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From *Mare Liberum* to *Mare Reservarum*

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Abstract

Four hundred years ago, Hugo Grotius defined the notion of *Mare Liberum*, leading to the concept of the 'Freedom of the Seas'. This concept has dominated humanity's relationship with the oceans and its renewable resources ever since. We present the conceptual reasons for society having arrived at the current ecological, economic and policy dilemma of widespread overfishing by global marine fisheries. We propose a call for global action to change our attitudes and behaviour towards the oceans away from 'free and open' towards 'heritage'. We then propose one mechanism (ocean zoning) that we consider crucial to address what is clearly a supra-national problem of global dimensions.

Keywords: *Mare Liberum*; *Mare Reservarum*; Marine reserve; Ocean zoning; Overfishing

1. Introduction

Over the last decade, concerns have increased rapidly over the growing problem of overfishing of marine ecosystems, and the associated threat to global food security, biodiversity preservation and general ecosystem functions [1–3]. This global concern has finally come to the forefront at the 2002 World Summit on Sustainable Development (Rio plus 10) in Johannesburg, South Africa, with a joint communiqué calling for the restoration of depleted world fisheries by the year 2015 (http://www.johanesburgsummit.org/html/whats_new/otherstories_fishing_28008.htm, and http://www.un.org/esa/sustdev/csd.htm). A recent review [3] suggests that the concept of sustainability upon which current fisheries management is often based is flawed, and that continuing 'business as usual' and tinkering with the existing traditional management protocols (e.g., technical and property right measures such as gear and size restrictions, total allowable catches, individual transferable quotas, etc.) has failed and will never be sufficient. The authors are calling for a general policy change towards ecosystem restoration as a pre-requisite to eventual sustainability, and are suggesting a dual solution approach to this global problem. Firstly, drastic reductions of subsidies to the fishing industry. This in turn, can lead to the urgently required global reductions in fishing overcapacity through standard market-driven forces, given that current management approaches such as conventional decommissioning schemes appear not to achieve long-term capacity reductions. Secondly, the establishment of large-scale 'no-take' marine reserves (areas of the ocean where all extractive uses are banned perpetually).

The issue of subsidies is being addressed elsewhere [3–7]. Furthermore, the increasing recognition of global overcapacity in existing fishing fleets [7–10] indicates that this problem is beginning to be recognised by decision makers. The issue of marine reserves, on the other hand, while discussed extensively in the scientific literature [11,12], and increasingly recognised as the best and simplest means of achieving sustainability in fisheries [13–15], is not generally debated at the global level. It is usually viewed as a local, or regional concept. It is time to change this point of view.

Here we present a short, historical perspective on humanity's traditional perception of and approach to the global oceans. We then suggest a mechanism to address what is rapidly becoming an issue that should concern us all—the declining state of the global marine ecosystems.

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2. Where are we coming from?

In 1608, the 'Father of International Law', Hugo Grotius, gave us *Mare Liberum*, the concept of the 'Freedom of the Seas' [16,17]. This document from The Hague was written primarily to justify The Netherlands' trading activities in the Indian Ocean, and secondarily to resolve conflicts between nations over trade routes and fishing. The concept proposed by Grotius has dominated humanity's approach to fishery resources for the last 400 years. Fish were considered as 'Open Access' or 'Common Property' resources. It has now been demonstrated beyond doubt that such an approach inevitably results in over-exploitation (the 'tragedy of the Commons' [18]), with little incentive to conserve [19].

The Hague Conference on the Codification of International Law in 1930 was the first time the international community resolved that claims to territorial waters by countries were acceptable [20]. At the time, most countries claimed only modest coastal areas (a few km of inshore waters). After World War II, several United Nations Conferences on the Law of the Sea (UNCLOS) resulted in many nations declaring 12 nm (nautical miles, $\sim$22 km) limits of territorial seas. In 1947 both Chile and Peru claimed 200 nm maritime jurisdictions, but it was not until the 'Cod Wars' in Iceland in the 1970s that most nations began to declare 200 nm Exclusive Economic Zones (EEZs) and take responsibility for managing the resources in these areas [20]. This was formally encoded through the Law of the Sea Convention [21]. Since an estimated 90% of fisheries yield was taken within 200 nm of coastlines [20,22], most fisheries came under national jurisdiction.

The fishery resources outside EEZs are still predominantly treated as Open Access, resulting in generally uncontrolled overexploitation of international resources. This is exemplified most recently by the largely illegal and unregulated fishery for Patagonian Toothfish (*Dissostichus eleginoides*), better known by its marketing name of 'Chilean Seabass' [23]. Furthermore, even within EEZs, failure of traditional fisheries management to control fishing effort has led to massive overexploitation of resources [1,3,24,25]. Some countries are attempting to address this by limiting catch, and dividing this limited catch amongst a strictly limited number of fishers through the allocation of property rights (e.g., Individual Transferable Quotas). However, this is a slow and controversial process. It generally leads to problems like wasteful high-grading and discarding [26], and over-concentration of quotas in a few commercial enterprises [27]. Furthermore, in most instances allocation of property rights does not lead to any protection from the negative impacts of subsidies on sustainability [6].

