Virtual Regional Fisheries Management Meetings in the Western and Central Pacific Ocean Region: A Preliminary Appraisal of Performance and Fit

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Regional fisheries meetings that support the management of Western and Central Pacific Ocean (WCPO) capture fisheries are usually held face-to-face and in-person. In 2020, the travel and gathering bans due to the global COVID-19 pandemic meant that these meetings were held "virtually," primarily via videoconferencing. But can virtual meetings perform the same functions and deliver the same management outcomes as face-to-face meetings? This study is an initial investigation of the experiences, perceptions and attitudes of WCPO region government participants in a number of virtual regional fisheries meetings in 2020. Results indicate a strong preference for face-to-face regional meetings, with the perception that virtual meetings performed comparatively poorly at supporting a number of key meeting processes and outcomes. However, one-quarter to one-third of study participants consistently found no difference between format performance for many meeting processes and outcomes. Virtual formats were considered more appropriate for smaller and non-regional meetings, and allowed for greater staff attendance at meetings as well as cost and time savings for some, but not all, participants. Study participants believe that virtual regional meetings will be more common in the region in the future, despite nearly half indicating that virtual meeting are not a good fit for the region generally. Many of these experiences and perceptions are consistent with organizational behavior, communications media, and information systems literature. Some results appear unique to the region's socially and culturally diverse Pacific island countries and territories, which are relative newcomers to the global information and communication technology "revolution." A greater use of virtual regional fisheries meetings in the future requires meeting hosts and facilitators to carefully consider the potential impacts of virtual meetings on effective communication and inclusive participation in WCPO regional fisheries management and other governance outcomes.

Keywords: western and central Pacific fisheries, virtual meeting, information and communication technology, effective communication, fisheries management

INTRODUCTION

Marine capture fisheries are an important socio-economic resource for countries and territories across the Western and Central Pacific Ocean (WCPO) region (Gillett, 2007, 2016; Bell et al., 2009). Managing these fisheries responsibly to sustain their benefits across the region into the future means that countries and territories are obliged under numerous internationally negotiated laws, policies, and guidelines to communicate regularly with each other about fisheries management and conservation issues that have national, regional, and global significance, e.g., United Nations Convention on the Law of the Sea (UNCLOS) (1982), Food and Agriculture Organization (FAO) (1995), UNFSA (1995), WCPF Convention (2000). This international management framework also ensures that the region's coastal island countries and territories, many of which are also considered small island developing states (SIDS), are supported in fisheries development, conservation, and management, e.g., LOSC (various, e.g., arts. 56, 61, 62, 203), UNFSA (art. 24), FAO (art. 5), WCPF Convention (art. 30).

These regular communications between states and territories (and other interested parties, e.g., non-government organizations) often occur as formal meetings. Meetings are used to accomplish a common set of task-based and relational outcomes through a series of action steps, here referred to as processes, that are set within a time-bound agenda (Bostrom et al., 1993). Meeting processes support one or more purposeful, dynamic group communication tasks. These tasks include interpersonal interactions like: generating ideas and plans; exchanging information; making decisions; resolving conflicts and problems; and executing performance-based and competitive tasks (e.g., negotiating outcomes) (McGrath and Hollingshead, 1993). The result of these interactions are outcomes that support individual, intra-organizational, and/or inter-organizational goals and maintain constructive interpersonal and inter-organizational relationships.

More than 40[1] regional-level, multilateral fisheries meetings are organized by Regional Fisheries Bodies[2] (RFBs) every year in the WCPO region. Here, regional fisheries meetings (RFMs) include regional fisheries management organization (RFMO) plenaries, major regional committee and intersessional working group meetings; regional management advisory organization meetings; and, regional technical meetings. These RFMs serve a range of purposes and involve anywhere from dozens to a few hundred participants from governments, civil society organizations, academia, and the private sector from around the WCPO region and beyond. The conventional format for WCPO RFMs is face-to-face and physically co-located (i.e., in-person, in the same room). Ensuring that a state's interests[3] are represented in RFM outcomes therefore requires a considerable expenditure of human, time, and financial resources for delegations to travel to and participate in face-to-face meetings. Pacific island countries and territories (PICTs), which are geographically dispersed and typically have limited human and financial resources to allocate toward attending multiple, year-round, international meetings, may acutely feel these costs[4].

Despite the resourcing, logistical, and environmental (e.g., waste, travel carbon emissions) challenges of organizing and attending face-to-face international fisheries meetings, no demand to explore other modes of meeting, e.g., "virtually" at a distance using information and communication technologies (ICT) like computers, mobile phones, the internet, and/or audio/videoconferencing systems, has ever been clearly articulated in a fisheries context. This lack of articulated demand for alternate, distanced meeting formats contrasts with other sectors where international gatherings are also part of routine operational practice, e.g., corporate business and academia (Arnfalk and Kogg, 2003; Niner and Wassermann, 2021).

The emergence of the global COVID-19 pandemic in early 2020 and the attendant international travel and physical gathering bans meant that RFBs and their constituent governments had to adjust to organizing, hosting and participating in shorter, virtual "e-meetings," notably through computer-mediated, online videoconferencing platforms like Zoom (2020). This situation provided an unprecedented opportunity to investigate whether virtual RFMs can perform the same communication tasks and deliver the same management outcomes as face-to-face RFMs, while providing organizational cost savings. Assessing the early performance of virtual RFMs also provides an opportunity to consider post-pandemic implications for their future use in fisheries conservation and management in the region.

Participants are one of the most influential interpreters of meeting performance. Information systems (IS) technology use and acceptance research suggests that a meeting participant's early impressions of virtual RFMs will be influenced by their experiences of how well, and how easily, they are able to perform anticipated meeting tasks and reach expected outcomes using computer-mediated meeting technologies (Davis, 1989; Trevino and Webster, 1992; Goodhue and Thompson, 1995; Venkatesh et al., 2003). Media communications scholars suggest that performance is likely to be influenced by the choice of media used to carry out these tasks (Daft and Lengel, 1983; McGrath and Hollingshead, 1993).

This uniquely interdisciplinary study draws on IS, media communications, and organizational behavior literature to better

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[1]This is a conservative "back-of-the-envelope" estimate of semi-formal to formal, medium-to-large, annual meetings about fisheries management, and conservation issues. *Ad hoc* meetings, bilateral meetings, smaller intersessional meetings, and workshops are not explicitly considered here. Including all forms of international fisheries meetings would easily bring this estimated meetings tally well into the hundreds in the WCPO region alone.

[2]Regional fisheries bodies (RFBs) are intergovernmental fisheries organizations or committees. Some RFBs have an advisory function, e.g., Forum Fisheries Agency (FFA), while some have the power to establish conservation and management measures and are more commonly referred to as RFMOs, e.g., Western and Central Pacific Fisheries Commission (WCPFC). The RFB concept was originally established under the FAO Constitution but many RFBs are not formally established under this legal framework in practice.

[3]For comprehensive examples of "interests" as they relate to advocacy for shared concerns and influence in policy in WCPO tuna fisheries, see Hanich (2011).

[4]In recognition of the cost burden of participating in international meetings, RFBs/RFMOs and aid donors often subsidize developing countries to attend meetings, see, e.g., WCPFC Financial regulations 3.5: https://www.wcpfc.int/doc/commission-02/financial-regulations-updated-december-2012.

understand the practical potential for using virtual formats for RFMs in the WCPO region into the future. This is achieved through the investigation and appraisal of the initial experiences and attitudes of key participants in a number of virtual regional fisheries meetings in 2020.

This study asks:

(1) How do meeting participants rate the performance of virtual meetings compared to face-to-face formats in terms of supporting key meeting resourcing, processes and outcomes?
(2) What are participant perceptions about the appropriateness and fit of virtual meetings for supporting fisheries management in the region?
(3) What do these experiences and attitudes reveal about the possible future role of virtual meeting formats in WCPO fisheries management contexts?

