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Marine Mammal Science Without Borders

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Abstract

Globalization has connected people and cultures at an unprecedented rate. The effects of globalization have been far-reaching on different sectors of science and technology, and the environment, including marine mammal research and conservation. Despite the increased connectivity and knowledge transfer that has occurred in the past decade, there is still an ever-widening gulf between data-poor and data-rich nations. As a result, there is an absence of different voices and limited geospatial research coverage in marine mammal science. This skewed trend precludes the positive promotion and translation of science into policy action and impacts, as well as the sustenance of conservation initiatives that affect marine mammals globally. In this article, I argue that the practice of marine mammal research and conservation as it stands today requires a paradigm shift. I do this by first discussing patterns and antipatterns of globalization, and then by recommending strategies for the marine mammal scientific community to consider and implement to challenge and change the status quo.

Key Words: global conservation, conservation practice, conservation values, marine mammals, marine mammal science

Introduction

Since the last wave of globalization, which has interconnected people more than at any other time in our modern history, there is still a vacuum in the variety of science and conservation voices being heard from different corners of the globe (Smith et al., 2017). Threats to marine species are fundamentally global (Avila et al., 2018), yet data gathering, priority setting, and decision making can often be the prerogative of better funded, media savvy, scientifically credentialed actors in the marine conservation arena.

This dichotomy can also lead to the dominant influence of one or more countries (Smith et al., 2009; Holmes, 2011) in conducting research, shaping global conservation policy, and addressing bilateral or multilateral conservation problems. Also, the disproportionate representation of a few geographic players influencing environmental governance and conservation may suppress indigenous conservation solutions from being considered and promoted (Rodríguez et al., 2007; Smith et al., 2009). This disparity has always existed but has taken a different form in the speedier, widespread age of globalization (Singh & Houtum, 2002; Seshabalaya, 2006).

Thomas Friedman (2007) conceptualized the idea that the "world is flat" and that technology and geo-economics were globalizing and revolutionizing our daily lives, regardless of where we lived. Globalization is not a new phenomenon (Frank & Gills, 1992; Seshabalaya, 2006), but the nature, intensity, and magnitude of these effects are different today than during past phases of globalization. Within this "flattened world" construct, there has been a profound reshaping of markets worldwide. But the changing economic space has its share of costs (e.g., the increased spread of zoonotic diseases, inequity, and dilution of local cultures) and benefits (e.g., improved commerce, economic growth, and technology transfer) (Global Policy Forum, 2018). Also, the costs and benefits can be interchangeable depending on sociocultural perspectives and setting. With time, globalization has expanded beyond the technology sector and has influenced science and conservation with similar costs and benefits.

In some tropical areas in Africa, globalization has led to improved reforestation efforts but at the cost of social marginalization (Kull et al., 2007). Similarly, the presence of international nongovernmental organizations has allowed consistent conservation strategies to be adopted by different African nations and led to the establishment of important biodiversity areas or hotspots. In the process, however, local ideas and initiatives for conservation management have been overlooked and communities disregarded (Singh & Houtum, 2002; Mwampamba et al., 2016). Similar views

have been expressed by sociologists about the creation of new postcolonial states by global institutions embracing western science notions of conserving nature and natural resources at the expense of local community rights and access to resources (Randeria, 2007).

The marine mammal science world suffers from a similar dilemma. Marine mammals are circumglobal species and, unlike humans, do not observe socioeconomic or political boundaries. Yet, the socioeconomic, cultural thinking, and political landscapes have a profound influence on the study and protection of marine mammals.

There are approximately 126 marine mammal species (Committee on Taxonomy, 2017) found in all marine environments, as well as in lakes and rivers around the world (Forcada, 2009). Despite their widespread occurrence, there is considerable global variation in where marine mammal studies are undertaken and who conducts the studies. The global priorities for marine mammal research and conservation are largely defined on the basis of species richness; range maps; and endemic, at risk, or unique species (Schipper et al., 2008; Pompa et al., 2011; Selig et al., 2014). These investment areas are derived from data-rich areas while using sparse information to predict other global "hotspots." But with no clear plan to validate predictions in data-poor zones, these areas remain hypothetical hotspots. Kaschner et al. (2012) found that, excluding Antarctica, marine mammal surveys were largely restricted to the Northern Hemisphere, and only a quarter of the world's oceans have been surveyed. Clearly, the underlying data are not comprehensive, and the risks and threats to marine mammals may be grossly underestimated in data-deficient regions (Avila et al., 2018). Therefore, it is doubtful that hotspot designations (place-based) or a threat-based approach are optimal solutions to dictate conservation policy in data-sparse regions (Briscoe et al., 2016).

