Collaboration in Conservation: Multidisciplinary Solutions to Wicked Problems

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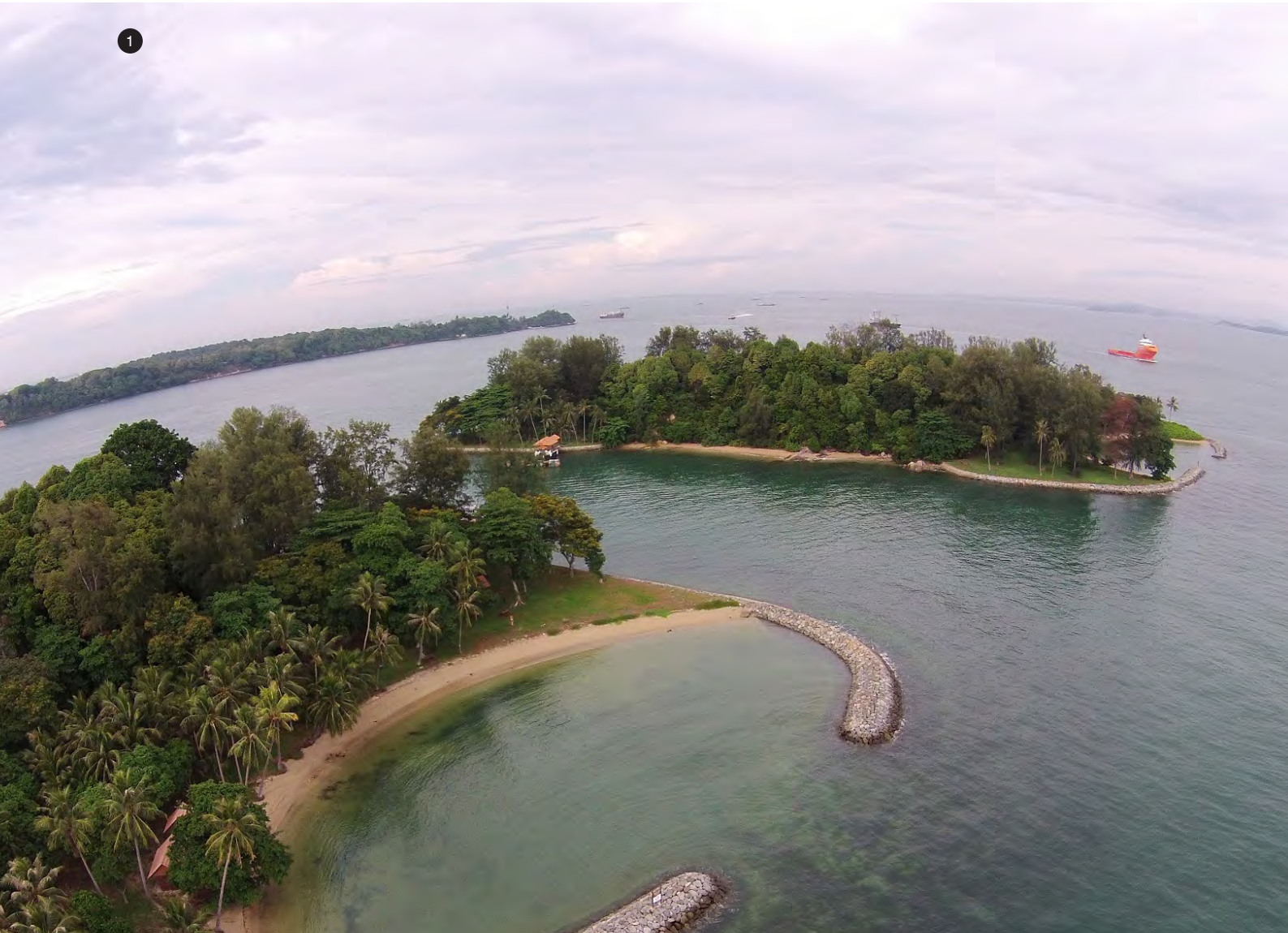


Complexity of Biodiversity Conservation

Biodiversity conservation is becoming an increasingly pressing global issue. The term biodiversity incorporates the variety of life on earth from the level of genes, through to species and the dynamic ecosystems that they form part of, such as coral reefs. Conserving biodiversity is therefore inherently complex, from the very outset. The challenges span governance scales (local to global), geographic areas (e.g. bioregions, species ranges) and sectors (e.g. fisheries, transport, extractive industries, tourism).

