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Preferences for fair decision-making principles in marine conservation

Melissa Hampton-Smith [a,*], Georgina G. Gurney [a,b,c,d], Cristina Ruano-Chamorro [e,g], Jacqueline Lau [a,d], Joshua E. Cinner [a,f]

[a] College of Arts, Society and Education, James Cook University, Townsville, Queensland, 4811, Australia
[b] Institute of Marine Science, University of Tasmania, Hobart, Tasmania, 7001, Australia
[c] School of Geography, Planning, and Spatial Sciences, University of Tasmania, Hobart, Tasmania, 7005, Australia
[d] Centre of Sustainable Fisheries and Tropical Aquaculture, James Cook University, Townsville, Queensland, 4811, Australia
[e] Lancaster Environmental Centre, Lancaster University, Lancaster, UK
[f] Thriving Oceans Research Hub, School of Geosciences, University of Sydney, Camperdown, NSW, 2050, Australia
[g] Institute of Environmental Science and Technology ICTA-UAB, Universitat Autònoma de Barcelona, Bellaterra, Cerdanyola del Vallès, 08193, Spain

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ABSTRACT

The global expansion of area-based conservation has heightened the urgency of attention to equity in environmental governance. Procedural equity—fair decision-making—is central to achieving just and effective conservation outcomes yet remains underexplored in empirical research. This study addresses a critical gap by examining stakeholder and rightsholder (hereafter local actor) preferences for eight procedural equity principles within the context of Australia's Great Barrier Reef Marine Park. Using factorial survey experiments and 1739 vignette ratings from 435 coastal residents we find that local actors favour a holistic approach to procedural equity, with particular emphasis on trustworthiness, transparency, interpersonal treatment, and voice. While participation has long dominated the discourse on equitable conservation decision-making, our results reveal that alone it does not satisfy local actors' fairness preferences. Instead, we suggest a shift towards more relational approaches that focus on the quality of the relationship between decision-makers and local actors. This study provides practical recommendations for environmental governance and underscores the need to center local actor-defined fairness to achieve socially just and ecologically sound conservation outcomes.

1. Introduction

Area-based conservation is set to rapidly expand in the coming years, raising concerns for equitable conservation governance (Gurney et al., 2023; Gurney et al., 2021a; Obura, 2023). Equity is distinct from but closely related to the concepts of fairness and justice (Fraser, 2009; Rawls, 1958),[1] and defined here as the recognition, meaningful involvement, and fair treatment of all conservation actors (Blythe et al., 2026). Equity in conservation is necessary to respect people's deep-seated preference for fairness (Fehr and Schmidt, 1999) and can have tangible positive effects on social and ecological outcomes (Hampton-Smith et al., 2024a; Kuperan and Sutinen, 1998). Conservation actors are becoming increasingly aware of longstanding inequities that require urgent solutions (Bennett et al., 2025), in part because of Indigenous leaders' efforts to highlight to systemic injustices and advocate for the rights and needs of historically marginalized groups, from global policy (e.g., Convention on Biological Diversity, 2022) to local level management (e.g., co-management in Australia's Great Barrier Reef (Reef Authority, 2023a)). There is a risk that entrenched power asymmetries can derail efforts to promote equity within conservation governance (Gurney et al., 2023). This poses a problem not only from an ethical standpoint, but because inequitable benefit sharing and decision-making may stymie efforts to expand area-based conservation – the primary tool used to stem biodiversity decline worldwide (Pienkowski et al., 2025).

Procedural equity refers to fairness in decision-making (Ruano-

* Corresponding author.
E-mail address: melissa.hamptonsmith@my.jcu.edu.au (M. Hampton-Smith).

[1] We note that the use of the terms equity, fairness, and justice is discipline specific, such as in philosophy (Sen, 2006), social justice (Young, 1990), justice psychology (Thibaut and Walker, 1975), environmental justice (Schlosberg, 2007), and economics (Konow, 2003). Here in the context of conservation, we use the term fairness to refer to subjective judgements (Gurney et al., 2021b). We use the term justice primarily to refer to structural elements that enable or disable equity in conservation (Zafra-Calvo et al., 2025), or when referring to literature that uses the term 'procedural justice', such as justice psychology.

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Chamorro et al., 2021) and plays an important role in society, both intrinsically and instrumentally. Procedural equity is one part of an equity framework commonly used in conservation comprising recognition, procedure, and distribution (Schlosberg, 2004), and sometimes additional domains including context (McDermott et al., 2013). Here, we focus on procedural equity due to the prominent role it plays in environmental governance (Borrini-Feyerabend et al., 2013) and the empirical focus on distribution over procedure (Friedman et al., 2018). There is strong support in the justice psychology literature to show that procedural justice may shape people's identity, in that fair treatment during decision-making affirms identity within groups and encourages feelings of being respected, valued, and included (Tyler et al., 1996). Social justice scholars have also put forth an intrinsic justification for procedural justice (Fraser, 1998), based on the premise that parity in participation ensures all who are affected by decisions can contribute. Instrumentally, justice psychology research has found that procedural justice is important in social settings because it promotes cooperation, cohesion, and morale (e.g., Lind, 2001; Tyler, 1990). Moreover, procedural justice promotes satisfaction with decisions and adherence to regulations (Tyler, 2003b), an encouraging finding that helps to justify investment therein. The effect of procedural justice on legitimacy and compliance extends temporally, with people are more likely to obey laws and legal authorities over time when they perceive the procedures as fair — even if they disagree with the outcomes (Tyler, 1990). Thus, fair decision-making not only promotes decision satisfaction and compliance, but also reinforces justice within society and positive social identity—a powerful driver of psychological wellbeing (Blader and Tyler, 2009).

