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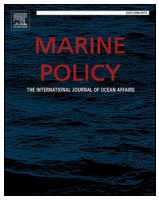

Gender-based ocean uses and values: Implications for marine spatial planning

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ABSTRACT

Our study contributes to a more gender-sensitive approach to marine spatial planning, aiming for balanced, sustainable growth in the blue economy. It examined gendered ocean use patterns and their implications for equitable marine spatial planning. To document the distinct ways men and women interact with and value ocean spaces, we analyzed participatory mapping results from Ocean Use Surveys (OUS) conducted in three regions: the Maldives, the Azores, and Belize. The findings show that, globally, men dominate offshore activities like commercial fishing, whereas women's activities are concentrated nearshore, often involving informal economic roles such as subsistence fishing, tourism, and cultural uses. Our analysis generated gender-specific heat maps highlighting areas of ocean use by sector and gender. This gender-disaggregated data revealed spatial and sectoral differences: in the Azores, women are more active in research and recreational fishing; in Belize, they engage in mariculture; and in the Maldives, they participate in more informal, small-scale, self-employed economies. We also addressed the gender gap in ocean data, a result of historic biases in data collection, which has led to undervaluing women's contributions to the maritime economy and to gender-blind policies. The findings stress the need for gender-disaggregated data in marine planning to avoid exacerbating gender inequities and to ensure inclusive, effective policies. We recommend enhanced data practices that capture women's oceanic contributions, advocating for mixed-gender survey teams and targeted outreach to reduce bias. Policymakers are encouraged to integrate these insights to support equitable marine governance, fostering inclusivity in ocean resource management.

1. Introduction

Women play an essential role in the maritime and blue economy, though their contributions are often unrecognized. While men typically engage in offshore activities such as industrial fisheries, defense, and shipping, women have traditionally managed related nearshore and onshore tasks [1–7]. Habitats fished in, species targeted, and gear types often differ based on gender [7,8]. These divisions are still prevalent globally, although specific gender roles are highly variable between regions and intersect with marital status, wealth, and nationality [2,9,

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Table 1
Focus sectors defined in the Ocean Use Surveys and reviewed in this paper.

Belize	Azores	Maldives
Fisheries and Aquaculture	Commercial and Recreational Fishing	Fisheries
General Use	Recreation, Sports, and Tourism	Community Recreational Use
Tourism		Accommodation and Tourism
Marine and Coastal Ecosystems	Science, Technology, and Monitoring	Research

Table 2
Shape statistics for the Maldives Ocean Use Survey.

Statistic	Men	Women	Men/Women Difference p-value	Unspecified
Mean number of shapes drawn	6.78	3.88	< 0.01	4.97
Mean shape size	358 km^2	7 km^2	< 0.01	346 km^2
Mean shape distance from land	3215 m	236 m	< 0.01	1812 m

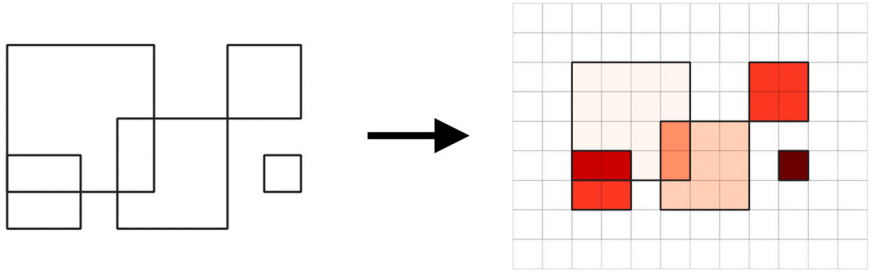

Fig. 1. Heatmap creation process. Value is represented by color intensity.

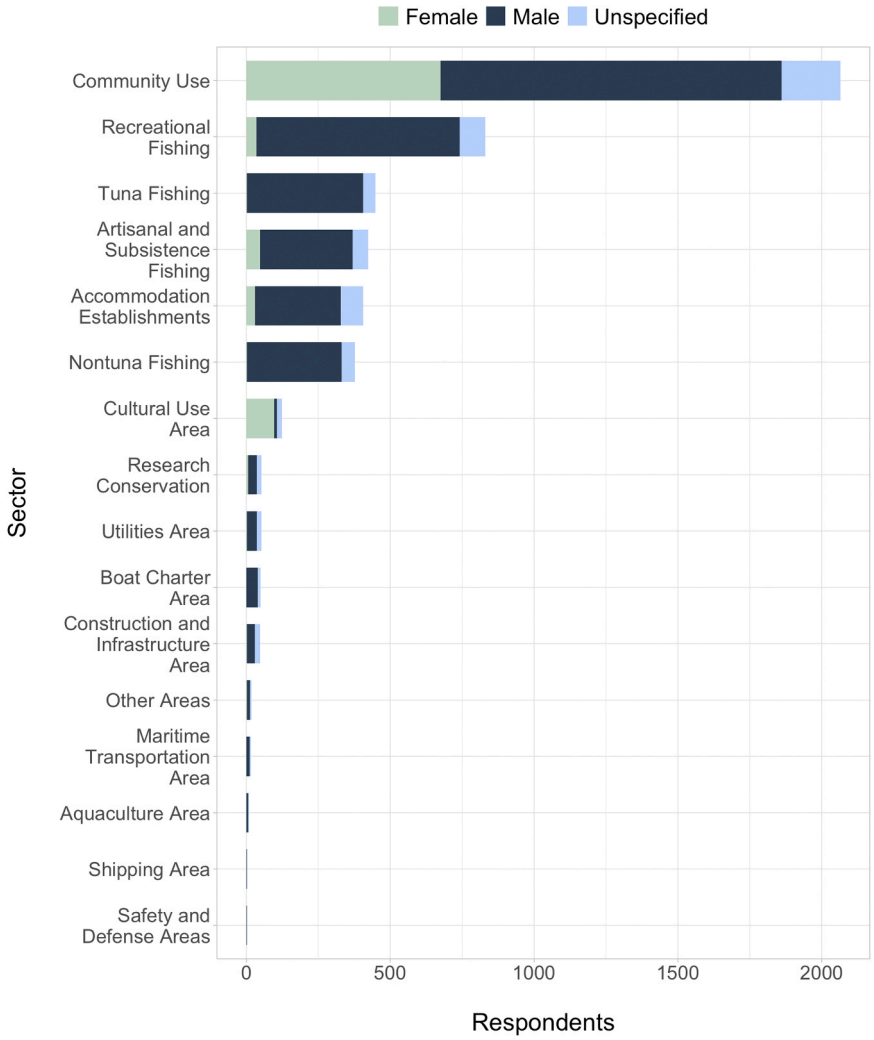

Fig. 2. Participants represented for each sector by gender in Maldives Ocean Use Survey.

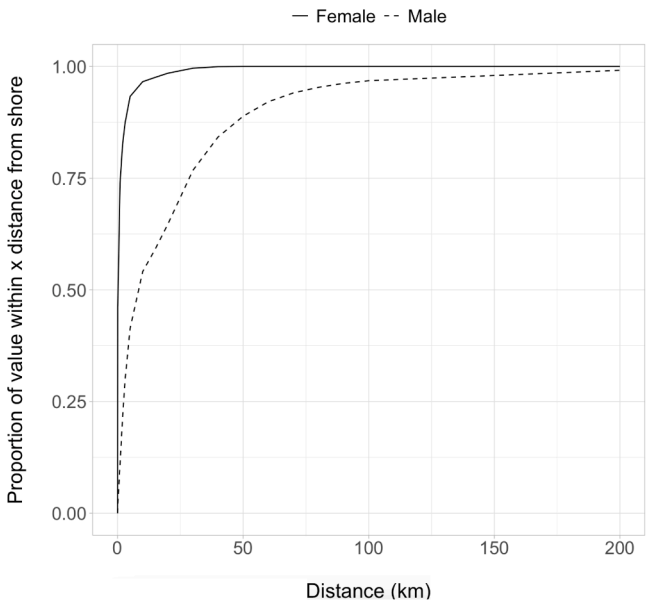

Fig. 3. Proportion of value by distance to shore and gender. Values were winsorized at the 98th percentile to reduce skewing from a small number of extremely high value pixels.

10]. In some regions, women have limited access to motorboats [7,9] and are responsible for the majority of childcare, restricting activities to shallow, nearshore waters [11,12]. In others, women are predominantly involved in fish processing, algae farming, subsistence gathering, and linking fisheries with tourism [13–15]. These sectors are crucial for food security and livelihoods in coastal communities but are often considered part of the informal economy and ignored in marine spatial planning processes [16,17].

Biased data collection methods and failure to capture gender in surveys have created a data gap for women's ocean use [5,7,17–20]. Consequently, women remain "invisible" in most baseline data sets, leading to an undervaluation of their roles and impacts in the maritime and blue economy [13,21,22]. As a result, female perspectives may be missed in decision-making processes, leading to "gender-blind" ocean-related policies [5,23]. Where women and men use the ocean differently, ocean management, particularly Marine Protected Areas (MPAs) and ocean zoning, can have disproportionate impacts [8,11,24]. This situation will persist until women's contributions are recognized and valued, and their voices are included in decision-making, policy development, and management processes where they are currently underrepresented. Gathering data on women's relationship with the ocean is therefore essential to equitable decision-making [25–27].

Three Ocean Use Surveys were conducted in the Azores, Belize, and the Maldives, representing 5050, 2265, and 25,330 people respectively. These data are spatial and disaggregated by gender, providing critical insight into how ocean use and value varies between genders. Rather than gather data on the economic or ecological value of ocean spaces, Ocean Use Surveys instead focus on the personal value of ocean places to people, in which ocean places are "space[*s*] with meaning" [28]. We identify and analyze gender differences in ocean usage through the results of this participatory mapping, highlighting women's distinct roles and contributions to marine activities in each case. We then discuss improvements to data collection methods, engagement strategies, and management policies to achieve inclusive and equitable ocean management.

2. Methods

Ocean Use Surveys were conducted in the Maldives, the Azores, and Belize as part of their marine spatial planning efforts (Noo Raajje, Blue Azores Program, and Belize Sustainable Ocean Plan (BSOP), respectively). The Ocean Use Survey (OUS) is a participatory mapping survey using SeaSketch [29] that asks respondents to identify areas in the marine environment that they value or use. Respondents select the ocean use sector they associate with, draw shapes to specify the areas they use, and assign value for each shape.

The full list of ocean use sectors surveyed in each region is available in Appendix Table 1. It's important to note that the surveys were conducted to support specific planning initiatives, and sector choices and definitions are therefore region-specific. We focus our detailed discussion on the fisheries, cultural/recreational use, tourism, and research sectors (Table 1), key sectors which are present in all three OUS.

The surveys were conducted by surveyors trained to use the SeaSketch survey tool to interview ocean users. Surveyors participated in a 12–16 hour training on SeaSketch survey tools and the basics of marine spatial planning. In each region, specific targets were set for each sector and respondents were selected using a combination of random and snowball sampling methods. Surveyors met with the respondents in their respective areas of work or residence, such as fisheries unions, beaches, offices, and other relevant locations.

A respondent can represent multiple people (e.g., a boat captain representing their crew), therefore some shapes are attributed to a combination of genders. In the three surveys analyzed, the age and gender questions were optional. In the following analyses, we only included survey responses with gender information. Gender selection was restricted to "Male," "Female," and "Prefer not to say." We recognize these options reinforce a strict gender binary, narrowing analysis to men and women and excluding non-binary ocean users.

The Maldivian OUS collected 4924 survey responses representing 25,330 people from December 2021 to November 2022. The Azorean OUS collected 1978 survey responses representing 5050 people from February to December 2022. The Belizean OUS collected 563 survey responses representing 2265 people from January to April 2024. For a full report on each Ocean Use Survey see the Noo Raajje Ocean Use Survey Comprehensive Report [30], the Azores Coastal Mapping Comprehensive Report [31], and the Belize Sustainable Ocean Plan StoryMap [32].

Improvements to the survey tool and collection process were made in each consecutive OUS. Insights on the difficulty of gathering female responses from the male-dominated survey team in Maldives encouraged more female surveyors in the Azores and Belize. In the Maldives and Azores, the survey tool was unable to collect demographic information for all individuals in group responses. Therefore, only the respondent for the group is used in our analyses. Particularly in the Maldives, this is of importance as women often responded in groups. The survey tool was improved to collect this data for the Belizean OUS.