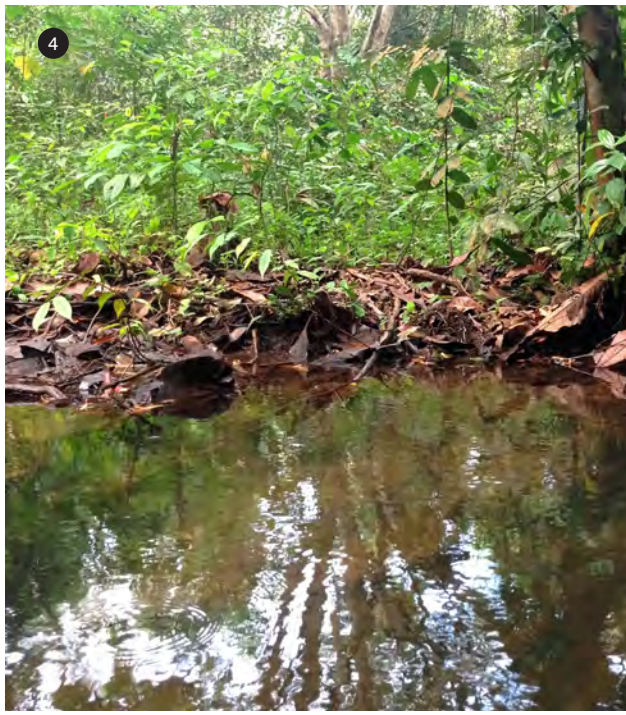
Take the increasingly documented issue of plastic pollution in the ocean as an example. High densities of plastic have been found from the deepest parts of the ocean (Chiba et al., 2018) to remote islands (Lavers and Bond, 2017), with growing evidence of ecological impacts (Browne et al., 2015) and worrying projections that there will be more plastic in the oceans than fish (by weight) by 2050 (World Economic Forum, 2016). The vast majority of marine debris comes from land-based sources, requiring huge changes in waste management in coastal and inland cities and communities, and some argue a complete rewiring of our economies to generate more sustainable 'circular economies'. The overlying conditions of complexity and uncertainty means that conservation is rife with so-called 'wicked problems' (Rittel and Webber, 1973:155), which defy resolution and involve many actors.

Given the complexity and 'wickedness' of the problems, conservation solutions tend to be multidisciplinary, cutting across ecological, social, economic and political spheres, and involve multiple stakeholders. No organisation or individual can tackle such challenges alone and collaboration is increasingly seen as the way forward in conservation. According to Dr. Cristiana Paşca Palmer, Executive Secretary of the United Nations Convention on Biological Diversity, "it is perfectly clear that we cannot halt the biodiversity crisis by working in isolation, cocooned in our own little world with like-minded people. Working in silos to solve systemic problems simply doesn't work. The complexity of the interdependencies between human, social and economic systems, and the natural Earth's systems requires interconnected measures and solutions."

Collaboration: Help or Hindrance?

Why do organisations and individuals collaborate in conservation? Perhaps one of the most common motivations is the potential to pool and increase resources (e.g. funding and expertise) through the participation of a larger number of stakeholders. In terms of raising awareness of conservation problems and solutions, collaboration can potentially maximise the reach and engagement that spans boundaries vertically, to a larger group of people, or horizontally, across different groups of target audiences (Reid et al., 2018; Runhaar and Polman, 2018). This can sometimes result in greater participation in conservation activities and implementation on the ground (e.g. beach clean-ups, reforestation efforts, citizen science for conservation) (Runhaar and Polman, 2018).