Findings on the importance of procedural equity from social justice and justice psychology are mirrored in a nascent but growing body of literature on equity in conservation (e.g., Borrini-Feyerabend et al., 2013). Participatory governance in conservation has a richly populated literature (e.g., Lauber and Knuth, 1997; Smith and McDonough, 2001) and more recent studies have applied an explicit empirical equity lens to procedure (e.g., Hampton-Smith et al., 2025; Lau et al., 2021; Ruano-Chamorro et al., 2024). A more precise understanding of procedural equity's central role in conservation can both further desirable social and ecological goals and illuminate problematic or harmful processes. For example, knowing how principles (hereafter criteria) of procedural equity such as transparency and agency can promote stewardship does much to explain the numerous examples of conservation gains achieved in Indigenous-led conservation initiatives in Canada (Artelle et al., 2019) and South American nations (Borrini et al., 2004). Conversely, using the identity-based view of procedural justice sheds light on how exclusion from decision-making regarding protected areas in Australia affected Indigenous rightsholders' wellbeing (Gollan and Barclay, 2020). Their exclusion not only produced dissatisfactory outcomes, such as being unable to access cultural sites, but also promoted feelings of disempowerment and devaluation (Gollan and Barclay, 2020). Furthermore, as humans drive rapid ecosystem change (Steffen et al., 2018), promoting socio-ecological resilience through adaptive and transformative responses is vital (Cinner and Barnes, 2019). The potential for an increased focus on procedural equity to bolster resilience by promoting government legitimacy and fostering trust in institutions is promising (Folke et al., 2005; Westley et al., 2013).

Identifying local actor preferences for different decision-making criteria is an essential component of assessing and managing for equitable governance. These preferences are important because they determine what local actors consider to be fair and subsequently shape their notions of fairness, or ideals about what they think a process ought to entail (Hochschild, 1981) (Fig. 1). In contrast to notions of fairness, perceptions held by local actors are a combination of their preferences for decision-making criteria (i.e., their notions of fairness) and their situational judgements (Fig. 1). Justice psychology literature has developed an empirical approach to study notions and perceptions, which explicitly acknowledges plurality in what constitutes fairness

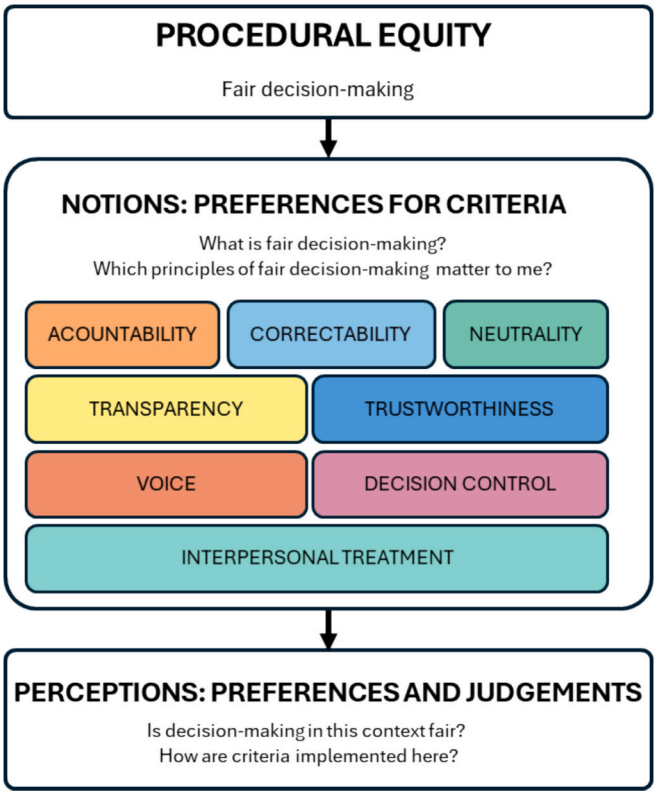

Fig. 1. Relationship between procedural equity, procedural equity criteria, and notions and perceptions of procedural equity. Procedural equity, or fair decision-making, is composed of criteria (Ruano-Chamorro et al., 2021). Notions of procedural equity, or what people believe to be fair, are based on their preferences for different criteria, which may be shaped by their sociocultural context. Perceptions of equity arise from a combination of preferences for different criteria, lived experience, and the subject of (un)fairness in question, i.e., the context.

(Lind and Tyler, 1988). The empirical approach has been advocated for in the conservation literature (Sikor et al., 2014), but in general this literature tends to adopt a normative standpoint[2], based on tacit assumptions on what constitutes fairness, such as participation (Friedman et al., 2020) or equality (Gurney et al., 2015) (see Table S2 for more detail on how procedural equity is operationalized in the literature). Participation itself is in fact a complex concept comprising voice and decision control (i.e., influence over decision-making) that manifests at varying degrees (Rowe and Frewer, 2000). Studies that empirically examine perceptions often do not elicit preferences for equity criteria, thus introducing the confounding effect of situational judgements (e.g., Lauer et al., 2018; Ruano-Chamorro et al., 2024). Moreover, in the few studies that investigate what constitutes fairness for local actors, the distribution of benefits and burdens continues to receive far more attention than procedure (e.g., Gurney et al., 2021b; Martin et al., 2014). Attention to what constitutes fairness for local actors is particularly important in conservation because it is a mission-driven field and practice that operates in very different contexts (Sandbrook et al., 2013). To begin to fill this gap, Ruano-Chamorro et al. (2021) drew upon social (Fraser, 1998), psychological (Leventhal, 1980; Thibaut and Walker,

[2] We note that equity may be approached from two perspectives. The normative approach delineates universal standards and is often seen in the philosophy literature such as Rawls (1971) and Habermas (1990). The empirical approach seeks to understand how equity is perceived in particular contexts, and is often seen in justice psychology literature such as Tyler (1990) and Lind (1988), as well as in conservation (Sikor et al., 2014).