2.1. Heatmap methods

Heatmaps were generated from shapes drawn in the SeaSketch survey tool in order to summarize the spatial value in each sector of ocean use. They were created using the Spatial Access Priority Mapping (SAPM) method proposed by Yates and Shoeman [33]. SAPM entails weighting locations of value based on assigned "importance" and area. During the survey process, respondents assign importance to each shape drawn on the map using a slider which translates to a value between 1 (low importance) and 100 (high importance). Respondents have 100 points of importance to allocate among the shapes they draw for a particular sector. The resulting "value" of each shape is calculated by multiplying importance by the number of individuals represented in the response and then dividing the product by the square kilometers covered by the shape.

$$value = \frac{individuals\ represented * importance}{area(km^2)}$$

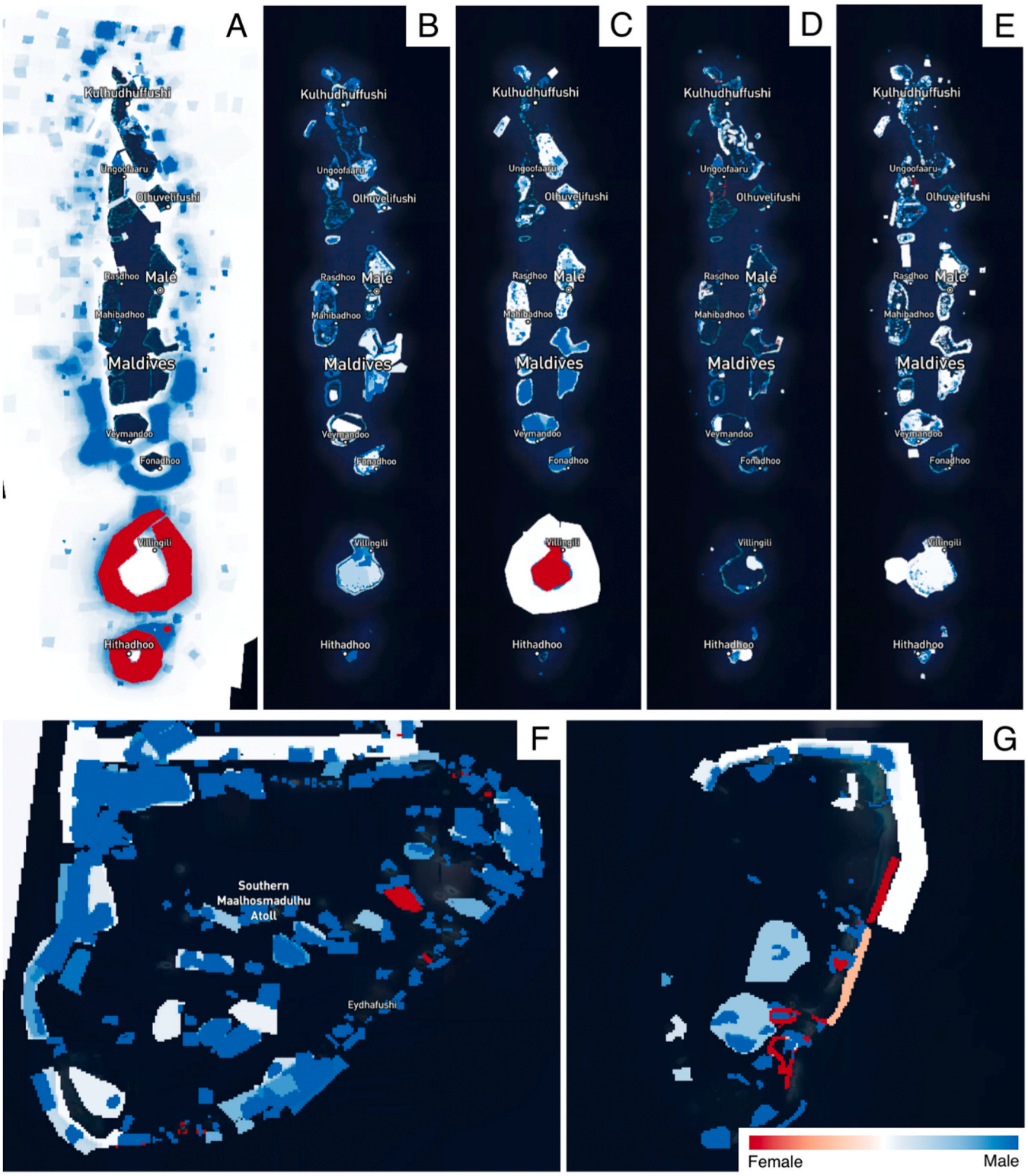

Fig. 4. Value difference by gender heatmap of the fisheries sectors. (A) Tuna fishing. (B) Non-tuna fishing. (C) Bait fishing. (D) Artisanal and subsistence Fishing. (E) Recreational Fishing. (F) Recreational Fishing, Baa Atoll. (G) Artisanal and subsistence fishing, Kaafu Atoll.

The shapes from each response within a sector are rasterized, burning in each shape's calculated value to overlapping pixels. The rasters from all responses are then summed to create a final aggregate heatmap. The pixel values of the resulting heatmap represent relative ocean value in the associated sector. This general process is illustrated in Fig. 1.

2.2. Heatmap by gender methods

2.2.1. Tools

The following analysis was conducted in R (version 4.3.1) using the packages terra (version 1.7.71) for raster data and sf (version 1.0.16) for vector data. Rasters were styled in QGIS (version 3.36.2).

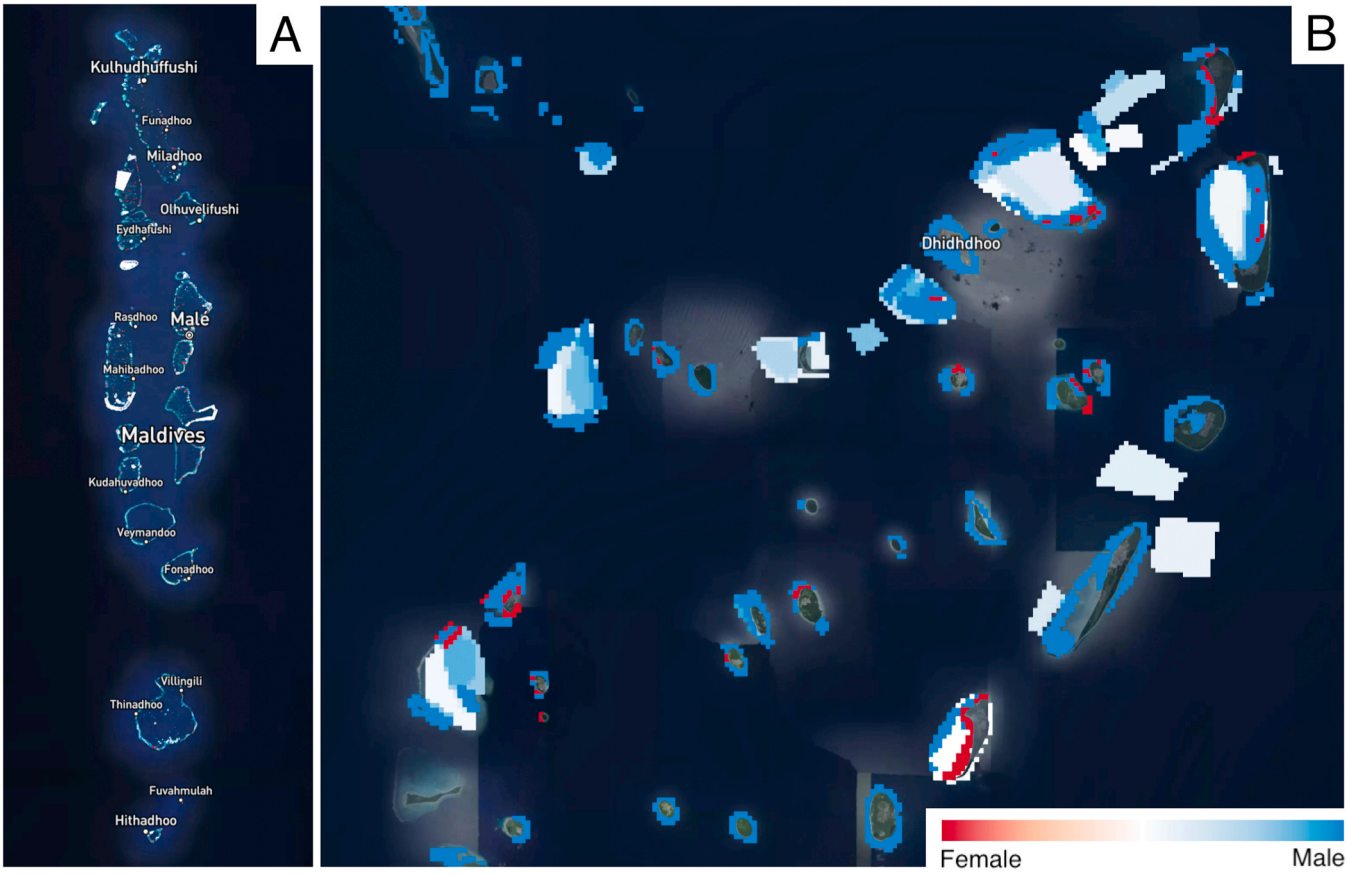

Fig. 5. Value difference by gender heatmap of the Community Recreational Use sector. (A) Entire heatmap (B) Haa Alifu atoll.

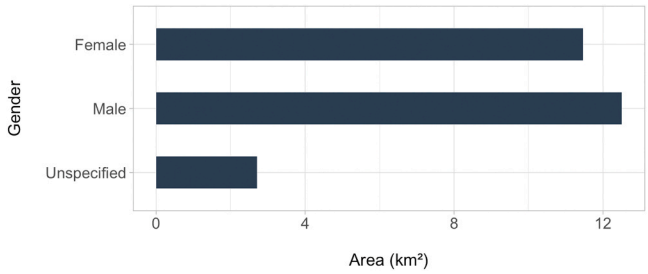

Fig. 6. Mean shape size for Accommodation and Tourism Establishments (Tourism) by gender.

2.2.2. *Value heatmaps*

Ocean use survey shapes were separated based on the gender of the respondent for each use sector and for all sectors combined. In cases where both women and men were represented in a response, the shapes in those responses were included in both male and female subsets of the data, but the number of people represented only reflected individuals of the respective gender. The heatmap generation process detailed above was then applied to each subset of shapes to produce heatmap rasters for each combination of gender and sector.

2.2.3. *Difference heatmaps*

Value rasters were scaled between 0 and 10^8 and extents were set to match for corresponding raster pairs. Raster cells containing NA values were given a value of 0 if the same cell in its counterpart raster (representing the other gender) contained a numeric value — this was done to allow all cells where shapes were drawn to be subtracted in the next step, while leaving cells where no shapes were drawn by either gender with NA values. Female rasters were subtracted from corresponding male rasters for each sector. Large negative values in the resulting rasters represent areas of high female-attributed value compared with that of males, large positive values represent areas of high male-attributed value compared with that of females, and small values represent either areas of equally-attributed value or simply low relative value.

2.2.4. *Symbology*

Linearly interpolated color ramps were applied to value rasters and difference rasters. The value range for these color ramps were capped at a varying quantile, typically around 99 %, using the "Cumulative cut count" option under "Min / Max Value Settings" in the raster symbology pane in QGIS. This was done to highlight the variation in value within each raster which is otherwise obscured by a select few extremely high value cells. In the heat maps presented, red indicates higher female value and blue indicates higher male value.

3. Results

As each Ocean Use Survey is designed and implemented to best suit the needs of the associated region, we present our results as case studies with no direct comparison among them. The results were interpreted by the participating co-author OUS coordinators of each case study, together with the other authors of this work, to ensure local socio-cultural factors were considered. MSP experts from Noo Raajje partnership analyzed the Maldives' results, an MSP expert from the Oceano Azul Foundation reviewed the findings from the Azores, and MSP experts from The Nature Conservancy examined the data from Belize. All heatmaps created for these analyses are freely available on the SeaSketch project website (https://seasketch.org/gender).

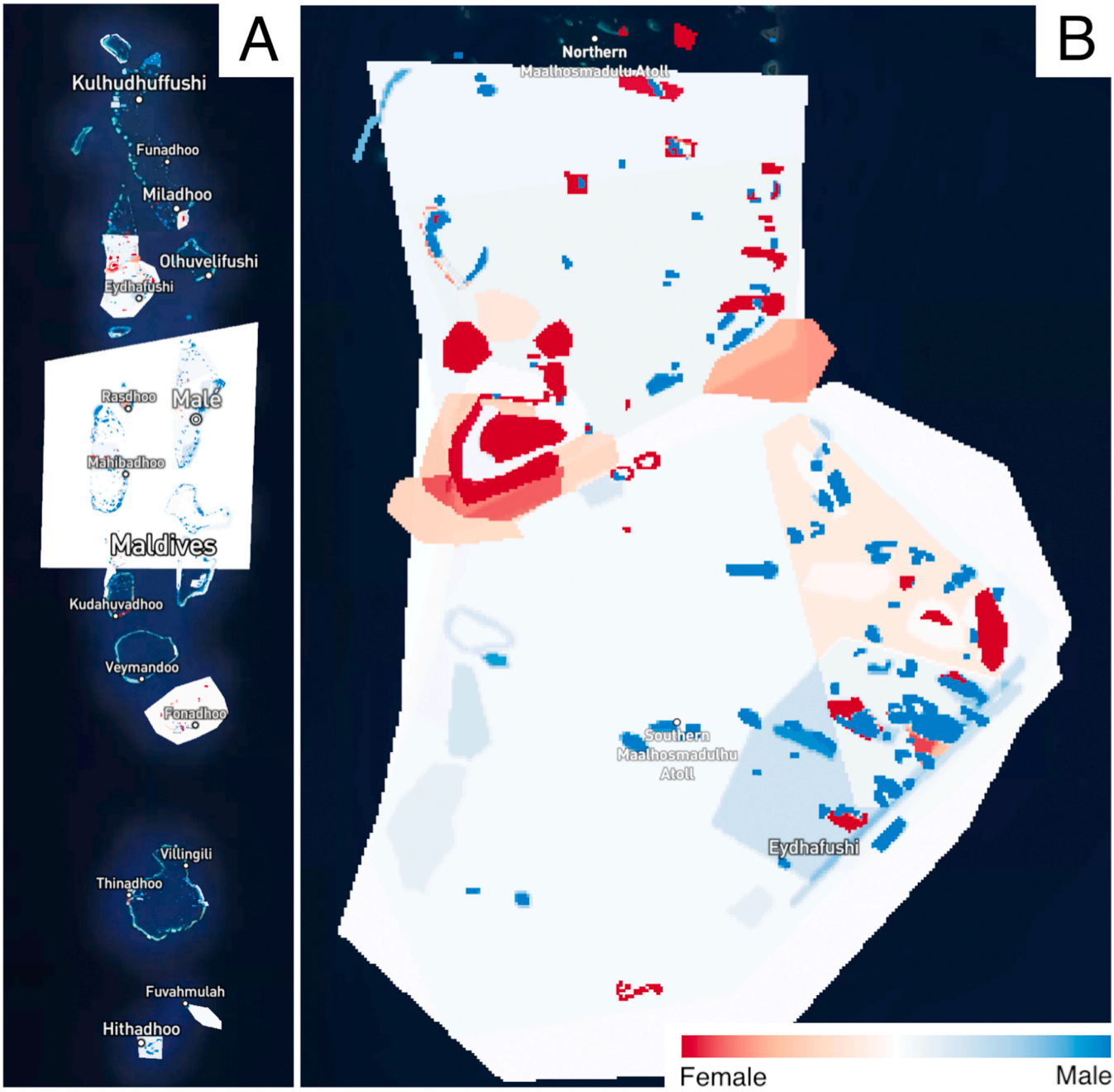

Fig. 7. Value difference by gender heatmap of the Accommodation and Tourism Establishments (Tourism) sector. (A) Entire heatmap. (B) Baa Atoll.

