Established in 1884

The Marine Biological Association

Incorporated by Royal Charter

THE MARINE BIOLOGICAL ASSOCIATION

Annual Report 2020-21

Overview of our year

Our Members and Collaborators

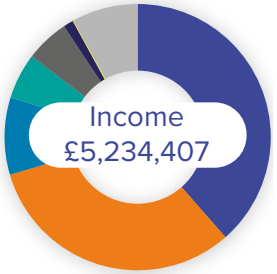
>1,700 Members
>500 Collaborators

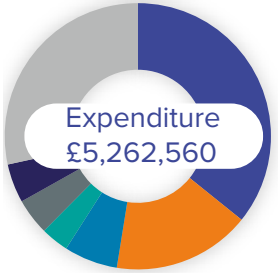
Follow us

17k Twitter followers	68,142 YouTube views	9,849 Facebook likes	2,588 Instagram Followers

> 3million impressions!

@thembauk





THE MARINE BIOLOGICAL ASSOCIATION

A Learned Society defined and recognised by Royal Charter

Together we are *the* voice of marine biology

1 Guinness World Record for greatest distance (**7 million nautical miles!**) sampled by a marine survey awarded to the CPR Survey.

19 business assists as part of the Marine Business Technology Centre.

50 parliamentarian engagements undertaken on behalf of our Members.

52 media mentions of our work.

135 peer-reviewed research papers published.

191 people helping us achieve this all including: **17 Volunteers, 54 Students, 97 Staff Members and 23 Trustees.**

305 items bought from our carbon neutral store. Plus **887kg of CO_2 saved** by trees planted and **141kg of plastic eliminated** by using plastic-free packaging.

500 collaborators we work with in **62 countries** around the globe.

1,700 members including: **44 Fellows, 527 Professional, 326 Student and 548 Young Marine Biologists.**

3.5 million awarded in research grants, thanks to our **52% grant success rate.**

1.3 billion!! downloads from our online, open-access data portal.

Contents

Cover image Our Research Vessel *MBA Sepia*

Reg. Charity no. 1155893
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Proof-readers Marion Smith and Dr Astrid Fischer

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Together we are ***the*** voice of marine biology

About the MBA

The Marine Biological Association (MBA) is one of the world's longest-running societies dedicated to promoting research into our oceans and the life they support. Since 1884, we have been providing a unified, clear, independent voice on behalf of the marine biological community and currently have a growing membership in over 41 countries. We also run a leading marine biological research laboratory where many eminent scientists - including twelve Nobel prize winners - have carried out their research.
This report showcases some of our achievements from April 2020 to March 2021.

Incorporated by Royal Charter

A Learned Society defined and recognised by Royal Charter

Make a donation, make a difference

Would you consider making a donation to help contribute to the work of the MBA? We are an independent, non-profit institute. We represent a community of individuals, passionate about marine biology and the marine environment. Each year we are very grateful to a variety of individuals and organisations who kindly donate or leave legacies to the MBA, enabling us to invest in everything from public engagement and science outreach, to investment into topical areas of research.

For further information on making a contribution, including details on the range of areas that would benefit most, please contact Alex Street: membership@mba.ac.uk or visit www.mba.ac.uk/support-marine-biology

Welcome

Welcome to the MBA's Annual Report, which showcases our membership and scientific highlights over the last year.

It was a year dominated by the global pandemic that impacted everyone. However, in reading the report you may be fooled into believing the MBA was untouched by the restrictions.

It is testament to the tenacity, resilience and enthusiasm of staff and students that we overcame many of the challenges thrust upon us. Consequently, we are presenting one of the busiest programmes we have ever had. It is dominated by our many successes, such as the highest numbers of research papers ever published, the Asian Women of Achievement Science Award to Dr Trupti Gaikwad (pictured below), and of course, the coveted Guinness World Record given to the Continuous Plankton Recorder Survey for the greatest distance sampled by a marine survey.

"We are presenting one of the busiest programmes we have ever had"

The year 2021 saw the start of the UN Decade of Ocean Science for Sustainable Development, whose Navigation Plan was adopted by the G7 Nations at the Cornwall Summit. It is vital that our voice is heard through research and advocacy to support this global initiative. We must drive transformative change in ocean science together with actions to achieve societal outcomes. I hope this report convinces you, as it does me, that we are at the forefront of this global drive.

My thanks go to everyone at the MBA for achieving so much in this difficult year.

Dr Gill Rider CB
President

Looking ahead

In a year dominated by the challenges of the COVID-19 pandemic, I have remained optimistic since we are implementing what I believe is a robust 15-year Strategic Plan: 2020–34 "Charting 150 Years of the Marine Biological Association". This year has seen innovations in the development of our communications outputs, which is the foundation for new investments in branding, website design, membership offer, training & events programme, and fundraising. You will hear much more about these over the next year. Our iconic Citadel Hill HQ will be turned into a building site as the £4-million phase 1 of our £20-million infrastructure masterplan comes to fruition. It will be organised chaos with some new world-class research laboratories being the light at the end of the tunnel. I hope you enjoy the highlights from our Annual Report, it is clear we have a great deal to be optimistic about.

Professor Willie Wilson FMBA
Director

MBA Council

Council members who were Trustees during the period (with Governing organisations where relevant noted in brackets) were:

Dr G Rider CD (President)
Mr B Mills FCIM Treasurer (elected annually)
Prof P S Rainbow FMBA (Zoological Society of London) (resigned 2 December 2020)
Prof M J Whitaker FMedSci FBS FRSA FMBA (The Physiological Society)
Prof S Rogers CSci FIMarEST Mem.MBA (Cefas on behalf of Defra)
Prof C Frid FMBA (The British Science Association)
Dr J Ashworth FMBA (The Worshipful Company of Fishmongers)
Prof J A Raven FRS, CBiol, FRSB, FMBA (The Royal Society)
Prof A G Smith FRSB FMBA (University of Cambridge)
Prof D Laffoley FRSB FLS FRGS FMBA
Mr R Coombs
Prof J Petts CBE
Prof P J B Hart Mem.MBA
Prof P M Holligan Mem.MBA
Prof R Rickaby Mem.MBA (University of Oxford) (elected 2 December 2020)
Prof H Koldewey Mem.MBA (Zoological Society of London) (elected 2 December 2020)

Council Members who are not Trustees, and each hold a Vice President role (who can advise, but not vote on Council matters), were approved at the 2 December 2020 AGM and include: **Prof G A Boxshall FRS**, **Prof M Burrows FRS** & **Prof S Hawkins FMBA**.

