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A framework for improving the cross-jurisdictional governance of a marine migratory species

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Abstract

Marine migratory species require collaborative decision-making because individuals move across jurisdictional boundaries within and between countries. However, governance of these species is not always harmonized or truly collaborative. We analyzed the *Recovery Plan for Marine Turtles in Australia 2017* (the Plan) and three of its subsidiary plans for evidence of collaborative governance using a two-part gap analysis and interviews with environmental managers, scientists, and other stakeholders involved in the development of the Plan and in managing marine migratory species in Australia more generally. We applied existing adaptive and collaborative governance frameworks, which focused mainly on the social components of collaborative governance, and identified a need for a new, interdisciplinary framework for the collaborative governance of marine turtles in Australia. We applied our new framework to the Plan and identified that while the biological components of the Plan were well-developed, stakeholder analysis and engagement details were largely missing. We recognize that recovery plans are inevitably silent about certain issues but suggest that plans would benefit from including better guidance on stakeholder engagement and analysis. Our framework is directly relevant to harmonizing the management of marine turtles across jurisdictions in Australia but it could also be applied to managing threats towards other migratory species that inhabit large marine jurisdictions.

KEYWORDS

collaborative governance, cross-jurisdictional governance, marine migratory species, threatened species management

1 | INTRODUCTION

Effective natural resource management typically requires collaboration across jurisdictions (within and between countries), adaptability, and the ability to incorporate the latest scientific information for developing and improving indicators for evaluating and adjusting management strategies (e.g., Failing, Gregory, & Higgins, 2013; Olsson, Folke, & Berkes, 2004; Scarlett, 2013), while also responding to the societal drivers of resource decline. Collaborative governance—that is, the processes and arrangements of public decision-making and management across multiple levels of government, public agencies, and the private sector (Emerson, Nabatchi, & Balogh, 2012)—is particularly critical to effectively managing natural resources with large geographical ranges, such as marine fisheries or migratory

species, as large-scale application of adaptive management often cannot be achieved by a single regime (e.g., Berkes, 2009; Meek, Lovecraft, Varjopuro, Dowsley, & Dale, 2011; Morrison, 2017; Olsson et al., 2004, 2006).

Collaborative adaptive management represents a movement from centralized environmental governance towards hybridized forms of adaptive governance in dynamic systems (Lemos & Agrawal, 2006; Plummer, Armitage, & de Loë, 2013) and is a component of an overarching collaborative governance system that lends itself to more adaptive means of managing natural resources across governance levels. Adaptive management is a cyclical process (Figure 1) of employing experimental management strategies and using those results to inform and reform policies and management plans (see Holling, 1978; Stringer et al., 2006). Adaptive management is often applied to large-scale, multifaceted, socio-ecological management problems (e.g., Armitage, Marschke, & Plummer, 2008; Berkes, 2009) because this approach can be more flexible than a predetermined, set management framework (Armitage et al., 2008; Berkes, 2009). The flexible nature of adaptive management allows for the uptake of the latest scientific information to develop appropriate indicators for the evaluation of management strategies and helps promote structured decision-making (Failing et al., 2013; Olsson et al., 2004). The flexibility of adaptive management also aids in the integration of a diverse set of values from an array of stakeholders and stakeholder agencies (Dietz, Ostrom, & Stern, 2003; Failing et al., 2013; Stringer et al., 2006). Adaptation within a polycentric, collaborative governance system is important when managing large-scale environmental problems, such as marine migratory species that face varying threats across their range.

1.1 | Polycentric governance and collaborative governance in threatened species management

Natural resource management regimes are frequently characterized by polycentricity; these systems comprise interactions between multiple, independently-operating governance bodies, involving both state (governments of different nation states; local, state, and national governments within a country) and nonstate actors (nongovernment organizations [NGOs] coordinating community groups and government agencies; Lockwood, 2010; Ostrom, Tiebout, & Warren, 1961; Ostrom, 2012). Such systems can facilitate the adaptive, collaborative governance of resources because they link policy actors and stakeholders across different governance levels. A polycentric approach includes actors operating at the same level of governance (e.g., a municipal government interacting with other municipal governments) and actors operating at different governance levels (e.g., a municipal government interacting with a national government; see