3.1. *Maldives*

The Maldives Ocean Use Survey collected 4924 survey responses representing 3422 men, 897 women, and 605 unspecified people from December 2021 to November 2022. Men are more represented in most sectors of the OUS in the Maldives. All fishing sectors (Recreational, Commercial Tuna, Commercial Non-tuna, and Artisanal) show a large disparity in representation. Women showed a bigger representation in Cultural Use compared to men. When comparing women's ocean use across sectors, the Community Use sector showed the highest level of representation in ocean use for women (Fig. 2). The following results were interpreted by the participating authors who were coordinators of the Maldives OUS, together with the other authors of the work.

On average, men drew more and larger shapes than women (Table 2) and women valued the ocean closer to shore than men (Table 2 and Fig. 3).

For the Maldives we explored Fisheries, Community Recreational Use, Accommodation and Tourism, and Research sectors in more detail.

3.1.1. *Fisheries*

The fisheries sector in the Maldives OUS includes different types of commercial fishing, artisanal and subsistence fishing, and recreational fishing. Commercial fishing included different species-specific fisheries such as tuna (trolling/drifting dropline, handline, longline, pole and line), non-tuna (billfish and reef fish), and baitfish. Recreational fishing sector included activities such as big game, sports fishing and reef fishing.

The results from the OUS resulted in more male than female respondents (Fig. 2). This reflects the reality that all licensed fishers for commercial operations in the Maldives are men [34]. Areas shaded in

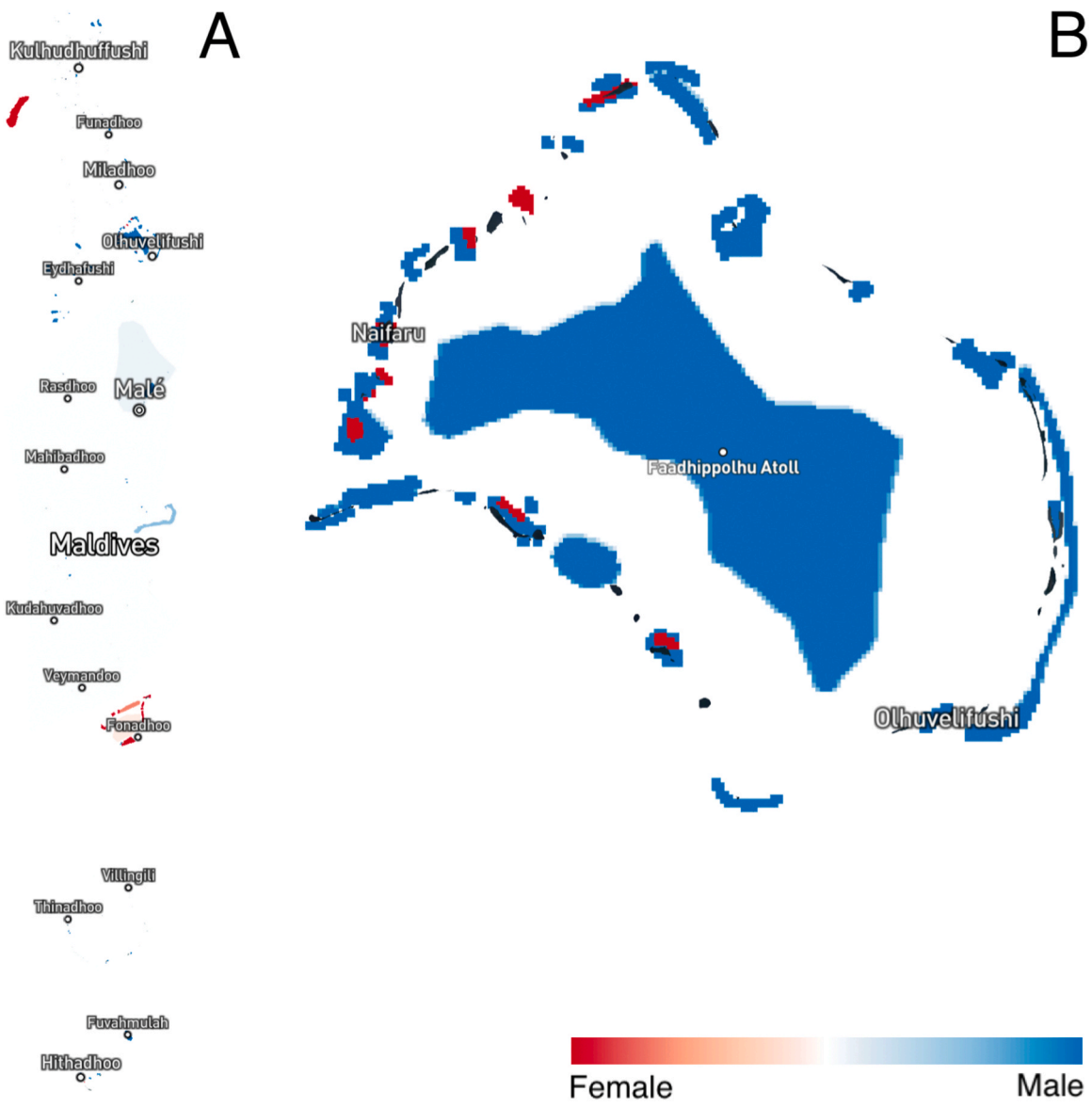

Fig. 8. Value difference by gender heatmap of the Research sector. (A) Entire heatmap. (B) Lhaviyani Atoll.

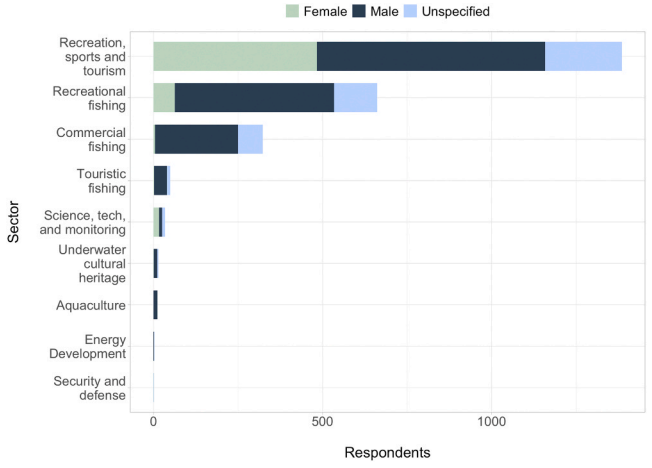

Fig. 9. Participants represented for each sector by gender in Azores Ocean Use Survey.

Table 3
Shape statistics for the Blue Azores Ocean Use Survey.

Statistic	Men	Women	Men/Women Difference p-value	Unspecified
Mean number of shapes drawn	3.69	3.58	> 0.05	3.14
Mean shape size	1611 km^2	631 km^2	> 0.05	263 km^2
Mean shape distance from land	1550 m	765 m	< 0.05	1331 m

blue on the map represent high-value ocean use for male participants, who dominate across all fishing sectors, particularly in the offshore commercial tuna fishery (Fig. 4 A, B, C, D, and E).

In contrast, areas highlighted in red (Fig. 4A and C) indicate zones of higher value for women. While women's participation in formal commercial fisheries and aquaculture is low (1.3 % and 1.4 % women in 2016, respectively), they play a significant role in the more informal, small-scale, self-employed economy around fish processing (26.8 % women in 2016) and rope making (92.2 % women in 2016) [35].

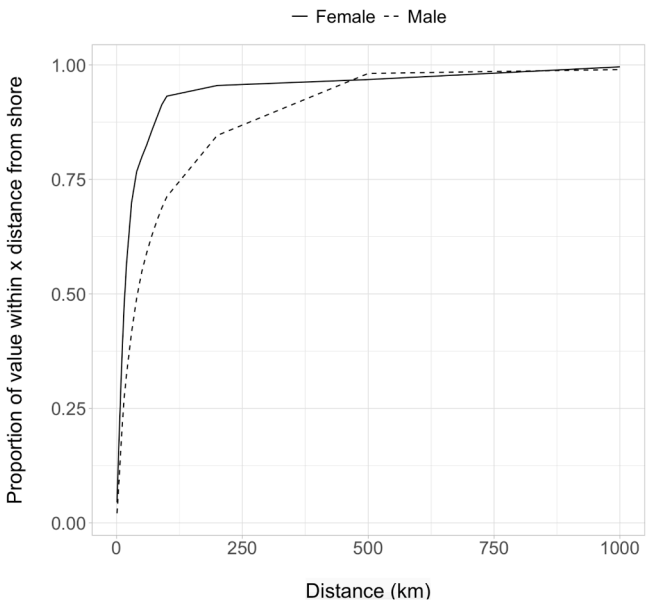

Fig. 10. Proportion of value by distance to shore and gender. Values were winsorized at the 98th percentile to reduce skewing from a small number of extremely high value pixels.

Consequently, the value ascribed by women is concentrated in southern atolls, where their activities and associated impacts are most directly felt [36].

Women are more actively engaged in the artisanal and subsistence, and recreational fishing sectors in the Maldives, with their participation in these sectors reflected in the OUS. When examining atoll-specific maps for these sectors, distinct patterns emerge in how men and women value ocean places. Women appear to value smaller areas closer to shore for both artisanal and subsistence, and recreational fishing (Fig. 4F and G), which are less visible in the broader national-scale maps (Fig. 4D and E).

3.1.2. Community recreational use

In the community recreational use sector, which includes activities such as swimming, snorkeling, diving, and watersports, men are more represented overall. However, when comparing women's ocean use across various sectors, community recreational use shows the highest level of representation for women. Women are notably more present in a few site-specific locations, such as the swimming and beach areas, where they often take children.

Women tend to assign value to smaller, more specific coastal areas (Fig. 5), often choosing locations closer to shore that are perceived as safer for their families. This suggests that women prioritize safety and accessibility when engaging in community recreational activities, particularly when accompanied by children.

3.1.3. Accommodation and tourism

The accommodation and tourism sector is comprised mainly of guesthouses and resorts. Guesthouses operate community-based tourism on inhabited islands, whereas luxury resorts promote a "one island, one resort" model on uninhabited islands, which keeps tourists separate from local communities.

Responses from the guesthouses were facilitated, while many resorts completed unfacilitated responses. As a result, the group sizes reported in the accommodation and tourism establishments sector were highly disparate, with 36 % of all resorts surveyed and 61.5 % of all operational guesthouses participating in the survey.

The activities for the accommodation and tourism sector include big game fishing, sport fishing, reef fishing, diving, conservation, swimming, snorkeling, watersports, beach nourishment, waste management excursions, and other related activities targeted towards tourism activities, showing a higher representation of men overall. However, women are more prominently represented in specific locations, such as Laamu Atoll, with some presence in Baa, Shaviyani, Alif Alif (Rasdhoo), South Ari, Faafu, and Male Atolls.

Men and women appear to value ocean places similarly for tourism-related activities (Fig. 6 and Fig. 7), with both genders identifying larger areas for ocean use. This similarity in spatial valuation can be attributed to both men and women submitting responses based on the ocean use of tourists staying at their respective accommodation establishments.

3.1.4. Research

The research sector, encompassing ocean use for conservation efforts and research projects by NGOs, marine biologists, and other entities, reveals notable differences in how men and women value ocean places. Men appear to value larger areas, while women value smaller areas (Fig. 8). Women may value areas specific to their research, while men may value areas generally important for research.

3.2. Azores

The Blue Azores Ocean Use Survey collected a total of 1978 responses representing 1105 men, 508 women, and 365 unspecified people from February to December 2022. In the Azores, men are more represented in all sectors of the OUS beside Science, Technology, and Monitoring and Security and Defense. Recreational and Commercial Fishing show a large disparity in representation. The most evenly represented sector with a significant respondent count was Recreational Sports and Tourism (Fig. 9). The following results were interpreted by the participating author who coordinated the Azores OUS, together with the other authors of the work.

On average, women valued the ocean closer to shore than men (Table 3 and Fig. 10).

In the Azores, we analyzed Commercial Fishing, Recreational Fishing, and Recreation, Sports, and Tourism. We considered that the sample size for Science, Technology and Monitoring ($n = 6$) was too small to properly analyze in this study.