Vice President resignations received during the year include **Sir Richard Carew Pole Bt DL**, **Sir Neil Chalmers Kt**, **Sir Crispin Tickell GCMG KCVO** & **Prof Michael Whitfield FRSC FGS**

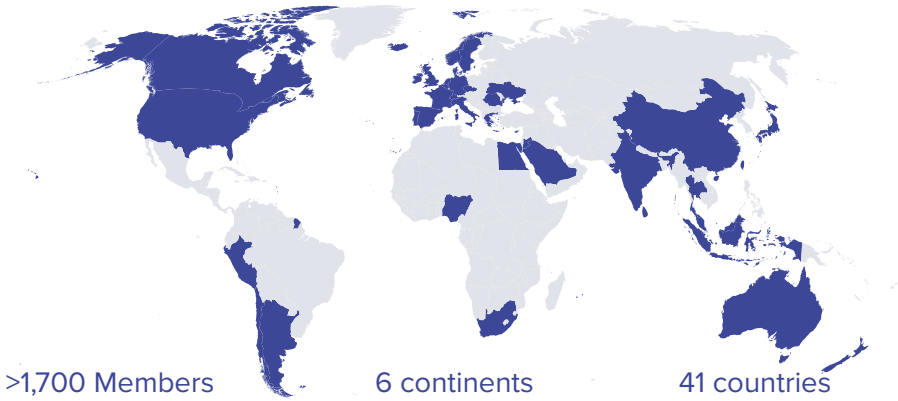
Membership

Contact Jo Langston
e membership@mba.ac.uk
@thembauk

>1,700 Members | **44** Fellows | **>1,200** attended our Deep Dives | **420** YMBs registered for our Summit

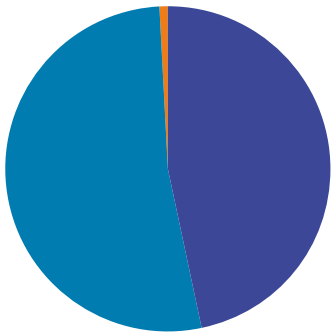
Together we strengthen the voice, and the future, of the ocean

Our Members are global

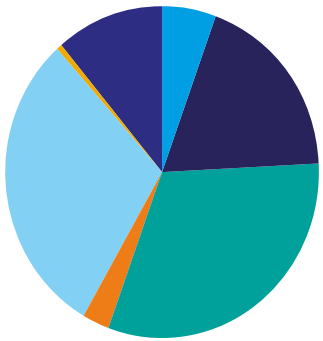


>1,700 Members | 6 continents | 41 countries

Our Members are diverse



Female
Male
Undisclosed



Institutional
Other
Fellow FMBA
Student
Associate
Young Marine Biologist
Professional, Mem.MBA

Our Fellows

Since establishing the MBA Fellow grade 44 people have been honoured. Our Fellows have made a significant contribution to the profession that goes beyond their employment. They are senior practitioners in marine biology who have contributed to the discipline at the highest level.

We welcome suggestions from our Members.

Admitted in 2020/21:
Dr Ranjeet Bhagooli Prof Ross Coleman Prof Paul Rodhouse

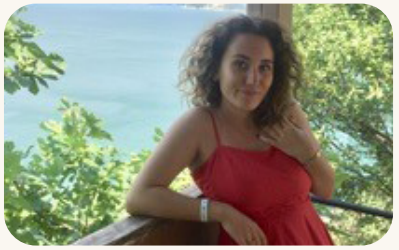
Current Fellows: Dr David Agnew, Dr Brad Amos, Dr Jennifer Ashworth, Prof Joseph Borg, Prof Colin Brownlee, Dr Matthew Bunce, Prof Alasdair Edwards, Prof Mike Elliott, Dr Zoe V. Finkel, Prof Chris Frid, Dr Paul Gilliland, Prof Chris Hauton, Prof Steve Hawkins, Prof Alistair Hetherington, Prof Alan Hodgson, Prof Peter Holland, Prof John Humphreys, Dr Magnus Johnson, Prof Dan Laffoley, Prof Paul Leonard, Prof Jane Lewis, Dr Bev MacKenzie, Dr Shaun Nicholson, Dr David Ogden, Prof Nicholas Owens, Prof Chris Parsons, Prof David Paterson, Prof Siew-Moi Phang, Prof Nicholas Polunin, Prof Philip Rainbow, Prof John Raven, Prof Stuart Rogers, Dr Shubha Sathyendranath, Prof David Schiel, Prof Alison Smith, Prof Geraint Tarling, Prof Alison Taylor, Prof Michael Whitaker, Dr Michael White, Prof Ray Williams, Prof Willie Wilson

His Royal Highness, Prince Philip, The Duke of Edinburgh

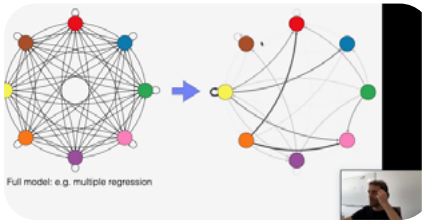
HRH The Duke of Edinburgh attending the celebration of the granting of the Royal Charter in 2014

We were sad to hear of the death of our Patron, His Royal Highness, Prince Philip, The Duke of Edinburgh. HRH had been the Patron of the MBA since 1953. He had shown a keen interest in raising public awareness of the relationship of humanity with the environment and was awarded an Honorary Fellowship by the Association in 2014.

Our membership supports the lifelong journey of Marine Biologists



I am not sure I can describe in words how many doors this association has opened for me, but I do know one thing. I am undeniably convinced that my most powerful desire is to become a marine scientist and connect with all the nature around me, like never before.
Ana Maria Munteanu, Student Member



Thanks to our bursary award, student member Jordi Sola-Codina was able to attend the '2020 Bayesian Inference approaches with Transmitting Science' course

Members receive discounts on training courses

Professional Mem.MBA
For practising marine biologists and graduates

Associate
Available to all interested in marine biology

As members *you* steer the direction of the MBA

Student
For all students registered in full-time university education

Young Marine Biologist
For our younger enthusiasts under 18 years

Creative opportunities included our popular SciArt and Writing competitions

Our AGM, held in December, was our first entirely online event allowing us to engage with more members than ever before. This was preceded by our Annual Science Talk, this was given by remote sensing scientist Dr Shubha Sathyendranath FMBA on *Aquarelle: Inferences from the colour of waters*, which attracted over 100 attendees

Our members-only magazine is produced quarterly - doubled from previous years!

Institutional Membership
Available to organisations with an interest in the marine sciences

We run exclusive Member-only events

Honorary Fellow Hon.FMBA
For persons of distinction who have made a substantial contribution to the field of marine biology

Fellow FMBA
For senior practitioners in marine biology

We ran 4 **Deep Dives**' online talks delving deeper into marine biology

Becoming a part of an international community heavily focused on marine science is the highlight of my involvement in the MBA, and better yet to learn that I was the first Peruvian to do so.
Bernabe Moreno. YMB Member

Members are offered **exclusive discounts** on our **bespoke merchandise**
themba.teemill.com
Pictured YMB member Bethan Griffiths

I joined the MBA in order to be a part of a larger network of professionals in marine biology. I have learned a lot about marine life from the association and this helped me to become a Chartered Marine Scientist and Chartered Scientist this April 2021.
Denise Okpala, Professional Member

Interested in becoming a Member? See www.mba.ac.uk/membership

Engaging with us

Contact Maya Plass
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@thembauk
@thembauk

3 million social media impressions

> 5,000 new followers

17 volunteers helping us

22 events

Shoreline mosaics drawing by © Bryony Caswell

SciArt competition

Open to our members and staff this was a chance to showcase their creative talent and celebrate our ocean with winner's artwork being displayed in the National Marine Aquarium, Plymouth.

Winners of competition categories: 1. Aquarium; photo of a stalked jellyfish by Alix Harvey. 2. Mega; Blue Whale by Alosha Samaraarachchi. 3. UN Decade; Sealife painting by Jack Daniels. 4. Micro; Diatom photo by Gemma Brice. 5. Wildcard; Shoreline mosaics drawing by Bryony Caswell.

