



# The Role of Perceptions for Community-Based Marine Resource Management

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Every community-based marine resource management (CBMRM) inherently takes place in a highly complex social–ecological environment, and stakeholder perceptions related to various aspects of the natural and social environment guide behavior in every stage of the management process. This paper provides an introduction to the psychology of perception with regard to marine resource management. In particular, it offers a typology of CBMRM relevant perceptions along with an analysis of psychological, societal, and physical factors that modulate them. Based on this analysis, we propose the introduction of specially trained local Perception Experts (PE's), whose role will be to recognize and reflect individual perceptions of involved stakeholders, and to communicate them at community meetings where decisions are made. This empirically testable addition to current CBMRM schemes could help to increase participation, develop management measures that fit the capacities of the involved stakeholders more accurately, and hence, contribute to a faster rehabilitation of marine resources.

**Keywords:** perception, community-based resource management, psychology, participation, attitudes, norms, values

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## INTRODUCTION

In times of increasing socio–ecological pressures, sustainable resource management is more important than ever. Conservation and resource use behaviors are motivated by a variety of factors and understanding the psychological underpinnings may offer valuable insights for resource management approaches. Key here is stakeholder perceptions, which affect the management process from earliest conception to the actual implementation and monitoring. The centrality of the issue is increasingly acknowledged and recently there have been calls for perceptions to be considered as a part of natural resource management strategies (Jefferson et al., 2015; Bennett, 2016).

Community-based marine resource management (CBMRM), where communities manage the marine resources upon which they depend for daily life, constitutes a common management scheme that makes apparent the essential role stakeholder perceptions play in such efforts. Coastal and island communities around the world have typically used and managed their crucial marine resources autonomously based on experience handed down from generation to generation (Zann and Vuki, 1998; McMillen et al., 2014). In today's context, these endeavors are often instigated or supported by outside partners [e.g., governmental agencies, non-governmental organizations (NGO's), academic research teams], who offer supplemental ecological analyses

along with advice on contemporary management methods (Mühlig-Hofmann et al., 2006; Glaser et al., 2015). Whatever the exact circumstances, every CBMRM procedure inherently takes place in a highly complex social–ecological environment (Glaeser and Glaser, 2010, 2011). As such, it is influenced by external factors (e.g., environmental changes, market access, and demands) as well as internal community-specific conditions (e.g., inherited ownership structures, hierarchies, religious influences, or societal obligations). An individual's perception of either of these significantly shapes the dynamic of the entire project, including decisions on management measures and their execution.

Community-based resource management frequently encounters problems due to stakeholder misunderstandings, lack of commitment, non-compliance, or conflicts (Bloomfield et al., 2012; Glaser et al., 2015). In our opinion, a commonly underestimated cause for this predicament is the differential perception of environmental changes, coping strategies, and social processes on part of individual stakeholders. For example, community members may evaluate ecological conditions quite differently, therefore reaching dissimilar, possibly even incompatible conclusions regarding management demands. Once in place, the specific responses to such given challenges might be considered efficacious by some, yet completely unsuccessful by others. Throughout this process, the perceptions that stakeholders have of each other can lead to further dissonance among them. We believe that insights from environmental psychology can prove essential for addressing these obstacles (see also Jefferson et al., 2015; Walker-Springett et al., 2016).

The main objective of this paper, therefore, is to offer practitioners involved in CBMRM an introduction to the psychology of perception as it relates to resource management within local coastal communities. Here, we will assume a slightly unorthodox approach, where perception is defined and assessed through a carefully hewn phenomenological lens. Accordingly, the emphasis will lie on the structure of perception as the necessary condition of the possibility of experiencing the world in a meaningful way. Going a step further than merely acknowledging the importance of perceptions, we propose the introduction of specially trained Perception Experts (PE's) as a possible, empirically testable addition to community-based resource management approaches.

## ENVIRONMENTAL PSYCHOLOGY BACKGROUNDS ON PERCEPTIONS AND CBMRM-RELATED BEHAVIOR

Environmental psychology “examines the influence of the environment on human experiences, behavior and well-being, as well as the influence of individuals on the environment, that is, factors influencing environmental behavior, and ways to encourage pro-environmental behavior” (Steg et al., 2013b, p. 2). In doing so, environmental psychology has generated and adopted a series of theories explaining behavior and the factors that shape it. Of these, some are particularly

valuable for the CBMRM context, such as Ajzen's theory of planned behavior (1991), the norm activation model (Schwartz, 1977), the protection motivation theory (Rogers and Prentice-Dunn, 1997), and the transactional model of stress and coping (Lazarus and Folkman, 1984). More recent models include the integrative socio-cognitive model of private proactive adaptation to climate change (MPPACC), which focuses on adaptation to weather extremes (Grothmann and Patt, 2005), and Bamberg's stage model of self-regulated behavior change (2013). Space limitation and purpose of this article preclude us from examining every theory in detail, but suffice it to say aspects of each underlie the present discussion.

In the following, we will describe what psychologists mean by perception, outline the role it plays in CBMRM, identify different stakeholders whose perceptions affect CBMRM, highlight what is being perceived, and summarize the main factors shaping CBMRM-relevant perceptions.

### Perception Defined

Psychologists commonly envision perception as that process by which individuals organize sensory information and interpret it as “having been produced by properties of objects or events in the external, three-dimensional world” (Gerrig and Zimbardo, 2008). This definition is as oversimplified as it may be useful. It reduces perception to merely the act of sensing physical stimuli and to creating mental representations of environmental information. One could ask though, whether the activities in receptor cells and neurons in the brain, both clearly indispensable physiological *aspects of* perception, are by themselves sufficient to qualify *as* perception. Moreover, it is not clear whether the representational scenario, according to which we encounter objects as mental intermediaries, is truly the most adequate conception of how we perceive the world. Phenomenologists have long argued that perception is unmediated and confronts us not with mental images of objects, but with the objects themselves (Gallagher and Zahavi, 2012)<sup>1</sup>. Hence, defining perception as the operation of organizing sensory information into mental images seems overly reductionistic.

A more comprehensive account of perception is used in studies assessing people's responses to unpredictable and potentially adverse challenges. *Risk perception* has been defined as an individual's “subjective judgment about the risk associated with some activity, event, or technology” (Böhm and Tanner, 2013, p. 24). This obviously involves not only the sensation of objects, but also higher cognitive processes such as reasoning. The perceiving individual logically discerns its future actions over and against the seeming facts with which it finds itself confronted. It does so with regard to held knowledge, previous experiences, and values. While clearly more refined,

<sup>1</sup>The problem with representational theories is simply that it is unclear how the phenomenal subject would know that an intramental image represents a given extramental object. If indeed it is the resemblance to the extramental object that provides an intramental image with its representational quality, as representational theories would have it, a subject must have direct access to the extramental object to realize said quality. (For a detailed discussion see Gallagher and Zahavi, 2012).

this definition overemphasizes reflective cognition and largely ignores the affective aspects of evaluating one's circumstances.

In the present study, we use perception as the subjective way people experience, think about and understand someone or something. This involves conscious and unconscious processes of meaning making in a complex social and natural world, as well as affective states and reactions. The objects of perception can be quite concrete or abstract, animate or non-animate entities, simple or complex, all depending on where the attention of the perceiving subject is focused. To put it into phenomenological terms, perception has an intentional structure and as such, is always about or of something (Gallagher and Zahavi, 2012). It is not merely the reception of information, but a process that involves the interpretation of phenomena within a given context. Rather than the external world impressing itself upon a passive subject, the subject's attention focuses perception onto a "perceptive field," thereby allowing the rest of the world to recede into the unconscious background. What directs the subject's attention is not only its physical surroundings, but also its interests and needs. In other words, whether a subject perceives objects while engaged in fishing is partially determined by the physical qualities of the objects sensed, yet largely also by his attention resulting from his desire to catch fish. One can say, then, that perception, further influenced by psychological and physiological factors, constitutes the background of experience and thus, guides a phenomenal subject's conscious acts (Merleau-Ponty, 1962).

