertebrates and seaweed, which generally did not require specialized gear, was carried out by 78% of the women interviewed. Handlines were the most common type of fishing gear used (86%) followed by hand nets (49%) (Table 1). Thirty percent of women fishers used gillnets but only 14% used a hand spear. Forty-eight percent of the women fishers used a boat to reach one or more of their fishing sites. Of these women, 83% used a boat without a motor while 18% used a motorized boat. However, only 13% of the women knew how to drive a boat with an outboard motor. Twelve percent of women wanted to diversify the fishing gear they used, and of these, 26% desired gill nets.

During the focus group discussions, we asked women to describe the three main challenges they faced as fishers. Two of the main challenges involved fishing gear or boats: not having a boat for transportation to their fishing site (30%) and lack of fishing gear (15%). The other main challenge they faced when fishing was weather that was bad, cold, or unpredictable (16%). Other barriers identified by the women included distance to their fishing sites, surging waves and strong currents, no money to pay for use of boats in the village, and habitat damage. Although 50% of the villages said that at least one of the challenges was unique to women, only a few villages specified what these were, listing cold weather and strong currents as women-specific challenges.

Overall, the women fishers caught at least 160 species of fish: 159 for subsistence and 68 for sale. Out of the 160 fish species, 91 were caught solely for subsistence, 67 were caught for both food and income, and just one species was caught only for income. The main fish targeted by the women for both food and income were specific groupers (*Epinephelus* spp.) and emperors (*Lethrinus* spp.). The women fishers also harvested at least 104 species of invertebrates and seaweed: 99 for subsistence and 57 for income. Five invertebrate and seaweed species were harvested solely for income, 47 solely for consumption, and 99 for both food and income. The most commonly caught invertebrates included freshwater prawns (*Macrobrachium* spp.), freshwater mussels (*Batissa violacea*), giant clams (*Tridacna* spp.), mud crabs (*Scylla serrata*), and sea cucumbers (Family *Holothuridae*).

Many of the most commonly caught species were used for both consumption and sale. For example, the specific groupers (*Epinephelus* spp.) and emperors (*Lethrinus* spp.) were caught for both food and income in multiple habitats. However, in some habitats the women targeted different species for food and income. For example, in the coral reefs habitat only one of the top invertebrates for consumption (trochus shell, *Tectus/Trochus* spp.) was also a top species for sale. Instead, giant clams (*Tridacna* spp.) and spider shells (*Lambis lambis*) were harvested for food while sea cucumbers (Family *Holothuridae*) and octopus (*Octopus* spp.) were caught for sale. In the mangroves and mud flats, snapper (*Lutjanus* spp.) was one of the top three species for food but not

for income; however the opposite was true for the fringelip mullet (*Crenimugil crenilabis*).

The most common mode of transportation to fishing sites was on foot (63%). Boats with motors was the second most common mode (27%), and were used for habitats that were further away such as offshore coral reefs. Swimming (10%), boats without motors (7%), rafts (5%), canoes (2%), and 'other' (e.g. bus, horseback; 2%) were less common forms of transportation to women's fishing sites. Some women used multiple modes of transportation to a fishing site. Women usually fished close to their village, with 62% reporting it took them less than an hour to get to their fishing site. A further 17% needed one hour to travel to their fishing site and 11% stated it took them two hours. Only 4% of the women fishers took three hours or more to travel to one of their fishing sites. The time spent fishing once at the site was more variable, but two or three hours (25% each) were the most common responses. Four hours was the next most preferred (14%) amount of time spent fishing. Five hours (10%), more than five hours (11%) and one hour (11%) had similar frequencies. Only 5% of the women fished for less than an hour once arriving at their fishing site. The time spent fishing sometimes included searching for bait. The women fishers also expressed a clear preference for the time of day they went fishing, with 58% fishing during low tide. Mornings were the second most common time (29%). Eleven percent of women fished during the early morning or midday, and 7% during the afternoon. Fishing during the evening or at night were the least preferred times, with just 5% of the women fishing during these two time periods.

