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ORIGINAL ARTICLE

Capturing the foodscape of mangrove fishers in Indonesia

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Abstract

Mangroves and small-scale fisheries are frequently framed as critical to food systems sustainability, yet the communities that depend on them often remain marginalised within policy processes. Dominant approaches to achieve food systems sustainability have tended to prioritise technical and measurable dimensions, overlooking how food is experienced, valued, and made meaningful in everyday life. This study focuses on the lived experiences of mangrove small-scale fishers in Indonesia. Using a foodscapes lens, we explore how fishers make sense of, and give meaning to, the relationship between food, people, and place, with particular attention to the gendered nature of these experiences. Drawing on participatory visual methods, we generate visual and qualitative data on fishers' practices and experiences, which are analysed using reflexive thematic analysis. We identify three key themes: (a) the fish catch reflects the fisher, (b) finding peace and joy in the foodscape, and (c) mangrove livelihoods rely on both land and sea. These findings reveal contrasts between global and local narratives: while food sustainability discourses emphasise nutritional and environmental functions, fishers understood food as embedded in socio-cultural meanings, reciprocity, and place-based identities. We highlight the need to re-examine the role of mangrove fisheries by recognising the interconnectedness of fishing and land-based activities, especially for women who particularly make this relationship visible. We argue that sustainability interventions informed by dominant global narratives risk misalignment with local realities and call for greater attention to lived experiences in designing more context-sensitive and inclusive food systems policies.

Keywords Borneo · Food security · Natural resource management · Photovoice · Small-scale fisheries · Socio-ecological systems

Introduction

Food systems research describes the interlinkages between diverse actors and processes, as well as the sustainability outcomes of activities involving food (Ericksen 2008). These systems underscore the interdependences underlying some of the greatest global challenges, including increasing malnutrition, environmental degradation, and inequality (HLPE 2020). The holistic nature of food systems thinking brings together diverse scholars and scientific experts to define these sustainability challenges and provide a proposed agenda of action (Béné et al. 2019; Brock 2023).

Policy efforts to transform food systems toward greater health, sustainability, and equity have largely been driven by distinct narratives shaped by technical experts and powerful actors (Leach et al. 2020). While the 'food systems sustainability' concept has helped to move considerations beyond narrow concerns centred on food productivity and caloric

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intake, empirical insights in practice continue to prioritise food and nutrition availability. Environmental footprints are increasingly incorporated as an extension rather than a substantive shift in approach (Béné et al. 2019; Willett et al. 2019; Clark et al. 2020). These framings have dominated, in part, due to their ability to render complex problems as technical, controllable, and scalable (Kimura 2013; Hayes-Conroy et al. 2014), aligning with technocratic approaches that privilege what can be measured over social and cultural dimensions that are harder to quantify or govern (Béné et al. 2019; Chao 2021). This technical framing overlooks the diversity of lived experiences of those affected by policies that seek to address issues related to food sustainability (Arthur et al. 2021). This is especially relevant given that 3.8 billion people worldwide live in households working in agricultural food systems (Davis et al. 2023), many of whom reside in rural areas of low- and middle-income countries and are marginalised from decision-making processes that define how problems are framed, and what should be done to address them (Spires et al. 2023; Woodhill et al. 2022).

This study focuses on the lived experiences of mangrove small-scale fishers in Indonesia, a group whose livelihoods sit at the centre of this tension, as their food systems are increasingly shaped by policies grounded in technical framings of food and the environment privileging measurable outcomes over local knowledge and experiences (Srivastava and Mehta 2021; Arthur et al. 2021). We argue that sustainability interventions informed by dominant global narratives risk misalignment with local realities by overlooking how food is experienced, valued, and made meaningful in everyday life. By identifying these gaps, we examine how these insights can inform more effective and context-sensitive policies.

More broadly, central to understanding lived experiences of food systems is examining how people make sense of food systems in specific places, the values and meanings they attach to them, and how this shapes action toward change (Urquhart and Acott 2013). Here, place denotes a location that people have a relationship to, and further attach emotion and meaning through these relational experiences (Cresswell 2014). Understanding these experiences can inform policy by revealing whether proposed interventions align with how people already relate to and value a place. Such alignment shapes public acceptance, perceived legitimacy, and ultimately whether interventions succeed or are resisted (Abbott and Wilson 2015).

This gap becomes evident in how policies are formulated and applied in practice. As shown by Darmanto (2022) and Chao (2022), food security policies in Indonesia are typically assessed through standardised economic and nutritional indicators, such as income, caloric intake, and (staple) food production. While enabling comparison, these measures often fail to capture locally embedded food practices and meanings in place. As a result, some regions are misidentified as food insecure despite relying on diverse subsistence systems, leading to interventions that do not address the actual needs of local communities.

Classifying regions incorrectly can have material consequences. For example, areas deemed as food insecure have been targeted with rice distribution programmes to address perceived deficits in staple access (Darmanto 2022). However, by privileging rice over locally valued foods, these interventions disrupted existing practices and were perceived by communities as inappropriate or ineffective. Policy frameworks solely grounded in narrow metrics can be reductionist, obscuring local realities and the potential to inadvertently undermine the very systems they aim to support. Incorporating local narratives into policy design is important to ensure contextually relevant and effective responses.

While the term food systems is typically used as a heuristic tool to provide a broad, collective language and objective amongst diverse actors to facilitate research practice (Maye et al. 2025), it often gives limited attention to how food is experienced and interpreted in everyday life. A foodscapes framework offers a complementary lens to examine local food systems narratives. A compound term derived from the words ‘food’ and ‘landscapes’, the foodscapes concept encourages a deeper exploration of the relations between food, people, and place in everyday life (Nyberg 2019). Foodscapes are socially constructed spaces in which cultural meanings and representations intersect with material and environmental contexts, shaping how food is experienced and valued (Dolphijn 2005). They adopt a relational approach, highlighting the meaningful and often reciprocal relationships among humans and between humans and non-humans (West et al. 2020), as well as acknowledging the plurality of values informing human-nature interactions (Astorga de Ita et al. 2025). Socio-cultural identities, such as gender and religion, shape these experiences and the meanings attached to food practices (Yasmeen 2023; Plank 2015; Bruckner and Paia 2024). Consequently, a foodscapes lens provides an analytical framework for taking a more critical approach to sustainability: first, by foregrounding the marginalised actors excluded from defining its meanings, and, second, by rethinking our relationships with food, the environment, and the ‘living’ in general (Matta 2023). In this way, foodscapes can enrich food systems thinking by offering a means to interrogate whose narratives shape food systems, attending to the meanings and experiences of food in place.