At first sight, this working definition may resemble the psychological concept of *attitudes*, but upon closer analysis it reveals an additional dimension that renders it more comprehensive. Attitudes are defined as the evaluation of an attitude object (Eagly and Chaiken, 1993; Haddock and Maio, 2012), whereas our use of perception refers to a more integral process involving the experience and interpretation of encountered reality. In this sense, it comes close to the common use of the term perception as "the way people think about or understand someone or something" (Merriam-Webster Online Dictionary, 2016).

## The Dynamics between Individual Perception and Group Behavior

As mentioned above, CBMRM is always a social enterprise, insofar as it is a concerted, collaborative community effort involving specific actions toward a shared goal. In this sense, it is a form of group behavior. The group, here, is characterized not only by its common objective, but also by the interdependence of its members and their interactions (social structure), as well as a common social identity (Jonas et al., 2014). How individual stakeholders act depends to a great extent on the influence of the group, just as the group's overall actions are shaped by the individual behaviors of its members. In other words, CBMRM is invariably the result of a dynamic relationship between individual and group behaviors.

This complex interrelation is commonly absent from portrayals of CBMRM, which remain on the meso-level of the group and depict the process as a rather straightforward progression of distinct steps from problem identification to implementation of management procedures (Figure 1). Accordingly, when the decline of marine resources is identified as a problem that cannot be addressed by the community alone, official partners are approached for assistance. Subsequently, strategies for marine resource management are developed and implemented. Depending on compliance and the evaluation of the process and results, the problem will be reassessed. Of course, this captures the process in theory, though at the expense of a more adequate analysis that takes into account the interaction of group and individual.

In fact, the picture becomes even more intricate when one takes into consideration stakeholder perceptions that significantly shape individual behavior and, thus, CBMRM as group behavior. Simply put, whether and how community members act in terms of managing local marine resources depends on whether they perceive circumstances as requiring such actions. For instance, individual stakeholders might become aware of changes in environmental features or may simply develop an unreflected sense of change that raises concern. They may attribute reasons for why the observed changes exist and in turn infer the need for some kind of action to adjust

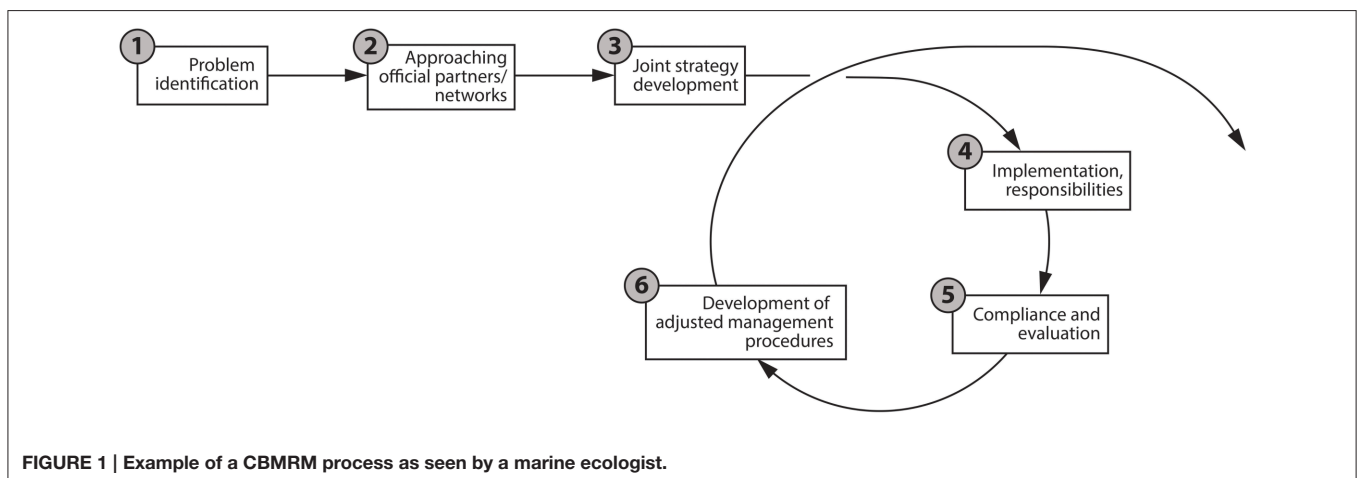


FIGURE 1 | Example of a CBMRM process as seen by a marine ecologist.

the situation. Once coping strategies have been devised and implemented, individual stakeholders appraise them with regards to efficacy and associated costs. The behavioral outcomes and experiences provide feedback, which can result in a reappraisal of the situation, and of coping strategies. Thus, throughout the CBMRM process individual behavior presupposes perceptions, which in turn affect CBMRM as a group activity.

## Perceptions Influencing CBMRM Efforts

Perceptions in the context of the CBMRM process are manifold. But before going into detail here, it is important to remember that much of environmental perception functions unconsciously. For instance, changing temperatures and precipitation rates, or dwindling fish stocks can be experienced as a new reality without immediate or continuous conscious reflection upon reasons and consequences. This poses two significant issues for CBMRM efforts. First, stakeholders may not be able to clearly voice their concerns during the planning phase. As a result, important aspects of the status quo of the resources to be managed may go unnoticed and the resulting management plans may not be entirely adequate for the given situation. Second, and closely related to the first problem, stakeholders may not agree with specific management proposals, but cannot articulate their reasons. Thus, CBMRM efforts may actually encounter serious challenges before they have really begun.

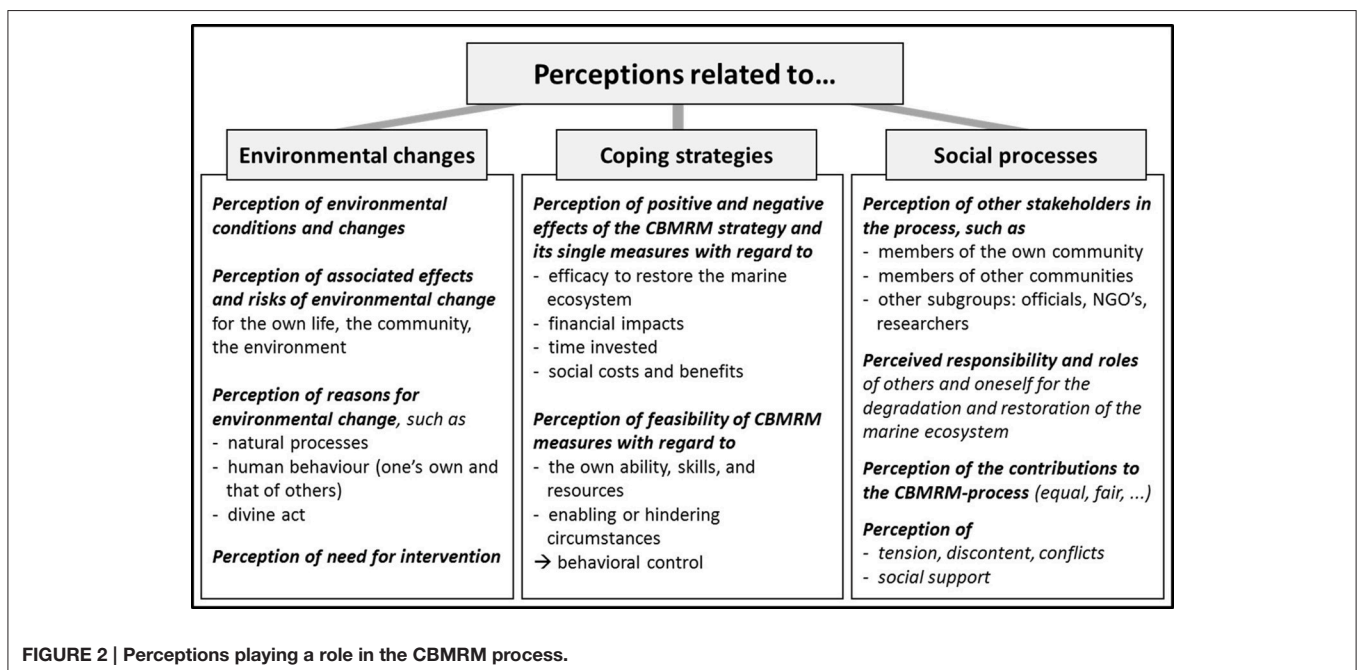
**Figure 2** gives a brief overview of three major areas—environmental changes, coping strategies, and social processes—whose contents overlap and are not independent of one another. For example, the perception of responsibilities for environmental changes and responsibilities for interventions are connected. The objective here is to offer a brief overview that helps identify the variety of possible perceptions relevant for CBMRM. Previous studies on perception in CBMRM have usually paid attention

to specific segments of perceptions and provided very useful insights. Nevertheless, a more systematized approach, as we offer it here, might open up new perspectives for researchers, marine resource managers, and communities.