3.2.1. Commercial fishing

As shown in Fig. 9, commercial fishing at sea is a male-dominant sector, with 246 male, 4 female, and 73 unspecified responses. However, it's important to note that land-based activities are less gender-specific and were not targeted during this survey. Women often use and value the ocean for commercial fishing indirectly, by preparing gear and processing catch [37]. It's interesting to note that with only 4 women represented, we are able to identify some areas around the island of Graciosa that appear to be more highly used and valued by women (Fig. 11B). Further research is needed to draw any specific conclusions about the differences between genders in their use and value of the ocean for commercial fishing in the Azores. In future studies, survey respondents should be asked how many men and women are represented in their answers to capture the involvement of women in the commercial fishing industry particularly with respect to land-based activities such as gear preparations, sales, processing and crew support.

3.2.2. Recreational fishing

The ocean use survey in the Azores collected more responses for women in the recreation fishing sector compared to the commercial fishing sector. In total, 63 women and 472 male responses (Fig. 9) generate distinct differences in the spatial patterns of use (Fig. 12). Throughout the entire archipelago, women and men appear to value different ocean places for recreational fishing. Generally speaking, women value places closer to shore with the exception of women from the island of Santa Maria where they also use offshore areas. In Santa Maria, there is a well-established fishing tournament specifically

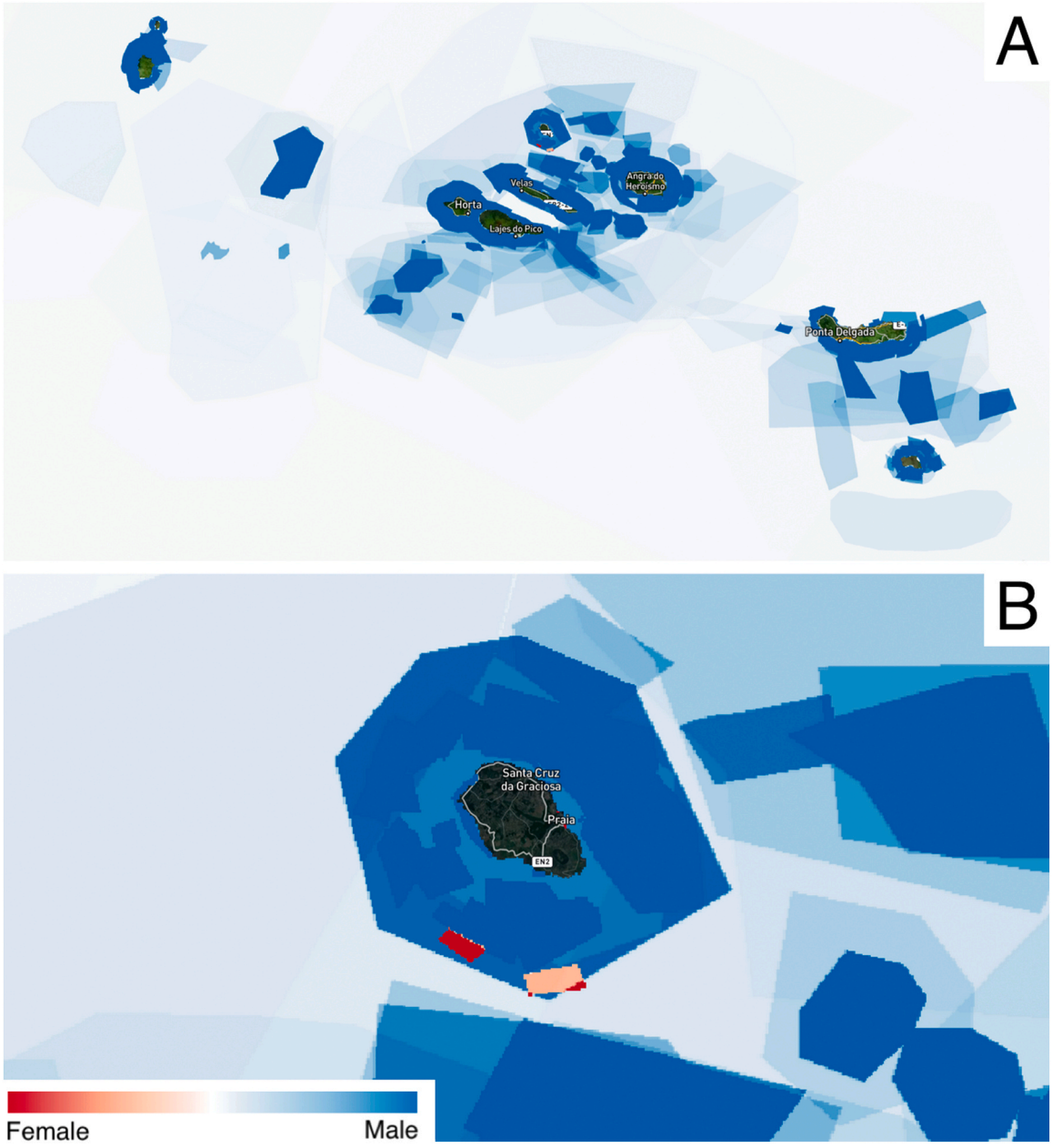

Fig. 11. Value difference by gender heatmap of the Commercial Fishing sector. (A) Entire heatmap. (B) Graciosa Island.

designed for women that has been ongoing for at least 12 years. In the latest tournament, 13 boats composed only of women fishers competed. The relationship of women to the recreational fishing sector is well established and growing and their spatial pattern of use around Santa Maria are quite different from those of men.

In the Azores, female recreational fishers almost exclusively indicate areas outside of marine protected areas as valuable or important for their activity (Fig. 13). In contrast, men value areas for recreational fishing both within and outside marine protected areas. This is particularly evident when examining the survey results for the island of Santa Maria where areas drawn by women fall precisely outside MPA boundaries almost suggesting they are intending to avoid fishing within MPAs. This suggests that women are more aware of the protected area boundaries and regulations and therefore avoid places where they cannot legally fish. In any case, these patterns should be considered in future stakeholder engagement and marine spatial planning exercises particularly when new fishing regulations are considered.

3.2.3. *Recreation, sports, and tourism*

Throughout the Azores archipelago, women indicate smaller areas closer to the shore as areas valued for recreation, sports and tourism, whereas men value larger areas including those further offshore (Fig. 14). The specific activities undertaken by men and women may themselves inform the size and location of their valued places. For example, areas used for surfing will be small and nearshore where areas used for sailing will be larger and frequently offshore. Further research is needed to determine if the observed differences are due to gender differences within each activity or if men and women are representing entirely different activities (e.g., recreation activities such as swimming versus sports activities such as sailing).

3.3. *Belize*

The Belizean Ocean Use Survey collected 563 responses representing 1863 men, 401 women, and 1 unspecified person from January to April 2024. In Belize, men are more represented in all sectors of the Belize

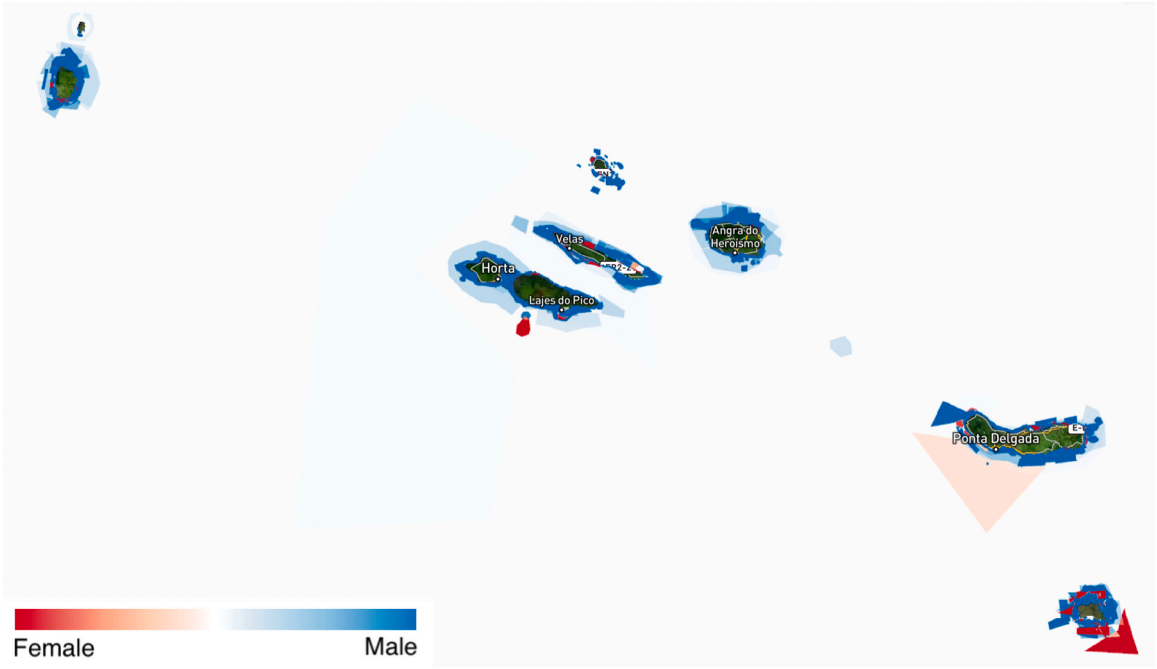

Fig. 12. Value difference by gender heatmap of the Recreational Fishing sector.

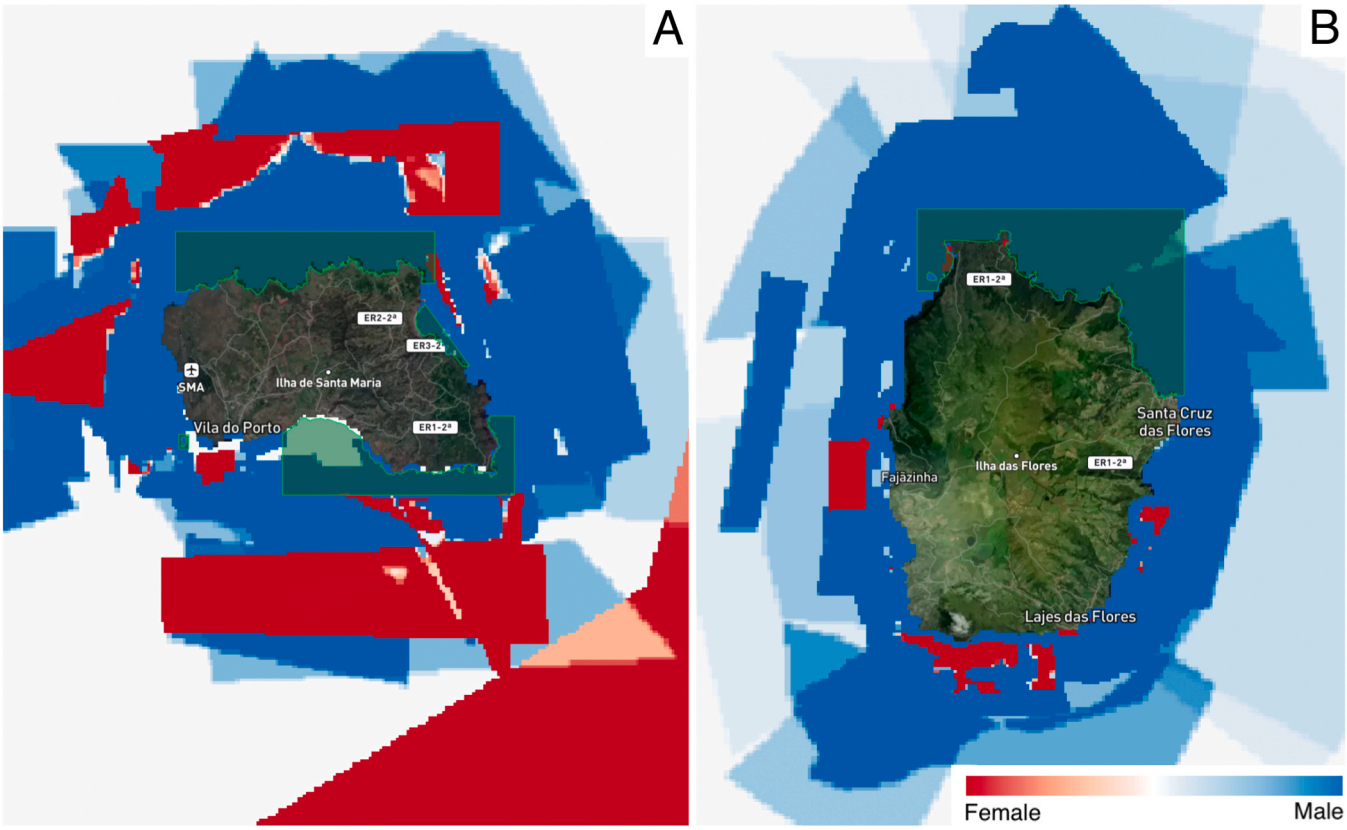

Fig. 13. Value difference by gender heatmap of the Recreational Fishing sector in (A) Santa Maria and (B) Flores islands. Marine protected areas that prohibit fishing are depicted in green.

OUS (Fig. 15). Fisheries, Tourism, Marine and Coastal Ecosystems, Energy, and Maritime Administration all show a large disparity in representation. The most evenly represented sectors were General Use, which includes religious, cultural, traditional, recreational, and medicinal uses; and Marine and Coastal Development, which includes coastal habitat restorations as well as development for residential and tourism purposes. The following results were interpreted by the participating authors who were coordinators of the Belizean OUS, together with the other authors of the work.