1975), and environmental (Schlosberg, 2004) justice literatures to outline a set of criteria for fair decision-making relevant in conservation settings (Table 1).

Here, we operationalize the framework outlined by Ruano-Chamorro et al. (2021) to empirically examine procedural equity in conservation. We use factorial survey experiments to elicit local actors' preferences for eight key procedural equity criteria in the context of Australia's iconic Great Barrier Reef. As a World Heritage Area, the reef's biodiversity is critically endangered by global and local threats (Reef Authority, 2024b). It is governed by separate but interrelated bodies at the federal, state, and local level (Morrison, 2017), with established co-management between government and Indigenous rightsholders (Reef Authority, 2023a). With the potential for equitable governance to promote positive conservation outcomes (Hampton-Smith et al., 2024a), the Great Barrier Reef thus represents an ideal case study to examine fairness in conservation decision-making. Using data from 1739 vignettes rated by 435 residents of coastal catchment regions adjacent to the Great Barrier Reef Marine Park, we examined local actor notions of fairness by identifying their preferences for eight key procedural equity criteria relevant in conservation practice.

2. Methods

2.1. Study site

Designated in 1975, Australia's Great Barrier Reef Marine Park encompasses the largest coral reef system in the world and is inscribed as a World Heritage Area due to its outstanding cultural and natural value. At the federal level, the Reef Authority is charged with managing the park. This federal agency liaises with state and local counterparts in a complex polycentric governance structure in which these agencies interact but are formally separate (Morrison, 2017). Legal frameworks provide mechanisms for public input and appeals (Commonwealth of Australia, 1975) and the Australian government has processes in place to ensure accountability and transparency in reporting (Reef Authority, 2024c). In addition to its biodiversity value, the diverse ecosystems of the reef provide important services to the approximately 1.2 million people who live in the six Great Barrier Reef catchment areas adjoining the coastline, among them the Traditional Aboriginal and Torres Strait Island Owners of the area (Lewis et al., 2021). However, the reef is under threat from human-induced pressures including multiple mass bleaching events, which have prompted a shift towards active mitigation of risks (Walpole and Hadwen, 2022). These active interventions include the regulation of land use to improve water quality and new restrictions on commercial and recreational fishing. Interventions such as these require public support and participation to be successful, and indeed, legislative frameworks for managing the reef emphasize local actor involvement in decision-making processes (Reef Authority, 2023b).

The legislative requirement for formal public consultation can be seen in the development of Plans of Management that govern how the reef may be used, in which local actors may voice their opinions or concerns during the development of the Plans (Reef Authority, 2025). Under Australian environmental law, public input into major decisions affecting the Reef must be considered but may be overridden by decision-makers in some circumstances (Commonwealth of Australia, 1999). As per its mandate, the Reef Authority retains ultimate control over all decision-making. The Reef Authority has publicly prioritized procedural equity criteria such as voice (see Table S1 for specific examples of how procedural equity criteria manifest in the Great Barrier Reef Marine Park). However, despite these opportunities for involvement in decision-making, approximately one-third of Great Barrier Reef catchment residents do not feel satisfied with management and decision-making processes (Hobman et al., 2024). Moreover, policy initiatives have faced sustained strong opposition from some local actor groups, and trust in management is declining (Curnock et al., 2024). A potential explanation for this apparent paradox is a misalignment between the

Table 1
Key procedural equity criteria recognized in the context of conservation (Ruano-Chamorro et al., 2021).

Criteria	Description	Foundational literature	Conservation relevance
Accountability	Decision-makers are made responsible for their actions and inactions.	Fulfilling obligations within relationships underpins social interactions and procedural justice (Folger and Cropanzano, 2001).	When local actors perceive a lack of accountability, this can result in dissatisfaction, a loss of support for conservation, and reduced rule compliance (Dawson et al., 2017).
Correctability	Decisions may be reversed or corrected.	The presence of an appeal process impacts positively on satisfaction with decision-making (Conlon, 1993) and is used when making procedural justice judgements (Leventhal, 1980).	Formal complaint mechanisms are recommended to improve the perceived fairness of conservation law enforcement (St. John et al., 2025). Conversely, a lack thereof can negatively impact on local actor wellbeing in conservation by promoting feelings of powerlessness (Lecuyer et al., 2018).
Interpersonal treatment	Being treated with dignity, politeness, empathy, and honesty.	Often referred to as 'status recognition' (Tyler et al., 1996), interpersonal treatment conveys to individuals their intragroup status. This can promote positive social behaviours and feelings of self-respect and pride.	In conservation, interpersonal treatment has received scant attention. Isolated studies record instances where local actors perceived procedural inequity due to being ignored or disrespected (Lecuyer et al., 2018).
Neutrality	Impartiality or a lack of bias in decision-making,	Honesty, accurate information, and temporal consistency in treatment promote positive assessments of procedural justice (Leventhal, 1980; Tyler, 1989).	Accusations of bias are commonly seen during the delineation of zones for resource extraction in marine conservation (Barnett and Eakin, 2015; Burbano and Meredith, 2020).
Voice	Stakeholder opinions, priorities and concerns are taken into account by decision-makers.	Having a voice is one part of agency and allows local actors to defend their interests (Thibaut and Walker, 1975). Voice contributes to perceptions of procedural justice, even in the absence of outcome favorability (Tyler, 2003b).	Often referred to as participation, having a voice is an important component of equitable conservation (Borrini-Feyerabend et al., 2013). A lack of voice has been linked to the sabotage of conservation initiatives by local actors (Sowman and Sunde, 2018).

