A Research Paper Detailing Coral Bleaching and Ecological Grief

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On May 29, 2023

Class: Climate Anxiety, Grief and Resilience
(BIS 456 A)

A Comparison of Coral Reef Restoration/Mitigation Efforts and the Associated Ecological Grief at Two Major Reef Systems:

Coral reefs, as sensitive ecosystems, suffer the most severe effects of climate change and world temperature increases. Consequently, researchers, locals, individuals employed in the fishing industry, and anyone else interacting with reefs exhibit differing levels of ecological grief. **To successfully implement coral bleaching restoration and mitigation plans, attitudes of entire communities must be addressed because their manpower will be required. Likewise, identifying individual researcher's personal distresses will help to avoid unintended consequences of policy creation.**

Most common reef protection techniques will affect all aspects of the surrounding societies. Common techniques include the creation or expansion of Marine Protected Areas (MPAs), establishment of no-take zones (prohibition on resource extraction) and fishing/boating moratoriums (Caillaud et al., 2012). Scientists performing studies often experience extreme discomfort when once vibrant ecosystems turn white and become bleached (Caillaud et al., 2012). This change can occur rapidly. For example, in 2016-17, roughly half of the Great Barrier Reef was lost (Walpole & Hadwen, 2022). Such degradation and the associated trauma is known as "Reef Grief" by many experts (Conroy, 2019, Marshall et al., 2019). Policy creation and scientific study is adversely affected when "Reef Grief" is ignored (Walpole & Hadwen, 2022). Researchers familiar with these patterns stress the importance of identifying "Reef Grief" in themselves and colleagues alike due to their shared experiences of processing difficult emotions (Conroy, 2019). Further, persons who interact with reefs commonly fear that the experiences they enjoyed during their lives will not be available to their children (Conroy, 2019). There are many catalysts for environmental mourning.

The scientific community deserves blame for inaction and burnout amongst experts. For decades, the path to becoming a scientist emphasized production of emotionally barren academic papers (Bearzi, 2020). This trend was established in the hope of avoiding terms such

as “coral-hugger” or “idealist,” and to avoid being deemed speculative research (Bearzi, 2020). The result was environmental researchers internalizing their grief. Bearzi notes that “some of my studies in the Mediterranean, originally intended to focus on the ecology of dolphin communities, ended up documenting their decline” (Bearzi, 2020). Bearzi suggests that such work may have been more self-serving than intended. His work product led to his personal advancement, and became his focus, rather than affirmative action or different types of involvement (Bearzi, 2020). Bearzi’s experience parallels unregulated capitalism’s effects on climate change.

The term “resilience thinking” indicates a new framework to conceptualize environmental research. There is no optimal state of an ecosystem anymore, only our ability to change research focuses alongside it (Walpole & Hadwen, 2022). Walpole and associates believe ecological grief plays a crucial role in the shaping of management strategy. Their assessment is valuable in identifying unwanted consequences of one perspective. The Kubler-Ross model for grief follows the pattern of denial, anger, bargaining, depression, and acceptance (Walpole & Hadwen, 2022). In relation to coral bleaching of the GBR, the final stage of acceptance involves understanding climate change’s effects in transformation of the GBR (Walpole & Hadwen, 2022).

Walpole describes three modes of resilience thinking: resilience as recovery, adaptation or transformation. Walpole posits transformation thought processes as the best option. Resilience as recovery attempts to revitalize an ecosystem after a major event occurs (Walpole & Hadwen, 2022). Walpole and Hadwen associate resilience as recovery with the denial stage of grief. No fundamental alteration has occurred, and previous restoration practices may still be viable (Walpole & Hadwen, 2022). Resilience as adaptation demonstrates protection strategies as adjusted models of what is expected to happen. Walpole links this thinking to the bargaining stage of grief, in that degradation mitigation efforts will continue to work so long as we do not

exceed certain thresholds of coral bleaching and temperature increases (Walpole & Hadwen, 2022).

Resilience as transformation can be called acceptance, another necessary stage of grief. Climate change has fundamentally altered basic properties of reef ecosystems, and new solutions must thus function within the new system (Walpole & Hadwen, 2022). Many protections are not focused on climate change but rather on conserving a “sustainable optimal state,” or a state which no longer exists (Walpole & Hadwen, 2022). Presenting new ways in which people are conceptualizing ecological grief and the science surrounding climate change is of vital importance to me, and I share a similar sentiment with Walpole’s description. Acknowledgment of a new reality is difficult for myself and likely many others.

