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## **From what and to where? Celebrating the first 50 years of *Marine Pollution Bulletin***

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In the 1960s and 1970s, industry in the north-east of England, as in many places, was in decline. In particular, heavy industries such as shipbuilding, coal mining, steel and chemical plants were shrinking or closing, partly due to cheaper alternatives from elsewhere. At the same time there occurred a series of catastrophic oil spills around the British coast, most famously the Torrey Canyon incident. Most of Britain's sewage was also being discharged with either none or minimal treatment or, if it was treated, it was often by ageing and inadequate treatment plants. The common philosophy was '*dilution is the solution to pollution*' which often verged on '*out of sight, out of mind*'! In several parts along the north-east of England, noteworthy pollution events affecting the sea and coast were increasing, such as strandings of marine mammals, fish kills, unusual seabird mortalities and more, these often reaching either the newspapers or TV news bulletins. However, scientific information about the pollution caused by those industries was far less abundant, as was the case as to how to manage it, control it or clean it up. It began to be realised, for example, that while it was quite easy to disperse oil - just deploy bulldozers on the beaches, spray rocky shores with hot water and apply tonnes of dispersant at sea - the environmental consequences of doing so could be even worse than the initial pollution.

It was in this context that Prof Bob Clark at Newcastle University and its Dove Marine laboratory on the coast started a monthly mimeograph called *Marine Pollution Bulletin* that first appeared in 1968. Its initial intent was declared to be to keep people in touch with events in the marine pollution field and with new advances in treating, controlling and preventing problems. Initially and for several years it was not intended to be a scientific journal but a monthly information bulletin to keep people (not only scientists but industry managers and authorities) abreast of fast-moving developments and advances. This was needed and so successful that in just a couple of years, in 1970, the mimeo format developed into Volume 1 of the printed MPB, published initially by Macmillan and then by Pergamon Press (who were later subsumed into Academic Press and then the current publisher Elsevier).

Now widely referred to as 'MPB', it has retained its news and information value throughout, although early on it included material of mainly British developments in the field of marine pollution. Its News sections (for many years collated by Paul Kingston in Edinburgh), and later its Viewpoints and Editorial numbers were increasing in both scope and global coverage; they have been valued, all still retained today, and this value is shown by usage figures and citations from not just academics but by industries, authorities and practitioners of many kinds. From our experience working for and with environmental protection bodies, it became apparent that even though practitioners did not usually consult more academic journals, which for the first two decades were difficult to access outside academic libraries, MPB was the one journal that they did take.

Nevertheless, it very quickly evolved and expanded into a "proper" journal too, with gradually growing numbers of scientists wishing to place their reports and papers under its title, particularly as they saw its role in reaching the practitioners. It has retained its very valued and usually well-cited Editorial and Viewpoint sections which usually contain thought-provoking articles from invited leading scientists, articles that have often generated strong feedback, usually praise but sometimes indignation from people and industry representatives guilty of perhaps less than perfect practices. The Editors have rightly taken the view that they should accept these opinion pieces and if readers query the views expressed, then they are entirely free to submit their own views. In its Editorials, Viewpoints and News it fulfilled a role that is not really catered for anywhere else, often lying somewhere between science and newspaper or other mass media articles. As such, even the modern e-media methods of today do not diminish the importance of Editorials and Viewpoint sections, the former in particular being a category that is still severely under-represented in

published fora. It also developed a separate section called Baseline, containing data-rich papers often with archival material – it is likely that MPB was one of the first journals, long before the advent of ‘electronic supplementary material’, to see the value of publishing such raw data which otherwise would be lost. These sections of the journal remain important and well-used but require a little more effort than usual on the part of the various editors.