(continued on next page)

Table 1 (*continued*)

Criteria	Description	Foundational literature	Conservation relevance
Decision control	The ability to influence decisions.	Along with voice, decision control is part of agency and allows a distribution of power between decision-makers and local actors (Rowe and Frewer, 2000; Thibaut and Walker, 1975). Decision control is often linked to voice under the terms 'participation' or 'representation', although the two criteria are distinct (Tyler, 1988).	A lack of real influence on decision-making can promote disillusionment with management and decrease the legitimacy of conservation authorities, particularly when promises of participatory governance are not fulfilled (Fudge, 2018).
Transparency	Stakeholders can see what is going on and how decisions are made.	Sometimes termed informational justice, by providing clear and accurate information about decisions and the process required to reach them, mistrust may be avoided and relations between actors bolstered (Rowe and Frewer, 2000; Shapiro et al., 1994).	A perceived lack of transparency in conservation decision-making can lead to perceptions of unfair decision-making (Barnett and Eakin, 2015), as well as distrust and reduced support for initiatives (McNeill et al., 2018). Transparency is a requirement for free, prior, and informed consent (Schreckenberg et al., 2016).
Trustworthiness	The belief that a person or entity is deserving of trust.	Although often equated with trust, the trustworthiness of authorities is a distinct construct that is both a part and product of procedural justice (Colquitt and Rodell, 2011; Van den Bos and Lind, 2002). Trustworthiness can promote government legitimacy and cooperation with authorities (Tyler, 2003a).	An authority's trustworthiness has been shown to be a critical part of eliciting compliance in natural resource management (Armitage et al., 2009). Conversely, mistrust can foster perceptions of unfair decision-making as seen in Mexican forestry conservation settings (Lecuyer et al., 2018).

notions of fairness being extolled by management and those held by local actors. Other explanations include a perceived lack of meaningful influence by local actors over decision-making, or that efforts made thus far to foster procedural equity are not reaching local actors. In sum, conditions enabling procedural equity include a robust legislative framework that promotes formal public participation, while constraining conditions include highly complex decision-making processes that are ultimately controlled by government bodies. The Great Barrier Reef therefore represents an ideal opportunity to explore notions of fairness in conservation decision-making (see Supporting Information for a summary of author positionality and relationship with the GBR context).

2.2. Sampling

We collected data from 435 residents of Great Barrier Reef catchment regions. Respondents were recruited using convenience sampling in three towns adjacent to the Great Barrier Reef Marine Park: Mackay, Townsville, and Cairns. We approached all potential respondents in public areas including beaches, shorefronts, boat ramps, shopping centers, and markets. We excluded any respondents under 18 years of age, and those not living in Great Barrier Reef catchment regions. Convenience sampling was used due to budget constraints. The final sample included more Indigenous Australians than the general population (7.8% versus 4.6%), and had on average higher income (76% of the sample earned more than $50,000 per year versus the median yearly income of $40,924) and higher level of educational attainment (49% of the sample had completed a university degree versus 31%) (Australian Bureau of Statistics, 2021). The sampling protocol was reviewed and approved by the James Cook University Human Research Ethics Committee (H9156). All respondents gave informed consent to participate in the voluntary survey.

2.3. Factorial survey experiments

To determine local actor preferences for procedural equity criteria, we used factorial survey experiments. Factorial survey experiments allow causal inference by using an experimental design to isolate the importance of disparate predictor variables. Following Auspurg and Hinz (2014), we created a full factorial design. We operationalized eight key procedural equity criteria drawn from Ruano-Chamorro et al.'s (2021) procedural equity framework for conservation. This framework is based on a review of the justice psychology, environmental justice, and conservation participation literatures (e.g., Schreckenberg et al., 2016; Tyler, 2003a; Zafra-Calvo et al., 2017) (see Table S2 for literature used to operationalize the criteria). The decision to create single-item indicators for the eight criteria reflects the constraints of the factorial survey experiment. We note that although constructs such as trustworthiness are complex and comprise multiple domains (e.g., integrity, competence, and benevolence (Colquitt and Rodell, 2011)), the use of single-item indicators to measure global constructs can prove valid and reliable (Jordan and Turner, 2008).

Using these eight criteria, we created a series of vignettes that typified concepts and situations relevant to procedural equity issues in the Great Barrier Reef. The vignettes consisted of eight dimensions—our eight procedural equity criteria—that were either absent or present (Table 2). We created the vignettes by systematically varying the dimensions between their two levels (absent/present) to create a vignette universe with every possible combination of dimensions and levels ($n = 256$). We excluded vignettes in which decision control but not voice was present ($n = 64$), because it is impossible to exert influence over decisions without a voice (Lauer et al., 2018). The exclusion of illogical vignettes has precedence in factorial survey experiments to improve plausibility and respondent acceptance (Auspurg and Hinz, 2014).

Our final vignette universe contained 192 unique vignettes, which we randomly divided into 48 decks each comprising four vignettes (see Table 3 for example vignette). We conducted pilot testing on local residents ($n = 55$) to refine survey items and response scales before deploying the final survey. Our 435 participants were randomly assigned one deck and were asked to rate how fair they found the four vignettes using an 11-point Likert-type scale (i.e., 0 = 'very unfair' to 10 = 'very fair'). Within each deck, the vignettes were presented in random order to the respondents. After removing incomplete responses ($n = 1$), our final sample comprised 1739 vignette ratings, our unit of analysis. See Supporting Information for further detail.