This study adds value to the marine policy and fisheries management literature by being the first evidence-based study to investigate the initial experiences and attitudes of key virtual RFM participants and to consider what challenges and opportunities these early perceptions may present for computer and video-enabled meeting formats in such a context into the future. It is also the first study to connect IS, media communications, organizational behavior and marine resources management literatures together to generate new analytic insights. In doing so, this study provides valuable insights that are of relevance to regional fisheries management processes and outcomes in a post pandemic era. Finally, this study also establishes a starting point for future research into the under-studied area of ICT's role in fisheries management.

This manuscript is organized as follows: the next section briefly reviews relevant literature, which guides this research inquiry. This is followed by a description of the study methods, which include a questionnaire scoped to include professional staff from PICTs, Australia, and New Zealand who participate in WCPO RFMs. Questionnaire results are then presented and discussed in relation to the above literature. Finally, the implications of this study's findings are appraised in terms of the potential role virtual meetings may have in the region in the future.

Linking Technology Use Experiences and Attitudes to Acceptance of Virtual Meetings

Virtual RFMs involve people communicating and relating at a distance using information and communication technologies. IS and organizational behavior research establish that human responses to using newly introduced technologies are a critical influencer of technology acceptance and adoption (or resistance) behaviors in a professional environment (Davis, 1989; Arnfalk and Kogg, 2003; Venkatesh et al., 2003). Most IS "user acceptance" models are based on the premise that a person's experiences, beliefs, and attitudes about a given technology influence their intention to use that technology in the future,

which in turn influences actual usage behavior, i.e., longer-term adoption/continuous use or resistance to use (Fishbein and Ajzen, 1975; Davis, 1989; Ajzen, 1991; Venkatesh et al., 2003; Kim and Kankanhalli, 2009).

Unifying IS theory points to a number of common factors that influence acceptance and use of technology (Venkatesh et al., 2003). These include concepts like performance expectancy, or "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh et al., 2003, p 447). "Effort expectancy," or a technology's ease of use, is another key influence and includes constructs like perceived ease and complexity of use (Rodgers, 1983; Davis, 1989; Venkatesh and Davis, 2000; Venkatesh et al., 2003). As well, "facilitating conditions" consider the removal of technological and/or organizational barriers to use and the overall compatibility of the new system with existing values, needs, and experiences (Rodgers, 1983; Venkatesh et al., 2003). Organizational cost factors could be considered a component of facilitating conditions and are also a feature of organizational-level considerations around which meeting format to use in business settings (i.e., face-to-face or virtual) e.g., see Arnfalk and Kogg (2003).

The switch from face-to-face to videoconferencing-based RFMs in 2020 represents a significant change to how communications media were used to support the delivery of WCPO RFM processes and outcomes. Years of experience in attending face-to-face RFMs, as well as publicly available online meeting agendas, identify broad categories of procedural communication tasks and related outcomes that are a common feature of RFMs. In this regard, a given RFM may include some or all of the following communication tasks: sharing and receiving information and knowledge, making group decisions (often by consensus), advocating for organizational interests, negotiating written text, negotiating measures and policies, and resolving conflicts. Common outputs from these communication tasks include negotiated written texts, measures and policies as well as strategic plans. These outputs directly affect the way WCPO fisheries are conserved and managed and how national and regional organizations support this management. Less tangible key outcomes include institutional strengthening through relational interactions, inclusive representation in decision-making, and conflict resolution.

Formative media communications research suggests that the choice of communication media can affect how well information messages are conveyed between sender and recipient, clearly understood, and interactively responded to Daft and Lengel (1983, 1986), McGrath and Hollingshead (1993); Suh (1999), Arnfalk and Kogg (2003); Naquin and Paulson (2003). Interpersonal communication is considered effective if these information messages can be transmitted, received, and interpreted with minimal misunderstanding. Effectiveness is thought to be further supported by the frequency, personalization, and sequencing of messages, and by the provision of synchronous feedback (Fletcher and Major, 2006).

Conventional communications theory suggests there should be little difference between using videoconferencing and face-to-face speech to communicate effectively (Daft and Lengel,

1983; McGrath and Hollingshead, 1993; Kydd and Ferry, 1994; Suh, 1999). Face-to-face and videoconferencing are considered the "richest" forms of communication media because of their similar abilities to transmit "information-rich" messages that have multiple visual (e.g., body language, gestures) and auditory (e.g., speech, inflection) cues and therefore a high potential for multiple and conflicting message interpretations by recipients (Daft and Lengel, 1983, 1986; McGrath and Hollingshead, 1993; Kydd and Ferry, 1994; O'Malley et al., 1996; Fletcher and Major, 2006). This is in contrast to "leaner" media like email, which some key studies consider effective for more "simple" or explicit message exchanges (Daft and Lengel, 1983; McGrath and Hollingshead, 1993).

However, other research finds that communicating via videoconferencing can create "unnatural" lags and interruptions in the transmission and comprehension of messages, thus reducing ease of understanding and interpretation and increasing cognitive processing time (O'Conaill et al., 1993; O'Malley et al., 1996; Purdy et al., 2000; Kock, 2004; Klitmøller and Lauring, 2013). When negotiation is the focal communication task, these delays have been shown to reduce outcome satisfaction and the desire to interact in the future (Purdy et al., 2000; Naquin and Paulson, 2003). Other research suggests that videoconferencing may struggle to facilitate the transmission of social cues and sense of physical closeness necessary for creating positive sentiments like trust and confidence in online environments (O'Malley et al., 1996).

METHODOLOGY

Study Scope

This study focuses on annually held, regional fisheries meetings convened by regional fishery bodies in the WCPO area RFBs. In order to control the number of meetings explicitly included in the survey instrument described below, the principal focus of inquiry was scoped to major tuna meetings as well as to the one regional-level coastal fisheries meeting. This scope includes plenaries, medium-to-large intersessional committees and working groups of dozens to hundreds of participants. It excludes *ad hoc*, bilaterals, workshops, and small working groups. However, the survey instrument allowed for any meetings to be identified and manually included by survey participants. The focal study population was government fisheries management decision-makers and/or policy-makers on regional meeting delegations from PICTs, including Australia and New Zealand.

Data Collection and Analysis

Data were collected using an online questionnaire developed in Qualtrics (2020) and distributed by email. The email survey approach to data collection was chosen because it has the greatest potential to capture a diversity of respondents within a geographically and physically dispersed sample group (Kelley et al., 2003). This approach also assumed that the target group was likely to regularly check and respond to emails in the execution of their work.

Study group sampling was purposive and criterion-based. In order to be included within the questionnaire sample group, potential study participants must have attended one or more face-to-face regional fisheries meetings on a national delegation in 2018 and/or 2019[5] as well as virtually in 2020. Identification of eligible meeting participants was determined by direct observation or through publicly available participant lists for meetings between 2018 and late 2020. This approach also relied on the ability to source a working email address.

Using this approach, 120 total participants from 22[6] states and territories were identified from a total focal population size that is unknown but roughly estimated to be less than 300 people given observed average delegation sizes and the common practice of the same participants attending multiple meetings across the year. This group of potential study participants was invited by email to complete the online questionnaire over two, two-week periods toward the middle and end of 2020. Having two questionnaire rounds allowed for the collection of responses from newly identified and previous non-responding meeting participants.

The online questionnaire used mostly 5-point scale-based questions to keep survey completion time down. This format also intended to encourage a greater response rate from a group of "time-poor" people. Question elements were developed using the authors' own experience in attending RFMs and informed by concepts from the information systems, organizational behavior, and media communications literature described above. Questions were then refined for clarity and flow during a short pilot phase. Questions asked about:

- Recent meeting participation history;
- Comparative face-to-face and virtual meeting experiences with respect to a range of processes, outcomes, and organizational resource use;
- Levels of agreement with statements around personal and team performance, preferences, and format fit-for-purpose; and
- Levels of agreement with statements about future virtual meeting use.