As long as oceans and marine resources are treated as a Commons, and fishing considered a right rather than a privilege (in relation to current and future generations), they will inevitably be over-exploited, particularly given the inherent uncertainties associated with natural marine systems [13,25,28,29]. Many countries are recognising the need to improve the conduct and operations of fisheries (e.g., resulting in the *Code of Conduct for Responsible Fisheries* [30]), and are making progress in improving how fishing operations are conducted. However, these efforts are generally voluntary, non-binding, and virtually impossible to monitor and enforce on the global scale. The time has come to move on from Hugo Grotius's vision and to act on a global scale in the interest of future generations.

3. Where should we be going?

Clearly, the world is moving away from the notion of marine resources as 'free and open' to all, and has adopted a position better described as 'common heritage of mankind'. This 'heritage mindset' was adopted by UNCLOS III, and suggests a requirement of responsible management for the benefit of all humankind, future generations included. However, given declining global fisheries landings since the early 1990s [2], society's poor record of maintaining stocks at sustainable levels and avoiding stock collapses [24,25,29], and the insidious problem of our inaccurate perception of the current state of ecosystems and resources (the shifting baseline syndrome) [31], leads us to seriously question if just a change in mindset is sufficient. We consider not, and propose a call for global action to not only change our perception away from 'free and open' towards 'heritage', but also undertake steps to support this notion with action on a global scale.

Why a shift from essentially national or regional fisheries considerations to global action? Increasingly, humanity is coming to the realisation that no single stock, meta-population or even ecosystem can be considered in isolation. Issues such as the impacts of climate change and global overfishing need to be addressed at the scale at which they occur, globally. Thus, we have to give serious consideration to zoning the entire oceans of the world, not just the land margins, giving specific responsibility and international accountability for resource management to individual entities, International Groupings (e.g., The Antarctic Treaty) or Global Organisations (United Nations type institutions). Central to such a 'multiple-use' zoning approach on a global scale (EEZs included) should be limited areas of fishing (accompanied by global reductions of overcapacity) and fully protected 'no take' marine reserves of substantial total size. 'No-take' marine reserves are best viewed as a form of bet-hedging, a

well-established and highly successful economic and biological strategy [13,14,32], and thus represent a healthy dose of the precautionary principle [12]. Such a global zoning approach can also account for the complex issues of straddling and highly migratory stocks [33,34] by providing large scale protected areas monitored and enforced by the global community through the relevant responsible authority or organisation. A useful, albeit national example of this zoning approach can be found in the Australian Great Barrier Reef Marine Park Authority's (GBRMPA) multiple-use management style, with the prime focus on fishable versus non-fishable zones [35]. It is worthy of note that concerns regarding overfishing of the GBR were expressed as far back as the late 1970s, even pre-dating the establishment of the Marine Park [36]. Such a zoning approach should be expanded to encompass the resources of all ocean areas. This is clearly a massive and onerous task, and one that many may argue is impossible. However, we note that (i) similar sentiments were put forward prior to the discussions leading to 200 nm EEZs; (ii) the rapidly expanding technological abilities in global communication, monitoring and surveillance enhance the likelihood of success; and (iii) existing international legal instruments and institutions can be modified.

The scale of required closures will continue to be debated and investigated [32], but several points are worth noting. While there are now some 1300 marine reserves globally [37,38], still only 0.01% of the world's ocean areas are effectively closed to fishing [3]. This small percentage may come as a surprise to most readers, given the extensive literature on marine reserves. What are possible options? Coverage of regional 'no-take' zones range from 0.14% in California [37] to 20% of continental shelf for Bermuda [39]. Interestingly, the Australian Great Barrier Reef Marine Park Authority is currently giving serious consideration to increasing their total 'no-take' zone component from 4.7% of total area to at least 20–25% to ensure long-term sustainability of resources and protection of all representative habitats [40]. Many studies have focused on using 20% closures, while recent modelling studies have shown that between 40% and 50% of closures may provide the greatest benefits to fisheries [13,41,42]. A consensus call for action of 20% by the year 2020 (the 20/20 proposal, [41]) supported by over 1600 scientists would (if enforced) represent a 2000 fold increase in the existing global coverage of 0.01% [3]! This would indeed be a significant step in the right direction. However, some fisheries scientists are going much further, suggesting a complete reversal of our views to fishing access by treating the seas as closed to fishing with small exceptions in space and time [25], as well as calling for a 'reversal of the burden of proof' in fisheries management, placing the onus on the exploiters of public resources to scientifically demonstrate that their actions do not cause damage [43].

We propose that the first step towards zoning for long-term sustainability, and the protection of global marine resources and critical ecosystem functions that would result from ocean-scale marine reserves, would be a series of international UNCLOS-style conferences to discuss the steps toward some degree of global *Mare Reservarum*[1], preferably with a foundation argument based on the 20/20 scenario.

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[1] We refrain from considering the concept of *Mare Clausum* (closed sea) first presented by J. Seldon in 1652 [44] regarding national sovereignty over the seas, and instead focus on precautionary management of marine resources rather than on territorial issues. We are cognisant of the potential problem of 'mission-creep' towards perceived sovereignty.

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