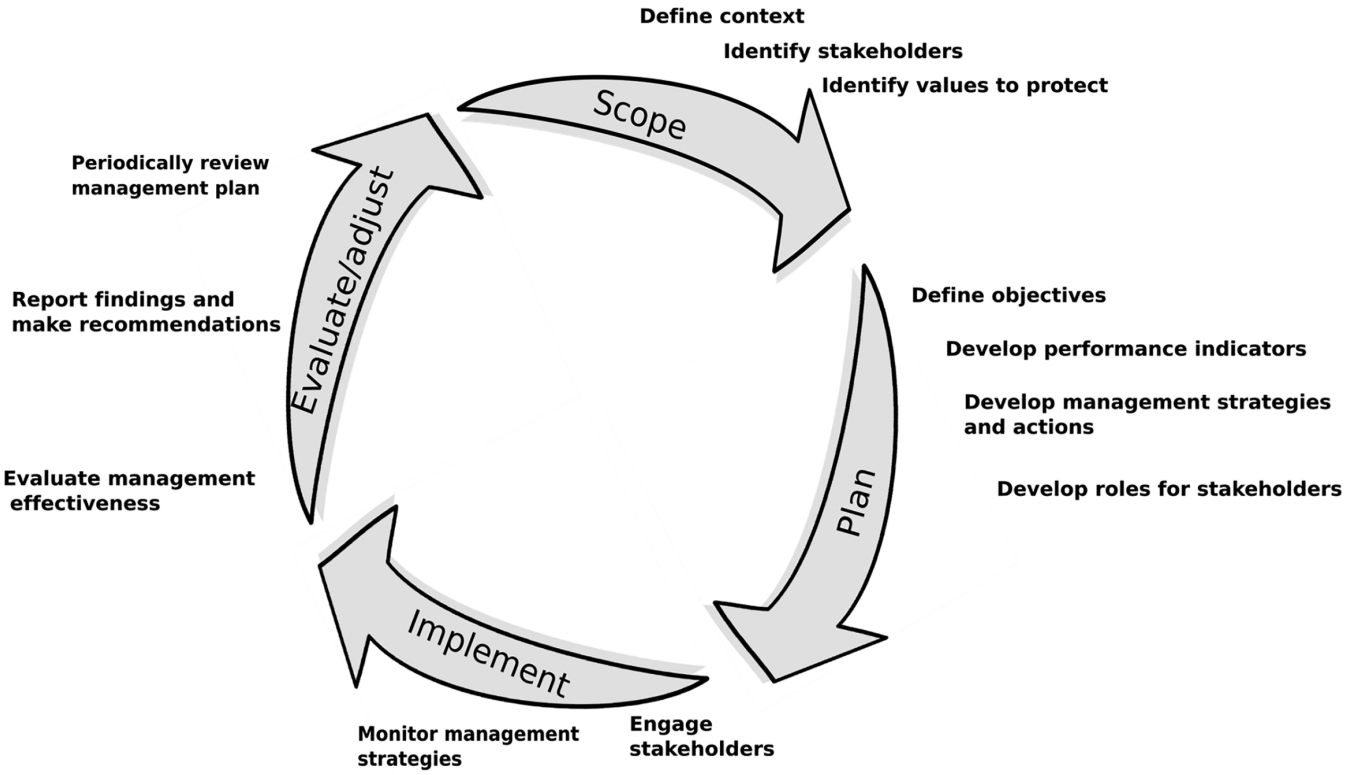

FIGURE 1 The adaptive management cycle used in natural resource management (Adapted from Jones 2005, 2009; Hockings et al., 2006; Williams, 2011)

Armitage et al., 2008; Termeer, Dewulf, & van Lieshout, 2010; Young, 2002). At an international level, management of some threatened marine migratory species protected under the convention on the conservation of migratory species (CMS) facilitates collaboration between range states, thus inevitably encompassing a broader range of stakeholders than single-state management regimes. The memorandums of understanding for marine turtles and dugongs are evidence of such polycentrism (e.g., Dugongs, 2019; IOSEA Marine Turtles MoU, 2019).

Stakeholders in natural resource governance include all individuals who influence or are affected by a natural resource governance issue (Freeman, 1984; Prell, Hubacek, & Reed, 2009). Stakeholders can be grouped in diverse, interest-based "stakeholder agencies" for governance purposes (Prell et al., 2009), as in this paper. The early involvement of diverse stakeholder agencies at a variety of levels is beneficial to the effective governance of complex ecological problems (Lebel, Anderies, Campbell, Folke, & Hatfield-Dodds, 2006; Plummer et al., 2013), as stakeholder involvement may mean that natural resource managers are better able to capture a diverse set of values and management concerns, and better "match" the scale of governance interventions to the scale of the problem (Benham, 2017; Dietz et al., 2003; Folke, Hahn, Olsson, & Norberg, 2005).

In Australia, many environmental governance decisions, including the governance of threats towards marine migratory species, are large-scale due to the sheer size of Australia's land (~7.7 million km^2; sixth largest country) and marine jurisdictions (~10 million km^2; third largest marine jurisdiction; Geoscience Australia, 2019). The movements of marine migratory species are not constrained by political or jurisdictional boundaries (Boersma & Parrish, 1999; Hooker & Gerber, 2004). As such, they may move between protected and nonprotected waters on their migrations (Lascelles et al., 2014; Pendoley, Schofield, Whittock, Ierodiaconou, & Hays, 2014), making it difficult to manage threats appropriately (Miller, Marsh, Cottrell, & Hamann, 2018). Thus, meaningful, cross-scale stakeholder engagement would benefit the overall environmental governance system protecting marine migratory species in Australia.

In Australia, the *EPBC Act 1999* (Australian Government, 1999) stipulates a mandatory public consultation period of 90 days when drafting or amending management plans (e.g., recovery, threat abatement, or wildlife conservation plans). Consultation is a passive, and often tokenistic, means of engaging stakeholders, compared with collaboration (Arnstein, 1969; Reed et al., 2009; Rowe & Frewer, 2000). Collaboration promotes the active exchange of ideas between multiple groups of stakeholders (Reed et al., 2009; Rowe & Frewer, 2000). Including multiple stakeholder agencies and accurately capturing stakeholder viewpoints requires a structured approach to decision-making, incorporating both science and values into the management framework (Failing et al., 2013; Gregory et al., 2012), while maintaining the ability to reorganize the system in a dynamic environment (de Loë, Armitage, Plummer, Davidson, & Moraru, 2009; Plummer et al., 2013). Structured decision-making also promotes collaborative governance by involving multiple actors, including external stakeholder groups, in decision-making (Ansell & Gash, 2008; Benham & Hussey, 2018; Dietz et al., 2003; Rijke et al., 2012).

1.2 | Purpose of this paper

Managing marine migratory species should involve harmonized, multijurisdictional collaborative decision-making processes that incorporate both biological and social values for mitigating threats towards species across their range (Meek et al., 2011; Miller et al., 2018). Several management frameworks exist for collaboratively addressing cross-scale environmental management issues in social-ecological systems (e.g., Folke et al., 2005; Garmestani & Benson, 2013; Jones, 2005; Jones, 2009; Williams, 2011). We considered several of these existing frameworks and found that they emphasized the social components over the biological components of natural resource governance. Additionally, existing frameworks were not designed for cross-scale collaboration at the scale needed to collaboratively and adaptively manage threats towards marine migratory species across their range.