Small-scale mangrove fishers offer a compelling case through which to apply this lens as they operate at the intersection of various food system priorities, balancing the need

to sustain local livelihoods, diets, and mangrove ecosystems to meet broader conservation goals. Mangroves are intertidal forest ecosystems that are typically found along the coastal tropics and sub-tropics (Warne 2007). They are globally important for biodiversity (Carugati et al. 2018) and acknowledged as key carbon sinks that mitigate against climate change (Kristensen et al. 2008). Yet, an estimated 62% of mangroves were lost between 2000 and 2016 globally, mostly driven by aquaculture, oil palm production, and other agricultural expansion (Goldberg et al. 2020).

Indonesia has the largest population of mangrove small-scale fishers, comprising ~ 40% of all mangrove fishers worldwide (Zu Ermgassen et al. 2020). Mangrove fisheries comprise any fishing activities where mangrove-associated species are targeted, and/or use techniques specific to fishing in mangrove habitats (Seary et al. 2021). An estimated 893,000 mangrove fishers work full- or part-time in the country, representing roughly one-third of Indonesia's small-scale fisheries workforce (KKP 2022). In Indonesia, small-scale fishers (*nelayan kecil*) are defined as fishers who harvest fish (and other aquatic animals) for meeting their daily living needs, and do not use a large fishing vessel over 10 gross tonnes (Undang-undang nomor 7/2016).

Given the critical role of mangroves in supporting small-scale fisheries, mangrove fisheries are receiving increasing attention for their role in the sustainability of marine environments and food consumption (Ickowitz et al. 2023; Duke et al. 2014). Mangroves provide essential nursery habitats and nutrients for marine species, while also protecting fishers' livelihoods from erosion and storms, and further improving water quality and fish populations (Mumby et al. 2004; Nagelkerken 2009). Research has shown that degradation of aquatic ecosystems, including mangroves, reduces the productivity of fisheries, leading to declines in fish stocks and a reduction in catch and income for small-scale fishers (Yamamoto 2023). Win–win narratives around ecosystem conservation and social outcomes are frequently used to justify mangrove protection; protecting marine biodiversity increases the marine resources, which supports local food consumption and income from selling fish catch (Yamamoto 2023; Dabalà et al. 2023; Chaigneau and Brown 2016).

The prevailing science and policy narrative around mangrove fisheries emphasise their positive contribution towards climate change, protecting biodiversity, and poverty alleviation through the ecosystem services they provide (Arthur et al. 2021; Sasmito et al. 2023; Dabalà et al. 2023). However, this interest is often framed in highly instrumental terms, situated within top-down environmental and development narratives that privilege powerful actors and scientific experts (Srivastava and Mehta 2021). Small-scale fishers, who constitute 90% of Indonesia's fishing sector, remain largely marginalised from shaping conservation and development policies and initiatives (Arthur et al. 2021; Sari et al. 2021), despite them being key producers and actors in the food system (Canfield et al. 2021). This marginalisation also has a key gender dimension: women are often excluded from formal recognition as fishers, limiting their rights to resources and support (Pasaribu and Machdani 2025). Gender norms around who undertakes which food-related activities, from fishing and gathering to preparing and provisioning, further shape how foodscapes are experienced and valued differently by gender (Arthur et al. 2021; Bruckner and Paia 2024).

Using a foodscapes lens, we take a relational approach to explore how fishers give meaning to, and draw connections between food, practices, and places. By emphasising meaning-making, we capture not only what fishers do, but how they understand, value, and relate to these activities within their social and environmental contexts. We achieve this via participatory visual methods to assess how foodscapes are experienced differently across genders, highlighting the implications of these differences for policy interventions.

Methodology

Study site

This study focuses on small-scale mangrove fisheries in Kubu Raya (Fig. 1), a district (*kabupaten*) in the province of West Kalimantan, Indonesia. The name of the sub-district (*kecamatan*) and village has been anonymised. In this coastal region, fishing livelihoods, local food practices, and mangrove ecosystems are closely connected. West Kalimantan is one of the nine provinces (out of 38) where the national government of Indonesia planned to rehabilitate 600,000 ha of mangroves by 2024 (Sasmito et al. 2023). Kubu Raya regency contains the largest area of mangroves in the province (Maulidia et al. 2022).

Found along the Kapuas Hulu estuary, the coastal villages in Kubu Raya mostly engage in small-scale fisheries. Fishing activities are seasonal, typically peaking during the dry season between June and August (Aditya et al. 2021). During this time, the intake of fish and other aquatic animals is higher, due to the increased availability of fish (Middleton et al. 2025).

Socioeconomic challenges remain pronounced in the province despite progress countrywide. Around 40% of under 2 year olds are affected by stunted development (Permana et al. 2023), almost double the national average (Rokom 2023). Urban and rural divisions are also prevalent. In West Kalimantan, 8.5% of the rural population experienced poverty in 2021, almost twice the proportion

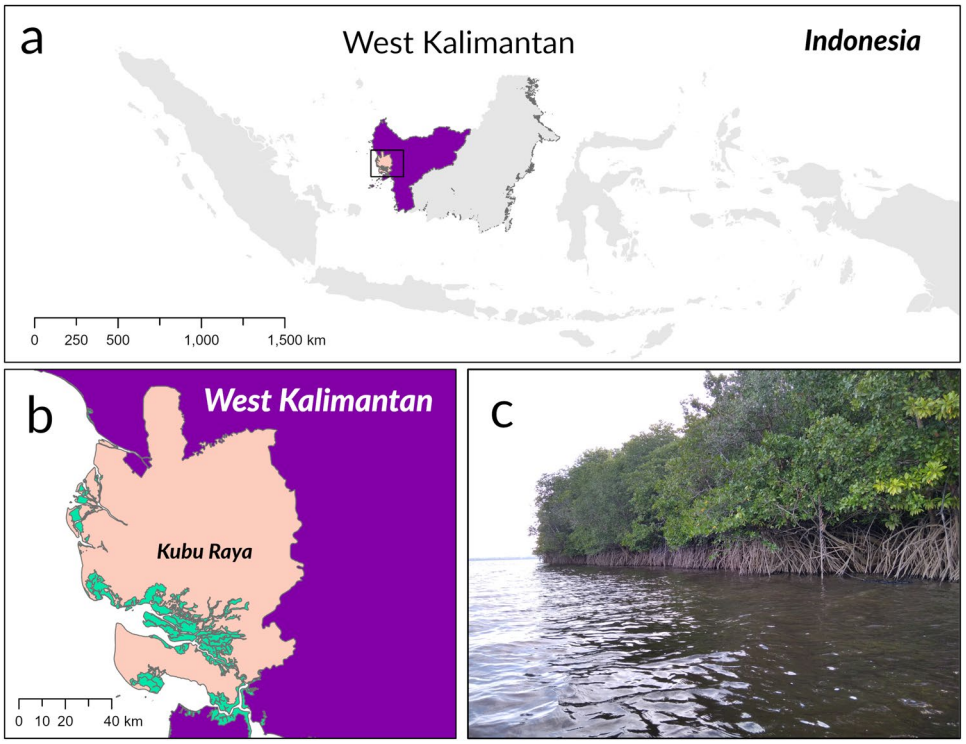


Fig. 1 Location of study site in Kubu Raya, Indonesia. **a** A map showing the location of West Kalimantan in Indonesian Borneo. **b** Kubu Raya district (*kabupaten*) is shown in pink. Mangrove cover in West Kalimantan is represented in green (Ministry of Environment and Forestry 2017). **c** A picture taken by one of the participants in the study, showing a mangrove forest in Kubu Raya

observed in urban areas (BPS 2021). These figures point to the ongoing challenges in nutrition, health, and livelihoods in coastal and rural communities.