## Perceptions Related to Environmental Change

At a very fundamental level, individual stakeholders may perceive physical changes in their environment, and based on it, assess the situation with regard to immediate or future intervention. Perceptions of impaired marine ecosystem health can include declining fish numbers and sizes, increases in algae density, the absence of known species and presence of novel species in familiar fishing grounds, altered coral colors along with increasingly fragile or broken calcareous structures, or changes in what is washed up on beaches. For the most part, these are readily sensed differences, but there are also other, more intricately perceived anomalies, such as declining catch over longer periods of time along with the associated impacts on income and food security, as well as the lack of specific species for traditional functions (Veitayaki et al., 2015). The perception of such changes can be interpreted not only as an unfortunate environmental deterioration but also as a risk to accustomed and valued lifestyles and personal well-being.

Simultaneously to perceiving environmental changes, stakeholders may attempt explaining the situation as to gauge potential courses of action. Where responsibility is placed can make a significant difference regarding future behavior change and participation in any kind of CBMRM effort. For instance, if human behavior is perceived as a reason for the change, stakeholders will allocate culpability either to themselves or others and negotiate possible responses accordingly. However, if, for example, environmental deterioration is seen as divine punishment for human transgressions, stakeholders could





consider morally offensive behaviors entirely unrelated to the treatment of natural resources and conclude remedies with no further ecological impact (Mortreux and Barnett, 2009; Kuruppu and Liverman, 2011). Whether the changes are perceived as due to human actions or due to a larger process, stakeholders are faced with the question of whether they are actually able to address the changes, and how. Their response to this shapes future decisions with respect to CBMRM.

Thus far, there has been limited research focus on the perception of marine biodiversity change. Inquiries related to changes in marine biodiversity have largely been restricted to ecological and occasionally anthropological rather than more comprehensive studies encompassing psychological assessment (Mills et al., 2013; Young et al., 2016; Webster et al., 2017; Katikiro, 2014). One reason for this is clearly that here the detection of change is complex, involving a plethora of organisms, long timescales and various factors of change. Despite these undeniable difficulties, we nonetheless suggest intensifying a holistic strategy and encourage cooperation of marine biologists, ecologists, environmental psychologists, social scientists, governmental and non-governmental organizations, and communities. The benefits gained from including such a transdisciplinary approach for monitoring and evaluating environmental perceptions in CBMRM processes potentially far outweigh the methodological challenges associated with their implementation.

### Perceptions Related to Coping Strategies

How stakeholders perceive coping strategies that have been devised and implemented in response to perceived environmental change is yet another area of inquiry for environmental psychologists (Grothmann and Patt, 2005). What makes this category interesting is that it reveals the importance of perceptions at every stage of the management effort. Already during the planning phase, stakeholders have a particular impression of a potential CBMRM strategy and will support the intended measures only insofar as they perceive them as adequate. As the strategy is implemented, they may experience the procedure quite differently, and it is at this point that some will withdraw their participation. When management measures have been in place for a while, stakeholders will most likely assess their success differently, once more potentially giving rise to conflict or disenchantment. In short, throughout the whole CBMRM process, stakeholder perceptions of the actual measures can decide the ultimate success of the entire enterprise.

The perceptions related to CBMRM strategies can be divided into two broad categories: first, the perceived positive and negative effects of a measure and second, perceptions related to feasibility, including potential behavioral barriers and facilitators to engage in specific activities.

Positive and negative effects of a measure do not only include its efficacy with regard to the restoration of the marine ecosystem, but also to the associated costs and benefits for individual stakeholders. These can be of a monetary nature, yet also related to the individual's invested time, energy, and social recognition or disapproval by others. No-take areas, for example, can be perceived as very effective to restore the marine ecosystem,

but also as costly and consequently, undesirable. For instance, additional expenses for fuel to travel further to alternative fishing grounds and extra time spent on fishing trips may make it hard for some stakeholders living adjacent to the protected area to comply with such a measure.

In addition to their perceived effects, single CBMRM measures will be judged by the involved individuals with regard to feasibility. Here, the perception of behavior facilitators and barriers is specifically relevant for stakeholder motivation. The extent to which people perceive themselves as able to exert an intended behavior depends on the perception of their individual skills, abilities and resources (Bandura, 1977). These assessments affect how actively stakeholders will engage in the community management effort. In addition, the sense of how circumstances allow stakeholders to bring to bear their abilities to partake in one or each decided measure plays a crucial role. Both aspects, the perception of individual abilities and enabling or hindering circumstances can be summarized as perceived behavioral control which is known as one important factor for motivating behavior (Ajzen, 2001, 2002). In Pacific small island contexts for example, where traditionally women fish in near-shore areas, establishing protected zones close to the beach would make it impossible for women to fish at all for lack of skills, abilities, and resources to go elsewhere (Mühlig-Hofmann, 2007). Finally, not only the perception of their own abilities, but also the perception of potential alternatives to make a living, will affect their motivation to engage in conservation measures that might impair their own subsistence.

Taken together, these perceptions related to management strategies and measures can be key to resolving issues of stakeholder discontent with CBMRM and resulting lack of commitment. It is therefore absolutely crucial to reflect on them carefully throughout the entire process and particularly to anticipate them when precise management plans for a community are being conceived.

### Perceptions Related to Social Processes

As outlined above, CBMRM is a group behavior involving various stakeholders and subgroups, which include, among others, the participating local communities of resource users, advising scientists, regulators, and government officials, as well as supporting NGO's. Social dynamics unfold both, within and between subgroups; individuals perceive and consequently interact with one another in their own group and also with individuals of other subgroups. These continuous perceptions of and experiences with one another constantly shape future expectations and behaviors.

With respect to social perceptions, the perhaps most important subgroup of stakeholders are the resource users themselves, who in essence depend on the well-being of the local marine environment. As residents of the same village or region, these individuals likely engage with each other frequently and because of it stand in rather complex relationships with one another. Whether such a group can organize a facilitated effort to manage resources is dependent to a large extent on whether individual resource users perceive the activities of other group members as equitable, responsible, and just. Moral perceptions,

as difficult as they are to diagnose, are absolutely key to the social dynamics of communities (Syme et al., 2000). They are therefore, also crucial for CBMRM.

Concerns about justice come to bear already in the earliest stages of a CBMRM process, where negotiations of necessary management measures are strongly affected by who individual community members consider responsible for the state of the marine ecosystem (Montada and Kals, 2000; Fielding and Head, 2012; Kalamas et al., 2014). If others are seen as responsible for the observed environmental deterioration, stakeholders might not see any reason to act. Alternatively, group members could demand a greater contribution to the management efforts from those they deem accountable for the state of things. In any case, with the question of liability unresolved dissension within the community is almost inevitable. Hence, it is important, that the causes of marine environmental change are discussed transparently and a course of action is devised jointly along with a clear and accepted distribution of responsibilities.