In this paper, we draw on an analysis of interagency relationships, including state and nonstate stakeholder agencies, to develop and apply an interdisciplinary framework that can be used for the cross-jurisdictional management of threats towards a marine migratory species. We assessed existing management arrangements against key indicators of collaborative governance (Table 1) and in doing so, identified a need for a more comprehensive framework for assessing threat management plans and harmonizing threat management for marine migratory species across multiple jurisdictions. Because marine turtles move across jurisdictional boundaries (e.g., local, state, national, international) and face varying threats across their range, we developed a framework that encompasses critical components of adaptive management (as illustrated in Figure 1), collaborative governance (Table 1), and important ecological considerations (illustrated in Figure 2; Table S1 in Supporting Information). Our framework builds on existing frameworks by integrating social and ecological influences at the scale needed to manage marine migratory species and provides a model for the transdisciplinary analysis of conservation plans.

2 | METHODS

We collected and analyzed data using an adaptive theory approach (Layder, 1998), through document analysis and

TABLE 1 The key components of collaborative governance (adapted from Donahue, 2004; Bouwen & Taillieu, 2004; Emerson et al., 2012) used to analyses the *Recovery Plan for Marine Turtles in Australia 2017*

Key components of collaborative governance	
Component	**Description**
Describe the focus and scope of the collaboration	Describe and identify the focus (including shared motivation), objectives, management strategies and performance indicators of the collaboration
Presence of steering group(s)	Identify a group that will lead the collaboration and connect stakeholders at different governance levels
Describe the system's "architecture"	Outline the legal and economic frameworks under which the collaboration operates; identify any potential conflicts or issues that may arise and solutions for those issues; structure the system's information flow; describe resourcing
Stakeholder analysis and engagement	Identify values of participating stakeholder agencies; deliberately engage (e.g., face-to-face or public meetings) stakeholder agencies (incl. at minimum one public and one private agency) and assign specific roles or tasks to each stakeholder group
Assess and adjust the collaboration	Periodically evaluate the collaboration's outputs (what was created) and outcomes (what was achieved); discuss evaluation with collaborating stakeholder agencies; adjust focus and scope, structure, and/or stakeholder roles as necessary

carefully selected case studies. Marine turtles make an ideal case study of collaborative natural resource governance because their threatened status, iconic nature, migratory life cycle, and large area of occupancy increase the likelihood that a diverse number of stakeholder agencies from their range states will be concerned about their management. We focused on three genetically distinct stocks (synonymous with populations) of marine turtles, all of which are protected in Australia: the south-west Pacific stock of loggerhead turtles (*Caretta caretta*), the Northern Great Barrier Reef (GBR) stock of green turtles (*Chelonia mydas*), and the North Queensland (Qld) stock of hawksbill turtles (*Eretmochelys imbricata*). We chose these stocks of marine turtles because they are data-rich, have ranges that span multiple jurisdictions (e.g., state, national, and international), and are populations of conservation concern (see Supporting Information for detailed descriptions of the plans). Distribution, threats, and management actions for each stock are detailed in the *Recovery Plan for Marine Turtles in Australia 2017* (henceforward, the Plan; Commonwealth of Australia, 2017a). We have chosen to use the Plan in the application of our interdisciplinary framework because it is comprehensive, includes biological components of marine turtle management, as well as components of collaborative and adaptive governance.

2.1 | Threatened species management in Australia

Threatened species recovery planning under the Australian *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* (Australian Government, 1999), Australia's key piece of environmental legislation, includes the development, adoption, and/or implementation of a recovery plan or a conservation advice for a listed threatened species or threatened ecological community by the federal Minister for the Environment (*EPBC Act 1999*: Australian Government, 1999). Recovery plans identify research and management activities required to stop the decline, and support the recovery of, species or ecological communities listed as threatened (excluding species/ecological communities listed as conservation dependent or extinct; *EPBC Act 1999*; Australian Government, 1999). Recovery plans are strong conservation tools. They contain elements of both policy documents (in that they constrain a Minister) and management plans (they provide a detailed plan for managing threats). Additionally, recovery plans have greater requirements for public consultation than other statutory recovery instruments for threatened species, such as conservation advices. Consultation can be run by a Commonwealth Government Agency or by the relevant state/territory involved in codeveloping the recovery plan (Section 275 of the *EPBC Act 1999*; Australian Government, 1999).

2.2 | Assumption and gap-analysis

We used a document analysis to conduct a two-part gap analysis seeking evidence for existing adaptive and collaborative governance frameworks in the Plan and its components.. We assumed that collaborating stakeholder agencies shared the goal of minimizing anthropogenic threats to the six species of marine turtles found in Australia, while supporting the recovery of these species to maximize their long-term survival (*EPBC Act 1999*: Australian Government, 1999; Commonwealth of Australia, 2017a). This assumption is based on the definition of a recovery plan under the *EPBC Act 1999* and on the long-term objective detailed in the Plan. We analyzed the Plan and three individual genetic stock plans contained within it (collectively referred to as the Plans) for the presence or absence of the key components of collaborative governance using an adaptation of existing frameworks (Table 1). It is important to