The questionnaire uses "virtual meeting" as a proxy term for any distanced, ICT-mediated meeting format. However, most virtual WCPO RFMs took place via videoconferencing (including functionalities like audio-only, chat boxes and break-out groups) in 2020, so it's likely this was a common conception of the term. The questionnaire also uses the term "face-to-face" to refer to in-person communication.

All data were collected, analyzed, and stored securely in accordance with university ethics approvals.

RESULTS

A total of 32 people representing 14 countries or territories responded to the questionnaire. Eight of these respondents did

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[5]The rationale for scoping meeting attendance to the past 2 years was to create some controls around the recall of meeting experiences (i.e., participants were more likely to remember the same meetings, with a similar degree of clarity).
[6]For a list of all states and territories contacted, see **Supplementary Material**.

not meet the criteria for participation and were excluded from analysis, i.e., they did not participate in face-to-face meetings in 2018 and/or 2019 (seven) or did not finish the survey (one). The remaining 24 respondents from 13 countries or territories represent a survey response rate of 20%, which is consistent with average response rate for "mail-out" questionnaires identified by Kelley et al. (2003). There was good response coverage across states and territories (63%). The average number of responses per state or territory was one. Participants included 15 men, eight women, and one unspecified (**Figure 1**). Most respondents were between the ages of 31 and 60, had a Master's degree, and were senior members of government with more than 10 years' experience in their organization. This indicates that the survey was successful in reaching a number of highly educated, skilled, key decision-makers across the study area. The survey results, however, cannot be interpreted as representative of the entire population of all decision makers engaged in all RFM meetings, given the research was not based on a probability sample. Statistical analysis was therefore limited to descriptive statistics and aggregated to protect respondent anonymity. In addition, there was no statistically identifiable relationship detected between demographic variable and questionnaire responses, so detailed analysis according to demographics was not conducted.

Meeting Process and Outcome Performance

The survey explored a number of aspects of meeting processes and outcome performance. These included; (a) how the meeting formats support them as participants, (b) how the formats support meeting processes in general, and (c) how they support key meeting outcomes.

When asked to rate which of the two meeting formats respondents felt best supported them as meeting participants, face-to-face formats were the clear preference over virtual for supporting all six investigated processes (**Figure 2**). Three processes – ability to share, receive, and understand discussed information – had no ratings in favor of virtual. There was also a notable percentage of "no difference" responses for all processes, particularly with respect to participants' ability to receive information (33%); to understand discussed information (29%); and, to support their delegation in decision-making (25%).

Face-to-face formats were also clearly preferred for supporting most, but not all, of the investigated general meeting processes (**Figure 3**). Two processes: "Facilitating clear communication" and "Minimizing technical barriers" had no ratings in favor of virtual. The strongest rating for virtual formats was "Minimizing logistical barriers to participation" (42% total). However, perspectives were also the closest to evenly split three ways for this particular process. AUS/NZ respondents felt that virtual formats were significantly better for "Facilitating opportunities for breakout sessions or side meetings." Between 21 and 33% of respondents experienced no difference between formats for five out of seven investigated processes.

Face-to-face meeting formats were again a clear preference when it came to rating meeting formats at supporting a selection of key meeting outcomes (**Figures 4, 5**). Two outcomes:
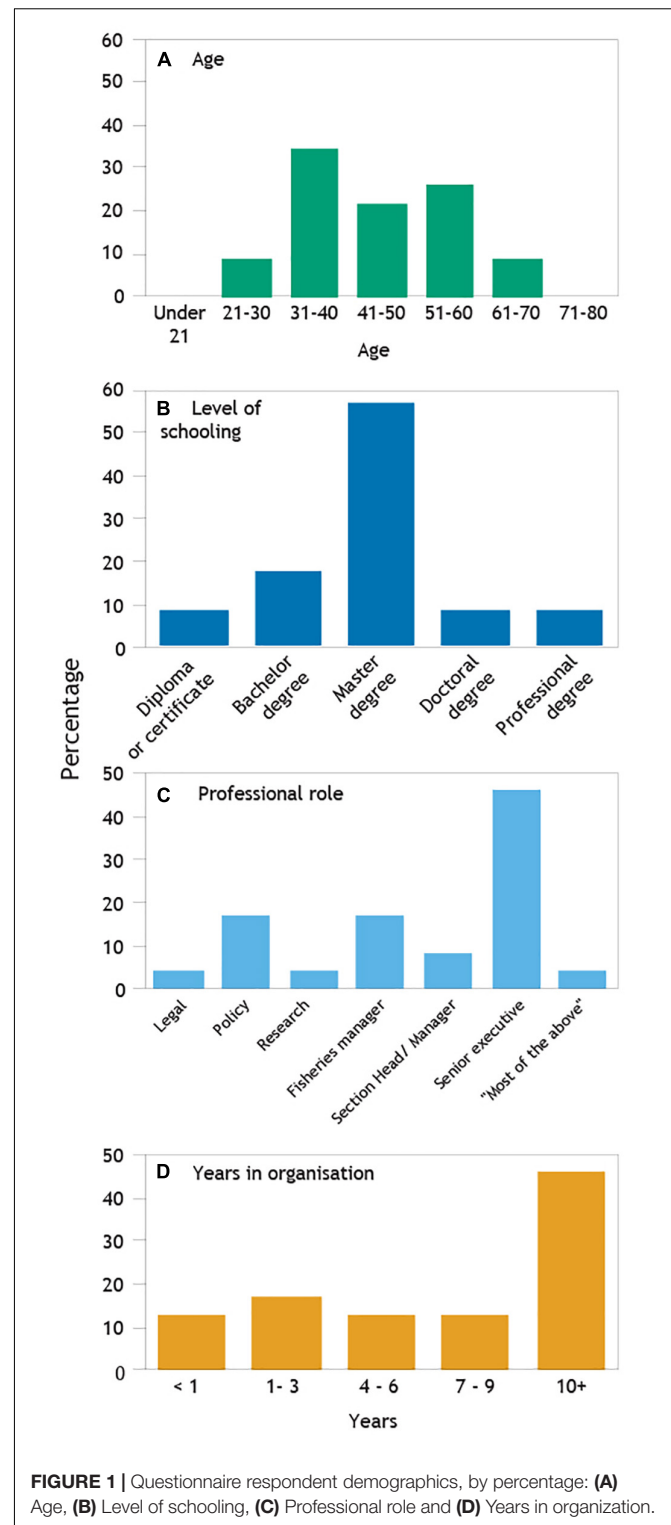

FIGURE 1 | Questionnaire respondent demographics, by percentage: **(A)** Age, **(B)** Level of schooling, **(C)** Professional role and **(D)** Years in organization.