1. Sisters' Islands Marine Park, Singapore's first marine park. Photo credit: Karenne Tun and NParks



2. A female *Johora singaporensis* with a brood of newly-hatched crablets. Photo credit: Max Khoo, NParks

3 . A close-up of a *Johora singaporensis* crablet that was hatched in the captive breeding programme. Photo credit: Daniel Ng, NParks

Furthermore, collaboration helps organisations and individuals "search for solutions that go beyond their own limited vision of what is possible" (Gray, 1998: 469) to tackle the complex and 'wicked' conservation problems. This is especially crucial at the planning and policy levels, where collaboration can better ensure that different perspectives (i.e. ecological, social, economic, political and cultural) are considered and that conservation plans, policies or standards are inclusive (Reid et al., 2018).

However, collaboration should not be a conservation panacea. It takes time, energy and resources, which can sometimes slow down the whole process of achieving results (Reid et al., 2018). Collaboration involves building consensus, shared norms and structures, and collective problem solving (Grey and Purdy, 2018), but including many actors in a process can lead to 'collaborative inertia', where significant efforts yield very little output (Huxham and Vangen, 2004). Collaboration might not therefore be suitable in instances where quick decisions need to be made when there is impending danger to habitats or wildlife or when the conservation problem is restricted in scale (Reid et al., 2018). In addition, collaboration might not be ideal in situations where there is significant power imbalance by one or a few parties and the lack of space for negotiation (Snow, 2001; Reid et al., 2018). More importantly, collaboration sometimes backfires and can result in more conflict when the stakeholders are not ready or do not want to work together (Reid et al., 2018).

Research Collaboration for Conservation in Singapore

There are many past and ongoing research collaborations for conservation in Singapore. The National Parks Board (NParks) works closely in collaboration with universities and research institutes such as the National University of Singapore (NUS) and the Nanyang Technological University (NTU) by funding and working with researchers on topics pertaining to the conservation of biodiversity. The outcomes and findings of these research collaborations support NParks' decision-making and project implementation in conservation.

One example of such research collaboration is the multidisciplinary study on the Nee Soon freshwater swamp forest by NParks and NUS, with support from the Public Utilities Board (PUB), from 2011 to 2016. The comprehensive in-depth study that covered a range of topics including hydrology, geomorphology, faunal and floral ecology, genomics, and eco-hydrological modelling has helped NParks develop science-based management measures for the conservation of the Nee Soon freshwater swamp forest and its biodiversity (Davison et al., 2018). Further in-depth collaborative studies continue today.

In addition, to conserve and re-populate the Critically Endangered Singapore Freshwater Crab, *Johora singaporensis*, the Freshwater Crab Working Group was established, with members from NParks, NUS, and Wildlife Reserves Singapore (WRS). Scientific and ecological research covering topics on ecology, behaviour, monitoring and husbandry of these endemic crabs

4. A natural stream in the Nee Soon Swamp Forest, the last remaining primary freshwater swamp forest in Singapore. Photo credit: Cai Yixiong, NParks

were conducted. As a result of the collaboration amongst members of the working group, non-governmental organisations and other government agencies, the "Conservation Strategy for the Singapore freshwater crab *Johora singaporensis*" was developed, which paved the way for long term population enhancement, monitoring and captive breeding of this species. Since last year, there have been successful hatching of crablets in the laboratories and they have been released to re-populate the wild population.