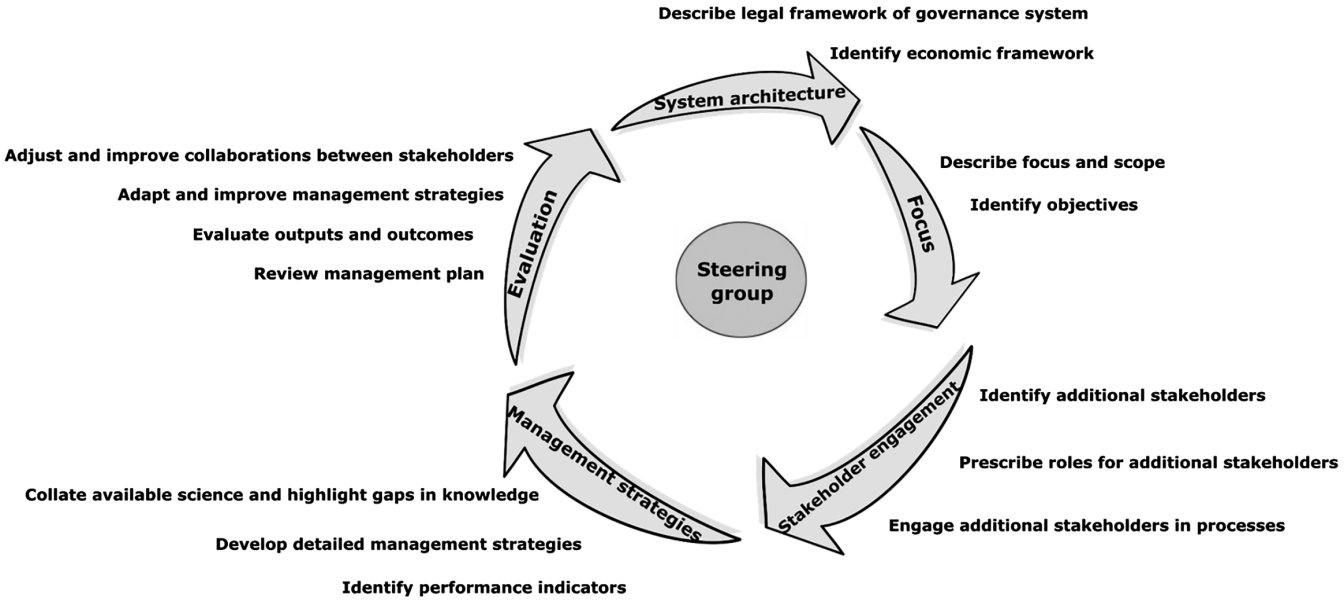

FIGURE 2 Key components of our new, interdisciplinary framework for the collaborative governance of a marine migratory species (see Table S1 in Supplementary Material for full framework). This framework was adapted from existing collaborative governance frameworks (Donahue, 2004; Bouwen & Taillieu, 2004; Emerson et al., 2012; Table 1) and informed by qualitative interviews with key stakeholders involved in the development of the *Recovery Plan for Marine Turtles in Australia 2017* and/or involved in the policy and management of marine migratory species. Management strategies include coordinated monitoring across jurisdictions

note that these stock plans are components of the overall Plan and are not recovery plans per se.

We then applied our new framework (Figure 2; Table S1 in Supporting Information) to the plans. We first analyzed each plan for explicit (plainly written and identifiable) statements (Miller et al., 2018; Ortega-Argueta, Baxter, & Hockings, 2011) describing collaborative governance. We then expanded our analysis to include implicit components based on interview responses from respondents who helped with the development of the Plan. We considered collaborative governance components to be implicit if their presence could be implied by the context of the Plan. To complement and expand on our analyses for application to other marine migratory species, we also conducted interviews ($n = 38$) with stakeholders involved in the policy and management of marine migratory species in Australia. These stakeholders included representatives from federal (3) and state/territory government agencies (10), industry representatives (6), NGOs (13), and independent researchers (e.g., scientists; 6) who study migratory species or environmental governance.

2.3 | Development and application of the new interdisciplinary, cross-jurisdictional collaborative governance framework

We supplemented data from the document analysis with the qualitative interviews we conducted with the Plan developers ($n = 5$; individuals from the Australian Government Department of Environment and Energy, the Great Barrier Reef Marine Park Authority, state and territory governments, and independent sea turtle biologists). We used these data to inform and develop a robust, interdisciplinary framework to improve cross-jurisdictional collaboration when managing threats towards a marine migratory species.

3 | RESULTS

We identified several characteristics of effective collaborative governance in the existing governance structures for marine turtles, and other migratory species, in Australia. For conciseness, we present the key findings from our analysis using the key components of interdisciplinary, collaborative governance of a marine migratory species from our new framework (Figure 2; Table 2; see Table S2 in Supporting Information for complete analysis).

3.1 | System architecture

The Plan is an overarching, federal policy document that is implemented by various jurisdictions and differing stakeholder agencies. The legal framework for managing marine turtles in Australia is explicitly included in the overall Plan and the stock plan for the south-west Pacific stock of loggerheads, including the international, national, and state legislation under which the Plan operates (Table 2; Table S2 in Supporting Information). However, relationships to legislation from New South Wales (NSW) and Qld, the states that

TABLE 2 The key results from our analysis of *The Recovery Plan for Marine Turtles in Australia 2017* (the Plan) and its embedded stock plans for south-west Pacific loggerheads (SWP loggerheads), Northern GBR green turtles (NGBR greens), and North Queensland hawksbill turtles (NQ hawksbills)

Essential governance component	The Plan	Stock: SWP loggerheads	Stock: NGBR greens	Stock: NQ hawksbills
System architecture				
• Clearly identifies the legal framework it operates under?				
• Clearly identifies the economic framework (including resourcing)?				
Steering group identified				
Focus and scope				
• Includes a clear and detailed focus and scope?				
• Includes objectives?				
These objectives are:				
– Specific				
– Measurable				
– Achievable				
– Relevant				
– Time bound?				
Stakeholder analysis and engagement				
• Describes how stakeholder agencies are engaged in the implementation and development processes?				
• Identifies specific roles assigned to additional stakeholder agencies?				
Develop and implement management strategies				
• Collate best available science and highlight gaps in knowledge?				
• Includes detailed management strategies?				
Management strategies are:				
– Supported by and inclusive of best practice science?				
Evaluation and adjustment				
• Identifies the capacity to evaluate outputs and outcomes?				
• Describes how collaborating stakeholder agencies will be involved in adjusting management strategies?				
• Identifies the capacity to adapt and improve management strategies?				
• Identifies the capacity to adjust and improve collaborations with key stakeholder agencies?				