Inadequately regulated and rapid expansion is unchecked in western Washington. Widespread clear-cutting of the PNW has left certain forest ecosystems forever changed. Noise pollution from boat traffic on the Sound may lead to the deaths of our few remaining Orcas. Smoky Summers have become the norm. To influence policy in the future, I must accept certain standards of my younger years are gone. The new state of the environment may be the only one left to protect. Walpole and Hadwen explain why acceptance is key in moving forward.

Mitigation and restoration plans which function under idealistic criteria fail to incorporate accurate projections of future climatic conditions, including an expected increase of catastrophic events and more days per year of extreme heat (Walpole & Hadwen, 2022). Walpole and Hadwen do not suggest scrapping plans associated with 2050 climate targets. Alternatively, they support combing through current action plans and adjusting them as necessary, even stating that “many of these actions may not be significantly different to those currently listed in the 2050 plan… but can be framed in a way that supports the investment and sets realistic future-focused targets, under both likely and desired future states.” (Walpole & Hadwen, 2022).

Utila:

Many indigenous communities have suffered following their designations as either tourist destinations or places of substantial resource (Kent & Brondo, 2019). Utila, located in Honduras, works as a microcosm of such development. Utila was likely originally populated by the Paya indigenous community (Kent & Brondo, 2019) Utila's population remained around 1,500 people until the 1980s (Kent & Brondo, 2019). Utila then transformed into a tourist destination in a shift that brought overdevelopment, high boat traffic, and significant pollution (Kent & Brondo, 2019). Utila citizens suffered severe consequences as their home became another unfortunate consequence of unchecked capitalism.

Because of attractive foreign investment opportunities, the policy and law in Utila which facilitated land investment and development ultimately degraded the Mesoamerican reef on which Utila sits (Kent & Brondo, 2019). This is relevant because resources are allocated towards bolstering toursit activity and focus moves away from climate change degradation (Kent & Brondo, 2019). Local Hondurans were displaced and disrespected by the growth, which in turn exacerbated already existing class disparities (Kent & Brondo, 2019). Unregulated growth eroded knowledge and traditions, and permitted shady business dealings which deprived locals of their home (Kent & Brondo, 2019). "Lifestyle migrants," mostly from Europe or the U.S., flocked to Utila to enjoy the scenery (Kent & Brondo, 2019). Ultimately, this migration further displaced natives and generational occupants (Kent & Brondo, 2019).

Kent and Brondo compiled surveys conducted on long-time residents of Utila. Ecological grief brought about by rapid development and climate change affected the most basic aspects of culture and lifestyle for the people of Utila. New technologies were introduced into the lives of the indigenous. The people of the island lament these changes (Kent & Brondo, 2019). They speak of how it has disconnected the people from the land. Motorized vehicles allow for quick transport around the island. Locals claim this change has taken away their interactions with the ecosystem (Kent & Brondo, 2019).

Islanders have changed the ways in which they obtain sustenance, as land and marine animal resources have been depleted (Kent & Brondo, 2019). Bananas, coconuts, and other land resource supplies have been affected as well (Kent & Brondo, 2019). Such issues are intensified as traditional harvests of animal and plant resources are now being restricted via government initiative and intervention (Kent & Brondo, 2019). Anger is born from such policy. Anticipatory grieving demonstrates how Utila citizens are plagued by the diminished species which were once abundant in their landscape (Kent & Brondo, 2019). Further, sources of anticipatory grief are equally distressing. Locals feel they have little to no agency in changing inadequate patrolling of poachers, ineffective climate legislation, and plain corruption (Kent & Brondo, 2019).

Kent and Brondo present strategies which have proven beneficial in reducing degradation of island and reef communities like Utila. Many surveyed locals recognized the land they knew is not the same their children are seeing. Ensuring first-hand accounts of the depletion of resources are shared will help new generations conceptualize the severity of the loss (Kent & Brondo, 2019). Creating “communities of mourning” will allow people to understand environmental degradation as the cause of their internal stressors. Additionally, this creation will create a space for people to grieve and find validation (Kent & Brondo, 2019). Environmental education is another strong tool in promoting conservation, and thus Kent and Brondo believe unidentified “Reef Grief” furthers apathy and inaction (Kent & Brondo, 2019).