2.4. Analysis

To analyze the factorial survey experiment data, we used hierarchical Bayesian ordinal regression models with a probit link. Following Bürkner and Vuorre (2019), we chose the probit link for our model because we assume that the latent variable, that is, people's perspectives

Table 2
Vignette dimensions and levels used to create predictor variables and assess the relative importance of procedural equity criteria in predicting local actor notions of (un)fairness in the Great Barrier Reef Marine Park. Procedural equity criteria drawn from Ruano-Chamorro et al. (2021) framework of procedural equity criteria in conservation. Criteria were operationalized and adapted from the cited literature.

Dimension	Levels	Type	Reference
Accountability	Decision makers **are not held responsible** for what they do and don't do/ Decision makers **are held responsible** for what they do and don't do	Binary (0 = absent, 1 = present)	(Schreckenberg et al., 2016; Zafra-Calvo et al., 2017)
Correctability	You **can't review** the decision and appeal if you want/ You **can review** the decision and appeal if you want	Binary (0 = absent, 1 = present)	(Estévez et al., 2021; Franks, 2023)
Interpersonal treatment	You **won't be treated** with respect and dignity/ You **will be treated** with respect and dignity	Binary (0 = absent, 1 = present)	(Sunshine and Tyler, 2003; Tyler and Lind, 1992)
Neutrality	They will make **biased decisions**/ They will make **impartial decisions**	Binary (0 = absent, 1 = present)	(Sunshine and Tyler, 2003; Tyler, 1989)
Voice	Your opinions, priorities and concerns **won't be taken into account**/ Your opinions, priorities and concerns **will be taken into account**	Binary (0 = absent, 1 = present)	(Devine-Wright and Howes, 2010; Thibaut and Walker, 1975)
Decision control	You **can't influence** the final decision/ You **can influence** the final decision	Binary (0 = absent, 1 = present)	(Devine-Wright and Howes, 2010; Lind et al., 1983)
Transparency	The process **is not transparent**, so the public **can't see** what is going on and how decisions are made/ The process **is transparent**, so the public **can see** what is going on and how decisions are made	Binary (0 = absent, 1 = present)	(Schreckenberg et al., 2016; Zafra-Calvo et al., 2017)
Trustworthiness	Decision-makers **are not trustworthy**/ Decision-makers **are trustworthy**	Binary (0 = absent, 1 = present)	(Sunshine and Tyler, 2003; Tyler, 1989)

on fairness, is continuous and normally distributed. We note that this is a common choice in psychological research for ordinal Likert-style data analyses. We used the Hamiltonian Monte Carlo algorithm implemented in Stan through the brms package (Bürkner, 2017) in R (v4.2.2; R Core Team, 2017) with 5000 iterations, 1000 burn in, four chains, and weakly informative priors (i.e., the posterior distribution was informed only by our data). We set respondent as a random factor to account for non-independence of data and potential intra-rater correlation arising from the multiple vignette ratings obtained from each respondent. The dichotomous predictor variables were checked for (multi) collinearity by calculation of pairwise Phi correlation coefficients. The variables voice and decision control were moderately correlated ($r = 0.51$, $t = 24.42$, $p < 0.001$) due to the removal of vignettes in which decision control but not voice was present. That is, our factorial design was not perfectly orthogonal and balanced, with a D-efficiency below 100 (see

Table 3
Example of vignette used in factorial survey experiments to examine notions of (un)fairness in conservation decision-making held by stakeholders in the Great Barrier Reef Marine Park.

Imagine that Great Barrier Reef Marine Park Authority has announced that a revision to the Plan of Management for the Great Barrier Reef will take place in this area. These plans outline the way people can use the Great Barrier Reef Marine Park. The Great Barrier Reef Marine Park Authority has organized stakeholder consultation processes and requested input from the general public.

The process:	The process **is transparent**, so the public **can see** what is going on and how decisions are made. You **won't be treated** with respect and dignity.
The decision-makers:	Decision-makers **are not trustworthy**. They will make **impartial decisions**. They **are held responsible** for what they do and don't do.
Your say:	Your opinions, priorities and concerns **will be taken into account**. You **can influence** the final decision. You **can review** the decision and appeal if you want.

How fair is this process?

0 – very unfair 1 2 3 4 5 6 7 8 9 10 – very fair

Dülmer, 2016; Kleinewiese, 2022 for further detail on orthonogality and D-efficiency). However, given that we were not interested in interaction effects and the correlation was only moderate, we feel justified in including both voice and decision control. No other collinearity was detected. Following Bürkner and Vuorre (2019), we compared a series of ordinal regression models including cumulative, adjacent-category, and cumulative with unequal variance. To assess model fit, we used approximate leave-one-out cross validation (Vehtari et al., 2017). We selected the cumulative model due to its goodness-of-fit and ease of interpretation (Table S4). For our chosen model, all chains converged (r-hat ≥ 1), all chains achieved high resolution (ESS ≥ 1000), and post-posterior checks demonstrated that our model usefully mimicked the data.

3. Results

We used factorial survey experiments to determine local actor preferences for eight key procedural equity criteria, including accountability, correctability, interpersonal treatment, neutrality, voice, decision control, transparency, and trustworthiness. Factorial survey experiments combine features of surveys and experimental design to allow causal inference on how people make judgements or decisions (Auspurg and Hinz, 2014). We generated hypothetical scenarios, or vignettes, related to decision-making in the Great Barrier Reef using a factorial design with eight criteria that were systematically varied between two levels — present and absent. We randomly assigned the resulting vignettes to respondents and asked them to rate the vignettes for fairness. Our Bayesian ordinal regression found strong evidence (i.e., where the 95% credible interval of a predictor variable's coefficient estimate – using the mode and highest density interval – does not intersect zero) that the presence of all eight criteria predicted higher fairness ratings (Fig. 2, Table S3). Trustworthiness and transparency had the greatest effect size on fairness ratings, followed by interpersonal treatment and voice. There was strong evidence that the presence of trustworthiness, transparency, interpersonal treatment, voice, and accountability reduced the probability of very unfair ratings (Fig. S1).