Given the spatial overlap between mangroves, poverty, and malnutrition levels in coastal fishing communities, this region has been targeted by several development and conservation interventions. These include improving the productivity of small-scale fisheries (Cavatassi et al. 2019), as well as specific education programmes (Pramana et al. 2023) and nutrition communication campaigns (Starkweather et al. 2020) with the aim of reducing malnutrition levels. Concurrently, a series of interventions have been introduced to combat mangrove deforestation. These include the establishment of protected areas, the prohibition of mangrove timber extraction, and the launch of several large-scale restoration programmes (Banjade et al. 2017; Sasmito et al. 2023). This convergence of poverty, malnutrition, and overlapping conservation and development agendas makes Kubu Raya an especially relevant setting to examine how food, livelihoods, and environmental management intersect.

Before the main period of data generation in 2023, we visited the study site from July to August 2022 to familiarise ourselves with the local setting, build relationships with the communities and local authorities, and identify appropriate sites for the main fieldwork study. This 2-month trip involved taking part in everyday practices, including spending time at people's homes, joining fishing trips, cooking, and sharing meals. Our visit also strengthened our relations with Blue Forests, a local conservation NGO, who initially acted as a bridge between the research team, local authorities, and the communities. Although not directly involved in the research process, their established relationships were instrumental in facilitating access. Through discussions with the local NGO, we identified three sub-villages where most households engaged in small-scale fishing activities and lived in proximity to mangrove forests: sub-village X, sub-village Y, and sub-village Z. These communities are mostly of Melayu ethnicity; however, there are also people who identify as Javanese, Tionghua (Chinese), Dayak, and Madura (Wulandari et al. 2021). Food practices vary across these groups, influenced by differences in religious practices, occupations, and broader sociocultural norms (Gandasari et al. 2024; Hariansyah and Rosilawati 2021).

During our 2-month visit, we conducted a pilot study in sub-village Z, involving 10 participants. This experience was valuable in helping us refine our methods, navigate linguistic and logistical challenges, and ensure that subsequent fieldwork would be feasible. After the pilot study was complete, we continued to the main period of data generation in the following year.

Data generation

Participatory visual methods are increasingly being employed for capturing the lived experience of social-ecological changes in place (Masterson et al. 2018; Turner et al. 2023). They entail a collaboration between researchers and participants that empowers the individuals and groups who

are the focal point of the research process (Teti et al. 2021). By shaping their own narratives, participants can gain a greater sense of agency and authenticity over how their lived experience is represented (Spiegel 2019). Visual methods are particularly valuable for mobilising knowledge that may be missed through oral communication alone (Saratsi et al. 2019). For example, using photographs, Masterson et al. (2018) found that ceremonial practices were still active at a customary shrine in Kenya that, previously, researchers thought had ceased. The photographs sparked conversations that surfaced knowledge which would otherwise have been disregarded. We therefore chose to take a participatory visual approach, specifically in the form of photography, collages, and mapping, to better understand the foodscapes of small-scale mangrove fishers and the meanings they draw from this.

A total of 27 fishers (12 women and 15 men), nine from each sub-village, engaged in the participatory process (Table 1). All participants were small-scale fishers that fished in mangroves (Seary et al. 2021). Participants were stratified by: (a) age (18 to 40 years old; > 40 years old) to provide a range of perspectives across generations, and (b) gender, as mangrove fishing is a highly gendered livelihood practice (Bruckner and Paia 2024). Participants were purposively selected to ensure a balanced representation across these categories, with local informants assisting in identifying and inviting individuals who met these criteria. All men in the group identified fishing as their primary livelihood activity (n = 15), while 40% of women did so (n=5), with the remainder primarily engaged in household care and charcoal production. Women who identified fishing as their main activity predominantly practiced gleaning, which is defined as the manual collection of targeted marine animals in shallow waters.

The participatory visual study was carried out from May to July 2023. Data were generated in three stages: (a) a participatory photography training workshop and data generating activities by individuals, (b) individual semi-structured interviews, and (c) focus group discussions to co-develop foodscape collages (Figure S1). Combined, these three stages lasted between one and two weeks in total, depending on the time availability of participants. The same three-stage process was repeated in each sub-village (sub-village X: 21–31 May, sub-village Y: 2–14 June, sub-village Z: 14–24 June). Across all three stages, participants and facilitators spoke in both Bahasa Indonesia, the national language of Indonesia, and Bahasa Melayu, the local language most widely spoken in the sub-villages.

Table 1 Sociodemographic and economic characteristics of small-scale mangrove fishers participating in the study

	Women	Men
No. of participants	12	15
Religion		
Islam	12	15
Age (average)		
Years [range]	46 [20–66]	37 [20–63]
Primary livelihood activity		
Fisher/gleaner	5	15
Household carer	2	0
Other	5	0

Stage 1: participatory photography training workshop and data generation

In each sub-village, a half day workshop session was held at one of the local informant's houses, as both the researchers and participants felt this was a comfortable space to host such events. The workshop was led by two facilitators (RW and MGYL) and supported by a research assistant. The workshop was divided into two parts. The first focused on introducing the purpose of the research, the value of participatory visual methods, and outlining the timeline of the entire study. Following this, participant informed consent was obtained from all individuals in written form (see "Analytical process"). Participants who experienced difficulties in reading were assisted with an oral explanation of the consent form.

In the second part of the workshop, the facilitators led the participatory photography training. Phone devices were lent to participants and shown how to take GPS coordinate-tagged photographs using the KoboCollect phone application (https://eu.kobotoolbox.org). Over the 3-day period we asked participants to take photographs with the following prompt:

> *What food, food places, and food activities, are important to you and your family?*

We explained that this might cover any livelihood activities that they felt related to food, and places where food activities might occur or that were associated with food in some way. We emphasised that photographs should tell a story, emotion, or a perspective related to the prompt and that they should be able to communicate about why it was important to them.