*Marine Pollution Bulletin* has a long history, and this too has its own value. For those of us who often have to review grant applications, how many times do we see an application to carry out research for something that has already been done but which remains unknown to the poorly-read applicant: something done perhaps before they were even born? There is the continued need to show that science did not start with the advent of the internet and now that the back-issues of journals have been scanned and uploaded, researchers no longer have the excuse that they could not find the older material. For those of us who have been involved with the journal for a long time it has sometimes been mischievously pleasurable to point out such omissions, sometimes of work documented in MPB, to young scientists who too often think that science began only a couple of years before they started their research!

Sometimes fondly called ‘Clark’s comic’ before the turn of the millennium by some who were only too pleased to have their own papers published in it, MPB swiftly became the leading journal in its field, as shown by the steadily increasing Impact Factor so loved amongst those reliant on research metrics. Bob Clark retired from the journal in the mid-1990s, passing the editorship to Charles Sheppard from the same University of Newcastle upon Tyne, whose background was also in marine pollution from both the same part of the UK but increasingly from more tropical regions where pollution problems commonly were much more severe and often with limited government agencies to handle them. Submissions increased hugely, as did the journal’s Impact Factor and importance in the scientific world, overtaking in size, Impact Factor and speed of publication several other journals also considered to be leaders in the field. The concept of pollution was broadened to any and all environmental factors affecting the oceans, and the content moved away from pollution in its narrowest sense. This created some debate, for a while, about whether to change its name to *Marine Environmental Bulletin*, but this was not followed through for several reasons, especially that the publishers believed that while libraries were all too happy to cancel subscriptions they rarely started new ones, and a change of name would be like starting a new one. The Editor and Editorial Board also took the view that its readers and authors were very well aware that it covered much more than pollution and was pre-eminent in starting to link the natural and social sciences, and

incorporate governance and management aspects. Therefore, the journal remained with its traditional name even though it was greatly expanding its original scope – and just to make sure that no one was in doubt, it added the subtitle ‘The International Journal for Marine Environmental Scientists, Engineers, Administrators, Politicians and Lawyers’! The interest of the scientific community for MPB has increased over time, as well as its geographic coverage, but the original intentions of Bob Clark have been maintained and enhanced and we are sure that he would fully support the expansion of the journal.

To achieve this expansion, the Editorial board expanded, and a section taking invited Reviews was started. Very importantly, the Viewpoint and Editorial sections stayed and remain strong to this day. Special issues, volumes devoted to a particular conference or theme, started appearing in the early 1990s and have also remained a strong feature ever since, many being single themed issues, while others developed into valuable series, notably one stemming from a series of conferences convened in Hong Kong. MPB has carried several of the proceedings of the MECS, the Environmental Management of Enclosed Coastal Seas, conferences with their first proceedings published in MPB in 1991. The numbers of authors using MPB also expanded, including especially, a sudden, sustained and large number of submissions from China. The journal has obviously evolved both in terms of the subject matter it covers as well as mechanistically becoming more electronic than paper today.

In 2017, Charles Sheppard left the journal after over 20 years editorship and passed it over to Francois Galgani, Pat Hutchings and Victor Quintino. The need for three Editors-in-Chief to replace Charles was not only a good indication of the increase in number of submissions, but also a link to past practice as one of the new Editors-in-Chief (PH) had previously been an Associate Editor. More recently, Victor resigned and was replaced by Gui-Peng Yang, so that now the Editors-in-Chief are from Corsica, Australia and China. Concomitantly, there has been an increase in the number of Associate Editors in order to handle the greatly increased rate of submissions. For continuity, the Editorial Board has retained long-standing members – for example, both Brian Morton and Mike Elliott have provided sterling service to the journal over many years, not only in providing reviewing expertise, but also offering both insight and foresight through their many Editorials. During this new phase, all the main sections in the journal have developed and remain today, at its 50<sup>th</sup> anniversary, more or less as they evolved over the past 50 years.