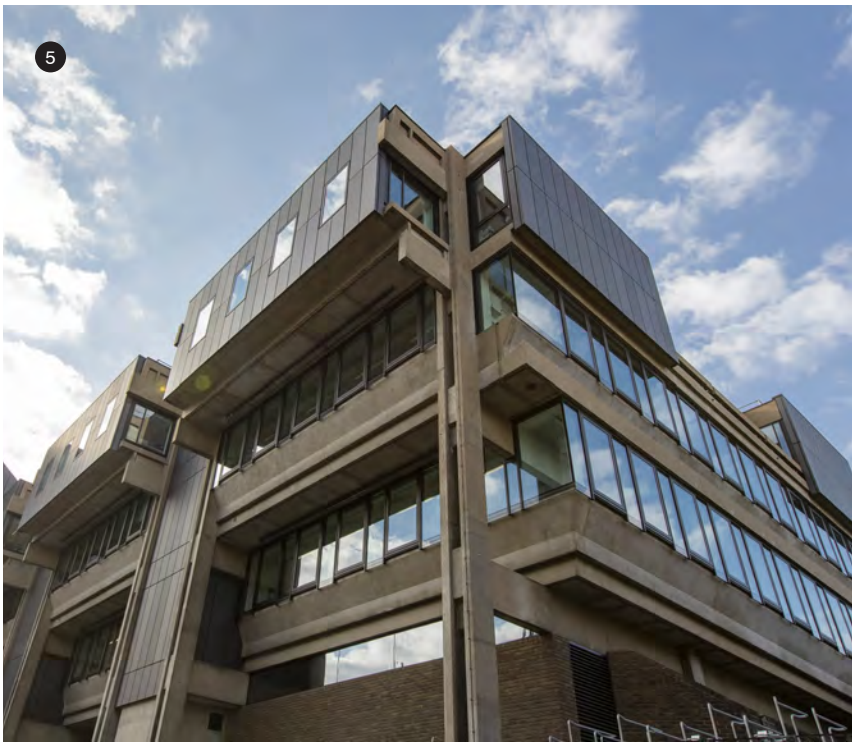
More specific to marine conservation, the Coastal and Marine Branch of NParks' National Biodiversity Centre develops and manages marine research projects with researchers and consultants funded by the Technical Committee on Coastal and Marine Environment. For instance, an agent-based model was developed in collaboration with DHI Water and Environment to simulate coral larvae dispersal patterns. This has helped to identify the sources and sink reefs in Singapore to prioritise the areas that are most important for conservation. The Sisters' Islands Marine Park, an important source reef for corals, was established as Singapore's first marine park in 2014.

Furthermore, the five-year Marine Science Research and Development Programme (MSRDP) that was launched in 2016 promoted even greater opportunities for research collaboration among different research institutes, government agencies and industry players in four key themes: marine ecosystems and biodiversity, environment impact and monitoring, coastal ecological engineering, and marine technology and platforms, which can have potential application to marine conservation (National Research Foundation, 2019).

Creating Collaborative Conservation Hubs

Beyond Singapore, major interdisciplinary conservation hubs are starting to emerge worldwide. Cambridge has been a centre of learning for over 800 years and is famous for having a world class university. In the last few decades, it has firmly established itself as the 'conservation capital' in the United Kingdom. The city and its environs are thought to have the highest density and diversity of conservation experts and practitioners in the world. At the centre of collaborative efforts is the Cambridge Conservation Initiative (CCI), which describes itself as a "unique collaboration between the University of Cambridge and the largest distinct geographical cluster of leading biodiversity conservation organisations in the world".

CCI was established in 2007 to enable collaboration between organisations and across disciplines, and is composed of ten founding partners, which includes non-governmental conservation organisations, such as BirdLife International or the wildlife trade specialists TRAFFIC, as well as six departments of the University of Cambridge. Although CCI is not an organisation in its own right, it has its own Council (made up of representatives from all partners) and employs an Executive Director and a small team



of staff which fosters collaborative conservation efforts between the partners in two broad focal areas: i) research to inform policy and practice and ii) capacity development and leadership. The intention is to tackle complex and challenging issues using innovative and multi-disciplinary approaches that cannot be delivered by any single institution, and one of CCI's strategic objectives is to find new ways of working beyond organisational boundaries through co-location and closer collaboration and convening.

Early achievements included the establishment of the CCI Collaborative Fund for Conservation, which aims to facilitate innovative projects with a particular emphasis on partnerships between university departments and Cambridge-based conservation organisations. CCI has also been developing a range of capacity building activities, the most prominent being a Masters in Conservation Leadership to train future conservation professionals, which draws heavily on the wealth of expertise across the CCI partners.