"confidence in meeting decisions" and "environment of trust created" had no ratings in favor of virtual (**Figure 5**). More respondents felt that face-to-face formats were "significantly better" for supporting outcomes that fairly represented the interests of PICTs compared to representing the interests of
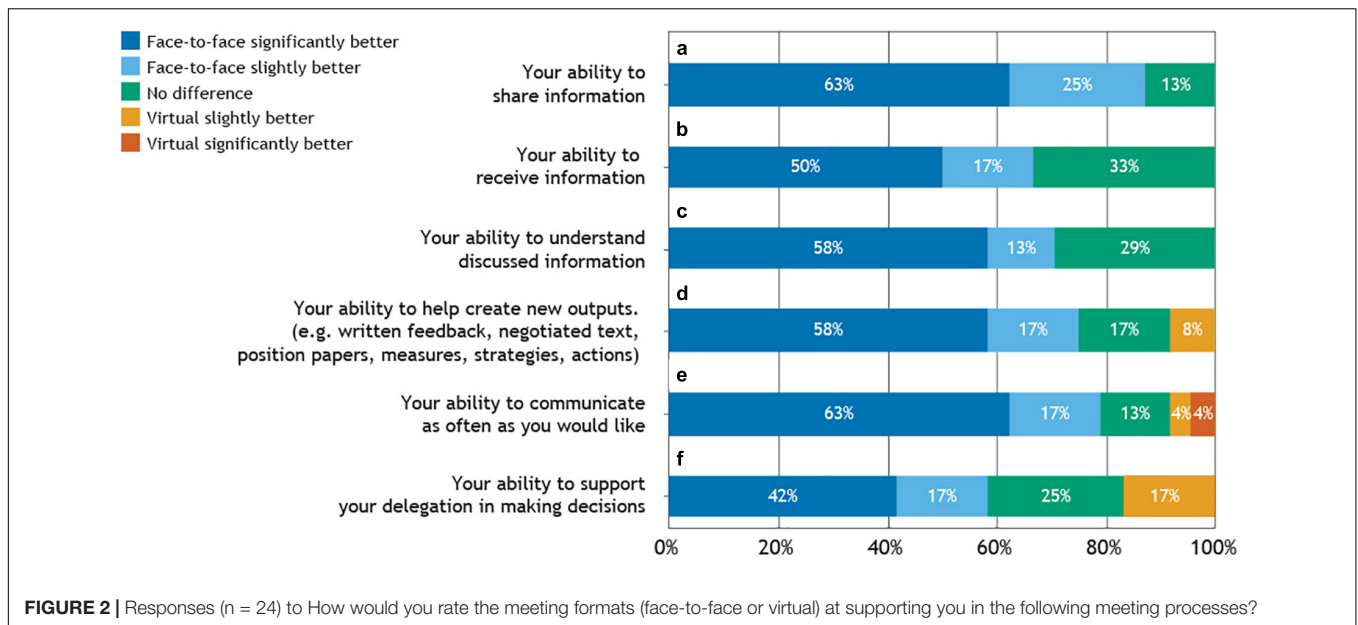
FIGURE 2 | Responses (n = 24) to How would you rate the meeting formats (face-to-face or virtual) at supporting you in the following meeting processes?
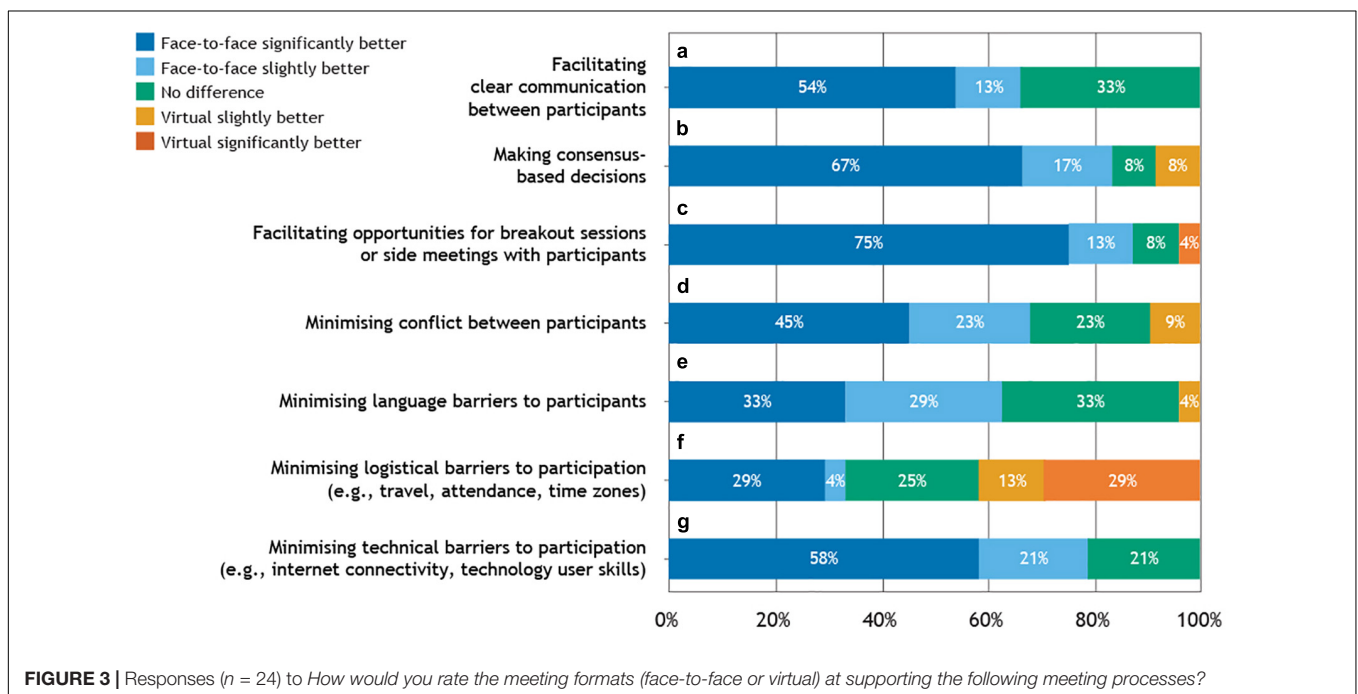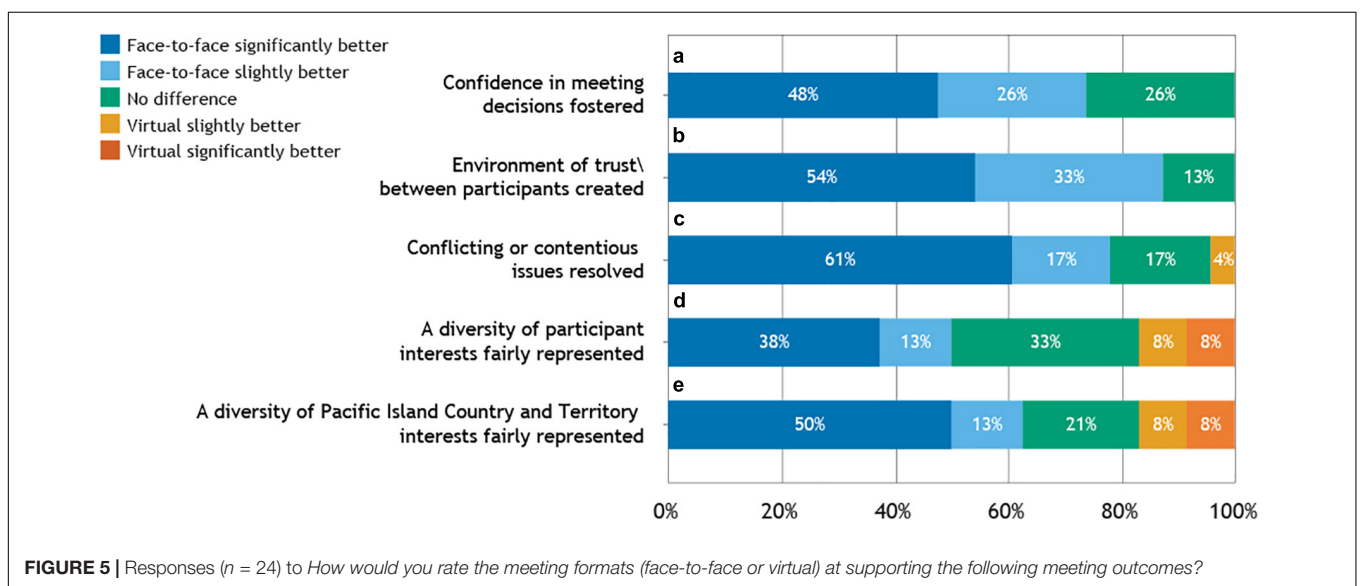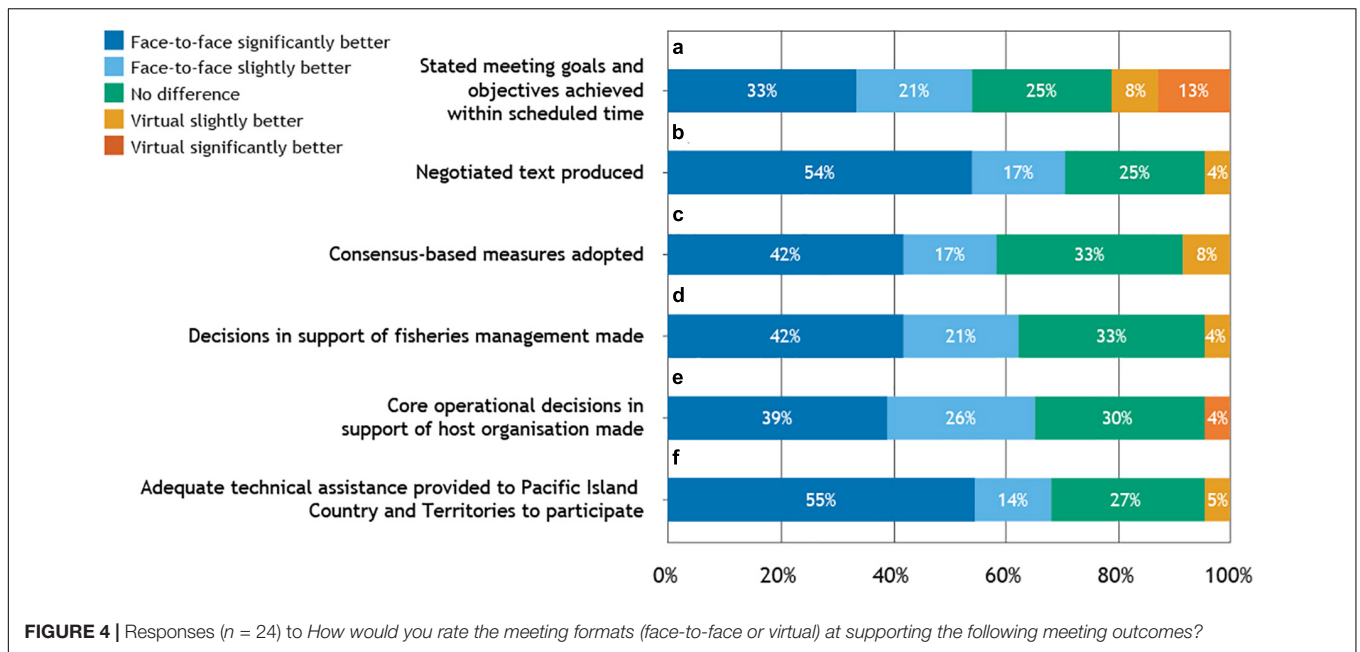