Note. For a detailed analysis, see Table S2 in Supporting Information. Darkly shaded boxes indicate the explicit inclusion of a framework component, lightly shaded boxes indicate implicit inclusion of a component, and white boxes indicate the absence of that component.

were codevelopers of the Plan, were not explicitly detailed other than in the table that lists the status of each species in the states (Table 4 on page 10 of Commonwealth of Australia, 2017a). Plan developers advised that the Plan was made only with Ministers from NSW and Qld because although the other key range jurisdictions within Australia, Western Australia and the Northern Territory, were "extremely supportive of the Plan, they did not have the

legislative ability to make the Plan at a state level.[1]" It was considered to be a favorable outcome to have the Qld government's agreement to codevelop the plan because there is no mandate in Qld legislation for recovery planning (respondent: federal government agency; *Nature Conservation Act 1992*). Some respondents suggested that for migratory species, "harmonizing the states would also be beneficial" (respondent: state government agency) and that "these legislations that are [protecting] migratory species need to come from [the] federal level" (respondent: state government agency).

None of the plans include a budget for the implementation of management strategies. Respondents who assisted in developing the Plan expressed concern about this lack of information on the funding required for recovery. One respondent stated "I know what programs I should be running to address some of these issues. My issue is I have no funding to do that. (…) It's a Commonwealth priority, but turtles have never come with a lot of money.[2]" Section 5.2 of the Plan states that resourcing is a component of "core government business" (at state/territory and national levels) and that it is not practical to predict actual costs of implementing the actions outlined in the Plan. A respondent suggested that "(…) the government holds that up as they're being effective, and they're delivering on expectations and the Act, but technically, they actually are for that example [the Plan], but it's the funding and the support that isn't provided to those plans" (respondent: environmental NGO). This lack of financial framing was viewed as a major weakness of the recovery planning process and of threatened species protection as a whole in Australia (see Parliament of Australia, 2019): "recovery plans are (…) pretty much on the shelf because they're never [or not often] funded or not adequately funded. (…) Not to say that the frameworks aren't there or in place, they're just not used or funded. Therefore, not effective" (respondent: environmental NGO). Some respondents suggested that a lack of funding for environmental governance concerns, including marine migratory species, is because "conservation in general is a lower priority [than other public policy concerns] of both states and Commonwealth governments" (respondent: environmental NGO).

3.2 | Steering group formation

Steering groups were identified for each of the three genetic stock plans (e.g., the Queensland government is the steering group for managing the south-west Pacific stock of loggerheads), but not the overall Plan (Table 2; Table S2 in Supporting Information). The overall Plan lists states and territories as the responsible parties for on-ground implementation (see section 4.3 of the Plan for more information). One respondent who assisted in the development of the Plan indicated that having states and territories as the primary implementers of the Plan was a downside, stating that there is "an expectation the relative jurisdictions and the states and the territories will then have the means to implement [actions within] them [recovery plans] to drive the actions in the field." However, another stated, "(…) there are some very obvious actions and objectives identified that the Commonwealth itself can take the lead on," indicating that the Commonwealth Government is an implicit steering group in some cases. Steering groups for managing marine migratory species are not limited to the Commonwealth Government in Australia and can come from any stakeholder agency, such as "an environmental NGO that is particularly concerned about an individual species" (respondent: federal agency) and has the capacity to work across jurisdictional boundaries, especially international.

3.3 | Focus and scope

The focus and scope of the overall *Recovery Plan for Marine Turtles in Australia 2017* (the Plan) is clearly defined. Many Commonwealth documents pertaining to environmental governance have an umbrella role, as indicated by a respondent from a state government, who stated "(…) Commonwealth documents are (…) that umbrella which pulls it all together." The Commonwealth Government has taken a similar approach for other marine migratory species, such as whales, by developing documents like the Australian National Guidelines for Whale and Dolphin Watching 2017. Several respondents identified the umbrella approach as a strength of the Plan, with some respondents saying "it's ultimately just a guide for everyone to attach their programs to and to hope that we're all working in the same direction" and "(…) in articulating those priorities, it also gave them [states and territories] a basis to defend ongoing work." However, many of the objectives in the Plan are high-level objectives. As currently worded, the objectives are difficult to quantify and progress against them is not explicitly measurable. Developers of the Plan stated that progress is implicitly measurable "if you can actually prove that you've (…) reduced the anthropogenic threats" and that "the measure of success for each stock provides the context of what could be achieved for the stock within the life of the Plan. These [objectives] are generally specific, measurable, achievable, relevant and time bound." Having "certain goals and objectives that we have to achieve that are measurable, or SMART" is not limited to legislative documents, but are also "(…) important for our [environmental NGO] conservational planning" across other stakeholder agencies.

3.4 | Incorporation of best available information

One of the strengths of the reviewed plans was the use of best practice science based on available peer-reviewed literature and/or expert opinion in developing detailed management strategies (outlined in "priority actions specifically required to recover this stock"). Action Areas 4 and 8, for example, protect habitats critical to survival (as identified by marine turtle experts during a 2016 workshop) for each genetic stock. Multiple respondents involved in the Plan's development stated that there was an improvement in the incorporation of science into this Plan and praised the use of genetic stocks as its basis. One respondent from a territory government stated, "I think an important difference [from the previous recovery plan adopted in 2003] is that the more recent genetic science that we have has allowed for the structure of this report, or the recovery plan, to be based around stocks." Additionally, "not all turtles move around and share the same region, there [are] specific genetic isolation areas that we can manage" (respondent from a territory government). A respondent from a federal government agency emphasized the importance of best practice science for all environmental policies and management actions, stating "So, for us, we rely very strongly on the findings of research, (…) getting access to information early, taking the findings of research and putting that into policy." As stated by a respondent, "decisions and policy directions need to be based on something, whether they are just community view or whether they are based on something that is known, a fact or a belief [such as science]," indicating that science plays an important, but not the only, role in environmental governance.