Once management measures have been established, stakeholder attention will shift somewhat from responsibility to equity, where individual contributions to the group effort are perceived in comparison with a stakeholder's own efforts (Van Lange, 1999). For instance, when others seemingly spend less labor, time, or money on altogether costly procedures, stakeholders might find their own involvement unduly taxing. Likewise, some community members may be perceived as disproportionately benefiting from the measures (e.g., if they live farther away from an established no-take area than the perceiving stakeholder or possess the means to travel further to fish when no-take areas were set up in their usual fishing spots). Perhaps the most damaging to stakeholder ambition would be if others are perceived as cheating. Fraudulent behavior undermines trust and therefore, the entire CBMRM effort, which as a group behavior is dependent on reliable stakeholder participation (Yandle et al., 2011; Van Lange et al., 2013). In turn, general participation according to the agreed-upon course of action can further a sense of community and ultimately increase motivation of individual stakeholders. Whatever the particular perceptions related to fairness, for the CBMRM process it is advisable to maintain a high degree of transparency at all times. In the best case, a social norm of fair co-operation would emerge. Although the perceptions of responsibilities and individual contributions are subjective and may not always be objectively verifiable, they will guide the CBMRM process and the motivation to engage in it.

Aside from the actual resource users, other subgroups, such as government officials, NGO's, or research teams, play an integral part in a functional CBMRM process, and how they are seen by participating community members is crucial for overall success. When outsiders are perceived as competent, credible, perhaps even likeable, but most certainly culturally sensitive and consequently, as an acceptable authority, community members are far more likely to welcome advice and collaborate in a lengthy management approach (Fiske and Dupree, 2014). Of course, here past experiences with either of the participating outside subgroups decide current relationships: Some communities might have had extraordinarily positive experiences, whereas

others could have gone through disappointments and may therefore be not as open and optimistic when it comes to new plans for co-operation.

Although these factors are inherent to any human relationship and interaction, it might be helpful to be aware of their potential influence on CBMRM endeavors. Consequently, perceptions related to social processes are relevant in all stages of the CBMRM as it is by definition a group conduct extending over a longer period of time.

### Factors Modulating Individual Perceptions

Perceptions are affected by a variety of individually and socially relevant psychological factors, of which Figure 3 offers a systematic overview. As we mentioned initially, perceptions are focused onto a perceptive field by physical, societal, or psychological circumstances, and their interactions. By way of illustration, how a community member perceives the state of the natural resources on which she relies is significantly affected by the environmental conditions she encounters, her relationships with others within the community, and her personal needs, interests, or psycho-physiological status. Thus, perceptions are not simply the result of a sensory input generating neural representations, but rather the product of a complex interaction between the perceiving individual and its

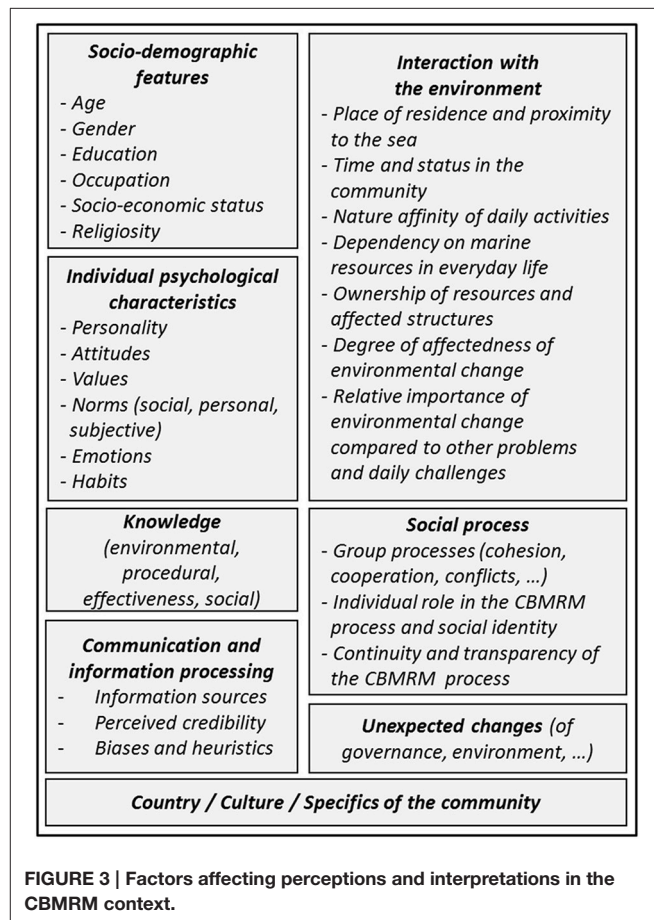


FIGURE 3 | Factors affecting perceptions and interpretations in the CBMRM context.

surroundings. In view of such intricate reciprocity it does not surprise that even modulating influences of the most unlike kind can alter perceptions at each level (environmental change, coping strategies, or social processes). Analyzing single factors isolated from the rest is therefore prone to oversimplification. Nonetheless, in the following section we provide a brief overview with short introductions to the most relevant classes of perception modulating factors.

- (1) *Socio-demographic characteristics.* Differences in perceptions can be related to socio-demographic characteristics like age, gender, education, or socio-economic status. Religiosity, place of residence, property situations, as well as status and time spent in the community can also help to understand how people perceive their environment and potential management strategies (e.g., McClanahan et al., 2005; Anton and Lawrence, 2014; Jefferson et al., 2014; Rasool and Ogunbode, 2015; van der Linden, 2015). Furthermore, the interaction with the environment shapes perceptions that are relevant in CBMRM-contexts (Pita et al., 2013; Wyles et al., 2014; Beardmore, 2015).
- (2) *Knowledge.* For understanding people's perceptions it is further useful to be aware of the knowledge that they hold. Knowledge can include *declarative knowledge* about environmental systems and associated mental models, *procedural (action-related) knowledge* about what to do and how to do it, *effectiveness knowledge* about which actions can have beneficial outcomes, and *social knowledge* referring to motives, intentions, and expectations of others (Bostrom et al., 1994; Kaiser and Fuhrer, 2003). Often, informational strategies aim at imparting only environmental knowledge to raise awareness and try to motivate behavioral change. Yet, normative information about the behavior of others can be even more motivating than pure factual information about the environment (Cialdini, 2003; Goldstein et al., 2008).
- (3) *Communication.* As CBMRM is a social process, face-to-face as well as mediated communications are essential in shaping perceptions and mutual understanding. Naturally, the potential for misunderstandings here is exceedingly high, especially when non-community members suggest the implementation of unfamiliar strategies, like the adoption of novel management schemes (Pomeroy and Carlos, 1997). An often-underestimated communication problem is a subtle form of what one might summarize as culturally contingent misconception. That stakeholders speak the same language does not guarantee they use terms and concepts in the same culturally appropriate fashion. Also, proficiency in a given language may differ between stakeholders within a CBMRM project (Nunn, 2009). Thus, although project advisors from outside the community (e.g., NGO's from a different country) and local resource users technically speak the same language, they may still fail to understand each other. Aside from such language barriers, what can further impede mutual understanding between involved stakeholders is whether the dialogue partners perceive each other as trustworthy and credible. Even more, successful communication may ride on whether stakeholders perceive their conversation partners as similar to themselves (Siegrist et al., 2000). How things are communicated and by whom, plays an important role in any group behavior.
- (4) *Cognitive biases and heuristics.* How information is perceived and interpreted is influenced by cognitive biases and heuristics, which are rules of thumb and an economic way of using cognitive resources (Tversky and Kahnemann, 1974; Böhm and Tanner, 2013). Being aware of effects like the positive optimism bias, the affect heuristic, or the availability and anchor heuristic cannot only help to better understand perceptions, but also to improve communication and decision-making processes (Weinstein, 1980; Gregory et al., 1993; Finucane et al., 2000; Böhm and Pfister, 2005; Gattig and Hendrickx, 2007).
- (5) *Personality.* Clearly, community members vary in their personalities, which can lead to varying perceptions and, consequently, dissimilar behaviors. For example, personality-related tendencies of thinking such as self-efficacy and control beliefs contribute to reveal why individuals engage in or refrain from certain actions (Bandura, 1977; Judge et al., 2002; Kormanik and Rocco, 2009). How individuals engage in a group effort depends furthermore on personal abilities like social competence and creativity, as well as on personality related interests, needs, and motives.
- (6) *Norms.* Particularly in social contexts, perceptions and behaviors are inherently shaped by social norms, i.e., "rules and standards that are understood by members of a group, and that guide and/or constrain human behavior without the force of laws" (Cialdini and Trost, 1998, p. 152). What is more, individuals also adapt their behavior to what they believe others would consider acceptable (subjective norm). Furthermore, rules and standards referring to one's own behavior (personal norm) are crucial (Keizer and Schultz, 2013).
- (7) *Values.* In addition to norms, the values that individuals and social groups hold determine the interaction with one another and the environment. In psychology, values are defined as desirable trans-situational goals that vary in importance and serve as guiding principles in the life of a person or a social group (Schwartz, 1992, 2006, 2012). Values include beliefs about desirability or undesirability, are relatively stable, ordered in a system of priorities, and serve as guiding principles for the evaluation of people, events, and behaviors (de Groot and Thøgersen, 2013). Values have been shown to affect attitudes and behaviors, and the value-belief-norm-theory of environmentalism describes such processes (Seligman and Katz, 1996; Stern et al., 1999; Stern, 2000; Thøgersen and Ölander, 2002). Identifying underlying values in communities can be helpful to explain and understand CBMRM-relevant perceptions and behaviors.
- (8) *Attitudes.* As already mentioned above, the concept of perception or public perception is often used in a similar