FIGURE 3 | Responses (n = 24) to *How would you rate the meeting formats (face-to-face or virtual) at supporting the following meeting processes?*

meeting participants more generally (50 versus 38%) (**Figure 5**). Interestingly, 16% rated virtual formats as either slightly or significantly better for the same two "representation" outcomes (**Figure 5**); this was the second strongest response in favor of virtual formats out of the investigated outcomes beside "stated meeting goals and objectives achieved within scheduled time" (21% total) (**Figure 4**). However, 25–33% of respondents found no difference in most outcome delivery support between the two formats.

Use of Organizational Resources

Participants reported using more organizational resources for face-to-face meetings (**Figure 6**). The exception to this was the number of staff allocated to attend meetings (61% said virtual had more). A small but consistent minority of respondents reported that virtual meetings were "significantly more" expensive to prepare for and attend. For some, virtual meetings were also slightly or significantly more costly in terms of preparation and

FIGURE 4 | Responses (n = 24) to *How would you rate the meeting formats (face-to-face or virtual) at supporting the following meeting outcomes?*

FIGURE 5 | Responses (n = 24) to *How would you rate the meeting formats (face-to-face or virtual) at supporting the following meeting outcomes?*

follow-up time. The "no difference" response was between 26 and 48% for four out of six investigated resources.

Virtual Meetings: Preferences, Appropriateness and Fit

An overwhelming 92% of respondents said they preferred face-to-face meetings, while 8% (which included PICT respondents) said they did *not* prefer face-to-face meetings (**Figure 7**). In terms of personal and team performance, 51% of respondents stated that they felt comfortable participating in virtual meetings, while 38% were ambivalent and 13% were not comfortable. Most respondents (59%) felt that virtual meetings provided fewer

opportunities to have their voices heard, while around one-third were neutral. A few people felt virtual meetings provided more opportunities to be heard. Most respondents were neutral about whether they were satisfied with their delegation team's performance in virtual meetings (42%).

In terms of attitudes around virtual meeting appropriateness and fit-for-purpose, 62% felt that fisheries meetings need to be held face-to-face in order to be effective, while 17% disagreed with this sentiment and 21% were neutral (**Figure 8**). Respondents were evenly split about whether virtual meeting formats are a good fit for discussing fisheries issues more generally (38% agree/disagree, 25% neutral), while 46% of respondents felt virtual meeting formats were not a good fit for the WCPO
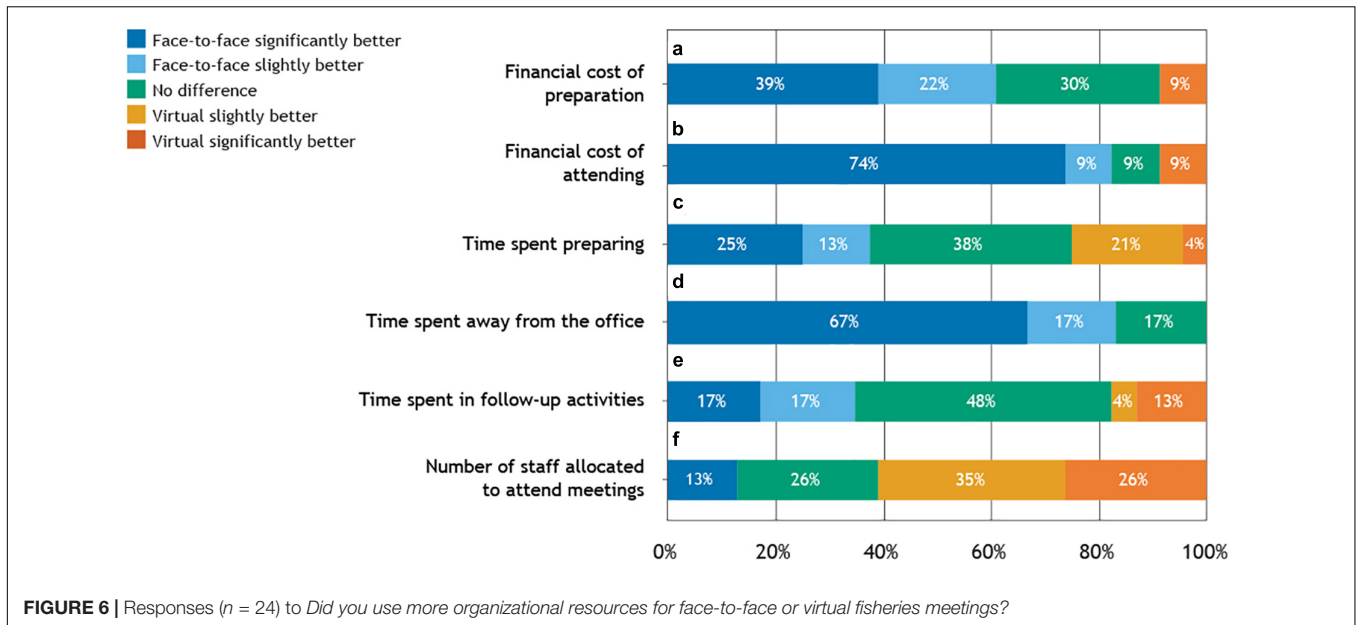
FIGURE 6 | Responses (n = 24) to *Did you use more organizational resources for face-to-face or virtual fisheries meetings?*
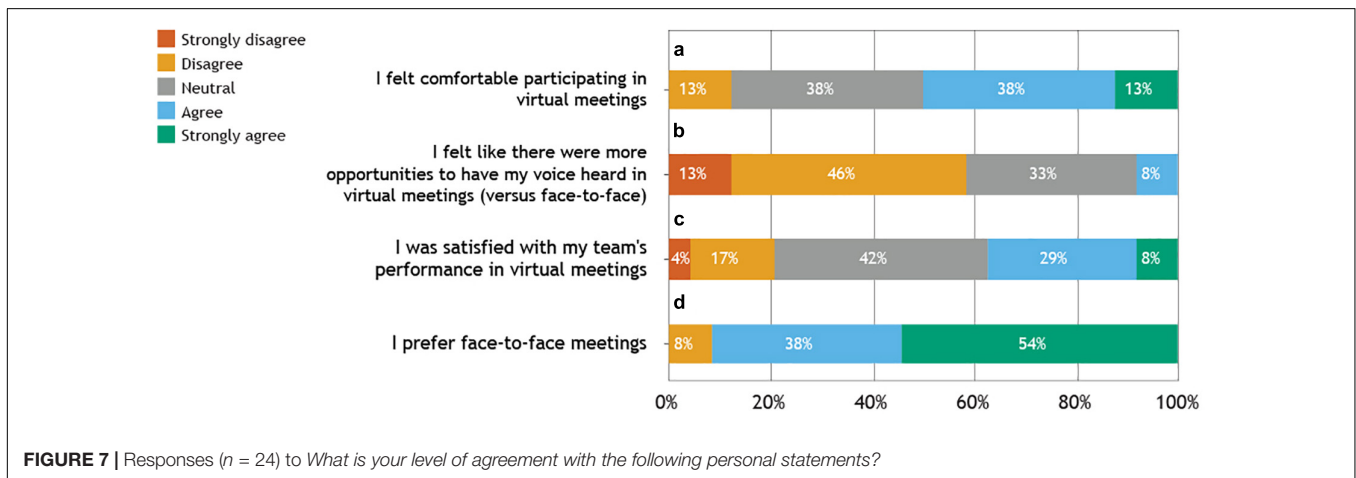