3.5 | Stakeholder analysis and engagement

None of the plans explicitly indicated how stakeholders were engaged during plan development, nor how stakeholders would be engaged during implementation (Table 2; Table S2 in Supporting Information). Developers of the Plan indicated that consultation workshops were held with some Indigenous groups during the development of the Plan in addition to the 90-day public comment period required by the *EPBC Act 1999*. A respondent from a federal government agency described the difficulties of stakeholder engagement, stating:

> Sometimes our processes simply don't match up with everybody's idea of how you should do consultation. People feel sometimes that there is almost a view that there needs to be a program of over-consultation. And sometimes, we simply can't accommodate that. And so, depending on the situation, there's going to be a bunch of things there that influence whether or not you can effectively consult with groups.

Some respondents involved in the Plan's development suggested that "(…) there [are] probably better ways that it could maybe be more accessible to community groups and how they might be able to see 'what can we do, there's a recovery plan, but what can we actually do?" A suggestion to make the plan more accessible was "if (…) there was a summary sheet (…) attached to it that could be provided to community groups or ranger groups that could help them understand [what they could do]." While there were no clear roles for stakeholders included in any of the plans, Plan developers stated that the Plan highlights current work that the states and territories are doing, and also "gives them shape and direction and (…) gives an understanding for someone coming in from an external point of view to understand what we're all trying to achieve with regards to turtles."

In 2018, Commonwealth, state, and territory management and regulatory agencies met for an Australian Marine Turtle Government Round Table to discuss what roles these agencies (tasked with marine turtle recovery activities in Australia) could take in implementing the Plan (pers. comm. Department of Environment and Energy). This Round Table helped agencies to "look outside and to see who else needed support in their management of marine turtles and to question whether there might be some issues that require different stakeholders to be brought together." Several respondents suggested that these Round Tables would be beneficial for managing other migratory species, stating, "those [round tables] are really good think tanks" (respondent: state government agency), and: "(…) a way to check in with each other, (…) consolidate what's happening in the state, and bring it together and report it to others" (respondent: state government agency). However, there is currently not a system in place (e.g., a website or blog) to easily share documents or experiences between participating stakeholder agencies.

3.6 | Capacity for evaluation and adjustment

The overall Plan also encompasses the components of evaluation and adjustment of the management strategies, a key component of adaptive management (Figures 1 and 2; Table S2 Supporting Information). Plan developers emphasized the importance of having an adaptive recovery plan, stating "the way that data improves and science is developing at the moment (…) that's something important (…) that it's not enshrined in this document that remains static because things are quite dynamic" and "we don't constrain ourselves to something we know now. It could change dramatically." A respondent from a state government emphasized the need for adaptability when discussing the

threat of climate change to other marine migratory species, stating:

> Now, if we're only retrospectively, through our legislation and through our planning approvals, (…) applying rules, it doesn't allow migratory species, which are before our eyes adapting to climate change, if we can't factor that into our future planning, then that's a real problem.

Similarly to the silence on some aspects of stakeholder engagement and analysis, none of the plans detailed the involvement of collaborators in the adjustments of management strategies or identified ways to evaluate and improve collaborative relationships throughout the life of the Plan, such as a central website or a blog.

4 | DISCUSSION

Governance of marine migratory species occurs within a polycentric system because these species move across jurisdictional boundaries and their management involves multiple state and nonstate actors. However, this does not mean that governance arrangements are necessarily harmonized. Marine turtles in Australia provide a good case study for collaborative governance because they highlight strengths and weaknesses in a relatively well-developed natural resource governance regime. Policy instruments protecting marine migratory species in Australia are rarely explicitly connected to other governance levels (Miller et al., 2018), but harmonization and collaboration may be achieved through the actions of a multijurisdictional steering group comprised of diverse stakeholder agencies (Figure 2). While an "umbrella" plan, like the *Recovery Plan for Marine Turtles in Australia 2017* (Commonwealth of Australia, 2017a), can be beneficial, a distinct steering group (or recovery team) may improve the effectiveness and delivery of the plan (Figure 2; Commonwealth of Australia, 2017b).

Collaborative governance is viewed as a move away from centralized environmental governance towards more adaptive forms of governance within a polycentric system (Lemos & Agrawal, 2006; Plummer et al., 2013). Steering groups are a form of clear leadership and are important in connecting different governance levels and stakeholder groups (Figure 2; Folke et al., 2005; Garmestani & Benson, 2013; Schuett, Selin, & Carr, 2001), particularly where there are weaknesses in formal legislation. Additionally, representative steering groups are a recognition of the polycentricity of the governance system surrounding marine migratory species. The members of the Australian Marine Turtle Government Round Tables currently implicitly serve as a steering group for activities related to the *Recovery Plan for Marine Turtles in Australia 2017* (Commonwealth of Australia, 2017a), as there is no Marine Turtle Recovery Team in Australia (pers. comm. Department of Environment and Energy). The first Round Table brought together representatives of multiple federal, state, and territory government agencies, who discussed the implementation of the Plan and identified "Hot Topic" issues (e.g., National Light Pollution Guidelines) stemming from the Plan (pers. comm. Department of Environment and Energy) and increasing collaboration. Such a steering group could serve as a link for some components of collaborative governance by clarifying the focus and scope of management tools and conducting further stakeholder analysis and engagement (Figure 2).

To be effective, a steering group should be assembled early in the planning process and should include key nongovernment stakeholder agencies (Bouwen & Taillieu, 2004). Expanding the membership of the Round Tables to include nongovernment stakeholders could strengthen its role as a steering group. Nongovernment groups are not subjected to the same jurisdictional constraints as state and federal governments and may have more capacity to influence policy (Carlisle & Gruby, 2018; Heikkila & Weible, 2018).

Nongovernment steering groups may be both expertise and representative-based, increasing the number of stakeholders represented in management actions (e.g., Advisory Committee and Scientific Panel of the Northwest Shelf Flatback Turtle Conservation Program). Greater representation of stakeholders, including industry and other NGOs early on in the planning process, would improve collaboration and coordination between groups and jurisdictions, and increase the quality of plans (Brody, 2003; Hawke, 2009).