The Great Barrier Reef:

The Great Barrier Reef (“GBR”) is the largest reef on the planet, spanning 133,000 square miles (World Heritage Convention, n.d.). Its biodiversity is unmatched, housing 400 coral types, 1,500 fish species and 4,000 species of mollusk (World Heritage Convention, n.d.). Marshall and associates explored various perspectives of “Reef Grief”, in doing so attempting to

glean meaningful explanations about the extent of ecological grief. Tourists, residents, tourism operators and fishermen comprised the separate sample groups (Marshall et al., 2019). Percentages of total survey respondents who had experienced reef grief were summarized: 53.5% of residents experienced “Reef Grief”, 48.4% of tourists, 44.2% of tourism operators and 22.9% of fishermen/women (Marshall et al., 2019). The sentiment is shared by both Marshall’s team and by Curnock’s, who interviewed strictly tourists, and citied place-identity as the most influential factor in determining ecological grief (Curnock et al., 2019).

Beauty of the GBR was strongly correlated with lower intensity of “Reef Grief.” (Marshall et al., 2019). Accordingly, enjoyment of a reef for hobbies creates a weaker bond to it than does reliance or self-identity. Additionally, many who responded may have only interacted with still intact sections of the reef and avoided seeing the widespread coral bleaching (Marshall et al., 2019). This finding does not directly align with the percentage values associated with each group that were presented previously. Marshall attributes lower statistics among certain respondents, such as tourism operators and fishermen/women, to either denial, acceptance and thus adaptation to new circumstances (Marshall et al., 2019). Such denial stems from avoiding the inevitability of the loss of their home and livelihood (Marshall et al., 2019). There is likely an intersection between tourists and tourism operators, as both are only exposed to unaffected sections of coral (Marshall et al., 2019). Curnock’s research team likely believes such explanations are unnecessary because his team’s results are indicative of tourist’s coral bleaching grief despite their lack of proximity to the GBR (Curnock et al., 2019).

Curnock and team’s study focused solely on the attitudes of tourists, despite the fact that the tourist respondents were from all over, including vacationing Australians. Such projects provide insights about a range of cultural identities (Curnock et al., 2019). Climate change is on the minds of eco-tourists and Australian locals alike. An identical question was posed during 2013 and 2017 studies: “What do you think are the three most serious threats to the GBR?”

(Curnock et al., 2019). 40% of respondents noted climate change in 2013 and 51% in 2017, establishing it as the most commonly cited issue (Curnock et al., 2019).

Coverage of coral bleaching in media has likely led many to apathy and hopelessness. Curnock's team suggested media imagery can foster large-scale awareness, but that such awareness will not lead to action (Curnock et al., 2019). The research supported respondents' similar sentiment in that they had little agency over widespread coral degradation (Curnock et al., 2019). This is similar to Utila's situation, and the overall threat presented by climate change. Respondents expressed little faith in government policy and bona fide enforcement of policy (Curnock et al., 2019). As awareness increased, perception of agency decreased**.** As many indigenous respondents put it "If the land's sick, we're sick" (Marshall et al., 2019).

Marshall's team suggests multiple options for alleviating "Reef Grief" among communities that interact with the GBR. There is notable overlap between their ideas and the ideas discussed by Kent and Brondo. Place and self-identity were again deemed highly influential in reef grief statistics (Marshall et al., 2019). Therefore, place-specific mental and physical health resources should be created with the intricacies of different cultures in mind (Marshall et al., 2019). Climate change initiatives ought be front and center (Marshall et al., 2019). Researchers must involve local communities as much as possible and provide up-to-date reports which express current status of reefs, as doing so can galvanize community members following their loss or improvement in real time (Marshall et al., 2019). As Marshall and associates state, acknowledging the inevitability of biomass loss allows populations to move past denial and engage in conservation practices (Marshall et al., 2019). Action requires continued support, resources and motivation rather than limited visual aids warning of bleaching's effects (Curnock et al., 2019).