Conservation research can also be highly concentrated and exclusive, wherein the most biodiverse regions for terrestrial mammalian, vascular plant, endemic, and functional species are less studied and predominantly led by foreign researchers rather than in-country researchers (Wilson et al., 2016). There is a similar lack of diversity in the marine conservation field with nearly 73% of the members of the Society of Conservation Biology Marine Section originating from the United States, United Kingdom, Australia, and Canada in 2016 (Smith et al., 2017).

The marine mammal scientific community is also challenged by the lack of diverse representation. The membership figures from the international Society for Marine Mammalogy—a non-profit entity with a mission to advance marine mammal science globally—demonstrates this disparity (Figure 1). In 2017, 66% of the members (n = 1,540) were from North America followed by Europe. This geographic exclusivity is also reflected in articles published in the journal *Marine Mammal Science* (Figure 2). Between 2013 and 2018, 85% of the papers published (n = 511) had first authors from North America, Europe/Russia/Turkey, and Oceania. There are definite caveats associated with these numbers. Many researchers outside and including the Americas may have opted out of membership, obtained membership on biennial conference years, or have an undeclared nationality since at least 100 members had an unknown country affiliation. Past member geographic profiles do not appear to be drastically different from 2017. Another caveat associated with these numbers is that not all marine mammal scientists publish papers in *Marine Mammal Science*, and country of residence may be different from country of origin. It would be interesting to do a meta-analysis spanning 10 to 15 years covering different journals that have published marine mammal research to confirm these trends more broadly and ascertain the geographic focus of the research. These issues notwithstanding, the publishing record and membership numbers combined with the literature on marine mammal data availability reveal a skewed trend in the demographics of the marine mammal scientific community and active research sites. This is not an unrecognized observation. In fact, for several years, some research groups and institutions have pursued various initiatives with mixed success to address knowledge gaps in marine mammal science (discussed below).

Generally, borrowing terminology from the software development world, there are patterns (e.g., the problem to be solved and the solution to the problem) and antipatterns (e.g., solutions to problems that may sometimes cause more harm than good) (Laplante et al., 2007) in the globalization of marine mammal research and conservation. Therefore, herein I address two objectives: (1) to evaluate the patterns and antipatterns of globalization within the marine mammal field and (2) to suggest implementable strategies for the marine mammal scientific community to consider with an aim to alter the status quo. Unless otherwise stated, I use data-poor and underrepresented nations to reflect both representation of people and spatial research coverage outside of North America, Europe, and Oceania, and excluding the Arctic and Antarctic. Also, while some countries such as South Africa, Japan, and Brazil may have a strong presence in the marine mammal field, the focus is on contributions from other countries within Africa, Asia, and South and Central America.