'I'm a Scientist Get Me Out of Here'

We secured public engagement funding to work with the citizen science organisation Seasearch in order to collect subtidal species for the Darwin Tree of Life project (DToL). MBA DToL team members are participating in the 'I'm a Scientist Get Me Out of Here' programme, to engage sixth form students across the UK with the DToL project.

Newsround

PhD student Cordelia Roberts joined the CBBC Newsround team on World Ocean Day for a special feature to celebrate the importance of our ocean. Photo depicts Cordelia with two tiny cups that went down to 4850m in the North Atlantic as part of a research cruise last year.

Embracing online

With Covid restrictions we have looked to alternative options to deliver some of our events. This has included:

- Filming boat and lab sessions for the Liverpool University field course.
- Hosting South West Marine Ecosystems public Webinars online.
- Running a range of virtual demonstrations and interactive activities for work experience students and Marine Science Camp participants including fish dissections and live microscopy practical sessions.
- "Marine Biology Live" virtual speaker series, sharing the latest research and news in the marine biology community via our YouTube channel.
- Plus with social distancing we have been able to run practical sessions for our MRes students including learning skills required for genetic engineering of marine microalgae and DNA extraction.

Social media

Our main Twitter account @thembauk has seen a growth of 13% (2k new followers) with a great engagement rate.

Facebook has also seen a growth of 23% with almost 10,000 likes.

Our fastest growing platform this year has been our relaunched Instagram account, a growth of 136%!

We now have 602 YouTube subscribers with videos viewed an impressive 68,142 times!

Altogether this year our posts have made more than **3 million impressions!**

Science Journal For Kids

A thank you to Prof Geoff Millward, whose generous donations provided a funded opportunity for two papers to be adapted by Science Journal for Kids. This is a small non-profit organisation which 'translates' academic papers into easy-to-understand science articles for school students worldwide. It also makes them easily accessible to our YMB members through republication in *The Marine Biologist*.

Deep Dive

Deep Dive is a live, online, conversation based on articles from *The Marine Biologist* magazine. The Editor is joined by authors of articles, and the audience can participate through a Q&A. The Deep Dive is aimed at younger members, but the content is engaging for all ages. Four "dives" have run this year and are available on our YouTube channel.

Ocean Decade Writing Challenge

We led this initiative and partnered with author and presenter Dr Helen Scales. The challenge encouraged contestants to consider '10 years in the ocean'. Young authors (14-18) from around the world explored their own relationships with the ocean. Winning essays were published in *The Marine Biologist* magazine, and a selection in the Guardian newspaper.

"In less than a decade we can protect (them) for centuries to come."

Otter illustration by Ellie Sillar - Winner in the 14 and Under category

The Young Marine Biologist Summit

The YMB Summit was conceived to enable our young Members to meet each other and interact with other marine science professionals.

420
individuals registered

30
marine biology advocates

35
countries participated

This year's YMB Summit was taken online, becoming the most well attended yet. Many unexpected opportunities and benefits transpired. For example, without the usual financial and environmental costs, we were able to assemble over **30 marine biology advocates** from around the globe, promoting the summit to an international audience for the first time since its launch. **More than 420 individuals registered** and we welcomed participants from **35 countries**. We delivered the event as a Zoom webinar, making it safe, secure and interactive.

Looking ahead

YMB 2021 will take place on November 27th and 28th and will be in partnership with Save Our Seas Foundation with the theme 'Ocean Predators'.
We will be launching a revised training and events programme, our new branding and website in 2022.

Publications

Contact Guy Baker
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@thembauk

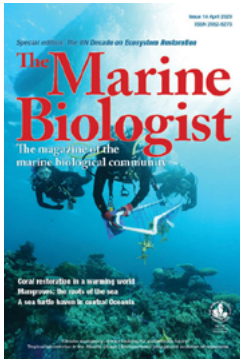
17 Issues of The Marine Biologist magazine

JMBA published articles from >50 countries

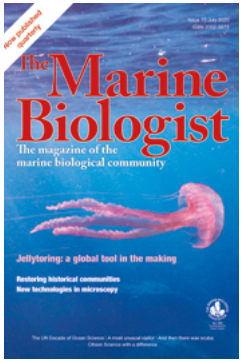
MBR is our first GOLD open access journal

The Marine Biologist

Our popular members' magazine, *The Marine Biologist* (*TMB*), expanded to quarterly production this year and published articles from a range of contributors.

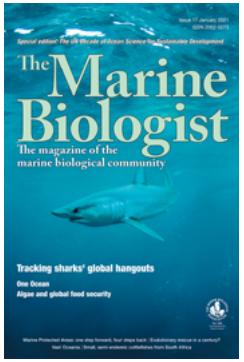


Issue 14 celebrates the UN Decade of Ecosystem Restoration with articles on coral reef, mangrove, and estuary restoration.

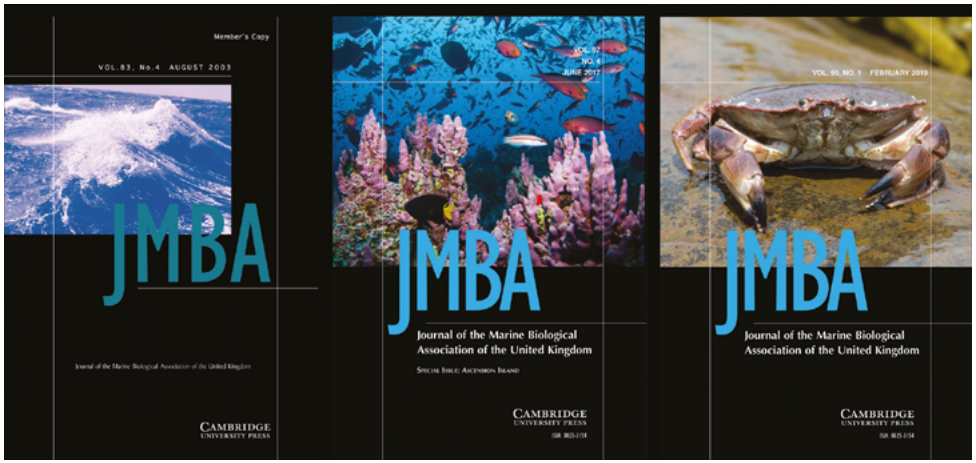


Issue 15 leads with a very timely article about new technology that enables automatic detection, identification, and recording of jellyfish.

Issue 16 we were delighted to welcome explorer and TV presenter Paul Rose, who proposes changing our values towards nature. Changes in society in 2020 are reflected in the magazine as we consider how we relate to nature; diversity, equality and inclusion in marine science; and how the marine scientists of the future can get better at observing nature.



Issue 17's theme is The UN Decade of Ocean Science for Sustainable Development. By way of an introduction to this important initiative, we are delighted to present an interview with Vladimir Ryabinin, Head of the IOC (Intergovernmental Oceanographic Commission of UNESCO). All also available at www.yumpu.com/user/marinebiologist



Journal of the Marine Biological Association (JMBA)

First published in 1887, the JMBA is recognised as a key international journal for original research and reviews on all aspects of marine biology. The Editor in Chief, Prof Jane Lewis, continues to work on increasing the journal's long-standing reputation for supporting fundamental research.

Marine Biodiversity Records (MBR)

Our first Gold Open Access journal, Marine Biodiversity Records (MBR), continues to publish findings from around the world, documenting and reviewing changes in geographical ranges of marine species.