way as the concept of attitudes. In psychology, attitudes are defined as the evaluation of an attitude object—which can be a person, place, thing, event, or action—and include firstly a cognitive component referring to thoughts and beliefs about the attitude object, secondly an affective component which refers to emotions related to the attitude object, and thirdly a behavioral component relating to previous, current and anticipated behaviors related to the attitude object (Eagly and Chaiken, 1993; Ajzen and Fishbein, 2005; Haddock and Maio, 2012). Attitudes can vary in valence and intensity. They do not only affect the processing and interpretation of information but also bias attention. Although individuals might have positive attitudes toward environmental protection and sustainable resource use in general, their specific attitudes related to concrete CBMRM measures can vary greatly. Therefore, to elicit people's attitudes toward a certain measure, it is prudent not to rely on general statements, but to be as specific as possible with regard to the attitude object in question and about involved actions, contexts, and times. In that way, attitudes contribute to the explanation and prediction of behavior (Ajzen and Fishbein, 1977).

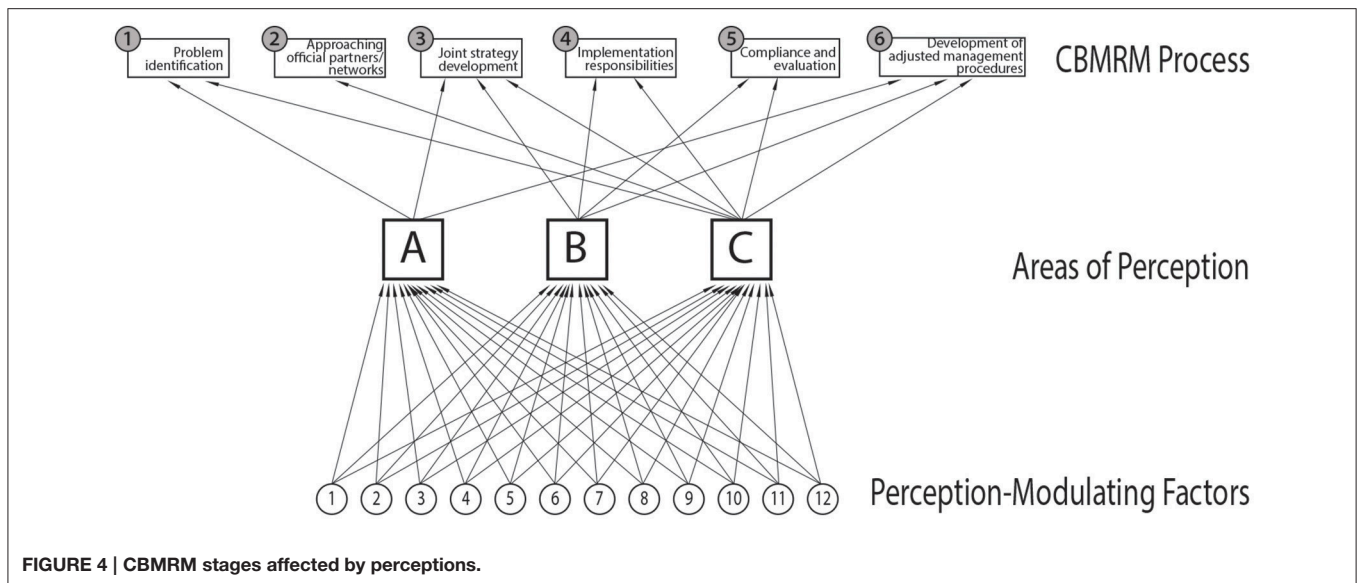
- (9) *Emotions and affective reactions.* Affective states, that is, a person's positive or negative feelings about specific objects, ideas, images, or other stimuli, are often underestimated variables when it comes to managing natural resources, even though they are powerful motivators of behavior (Keller et al., 2012). A case in point would be the assessment of risks, where emotions are used as mental shortcuts to reach conclusions especially when the required decision is complex or mental resources are limited (Finucane et al., 2000; Slovic et al., 2007; van der Linden, 2014). Therefore, it would be advantageous to be aware of emotions involved in CBMRM so perceptions can be better understood and motivation can be maintained.
- (10) *Habits.* In daily resource use individuals tend to repeat behaviors more or less habitually. Habits are “cognitive structures that automatically determine future behavior by linking specific situational cues to (chains of) behavioral patterns” (Klößner and Verplanken, 2013, p. 198; Aarts and Dijksterhuis, 2000). As some fishing practices that contribute to the degradation of the marine ecosystem are likely to have been in place for quite some time and already have become habits, alternative practices might be difficult to imagine and relearning requires some conscious change. It is hence important to identify and reflect on existing habits and acknowledge their power in guiding daily perception and behavior. Based on that, it might be easier to break up habitual structures, which contribute to resource-overuse and plan more sustainable alternative behaviors.
- (11) *Social interactions.* When it comes to social interactions affecting individual stakeholder perception, phenomena such as competition and acknowledgement are of fundamental importance. For example, efforts of single group members are known to increase in situations of perceived social competition and decrease if a person perceives its contribution as hardly visible or unimportant (Latané et al., 1979; Kerr and Bruun, 1983; Williams and Karau, 1991; Stroebe et al., 1996; Kerr et al., 2007). Critical for the problem at hand is also the fact that stakeholders possess a social identity that “describes those aspects of a person's self-concept based upon their group memberships together with their emotional, evaluative and other psychological correlates” (Turner and Oakes, 1986, p. 240). As a member of a particular group, a stakeholder might seek to maximize the benefits of her own group over that of other stakeholder groups. Hence, some stakeholders will try to advance the interests of their own village, whereas others may act to achieve a common goal cooperatively with all subgroups and stakeholders (Tajfel and Turner, 1986; Turner et al., 1987; James and Greenberg, 1989; Lickel et al., 2000; Johnson et al., 2006). Being cognizant of social groups and addressing potentially existing prejudices or conflicts, which might hamper effective cooperation for CBMRM, would therefore be valuable (Nelson, 2009).
- (12) *Cultural context.* Zooming out from an individual to a societal perspective, it is clear that all the aforementioned factors need to be seen embedded in the cultural context. Cultural dimensions affect perceptions, group processes, and social practices (Hofstede, 2001; Triandis, 2001; House et al., 2004; Schwartz, 2006; Trompenaars and Hampden-Turner, 2012). Accordingly, if stakeholders from outside are involved in the CBMRM process, or if approaches developed elsewhere shall be applied, potential contradictions to the cultural context should be anticipated. Generally, it is important to bear in mind that the psychology on which the present discussion is based has its origin in Western thought. Applying its concepts and analyses elsewhere, as for example the Pacific Islands or African coastal regions, must be done cautiously and with the necessary consideration of cultural idiosyncrasies.