FIGURE 7 | Responses (n = 24) to *What is your level of agreement with the following personal statements?*

region in general. In terms of the appropriateness of virtual meeting formats at different operational scales, the majority of respondents (58%) felt that virtual formats are inappropriate for regional-scale fisheries meetings. However, most saw a role for virtual formats at non-regional (58%) and smaller-scale fisheries meetings (71%).

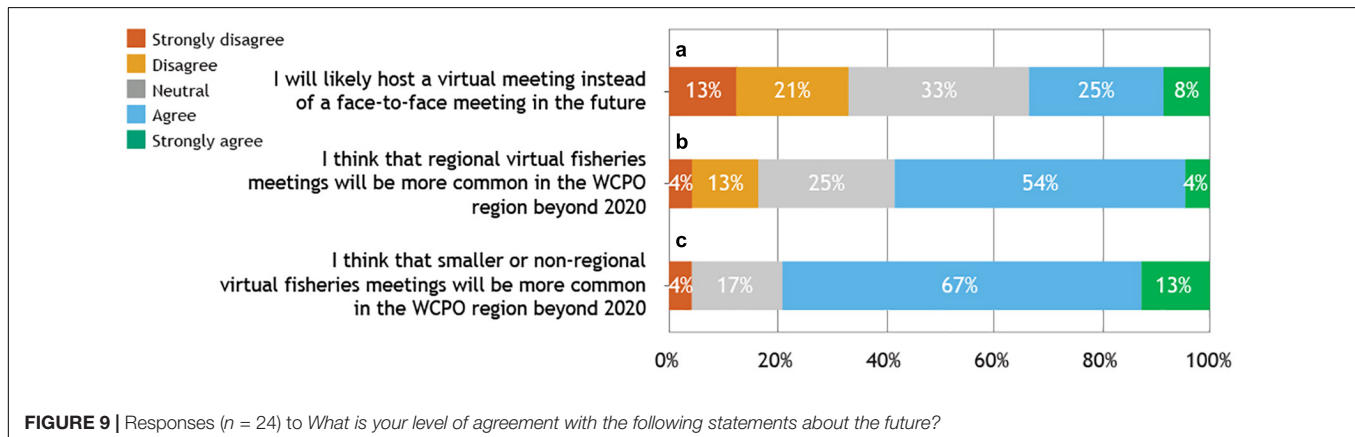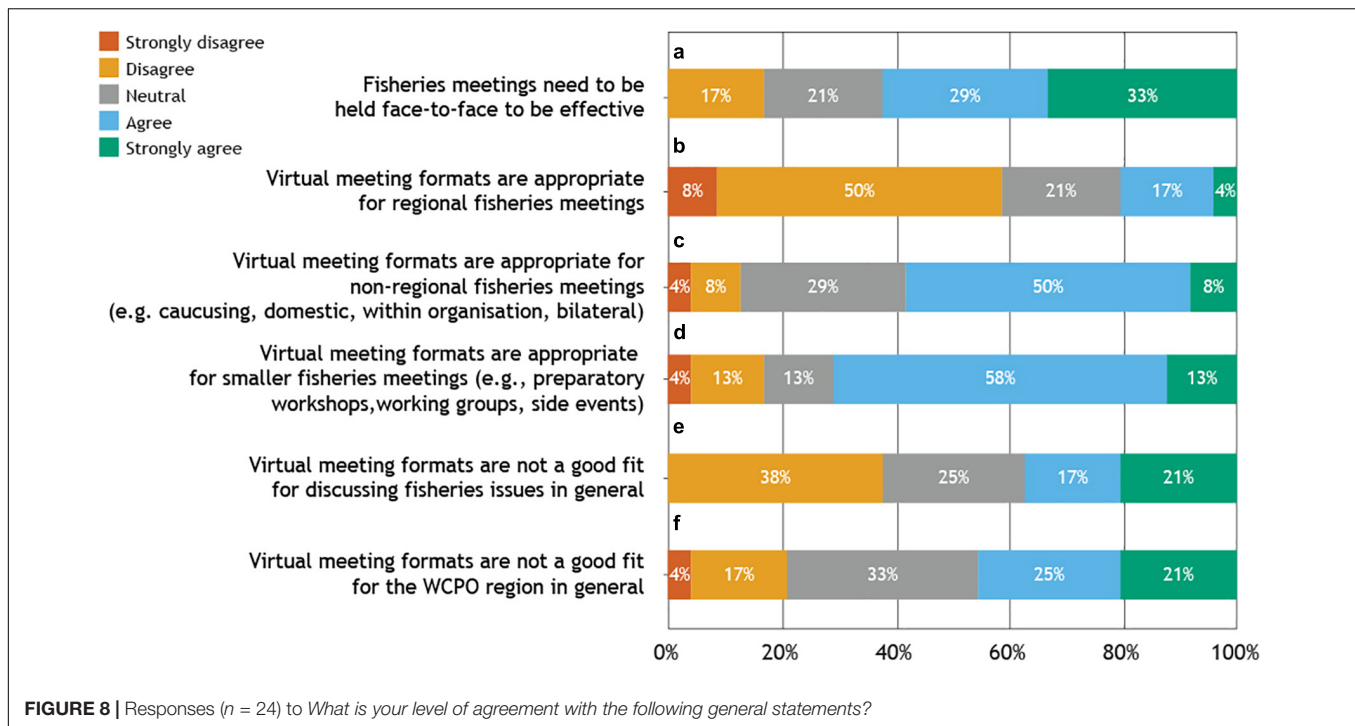## Attitudes About the Future of Virtual Meetings

The majority of respondents expressed an overall preference for face-to-face meetings (**Figure 7**) and felt this format to be most effective for fisheries meetings (**Figure 8**). However, the majority also agreed that virtual formats will likely play a greater role in the region beyond 2020 (**Figure 9**). In total, 58% of meeting participants expect regional-level virtual fisheries meetings to be more common in the future despite an equal percentage believing that virtual formats are not appropriate for fisheries meetings of this scope and scale (**Figure 8**). Most (79%) expect virtual

formats to be more common for smaller and more local-scale fisheries meetings. However, participants were almost evenly split or neutral about whether *they'd* be the ones to host virtual meetings instead of face-to-face formats in the future. No PICT respondents "strongly agreed" that they would likely host a virtual meeting instead of a face-to-face one in the future.