MBR will merge with JMBA in 2022 creating a single easily located repository for original research articles, opinion and records of key changes in the marine environment.

Policy

Contact Dr Matt Frost
e mfrost@mba.ac.uk
@thembauk

2 Special Interest Groups established

12 policy papers published

50 Parliamentarian engagements

As an association with a Royal Charter, we offer an independent voice on policy matters on behalf of the marine biological community via our ever-expanding international membership.

Pathways to decision makers

We provide a valuable pathway for evidence and advice to be passed from our members to decision makers. Using this we feed into policy issues ranging from national (UK marine monitoring) to Global (UN OceanDecade). We have worked with policy makers from local through to national (e.g. government departments and agencies) to international (e.g. IOC-UNESCO).

Consultations

We have provided advice and evidence for Defra's consultations on the Marine Strategy Part 1 (Marine Monitoring).
We responded to national (GCSE curriculum) and international (UN Decade) consultations.

Publications

We have published 12 policy articles and contributed policy advice (as chair or member) to the same number of science/ policy committees.

Science-Policy interface

We have chaired / contributed to numerous science-policy committees, including the Marine Climate Change Impacts Partnership and Overseas Work Group; the Healthy and Biologically Diverse Seas Evidence Group; and the International Working Group of the Marine Science Coordination Committee.

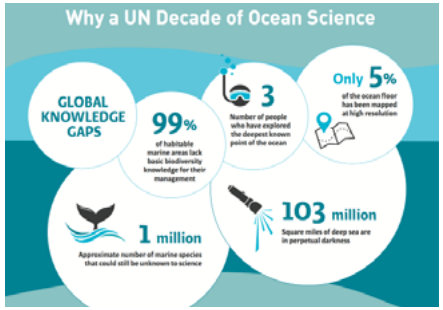
Ultimately, the sustainable use of the oceans is informed by the evidence and advice we provide

The UN Ocean Decade Programme

The vision for this programme is to

"*Develop scientific knowledge, build infrastructure and foster partnerships for a sustainable healthy ocean*"

We represented the UK as part of the UK Delegation to the United Nations Decade of Ocean Science.



Special Interest Groups

We have established new Special Interest Groups (SIG) including the Marine Protected Area SIG led by MBA Member Eoin Lyttle, and an Equality, Diversity and Inclusion Committee led by Rob Camp.

Knowledge exchange

We have provided lectures, training and placement opportunities to graduates, post-graduates and other MBA Members.

Looking ahead

We continue our work on the establishment of a new World Association of Marine Stations (WAMS) with a World Congress of Marine Stations planned for November 17th and 19th. The Programme Committee is led by Dr Matt Frost and supported by MBA Policy Intern Giulia Licocci.
We look forward to further input to the United Nations Framework Convention on Climate Change (UNFCCC) Conference of Parties (COP), G7 and UN Decade activities.

Research Highlights

Contact Prof Willie Wilson

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@thembauk
@thembauk

135 papers published

>£3.5 million in research grants

>40 conferences attended and presented

52% research grant success rate

Research programme

Our research programme is driven by world-class scientists based largely at our Citadel Hill Laboratories. Our Science Strategy spans overlapping biological scales from microscopic to ocean-basin focusing on:

These contribute to three broad highly topical strategic science themes:

Climate Change is one of the greatest societal challenges of the 21st Century. The continued collection and interpretation of biological data provides detailed insights into how the ocean is responding to this threat and supports predictions about future impacts.

Blue Economy is best defined as taking inspiration from the ocean to derive economic benefit for a sustainable society. Biodiversity (particularly microbial biodiversity) and sustainable resources are the foundations of a vibrant blue economy, including biotechnology.

Ecosystem Health. As a major reservoir of natural capital, the ocean provides global economic benefits valued at $2.5 Trillion/year. Most of that value depends on healthy ecosystems. Our researchers perform unique health checks at large ecological scales helping to identify anthropogenic threats such as microplastics, pathogens and invasive species.

Our mission is to understand the causes and consequences of environmental change in the ocean through discovery and dissemination

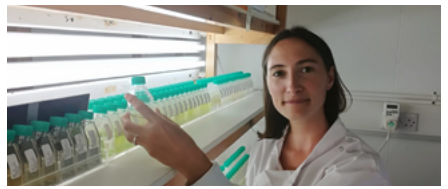
There are almost 30 research active Principal Investigators (PIs). These are a rich group of science PIs that all contribute significantly to the MBA's engaging research programme, highlights include:

Grant successes

The prestigious European Research Council (ERC) have awarded research grants to Dr Michael Cunliffe for the marine fungi MYCO-CARB project, Prof. Colin Brownlee for the phytoplankton SeaCells project and Prof David Sims to develop oxygen-sensing bio-logging tags to understand how pelagic sharks and tuna respond to ocean de-oxygenation.
Dr Dan Smale was awarded the NERC Future Leaders Fellowship on impacts of marine heatwaves on benthic ecosystems.
We are highly successful at the MBA with a grant success rate of 52%; one of the highest in the UK.

Awards

Dr Trupti Gaikwad who was awarded the Asian Women of Achievement Science Award.



Dr Katherine Helliwell who was a finalist for the Society of Biology President's medal in plant biology.

Marine Microbiome

Contact Dr Michael Cunliffe

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@mbacell

400 strains of phytoplankton held in our culture collection

35 peer-reviewed publications

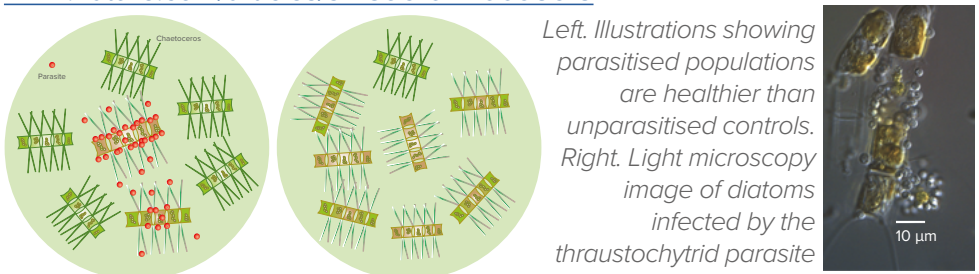
10 conferences presented at or attended

37k twitter impressions

We study the biology and ecology of marine microbial life to better understand their roles in sustaining healthy functioning marine ecosystems.

Parasites in the plankton are not all bad news

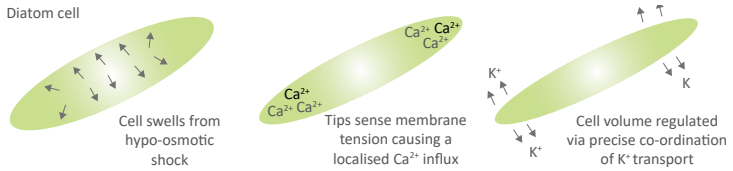
Selective removal of unhealthy individual cells by protist parasites can be beneficial to phytoplankton populations. We found that parasitised populations of Chaetoceros were unexpectedly healthier than unparasitised controls.
This interaction (or symbiosis) is a novel discovery at microbial scales.
www.nature.com/articles/s41396-021-00936-8



Left. Illustrations showing parasitised populations are healthier than unparasitised controls. Right. Light microscopy image of diatoms infected by the thraustochytrid parasite

How do diatoms deal with osmotic changes?