After the three-day period, all data were uploaded to the Kobo Toolbox. In some cases, the GPS coordinates of the photograph location were not recorded in KoboCollect, either due to technical issues with the phone device, or poor GPS signal when in remote locations. Any missing GPS coordinates were assigned manually in collaboration with the relevant participant. In total, ~ 800 photographs were taken by all fishers over the three-day period.

Two visual outputs were printed by the research team: all individual photographs that were taken by the participants, and an A4 sized foodscapes map, showing the locations of where the photographs were taken (see Figure S1). The use of maps alongside interviews, is a well-established practice in place-based research as it facilitates participants' interpretation and articulation of lived experiences (Bell et al. 2015; Kwan and Ding 2008; Dennis et al. 2009). We used Google Earth satellite imagery for the basemap, as it is readily accessible and higher detailed resolution for the study site compared to other open access platforms.

Stage 2: individual semi-structured interviews

After the printed materials were prepared, we asked to meet participants individually in a space they felt comfortable, to discuss the photographs. These discussions took the form of semi-structured interviews, allowing participants to articulate their experiences in depth, capturing nuanced perspectives and meanings, and offering the flexibility to pursue topics that unfolded during the conversation (Knott et al. 2022). First, we shared the printed photographs that each participant took and their own foodscape map, prompting each participant to reflect on their place-based experiences. We then encouraged participants to share their overall thoughts on the photograph-taking exercise and asked questions about their socioeconomic background and household characteristics. These opening questions were specifically chosen because they are relatively easy to answer, which helps to ease the conversation and build trust between researchers and participants (Knott et al. 2022). To prioritise experiences that best reflected participants' everyday lives (Wang and Burris 1997; Masterson et al. 2018), each participant was asked to select the three photographs that resonated most with their daily experiences. They were also asked to provide a caption for each photograph, including: (a) where and when it was taken, (b) a description of the content, and (c) why it was important to them and their family (Table S1). Additionally, participants were invited to share moments that they wanted to talk about but were unable to photograph. Although these could not be visually documented and accounted for in the collages, they were discussed in detail during the interviews, transcribed and analysed under the category of 'uncaptured moments'. Interviews were audio recorded, lasting 1–2.5 h per participant.

Stage 3: focus group discussions and collage-making

After the individual semi-structured interviews were complete, the research team held two focus group discussions in each sub-village, one for women and one for men, each consisting of four or five people. We decided not to combine focus groups across all three sub-villages as having smaller groups allowed for more intimate discussions. Moreover, as we wanted all participants from the participatory photography exercise to take part in a focus group discussion, it made scheduling them easier. The focus group discussions were audio recorded, with the consent of attendees. We divided the groups by gender for two reasons: (a) to prevent tensions and ensure that participants felt at ease to speak, and (b) identify distinct patterned meanings that may exist between genders. Differentiating focus groups by gender acknowledged the power dynamics and gender roles that are present within the household and the broader political sphere in our study context (Azizah 2023). In each of the focus group discussions, participants were asked to share their three chosen photographs and the associated stories with the group, which took about 20 min in total (Table S2).

After everyone in the group had shared their stories, participants were asked to discuss the similarities and differences between them and then co-create a collage with the photographs (Fig. 2). This exercise lasted ~ 30 min. We chose collages as they can visually represent shared meanings and values between photographs, as well as the type of connections between photographs, should they exist (Butler-Kisber 2018). We then asked participants to reflect on their own experiences in relation to others and deliberate on their shared experiences together. Additionally, they were prompted to provide labels for groupings and linkages, meaning that they were able to decide how they wanted the photographs to be represented collectively, further subduing the assumptions of the researchers (Liebenberg et al. 2020).

The participants have copyright of all the photographs they generated and the co-created collages. They were also given printed copies of their photographs and foodscape map, should they wish to keep them. At the end of focus group discussions, we asked participants to fill out an evaluation survey to provide feedback of the research process and indicate how they would like their stories and research to be shared (Supplementary Note 1).

Analytical process

The three chosen photographs from all participants (n = 81), foodscape maps (n = 27), and collages (n = 6) were printed as visual support for the analytical process. The audio recordings of the interviews and focus groups were transcribed into Bahasa Indonesia and uploaded into NVivo version 12. To understand how mangrove fishers make sense of, and attach meaning to, food and food practices in place, we took a reflexive thematic analysis approach (Braun and Clarke 2022). The purpose of capturing these meanings is to identify the underlying values that shape how fishers relate

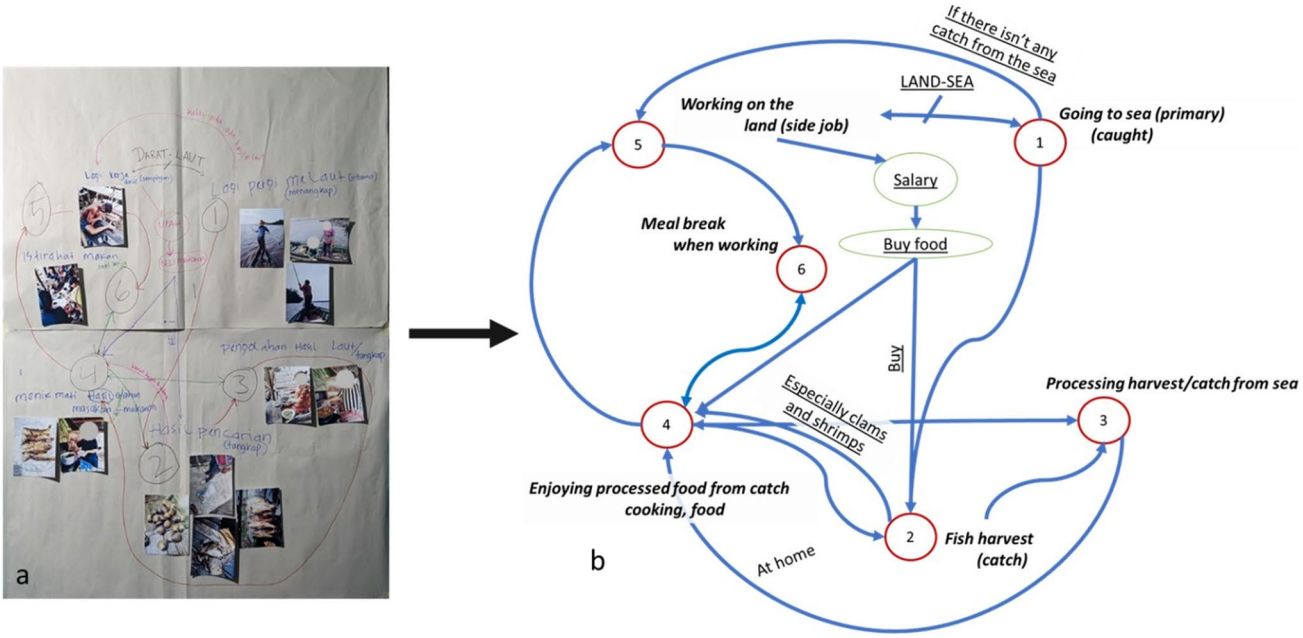


Fig. 2 Foodscape collage created by focus group (women) in sub-village X. **a** Image of the foodscape collage generated by the focus group (women) in sub-village X, illustrating the titles and relational linkages. Visual personal characteristics (e.g., faces identified in images) have been covered to ensure that participants, and the people captured in the photographs, remain anonymous. **b** A translation of the foodscape collage. Titles of groupings were recorded as parent title codes (bold italics). Text describing linkages were recorded as parent relational codes (underlined). This focus group decided to numerically order categories to show the relations between them (red circles 1–6)