Women on average drew fewer shapes and valued the ocean closer to

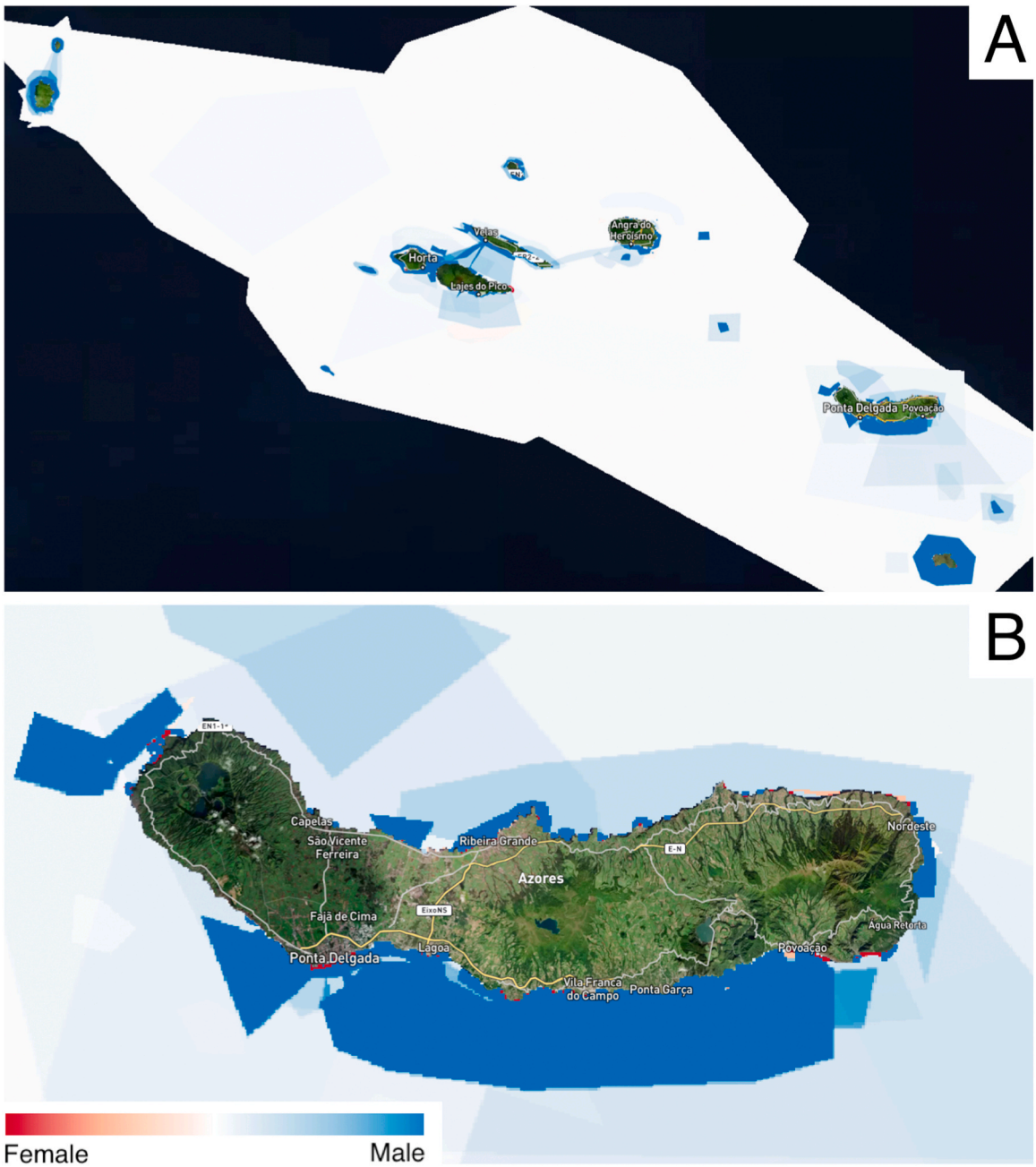

Fig. 14. Value difference by gender heatmap of the Recreation, Sports, and Tourism sector. (A) Entire heatmap. (B) São Miguel Island.

shore than men (Table 4 and Fig. 16).

For Belize, we explored the Fisheries and Aquaculture, General Use, Tourism, and Marine and Coastal Ecosystems sectors in more detail.

3.3.1. *Fisheries and aquaculture*

The fisheries sector in the Belize OUS includes all activities related to harvesting products from the sea, including commercial fishing, subsistence fishing, and seaweed farming. This sector also involves recreational activities such as sports fishing, fly fishing, and deep-sea fishing. Fisheries is a male-dominant sector [38], with 4 % of the 3500 licensed fishers being female in 2023 according to the Belize Fisheries Department. With 121 females and 1052 males represented in the fisheries sector of the OUS (Fig. 15), women comprise 10.3 % of the represented individuals. The majority of surveyed respondents identified as commercial fishers, with a minority identifying with subsistence fishing.

Overall, male fishers valued areas farther from shore than female fishers, with female value concentrated near land (Fig. 17A). Women fishers are involved in conch, lobster, and intertidal and shallow fishing, as well as fish processing [39]. Women fishers conduct subsistence fishing on the coastline north of Hopkins village and are limited by boat access to venture further (Fig. 17B). A notable exception to the trend of women fishers concentrating nearshore is the Belize Women Seaweed Farmers Association, a small organized group of women residing in Placencia Village and conducting mariculture activities, specifically growing seaweed *Gracilaria spp*. nearby Ray Caye (Fig. 17C) [14]. Mariculture growth for seaweed conducted by Placencia women is possible through their access to boats via their membership in the Belize Women Seaweed Farmers Association, as noted by local experts N. Chacon and J. Balderamos. They are able to access the barrier reef, where conditions are favorable for seaweed farming.

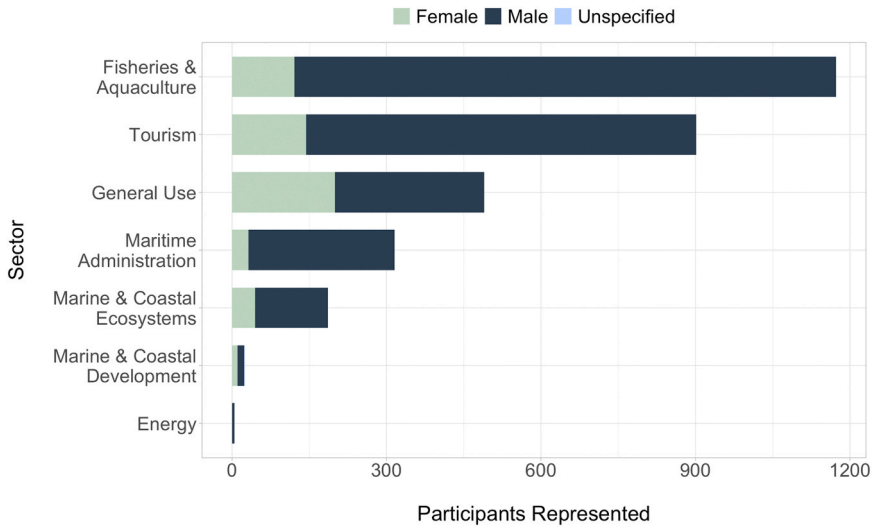

Fig. 15. Participants represented for each sector by gender in Belize Ocean Use Survey.

Table 4
Shape statistics for Belizean Ocean Use Survey.

Statistic	Men	Women	Men/Women Difference p-value
Mean number of shapes drawn	3.68	2.81	< 0.05
Mean number of shapes drawn with group responses*	4.01	2.81	< 0.05
Mean shape size	144 km^2	168 km^2	> 0.05
Mean shape size with group responses*	143 km^2	182 km^2	> 0.05
Mean shape distance from land	980 m	168 m	< 0.05
Mean shape distance from land with group responses*	1017 m	310 m	< 0.05

* Group responses count towards the majority gender in the response

3.3.2. *General use*

The General Use sector encompasses religious, cultural, traditional, medicinal, and recreational use of the ocean. In the OUS, the number of male and female respondents were similar for the General Use sector (Fig. 15), with 290 males and 200 females represented. Surveyors intentionally targeted households for this sector, contributing to the increased gender parity in representation. In general, the overall results for the entire country show women valuing the ocean closer to the coast (Fig. 18). Many locations of higher female value are conducive for swimming and other family oriented activities (Fig. 5B). Women are often responsible for the household and childcare [39–41], and may be culturally responsible for maintaining family well-being and organizing activities in places that facilitate family gatherings [42].

On the other hand, the areas identified by men show that they value areas beyond the coast into the barrier reef. Men can reach these sites because they have access to the necessary modes of transportation. As noted by local experts, many of the offshore areas of high value are considered to be traditional and cultural are popular locations for families taking easter and summer breaks in the cayes. Interestingly, the southern part of Belize between Dangriga and Placencia (Fig. 18B) shows women identify the area for cultural values. The Garinagu, an indigenous group, are prevalent in these southern communities and this coast was identified for the Sere Mei, a traditional reenactment of how the Garinagu arrived in Belize.

3.3.3. *Tourism*

Belize is a global tourist destination. According to the Statistical Institute of Belize, in 2019, tourism contributed approximately 11.8 % to Belize's Gross Domestic Product (GDP), cementing its position as the second largest contributor within Belize's major industries. The tourism sector is a significant employer, supporting nearly 25,000 jobs across more than 2200 establishments. One in every seven jobs in Belize is directly tied to tourism-related activities, underscoring its role as a critical source of employment and livelihoods nationwide [43]. The tourism sector represented in the Belize OUS encompasses all marine-based tourism, including eco, educational, wildlife-watching, and cruise ship, as well as recreational activities like ocean kayaking and sailing.

In the OUS, male respondents outweigh female respondents for the Tourism sector with 757 males and 144 females represented (Fig. 15). However, women play a large role in the growing Belizean tourism sector [40,42]. The majority of the respondents for the tourism sector represented ecotourism tour guides and tour shop operators.

The resulting heatmaps from the Belize OUS (Fig. 19) indicate that men more highly value the cayes along the barrier reef (Fig. 19A), with females placing higher value around areas of Placencia (Fig. 19A) and to the west of Caye Caulker (Fig. 19C). Areas which are more highly valued by men are used in ecotourism activities including snorkeling, wildlife watching, and diving. Both men and women take part in conducting guided tours.

3.3.4. *Marine and coastal ecosystems*

Belize's rich biodiversity in coral reefs, mangroves, and seagrass is a haven for many activities including research, restoration, and protection. The Marine and Coastal Ecosystems sector in the OUS requested users to identify areas that are of significant ecological value. These areas are vital in supporting one or more species or entire ecosystems, including breeding grounds, spawning sites, nurseries, migration stopover sites, and habitats crucial for different life stages of species.

In the Belize OUS, 141 males and 45 females are represented in the Marine and Coastal Ecosystems sector. All responses were for either research or restoration. Male responses identify high-value areas along the barrier reef below Caye Caulker Marine Reserve to Dangriga and the cayes in front of Placencia (Fig. 20A). Areas of value for research were identified along the coast in Gales Point, the area where manatees reside. Caye Caulker and Tobacco Caye (Figs. 20B and 20C) were valued highly by female respondents. Expert knowledge from J. Balderamos identified these areas for research and restoration. Female-led nonprofit organizations drive the restoration of mangroves in Caye Caulker and use Tobacco Caye as an educational site to provide opportunities to youths residing in Dangriga and surrounding coastal communities adjacent to South Water Caye Marine Reserve.

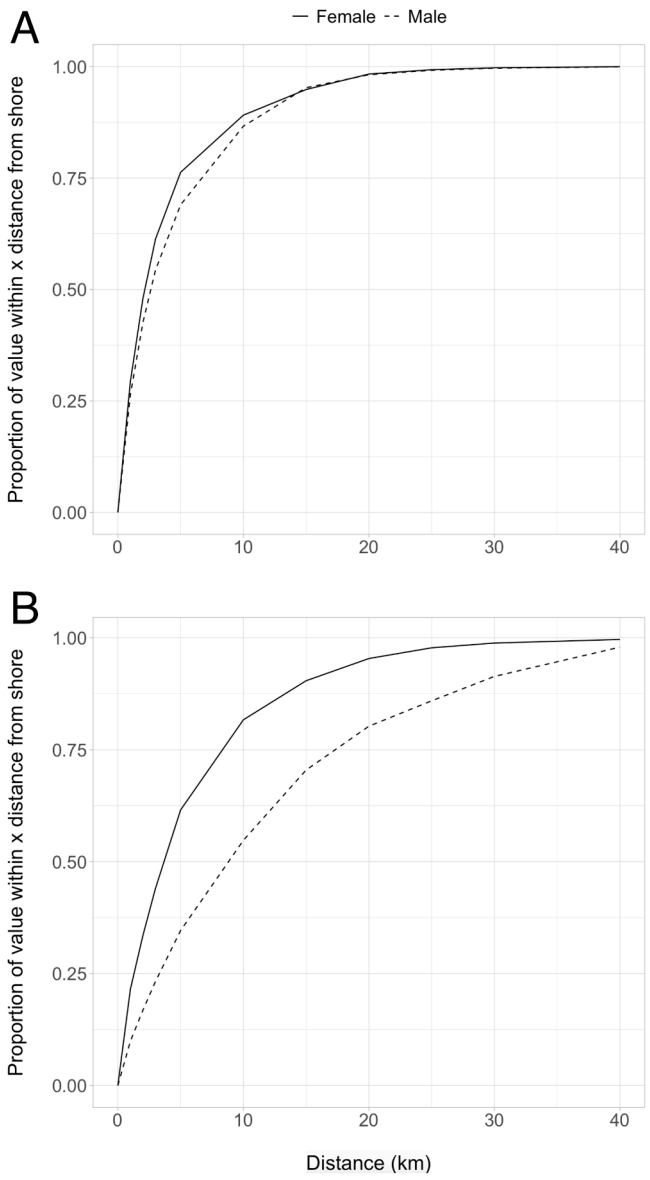

Fig. 16. Proportion of value by distance to shore and gender. Values were winsorized at the 98th percentile to reduce skewing from a small number of extremely high value pixels. (A) Mixed-gender responses included. (B) Mixed-gender responses removed.