Sixty-four percent of the women fished every month during the year, and 28% said the months they went fishing was random. Eight percent gave specific months for their fishing, although there were few discernible patterns. Most of the women fishers divided their fishing effort between the accessible habitats, as a particular habitat was most often fished one (31%), two (29%) or three (23%) days a week. Fourteen percent of women fished a habitat more than four days a week, and 3% fished a particular habitat less than once a week. On a weekly basis, the time invested was split fairly evenly: 27% one week/month, 30% two weeks/month, 14% three weeks/month, and 28% every week during the month. Only 1% of women reported fishing a habitat less than one week during a month. Although the majority of women preferred fishing with other women (76%), some preferred fishing alone (26%). Fishing with other members of the household (15%) or relatives (10%) was most common when transportation was by boat.

### 3.2. Post-harvest processing and catch sales

Thirty percent of the women fishers we interviewed reported undertaking post-harvest processing for at least one other person. The other person was most often their husband (37%), another household member (30%) or a relative (24%). 'Another household member' included both females (54%) and males (46%). The women fishers sold their catch to a range of buyers including those inside their village and in neighboring villages, along the roadside, at municipal markets, and to

**Table 1**  
Use and ownership of fishing gear and boats. Numbers refer to the percentage of women.

Gear	Use	Ownership						
		'Only me'	Household	Clan	Association	Village	Relative	Other
Handline	86	92	6	<1	0	1	1	0
Hand net	49	82	6	1	1	4	4	4
Boat	48	5	20	13	3	39	9	11
Gill net	30	30	11	13	3	22	15	5
Hand spear	14	64	30	10	0	10	0	0
Multiple hooks	9	86	11	0	0	2	1	0
Spear gun	4	38	57	2	0	0	0	2
Fish trap	2	58	30	10	0	10	0	0
Poison	2	57	29	0	0	5	0	10
Trolling line	2	48	44	0	0	0	4	4

middlemen. Only 18% of the women sold at a municipal market, although a further 26% expressed a desire to sell at a municipal market if they had the opportunity. Most sold their catch fresh, and only 7% of women carried out any value-adding. Most of the value-adding done was for seafood packs (usually with fish) to be sold at ferry terminals and resorts.

Our results showed that most women used fisheries as a supplemental source of income. Overall, an average of 33% of women fishers' incomes came from fisheries; however, 24% reported that fisheries was their sole source of income. Conversely, 56% of women received no weekly income from fisheries (meaning they were subsistence fishers), and another 12% received 50% or less. Women fishers used the income from selling their catch for multiple purposes; but household expenses were the most common (93%) use of that income. The other most common uses were for food (86%), church (79%), village functions (75%) and school (69%). Only 3% of women fishers used their fisheries income for other purposes, such as fuel for fishing trips, paying off loans, personal expenses, or travel.

At the village level, the women were asked during the focus groups what barriers they faced in selling their catch. The most common challenges were those related to selling their catch at municipal markets: access to a market (17%), no available market facility (11%), lack of transportation (10%), and distance to the market (7%). Other challenges included too much competition (8%), or a low demand for freshwater or marine catch (7%). The majority (61%) of focus groups also reported that at least one of these challenges was unique to women, although none of them specified which one(s). However, of the villages where women sold at a municipal market, women in 59% of them considered the market a safe place to sell. Some of the women elaborated that the municipal market was a safe place for them to sell, "as long as you have a license to sell". Otherwise, women in multiple focus groups reported that they were sometimes harassed and threatened while selling their catch.

Finally, we asked the women if they received the same price for their catch as the men. For villages where women sold their catch, 69% replied 'yes', 28% 'no' and 3% 'not sure'. For those that responded in the negative, the women reported that they received lower prices than the men, particularly men who sold at the municipal market. In some cases, the lower price received by the women was because they were limited to selling their catch inside their village, while men travelled to a municipal market to sell.

### 3.3. Contribution to household food security

We asked women fishers about the types of protein (i.e., fresh fish, canned fish, invertebrates (e.g. crabs, shellfish), *dahl* (lentils), canned meat, pork, chicken, and beef they served in their main meals over the previous week. Fresh fish was the most commonly consumed protein, eaten on average three times a week, and two times a week was the most common frequency. Ninety-five percent of the women fishers' households had consumed fresh fish up to seven times in the past week, or an average of once a day. However, 13% of the households had eaten no fresh fish during the prior week. Canned fish was the second most common (1.3 times/week) source of protein, followed by *dahl* (1 time/week). Invertebrates (0.9 times/week), chicken (0.7 times/week), pork (0.3 times/week), canned meat (0.3 times/week) and beef (0.2 times/week) were all eaten less than once a week on average. Women fishers' households that had consumed fresh fish or invertebrates were then asked a follow-up question on the source(s) of the protein. The women themselves caught the majority of both the fresh fish and invertebrates (Fig. 3).