to food in place. As part of the reflexive thematic analysis, coding is required to systematically organise the qualitative data. This process allowed us to develop themes that capture the values and experiences most important to participants, synthesised from across the individual stories (Braun and Clarke 2022). These themes that summarise local perspectives can be contrasted with dominant narratives that currently shape actions and policies in food systems sustainability. Both inductive and deductive strategies were applied to identify patterns organised around central concepts (see Figure S1).

We used open inductive coding to identify data that were relevant to the research question in the interview transcripts. This is an exploratory 'bottom-up' form of data analysis, where codes are generated from language and words used by participants capturing explicit or surface meaning to explore people's own perspectives related to their lived experiences (Braun and Clarke 2022).

In contrast, deductive parent coding is more of a 'top-down' approach that uses predetermined codes, which, in this case, were derived from the six collages formed by participants (see Fig. 2 for example). These codes included: (a) the titles of the photograph groupings, and (b) the relational linkages identified between the groupings. We called these our parent title codes and parent relational codes, respectively. In addition, we recorded which of the three sub-villages generated the parent title and parent relational code, and the gender of the relevant focus groups. Focus groups consisted of individuals of mixed age; therefore, we were unable to determine which codes were attributed to specific age groups.

All inductive codes generated through open coding were placed within the relevant deductive parent codes, allowing us to organise participants' accounts within a structured framework. Once coding was complete, we examined patterns within and across the parent codes to identify shared meanings. These patterns informed the development of preliminary themes reflecting how participants conceptualised their foodscape, including the type of food, food places, and associated activities that were most important to participants. Each theme was iteratively reviewed against the full dataset to ensure it accurately reflected participants' experiences while remaining analytically distinct. Themes were further refined through ongoing team discussions, with particular attention to how fishers attach meaning to, and represent, the relationships between food, people, and place.

Overall, 33 title groupings were recorded in the six collages (Table S3). These codes were aggregated together if they shared the same or similar titles, resulting in 14 parent title codes (Table 2). Likewise, 12 relational linkages from all the collages (Table S4) were distilled down into nine parent relational codes (Table 3). Three overarching themes were developed to characterise the foodscapes of mangrove fishers. In the next section, we discuss each theme,

Table 2 Parent title codes derived from the foodscape collages

Parent title code	Sub-village	Gender
Processing harvest	X	Women
Working on the land	X, Y, Z	Women
Good weather	Y	Women
Daily cooking needs	Z	Women
Going to the sea	X, Y, Z	Women
Fishing gear	X, Y, Z	Men
Location	X, Y, Z	Men
Capture method	X	Men
Fishers group	X	Men
Other harvest from mangroves	Z	Men
Family	Z	Men
Transport	X, Y, Z	Women, men
Meals	X, Y, Z	Women, men
Fish harvest	X, Y, Z	Women, men

Table 3 Parent relational codes derived the foodscape collages

Parent relational code	Sub-village	Gender
Land and sea connection	X, Y, Z	Women
Salary from land work	X, Z	Women
Shellfish subsistence	X	Women
Weather-cooking	Y	Women
Happy feeling	Y	Women
Boat and equipment interdependent	Y	Men
Fishing time	Y	Men
Income from fishing	Z	Women
Food is most important	Z	Men

illustrating them with quotes from participants and situating them within existing scholarship.

Reflexivity and ethics

This study takes a reflexive approach (Braun and Clarke 2019), recognising that our worldviews, positionalities, and ethical commitments have shaped the design, implementation, and outcomes of the research (Beck et al. 2021; Pienkowski et al. 2023). Reflexivity does not only concern our positionalities, but also how our social skills and emotional responses influence relationships with participants and the knowledge produced (Moser 2008). While engaging reflexively, we were careful to maintain a clear focus on how our perspectives influenced the research process, avoiding overly self-centred reflections and tokenistic declarations (Gani and Khan 2024; Kaechele et al. 2024).

Our team held varying degrees of outsider status in relation to the communities we worked with in West Kalimantan. Some of the co-authors are from a UK university (MGYL, MJS, ZGD), while others were Indonesians from, or based, in Java (RW, PU, MN). For the fieldwork team (MGYL, RW, PU), not being from West Kalimantan sometimes proved beneficial. It allowed us to ask simple, straightforward questions, whilst also helping us to connect local experiences to broader issues in Indonesia and beyond, particularly in relation to food security, fisheries, and mangrove conservation (Bruckner 2025). Throughout our interactions with participants, we adopted what Caniglia et al. (2023) describe as humility, being open to worldviews other than our own, and positioning ourselves as learners rather than experts.

Following Rushton (2024), we recognise that gender shapes how knowledge is situated and produced. With this awareness, we sought to understand local gender norms and consider how the gender composition of our team influenced power dynamics in the field. For example, the pilot included two male research assistants, while the main data generation exercise was carried out entirely by an all-women fieldwork team. During the research process, we reflected on how our all-women team may have facilitated more open conversations with women but limited access to men's perspectives, shaping both the relationships we built and the knowledge we were able—or unable—to access.

Fieldwork in each sub-village spanned multiple days, which intersected with participants' work and caregiving duties. To minimise disruption, we adopted flexible scheduling and maintained an "ethics of care" approach (Warnock et al. 2022). To remove financial barriers, we compensated participants based on local hourly wage rates in West Kalimantan and covered travel costs for training and focus groups. Payments were consistent with those offered by our NGO partner, reducing the risk of conflict or competition. The study received ethical approval from the School of Anthropology and Conservation Research Ethics Committee, University of Kent, UK (Ref: 20221656353811154) and Indonesia's National Research and Innovation Agency (BRIN, Ref: 77A/SIP/IV/FR/4/2023).

Results and discussion

In this section, we present three key themes identified through our analysis of mangrove fishers' foodscapes. Together, these themes identify what is collectively most important to participants, allowing us to compare local realities with global narratives in food systems sustainability, and demonstrate why more context-sensitive policy interventions are required.