4. Discussion

In all three regions, we find significant differences in how women and men use and value the ocean. Interviewed men and women differ in the number of shapes drawn and the size of shapes drawn. In all regions, women appear to value ocean places closer to shore than their male counterparts, corroborating similar findings for the fisheries sector [4,6,7,44], although Chapman [2] pointed out that this spatial difference may be cultural and vary in each case.

Nevertheless, this study revealed that this pattern is also evident in sectors beyond fisheries, such as tourism and recreational areas, while highlighting the value of each area of interest. There are clear, local differences in areas valued by male and female respondents as shown in the gender heatmaps for each case study. These differences showcase the value in collecting gender disaggregated data for ocean planners [18–20,27], as locations of marine protected areas, aquaculture sites, and other activity-excluding ocean zoning can affect men and women disproportionately.

Male respondents outnumbered female respondents in all three regions' Ocean Use Surveys. This pattern is common throughout studies on how male and female fishers use the ocean or benefit from it [5,8,21]. If the role of women in fishery and ocean management is not taken into account, we risk overlooking ocean-related activities that take place in estuaries or mangroves, areas where women are more actively involved, as highlighted in the literature [4]. Consequently, managerial decisions might fail to account for these critical regions, as they may remain invisible in mapping processes without women's input. Hellebrandt [45] pointed out that it is crucial to include women in interviews and discussions and not rely on men to "speak for them." This is something to take in account when gathering group responses with the OUS. Although measuring only the representation by number of females in a specific task is an insufficient proxy for inclusion [46].

Due to the facilitated nature of the surveys, surveyor selection can highly impact the demographics of respondents, as pointed out by Mangubhai et al. [47] and Kleiber et al. [7]. In the Maldives, we note the increase in female respondents in Raa atoll (from 5 % to 37 % female respondents in other atolls to 53 % in Raa atoll), potentially due to a single female surveyor whereas other atolls were surveyed mainly by male surveyors. These results indicate the importance of mixed-gender surveyors to improve equity in the surveys and avoid biased results.

Additionally, it's important to have specific approaches in interviews to include more women and capture their perspectives on activities [15,44]. Research practices should be reviewed to ensure that women's voices are heard [37,45]. De Souza et al. [48] suggest that in-depth interviews allow women to share their life stories and perspectives on fishing activities, which can reveal information that some questionnaires do not capture. The OUS methodology allows surveyors to talk with interviewees and establish trust, therefore allowing them to express themselves.

In all case studies, no targets were set for female response rates. Key to collecting representative data is to set demographic targets, monitor responses as they come in, and adjust survey processes accordingly. These demographic targets, when applicable, should be based on official statistics. However, there appears to be a gap in official statistics about the gender breakdown of ocean use across sectors, with women often undercounted due to greater involvement in informal activities [49]. Going through this exercise for Belize, the high male to female ratio was noticeable after gendered analysis was conducted. A second round of the Belize OUS will be conducted to increase female participation, with strategies to survey more female ocean users including targeting women in the fishery value chain and women's groups in their communities.

In addition to setting gender-sensitive targets, robust demographic collection is important. As noted in the 2.1 Methods section, the survey tool was unable to collect demographic information from group responses in the Maldives and Azores. Therefore, group responses are treated as individuals and assigned the gender of the respondent. Particularly in the Maldives, this is of importance as women often responded in groups. The survey tool was improved to collect this data for the subsequent Belize OUS. While we avoid direct comparisons between case studies, we can see that trends present in the Maldives and Azores still persist in Belize with the inclusion of group responses. Future surveys will benefit from collecting demographic information for every person represented in group responses.

In the recreational fishing sector in the Azores, we note that women fishers show greater knowledge of and/or compliance with current fishing restrictions than their male counterparts, specifically fishing outside of marine protected areas. Empowering women fishers where this phenomena exists may lead to more effective marine protection in designated areas.

As women tend to use coastal areas more frequently, often in ecosystems that are hybrid – spanning both land and sea – it is crucial to understand ocean-related uses and activities as a continuous flow, recognizing the land-sea interface where ecosystems and their services are inherently interconnected [50–53]. This underscores the need for

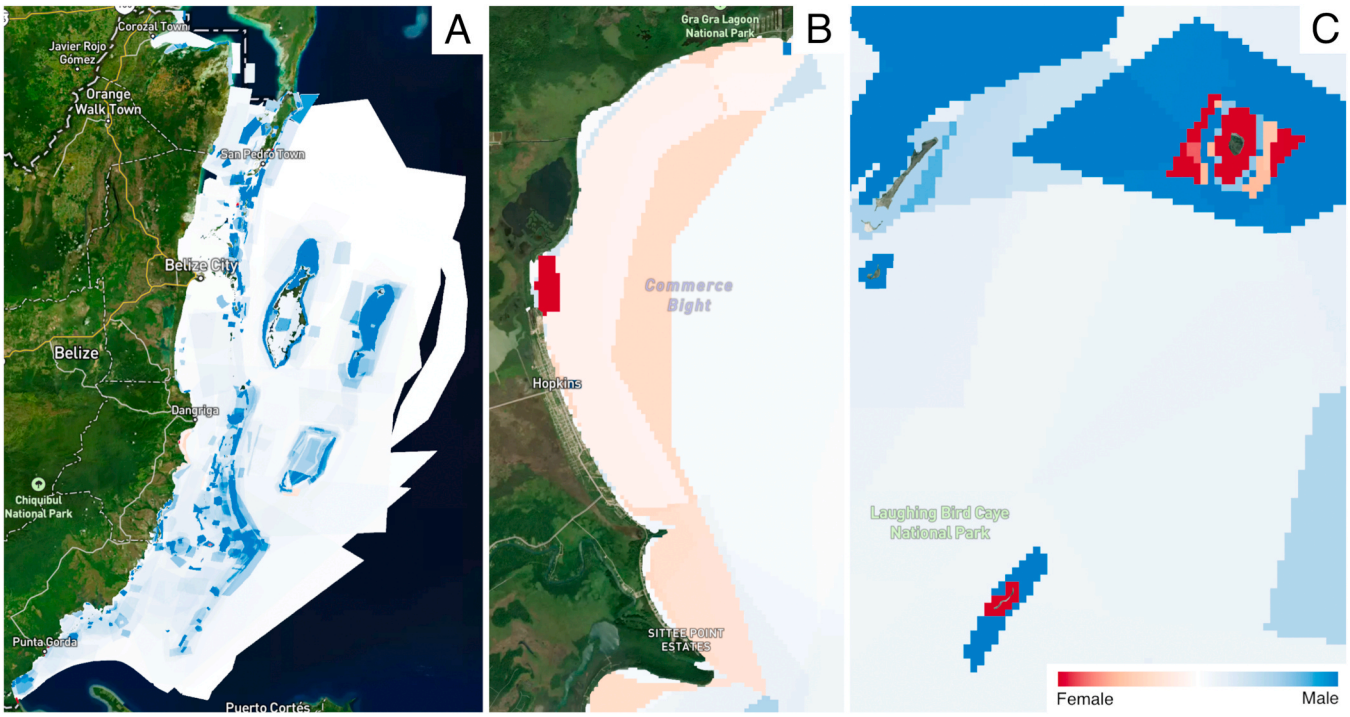

Fig. 17. Value difference by gender heatmap of the Fisheries and Aquaculture sector. (A) Entire heatmap. (B) Commerce Bight. (C) Moho Caye and Laughing Bird Caye.

integrating Area-Based Management Tools (ABMTs), such as Integrated Coastal Zone Management (ICZM), Marine Spatial Planning (MSP), and Marine Protected Areas (MPAs), to ensure they function as complementary and interconnected strategies. International organizations are increasingly adopting more holistic approaches that incorporate multiple area-based management strategies (e.g., the High-Level Panel for a Sustainable Ocean Economy – Ocean Panel; Sustainable Ocean Planning and Management Working Group at IOC/UNESCO).

As argued in Bennett et al. [54], social equity is a key part of achieving robust, just marine management and conservation. In their 2022 study, Gissi et al. [55] assessed the contributions of ABMTs toward achieving the Sustainable Development Goals (SDGs). They highlight that, regarding Gender Equity (SDG 5), further research is needed, as the role of ABMTs in ocean governance may be underestimated and the potential of spatial management in promoting gender equity remains largely unrealized. We argue in this paper that gender-conscious data collection and ocean management strategies can lead to both more effective and equitable outcomes for ocean users.

5. Conclusion

Although there are several publications on gender differences concerning the uses and activities at sea, particularly in fisheries, not all address the spatial analysis of these differences. Even fewer explore the importance or value that users assign to each area of interest. In this regard, the work presented here is innovative and provides important insights for coastal and marine planning and management.

Women and men use and value ocean places differently. It is crucial to understand where and how the ocean is not just used, but valued between demographic groups to avoid disproportionate managerial decisions and impacts. Spatial understanding enhances the visibility of women's contributions, supports the development of gender-sensitive policies, and ensures that the blue economy grows in a way that is inclusive, equitable, and sustainable. To achieve this, it is essential to invest in comprehensive data collection and mapping efforts that capture the full extent of women's involvement in ocean and coastal activities.

Marine spatial planners should utilize gender-disaggregated data in planning processes to ensure conservation efforts are gender-sensitive and equitable. This spatial representation of where women are active in the maritime and blue economy can inform more inclusive and effective policies. Policymakers can design interventions that support women's activities, enhancing and correctly valuing their contributions to local economies. This can shift the perception of their work from informal to formal economic activities, highlighting their importance in food security, livelihood sustainability, and economic resilience in coastal communities. Local knowledge and practices can be integrated into broader blue economy initiatives, ensuring that women's voices are heard and valued in community development projects. Knowing where women operate can also inform measures to ensure their safety and security. Coastal and nearshore areas can be made safer through targeted interventions, reducing risks related to climate change, natural disasters, and socio-economic vulnerabilities.

We recommend the collection of gender-disaggregated spatial data in coastal and marine planning efforts. To ensure the quality of this data and avoid gender bias in data collection, survey teams should strive for gender parity. Surveys should be tailored to the unique socio-cultural landscape of the community with attention given to engaging the female population, including setting survey targets and adapting the survey methodology. Care should be given when a single respondent is answering on behalf of multiple people, especially when the group crosses demographics.

If women's activities have different environmental impacts compared to those dominated by men (which tend to be more extractive), spatially distinguishing these activities can help assess and mitigate negative impacts. Additionally, environmental challenges intersect with gender. Climate change and the depletion of marine resources impact women and men differently due to their distinct roles and responsibilities. Addressing these challenges requires acknowledging these differences and promoting inclusive and effective policies which better represent the wide range of ocean users. Engagement strategies for ocean conservation should ensure the participation of women in

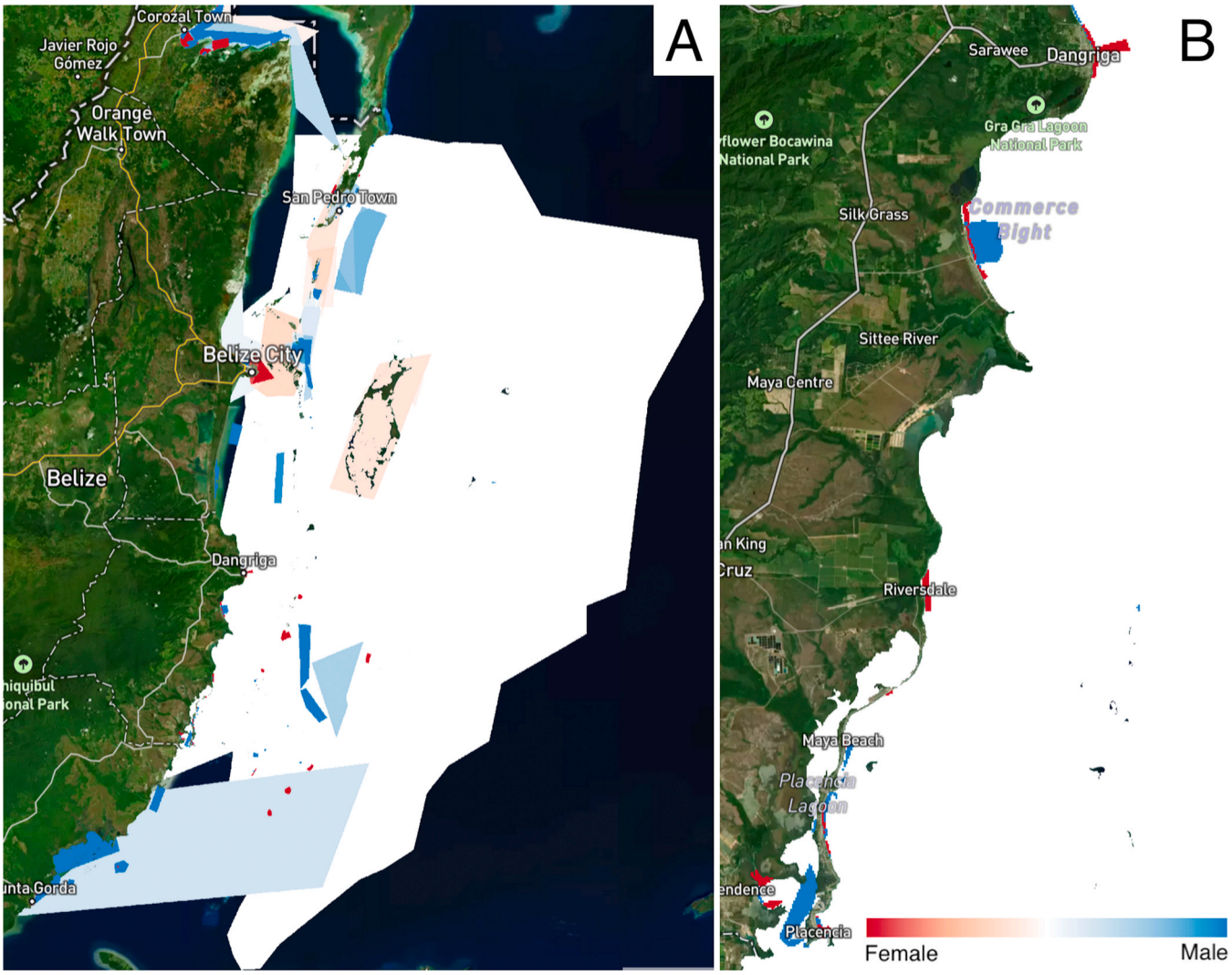

Fig. 18. Value difference by gender heatmap of the General Use sector. (A) Entire heatmap. (B) Dangriga to Placencia.

ocean-related decision-making. Promoting gender equality in ocean-related sectors introduces new perspectives and innovative ideas. Diverse voices improve problem-solving and decision-making processes, which are essential for the sustainable use and conservation of ocean resources.