## Ramifications of the Psychological Insights on Perceptions

This study set out to provide CBMRM practitioners with an introduction to the psychology of perception so that frequent problems of stakeholder misunderstandings, lack of commitment, non-compliance, or conflicts could be avoided. At this point, three conclusions of what has been said can be drawn:

First, perceptions play a central role at every point of a CBMRM endeavor. As we have pointed out above, CBMRM is often oversimplified as the sequentially unfolding resource management process around the shared objectives of a homogenous community (Figure 1). However, this view neglects to a large part the heterogeneity of involved stakeholders as well as differences in their individual perceptions (Campbell and Vainio-Mattila, 2003). When stakeholder perceptions are taken into consideration, a far more complex picture begins to emerge (Figure 4). Perceptions affect every aspect of CBMRM, which is why an organized reflection on them throughout the process is necessary.





Second, perceptions relevant to CBMRM can be grouped into three major areas with regards to (A) environmental changes, (B) chosen coping strategies, and (C) the involved social processes. These different types of perceptions act at various points of any CBMRM effort (**Figure 4**). Thus, perceptions of environmental changes are pivotal during the early stages of problem identification and the development of a joint strategy, but also during the evaluation of the implemented management schemes and subsequent adjustments to the strategy. Perceptions with respect to chosen coping strategies are of relevance during the development, implementation, and subsequent evaluation of the actual measures. Finally, social perceptions directly affect CBMRM efforts at every step of the way. With this in mind, practitioners can anticipate potential problems and their causes long before they occur. Moreover, they can respond more adequately to misunderstandings between stakeholders that may arise during the CBMRM process and which, if left unattended could hamper the management process.

Third, perceptions in all three areas are shaped by a variety of psychological factors (1–12 in **Figure 4**). How stakeholders experience their situation and respond to it largely depends on their socio-demographic background, knowledge, attitudes, norms, or other kinds of psychological modulators. The ability of practitioners to identify any one of these factors can mark the difference between success and failure for a CBMRM effort. Taking them into consideration allows the development of more adaptive strategies tailored to the specific needs of a community in need of resource management. Equally important, it would help facilitate productive communication between stakeholders during the CBMRM process, especially once misunderstandings or conflict have ensued.

Although the role of perceptions is increasingly acknowledged in the CBMRM literature (Pita et al., 2011; Jefferson et al., 2015), only little attention has been paid to psychological theories connecting perceptions to behavior (Bennett, 2016). As a result, perceptions that are crucial but not obvious are usually

considered neither in CBMRM theory nor in CBMRM projects. Several studies focus on perceptions related to coping strategies, asking primarily about stakeholder perceptions of implemented fishing restrictions and their efficacy (e.g., McClanahan et al., 2005; Bloomfield et al., 2012; Cinner et al., 2014; Katikiro et al., 2015). Others address mainly environmental perceptions with regards to changes in catch size, fishery stock, condition of current fishing grounds, and the number and type of affected groups or species (Jefferson et al., 2014; Katikiro, 2014). A small minority of inquiries either combines the two, while even fewer include social perceptions (Gelcich et al., 2005; Abecasis et al., 2013; Deiye, 2015). Even though some of these studies control for socio-demographics and occasionally psychological factors such as personal values, virtually none of them have embedded their inquiry into psychological theory. For example, perceptions are almost never defined nor are different types of perceptions comprehensively distinguished. Moreover, how psychological factors shape perceptions and ultimately, behavior is a problem left unresolved. With the present summary of perceptions from the perspective of environmental psychology we hope to offer researchers and practitioners a theoretical foundation for more constructive management methods.

Going beyond theoretical foundations, one question that might arise for practitioners is how to include the diverse range of perceptions in actual long-term CBMRM projects. Over the past decades, one strategy seeking to work with stakeholder perceptions is a participatory approach, where a special emphasis is placed upon developing natural resource management strategies jointly with every relevant stakeholder (DeCaro and Stokes, 2008; Ferse et al., 2010; Lin and Chang, 2011; Akbulut, 2012; Rabe and Saunders, 2013). Yet, against better intentions these approaches more often than not fail to consider the full breadth of relevant perceptions. As a result, they miss the inclusion of underprivileged members of society in decision-making processes over longer timescales and in effect, perpetuate existing power structures and inequalities

(Akbulut, 2012; Rabe and Saunders, 2013). Although the idea of participatory, community-based management has valuable potential, the gap between expectations and reality is often undeniable. One reason for this might be that participatory projects are frequently facilitated by outside experts, who tend to face not only project-related constraints with regard to time and resources, but also lack local expertise, social embeddedness, and authority (Campbell and Vainio-Mattila, 2003; Akbulut, 2012). Furthermore, most resource management endeavors rely on the expertise of ecological experts rather than that of social and behavioral scientists (Campbell and Vainio-Mattila, 2003). It therefore is no exaggeration to say that approaches to community-based resource management considering stakeholder perceptions in their full complexity are still largely missing.

In the following, we propose one potential solution to the challenge of working with perceptions in CBMRM that considers not only their diversity, but also addresses the need for continuity to work with stakeholder perceptions throughout the whole CBMRM process.

## PERCEPTION EXPERTS—A PRACTICAL PROPOSAL

As clearly shown, perceptions of involved stakeholders affect every phase of the CBMRM process. Acknowledging the importance of perceptions for CBMRM contexts raises the question how psychological understandings of perceptions might enable community-based managers to detect possible inefficiencies and their causes early on to respond more flexibly, and how such a process could be anchored and unfold in a community-based context. As an empirically testable approach we propose that appointed individuals from the communities receive a tailored training program on psychological backgrounds.

### Core Tasks of Perception Experts and their Role in the Community

When a CBMRM process is initiated and a management strategy is developed, usually certain tasks are defined and designated among the community members. These tasks (e.g., of fish-warden) focus mostly on environmental monitoring and watching over compliance with the decided rules and measures (Mühlig-Hofmann, 2007; Pomeroy et al., 2015). Already at that phase of the process, being aware of perceptions of involved stakeholders can offer insights in how management measures are assessed or where difficulties for compliance might arise. Therefore, from its earliest stages on, the CBMRM process would benefit from having trained individuals who work with perceptions of involved stakeholders to reach management approaches which fit stakeholders' needs and capabilities.

The core task of such "perception experts" (PE's), would be mainly a reflective and communicative one. First, they are to reflect prevailing CBMRM-relevant perceptions together with involved community members and other stakeholders. Second, they should help to detect misunderstandings or

biases which could then be clarified in communication within the community. Finally, by facilitating a transparent and respectful communication, the PE's will ensure that concerns, expectations, and needs of all CBMRM-stakeholders are taken seriously and will be articulated during regular CBMRM meetings.

As modes of participation and decision-making can vary greatly across regional and cultural contexts, defining the specific role of the PE's would demand developing it together with local stakeholders, such as fishing communities and local institutions like universities or NGO's. Specifying the PE-role and agreeing on it within the community should vest some degree of authority and legitimization to the appointed individuals (Leaua and Aniței, 2012). This should include, for example, being entitled to invite subgroup meetings, do interviews, and accompany stakeholders at their fishing- and CBMRM-relevant activities. Furthermore, the PE's role should allow them to speak and reflect on perceptions in regular CBMRM-related community meetings.

As CBMRM is a long-term social-ecological process, perceptions and specific needs of involved people are likely to change over time (Roovers and van Buuren, 2016). PE's should therefore be in regular exchange with the stakeholders about perceptions of the status of the marine resources and management measures. Hence, the CBMRM strategies could be adapted dynamically depending on perceptions, ongoing environmental changes, and needs. Also, potentially needed support for individual stakeholders could be identified and provided more purposefully to help to reduce objective as well as psychological behavioral barriers.

Perception experts would not only encourage community members to reflect their own perceptions and behaviors, but foster a participatory process in which stakeholders could shape the CBMRM process more actively. Decision makers, marine managers, as well as community members would engage in active feedback loops (Staats et al., 2000; Abrahamse et al., 2007). On the one hand, they would receive information on each other's perceptions of the environment, coping strategies and the process dynamics, and, on the other, get behavioral feedback on what CBMRM-measures proved useful for what reasons, or why single measures might suffer from a lack of acceptance. Since behavioral feedback is an essential factor for motivating behavior, experiencing that realistically negotiated goals can be achieved is likely to support people's motivation for remaining dedicated and committed over a longer timeframe (McCalley and Midden, 2002).