4. Discussion

Advancing equitable conservation governance requires understanding what local actors consider to be fair decision-making. Our examination of preferences for fair decision-making criteria found that all criteria were positively related to fair decision-making. Stakeholders prioritized trustworthiness and transparency, followed by interpersonal treatment and voice. We therefore contend that a comprehensive

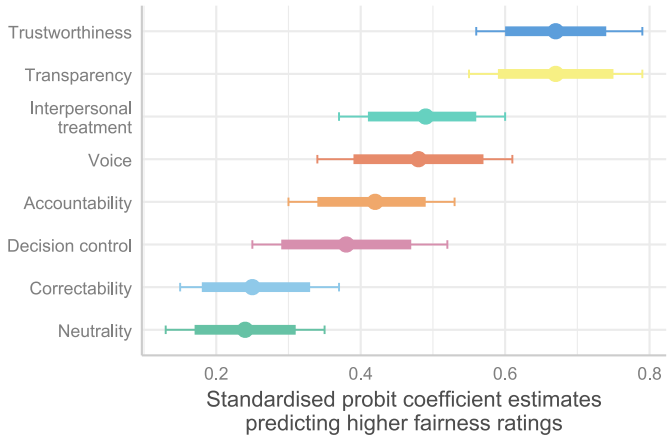

Fig. 2. Relationships between the presence of procedural equity criteria (i.e., accountability, correctability, interpersonal treatment, neutrality, voice, decision control, transparency, and trustworthiness) in decision-making to local actor notions of fairness in decision-making in the Great Barrier Reef Marine Park. The model shows how the presence of individual criteria in hypothetical vignettes about decision-making in the Great Barrier Reef Marine Park is positively related to higher fairness ratings of the vignette. Relationships are displayed as standardized probit coefficient estimates from the Bayesian cumulative ordinal regression model, with error bars showing 95% credible intervals. Thick bands show 80% credible intervals. Colors match those used for each criterion in Fig. 1. Note that the reference category for all procedural equity criteria is 'absent'.

approach to fostering fair conservation decision-making is required, with a particular focus on trustworthiness, transparency, interpersonal treatment, and voice. Our results highlight the need to go beyond a sole focus on participation to promote equitable conservation governance, as well as the importance of a relational view towards conservation decision-making.

First, we found that local actors preferred all eight procedural equity criteria to be present for fair decision-making in relation to management of the Great Barrier Reef Marine Park. In other words, fulfilling a diversity of criteria is required for decision-making to conform to local actors' ideas about fairness. Factorial survey experiments in conservation research are relatively uncommon (but see Ibbett et al., 2025), yet here, this method allows causality to be established between the presence of individual criteria and how fair local actors perceive the resulting hypothetical decision-making process. Our findings advance the understanding of procedural equity in the conservation literature, in which there is a tendency to create aggregate scores of procedural equity rather than assessing the importance of each criterion separately (e.g., Dehmel et al., 2025; Zhang et al., 2025). Moreover, conservation remains largely focused on participation in both science (e.g., Friedman et al., 2020) and practice (e.g., Reef Restoration and Adaptation Program, 2024). Participation is comprised of voice and decision control—both essential components of fair decision-making—but alone, our findings show that these criteria are too narrow to fulfill local actor expectations of what a fair process should entail. Thus, governance bodies should instead aim to include a diversity of procedural equity criteria in conservation decision-making. While decision-makers must ensure that procedural equity criteria are relevant in their conservation context, our findings do echo procedural equity frameworks (Ruano-Chamorro et al., 2021) and governance policies (Borrini-Feyerabend et al., 2013) that urge a holistic approach. Including diverse equity criteria has the potential not only to fulfill local actor expectations regarding fair process, but may also promote the adaptive capacity of the Reef Authority as it confronts rapid change in the Great Barrier Reef Marine Park (Gupta et al., 2010).

Second, we found that local actors prioritized trustworthy decision-makers and transparent decision-making processes. The trustworthiness of leaders has been consistently found to play a key role in fair conservation decision-making (Diedrich et al., 2017; Ruano-Chamorro et al., 2024). Trustworthiness refers to the belief that another entity or person is deserving of trust and is distinct from trust— the positive belief in the reliability, ability, or strength of another entity or person. Justice psychology literature posits benevolence—whether decision-makers care about the needs and opinions of local actors—as an important component of trustworthiness (Tyler, 2003a), and this finding is echoed in research on natural resource management governance, particularly in crisis situations (Sharp et al., 2013). This definition of trustworthiness is informative in light of the declining trust in information shared by scientific bodies and management of the Great Barrier Reef (Curnock et al., 2024). In contrast to trustworthiness as care, building trust in the Great Barrier Reef region is often equated with disseminating information (Hobman et al., 2024). However, although our results show that transparency is essential, this alone does not address the public's desire to feel that decision-makers are compassionate and care about their priorities, needs, and opinions. As an example of how trustworthiness may be undermined, recent changes to fishing regulations in the Great Barrier Reef have been met with criticisms that they endanger and ignore the needs of commercial fishers (Stephen and Byrne, 2023). It is revealing that in contrast to other procedural equity criteria, we found no concrete examples of attempts from the Reef Authority, the federal body charged with the management of the Great Barrier Reef Marine Park, to promote perceptions of trustworthiness among the public (Table S1).