The hypo-osmotic Ca^{2+} signalling pathway is likely to be critical to diatom survival in dynamic osmotic environments. These rapid sensory systems are vital to mitigate the harmful consequences of osmotic stress in diatoms.
https://nph.onlinelibrary.wiley.com/doi/full/10.1111/nph.17162

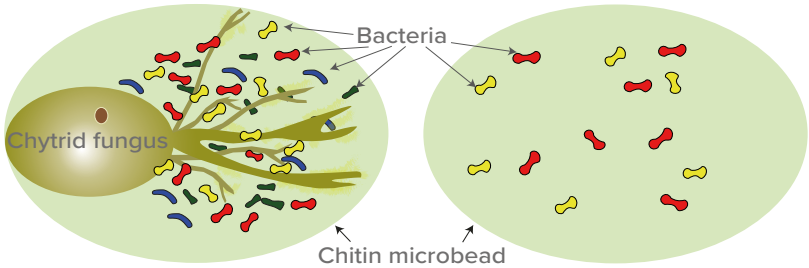


"Microorganisms form and sustain global biogeochemical cycles, underpin food webs and maintain ecosystem health. Our research provides a better understanding of these complex roles of marine microbes."

Fungi shape bacterial communities

Microbial colonisation and degradation of particulate organic matter (POM) are important processes that influence the structure and function of aquatic ecosystems. Using a model ecological system with a chytrid fungus and artificial chitin microbeads, the impacts of POM-associated bacteria were assessed. The presence of chytrids on POM alters concomitant bacterial community diversity and structure, including differing responses between chytrid life stages. The study suggests that chytrid fungi have complex ecological roles in aquatic POM degradation not previously considered, including the regulation of bacterial colonisation, community succession and subsequent biogeochemical potential.

http://dx.doi.org/10.1098/rsbl.2020.0368



Looking ahead

In summer 2021, we will take part in a major research cruise in the central Arctic Ocean to understand how sea ice microbial communities are impacted by climate change.

Coastal Ecology

Contact Dr Dan Smale

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@MBAEcology @MarClim_UK @NNSatMBA

>220k impressions on social media

27 papers published

16 conferences attended

12 new aquaria systems

From marine heatwaves and ocean acidification to non-native species, our research addresses critical questions on biological impacts of multiple stressors in coastal ecosystems.

Drivers and impacts of the most extreme marine heatwave events

Prolonged high-temperature extreme events in the ocean, marine heatwaves, can have severe and long-lasting impacts on marine ecosystems, fisheries and biodiversity. Our work has significantly advanced the understanding of climate change impacts on marine ecosystems, in particular responses to extreme warming events through applying an empirical framework to identify the most extreme marine heatwaves and their associated impacts.
https://doi.org/10.1038/s41598-020-75445-3

New recommendations for Algae Species Classification

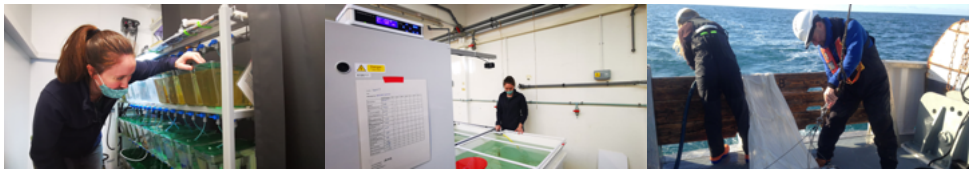
Our research proposes formal definitions for algae species to be classified first by DNA and then by other traits. Algae should evolve separately from other lineages based on DNA only, but ecological differences should also be considered, such as what they look like or their role in the environment.
https://doi.org/10.1111/jpy.13059

Non-Native Species (NNS)

We collaborated with Cefas staff to update the master list of marine NNS in the UK; a first step in creating new UK priority lists for marine NNS monitoring and surveillance.
We produced an enlarged edition of our Guide to Marine NNS (funded by Natural England / Bromley Trust), which is also being adapted by Natural Resources Wales for Welsh monitoring and surveillance.

Our research draws together expertise from estuaries and intertidal shores to kelp forests. Greater knowledge of these habitats will inform management and conservation efforts and help safeguard the ecosystem and socioeconomic services they underpin.

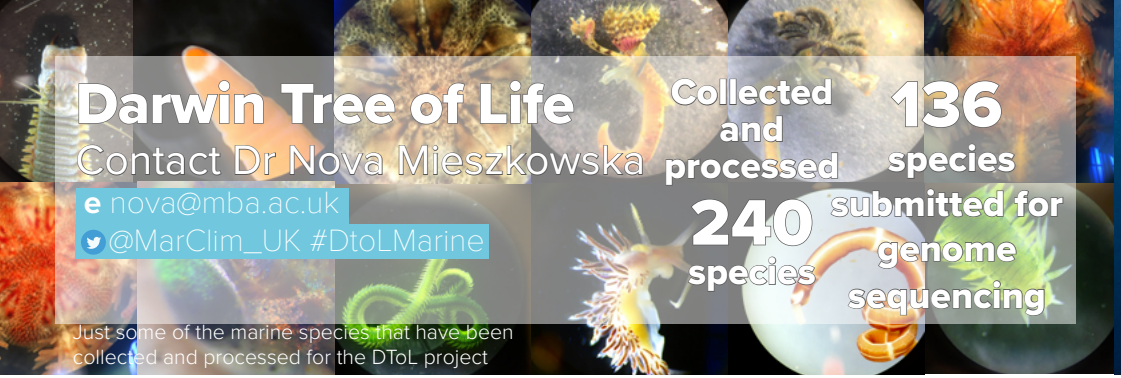
Facilities



- New Smart Experimental Aquarium (SEA) facility launched. 12 x 1000 litre tanks with automatic computer control and full life system support.
- Upgraded and updated tank rooms – we have replicate closed-system tanks ranging from 5-1000 litres capable of replicating a variety of different environmental parameters from temperature to pH.
- Crew from our research vessel *RV Sepia* participated in the annual NE Atlantic Marine Biological Analytical Quality Control (NMBAQC) scheme for fish; a course of external Quality Assurance for laboratories engaged in the production of biological data. Fifteen fish specimens identified to species level which will be checked by an external moderator as part of the fish reverse ring test.

Looking ahead

Further work on understanding the structure and functioning of kelp forest ecosystems. Continued research on the impacts of extreme warming events. Our EU Horizons 2020 FutureMARES project partner with MarClim time-series is being used for analyses and developing Nature Based Solutions. Completion of the project INNShore - Improving awareness of Non-native Species on shores and in estuaries - a combination of survey work and citizen science outreach activities.



Just some of the marine species that have been collected and processed for the DToL project

Mako Shark © Nuno Vasco Rodrigues

The Darwin Tree of Life project aims to sequence the genomes of all 70,000 species of eukaryotic species in Britain and Ireland.

The project is a collaboration between biodiversity, genomics and analysis partners that hopes to transform the way we do biology, conservation and biotechnology. Our primary role is the acquisition of marine samples, including macroalgae, invertebrates, protists, lichens and fungi taxon groups, while acting as the barcoding hub for marine fungi, protists and macroalgae.