In the case that additional necessity for conflict-mediation arises, which would need clarifying support going beyond the PE's competence, traditional and trusted conflict mediators could come into play (Alsop et al., 2006). Depending on the cultural context, these mediators could be, for instance, church members, village leaders, or others who usually engage in the role of traditional conflict mediators with the respective authority.

### Nomination of Perception Experts

How PE's are selected will prove a complex issue, first and foremost because of the cultural and social diversity of communities engaging in CBMRM. As we have pointed out, the

role of the PE's is primarily to listen to stakeholders, reflect upon their statements with regard to perceptions, and communicate their insights to the entire community during significant periods of the management process. Obviously, PE's must not only be respected and trustworthy authority figures within their community, they also need to possess some innate skills enabling them to engage stakeholders in open conversations and to create the safe spaces in which these exchanges can take place. Who qualifies as an authoritative voice within the community and how they are endowed with such a responsibility would clearly depend on the cultural background of the community in question.

We cannot offer one general solution to the problem of PE choice, but a few general concerns regarding selection criteria can be outlined. First, as mentioned above, PE's need to be authority figures that are trusted and well-respected within the community. These may be individuals who already hold positions of authority and trust (e.g., religious figures, community elders, etc.) or persons who can fill such a position for the very first time. Either way, PE's will have to be self-confident, while at the same time humble enough not to overestimate their abilities. In other words, PE's need to be self-reflexive and aware of their own potential biases and prejudices. Second, PE's have to be competent communicators, which implies on the one hand an aptitude for listening and on the other hand, the ability to distill relevant information. Third, PE's need to be able networkers, who have proven their capacity for bringing together various community members from diverse backgrounds to address issues of communal import. Fourth, PE's will have to be empathic, as well as endowed with a certain non-verbal sensitivity. This may very well be the most important trait for a PE, simply because it underlies all previously mentioned abilities. Fifth, PE's will have to be creative, finding novel, and heretofore untested approaches to resolve issues such as potential conflicts or misunderstandings arising from stakeholder perceptions. In summary, one could say that PE's should be selected on their social standing within the community, their social competence, and their communicative skills.

In addition, it would be important to recruit at least two PE's (or more, depending on the size of the community) to prevent loss of expertise should one PE be absent. Finding two individuals (or more) answering all of the demands listed above could be quite a challenge in itself, which is why it might be necessary to select two complementary individuals, who each possess some of the skills and together cover most or all of them. Of course, it would be necessary for both of them to be able to work together, which once more could be a function of the cultural context. For example, in strongly patriarchal societies with far-reaching gender separation, it may be both necessary as well as difficult to have a male and a female PE work together. Whatever the particular social structure of the community in question, it would be mandatory that the PE's will take into consideration perceptions of the greatest number of community members possible.

## Potential Training Contents

PE's can be understood as "system experts" (Mieg, 2001, 2006) who have experience within the local human-environmental

system and receive a science-based training to gain "interactional expertise" (Collins and Evans, 2007). Similar to training programs for fish-warden which have shown to benefit CBMRM efforts (Mühlig-Hofmann, 2007; Pomeroy et al., 2015), a specific training course could be developed for the PE's. Key partners for the development of such a training program could be psychology departments of local universities working in close cooperation with marine science departments, local governments, NGO's, and communities.

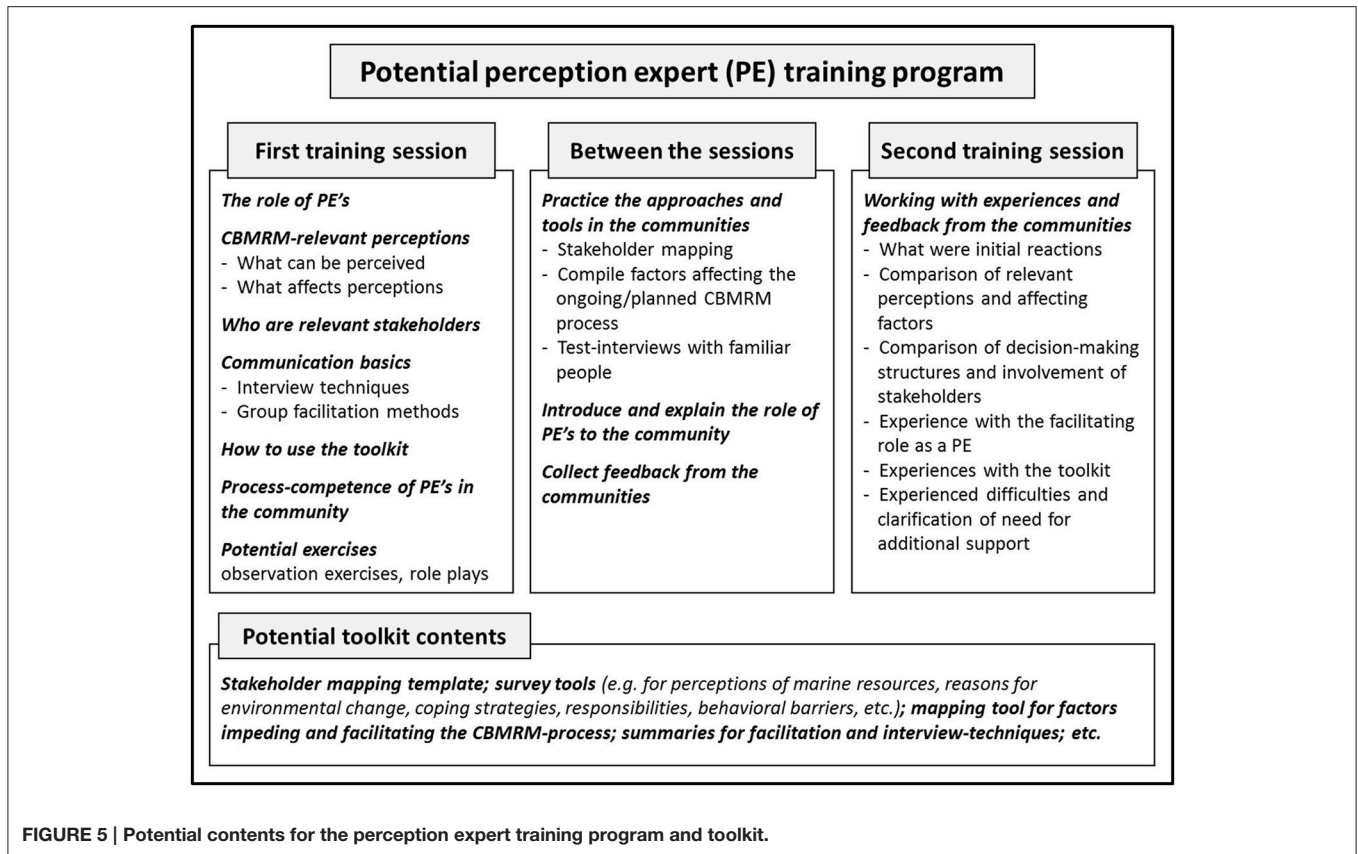
Insights from areas of environmental, social, motivational, and communication psychology in combination with expertise from marine science and conservation studies could serve as the basis for creating training contents. To enhance a mutual learning process, the training should be interactive, based on a mix of contentual input by the trainers, interaction between the trainees, and practical exercises.

**Figure 5** illustrates a suggestion for potential contents of a three-step program consisting of first, a training session providing theoretical backgrounds and practical tools; second, a practice run using the learned skills; and third, a second training session where experiences from the practice run are reflected, and ideas and concepts laid out in the first training session are expanded.

The first training session would focus on relevant perceptions in the CBMRM context and factors affecting them, as well as on mapping stakeholders that are involved in the whole process. Subsequently, ways how to elicit information about prevailing perceptions should be learnt and practiced. This could comprise interview techniques, group facilitation methods, and the use of qualitative and quantitative interview tools. Furthermore, ways of analyzing and integrating results to summarize and present them in community meetings should be introduced. Beyond that, prospective PE's should gain process-competence and get encouraged to reflect their own perceptions, assumptions, and role in the community.