In Australia, Traditional Owners are deeply involved in managing marine turtles (particularly green turtles in Northern Australia; e.g., Jackson et al., 2015; Kennett, Munungurritj, & Yunupingu, 2004; Kennett et al., 2004), where they are considered cultural keystone species (Butler, Tawake, Skewes, Tawake, & McGrath, 2012). Some Traditional Owner groups have co-ownership over the land and sea as a result of successful Native Title claims. Co-ownership of sea occurs in some important marine turtle feeding areas (e.g., the Torres Strait Native Title sea claim; *Akiba on behalf of the Torres Strait Islanders of the Regional Seas Claim Group v State of Queensland*, 2010*; Akiba on behalf of the Torres Strait Regional Seas Claim Group v Commonwealth of Australia*, 2013*;* Kennett, Jackson, Morrison, & Kitchens, 2010). Further, Traditional Owners have sole ownership over some important marine turtle nesting habitats (e.g., Traditional Owners have sole ownership of the intertidal zone of Blue Mud Bay in the Northern Territory; *Gawarrin Gumana & Ors vs Northern Territory*, 2007). As a result, engagement processes should explicitly include Traditional Owners as a key stakeholder group. Traditional Owners may be limited by

their capacity to attend meetings and discussions (pers. comm. independent researcher [Torres Strait Islander]; e.g., Jackson, Tan, Mooney, Hoverman, & White, 2012), so support (e.g., financial, technical) should be provided to increase the capacity of Traditional Owners to contribute effectively to management efforts (Dale, George, Hill, & Fraser, 2016; Jackson et al., 2012).

Experts, both in biology and/or environmental governance from nonaligned institutions such as universities or research agencies, may take the role of a facilitator or independent chair, allowing for all invited stakeholder agencies to participate and lead towards a more decentralized form of governance (Bouwen & Taillieu, 2004). Further, including scientific experts in a steering group can catalyze the adaptation and adjustment of the collaborative governance regime as more scientific information becomes available.

Evaluation and adjustment of management approaches are essential components of both adaptive (Figures 1 and 2) and collaborative governance (e.g., Figure 2; Armitage et al., 2008; Evans, Brown, & Allison, 2011). It is important to adjust management strategies to address new problems or to improve current management actions, particularly as new science becomes available (McDonald et al., 2015). Adaptation is important when managing marine migratory species, particularly in the face of large-scale threats such as climate change. Migratory species will benefit from more research into how their biology and life history are affected by climate change (e.g., feminization of marine turtles (e.g., Jensen et al., 2018); food supplies of whales feeding in Antarctic (e.g., Nicol, Worby, & Leaper, 2008)), as well as how to best manage these species in new locations as their ranges expand (e.g., Pecl et al., 2017). These large-scale threats also highlight the need for cooperative, coordinated monitoring to provide the evidence base for adapting management strategies as data become available (Hawke, 2009).

The adaptability of management strategies can also be constrained by the information of the evidence available to them and the standard of that evidence (Ortega-Argueta et al., 2011).The application of evidence to policy is limited by the information accessible to policy makers and its perceived management relevance (e.g., Cvitanovic et al., 2015; Cvitanovic, McDonald, & Hobday, 2016; Fazey, Fischer, & Lindenmayer, 2005). If the information available for decision-making is inappropriately used in policy decisions, it can lead to inequitable and/or inappropriate decisions (e.g., Charnley et al., 2017; Hockings & Myers 1994; Ryder, Tomlinson, Gawne, & Likens, 2010). The best-available science, including social science, should be published in the peer-reviewed literature. In the case of marine turtles in Australia, expert opinion had to be used to identify the threats to several of the genetic stocks and subsequent management actions, as required data are not yet in the peer-reviewed literature (pers. comm. Department of Environment and Energy; Commonwealth of Australia, 2017a). One issue for a stock-based Plan is that while biological data are often published at a stock level, data on threats are often aggregated at species level, or in the case of bycatch, species are not always identified (Riskas, Fuentes, & Hamann, 2016), highlighting gaps in threat mitigation for threatened species. Further, development of science-based policy and management is a process that may be overtaken by political practicalities and competing interests (Tear et al., 2005), often favoring the interests of more powerful stakeholder agencies (e.g., Epstein et al., 2015; Kumar, 2002).

Environmental objectives often compete for resources with areas of public policy with more influence (Tear et al., 2005), limiting the funding available for environmental management. Australia underfunds biodiversity conservation relative to other developed and developing nations (Threatened Species Scientific Committee, 2018; Waldron et al., 2013, 2017). A key concern about recovery planning and threatened species management in Australia is the limited funding for making and supporting recovery plans (e.g., Hawke, 2009; McDonald et al., 2015; Walsh, Watson, Bottrill, Joseph, & Possingham, 2012; see also Parliament of Australia, 2019). The Plan is meant to serve as a mechanism for directing funding to management actions by the states and territories (pers. comm. federal government respondent; McDonald et al., 2015), but making the Plan did not guarantee the financial support required to implement it. Western Australia has established funding for their North West Shelf Flatback Turtle Conservation Program through the use of environmental offsets funded by industry (Department of Biodiversity, Conservation, and Attractions, 2017), rather than relying on funding from state or federal agencies. Resource deficits not only hinder the implementation of management strategies and recovery of threatened species (Hawke, 2009; McDonald et al., 2015), but also affect how stakeholders are engaged in the recovery process (pers. comm. federal government respondent; Reed, 2008).