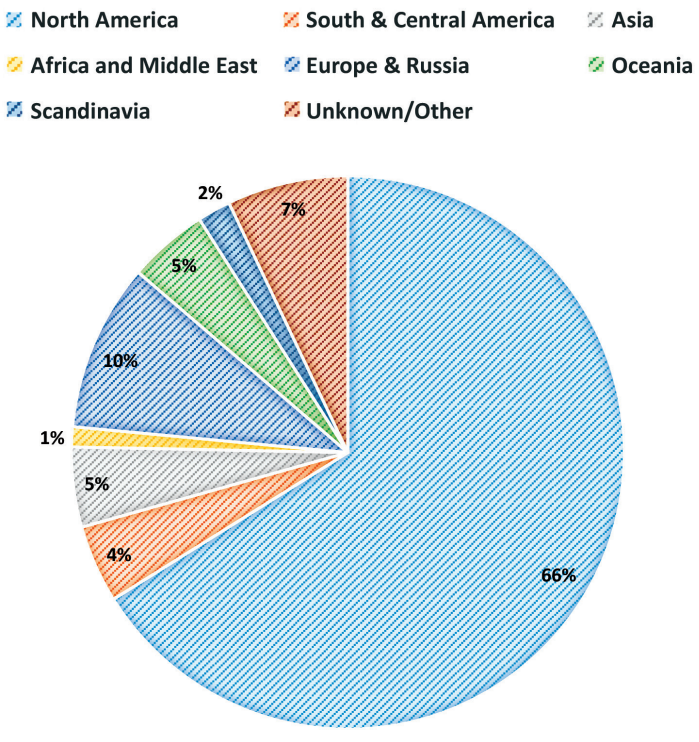

Figure 1. Geographic distribution of members of the Society for Marine Mammalogy as of 2017. North America includes the United States, Canada, Mexico, and the Caribbean. United States membership constitutes 80% of the North American membership. Similarly, Brazil constitutes 52% of the South and Central American countries, Japan represents 55% of the countries in Asia, and South Africa represents 88% of the African nations. Data courtesy of Dr. Chris M. Parsons, Society for Marine Mammalogy

Patterns of Globalization

I focus on two specific benefits of globalization within the context of marine mammal research and conservation. The first is knowledge transfer, and the second is training and capacity building.

Knowledge transfer (KT) involves the transfer of a precise set of skills and subject-matter information that can be repeatedly used to conduct research or apply the learning in decision making or policy development (Minshall, 2009). KT has traditionally translated into national or international research collaboration between academic and non-academic groups, including environmental nonprofit organizations and government entities (Kark et al., 2015). Common examples of such collaborations in the marine mammal field have focused on bycatch reduction technology, statistical modeling tools, animal telemetry devices, acoustical instrumentation, or ocean or animal observing systems. However, partnerships are conditional upon funding and resource availability, permitting, and other logistical challenges.

Other examples of KT include decision-support toolkits, which can have international applications such as the *Dugong and Seagrass Research Toolkit* (www.conservation.tools), the *Animal Counting Toolkit* (Williams et al., 2017), and the *Global Marine Animal Stranding Response* toolkit (*GMAST*; gmast.org). But there are also regionally applicable products such as toolkits to assist in Marine Protected Area (MPA) planning (reviewed by Pattison et al., 2004), and the Spatial Decision Support System (SDSS; http://seamap.env.duke.edu) and CetSound (https://cetsound.noaa.gov/cetsound), which are used for the assessment of human activity impacts on cetacean populations.

As an example, the *GMAST* toolkit was developed to make internationally accepted best practices and protocols in marine mammal stranding response openly available to trainers and trained responders with limited experience and resources.

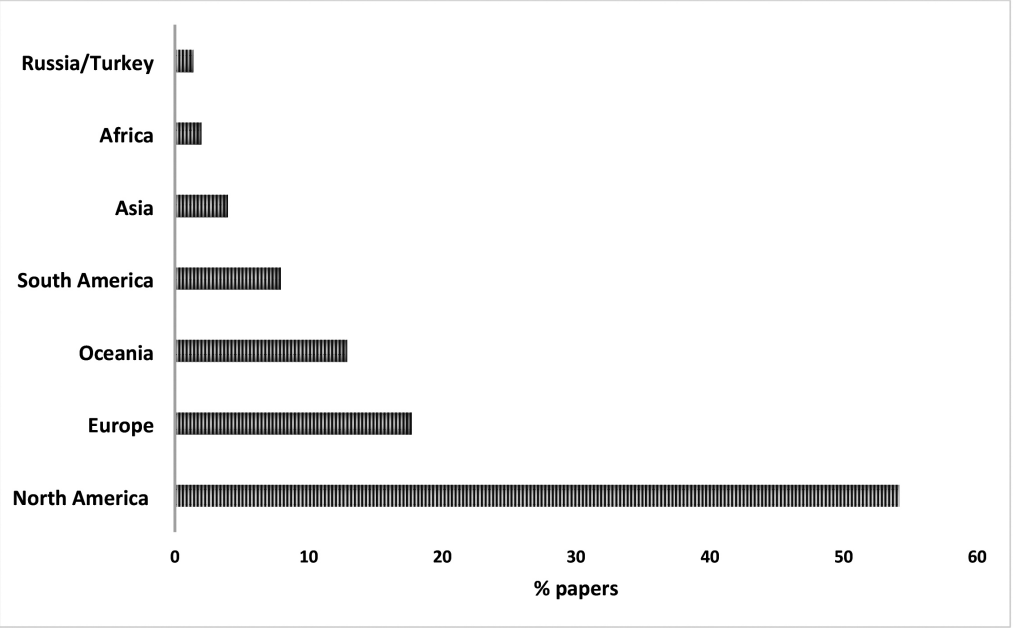

Figure 2. Percentage of primary author geographic affiliations in articles published in *Marine Mammal Science* between 2013 and 2018