Limiting scope is difficult for most. To accomplish this, stakeholders can employ techniques popular in psychological literature, including a "small changes approach, [an]

incremental success approach, and creating pride around engaging in environmentally-conscious decision making." (Curnock et al., 2019). To create lasting activist coalitions, progress must be celebrated even if the scope of such progress is not as expansive as one hopes.

Another barrier to finding support and strategy implementation for the protection of the GBR is the slow-moving timeframe of climate change (Walpole & Hadwen, 2022). Humans wait until change is apparent before their eyes, usually when damage is irreversible. Walpole and associates believe the GBR presents a unique look at this phenomenon, as many consider its current state to be permanently negatively altered (Walpole & Hadwen, 2022).

Strategies for protection should accept changes which have already occurred and operate under new conditions (Walpole & Hadwen, 2022). A persistent sentiment throughout my research. Walpole and Hadwen's team indicates indigenous people of Australia have experienced huge changes to their landscape and the GBR and could provide valuable insight about how to move on from the world that once was to begin working within new necessary constraints (Walpole & Hadwen, 2022). The World Heritage Convention acknowledges traditional harvesting by indigenous people has been affected, and that programs like the Traditional Use of Marine Resource Agreements and the Indigenous Land Use Agreements give Aboriginal and Torres Strait Islanders permission to participate in culturally essential fishing, hunting, and harvesting (World Heritage Convention, n.d.). Such initiatives are active in roughly thirty percent of the GBR and are considered inadequate by locals (World Heritage Convention, n.d.). Increasing the scope of traditional harvest initiatives is necessary. The necessity parallels Western Washington Native American tribal struggles to obtain whale hunting permits despite the practice's sustainability.

Change in the coming decades will undoubtedly occur at rates never seen before. Governments will change alongside the reef, and working with different regimes will become necessary (Walpole & Hadwen, 2022). Aside from changes in governmental positions of authority, many reefs span multiple territories which are protected under different bodies of law

(World Heritage Convention, n.d.). The sharing of information between all governments and peoples is necessary because fractured protection efforts are ineffective (Barnes et al., 2022).

Communities have responded and created collaboration summits. One such summit, titled the “Incident Management Group”, brought together 70 researchers from across the globe to share information (Barnes et al., 2022). Arrangements exist between governments. The “World Heritage Convention” forces fractured governments to set protection standards which supersede federal or local guidelines (World Heritage Convention, n.d.). However, recent campaigns with the purpose of keeping the GBR off the list of “threatened” World Heritage Sites merits the notion that denial of GBR degradation is present in government (Walpole & Hadwen, 2022). Policy, grant money, and support by experienced environmental professionals along with persons who possess detailed traditional knowledge are essential components in the puzzle of alleviating the symptoms of climate change.

Conclusions and Personal Reflection:

Only the Mesoamerican Reef and the Great Barrier Reef were examined. The two stories reveal parallels in proposed solutions to actively combat coral bleaching and ensure action will continue into the future. These stories are similar, and maybe that’s the point. Coral bleaching causes similar grief and response in all areas affected. We can draw insights from lived experiences. Acceptance is mentioned throughout many of the entries. Without acceptance, action plans adhere to a criteria of the past. Reefs have been changed forever. I don’t believe this means lost necessarily. It could mean providing the required attention and hoping that alleviation efforts can restore the entirety of the ecosystems given appropriate timeframes.

A point which resonated with me from earlier in our quarter curriculum: hope means that although the future is uncertain, we can do what makes sense now. The scientific community is

well aware of trauma resulting from the study of coral reefs. Talking openly helps provide peers avenues to discuss their grief. The sharing of information between all stakeholders is paramount in conservation efforts. Communities are finding their own ways of uniting via summits that bring together people who are passionate about their work. Government intervention and funding is necessary to prevent further degradation. Locals and non-locals alike often incorporate depleted reefs into their identity. Because of this, we all need to learn how to utilize these feelings in a non-manipulative, transparent manner. Helping populations understand inner turmoil resulting from loss of environment is tantamount to a healthy home, livelihood, culture, and family. “Reef Grief” is clear-cutting grief, it is grief over the destruction of the Amazon rainforest, it is grief over the melting of glaciers**;** “Reef Grief” is valid, as are the worries of any individual who feels anguish over the effects on their homeland by unregulated development.

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