Baseline was introduced as a regular section of *Marine Pollution Bulletin* in July, 1982, under the initial editorship of Eric Hamilton. Its role was to be, in Eric’s words, a “record of contamination

levels” which he believed would be “designed to be acceptable for computer storage”, a very new concept in those days. The first Baselines were extremely stripped-back affairs, a kind of “pollution sound-bite” of around 350 words, with minimal data and few signs of what we would now consider to be necessary (and adequate) Quality Assurance and Analytical Quality Control (QA/AQC). Eric recognised this fact, and considered that it should be part of Baseline’s role to accumulate a data bank whose merits could be either proven or disproven once analytical techniques – often in developmental phases at the time – became increasingly accurate, and thus more universally acceptable.

Eric remained Baseline Editor for 10 years, being succeeded in 1992 by David Phillips. In step with other changes occurring in the journal at the time, Dave widened the scope of Baseline’s articles and increased the length, breadth and depth of the contributions. A much greater emphasis was placed on data QA/AQC, as well as encouragement for the judicious use of tables and diagrams to accurately detail the content involved. As a result, Baseline took on a more “ecotoxicological” approach to marine pollution, documenting not only contaminant concentrations but the effects of the contaminants on living organisms.

In 2001, when Dave embarked on a highly successful environmental consultancy career, Baseline’s editorship passed to Bruce Richardson, who has continued in that role to the present day. During these 20 years, Baseline – and indeed the journal as a whole – has changed remarkably.

At the turn of the millennium, we were still receiving all our neatly typed and carbon-copied articles by mail; with the onset and popularisation of computing, this would rapidly progress through early electronic storage of material on discs, both floppy and hard, to a completely electronic, internet-based submission, review, revision and publication procedures. Remarkably, this was achieved by *Marine Pollution Bulletin* in 2003, meaning a switch from print-based to electronic journal management in just over 2 years. Throughput of articles increased rapidly, and concomitantly, so too did the number of Research Articles and Baselines. The format of Baselines altered to include Abstracts and Keywords, thus providing greater access for readers and further expanding the section’s role in documenting measurements which may have value in the future.

As article numbers increased, so too did the diversity of regions represented around the world. There was an enormous increase in numbers of papers from China especially, along with notable rises from South America (notably Argentina and Brazil); the Middle East, including Iran; and more

recently, the Indian Subcontinent (especially India). Many of these are “baseline” values – the first such reported in an area – and although a large number suffer rejection either due to inadequacies of language (a seemingly never-ending source of concern) or lack of QA/AQC, the sheer volume of data becoming available in our current age is truly staggering. Editors have spent, and are still spending, a lot of time encouraging scientists from such countries, some of which were sources of, and victims of, severe amounts of marine degradation.

Marine environmental issues have changed dramatically over the years and MPB has arguably kept pace with these and perhaps can even be regarded as leading the discussion. Accordingly, MPB’s history as a whole, when one looks back over the contaminants and issues of concern during the journal’s 50-year existence, can be seen in Table 1. In the early years, major concerns lay with metals, anti-fouling chemicals such as TBTs, and major oil pollution events; these would rapidly evolve to considerations of the ever-widening array of pesticides; the persistent organic contaminants such as the PCBs and other poly-halogenated compounds; flame retardants and plasticisers; endocrine disruptors in myriad forms; pharmaceuticals and personal care products, and, of course (and most recently), the widespread presence of plastics in the marine environment. Advances in analytical procedures have also resulted in vast changes as more accuracy has been achieved, and ever-decreasing detection limits of contaminants are measured in an ever-increasing number of situations, from waters to sediments and biota; from temperate to tropical; from tsunamis to golf balls, and from mussels to polar bears. Such advances mean that the journal, in particular Baseline, has and hopefully will always retain its value in preserving records for future comparison and critique – this being a “role within a role” for the journal as a whole.

The topics covered by MPB have also made the journey from looking at ‘contamination’, as the presence of material placed in the environment wittingly or unwittingly, to pollution per se, as the biological effects of those contaminants. This has then led to wider environmental management and thereby to including governance, economics and technologies. Hence the reason for the journal’s popularity with practitioners. More recently this has increased the links between the natural and social sciences and the consideration of small to larger scales and the short to long-term duration of marine problems (Table 1).