- To date, we have collected/ cultivated and processed 240 species from 148 families.
- Having optimised extraction and PCR protocols we have successfully extracted DNA from 61 species and obtained sequences from 57 species.
- Multi-gene phylogenetic analyses are currently underway to resolve problematic taxa and verify potential new species records for the UK.
- Scientists are also exploring the genetic features of entire ecosystems, starting with British shorelines to gain insights into the impacts of climate change, pollution and invasive species in the oceans and on shores.
- Explore the species list here // tolqc.cog.sanger.ac.uk/index.html
- Raw data and early-pass assemblies are available here: https://github.com/darwintreeoflife

The DToL team collecting samples at sea

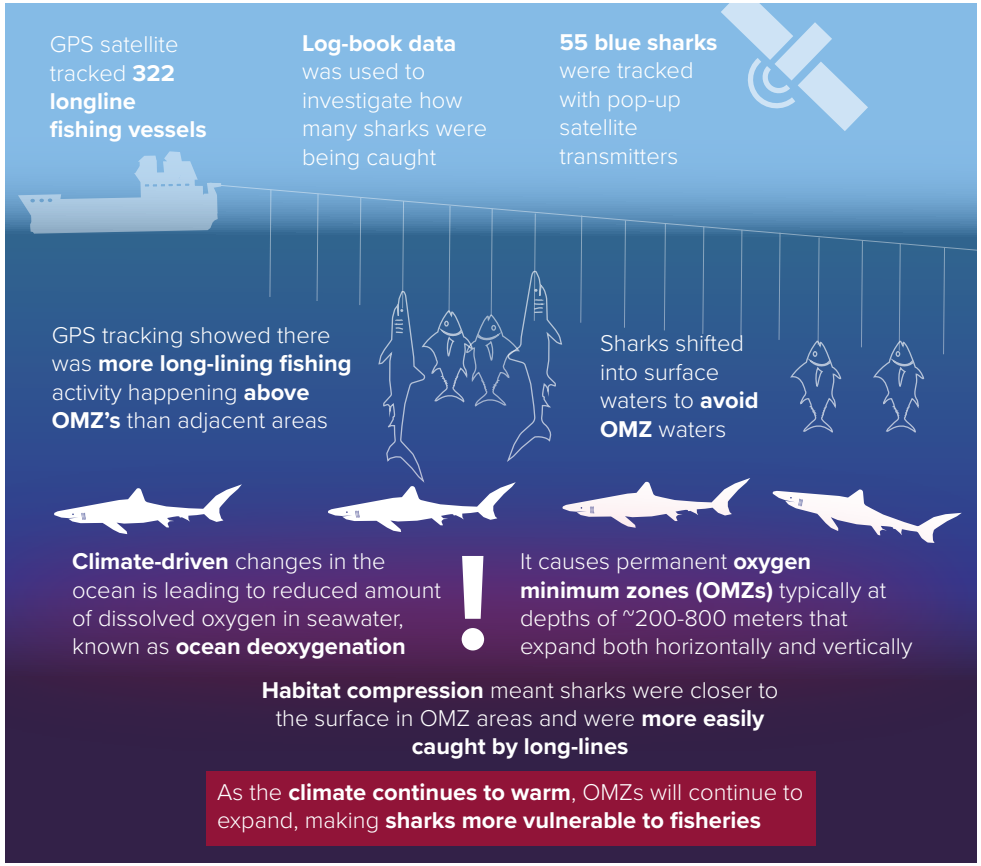
Looking ahead

The project is due to run over the next 10 years with the MBA aiming to process 1,800 marine species in Phase One.

Tracking the movements and behaviour of ocean predators to understand responses to changing environments and human threats.

Sharks under pressure

De-oxygenating deep-sea drives sharks to the surface making them more susceptible to capture by fisheries. https://elifesciences.org/articles/62508



Continuous Plankton Recorder Survey

Contact David Johns

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@CPRSurvey
@CPRSurvey

98,659 Miles towed in 2021

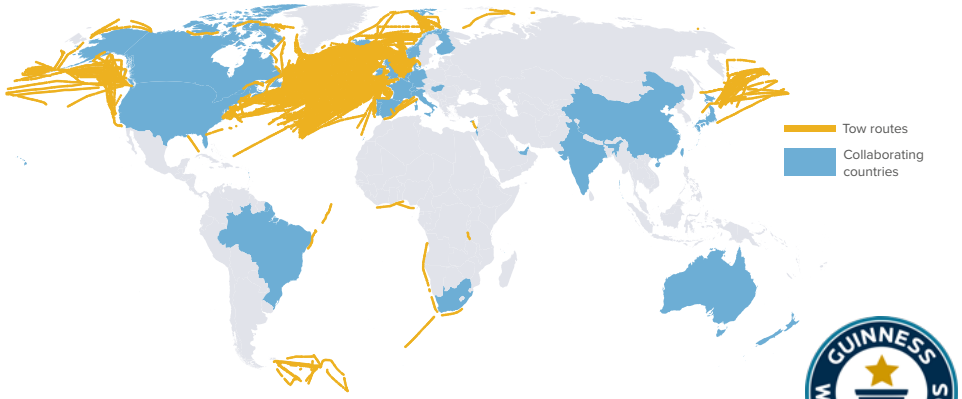
7 Million miles towed since 1931

90 years of CPR tows

1 Guinness World Record awarded

The Continuous Plankton Recorder (CPR) Survey is the world's longest running and one of the most geographically extensive marine ecological survey in the world.

Our tow routes and global collaborations



A world-record holding Survey!

The record has been set for the greatest distance sampled by a marine survey! Sir Alister Hardy invented the CPR back in 1931 and the technology has stayed much the same since. Towing 7 million nautical miles has allowed us to collect a huge wealth of data, creating an un-paralleled time series that can be used to show long term changes in the marine environment.

None of this would be possible without the continuing support of the shipping industry, who we are ever grateful to.

With changes in our ocean happening at an unprecedented rate, it is more important than ever that we are able to monitor the health of our marine environment using plankton as an indicator.

New projects

The iCPR project aims to expand the use of modern sensing technology and introduce Artificial Intelligence (AI) across the CPR Survey in order to better monitor the marine ecosystems.

We continue to collaborate internationally, and this is well demonstrated by our work in the EU-funded projects AtlantECO and Mission Atlantic. As part of AtlantECO, we will be towing the first CPR tow between Brazil and South Africa. Despite a global pandemic, civil disruptions and shipping changes, the first tow should be in October 2021.
CPR researchers are working closely with many organisations in both AtlantECO and Mission Atlantic, where our unique basin-scale dataset proves invaluable.

Policy

We deliver highly important, policy-relevant, strategic research. Research outputs are currently used to monitor changes in marine biodiversity and food webs and have enabled the development of indicators which assess the ecological health of UK and EU regional seas under the UK Marine Strategy (UKMS), EU MSFD the 25 Year Environment Plan, and OSPAR biodiversity commitments.

If you want to use your plankton data in any research or policy-relevant work, you need to make sure it's robust, and remains so through its time series.
As such, North East Atlantic Marine Biological Analytical Quality Control acts to promote QA in marine biological sampling, and the CPR Survey developed and continues to oversee the Zooplankton component.