DISCUSSION

Face-to-Face Meetings: Better for Complex Communication Environments

The majority perception was that face-to-face meetings were the preferred format to support nearly all investigated meeting processes and outcomes. This suggests that the relatively small differences in information richness between videoconferencing and face-to-face communication may make a big difference to the experiences of key meeting participants in the WCPO RFM

FIGURE 8 | Responses (*n* = 24) to *What is your level of agreement with the following general statements?*

FIGURE 9 | Responses (*n* = 24) to *What is your level of agreement with the following statements about the future?*

context. The procedural way that virtual RFMs were planned and held may have also contributed to negative perceptions of virtual meetings, particularly with respect to meeting outcomes. Beyond the accomplishment of formal meeting tasks, the benefits of meeting in person to build and maintain personal and professional relationships may also contribute to a the preference for meeting face-to-face (Arnfalk and Kogg, 2003).

Questionnaire response trends indicate that key participants feel virtual formats are performing poorly at supporting the sharing, receiving, and understanding of information and at facilitating clear communication in meetings. Many of the meetings included within the study scope could be characterized as having a complicated communication environment with a high degree of ambiguity in exchanged messages and a need for rapid and continuous message feedback. These messages may represent multiple, competing political positions in a management strategy discussion or a competitive negotiation

of measures or policy. There may also be more ambiguous "diplomatic nuance" used in verbal communication than in "normal" speech.

Many RFMs can also be characterized as having a high degree of participatory asymmetry, with different languages, cultures, and geo-political power structures existing between the meeting participants in a principally Western and English-language meeting environment. Cultural and language differences have been shown to affect communication effectiveness and knowledge sharing in international business and management environments (Welch and Welch, 2008; Klitmøller and Lauring, 2013). Feeling as though communication performance is effective is particularly important when the need for a person, and by extension a delegation, to communicate clearly and confidently in "real time" with no misunderstanding has geo-political consequences that extend well beyond the management of fisheries.

This level of situational complexity, combined with the newness of using videoconferencing to undertake such complex and ambiguous communication tasks, suggests that the richest possible media (i.e., face-to-face) generally provides the best chance at supporting effective communication and outcome satisfaction in a WCPO RFM environment. This study may have also identified another example of where the transmission and comprehension "lags" of videoconferencing can reduce ease of understanding and interpretation (O'Malley et al., 1996; Purdy et al., 2000; Klitmøller and Lauring, 2013). These lags may have been exacerbated by differences in internet connectivity observed between some virtual RFM participants in the meetings attended by the study researchers.

Nearly half of respondents perceived a lack of fit for virtual meeting formats in the region more generally (i.e., beyond their specific use for fisheries meetings), which may represent an expression of social or cultural preferences for physical, face-to-face meetings in the WCPO context, see, e.g., ABC (2020) and Mückler (2021). This supports the idea that that social factors (e.g., language, norms, peers) and cultural factors (e.g., core values, customs, economic, and legal systems), also play a role in influencing technology use and acceptance preferences (Thompson et al., 1991; Lee, 2000; Venkatesh et al., 2003; Klitmøller and Lauring, 2013).

Findings also suggest that virtual RFMs are also not performing well at supporting key outcomes related to decision confidence, trust between participants, and opportunities to be heard. Differences in the planning, length, and composition of virtual RFM agendas compared to equivalent past face-to-face meetings, and the absence of relationship-building informal side events or impromptu meetings normally associated with face-to-face meetings may have influenced these results. Issues of trust (e.g., interpersonal, technology, service provision, facilitation) are a key researchable issue in the "e-business" literature (Naquin and Paulson, 2003; Turel and Yuan, 2008; Garro-Abarca et al., 2021), and have been linked to sentiments about communication effectiveness and outcome satisfaction (Purdy et al., 2000).

Virtual Meetings: Some, Limited Benefits

Despite rating the performance of virtual RFMs quite poorly overall, study results and observations from attending a selection of virtual RFMs in 2020 suggest that there may be some benefits to meeting virtually for specific regional purposes, as well as for smaller and non-regional meetings.

Organizational cost results indicate that virtual meetings may be beneficial where meetings need to keep to a tight schedule and where financial, time, and human resources costs may represent a significant barrier to inclusive meeting participation. More staff were allocated to attend virtual meetings, presumably because it was easier and cheaper to attend. This could have delegation representation and junior delegate training benefits, particularly for the PICT delegations that are often three people or less in size. However, results also indicate that the organizational costs of meeting virtually are perceived as significant for a small number of meeting participants. With the region's "ICT revolution" beginning only relatively recently (Cave, 2012), this suggests that key ICT infrastructure, capacity and technical support may still be needed in some places to support more

inclusive participation in virtual meetings. Budget constraints in the wake of the pandemic may be a challenge to addressing this.

Results also suggest that virtual meeting formats may have an accepted role in supporting smaller and non-regional meetings. Smaller meetings with fewer people may have a shorter agenda with fewer or less complex and ambiguous communication tasks to accomplish within a given timeframe. It may be perceived as less necessary to meet in person for smaller meetings, which may be considered less formal, and individual participants may have more robust interpersonal relationships if these meetings, and their participants, are recurring. Arnfalk and Kogg's (2003) "situational factors" of meetings, e.g., language barriers, internet connectivity challenges, and time zone differences, may also be easier to overcome in smaller meetings. Finally, it may be easier to host and facilitate smaller meetings well, which can influence positive perceptions of meeting outcomes (Macaulay and Alabdulkarim, 2005).

While analyzing specific meetings is outside the scope of this article, a preliminary analysis of more disaggregated results, meeting participant feedback to regional organizations (SPC, 2020a), and observations as a virtual RFM attendee suggest that virtual formats may have a positive role to play in supporting regional-level meetings that focus on coastal fisheries. Regional-level coastal fisheries meetings tend to focus on planning, problem-solving, and knowledge and information-sharing tasks, e.g., sharing scientific and management best practice information, making decisions about shared capacity development and strategic policy directions [see SPC, 2020b], and not on issues of national distribution or binding negotiation. Despite the importance of coastal fisheries to the region (Bell et al., 2009; SPC, 2015), there is currently only one regular meeting that addresses coastal fisheries issues regionally, i.e., the Pacific Community Fisheries, Aquaculture and Marine Ecosystems Division Heads of Fisheries meeting (SPC FAME HoFs). Use of virtual meetings could increase opportunities[7] to more routinely profile and discuss important shared coastal fisheries issues during the intense, year-round schedule of oceanic tuna fisheries meetings.

