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Marine biology research for the last 50 years

A. Meadows

Graham Kerr Building, University of Glasgow, Glasgow G12 8QQ

E-mail: azra.meadows@glasgow.ac.uk

The Department of Zoology, University of Glasgow has been active in marine biology research for the last 50 years, and earlier with Sir C.M. Yonge's significant contribution to this field. This article outlines the work of several staff members who have made important research contributions in this field. Some are described only briefly because their work is also covered in other articles.

In 1963, Peter Meadows was appointed as a lecturer by Yonge. Peter had worked as a research assistant at Menai Bridge Marine Laboratory under Dennis Crisp, looking at the chemical basis of gregarious settlement of barnacle larvae. Even though Peter did not have a PhD, this ground-breaking research facilitated his appointment as a permanent lecturer at the University of Glasgow. From 1964 to 1980s Peter and his co-workers' research largely focused on habitat (substrate) selection by the marine amphipod *Corophium volutator* (Pallas), resulting in joint publications with John Anderson and Janette Campbell. A textbook on marine science was published (Meadows & Campbell 1978,1988). Peter and his more than 30 postgraduates (many from the Middle East and South Asia, including Azra Tufail, whom he later married) engaged in research from 1980 onwards that moved on to investigate marine sediment-benthos interactions - bioturbation of burrowing invertebrates and microorganisms (Fig. 1). The focus was on mucus secretions which bind sand grains together and help stabilise the sediment, under laboratory and field conditions, both in the intertidal zone and the deep sea. In 1980s Peter established the Biosedimentology Unit in the Zoology Department. This led to interdisciplinary collaboration with engineers at the University of Glasgow, measuring the sediment strength of the mucus stabilising effect of organisms as ecosystem engineers. Peter and his co-workers received a medal from the Institution of Civil Engineers for this pioneering work in 1995. He was a keen SCUBA diver. He participated in several deep-sea research cruises in the Atlantic, Pacific, and Indian oceans, examining the effects of bioturbation, geotechnics, and microbiology at the sediment-water interface and below. A symposium on the impact of burrowing animals was published as Meadows & Meadows (1991). From the early 1990s onwards, Peter and Azra Meadows (now an Honorary Senior Lecturer) and collaborators conducted research on coastal zone management and sustainable development of rural communities in Pakistan. These communities' livelihoods depend on artisanal fisheries and mangrove swamps (Fig. 2). An outcome was a symposium and publication of the proceedings (Meadows & Meadows, 1999). Peter and Azra, together with Professor Israr-ud-Din of the University of Peshawar, led the Royal Geographical Society-funded multidisciplinary 1999 International Hindu Kush Expedition to Chitral, Pakistan. In 2005 Peter was awarded a civilian award "Sitara-i-Quaid-i-Azam" (= Star of the Great Leader, Mohammad Ali Jinnah), by the Government of Pakistan for services to education and the environment. Azra and Peter were invited as consultants by the Asian Development Bank in 2006, to advise on the biological and environmental aspects of the six-year (2007-13) "Sindh Coastal Community Development Programme" with a loan of US$36 million to the Government of Pakistan. In 2010 The Scottish Government funded their two projects with collaborator Yasmeen Lari on natural disasters, preparedness, and rehabilitation in Pakistan. A key output was the publication of a manual on disaster preparedness (Lari *et al*., 2013). Peter with his co-workers published over 150 research papers and he retired in 2001 but remained active as an Honorary Lecturer until his death in 2023.

Fig. 1. Peter Meadows in his fieldwork clothes collecting at Ardmore Point, Clyde Estuary. (Photo: Azra Meadows)

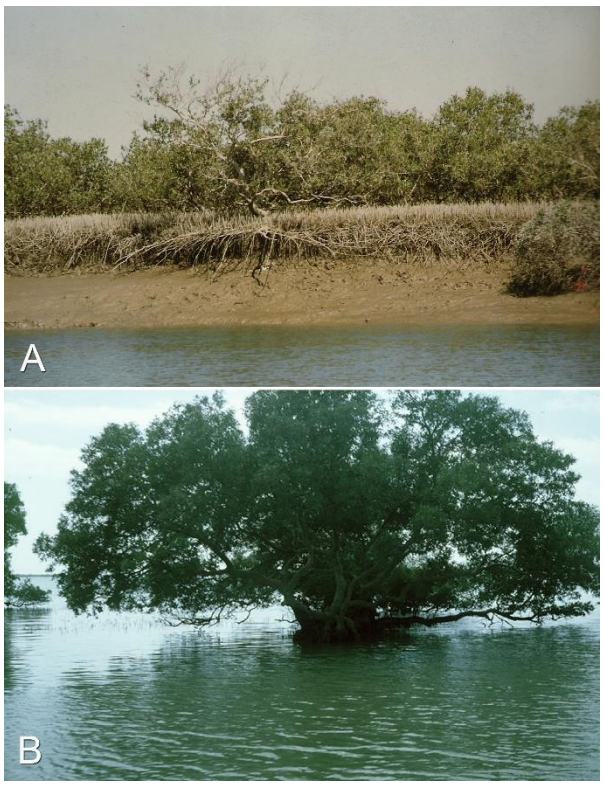

Fig. 2. Mangrove swamps in Sindh, Pakistan. (A) Unhealthy mangroves at low tide, showing erosion. (B) Healthy mangroves, high tide. (Photos: Azra and Peter Meadows)

Peter Spencer Davies was a marine biologist at the University of Glasgow from 1962 until 1999, where his special interest was in the physiology of tropical coral reefs. Douglas Neil joined in 1975 and retired in 2012. He and his collaborators including Keith Vickerman, studied the infection of Norway lobster (*Nephrops norvegicus*) in the Clyde Sea Area by the parasite *Hematodinium* spp., an endoparasitic dinoflagellate that causes morbidity and mortality. Alan Taylor (1978-2014) was a comparative respiratory physiologist working on marine invertebrates. The work of Davies, Neil and Taylor is covered by Neil (2024).