We suggest that trustworthiness may play a foundational role by underpinning the validity of other criteria from the perspective of local actors. For example, without trust in the motives of authorities, the value of having a voice in decision-making processes is undermined because local actors may feel that expressing their opinions and concerns is meaningless (Tyler, 1990). Moreover, debates about public trust in decision-makers often center trust as an end-goal (Petts, 2008), without considering the reciprocal relationship between trust and fair decision-making, in which trust in management both promotes perceptions of fair decision-making and is consequently increased by those same fair decisions (Lofstedt, 2006). Ultimately, fostering public trust is highly complex, requires long-term political and institutional commitment, and is inextricable from other aspects of governance such as institutional performance. However, to promote trustworthiness, decision-makers may consider on the micro-level focusing on consistent and positive interactions with local actors (Paton, 2007) and reducing feelings of vulnerability through relationship building and community outreach (Lachapelle and McCool, 2012). On the macro-level, fostering a culture of efficiency and dependability should assist in building perceptions of ability and integrity (Colquitt and Rodell, 2011). Transparency at all levels of decision-making is also of particular importance, given its prominence in our results. We suggest a shift from information availability to information justice through a focus on the adequacy and appropriateness of explanations (Colquitt et al., 2001) and the structural elements that enable or disable true transparency.

After transparency and trustworthiness, we found that local actors displayed a preference for positive interpersonal treatment, or being treated with respect and dignity, during decision-making. Conservation equity frameworks (Franks, 2023; Zafra-Calvo et al., 2017) and studies (Bennett et al., 2020; Lauber and Knuth, 1997) have tended to overlook interpersonal treatment, despite it featuring prominently in the justice psychology literature (Tyler, 2003a). This omission is concerning given the central role that interpersonal treatment has played in decades of experimental studies on procedural justice; how people are treated by authorities or decision-makers during procedures is a key component of ensuring that participants perceive fairness (Tyler et al., 1996; Tyler and Lind, 1992). Our study shows that respectful interpersonal treatment is in fact a crucial component of conservation decision-making, without which decision-making may be considered unfair by local actors. This result bolsters the argument linking procedural equity to recognitional equity (Ruano-Chamorro et al., 2021); in which interpersonal treatment

affirms the rights of local actors to be treated with respect and recognizes their status within groups. Furthermore, it underscores the relevance of an identity-based view of procedural equity in conservation (Tyler, 2003b). In essence, how people are treated is highly influential in shaping their perceptions of decision-making. When seen in conjunction with the importance of trustworthiness, the prominence of interpersonal treatment in our results highlights the need for a more relational view of conservation governance. It also helps to shed light on the so-called legitimacy paradox documented in other Australian conservation settings. In these situations, inclusion of participatory processes does not increase government legitimacy as expected, but rather the reverse (Fudge, 2018; Ruano-Chamorro et al., 2021). These oft-mandated rule-based processes may not produce their desired outcomes because they neglect relationality – the dynamic relationships between actors that shape how decisions are interpreted and implemented (Lejano, 2021). We suggest that attention to antecedents of procedural equity that promote relational judgements of authorities may be a pathway through which greater procedural equity may be realized and thus, legitimacy. In practice, this could be achieved by promoting personal contact between decision-makers and actors, such as through regular public fora – efforts that would dovetail with the trust-building exercises outlined above.

Following interpersonal treatment, voice featured highly in local actor preferences for procedural equity criteria. Voice is recognized as essential for fair decision-making, evidenced by its inclusion in global conservation policy (Hampton-Smith et al., 2024b), equity indicator frameworks (Franks, 2023), and a wealth of literature on participatory governance (DeCaro and Stokes, 2013; Reed, 2008) Indeed, decades of literature exploring participatory governance (Rowe and Frewer, 2000), emphasizes that local actor voice culminates in influence over actual decision-making (Ansell and Gash, 2008; Arnstein, 1969). Theoretically, modern concepts of participation draw upon scholars such as Fraser (1998) and Habermas (1990), who argue for participatory parity in public life and draw attention to the contextual inequities that prevent such equality. In the Great Barrier Reef Marine Park, despite a number of mechanisms to capture local actor voice (e.g., Reef Authority, 2025), approximately half (48%) of residents feel dissatisfied with the opportunities provided to express their concerns and opinions (Hobman et al., 2024). We posit that large-scale conservation management faces an inherent challenge of scale. Voice is elicited either locally or online, but decisions are made at the state or federal level. Thus, there is lack of visibility of the effect of voice on management response. In contrast to how participation manifests in small-scale conservation initiatives (e.g., Friedman et al., 2020; Lau et al., 2021), we argue that this issue of visibility may pervade governance of large-scale polycentric ecosystems. A mechanism for large-scale and multilevel decision-making processes in conservation could be promoting representatives of local voices at higher levels (Marshall and Jones, 2005), which may bolster government legitimacy and effectiveness (Jastram and Berberyan, 2023; Somuano Ventura and Takahashi, 2025). Additionally, increased transparency may better allow local actors to know how their voices have been considered.