Theme 1: the fish catch reflects the fisher

This theme captures how participants related to their fish catch (Fig. 3). Participants described fishing as more than its material gain: the catch reflected the skills, moral character, and personal responsibility in their social lives. In their accounts, qualities such as diligence, patience, and resilience



Fig. 3 A photograph chosen by one participant, representing their daily catch. Source: Z, woman, < 40 years old

directly shaped their ability to bring food home, making the catch a reflection of the fisher's identity and virtue. To them, the catch became a symbolic measure of whether one is a "good fisher" and, by extension, a good person.

This understanding of a "good fisher" was often expressed through everyday fishing practices, particularly in how participants described the skills required to secure a 'good' catch. For example, one participant explained how failing to read environmental conditions could directly result in poor outcomes:

> "As for that fisher, he often doesn't get much of a catch because he doesn't consider reading the weather, and sometimes he gets caught out by unexpected weather, like if it rains…We look at the weather first from the house and decide whether we go out to sea […] If the weather is clear, we go. If it's dark there, we read the wind direction, you need to read the wind too…" [sub-village Z, man, <40 years old]

Here, the ability to interpret weather conditions was not only a practical skill but also a basis for evaluating competence, where success or failure at sea became attributed to the fisher's knowledge and judgement.

Beyond technical competence, participants framed fishing as a moral practice, where patience, persistence, and diligence were seen as necessary to achieve a good catch. This was often illustrated through the everyday experiences and comparisons with others:

> "My husband? He doesn't like going to sea – he doesn't like waiting. He wants to work straight away and go home straight away, just like that. If you want to fish for shrimps, you need to search first…then fish. If there aren't any, we go search another place […] once my husband joined, he just slept [laugh], he doesn't like waiting long, 'you get sleepy' he says."
>
> [X, woman, <40 years old]

> "If you are a diligent person, it means you get the catch, if you are lazy then you wouldn't get anything."
>
> [X, woman, >40 years old]

In a village surrounded by waters abundant in fish, not bringing home food was not attributed to scarcity, but to personal shortcomings:

> "There is a saying in this village, that someone who doesn't eat [goes hungry], is a person who is lazy."
>
> [Z, woman, >40 years old]

Failure to catch fish was therefore moralised, reinforcing the idea that fishing outcomes reflected the character of the individual.

These accounts resonate with Gustavsson et al. (2017) where fishers in the UK frame skill and dedication as visible markers of a 'good fisher'. Similar traits are also found in a wider European context, where experiential knowledge, patience, and having genuine interest in the profession are expressed as important characteristics to make it as a small-scale fisher (Boonstra and Hentati-Sundberg 2014).

The symbolic significance of fishing is particularly evident in the expression of *rejeki* by participants. *Rejeki,* a key tenet in the belief system of Islam, is a word adapted from the Arabic term found in the Holy Qur'an, and can be translated into English as God's gift (Mokui 2023). Religion is an important part of Indonesian society, and the term is widely adopted across the country, but its meaning can vary across contexts (Mokui 2023). Participants expressed *rejeki* as two interrelated concepts. First, *rejeki* is one's fate determined by God. This type of concept states that all sustenance, livelihood, and provisions that individuals receive are from Allah under Allah's will, which includes finding a good catch.

> "Depends on *rejeki*. If there is *rejeki*, it means we catch a lot and it's big, if there is no *rejeki*, yeah, then it's a small [catch]"
>
> [X, woman, >40 years old]

At first, this framing of rejeki suggests a deterministic understanding of success, where the catch is entirely dependent on divine will. However, participants also expressed *rejeki* to signify a form of fortune embodied within a place or opportunity that must be actively pursued through virtues such as diligence and determination.

> "Here, we say that *rejeki* from Allah is good to us, if we have good intentions and are generous to others, Allah will provide abundantly."
>
> [X, woman, >40 yrs old]

> "My *rejeki* increased after marrying my wife, and the more children we had, our *rejeki* multiplied."
>
> [Z, man, <40 years old]

In this sense, *rejeki* extended beyond fishing itself and into diverse facets of life such as faith, generosity, and family relations. Sustenance was therefore understood as inseparable from broader moral and social obligations, linking everyday practices at sea to wider ethical and religious frameworks.

Together, these accounts show how fishers related to the food they produce, not just as sustenance, but evidence of who they are. The catch became a visible outcome of skill, effort, and moral character, reinforced through the concept of *rejeki*, which linked individual actions to broader social and religious responsibilities. By foregrounding these symbolic dimensions, we demonstrate that the fish catch is not merely an economic or nutritional output of the food system, but also holds a deeper meaning that speaks to the identity and virtues of fishers themselves.

Theme 2: finding peace and joy in the foodscape

This theme describes how participants relate to specific food activities, which are considered as a 'break' away from the work of everyday life presented as moments of calmness and bonding with friends or family. These activities range from producing and processing food, to cooking and eating.

For some participants, the sea was not only a site of work, but also a space of tranquillity and mental relief:



Fig. 4 A photograph chosen by one participant, showing the joys of eating together with friends. The photograph was deliberately cropped to maintain participant anonymity. Source: X, woman, > 40 years old

> "Your mind is calm, you don't think a lot, it feels calm at sea…"
>
> [X, woman, >40 years old]

As this fisher points out, being at sea meant you were able to momentarily disengage with everyday worries, reframing fishing as a source of calmness rather than solely labour.

Fishers further described fishing as a social activity, particularly when working alongside friends. For example, women spoke about gleaning together in groups, where the activity became lively and enjoyable, and further gave them a sense of liberation and empowerment:

> "If I go gleaning, I rarely go with my husband, all of them are my friends…yeah, I enjoy it! Because together, it's lively, we can shout out loud."
>
> [Y, woman, <40 years old]

Other studies have similarly highlighted gleaning in mangroves, particularly among women, as a communal, emotional experience that fosters a sense of connection and enjoyment with others, as seen in Indonesia (Middleton et al. 2024) and the Solomon islands (Bruckner and Paia 2024). Combined, these accounts challenge the traditional 'women as subsistence providers' narrative, which reduces women's roles to household caregiving and overlooks the broader meanings of their practices (Grantham et al. 2020).

Some participants shared photographs of eating together as a family after coming back from work, enjoying the food that is harvested and processed from their own catch. One participant showed photographs of eating with co-workers on a charcoal production site, describing these moments as "creating memories," and experiencing happiness from being in each other's company (Fig. 4).

Similar experiences have been noted elsewhere, in both Indonesia (Darmanto 2022) and the UK (Gustavsson et al. 2017), where food practices are shown to hold cultural and emotional value that goes beyond subsistence. By highlighting these dimensions, participants reframe food not as a narrow resource to be extracted and consumed, a perspective that dominates discussions in food systems research (Loring and Gerlach 2009), but as a medium through which peace is restored, relationships are nurtured, and joy is created (Gustavsson et al. 2017; Darmanto 2022).