Indeed, the impacts of marine pollution, so often only anthropomorphised in terms of their impacts, have slowly become recognised in terms of their wider effects upon other species, biological diversity, ecosystem structure and functioning, and environmental sustainability as a whole. From

specific studies of species, then communities and now whole ecosystems, research has grown to demonstrate the wider aspects of the effects on all biodiversity of pollution in all its forms. Associated with this have come calls from a fast-growing group of conservationists to effect the protection of endangered habitats on a variety of scales, from single marine species protection measures, such as the Indo-Pacific humpbacked dolphin, to huge areas of the oceans such as the Chagos Archipelago, a scattering of 55 small islands surrounded by 60,000 km<sup>2</sup> of coral reefs in the Indian Ocean. Another such recent initiative is the Tristan da Cunha marine protection zone of 754,000 km<sup>2</sup> situated in the southern Atlantic Ocean.

Interest in marine conservation at all its levels has grown rapidly over the decades since *Marine Pollution Bulletin* was founded fifty years ago and the journal has played a vital role in this. Moreover, because of the growing importance of and public interest in the threats that pollution (in all its forms) imposes upon us and all the life of this planet, it behoves the journal to expand its scope and coverage to embrace this and, thereby, promote an expanded and more environmentally integrated approach to the issue of marine activities, including pollution, and their impacts at a more universal level.

Looking to the future, therefore, one can only see a continued increase in the number of submissions, as our marine environments continue to be impacted by an ever-wider range of pollutants and other threats and pressures, and increasingly the impact of climate change on marine ecosystems. These impacts include increasing water temperatures and decreasing alkalinity, changes to ocean currents, increasing intensity of storms and increasing coastal developments often on reclaimed shorelines. Many of these factors act synergistically and are often difficult to separate. All of this means the need for a greater degree of ocean-wide management not just in terms of its resources, such as our already over-exploited fisheries, but also an increasing need to act as protective caretakers of our common marine heritage and this requires planning and a willingness by governments to provide the necessary funds to ensure this happens.

With the development of a world economy and globalization, anthropogenic activities have an increasingly significant impact on all kinds of marine environments. From coastlines to the open ocean, from the sea surface to the Mariana Trench, from the Arctic Ocean to the Southern Ocean, marine activities and pollution phenomena have been detected everywhere. It is becoming more and more important to strengthen global co-operation in order to face the challenges presented by marine environmental problems. The expansion of our Editorial Board reflects this. Our editors come from many different countries, including both developed and developing and their concerted efforts



will greatly expand the influence of *Marine Pollution Bulletin*. Understanding and resolving marine impacts requires everyone's participation. In the era of multi-media and mobile internet, our accounts in Twitter, Facebook, LinkedIn, and Mendeley provide strong support for our voice to be heard by the public. Recently, for example, we have created an official account in "WeChat", which will provide Chinese scientists and their communities with a more locally convenient means of obtaining the latest marine pollution research results.

We are now entering an era in which marine problems and their management will obtain an even greater exposure. The UN Decade of Ocean Science for Sustainable Development 2021-2030 and the UN Decade of Ecological Restoration 2021-2030 will be coupled with the implementation of the Sustainable Development Goals, of which SDG14 Life Below Water is dedicated to the seas. MPB is well-placed to take advantage of this increasing interest. As those long involved with *Marine Pollution Bulletin*, we can only see the importance of this journal increasing as the issues which Bob Clark highlighted in the late 1960s have mostly all increased and, while we have more techniques and knowledge to solve some of the issues, we still need to implement these. This journal provides lines of communication between science and managers and hopefully these can be enhanced in the next decade as marine habitats continue to be impacted, from charismatic coral reefs to estuaries, foreshores to fisheries and habitats which have barely been investigated, such as the deep sea.