Looking ahead

We will be celebrating 90 years of tows, a variety of events is planned to mark the celebratory achievement.
www.cprsurvey.org/policy-outreach/cpr90

Postgraduate Learning

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@MBAPhDGang

54 students studying

Our students published **15** papers

9 new PhD students welcomed

~2k social media followers

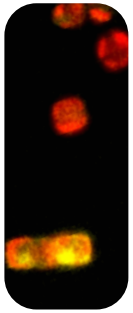
PhD student Nora Salland surveying kelp

Our postgraduate programme teaches the future generation of marine biologists at our world-leading laboratory with a broad range of collaborative partners in the UK and beyond.

This year we welcomed nine new PhD students to the MBA PhD cohort to projects collaborating with the University of Exeter, University of Bristol, Cefas, University of Plymouth, University of Southampton and the Universidade do Porto.

Our MRes and PhD students were authors on fifteen MBA research papers published this year.

How do diatoms sense nutrients?

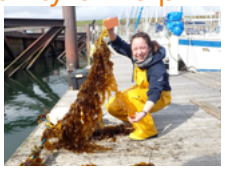


Diatoms commonly respond first to nutrient influxes but little is known of the sensory mechanisms that they employ. We discovered that phosphorous-limited diatoms use a $Ca2^{+}$ (calcium) dependent signalling pathway, not previously described in eukaryotes, to sense and respond to the critical macronutrient. This pathway is ecologically relevant, being sensitive to sub-micromolar concentrations of inorganic phosphate and a range of environmentally abundant P forms.

PhD students Ellen Harrision and Friedrich Kleiner are named authors
https://doi.org/10.1016/j.cub.2020.11.073

We are training the next generation of marine scientists

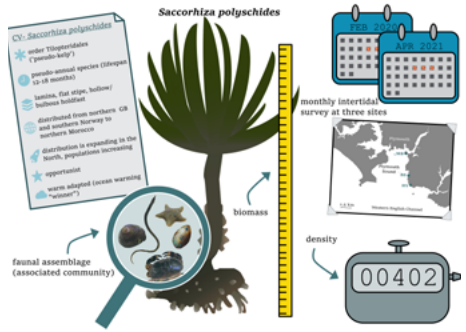
Environmental factors influencing primary productivity of kelp

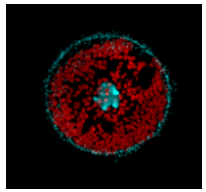


Rates and drivers of primary productivity are well understood for many terrestrial ecosystems, but remain poorly resolved for many marine ecosystems. Net primary productivity (NPP) was quantified within kelp forests (*Laminaria hyperborea*) around the UK. Ocean temperature was identified as a likely driver of productivity, with reduced NPP in warmer waters. Light availability was also strongly linked with carbon accumulation and storage, with increased light levels positively correlated with NPP and standing stock. NPP is likely to be important for local food webs, as a trophic subsidy to distant habitats and for inshore carbon cycling and (potentially) carbon sequestration.

MRes student Albert Pessarrodona is a named author
https://www.nature.com/articles/s41598-020-69238-x

Our students won several honours in recognition for their contributions at the 2021 British Phycological Society (BPS) meeting: PhD student Yasmin Meeda won the British Phycological Society Algae-Video bursary. PhD student Nora Salland was awarded a commendation for her poster "*Saccorhiza polyschides* an ocean warming "winner" in the UK?" (right).





Award winning micrograph taken by PhD student Davis Laundon. This image won first prize in the Hilda Canter-Lund competition by the British Phycological Society.

It is also available on t-shirts in our online shop
themba.teemill.com

Consultancy

Contact Dr Heidi Tillin
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Collaborated with 16 external experts

Contributed to life histories and sensitivities of 250 marine species

MBA consultancy services benefit conservation of habitats and species, while supporting sustainable use and maintenance of socio-economic goods and services to people.

This year we have been commissioned to undertake projects to support marine management in England, Wales Scotland and Ireland.
Our work considers a range of marine components and at different scales from habitats of conservation importance to seabed invertebrates and seaweeds including:

- Two studies to develop the evidence base and recommendations to support sustainable harvesting and aquaculture of seaweeds. This work will be used by Natural England and Natural Resources Wales case officers to develop authoritative and consistent advice to manage and monitor applications.
- We have contributed information on the life histories and sensitivities of 250 marine invertebrate species to support the development of fisheries models for the Marine Institute Ireland. The models will underpin sustainable management of fisheries in Marine Protected Areas.
- We have worked with NatureScot to develop habitat models to identify key feeding areas for sea ducks to support spatial management of Special Protected Areas for Birds.
- We have contributed to a pilot project to demonstrate how ecosystem services could be incorporated in Scotland's regional marine plans.

Looking ahead

We anticipate further projects arising from spatial and conservation management evidence requirements and further growth in marine ecosystem service work.

Marine Business Technology Centre

Contact Dr Rowena Stern
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@MBTCentre @Oceansgate

19 business assists

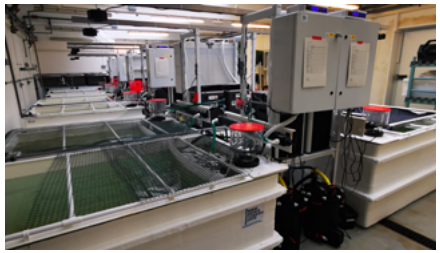
3 grants awards

4 in-depth assists

The MBTC is project funded by the European Regional Development Fund with five partners, led by Plymouth City Council. The aim is to use technology to assist Devon-based businesses.

Using our expertise we have assisted a wide range of businesses creating media-based educational products, biological testing for conservation and exploration.

- We are especially proud of our efforts to upgrade the Seawater Hall with the new Smart Experimental Aquarium platform with state-of-the-art automatic monitoring and remote access (on right). These are available for bookings - contact us!
- We helped Soundview media produce an immersive educational 3D video on plankton
- We assisted in measuring benthic biomass on underwater reefs with ARC Marine Ltd in their efforts to improve benthic biodiversity.
- Other partners have been instrumental in developing electric propulsion for marine pleasure crafts.



Our programme has relied on MBA staff giving their expertise to help Devon businesses. Our unique expertise and facilities have been key to helping these businesses develop their ideas and products to the next level. A big thank you to all staff who have helped with this initiative.

Looking ahead

The MBTC project officially ends in September 2021 but we are looking to extend it - watch this space!

Data and Information

Contact Dan Lear
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@dassh @marlinuk

1.3 billion data records downloaded

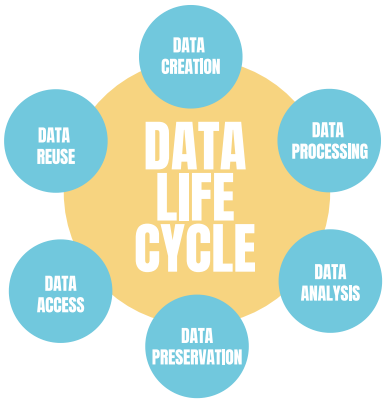
165,000 MarLIN users

652,000 MarLIN page views

69,678 DASSH downloads

The MBA Data and Information programmes continue to explore innovative and informative approaches to sharing knowledge, data and information on all aspects of the marine environment.

Our data principles



Our team supports the FAIR Data Principles to ensure data can be reused by as many people as possible.

Marine data are expensive and time-consuming to collect. By using data standards and sharing data in an open and transparent way we make sure that as many people as possible can use and benefit from the data we manage.

We work to provide a holistic, full life-cycle approach to data archiving & management.

Working closely with a range of marine biological data providers, we offer data management solutions for everything from archiving & analysis to publication of biological data relating to species & habitats.