The toolkit is of equal relevance to trainers and trained responders in countries with established networks to follow consistent curriculum and training instructions. The genesis of the project was the recognition that marine mammal strandings are a global phenomenon, and experts from one or two countries likely have neither the resources nor the capability to assist in all events. Moreover, lack of basic data collection from stranding incidents was impeding a scientific understanding of the potential causes of these stranding events and vulnerable species and areas. Further, training tutorials in workshop settings varied in content and scope, which is not conducive to success for emerging networks.

The *GMAST* toolkit materials, hosted on the Woods Hole Open Access Server (WHOAS) repository, were produced by leveraging the collective knowledge and wisdom of 34 experts from 12 different countries with extensive experience in different facets of marine mammal health and stranding response. The website GMAST.org, established in December 2017, was developed to serve as a conduit for nascent stranding networks to have access to experts and to equip individuals to become skilled and knowledgeable trainers and responders. Thus, in theory, the global network of responders would be expanded beyond the few pockets of response networks that exist today.

The obvious limitation of KT, whether through a toolkit such as *GMAST* or technology transfer, is the unidirectional nature of the transaction. Moreover, the onus is on the user to employ the product, tool, or application, and to evaluate its functionality for their scenario (Roux et al., 2006; Nguyen et al., 2017). This could be overcome through targeted training and capacity building, however. In training and capacity building initiatives, the focus is on the application and use of KT and usually involves a bidirectional interaction between experts and users. Capacity building, therefore, can be distinguished from KT by the scale, scope, and time frame involved, allowing for the development of skills and competencies in specific areas among individuals, institutions, and countries. Training is an element within capacity building—a teaching instrument. Also, both capacity building and training programs can help evaluate the efficacy and value of KT products.

While it can be tremendously hard to measure longevity of training programs, it is possible to qualitatively measure and document signs of progress or, as Nguyen et al. (2017) articulated in their knowledge-action framework, a conceptual gain in knowledge action and outcomes. For example, in India, subsequent to several marine mammal stranding response training workshops conducted by national and international entities

since 2009, there has been an increased recognition and awareness about marine mammal stranding events along India's vast coastline, particularly among wildlife enthusiasts, monitors (e.g., lifeguards), and researchers. Thanks to digital communications, media coverage and reporting of stranding events have also increased, even if they have not been wholly accurate. Stranding events are also broadcast faster through social media and networked communities. Significantly, many self-motivated small institutions and independent researchers are influencing change in their limited areas of operation through science, education, and community outreach.

Conversely, there are continuing problems, such as the lack of nationally established best practices and coordination, that affect the existence and longevity of functional coast-wide stranding response networks in India. I believe these challenges persist due to socioeconomic considerations, environmental priorities, and inadequate marine science and marine mammal expertise. These factors, in turn, create uncertainty and confusion about the roles of scientists and managers, government and nongovernmental organizations, state and national authorities, and the broader coastal community, especially the fishing community, in understanding the effects of marine environmental threats and how to effectively mitigate risk to marine mammals and other vulnerable marine species. Therefore, the focus is on the immediate aftermath of a publicized stranding event rather than seeking sustainable and holistic solutions through careful planning and collective stakeholder participation and input to understand the nature and reasons for stranding events, and the implications for maintaining the overall health of the marine environment. Inevitably, there is a chasm between wanting the policy tides to change and effecting change (Roux et al., 2006), which leads us to the issue of antipatterns of globalization.

Antipatterns of Globalization

Training, KT, and capacity building are undeniably valuable instruments for activating change in scientific thinking or conservation approaches to address the pervasive threats to marine mammal populations globally. In data-poor nations, however, community livelihoods, rights, and access to resources can be inextricably tied to marine wildlife protection. For some scientists working on the intersection of science and policy, it can be frustrating to see scientific evidence becoming a minor component in framing environmental governance or policy implementation, although scientists are realizing that sociological contexts matter and decision making is governed by different conservation value systems (Robinson, 2011). Thus, decisionmakers and knowledge users may often place a higher value on their trust networks, culture, and belief systems (Levin, 2013; Fazey et al., 2014) to take transformative steps rather than on scientific results alone. These factors need to become a part of the discourse in planning KT and capacity building initiatives. Therefore, the solution is not to abandon existing practices of technical transfer and exchange but to engage in knowledge co-production and in the acceptance of a plurality of ideas and value systems such that these ventures lead to action and impacts (Roux et al., 2006).