Theme 3: mangrove livelihoods rely on both land and sea

Like mangroves, often described as having 'one foot in the land and one in the sea' (Dybas 2015; Warne 2007) this theme highlights how the livelihoods of mangrove fishers are situated in both terrestrial and marine spaces. Participants

said that they often shared their foodscape with mangrove loggers (who supply the wood for charcoal production), forest product collectors (including harvesting wild honey or palms), and fuelwood producers. A concern frequently raised by fishers was that conflicts with loggers would arise, as a result of them not adhering to specific tree cutting regulations, which negatively affects fish populations:

> "Sometimes, there are people who violate the regulations […] People who use nets to fish are angry with people who cut down trees carelessly […] If the tree falls into shallow waters, it has a big effect if it's near a fishing pole, this really affects the fishing nets, it tears down like leaves falling, shaking out all the shrimps that were in the nets."
>
> [Y, man, <40 years old]

Yet, participants also emphasised a more mutualistic relationship between fishing and land-based work. Fishers noted that they are not on opposing sides with charcoal producers. Rather, they were interdependent and, in some cases, the same person performed both roles. Fishers diversified into different types of land-based activities, including building, and repairing boats, logging, charcoal production, and collecting mangrove palm tree leaves that are typically used as roofing material (Fig. 5).

Land-based income provides a financial safety net, particularly during seasonal fish shortages or bad weather spells:

> "If there is no work on the land, then I go to the sea. If there's work on land, then I don't go to the sea. If we go to sea, we can't be sure, catch is sometimes good, sometimes not, we cannot predict. But on land we can be sure of the income."
>
> [X, woman, <40 years old]

Having such financial security is connected to the need to buy food, including rice and vegetables, which cannot be produced along the coast due to the fertility of the soil.

> "You can't plant rice here. We have tried, but only the fruits of the grain appeared, but there was nothing inside. It's different from the mountains, here are coastal plains."
>
> [Y, woman, <40 years old]

Other participants stated that land-based work was not only a safety net, but also a means to invest into the future and avoid being in debt. These savings supported their children to attain educational success and pay for a wedding when the time comes:



Fig. 5 A photograph chosen by one participant, showing their day-to-day livelihood activity. The participant wanted to show themselves making roofing from palm leaves gathered from mangrove forests. Source: Y, woman, > 40 years old

> "Yeah, I didn't have much, there were no charcoal kilns. I've had one now for about 15 years. All expenses from my children who have married so far have been paid from the charcoal kiln."
>
> [Z, woman, >40 years old]

Studies have similarly highlighted the amphibious nature of fishers, whose lives and livelihood are shaped through continuous engagement with both land and water (Pauwelussen and Verschoor 2017; St. Martin and Olson 2017). As Pauwelussen and Verschoor (2017) demonstrate in their study on contested coral-human relations among the Bajau community in Indonesia, conservationist framings of coral as an endangered ecosystem often clash with local understandings that are relational, amphibious, and fluid, undermining conservation outreach efforts of preserving coral habitats. Building on this, the findings in this study show that fishers' practices are not divided into onshore and offshore domains but are instead mutually constitutive. However, such relational perspectives remain largely absent from dominant understandings of mangrove fisheries, where fishers' integrated land-sea practices are frequently overlooked.

More specifically, in relation to mangrove-charcoal dynamics, few studies have addressed what impact this has on local food security. One in the Solomon Islands found that mangrove degradation through logging negatively impacted local food security (Minter and van der Ploeg 2023). However, little is known about charcoal production in Indonesia, despite it being the largest wood charcoal exporter in the world (Hillring 2006; OEC 2024). Yet, charcoal and fishing are typically thought of as conflicting issues, with illegal logging is threatening fisheries and food security (Miller and Tonoto 2023; Njagi 2021).

However, the findings here complicate this assumption. Engaging in multiple livelihood activities ensured that the fishing households remained food and income secure, particularly during seasonal changes, or in the events of shocks and stresses. As other studies have shown in Indonesia, not having access to alternative livelihood activities during low fishing seasons can result in food insecurity and micronutrient deficiencies (Gibson et al. 2021). Parallels can also be drawn between farming and mining practices in Indonesia, where farmers engage in mining activities during the hungry season (Fisher et al. 2019).

In the interviews, mangrove fishers spoke of the interdependency between the sea and land, irrespective of their gender. However, the collages made by the women revealed that the land-sea interface narrative is at the forefront of their shared experiences (Fig. 2 and Table 3). Such detail was noticeably absent from men's collages. This shows that men and women drew from different experiences in visualising their foodscapes.

One participant expressed that with her husband earning the main source of income through logging, she had the freedom to engage in fishing. Moreover, it secured an independent source of income and gave her greater autonomy in managing her savings, reducing reliance on her husband's main source of income.

> "I would go every day [out to sea]. But when it rains, I don't go out to sea. If my body isn't feeling good, I don't go. If, like a year ago, I would go both in the morning and evening. But now, either I go just in the late morning, or at nighttime. It is like this, if I need anything, I don't need to ask for money, you know for things like shopping, shopping that I want, like clothes."
>
> [Z, woman, <40 years old]

Paradoxically, charcoal production is typically portrayed as a male activity carried out by the poor, where women's presence is made invisible, masking the multiple reasons for why they choose to engage in the charcoal sector (Jones et al. 2016). Similar findings can be found in Sub-Saharan Africa, where an overtly masculine focus hides the high participation of women engaged in the charcoal value chain (Jones et al. 2016; Ihalainen et al. 2020). In Mozambique, women also gain greater financial autonomy from their husbands and parents by earning money through charcoal production (Jones et al. 2016).

Using a foodscapes lens to examine contrasting narratives of food systems sustainability

Collectively, the three themes show that a foodscapes lens provides key insights into how fishers construct, experience, and assign meaning to food, with a greater attention to place, which contributes to reframing the sustainability of food systems. Our findings highlight a set of important contrasts between global and local narratives (Srivastava and Mehta 2021). First, whereas fishing is typically understood in economic and subsistence terms—as a livelihood or a source of nutrition—fishers also emphasised its symbolising role in shaping identity, character, and virtue (Gustavsson et al. 2017). Fishers attach additional symbolic and socio-cultural relations to food, making food activities expressions of emotion, reciprocity, and connection. Second, global conservation discourses promote mangrove protection primarily for environmental and food security benefits, positioning threats to mangrove forests as synonymous with threats to community well-being (Yamamoto 2023). In contrast, fishers articulated a more nuanced picture of their dependence on mangrove landscapes, underscoring the interconnectedness of fishing and logging, and recognising that land-based work as integral to sustaining livelihoods. Yet, these complexities do not always necessarily fit well under the global sustainability frameworks, highlighting the limits of top-down approaches that reduce diverse practices to binary categories and the need to consider local values, priorities, and trade-offs. Finally, a gendered perspective reveals diverse values that women attach to food practices that go beyond its subsistence value, as well as the type of spaces that they take up, spaces that are often perceived as masculine (Jones et al. 2016).