Area-Based Management Tools (ABMTs), including Marine Spatial Planning (MSP) and Marine Protected Areas, can significantly advance SDG 5 by fostering gender equity in ocean governance and resource management. This study emphasizes the need to maximize the contributions of ABMTs—such as marine protected areas and spatial planning mechanisms—to gender equality by promoting inclusive decision-making, enhancing women's participation in marine-related industries, and ensuring equitable access to marine resources. Integrating gender-responsive strategies into MSP, such as empowering women in marine conservation and leadership roles, can help reduce inequalities and create equal opportunities within the blue economy.

Understanding gender-specific patterns in ocean use and value is crucial for designing effective and equitable marine policies. Women and men often interact with marine environments in distinct ways, with differences in fishing practices, coastal livelihoods, and access to marine resources. Recognizing these variations allows policymakers to develop ABMTs that address specific gender-based challenges, ensuring that spatial management strategies benefit all stakeholders equitably. By incorporating gender-sensitive data and perspectives, MSP can enhance social sustainability and strengthen the overall impact of ocean governance initiatives.

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CRediT authorship contribution statement

Chacon Nidia: Writing – review & editing, Writing – original draft. **Dixon Brooke:** Validation, Project administration. **Estep Andrew:** Validation, Supervision. **Mohamed Shaistha:** Writing – review & editing, Writing – original draft. **Menzies Peter:** Writing – review & editing, Writing – original draft, Visualization, Formal analysis, Conceptualization. **Nistharan Fathimath:** Writing – review & editing, Writing – original draft. **Paufve Matthew:** Validation, Data curation. **Quintela Adriano:** Writing – review & editing, Writing – original draft. **Meyer Abigail:** Writing – review & editing, Writing – original draft, Visualization, Conceptualization. **McClintock William J:** Writing – review & editing, Writing – original draft, Conceptualization. **Scherer Marinez:** Writing – review & editing, Writing – original draft, Conceptualization.

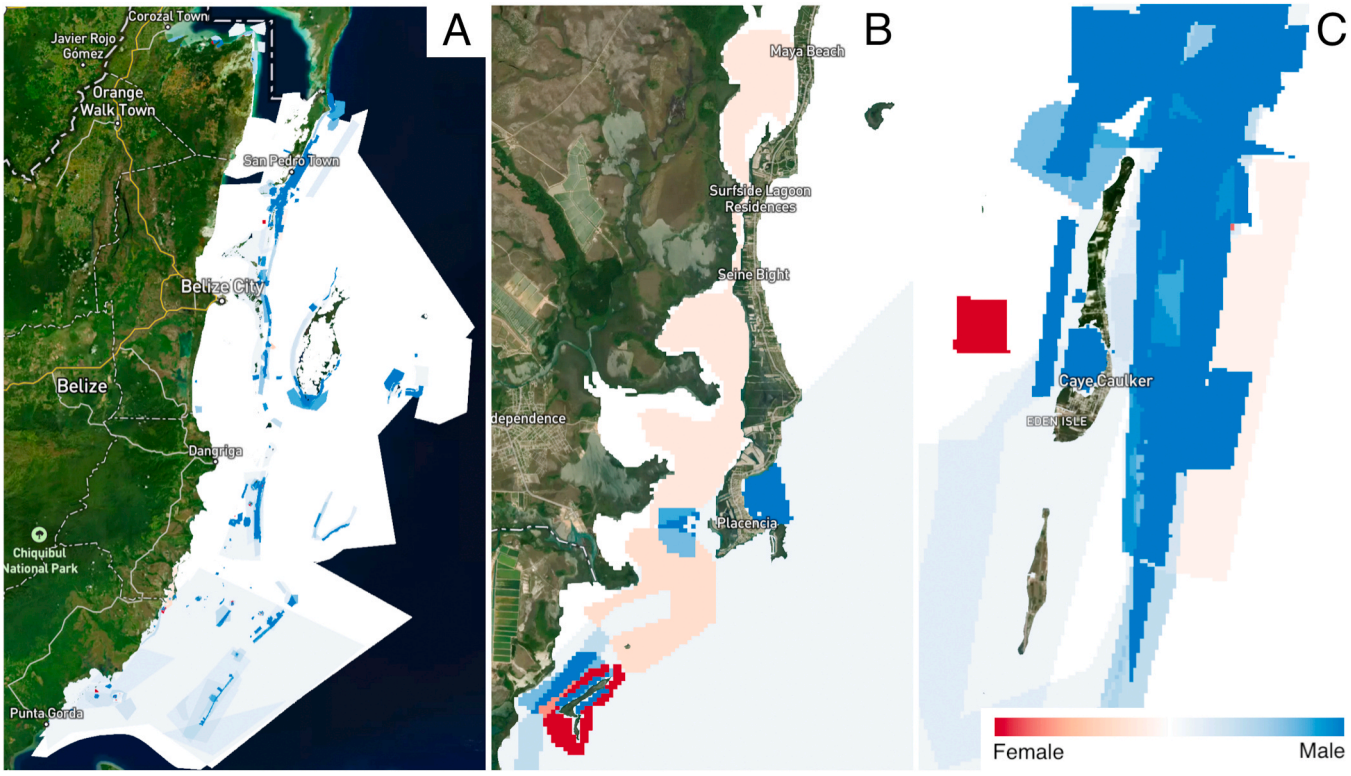

Fig. 19. Value difference by gender heatmap of the Tourism sector. (A) Entire heatmap. (B) Placencia. (C) Caye Caulker.

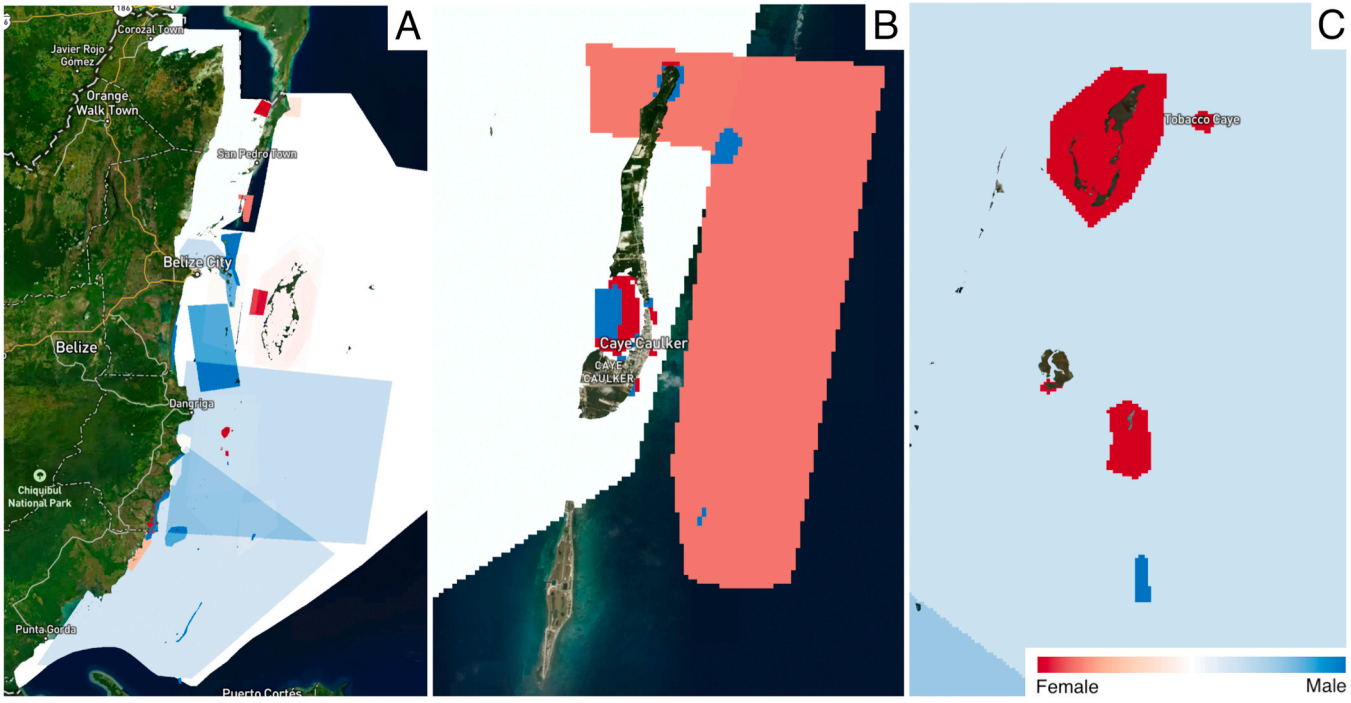

Fig. 20. Value difference by gender heatmap of the Marine and Coastal Ecosystems sector. (A) Entire heatmap. (B) Caye Caulker. (C) South Water Caye.

Balderamos Jamani: Writing – review & editing, Writing – original draft.

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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Appendix

Appendix Table 1
Sectors defined in the Ocean Use Surveys

Maldives	Azores	Belize
Commercial Tuna Fishing	Commercial Fishing	Fisheries & Aquaculture
Commercial Non-Tuna Fishing	Aquaculture	Tourism
Aquaculture	Recreational Fishing	General Use
Recreational Fishing	Recreation, Sports and Tourism	Marine & Coastal Development
Artisanal and Subsistence Fishing	Touristic Fishing	Maritime Administration
Accommodation and Tourism Establishments	Scientific Research, Technological Development, and Environmental Monitoring	Marine & Coastal Ecosystems
Boat Charters	Underwater Cultural Heritage	Energy
Community Recreational Use	Security and Defense	
Cultural Use	Energy Development	
Construction and Infrastructure		
Research and Conservation		
Safety and Defense		
Maritime Transportation		
Shipping		
Utilities		
Other		

Data Availability

The authors do not have permission to share data.

References

[1] M. Baker-Médard, Gendering marine conservation: the politics of marine protected areas and fisheries access, Soc. Nat. Resour. 30 (2017) 723–737, https://doi.org/10.1080/08941920.2016.1257078.

[2] M.D. Chapman, Women's fishing in Oceania, Hum. Ecol. 15 (1987) 267–288, https://doi.org/10.1007/BF00888026.

[3] Nilanjana Biswas, Towards Gender-Equitable Small-Scale Fisheries Governance and Development: A Handbook, United Nations, 2018, https://doi.org/10.18356/e999fb85-en.

[4] M.M. de Andrade, L.Y. Xavier, N. de, M. Grilli, C.C. de Oliveira, D.A. de Andrade, G.C. Barreto, L. Hellebrandt, M.C. Galvão, S.T. da Silva, T.C.F. Mont'Alverne, L. R. Gonçalves, Gender and small-scale fisheries in Brazil: insights for a sustainable development agenda, Ocean Coast. Res. 69 (2021) e21033, https://doi.org/10.1590/2675-2824069.21033mmda.

[5] K. Barclay, S. Mangubhai, B. Leduc, C. Donato-Hunt, N. Makhoul, J. Kinch, J. Kalsuak, Pacific handbook for gender equity and social inclusion in coastal fisheries and aquaculture, Pacific Community (SPC), 2021. ⟨https://hdl.handle.net/20.500.12348/4821⟩ (accessed February 4, 2025).

[6] M. de la Torre-Castro, S. Fröcklin, S. Börjesson, J. Okupnik, N.S. Jiddawi, Gender analysis for better coastal management – Increasing our understanding of social-ecological seascapes, Mar. Policy 83 (2017) 62–74, https://doi.org/10.1016/j.marpol.2017.05.015.

[7] D. Kleiber, L.M. Harris, A.C.J. Vincent, Gender and small-scale fisheries: a case for counting women and beyond, Fish Fish. 16 (2014) 547–562, https://doi.org/10.1111/faf.12075.