Between the first and the second session of the training course, the prospective PE's should get the opportunity to practice the approaches and tools they have acquired during the first training session at home in their communities. Exercises could encompass, for instance, getting an overview of the involved stakeholders in the local CBMRM-process, practicing observation skills, and doing test-interviews to compile a portfolio of factors that motivate or hinder relevant behaviors. Besides the value of practicing, the trainees could introduce and explain the role of the PE to the community and get first feedback and ideas to work with. Such exercises would also be important for the PE's to see if they feel comfortable with their new role and are willing to continue.

For the second training session, all trainees should contribute updates from their communities that can be used to further analyze the role of stakeholder perceptions and ways to include them in CBRMR-related decision-making. Based on their observations and test-interviews, the training participants should use this session to compare the CBMRM-relevant perceptions and their main modulating factors that they could detect in their communities. Here, similarities and differences



**FIGURE 5 |** Potential contents for the perception expert training program and toolkit.

between single communities could be highlighted, and important factors that might have been overlooked so far could be added. In a next step, the analysis of local decision-making structures could serve as the foundation for the development of strategies to work with perceptions in the specific CBMRM-processes.

The second training session would also fulfill the purpose that the trainees could describe their experiences with the toolkit, potential difficulties they encountered, and where they see the need for additional support for their work in the communities. This support could include, for example, an association of local experts who could assist the PE's. One group of experts could be the PE-trainers at the university or NGO who could take a supervising role not only during the time of the training-course but also for later consultation. Supervision is an approach that has proved very useful in other fields of psychology (Davys and Beddoe, 2010). Furthermore, a network of local PE's could be established to work together, exchange, and support each other. Thereby, it would also be possible to co-create further strategies for the PE's.

Last but not least, the competences of the PE's will not only be shaped by the initial training, but are likely to develop further over time and adapt to the needs and the composition of a community. If the PE-concept would prove valuable and should get established, experienced PE's could also train successors to ensure continuity. Thereby, the expertise could stay within the community.

## Potential Toolkit Contents

To facilitate the work of the local PE's, a compilation of easy to use tools could be developed in addition to the training contents. These tools could comprise checklists and short summaries of facilitation and interview techniques (e.g., McFadzien et al., 2005, for a Pacific small island context example). There could be tools for quick-surveys with suggestions for open or closed questions regarding perceptions of marine resources, perceived reasons for environmental change, and perceptions of coping strategies. The tools could further focus on perceptions of responsibilities for environmental change and coping-responsibilities, as well as perceptions of the own role, abilities and perceived behavioral control. Additionally, the toolkit could include suggestions for community-specific stakeholder mapping, mapping of factors impeding and facilitating CBMRM-relevant behavior, and suggestions for summarizing the results in community-meetings. During the training course, the single tools could be introduced, tried out, and practiced between the first and the second training session. As part of a continuous co-creation-process, all tools could also be developed further and enhanced over time to incorporate the input from the communities.

## Putting the PE-Approach to the Test

We are well aware of the fact that the proposed introduction of PE's to CBMRM raises a number of questions that are difficult to assess beforehand. As the introduction into the psychology of perceptions has made clear, perception and its modulators can



be culturally determined, so that one has to wonder whether the training of PE's would have to be so culture-specific as to make it practically infeasible. How exactly can environmental psychologists and others preparing training material for PE's anticipate the particular cultural idiosyncrasies of individual coastal communities? Should PE's be community-members or external professionals? Would the comprehensive and time intensive task of a PE be manageable for a longer time on a voluntary level, and what kind of compensation would be necessary or advisable? And perhaps most importantly, would conflicts arising within communities during the CBMRM process exceed the competence of PE's and potentially put them into a vulnerable position within the community? Some of these questions can only be resolved when the proposal is put to the test.

In order to gauge the efficacy of PE's in CBMRM it would be important to conduct pilot studies in a small number of communities, preferably from varying cultural backgrounds. To that end, it is imperative to carefully design both, the PE programs as well as the method by which they will be evaluated. Here, defining criteria for assessment is key. As we see it, possible indicators of success could be increased participation of various stakeholders in the negotiation process, a better understanding of ongoing environmental changes and management necessities, greater agreement among community members on adequacy of the chosen management measures, greater adherence to decided rules, as well as an overall reduction of conflict. Ultimately, however, the main criterion by which to establish the potential PE's may have for CBMRM would be a better and faster rehabilitation of marine resources.

In all, the PE approach is just one proposal and other ways to work with perceptions are conceivable. Our overall hypothesis is that the explicit inclusion of perceptions would benefit CBMRM-processes. We therefore invite practitioners and scientists to develop and test ways to systematically incorporate environmental psychology expertise on perceptions and behavior to CBMRM endeavors.

## CONCLUSION

Environmental psychology, as the science examining the relationship between human experience, behavior, and environment, provides theoretical and methodological expertise for understanding the role perceptions play for environmental behavior (Steg et al., 2013a). Therefore, the main objective of this paper has been to offer practitioners involved in CBMRM an introduction to the psychology of perception with regards to resource management within local marine communities. As has become apparent, perceptions are important and at work in every stage of the CBMRM process. They guide not only individual behavior, but also group conduct and, in the end, determine the welfare of the ecosystem in question. Stakeholder perceptions are nonetheless often disregarded in management planning, and usually receive attention only when obstacles are encountered. Given the importance perceptions have for resource management, it seems only prudent to make them a central part of the CBMRM process (Jefferson et al., 2015; Bennett, 2016).

As one way to include perceptions in CBMRM endeavors we proposed the introduction of specially trained perception experts (PE's) recruited from the communities as a possible, empirically testable addition to community-based resource management approaches. PE's are to reflect CBMRM-relevant perceptions and related behaviors together with stakeholders, detect misunderstandings, and assure that stakeholders' concerns are being heard and taken seriously in CBMRM processes. Based on the systematic compilation of CBMRM-relevant perceptions, we suggested the development and empirical testing of a training course and a toolkit for local PE's through a cooperation of local universities, NGO's and communities.

The described inclusion of perceptions in existing decision-making processes would build on traditional knowledge, beliefs, and norms, and acknowledge their importance. Decision-making procedures that have emerged over time within communities or cultures would be enriched without changing their fundamental structures. The implementation of PE's or similar approaches to ensure the inclusion of stakeholder perceptions could develop to be a "soft" way of participatory management and empowerment respecting existing and traditional decision-making structures of which Constantino et al. (2012) speak. Such an introduction of process advisors and trained local community facilitators has already proved valuable in other contexts of participatory decision-making like urban and regional planning and development projects (Bulkeley and Mol, 2003; Wongbusarakum et al., 2015).

Going beyond CBMRM, developing a training program with focus on individual perceptions could contribute to local capacity building and is applicable to various contexts. The psychological concepts mentioned here are relevant to human behavior in general, also in the contexts of natural disasters, climate change related hazards, prevention, adaptation, rebuilding efforts, and even for health relevant behavior (Rogers and Prentice-Dunn, 1997; Milne et al., 2000; Grothmann and Patt, 2005; Steg et al., 2013a).

Whenever human beings come together, they act based on their perceptions of the world. When conflicts arise in social situations, reflecting such perceptions, making at least some of them explicit, and taking them seriously can help to address concerns and misunderstandings in a respectful way. This may be a truism; yet, it still is overlooked time and time again during the conceiving and implementation of management plans. Paying greater attention to stakeholder perceptions would be a subtle, yet significant addition to current CBMRM practices and could help give rise to more sustainable futures not by relying solely on scientific data, but equally by emphasizing the way we experience ourselves within our natural and social contexts.

## AUTHOR CONTRIBUTIONS

AB and KB co-developed the initial idea for the manuscript. KB and OP conceived the research, as well as the idea of Perception Experts, and wrote the main manuscript text. KB provided the psychological background of perception. OP supplied the background on phenomenology of perceptions. AB provided background on CBMRM and practical experience with fishing communities. All authors reviewed the manuscript.

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