Stakeholder engagement is a critical component of any adaptive or collaborative governance program (e.g., Figures 1 and 2; Ansell & Gash, 2008; de Loë et al., 2009; Reed et al., 2009). The *Recovery Plan for Marine Turtles in Australia 2017* (Commonwealth of Australia, 2017a) met the legal requirements under the *EPBC Act 1999* for stakeholder consultation for a recovery plan. The introduction of the Plan states that the objectives of the previous plan for marine turtles were largely met, including communication with stakeholders, with the important exception of threat mitigation (Commonwealth of Australia, 2017a). However, even if previous versions of the recovery plan successfully engaged stakeholders, ongoing engagement is critical. As explained above, the respondents involved in the Plan's

development were primarily government officials and sea turtle biologists. All other groups were consulted rather than engaged in the planning process. The Plan was written to align with the policies of state and territory government agencies (pers. comm. federal government respondent) and the meaning of the text may be opaque to many nongovernment groups. Interested parties external to government must familiarize themselves with the Plan in order to understand what actions need to be done (pers. comm. federal government respondent). Some community groups or nongovernment stakeholder agencies do not understand the intricacies of engaging in the policy process (including the limitations of specific legislation), making it difficult for some groups to participate effectively in management actions. Additionally, at large scale scales, there is often little information sharing between different stakeholder agencies and governance bodies end up operating independently of one another (Dale, Vella, & Potts, 2013; Potts, Vella, Dale, & Sipe, 2016; Weiss, Hamann, Kinney, & Marsh, 2012). As such, stakeholder agencies may not know what other stakeholder agencies in the governance system to implement management strategies. A truly collaborative management system for marine migratory species needs to engage different stakeholder agencies throughout the management process, including representation on recovery teams (and steering groups) and implementation at later stages of the plan (e.g., Commonwealth of Australia, 2017b).

Clear roles for stakeholders or agencies help to determine roles and responsibilities, clearly assign accountability for environmental decisions and consequences, and build consistency and continuity into management actions, including monitoring (de Loë et al., 2009; Garmestani & Benson, 2013; Hawke, 2009). Stakeholder roles could be determined in the planning stage using the steering group, allowing for organizational structures to be reworked for delegating responsibilities to different agencies between governance scales (Garmestani & Benson, 2013). In the United States, some recovery plans describe some of the roles for stakeholders, identifying the agencies responsible for funding and implementing specific actions (e.g., *Recovery Plan for U.S. Pacific Populations of the Green Turtle*). In Australia, an Intergovernmental Memorandum of Understanding, much like the Common Assessment Method for harmonizing the management of threatened species, would need to be introduced at the state and territories level to facilitate complementary management of marine migratory species (pers. comm. Department of Environment and Energy).

For nongovernment or community stakeholder agencies, coordinated monitoring programs across jurisdictions (including citizen science) can increase stakeholder participation and provide new data about these migratory species throughout their range (Wintle, 2018). Stakeholder agencies may also become involved through a central data (or metadata) repository (e.g., national reporting framework for recovery team progress) or by identifying a central steering group to coordinate monitoring approaches in order to improve the management of threats towards marine migratory species as they cross jurisdictions. Explicitly outlining potential roles for different stakeholder groups is a robust way of helping groups become involved in accordance with their values and motivations for protecting marine migratory species.

5 | CONCLUSIONS

In this research, we drew on an existing, comprehensive framework to identify ways to harmonies the collaborative governance of a marine migratory species through a case study analysis of the *Recovery Plan for Marine Turtles in Australia 2017* (Commonwealth of Australia, 2017a) and its embedded stock plans for the south-west Pacific stock of loggerhead turtles, the Northern GBR stock of green turtles, and the North Qld stock of hawksbill. We used the results of our analyses to develop an overarching, interdisciplinary framework for managing a marine migratory species (or a group of species as in this study; Figure 2) that goes beyond biological components for managing marine turtles to include stakeholder analysis and engagement components that were largely missing from all four marine turtle plans we examined. This research was not intended to evaluate the Plan as a document. Rather, we considered it as part of the evidence we evaluated of the process defined under the *EPBC Act 1999* and used to develop the Plan. Our framework should be used to guide multiple stakeholder agencies, including state and nonstate agencies, in the initial planning stages (e.g., in the form of a steering group) for managing threats against a marine migratory species, setting appropriate priorities and targets (including biological and social targets), and for designating stakeholder roles for the implementation of the plan. Our framework would also be appropriately used to review and adjust existing management plans for a migratory species or for providing guidance for downscaling large, "umbrella" plans to make implementation of management strategies easier to understand for nongovernment stakeholders.

Our findings identify the need for a more comprehensive approach to stakeholder engagement for future, effective, transboundary collaborative governance of marine migratory species. Internationally, working groups under the CMS for threatened marine migratory species, such as the Sharks MOU Conservation Working Group, are comprised of a range of stakeholders, including academics, government, and nongovernment representatives. We recommend that key stakeholders are represented on all conservation planning committees, that future management plans are

effectively scoped to cover threats that require collaboration (e.g., entanglement of a migrating whale in fishing gear), and that future plans provide more explicit guidance for different stakeholder agencies wishing to participate in the implementation of a plan, irrespective of whether the Plan is a national or international instrument. One important component of managing marine migratory species, and a potential starting point for increased collaborations, is the coordinated monitoring of species throughout their range (Hansen et al., 2018). Improved informal collaborations through coordinated monitoring may then lead to more formalized collaborations reflected in policy instruments. Codifying the guidelines for the biological and social components of collaboratively managing marine migratory species may be the first step towards such harmonization and aid in the effective collaborative governance and recovery of marine migratory species.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Study design was conceived by all coauthors. R.L.M. collected and analyzed the data with contributions from all coauthors in interpreting the data. R.L.M. led the writing of the manuscript; all authors contributed original ideas, text, and references to the manuscript. All authors reviewed, edited, and approved the final manuscript.

DATA ACCESSIBILITY

Due to the possible sensitivity of human subjects' data and in compliance with Human Ethics Permit H6876 granted by James Cook University, interview and focus group files and transcriptions are only accessible to the authors.

ENDNOTES

[1] Under the *Wildlife Conservation Act (WCA) 1950*, there was no legislative mandate for recovery planning in Western Australia (WA). As of January 1, 2019, the *Biodiversity Conservation Act 2016* replaced the *WCA 1950* and has legislative support for recovery planning in WA. The Plan was drafted before this legislation took effect.

[2] Under the *EPBC Act 1999*, there is no obligation for any government to fund recovery plans.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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