[8] B.L.E. Walker, M.A. Robinson, Economic development, marine protected areas and gendered access to fishing resources in a Polynesian lagoon, Gend. Place Cult. 16 (2009) 467–484, https://doi.org/10.1080/09663690903003983.

[9] C. Ferguson, A Rising Tide Does Not Lift All Boats: Intersectional Analysis Reveals Inequitable Impacts of the Seafood Trade in Fishing Communities, Front. Mar. Sci. 8 (2021) 625389, https://doi.org/10.3389/fmars.2021.625389.

[10] M. Axelrod, M. Vona, J. Novak Colwell, K. Fakoya, S.S. Salim, D.G. Webster, M. de la Torre-Castro, Understanding gender intersectionality for more robust ocean science, Earth Syst. Gov. 13 (2022) 100148, https://doi.org/10.1016/j.esg.2022.100148.

[11] A.N. Santos, Fisheries as a way of life: Gendered livelihoods, identities and perspectives of artisanal fisheries in eastern Brazil, Mar. Policy 62 (2015) 279–288, https://doi.org/10.1016/j.marpol.2015.09.007.

[12] M. Tekanene, The women fish traders of Tarawa, Kiribati, in: P. Choo, S.J. Hall, M. J. William, W.C. Penang (Eds.), Glob. Symp. Gend. Fish. Seventh Asian Fish. Forum, WorldFish Center, Penang, Malaysia, 2006, pp. 115–120.

[13] L.E. Ogden, Fisherwomen—The Uncounted Dimension in Fisheries Management: Shedding light on the invisible gender, BioScience 67 (2017) 111–117, https://doi.org/10.1093/biosci/biw165.

[14] B. Moritz, Building Value Through Innovative Eucheuma spp. Product Development: A Case Study With The Belize Women's Seaweed Farming Association, Univ. N. Engl, 2020 https://dune.une.edu/theses/317.

[15] S.A. Martínez, L. Hellebrandt, Mulheres na atividade pesqueira no Brasil, Campos Goytacazes (2019).

[16] M. Ntona, M. Schröder, Regulating oceanic imaginaries: the legal construction of space, identities, relations and epistemological hierarchies within marine spatial planning, Marit. Stud. 19 (2020) 241–254, https://doi.org/10.1007/s40152-020-00163-5.

[17] S. Harper, C. Grubb, M. Stiles, U.R. Sumaila, Contributions by Women to Fisheries Economies: Insights from Five Maritime Countries, Coast. Manag 45 (2017) 91–106, https://doi.org/10.1080/08920753.2017.1278143.

[18] M. Kitada, E. Johannesen, R.A. Ojwala, S. Buckingham, Z. Sun, M. Rodriguez-Chaves, F. Neat, R. Long, C. Schofield, Barriers to the collection of gender-disaggregated data in ocean science. in: Hum. Factors Manag. Leadersh, AHFE Open Acces, 2023, https://doi.org/10.54941/ahfe1003736.

[19] V. Pangare, M. Miletto, L. Thuy. Tool 3 – Guidelines on the collection of sex-disaggregated water data, 2nd ed., UNESCO, Paris, 2019.

[20] PROBLUE, Annual Report, 2021, The World Bank, 2021.

[21] E. Michalena, T.R.A. Straza, P. Singh, C.W. Morris, J.M. Hills, Promoting sustainable and inclusive oceans management in Pacific islands through women and science, Mar. Pollut. Bull. 150 (2020) 110711, https://doi.org/10.1016/j.marpolbul.2019.110711.

[22] M. Kitada, L. Carballo Piñeiro, M.Q. Mejia, Empowering women in the maritime community, WMU J. Marit. Aff. 18 (2019) 525–530, https://doi.org/10.1007/s13437-019-00188-6.

[23] B. Neis, S. Gerrard, N. Power, Women and Children First: the Gendered and Generational Social-ecology of Smaller-scale Fisheries in Newfoundland and Labrador and Northern Norway, Ecol. Soc. 18 (2013), https://doi.org/10.5751/ES-06010-180464.

[24] N.J. Bennett, Mainstreaming Equity and Justice in the Ocean, Front. Mar. Sci. 9 (2022), https://doi.org/10.3389/fmars.2022.873572.

[25] S. Harper, A. Martin, Gender and the Ocean: Marine Resources and Spaces for All, in: F. Obaidullah (Ed.), Ocean Us, Springer International Publishing, Cham, 2023, pp. 309–319, https://doi.org/10.1007/978-3-031-10812-9_29.

[26] C. Doss, C. Kieran, Standards for Collecting Sex-Disaggregated Data for Gender Analysis; a Guide for CGIAR Researchers, (2014). ⟨https://hdl.handle.net/10947/3072⟩ (accessed May 20, 2024).

[27] M. de la Torre-Castro, Inclusive Management Through Gender Consideration in Small-Scale Fisheries: The Why and the How, Front. Mar. Sci. 6 (2019), https://doi.org/10.3389/fmars.2019.00156.

[28] L.M. Wedding, S.J. Pittman, C.A. Lepczyk, C. Parrain, N. Puniwai, J.S. Boyle, E. G. Goldberg, M. Young, P. Marty, K. Wilhelm, S. Taylor, L.B. Crowder, Integrating the multiple perspectives of people and nature in place-based marine spatial planning, Npj Ocean Sustain 3 (2024) 43, https://doi.org/10.1038/s44183-024-00071-9.

[29] M. Berger, W. McClintock, C. Burt, T. Welch, SeaSketch. in: Eval. Particip. Mapp. Softw, Springer International Publishing, 2023, pp. 121–147, https://doi.org/10.1007/978-3-031-19594-5_6.
[30] Noo Raajje Program, Noo Raajje Ocean Use Survey Comprehensive Report March 2023, Noo Raajje Program (2023). ⟨https://www.nooraajje.org/_files/ugd/bfe600_578cccdcedde4eb9a828363c5b9caeb2.pdf⟩ (accessed October 10, 2024).
[31] Blue Azores Program, Azores Coastal Mapping Comprehensive Report 2023, Blue Azores Program (2023). https://www.blueazores.org/documents#:~:text=from%20all%20sectors.-,REPORT%20(EN),-EXPEDITION%20REPORT%C2%A0 (accessed October 10, 2024).
[32] Belize Sustainable Ocean Plan (BSOP), Belize Sustainable Ocean Plan StoryMap, Belize Sustain. Ocean Plan BSOP Data Viewer (n.d.). ⟨https://czmai.maps.arcgis.com/apps/instant/portfolio/index.html?appid= 29121effe6ee40aa9fad5fa3aa94ef79&locale=en⟩ (accessed October 10, 2024).
[33] K.L. Yates, D.S. Schoeman, Spatial Access Priority Mapping (SAPM) with Fishers: A Quantitative GIS Method for Participatory Planning, PLOS ONE 8 (2013) e68424, https://doi.org/10.1371/journal.pone.0068424.
[34] Ministry of Fisheries Marine Resources and Agriculture, Phone survey 2017/2018 (Unpublished), 2021.
[35] FAO, Country gender assessment of agriculture and the rural sector in Maldives, Malé, 2019.
[36] A. Jaleel, H. Smith, The Maldives Tuna Fishery: An Example of Best Practice, Ocean Yearb. Online 36 (2022) 314–345, https://doi.org/10.1163/22116001-03601012.
[37] A.L. Neilson, R. São Marcos, K. Sempere, L. Sousa, C. Canha, A vision at sea: women in fisheries in the Azores Islands, Portugal, Marit. Stud. 18 (2019) 385–397, https://doi.org/10.1007/s40152-019-00155-0.
[38] C.L. Alves, O.D. Garcia, R.A. Kramer, Fisher perceptions of Belize's Managed Access program reveal overall support but need for improved enforcement, Mar. Policy 143 (2022) 105192, https://doi.org/10.1016/j.marpol.2022.105192.
[39] S.R. Fuller, N. Nembhard, Reform agenda for empowering women: A Study of three fishing communities shows only with empowerment can women occupy positions of power in fisheries cooperatives, Samudra Rep. (2020) 20–23.
[40] V.I. Martinez, A. Casteñada, M. Gongora, B. Wade, N. Requena, Managed Access: A Rights-Based Approach to Managing Small Scale Fisheries in Belize, FAO Fish, Aquac. Proc. Tenure Use Rights Fish. 3 (2019).
[41] M. Karlsson, E.L. Mclean, Caribbean Small-Scale Fishers' Strategies for Extreme Weather Events: Lessons for Adaptive Capacity from the Dominican Republic and Belize, Coast. Manag 48 (2020) 456–480, https://doi.org/10.1080/08920753.2020.1795971.
[42] G.J. Rich, Women in Belize, in: C.M. Brown, U.P. Gielen, J.L. Gibbons, J. Kuriansky (Eds.), Womens Evol. Lives, Springer International Publishing, Cham, 2017, pp. 239–256, https://doi.org/10.1007/978-3-319-58008-1_13.
[43] Statistical Institute of Belize, Tourism Satellite Account, 2024.
[44] A.-M. Schwarz, N. Makhoul, W. Lalavanua, P. Cohen, Module 7: Coastal fisheries management, in: K. Barclay, S. Mangubhai, B. Leduc, C. Donato-Hunt, N. Makhoul, J. Kinch, J. Kalsuak (Eds.), Pac. Handb. Gend. Equity Soc. Incl. Coast. Fish. Aquac. - Second Ed., Pacific Community, Noumea, New Caledonia, 2021, p. 28, https://purl.org/spc/digilib/doc/w8jrb.
[45] L. Hellebrandt, O que torna as mulheres invisíveis na pesca? Reflexões a partir de pesquisa com mulheres da Colônia Z3 – Pelotas/RS, in: Mulh. Na Atividade Pesqueira No Bras., EDUENF, Campos Goytacazes, 2019: pp. 265–278. ⟨https://www.researchgate.net/publication/334277560_O_que_torna_as_mulheres_invisiveis_na_pesca_Reflexoes_a_partir_de_pesquisa_com_mulheres_da_Colonia_Z3_-_PelotasRS⟩ (accessed February 12, 2025).
[46] E. Michalena, T.R.A. Straza, P. Singh, C.W. Morris, J.M. Hills, Promoting sustainable and inclusive oceans management in Pacific islands through women and science, Mar. Pollut. Bull. 150 (2020) 110711, https://doi.org/10.1016/j.marpolbul.2019.110711.
[47] S. Mangubhai, C. Donato-Hunt, D. Kleiber, Module 3: Monitoring evaluation and learning, in: K. Barclay, S. Mangubhai, B. Leduc, C. Donato-Hunt, N. Makhoul, J. Kinch, J. Kalsuak (Eds.), Pac. Handb. Gend. Equity Soc. Incl. Coast. Fish. Aquac. - Second Ed., Pacific Community, Noumea, New Caledonia, 2021, p. 11, https://purl.org/spc/digilib/doc/w8jrb.
[48] S.R. de Souza, N.S. Ribeiro, S.A. Martínez, Mulheres em comunidades pesqueiras no brasil: um balanço da produção em Teses e dissertações (2007-2017), in: Mulh. Na Atividade Pesqueira No Bras., EDUENF, Campos Goytacazes, 2019: pp. 21–50.
[49] M. Gustavsson, Women's changing productive practices, gender relations and identities in fishing through a critical feminisation perspective, J. Rural Stud. 78 (2020) 36–46, https://doi.org/10.1016/j.jrurstud.2020.06.006.
[50] M.E.G. Scherer, J.L. Nicolodi, Interações Terra-Mar: Contribuições do Programa Brasileiro de Gerenciamento Costeiro para o Planejamento Espacial Marinho, Costas - 2021 2 (N3) (2021) 253–272. ⟨https://rodin.uca.es/handle/10498/28341⟩⟨⟩(accessed February 4, 2025).
[51] European Commission, The EU Blue Economy Report, Publications Office of the European Union, Luxembourg, 2020.
[52] P.Q. García, J.A. Chica Ruiz, J. García Sanabria, Blue energy and marine spatial planning in Southern Europe, Energy Policy 140 (2020) 111421, https://doi.org/10.1016/j.enpol.2020.111421.
[53] M. Spalding, R. Morillo, A Sustainable Blue Economy, Rockefeller Insights, 2017.
[54] N.J. Bennett, L. Katz, W. Yadao-Evans, G.N. Ahmadia, S. Atkinson, N.C. Ban, N. M. Dawson, A. de Vos, J. Fitzpatrick, D. Gill, M. Imirizaldu, N. Lewis, S. Mangubhai, L. Meth, E.-K. Muhl, D. Obura, A.K. Spalding, A. Villagomez, D. Wagner, A. White, A. Wilhelm, Advancing Social Equity in and Through Marine Conservation, Front. Mar. Sci. 8 (2021), https://doi.org/10.3389/fmars.2021.711538.
[55] E. Gissi, F. Maes, Z. Kyriazi, A. Ruiz-Frau, C.F. Santos, B. Neumann, A. Quintela, F. L. Alves, S. Borg, W. Chen, M. da Luz Fernandes, M. Hadjimichael, E. Manea, M. Marques, F.M. Platjouw, M.E. Portman, L.P. Sousa, L. Bolognini, W. Flannery, F. Grati, C. Pita, Natașa Văidianu, R. Stojanov, J. van Tatenhove, F. Micheli, A.-K. Hornidge, S. Unger, Contributions of marine area-based management tools to the UN sustainable development goals, J. Clean. Prod. 330 (2022) 129910, https://doi.org/10.1016/j.jclepro.2021.129910.