### 3.4. Dependence on fisheries livelihoods

Women were asked about their livelihoods: activities they engaged in that provided food and/or income. Apart from fishing for subsistence,

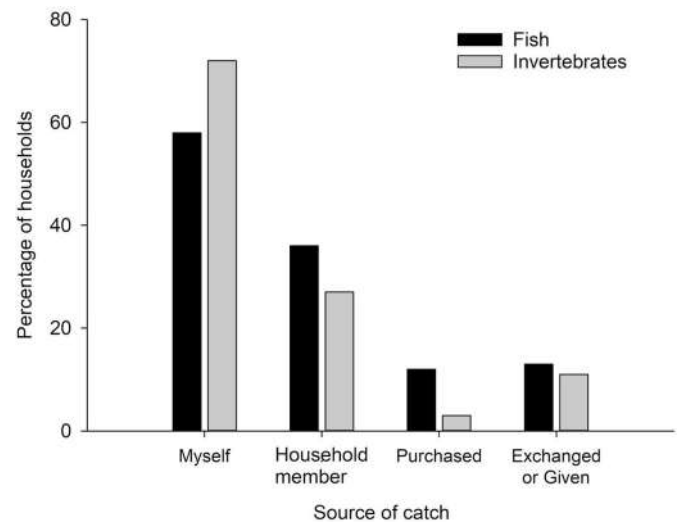


Fig. 3. Source of fresh fish and invertebrates for women fishers' households. Note, household member represents a member other than the fisher herself.

farming (including the maintenance of household gardens and family cash-crop plantations with their spouses) was the most common livelihood for the women (63%). Other common livelihoods were handicrafts (53%), fishing for income (44%), and small business (26%). Salaried employment (6%), tourism (3%), hunting and aquaculture (2%) and remittances (1%) were infrequent income-generating livelihoods for the women fishers (Fig. 4). The women also ranked their most important and second most important livelihoods. Overall, fishing for subsistence and handicrafts were viewed by the women fishers to be the most important livelihoods (30% and 29%, respectively). Fishing for subsistence was also one of the second most important livelihoods (40%) along with farming (20%).

Furthermore, women fishers noted their most stable livelihood and the one which brought in the most income. The top two 'most stable' and 'biggest income earners' were similar to their top-ranked: handicrafts (28% and 33%) and fishing for income (24% and 23%) (Fig. 4). Small businesses and farming were the third and fourth for both stability (13% and 12%) and income (12% and 13%), respectively. Fifty-two percent of

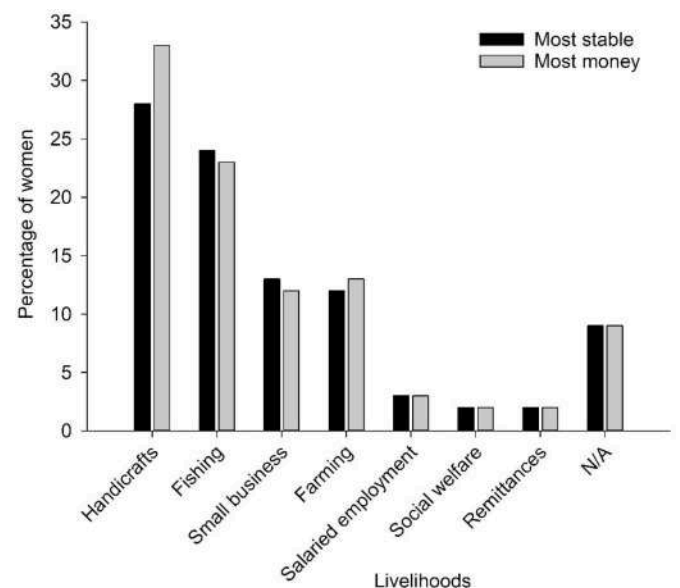


Fig. 4. Most stable and largest sources of income for women fishers. N/A means 'not applicable' as the woman did not have any source of income.

the women stated it was easy for them to earn income outside of fishing. Finally, 36% were neutral and only 10% disagreed about the ease of earning an income outside of fishing.