Finally, we would like to thank the many, many contributors and reviewers to *Marine Pollution Bulletin* over the past 50 years, as without you we would not have a journal to publish. May our journal continue to thrive long into the future.

Table 1: Marine Science & Management – the trajectory suggesting the decades when marine pollution issues first became of concern:

Decade	Features
1960s	Chemical pollutants, metals, pesticides including DDT ('Silent Spring'), gross biota community assessments, small area assessments, oil spills and clean-up technologies, fisheries agreements (ICES, London Fisheries Convention)
1970s	Pesticides, oils, gross biota (community ecology), toxicology, quality assessments, Environmental Quality Objectives/Environmental Quality Standards, better dilution for waste ('dilution is the solution to pollution', long-sea outfalls), dispersion modelling, organic enrichment, sectoral approach, UNEP Regional Seas pollution and dumping conventions (e.g. OSLO, Paris, HELCOM), sea disposal of sewage sludge, marine incineration of wastes, microbial pollutants, radioactivity as a pollutant, monitoring systems, 'Mussel Watch' monitoring, US Clean Water Act (land-based discharges)
1980s	POPs (persistent organic pollutants), sub-lethal biological effects (physiology and biochemistry, e.g. Imposex, scope-for-growth), better on-shore treatment of waste, waterbody classification schemes, biodiversity agreements, fisheries management, Environmental Impact Assessment, nutrient pollution and eutrophication, marine aggregate extraction; coastal erosion/flooding
1990s	Endocrine Disrupting Substances, sublethal effects, single indicators, Environmental Management Systems, habitats and species, integrating studies, world summits (UNCED, CBD), Regional Seas convention holistic approach (e.g. OSPAR, HELCOM), recognition of global problems, climate change (ozone layer), Integrated Coastal Zone Management, habitat restoration, offshore wind-power; land-based nutrient controls, single species modelling, fisheries yield modelling, habitat mitigation
2000s	Whole ecosystem analysis, catchment management, Ecological Quality/Ecological Quality Objectives, biological pollutants (non-indigenous species), estuary-coast links, action on global problems; holistic water and catchment instruments (e.g. EU Water Framework Directive), marine legislation (US Oceans Act), ecosystem restoration, integrated and multi-metric indicators, end-to-end modelling, Particularly Sensitive Sea Areas; separate effects of climate change (sea-level rise, ocean acidification, etc.); Marine Conservation and the development of Marine Protected Areas
2010s	Integrated science, relevant and monitoring funded but limited by economic austerity, joined-up thinking re. legislation and administration, solutions to global problems, World Oceans Assessment I, micro- and mega-plastics and ocean litter, noise as a pollutant, systems analysis approaches to management, nanotoxicology, pharmaceutical and personal care pollutants, holistic governance and marine strategies (e.g. European - Marine Strategy Framework Directive, Maritime Spatial Planning Directive), aquaculture replacing fisheries, environmental economics (ecosystem services and societal goods and benefits), remote scanning (satellite and unmanned techniques), risk assessment and risk management techniques. Environmental stabilisation, biodiversity, sustainability and marine conservation management.
2020s	Global initiatives, G7 Oceans, UN Decade of the Oceans for Sustainability, UN Decade of Ecosystem Restoration, decrease in science funding due to economic downturn post-COVID?, World Oceans Assessment II, Sustainable Development Goals (especially SDG14), holistic and synergistic effects of climate change (global heating, ocean acidification, hypoxia, sea-level rise, polar melting, thermal expansion), salinity changes due to run-off patterns (climate oscillations - NAO, El Niño, etc), offshore tidal and wave power, Natural Capital analysis and accounting, NetGain (biodiversity offsets) – environmental compensation, microplastic pollution, eutrophication, eDNA tracing, oil and gas decommissioning. The integration of marine pollution research and control into marine conservation development, planning and management.