A foodscapes framework contributes to rethinking food system sustainability, shifting attention away from narrow, top-down narratives and toward the lived relationships and meanings that shape how people make sense of food in place (Nyberg 2019). These comparisons are not intended to disprove one another or highlight contradictions. Indeed, fishers also recognise the economic, nutritional, and environmental value of mangrove fisheries. Rather, we argue that in food systems research, an overt focus on global framings through an environmental or developmental lens risks oversimplifying local realities, which are situated in specific moral, cultural, and livelihood contexts.

Recognising the diverse meanings and values of small-scale fishers is essential for challenging assumptions and mitigating unintended adverse consequences of poorly informed policies (Johnson 2006; Short et al. 2021). Progress toward more sustainable and just food systems requires embracing complexity and diverse narratives shaping policy agendas. This includes uplifting and integrating local lived experiences into policy decision-making and management to ensure they are more equitable and effective (Hawkes et al. 2024).

These issues are particularly pressing in the current policy climate. With growing international and national pressure to expand mangrove protected areas and enforce more stringent measures on illegal mangrove logging (Yogi Eka Sahputra 2021), policy interventions would be better informed by conducting a thorough analysis of the relationships between mangrove fishing and logging. Such analysis includes examining the institutional structure and conditions of the charcoal sector. Furthermore, as our results show, greater consideration also needs to be given to the social and cultural dimensions that are intertwined with the material and economic assets of fishers (Gustavsson et al. 2017). This can help us better understand the diverse motivations and actions of fishers and further provide a richer understanding of their livelihoods.

Imposing more stringent and extensive bans on mangrove logging may also have serious gendered implications. We show that the stable income from charcoal work gave women more opportunities to pursue livelihood activities they enjoyed, including fishing. These enforcements not only pose a risk to the well-being and autonomy of women, but also the food security of rural households, where women have been found to proportionally spend more on food than men (Ihalainen et al. 2020). To avoid such outcomes, policy and decision makers must pay closer attention and listen to the concerns of women to ensure that policy interventions do not risk exacerbating gender inequities. This includes the need to sensitise policy spaces to the existing power structures that already marginalise women's voices (HLPE 2023).

Alternative livelihoods have already been implemented as a development and conservation intervention in the study area, aiming to reduce people's reliance on specific natural resources (Cavatassi et al. 2019). However, evidence has shown that such interventions often fall short of their intended outcomes (Wright et al. 2016; Stacey et al. 2021). In the sub-villages where this study was based, both ecotourism and honey production have been promoted as livelihood alternatives (*pers. comm.*). Yet, villagers, practitioners and other key actors in the region have all reported that logging continues to rise (*pers. comm.*). Where alternative livelihood interventions are to be implemented, greater consideration should be given to how they fit within the existing livelihood strategies (Wright et al. 2016), with monitoring and evaluation put in place to determine their success (Stacey et al. 2021). Taken together, these insights demonstrate how centring the lived experiences of mangrove fishers can inform policies that are more responsive to the social and cultural realities necessary for building healthier, more sustainable, and equitable food systems.

Reflections on using participatory visual methods

Participatory visual approaches can be a powerful tool to support a better understanding of meanings associated with, and experiences of, foodscapes. From the evaluation survey (Supplementary Note 1), participants reported that they enjoyed the research process.

> "[Through this project] …I gained new knowledge and I enjoyed gathering with others in the community"
> - *Anonymous*

The photographs taken by participants gained interest from others in the community, including friends and family members across multiple ages. Participants were able to share copies of their photographs, as well as the stories that were attached to them. One of the participants now displays the photographs they took in their home, both as a visual reminder of moments captured in the pictures, as well as the memory of being part of research process (*pers. comm.*). By having the creativity and agency over the data generation process, participants were able to develop their own narrative of their foodscape and further choose what messages they wanted to share with others, a point that resonates with the goal of participatory visual methods more broadly (Spiegel 2019; Leavy 2020).

We also recognise several factors that may have influenced the data and their interpretation. As most participants had their own phone device, they were able to use the KoboCollect app intuitively to record the GPS locations of the photographs taken. However, several older participants mentioned having some difficulties and needing the assistance of younger family members to take photographs. In doing so, the output of the photograph may be different from what the participant had intended, or may be missing because help was not available when they wanted to take a particular image (Rivera Lopez et al. 2018). Nonetheless, participants also expressed the benefit of having someone take their photographs (e.g., someone independent of the research taking a photograph of a participant while they were fishing).

Some participants were able to orientate themselves and interpret the photographs located on the satellite imagery

foodscape maps, allowing them to trace daily movements and situate their food practices spatially. Others, however, found the maps more challenging to read, highlighting that individual familiarity with spatial imagery can vary. This emphasises the importance of employing multiple visual methods to gather data, ensuring that participants can convey their experiences of the foodscape without relying on a single tool.

Our study only represents a single snapshot in time, thereby restricting our ability to capture other habits or key experiences outside of the three-day period (Rivera Lopez et al. 2018). Likewise, our approach did not account for seasonal variations over time, which has been linked to shifts in the perceived importance of fishing activities (Grantham et al. 2020). Extending the duration of the exercise to span across multiple seasons and years could yield deeper insights into the temporal dimensions of foodscapes (Masterson et al. 2018). This prolonged engagement also provides more opportunity to foster trust between the participant groups and researchers, particularly when delving into sensitive topics in greater depth (Bandauko and Arku 2023; Castleden and Garvin 2008).

Conclusion

Experts and key actors from diverse disciplinary fields and sectors have proposed various pathways towards the sustainability of food systems (Béné et al. 2019; Brock 2023). Our findings, however, suggest that proposed interventions informed by dominant global sustainability narratives do not necessarily resonate with people on the ground. By centring the experience of mangrove fishers, we sought to elevate their perspective on what role food plays in their lives and what implications this should have in shaping decision-making processes. We show the importance of the socio-cultural dimensions of food in sustainability debates, as well as the need to re-examine the role of mangrove fisheries beyond fishing itself, especially from a gendered perspective. By employing the foodscapes lens alongside participatory visual methods, we captured the powerful and compelling stories that were pivotal in making the deeper values, meanings and connections held in relation to food apparent. These tools can contribute to ensuring that evidence-informed policy and practice are more attentive to, and reflective of, the experiences and perspectives of the key actors they seek to support.

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Data availability Due to privacy and ethical restrictions, data will not be openly available online.

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