Reshaping KT and capacity building initiatives might make scientific engagements more effective, but these could still be overshadowed by questions of what the conservation end goal is and what priorities matter. With globalization, there is a valid concern in many countries in Asia, Latin America, Africa, and the Middle East that capacity building or KT are mechanisms to imprint global policies and ideas—largely viewed as "western science constructs" to resolve local conservation problems (Randeria, 2007; Rodríguez et al., 2007). This creates the perception of a new form of colonization wherein local ideas and models are replaced by global forces in science and conservation (Rodríguez et al., 2007; Smith et al., 2009). However, western conservation ideologies need not always diverge from local approaches such as setting species harvest limits or creating protected areas (Robinson, 2011; Larsen, 2016; Shanker et al., 2018). It is equally possible that these local ideologies may be Colonial Era remnants and do not necessarily reflect traditional concepts of conservation (Singh & Houtum, 2002; Randeria, 2007).

Perceptions matter, but simply acknowledging and understanding traditional local knowledge and dynamics is insufficient. Local conservation champions and leaders are required to advocate both for research and traditional community knowledge, perpetuate local cultural models and thinking, and strive to balance the conflicts of modernity with past seascapes and conservation approaches. These local leaders need to be at the forefront of research and conservation operations, so they can network and collaborate with multiple local, national, and international stakeholders without being completely beholden to global ideologies or forces. Thus, in the development and continuance of KT and capacity building initiatives, the scientific community should consistently evaluate the tradeoffs, durability, and effectiveness of these investments before persisting on a predetermined path.

The Way Forward

The lack of diverse representation in the marine mammal field encumbers our collective ability to address and mitigate threats to marine mammal populations worldwide. Marine mammal science is not an easy career choice. Obtaining field and classroom experience and conducting research can be an expensive and unrealistic proposition for most students and researchers, let alone in those data-poor countries. Fundamentally, there are not enough educational and career pathways for marine science/marine mammal researchers in these countries, which can deter even the most passionate biologist. But there are some long-term solutions, which I elaborate further below. These solutions are neither novel nor unprecedented but require recognition and implementation by the marine mammal community as advocated more broadly in the conservation field (Tallis & Lubchenco, 2014). The proposed solutions are wholly focused on addressing growth and recognition of marine mammal researchers in data-poor nations and promoting research and development in these nations.

Investing in People and Research & Development

To create a talent pool of future marine scientists, universities might consider partnering with universities in data-poor/underrepresented countries. Such partnerships could involve the establishment of joint degree programs or courses—for example, in fisheries, marine science, oceanography, and marine ecology—as well as faculty and student exchange programs. Alternatively, universities in data-poor nations might consider funding students to obtain a degree at an established marine science/marine mammal science department with the condition that the student returns to her or his home country after graduation. But returning graduates or researchers need the incentive of employment or a career development path within their own country's government or academic institutions for their degrees to be worthwhile.

Preeminent and qualified experts still need to undertake international research in underrepresented nations and help in advancing marine mammal science. Subsumed within a research undertaking should be a concerted goal to identify, recruit, and harness in-country talent. In time, expert researchers must step back from being Principal Investigators and lead authors to encourage local scientists to take up the mantle and oversee research in their regions. It is equally vital that connections are not lost and that experts in the field continue to collaborate and provide technical guidance and assistance in the form of identifying funding sources and providing analytical or writing support. The emphasis should be on choosing effective collaborators and advocates for a specific region's chief research and conservation concerns.

Both national and international funding agencies could explore increases in multi-year research funding for underrepresented countries and minorities. This could occur through public–private industry partnerships to provide long-term research grants for underrepresented groups and to advance indigenous scientific and technological breakthroughs. Developing in-country technologies and access to research platforms may potentially reduce overall project costs and generate private industry investments and cross-disciplinary collaboration. Short-term research grants (e.g., the Society for Marine Mammalogy's small grants-in-aid of research for low-income countries) while useful for equipment purchases or field costs, do not ensure longevity of projects, which hinders both researcher and research continuity. The Rufford Foundation's small grants program is a good model to follow to support multi-year projects, but more such funding avenues are needed. Inter-governmental international agreements and research collaborations should also consider including a strong educational component that offers short-term marine science courses, or dual-degree or integrated curriculum for undergraduate and graduate students in science and engineering fields in their respective countries and facilitates visiting student research opportunities in both government and nongovernmental institutions.