As one of the first studies to quantitatively assess notions of procedural equity in conservation, we outline several limitations of our approach and future directions, before turning a critical gaze to the use of the empirical approach to further equitable conservation. First, our indicators were developed based on theories drawn from several bodies of literature. However, future research could consider co-production of indicators with local actors to improve their contextual suitability (Bennett et al., 2025; Cisneros-Montemayor et al., 2025). In particular, co-production with the Traditional Owners of the Reef could be a means to better understand their complex and unique governance role. Second, we used convenience sampling due to budget constraints, resulting in the over- and under-representation of certain groups and a limitation of the generalizability of our findings. Respondents with lower income and education levels, who may already experience marginalization during decision-making, were under-represented. Given the variable role that cultural and socioeconomic characteristics may play in shaping procedural equity perspectives (Brockner et al., 2001; Ruano-Chamorro et al., 2024; Sahin et al., 2024) and the influence of power dynamics on decision-making, we suggest future research prioritize representative samples where possible, using stratification if necessary. Third, our study focused on adding to the sparse quantitative evidence based on procedural equity by demonstrating the causal relationship of equity criteria to fairness in decision-making. To do so, our method necessitated using single-item indicators for each of our eight criteria. These criteria are complex constructs with rich bodies of literature dedicated solely to, for example, trustworthiness and accountability. Single-item indicators may replicate the validity and reliability of multi-item scales in some circumstances (Jordan and Turner, 2008). However, the investigation of procedural equity in conservation would be well-served by employing a diversity of methods, such as the development of multi-item scales for quantitative analysis or qualitative analysis. Finally, our study bears repeating in other contexts and scales, using appropriately adapted indicators. This is particularly relevant because our study was conducted in a conservation intervention led by a broadly legitimate and stable government body. Stakeholder preferences for procedural equity criteria may be very different in protected and conserved area contexts with less legitimate governance. Indicator adaption is also relevant in the context of Other Effective area-based Conservation Measures (OECMs), an area-based conservation tool that is likely to expand rapidly under the Convention on Biological Diversity's 30 × 30 target (Gurney et al., 2023). This is not only because OECMs can encompass far more diverse governance types than seen in protected and conserved areas, but because OECMs may be primarily managed for reasons other than conservation (Gurney et al., 2021a). Our findings on, for example, the need for relational decision-making should not be assumed to apply to these varying governance modes and management goals. Elite capture and corruption can pervert programs designed to be procedurally equitable, particularly in conservation contexts with decentralized governance or less institutional protections (Lucas, 2016; Persha and Andersson, 2014). We suggest that co-produced survey instruments may serve a dual purpose: by creating suitable indicators that incorporate context-specific concepts of procedural equity, and as a mitigation mechanism against the risk that elite capture and corruption may distort governance research findings by prioritizing elite views. The co-production of equity indicators with the groups they are meant to serve may also be a means to illuminate structural inequalities and power dynamics (Cisneros-Montemayor et al., 2025; Ruano-Chamorro et al., 2021).

Further, we suggest eliciting local actors' notions of fairness should not be an endpoint to fostering equitable conservation governance. Perceptions of equity can be influenced by social status, political ideology, self-interest, and social and cultural norms (Walker, 2014). Local actors can perceive equity within systems that do not benefit them (Lau et al., 2021), an apparent paradox that may be motivated by a psychological mechanism termed system justification. This mechanism prompts system support and legitimization, even in light of disadvantageous outcomes (Tyler, 2015). Additionally, perceiving untrustworthy authorities as trustworthy may make local actors vulnerable to manipulation (Hajer and Versteeg, 2005). Ultimately, positive perceptions of trustworthiness and respectful treatment do not automatically equate to beneficial outcomes for the individual. Thus, there are potential harms of promoting perceptions in general without considering contextual equity: the broader social, economic, and political structures and related power imbalances that shape equity in a particular context (McDermott et al., 2013). Without explicit and reflective attention to how context shapes power, decision-makers may exacerbate existing injustices or inflict new ones (Moon, 2025), thus entrenching marginalization (Zafra-Calvo et al., 2025) and deepening divides between those who benefit and suffer under conservation (Shackleton et al., 2023). Regarding procedural equity, using a power lens can illuminate who drives a supposedly neutral conservation agenda, or a contrast between the

compliance often required from less powerful actors and the influence often held by more powerful actors (Álvarez and Coolsaet, 2020; Svarstad and Benjaminsen, 2020). Our findings urge attention to the relational aspects of conservation decision-making, including the trustworthiness of authorities and their relationship with local actors. As a precursor to relationship building, we suggest that decision-makers use an awareness of power to first identify their organization's unique role in any existing systematic injustices and determine where influence is concentrated among actors. Using this knowledge when planning community outreach may assist in redressing existing contextual injustices and power imbalances (Dietsch et al., 2021). This is of particular importance in the reality of rapid ecosystem change (e.g., Reef Authority, 2024a), where local actors are frequently encouraged to make considerable personal sacrifices to achieve conservation goals (e.g., Stephen and Byrne, 2023).

In light of a global expansion in area-based conservation, the need to center social equity in conservation governance is increasingly emphasized (Gurney et al., 2023; Obura, 2023). The Convention on Biological Diversity's Global Biodiversity Framework contains mandates for both a sweeping expansion of protected and conserved areas, and the responsibility for signatories to further equitable conservation. Fostering perceived equity of management by local actors is one key pathway to equitable governance, important not only for human wellbeing but because it underpins local actors support for and compliance with conservation. Our results suggest that broadening the lens of procedural equity beyond participation, particularly to encompass the trustworthiness of authorities, transparency of processes, and interpersonal treatment, will do much to foster equitable governance of the Great Barrier Reef Marine Park. In broad terms, attention by conservation managers to the relational quality between decision-makers and actors may be a pathway towards more equitable conservation and improved outcomes amidst uncertainty and complexity (Brugnach et al., 2021). We close by arguing that equity—of which fair decision-making is a crucial component—is neither a lofty ideal, nor a means to an end. A focus on equity in conservation satisfies not only an innate human need for fairness but is a vital part of ensuring the future success of this vast and critically important conservation initiative. We urge conservation decision-makers to build on past successes and remain committed to addressing existing inequities to build a better future for people and nature.

CRediT authorship contribution statement

Melissa Hampton-Smith: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Georgina G. Gurney:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Cristina Ruano-Chamorro:** Writing – review & editing, Methodology, Conceptualization. **Jacqueline Lau:** Writing – review & editing, Supervision. **Joshua E. Cinner:** Writing – review & editing, Supervision, Conceptualization.

Declaration of competing interest

We have no competing interests to disclose, and all sources of funding have been acknowledged in the manuscript.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.biocon.2026.111869.

Data availability

Data will be made available on request.

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