We share data, information and knowledge to support education, research, management and informed decision making.

Highlights

The Marine Life Information Network (MarLIN) programme received additional funds to work on: 'contaminants' pressures and additional climate change sensitivity assessments focussing on pressure definitions and benchmarks for hydrocarbon and polycyclic aromatic hydrocarbons, synthetic chemical, and transitional metal contaminants.

MarLIN added climate change related sensitivity assessments for a further 27 marine biotopes within UK marine protected areas (www.marlin.ac.uk/news/article/185).

The Marine Evidence-based Sensitivity Assessment dataset was also made available for download via a range of APIs (www.marlin.ac.uk/data-extract).

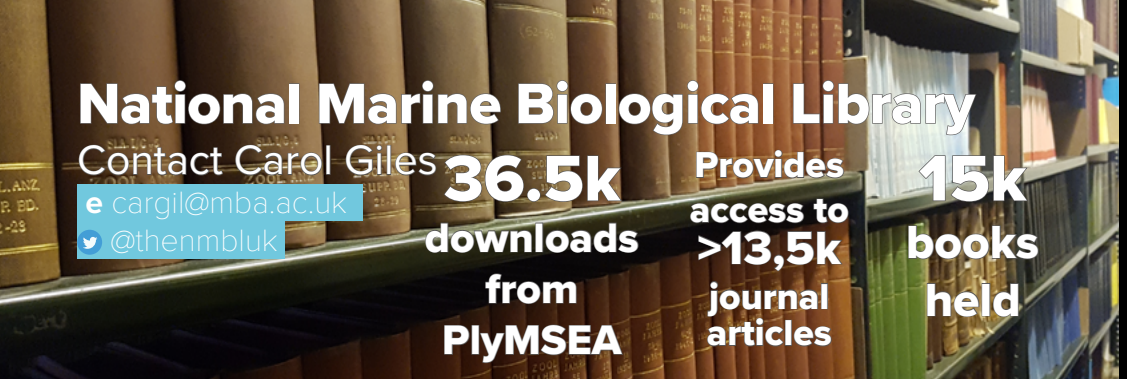
DASSH: The archive for marine species and habitats data continued to provide data management services to a wide range of external partners including UK and devolved government departments and agencies, the academic sector and commercial organisations.

Key roles in supporting the data infrastructure and governance of the UN Decade for Sustainable Ocean Science through the MBA's role as the UK node of Ocean Biodiversity Information System (OBIS) expanded our global reach.

Citizen science activities were further enhanced by the launch of iNaturalist UK, in partnership with the National Biodiversity Network and UK Centre for Ecology & Hydrology.

Looking ahead

We are continuing to develop how the Data and Information components of the MBA can align their work through shared infrastructure and resources, to provide a holistic access point to the wealth of information the MBA curates. Closer interactions with the research groups are planned to ensure the highest possible visibility and accessibility of MBA research data in support of the FAIR principles.



National Marine Biological Library

Contact Carol Giles
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@thenmbluk

36.5k downloads from PlyMSEA

Provides access to >13,5k journal articles

15k books held

Established in 1886, the National Marine Biological Library is one of the largest marine reference libraries in the world, holding thousands of scientific journal titles and books, historical literature, expedition reports and a herbarium.

- Despite being closed to visitors for the majority of 2020/21, our library staff (including a new Manager and temporary Library Assistant) have continued vital Library work from home, including input to further negotiations around the move from a '*Read*' to *'Read and Publish'* model of journal subscriptions. This is in order to comply with the Open Access policies of major funders, such as UKRI and the Wellcome Trust.
- A new atmospherically controlled Archive Room has been created in the Library and rationalisation of this material can now be undertaken, as Library staff return to working onsite.
- A new joint MBA and Plymouth Marine Laboratory Library Committee has been launched to create a forum for discussion for the future provision of electronic Library resources.
- Our Library Manager has now taken on the role of copyright advisor for the MBA.
- Over 115 new items were deposited into PlyMSEA, our open access repository. Use of the repository to access material continues to be strong, with over 36,500 downloads recorded.

Looking ahead

We aim to increase online access to the library assets including archive items and special collections through collaborative digitisation and mobilisation projects. These activities will ensure a global audience can benefit from the rich resources held within the National Marine Biological Library.

Financial Information

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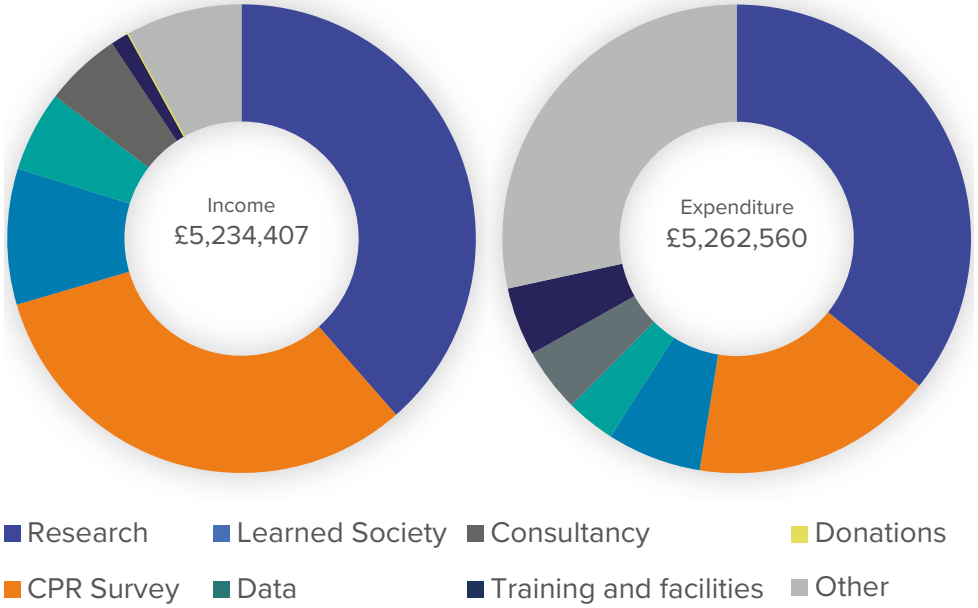
Stalked Jellyfish photo by Alix Harvey

The MBA was founded in 1884 and incorporated in 1885 as a company limited by guarantee without a share capital. We were granted a Royal Charter in 2013, as official recognition of our long and eminent history and status within the field of marine biology. This resulted in the incorporation of a Charter Body registered with the Charity Commission. Therefore we operate as a non-profit organisation.
The following finances show our management accounts which does not included depreciation and gains/losses on investments.



Join the MBA

and become part of a dynamic worldwide community

Members of the MBA are part of a global community of marine biologists. Whether you are a student, a professional, or just passionate about marine biology, we have a membership package for you, all with a fantastic range of exclusive benefits. Stay up to date with the latest news and events.

- ✓ Free subscription to our quarterly 'The Marine Biologist' magazine
- ✓ Discounts on MBA training courses, events and conferences
- ✓ Discounts off titles from leading publishers
- ✓ Opportunities for career progression
- ✓ Take part in science and networking
- ✓ Exclusive post-nominal letters
- ✓ Steer the future of marine biology

Join at www.mba.ac.uk/membership

A Learned Society defined and recognised by Royal Charter

Together we are the voice of marine biology