There is an obvious lack of field-based opportunities in marine mammal science, and traveling to the United States, Europe, or Oceania with no stipend is cost-prohibitive. Therefore, funding agencies might consider supporting research infrastructure development through industry and government partnerships as well as providing instructor stipend and travel costs to encourage internships in-country and, hopefully, as part of a long-term research initiative.

Hosting visiting graduate students and scientists has always promoted scientific exchange and can be effective in providing continued training at the host institution. However, host institutions might want to ensure that opportunities attract a diverse cadre of individuals who can successfully apply the experience to further research within their own regions or study areas of interest.

To improve coverage of marine mammal studies from data-scarce regions, peer-reviewed journals and publishing conglomerates could devote special sections or identify special subsidiary online journals to publish foundational work. Journals could consider publishing Special Issues to focus on research highlights from specific less-represented regions. International societies

and organizations could also compile a list of journals and other publication outlets to publish basic marine mammal research. Sometimes, non-native English speakers struggle to submit papers or prefer not to be lead authors due to language barriers. One way to achieve the requisite writing standards for important studies is to allow authors to easily obtain free or discounted editorial services and writing support from the journal editorial board or colleagues in the field.

Promoting Local Champions and Leaders

Conservation leaders are not created overnight. A deliberate strategy is required to integrate capacity building with fostering and empowering the next generation of scientists in underrepresented nations. Capacity building initiatives should also be expanded to include leadership, policy, and interdisciplinary collaboration training for early-career researchers (reviewed in Elliott et al., 2018).

Marine mammal conference organizing committees might consider reserving more sessions to feature foundational and promising research from less-represented communities and countries. Organizers could also seek funding to specially recognize enterprising new and early-career researchers through nominal monetary awards or by providing professional advancement opportunities. Quarterly or annual blogs or newsletters could be produced by international societies to feature a series of researchers or studies from data-poor areas. Utilization of local and international news outlets and social media could help shine a spotlight on important environmental matters and local researchers. Further, conference planning committees and executive boards of major marine mammal societies and organizations could identify new conference venues outside the standard practice of hosting events in North America, Oceania, and Europe to both raise awareness about marine mammal science and attract local researchers.

Finally, academic, government, and nongovernmental organization executive boards, government-funded working groups and committees, and international conservation committees and societies (e.g., the International Whaling Commission, International Union for the Conservation of Nature and Natural Resources (IUCN) – SSC Cetacean Specialist Groups, Society for Marine Mammalogy, and European Cetacean Society) need to nominate new and different voices and give them leadership roles to be truly representative of the transboundary nature of marine mammal species, the global threats they face, and the people who study them.

Conclusion

The international marine mammal scientific community must continue to be demand-oriented and user-driven to co-produce scientific knowledge, as well as to share capabilities and resources globally. In the process, however, non-native scientists should be receptive to in-country conservation models and belief systems and allow multiple local leaders to flourish and champion research interests.

Today, the natural resource conservation arena is replete with calls for improving *inclusion* and *diversity* in different disciplines. For the most part, these terms appear attractive on paper but have not transformed realities for affected groups (Dobbin et al., 2006; Dover et al., 2016). Already marginalized and affected groups find themselves recruited into committees to self-advocate for their interests and burdened to find solutions to diversity problems.

The lack of representation in the marine mammal field cannot be resolved through diversity and inclusion committees. Instead, existing committees and boards need to diversify their composition. This diversity can be enhanced with investments in education and radical shifts in cultural mindsets and business operations at all leadership levels in academic, government, and non-governmental institutions. This ideally involves the sustained recruitment, retention, empowerment, and integration of inadequately represented individuals or groups into career and decision-making positions within the scientific research enterprise. Changing long-established practices, attitudes, and work cultures takes time and, therefore, requires long-term thinking and planning. Thus, through persistence and sustained engagement by invested parties, the marine mammal research field can be transformed to truly reflect the global presence and transboundary nature of marine mammals and the people who study them with the eventual goal of filling in critical knowledge gaps in marine mammal science.

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