#### 4. Discussion

The contributions of women fishers to SSF continue to be *invisible*, *ignored* and *unrecognized*, and this is evidenced by how poorly institutions approach gender inclusion in the sector, and engage women in fisheries planning and management at sub-national and national levels (Mangubhai and Lawless, 2021). At the same time, social and cultural norms and practices can limit women's participation in local decision-making within their communities, including over the natural resources they use (Barclay et al., 2018; Lawless et al., 2019; Rohe et al., 2018). Although there have been individual case studies over the last decades on women in fisheries (e.g. Fay-Sauni et al., 2008; Vunisea, 2014, 1997), many of these are from a narrow set of geographies, and do not provide a national snapshot of the investments women are playing in the SSF sector, and their contributions to Fiji's subsistence and commercial economies.

Our study provided evidence of the vital contributions *iTaukei* women fishers make to food security and income generation within their households, which have evolved and expanded in several ways. Compared to the past, women are fishing a wider range of habitats (including those further out to sea), and higher diversity of fish, invertebrates and seaweed. For example, the coral reefs habitat was the second most fished by the women in our study, despite traditionally being the domain of men (de la Torre-Castro et al., 2017; e.g. Ram-Bidesi, 2015; Santos, 2015). Compared to the past (Fay-Sauni et al., 2008), a higher percentage of women were selling at least some of their catch to supplement their household income. Although women continued to be the dominant sellers of invertebrates and seaweed (Lambeth et al., 2002; Vunisea, 2014), many also sold a diversity of fish (at least 68 species) caught from all habitats. Similarly, despite cultural restrictions on and barriers to the use of motor boats (Kronen and Vunisea, 2007), almost half of the women in our study used a boat to travel to one or more of their fishing sites, predominantly in groups, including with men. However, women's investments in fisheries were still tied to cultural norms around their primary role of providing food for their family. Earning income was seen to be secondary, once a woman has completed her primary tasks of looking after the home and her household members (Fröcklin et al., 2013; M. Fox, pers. comm.).

Recognizing and quantifying the role and contributions of women in fisheries is vital to unlocking the development potential of fisheries, and achieving food security (Chant and Sweetman, 2012; Ram-Bidesi, 2015). Fish are rich in micronutrients (Kawarazuka and Béné, 2011; Thilsted et al., 2016) which are not found in plant sources, and are therefore a key component of food security (Golden et al., 2016; Hicks et al., 2019; Kawarazuka and Béné, 2010). In coastal rural areas and the outer islands of Fiji where residents are only able to purchase limited food supplies, fisheries provide a major source of protein for communities. Our study showed that more than half of fresh fish, the main source of protein for the women fishers' households, was harvested by the women themselves. Invertebrates were a supplementary source of protein, predominantly harvested by women. However, women's contributions to household food security are often overlooked because much of women's fishing is unpaid, informal, part-time or simply considered part of their household responsibilities (Gustavsson, 2020; Harper et al., 2017; Kleiber et al., 2015). Food security is also associated with a greater labor burden on women (Geheb et al., 2008; McKinnon et al., 2016; Quisumbing et al., 1996), especially since their food harvest is usually more reliable than that of men (Pacific Community, 2014; Tilley et al., 2020).

In Fiji, *iTaukei* women fishers faced several barriers in their efforts to provide fresh freshwater or marine catch for their households. Due to disproportionate time burdens placed on women (e.g. household duties,

childcare, care for the elderly) (Cole et al., 2018), most of their fishing sites had to be close (one hour or less) to the village, even by boat. This limited women's access to fishing grounds and habitats that were farther away from the village. Fishing gear was also an impediment. Previous studies have shown that women tend to use low technology fishing gear (Purcell et al., 2016; Ram-Bidesi, 2015), while men own and have better access to more complex gear (Cole et al., 2020; Gustavsson and Riley, 2018). Women fishers were most likely to own handlines, hand nets and hand spears, although many expressed interest in owning gill nets. Women often have insufficient purchasing power, which can limit their access to technology (Bradford and Katikiro, 2019; Quisumbing et al., 1996) and there are often gender norms around the ownership and use of certain gear (Cole et al., 2020). Furthermore, fishing gear owned at the household level is not necessarily available to women (Kleiber et al., 2017), and boats were usually owned at the village or clan level. Finally, the lack of skills of how to drive a boat with a motor meant that women must depend on the availability of both a boat and a driver to access to habitats which cannot be reached by *bilibili* (bamboo raft), foot or swimming.