Perhaps the most visible development has been bringing the conservation community together in a new conservation campus, named the David Attenborough Building, after the famous documentary narrator and naturalist, Sir David Attenborough. Since 2016 this has housed around 500 conservation researchers and practitioners under one roof, in a purposely refurbished building in the heart of the city. This holds institutional offices of the partners surrounded by shared facilities such as seminar and meeting rooms, networking spaces and a four-storey tall green wall. It is still early days. The full impacts of this model for collaboration are not yet apparent, but there are some positive indicators. For example, in April 2018 CCI hosted a large meeting of science and policy specialists from 25 different countries to inform the post-2020 biodiversity agenda, suggesting that the concentration of diverse expertise within Cambridge generates significant convening power.

Working across institutional boundaries is neither easy nor straightforward. Challenges to collaboration were evident in a 2018 analysis of the potential for the CCI to catalyse marine conservation efforts. The study found that expertise in marine and coastal conservation in Cambridge is substantive, and within CCI appears to be in an ongoing phase of growth, so there is a significant and as-yet largely untapped opportunity for amplifying marine conservation impact. At present, the amount of joint activity between CCI partners is limited on marine and coastal issues, with existing partnerships primarily externally focused. The most frequently identified constraints on marine collaboration within CCI were lack of funding, low visibility of marine work between organisations, and competition. In such circumstances defining and exploring the areas of overlapping interest is an important step towards identifying priorities for collaboration - these should present opportunities for additional impact that could not be achieved by any one organisation acting alone.

Recommendations

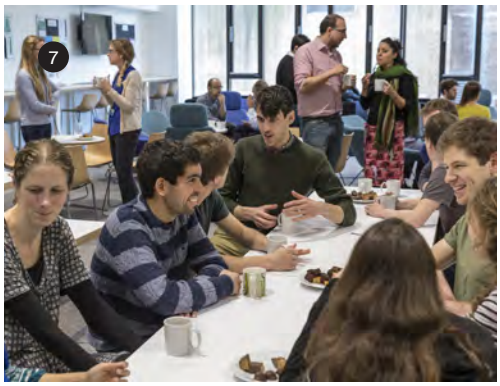
Although not always easy, when used and managed wisely, collaboration can have far-reaching benefits for biodiversity conservation. Examples of traits of good collaborators include the ability and willingness to i) recognise the reciprocal needs of each other; ii) respect all parties in the collaboration in terms of their roles, priorities and what they can offer; iii) maintain clear, regular and consistent communication on the participation, roles, levels of contribution and participation of each party, and the progress and outcomes of the collaboration; iv)

5. The David Attenborough Building was opened in 2015 in a repurposed building in central Cambridge. For the refurbishment a bespoke sustainability framework was developed, including features to support urban biodiversity. Photo credit: Toby Smith, CCI

6. A four-storey tall living green wall, featuring biodiverse rich vegetation, provides a compelling visual focus around which people move and interact as part of their daily routines. Photo credit: Toby Smith, CCI

7.Within the conservation campus are a range of collaborative spaces that all CCI partners can use. Photo credit: Toby Smith, CCI

8. Ensuring the conservation campus was as green a building as possible was at the heart of this refurbishment in the historic centre of Cambridge. Electricity is generated from solar photovoltaic. Photo credit: Toby Smith, CCI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create the environment where there is ownership of the problems, efforts and solutions by all parties of the collaboration; v) strive towards innovative solutions and ideas beyond compromise; and vi) ensure that there is proper and fair sharing of credit and acknowledgement of each party (Snow, 2001; Parker et al., 2018).

A crucial part of the process is understanding if there is a real advantage in collaborating, which emerges particularly when something must be achieved that a single organisation would be unable to deliver alone (Huxham and Vangen, 2004). It is also important to approach collaboration with an open mind. Being open to both formal and informal structures of collaboration can be useful.