Both Meeting Formats: Challenging for Some

As highlighted in previous sections, there was a strong preference expressed for face-to-face meetings in study results, although respondents also reported that face-to-face meetings are more costly in terms of most organizational resource use. The preference for face-to-face meetings is especially clear for some interrogated processes and outcomes, with only a small percentage of "no difference" or neutral responses, e.g., making consensus based decisions, facilitating breakout sessions/side

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[7]There is evidence that these opportunities are already occurring: a series of five meetings were facilitated virtually by the Pacific Community (SPC) and other regional partners in early 2021 to discuss strategies and supports for scaling community-based fisheries management around the region (see *Scaling-up Community-based Fisheries Management in the Pacific Region Workshops*, url: https://fame1.spc.int/en/meetings/255). These meetings arguably would have been much harder to organize in a "conventional" meeting year, or prior to a year's worth of experience with hosting, facilitating, and participating in virtual fisheries meetings.

meetings, communicating with the desired frequency, and creating an environment of trust.

However, a consistent 25–33% of respondents perceived no difference between either meeting format for many other process and outcome performance and organizational resource use questions, with the highest "no difference" ratings being for "time spent preparing" (38%) and "time spent in follow up activities" (48%). This same result exists in neutral responses to the appropriateness and fit of virtual meetings, and did not appear to differ between PICTs as a group or Australia/New Zealand respondents. While this "no difference" trend may represent a numeric minority, each response represents a key voice in the responsible management of WCPO regional fisheries that may be feeling marginalized by current meeting practices. Moreover, most study respondents are from developing SIDS whose special requirements in fisheries conservation and management are legally recognized (see section "Introduction").

This "no difference" trend may variously reflect: a genuine neutral sentiment; a negative sentiment toward both formats; or, a generally positive sentiment toward virtual formats as an additional means of fisheries management communication. Neutral and positive interpretations suggest that virtual meetings are slightly more "palatable" than they otherwise appear in the results. More negative interpretations suggest that 29–33% of respondents, most of whom are from PICTs, feel like they cannot communicate clearly, receive information, understand what is being discussed, overcome language barriers, or see a diversity of interests fairly represented in outcomes in *either* meeting format. In turn, this could suggest that a similar percentage are dissatisfied with the some of the key processes and outcomes of WCPO RFMs more generally.

This highlights that still more work may need to be done by meeting organizers and facilitators to better understand the barriers to participation in WCPO regional fisheries management meeting processes more generally and to explore whether operational changes could, and should, be made to meeting processes in order to improve participant perceptions of communication effectiveness and representation.

What Role for Virtual Meetings in the WCPO Going Forward?

Face-to-face meetings will continue to play a dominant role in WCPO fisheries management in a post-pandemic world if sentiments expressed in study results inspire future action about meeting format choice. Study respondents expect that regional-level virtual meetings will be more common in the future, but a near-equal percentage were also of the view that virtual formats are inappropriate for regional-scale fisheries meetings. This disparity in sentiment suggests that respondents anticipated "business as usual" was not likely to return in 2021, and foresaw that additional virtual meetings would need to be held in order to address meeting agenda items postponed in 2020. However, respondents, as technology users, could also be perceiving a lack of agency around how decisions relating to virtual meeting technology adoption and implementation are made by meeting organizers (i.e., typically RFBs) (Agarwal and Prasad, 1997;

Venkatesh et al., 2003). Regardless of the interpretation, meeting organizers may need to be more conscious of their role as technology implementers and how meeting participants are included or not (or understand themselves to be included) in operational decisions about virtual meetings while these formats are still evolving and relatively unfamiliar. By enabling meeting participants to feel more informed about how and why meeting planning decisions are made, RFBs could pre-emptively identify barriers to meeting participation, mitigate issues around participatory representation, and avoid the proliferation of antagonistic "user resistance" behaviors like apathy and sabotage that can generate conflict (Lee and Clark, 1996; Marakas and Hornik, 1996; Rivard and Lapointe, 2012).

Cost savings are a key driver of decisions around meeting format preference in the organizational literature (Arnfalk and Kogg, 2003). However, this does not currently appear to be the case in the WCPO meetings context despite the indication that there may be financial, time-saving, and delegation attendance benefits for some WCPO states and territories in participating virtually in meetings. This could mean that the relational benefits of meeting in person are of greater priority for most PICT, Australia and New Zealand participants compared to the benefit of reduced organizational costs. While not addressed in this study, environmental sustainability drivers (e.g., reducing waste and travel-related carbon emissions) may eventually play a greater role in deciding how meetings are held in the WCPO region, which is particularly susceptible to climate change impacts (Nunn, 2009; Bell et al., 2011). Environmental considerations are already evident in operational decision-making for international academic conferences and corporate business meetings (Arnfalk and Kogg, 2003; Niner and Wassermann, 2021).

As the pandemic continues into 2021 and possibly beyond, it will be important to monitor sentiments to determine whether the initial negative perspectives identified by this study change over time as participants become more familiar with communicating virtually and as meeting organizers and facilitators refine the technical and procedural ways in which they support such meetings. It also remains to be seen whether wider social, cultural and political factors help drive a rapid return to face-to-face meetings in the region as soon as practicable.

CONCLUSION AND IMPLICATIONS FOR FUTURE RESEARCH

The switch to primarily videoconferencing-based WCPO RFMs in early 2020 provided a unique opportunity to better understand the potential for using this virtual meeting format in a new working environment. While technical dimensions (e.g., telecommunications infrastructure and communication systems design) play an important role in the successful long-term adoption of technology interventions, it is the human users, through their experiences, attitudes, beliefs, and actions, who ultimately decide what role these interventions will play in a given environment. This study provides insights into some of the early sentiments of key actors in WCPO regional fisheries

conservation and management as they use virtual meetings for the first time in a new context. In doing so, it highlights the importance of considering ICT use as a researchable issue in fisheries management, particularly when developing countries are involved.

Study responses indicate that videoconferencing-based meetings currently struggle to accommodate many of the complex human interactions needed for some key meeting participants to feel like they are effectively engaging in meeting processes and contributing to the delivery of satisfactory outcomes. Going forward, technology adoption and acceptance literature suggests that this study's identification of a largely negative perception of virtual meeting performance, combined with the potential influence of wider social and cultural attitudes about the value of meeting in person, will negatively affect how video-conferencing is accepted and adopted for use in regional WCPO fisheries meeting contexts in a post-pandemic world. Moreover, unlike other sectors where international gatherings are common operational practice, the higher organizational costs of meeting in person do not currently appear to be increasing the appeal of meeting virtually. However, there is also an apparent openness to communicating virtually for smaller and non-regional meetings, and meeting virtually may have organizational cost benefits for some PICTs. This suggests that cautious opportunities may exist to diversify the ways in which States meet and communicate about WCPO fisheries conservation and management issues in the future.

However, before these opportunities can be best realized more research must be done into how to create a better fit between the expectations of fisheries meeting participants and the ability of virtual meeting formats, like videoconferencing, to meet these expectations. This may include working with meeting hosts, facilitators, and participants to identify procedural ways of improving the inclusivity of participation in the planning stage of virtual meetings, particularly while this meeting approach is still developing and evolving. It may also require a re-examination of how pre, during, and post-meeting activities are designed, including a more critical consideration of the ways different ICT like videoconferencing, email, website-based document repositories, and electronic document sharing applications can either support or limit the effectiveness of key communication tasks and relationship-building opportunities in context. This is turn may require a more systematic identification of meetings that may be better suited to virtual formats – i.e., where participant relationships are pre-existing and strong, and where effective communication requires reaching few, or no, meeting outcomes that are distributive, highly political, and of significant national consequence. Finally, moving beyond meeting expectations, it may also require identifying individual PICT capacity development needs and targeted development assistance strategies like improved telecommunications infrastructure and ICT use skills and training.

This study provides a starting point for this future research by raising awareness of the importance of better understanding the human dimension of communications technology interventions in marine resource management and policy environments and by providing an initial appraisal of some of the early challenges and opportunities in one regional fisheries management context.

DATA AVAILABILITY STATEMENT

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the UOW and ISLHD Social Sciences Human Research Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

FUNDING

ACKNOWLEDGMENTS

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fmars.2021.710088/full#supplementary-material

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.