Women's access to local natural resources for food and income can help them cope with shocks (Agarwal, 2018; Chaston Radway et al., 2016; Thomas et al., 2019). During times of food insecurity, fish and other natural resources can be sold for income to purchase household supplies (Chaston Radway et al., 2016; Eriksson et al., 2017; Nguyen et al., 2020; Pham et al., 2016). The COVID-19 pandemic has disrupted food systems across the globe (Bennett et al., 2020; Devereux et al., 2020), with the closure of municipal markets resulting in a loss of income for women fishers (Béné, 2020; Farrell et al., 2020); but women fisher's households in *iTaukei* communities appear to be relatively food secure as most of their household's protein needs are supplied by seafood, and farming provides vegetables (Walters et al., 2021). However, the shutdown of global travel due to COVID-19 and collapse of tourism in Fiji has resulted in loss of employment and family income (Bennett et al., 2020). Our study showed that fishing for subsistence, agriculture and handicrafts were viewed by the women fishers to be the three most important livelihoods. The decline in tourism market demands have affected these livelihood streams and will consequently lead to increased pressure on coastal resources, which were already under pressure to meet livelihood needs (Prince et al., 2019).

An understanding of the different resource users and their activities is a prerequisite for effective management (Bell et al., 2018; de la Torre-Castro et al., 2017). Including women in the decision-making process can also greatly assist in achieving social and ecological outcomes (Kleiber et al., 2015; Rohe et al., 2018). The exclusion of women's harvests from official statistics also results in substantial underestimates of catch volumes, as well as uncertain stock status. This could be especially important for invertebrate fisheries, as they are likely to come under more pressure as fish stocks are further depleted (Anderson et al., 2011; Costello et al., 2012; Pikitch et al., 2014). Women are the main users of nearshore habitats such as mangroves and mudflats, and soft bottom (includes seagrass beds), which are important nursery areas for a range of fish species (Nagelkerken et al., 2000; Olds et al., 2013; Short et al., 2011). As many more women enter commercial markets, there is a growing concern that women may be harvesting and selling undersized juvenile fish from these habitats, affecting the sustainability of some of the common fisheries. For example, one of the most frequently harvested species by women, *Lethrinus harak*, has been found to have a spawning potential ratio of 10% in Fiji, indicating that populations are likely to decline rapidly and if not corrected, is likely to result in local extinctions (Prince et al., 2019). Similarly, many women targeted groupers, which are in rapid decline in Fiji with spawning potential ratio values of <5% (Prince et al., 2019). However, awareness to reduce the targeting of juvenile fish in Fiji is challenging because Fiji's size limits are outdated, grossly inadequate, and do not reflect the reproductive biology of the species (Prince et al., 2018). A "Fish Smart" campaign (previously called "Set Size") launched in 2020 is trying to raise national awareness on the

importance of size limits for sustainable using and managing fisheries (Prince et al., 2020).

Historically, a woman's role was usually limited to the house and domestic sphere (Dyer, 2017; Lawless et al., 2019) and there were often norms that restricted women from leaving the house and their household duties (Barclay et al., 2018; Fröcklin et al., 2013). Although gender inequalities are argued to be rooted in traditional culture (Dyer, 2017), the gendered division of labor is dynamic as gender roles are constantly shaped and negotiated (Barclay et al., 2019; FAO, 2017), resulting in more flexible livelihood opportunities (Cohen et al., 2016). Lawless et al. (2020) identified economic benefit as one of the drivers of changes in norms, and the rise of the cash economy has transformed both economies and gender roles (Barclay et al., 2018; Cohen et al., 2016; McKinnon et al., 2016). Women have come under increased pressure to engage in cash livelihoods to help pay for household expenses and school fees (Fröcklin et al., 2013; Locke et al., 2017; Pham et al., 2016).