Robert Furness's main interest is seabird ecology: he joined in 1978 and retired in 2018 as Professor of Seabird and Fishing Interactions. He has published over 300 scientific papers and supervised over 55 PhD students. After retiring, Bob was appointed Principal Ornithologist at the environmental consultancy MacArthur Green, focusing on the impacts of offshore wind farms on seabirds.

Marine turtle studies had three origins. First, Roger Tippett and his wife Sally Solomon, who worked on avian egg-shell structure and hatchability, were asked in the late 1980s to help the Cayman Islands green turtle hatchery with their problems in achieving hatching success. Second, the first Trinidad expedition (1989) included a team assessing leatherback turtle nesting, and threats to it on Trinidad's east and north coasts. Then Tippett and Solomon were asked to help a small non-governmental organisation in North Cyprus which was attempting to monitor loggerhead and green turtle nesting success on many small beaches. From these beginnings grew the long-term North Cyprus marine turtle research programme, now run from the Penryn, Cornwall campus of Exeter University after Glasgow graduates Brendan Godley and Annette Broderick (both now Professors) moved there. There have also been multi-year turtle studies in Trinidad and Tobago. Both projects have generated many research papers and theses on a wide range of topics in marine turtle biology and contributed to an upturn in turtle fortunes at those locations. Annette Broderick writes: "The opportunity to participate in the Trinidad expedition gave me the marine turtle experience that was the basis of my career! If I had not been chosen to go on that trip, who knows where I would be right now?" Additional Glasgow staff involved have included Bob Furness, Roger Downie, and Malcolm Kennedy.

David Bailey was appointed as a lecturer in 2007. He came from the Scripps Institution of Oceanography in California where he had been a Marie Curie Outgoing Fellow. Although he had worked on conservation issues in the past, he was mostly doing deep sea physiology and ecology at that point. Pretty much straight after landing in Glasgow he was invited to join a Scottish Government "task force" on the state of the ecosystems of the West Coast of Scotland. With this background, and accidentally discovering that deep-sea fisheries were having a massive impact on fish communities, he ended up working thereafter mostly on conservation. Since 2007, David, his 13 postgraduate students and postdocs have done fieldwork and published about Angola, Antarctica, Atlantic deep sea, Australia, Bahamas, Bangladesh, Canada, Egypt, Mauritius, Mozambique, New Zealand, Indonesia, Scotland, and Spain. With relentless and foolhardy optimism, David and his team try to provide useful science to support conservation. They have had some successes on the regulation of fishing in the deep sea, and on protection of cod spawning here in Scotland. David maintains "There's a lot more to do on understanding and protecting essential fish habitat and helping improve conservation policy here and with our overseas partners."

Dominic McCafferty started working in 1999 as a lecturer in the Department of Adult and Continuing Education and was an Honorary Research Associate in DEEB. He joined IBAHCM in 2012. Dominic's main areas of research are thermal physiology of pinnipeds and seabirds. Some of the major research projects and collaborations undertaken so far include the energetics of moulting elephant seals, and collaborations with French scientists on an assessment of invasive research procedures on marine mammals. He has conducted elephant seal whisker and seabird carrion stable isotope analysis.

Anna McGregor was appointed as a Teaching Fellow in 2012 and she is now a Senior Lecturer. Her research background focuses on the use of sound in marine mammals and the potential for anthropogenic noise to cause physiologically relevant disturbance. More recently, Anna's work has included studying the effects

of noise on other animals as well as those in aquatic environments, and the use of acoustics to monitor cryptic animals in a number of habitats**.** Her other research projects are on cross-disciplinary approaches to determining habitat suitability for native oysters, and phenological synchrony in temperate terrestrial soundscapes.

Sofie Spatharis joined as a lecturer in 2013 and is now a Senior Lecturer. She is a community ecologist and specialises in phytoplankton diversity. Her research interests also cover coastal water quality and conservation such as the impact of pollution on coastal communities and the impact of harmful algal blooms on coastal seaweed and finfish aquaculture. Sofie's research includes dynamic modelling, hypotheses testing using laboratory microcosms, field mesocosms and field sampling in both in-situ biodiversity experiments with phytoplankton microcosms in incubators. Her team also tests for the effects of stressors such as artificial light and microplastics on ecosystem services provided by marine bivalves. Sofie is particularly interested in the role of temporal fluctuations of resources on the emergence of species-rich assemblages and the relative role of niche over dispersal processes in shaping phytoplankton composition, and in microalgal metabolomics and genomics. Her eDNA work with Martin Llewellyn, on salmon and seaweed aquaculture pathogens, is having direct impact on the Scottish aquaculture industry.

The Scottish Marine Animal Stranding Scheme (SMASS) began in 1992. It gathers, collates, analyses and reports data on all cetaceans, seals, marine turtles and basking sharks that strand on the Scottish coastline. After a tendering process, SMASS moved to the University of Glasgow from 2021, with its Director, Andrew Brownlow, becoming a Senior Lecturer in Veterinary Epidemiology. As this article was being written (July 2024), a particularly serious stranding event occurred when 77 pilot whales died on the shore of the Orkney island of Sanday. SMASS staff were quickly on the scene to carry out post-mortems and to gather as much evidence and data as possible.

Laurence De Clippele was appointed lecturer in mid-2023. Her main areas of research are marine ecology – spatial and temporal patterns in biodiversity using machine learning methods on image and acoustic data. Her current research projects include passive acoustic monitoring as a tool for offshore wind farm biodiversity assessments.

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