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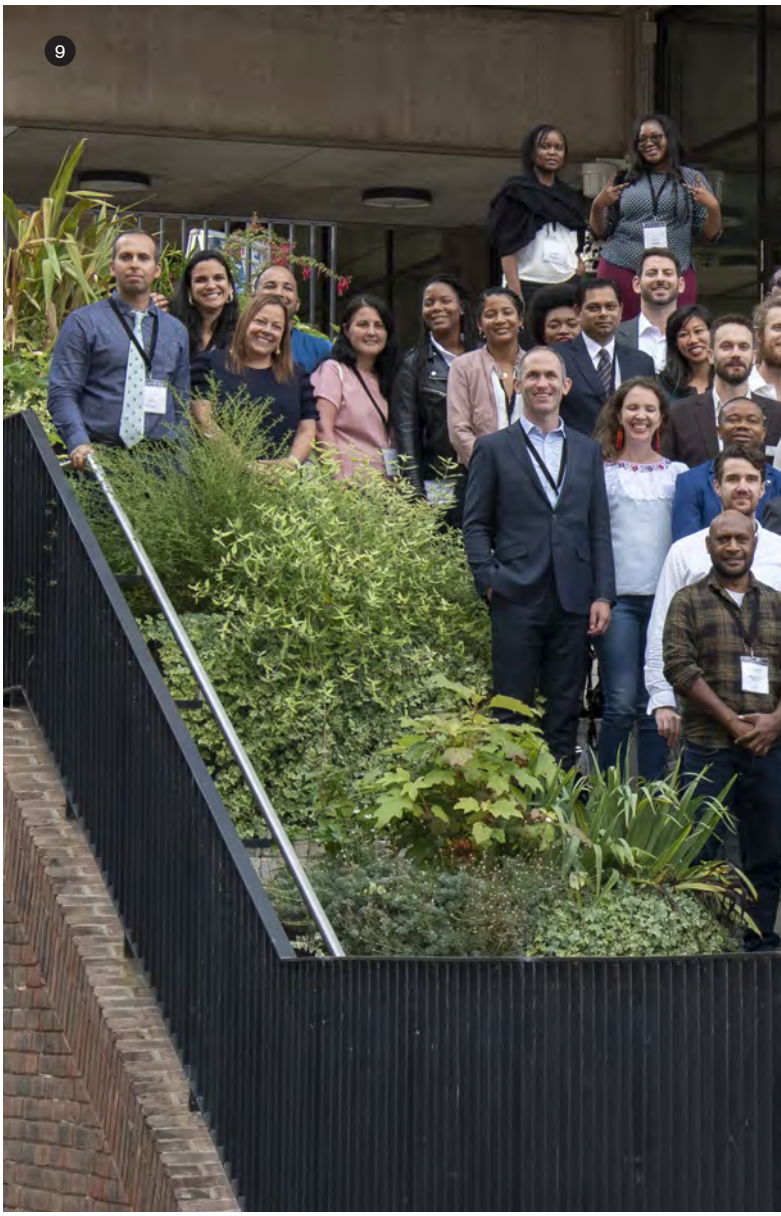
While having formal collaboration bound by written agreements are useful, informal collaborations which can be voluntary, experimental, inorganic and flexible, can also result in effective and creative outcomes (Snow, 2001).

Instead of working with the same collaborators, it is good to be open to working with new stakeholders from different fields or nationalities, towards inter-, multi- and trans-disciplinarity (e.g. computer scientists, social scientists, psychologists, businesses). They might shed a different perspective or bring with them a different network of people with other skill sets and expertise. Some people are hesitant about collaborating with government and public agencies as they are often perceived as bureaucratic and slow to respond. However, there can be high value in collaborating with government institutions. Public institutions have the power to convene and bring other stakeholders together formally, drive and develop policies, provide a view of the bigger picture, and perhaps shift the emphasis from science to policy and action, or from theory to practice (Sheil and Lawrence, 2004; Perez and Hogan, 2018).