The increasing number of women selling some of their catch follows a trend also seen in other countries, including in the Pacific (Rabbitt et al., 2019; Rohe et al., 2018). However, women's participation in new livelihoods does not necessarily lead to their empowerment or the transformation of established norms (Barclay et al., 2018; Fröcklin et al., 2013; Liebowitz and Zwingel, 2014). Women's traditional tasks have not decreased as they have gained greater participation in activities normally performed by men (Fröcklin et al., 2013; Vunisea, 2014). Instead, women entering the commercial fisheries sector can find themselves in a push-pull situation (Chant and Sweetman, 2012; Dyer, 2017; Maetala, 2010; Roberts and Mir Zulfiqar, 2019) as they seek to balance their traditional responsibilities with the time needed to acquire and sell their catch, leading to increased demands on their time. As a coping strategy women often seek to combine their income-generating activity with their domestic responsibilities in order to fulfill both simultaneously (Geheb et al., 2008; Santos, 2015). For example, some women take their children with them to the market in order to fulfil their childcare obligations (Ram-Bidesi, 2015).

Greater engagement with the cash economy has also meant an increase in physical mobility since women sometimes travel to sell their catch; although barriers remain. For example, some women were restricted to selling within their village while men were able to travel to municipal markets; as a result the women received lower prices for the same species. Mangubhai et al. (2016) found that in many instances women received lower prices for sea cucumber compared to men, and security concerns and transportation were barriers to women accessing the full range of markets available. Men are more likely to have access to private transportation such as a car or motorcycle (Fröcklin et al., 2013) while women depend on public transportation.

Women's participation in an activity traditionally associated with men does have the power to challenge existing gender roles (Fröcklin et al., 2013), which is a necessary precursor to women's increased participation in governance (Stacey et al., 2019). However, strong norms mean that many women still cannot take part in decision-making at the village level (Dyer, 2017; McKinnon et al., 2016; Waylen, 2014) or hold leadership roles (Rohe et al., 2018). The traditional, customary and institutional barriers that women face in communities will continue into the future, unless entry points are identified and established for women to participate in the decision-making process (Vunisea, 2014). Therefore, providing women with the opportunity to participate in new livelihoods is not enough, a gender-transformative approach is needed to truly empower the women (Cole et al., 2020; Stacey et al., 2019) and ensure poverty alleviation, food security, and improved health. Furthermore, empowering women for full participation in fisheries requires a re-consideration of traditional gender norms in rural communities, which are already shifting and evolving.

## 5. Conclusions

We aimed to better illuminate the role of *iTaukei* women in Fijian

SSF. The long-term sustainable management of fisheries is necessary for food security, livelihoods and poverty alleviation. Our results demonstrate that women fishers provide critical contributions to their household food security via the three pathways: (1) the direct nutritional value of fish; (2) increased purchasing power (and thus a source of income) from selling fish and invertebrates; and (3) an improved economic status (Kawarazuka and Béné, 2010). However, their substantial contributions from harvesting both fish and invertebrates are not included in most official statistics, and therefore are overlooked and continue to be *invisible, ignored and unrecognized* in fisheries management and policy development. Addressing these shortcomings will be crucial to meeting the United Nation's Sustainable Development Goals 14 (conserve and sustainably use the oceans, seas, and marine resources for sustainable development) and 5 (achieve gender equality and empower all women and girls). Sustainable management of SSF will require the collection of sex-disaggregated data, and for women's catches to be counted and included in all statistics. More information about the volume and sizes of fish and invertebrates harvested by the women would assist in the sustainable management of key species. Women fishers also need greater participation in management decisions and policies, especially for the habitats where they are the main users (e.g. mangroves and mudflats). This would allow them to utilize their traditional ecological knowledge to help manage local populations. Finally, the evolving changes in gender roles that guide social-cultural institutions should be used to redefine the gender use and management of the SSF sector to better meet the needs of fisheries dependent populations. These changes can help ensure that women fishers and their contributions are *visible, acknowledged and recognized*.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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