Collaboration in conservation should look beyond research and focus more on implementation, both during and beyond the funding period, by placing more emphasis on long-term engagement and sustainability. Like most other conservation endeavours, collaborations should be subject to monitoring and evaluation frameworks to track progress towards outcomes, identify problems and challenges, and continuously adapt to be more inclusive, relevant and sustainable. CG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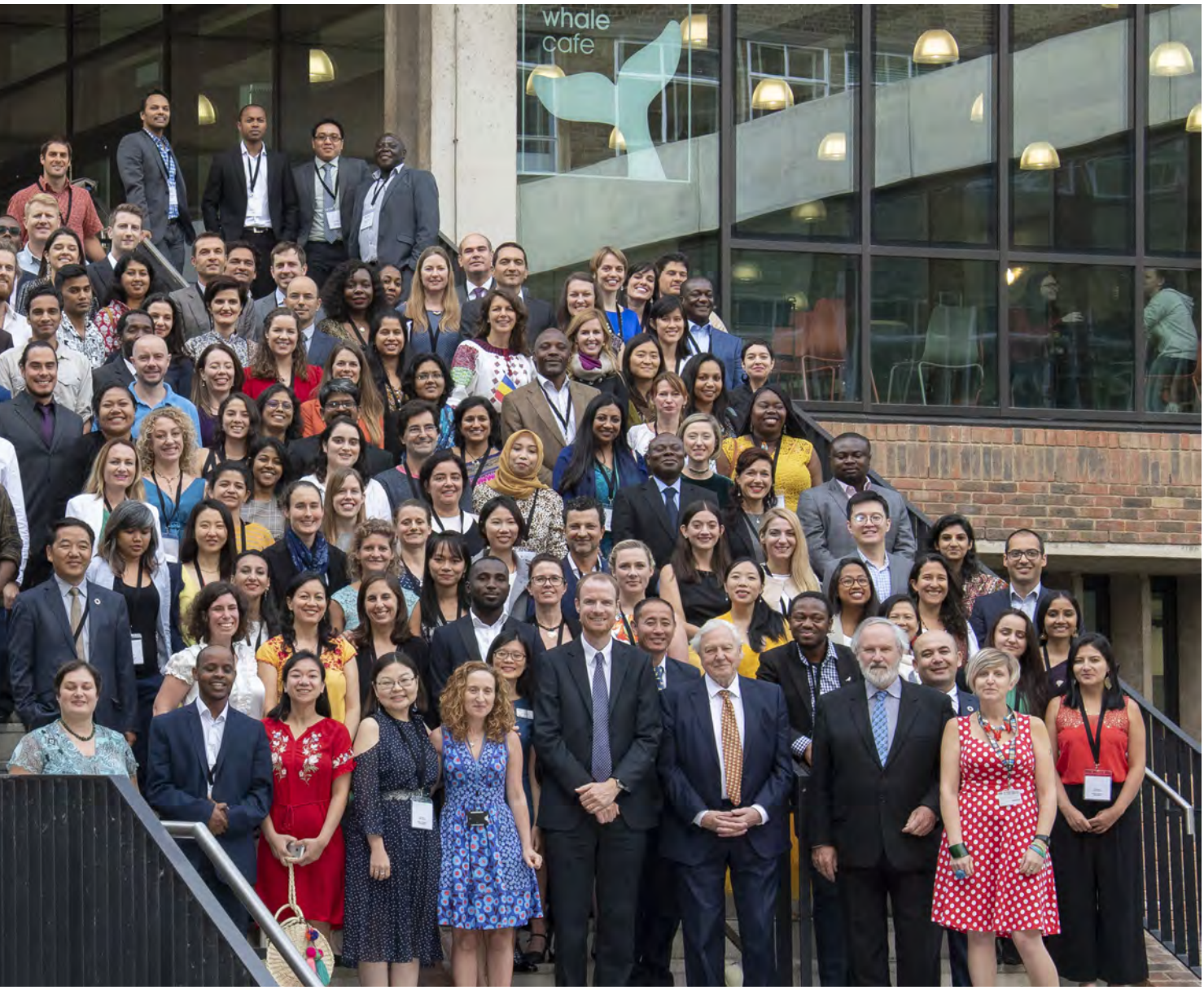

9. Since the Masters in Conservation Leadership was launched in 2010, 123 students have completed the course, from a total of 65 countries. Photo credit: University of Cambridge