

## MARINE ENVIRONMENTAL HISTORY

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**Keywords:** Shifting baselines, fisheries, whaling, marine resource management, marine science history, seafood, aquaculture.

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### Summary

This chapter provides an overview of recent trends in the historiography of marine environmental history, a sub-field of environmental history which has grown tremendously in scope and size over the last c. 15 years. The object of marine environmental history is the changing relationship between human society and natural marine resources. Within this broad topic, several trends and objectives are discernable. The essay argue that the so-called material marine environmental history has its main focus on trying to reconstruct the presence, development and environmental impact of past fisheries and whaling operations. This ambition often entails a reconstruction also of how marine life has changed over time. The time frame rages from Paleolithicum to the present era. The field of marine environmental history also includes a more culturally oriented environmental history, which mainly has come to more closely research the development of individual fisheries and the practices, thoughts and ideas of marine life in the sea. Past conflicts between fishermen, managers and scientists are often at the forefront, while in depth studies of the evolvment of marine science and its societal impact, especially through management, also feature prominently. The essay further points to future opportunities, where only little research has been undertaken so far. This includes studies on seafood and consumption as well as aquaculture.

### 1. Introduction

21st century sea fisheries is a high tech operation, where just one vessel's capability of catching fish is manifold greater than it were just a couple of decades ago, and the

growth seems only to be exponential enhancing the environmental problems associated with man's relationship with the sea. Considering the development of marine environmental history it could be said that a similar exponential growth in research has occurred since the beginning of the 21<sup>st</sup> century.. From a humble beginning of a few scattered researchers around the globe, the field is now having an impact on public awareness of problems in the oceans and resource management as well as signs of academic institutionalization of the discipline. This chapter intends to present an outline of some of the main trends and accomplishments of marine environmental history. A complete inventory of the development and present state of the field of marine environmental history is beyond reach of this chapter, where focus is on works, which are representative of a trend or a way of working. Hence, a number of important contributions will likely be left out. As any historiography, the one concerning marine environmental history is influenced by societal issues and discourses, as well as academic traditions and available methodologies. Inspired by John McNeill's 2003 essay on global environmental history (in *History & Theory*), the bulk of marine environmental history is here seen as shaped by two subcategories.

The first category is primarily material in nature, and has its main objective in reconstructions of the past exploitation patterns of marine resources, the past state of marine species and ecosystems, and in turn their relationship with socio-economic developments in society. The material marine environmental history gains methodologies from the fields of ecology as well as social and economic history and anthropology. Sometimes links exist between this subcategory and the second main category of marine environmental history, which is political and cultural by nature, and has its points of gravity towards the history of marine science and management as an integrated part of the political, social and cultural conflicts, which are often the topic of what is here termed, cultural marine environmental history. Often the two traits are intertwined, but in rough terms it could be said that, while material marine environmental history uses the past as a tool for addressing contemporary environmental problems, the more cultural marine environmental history focuses more on reconstructing how, in the past, environmental problems and issues were perceived and negotiated through measures of fisheries management, public imagination, and varying fishing practices. While the two subcategories are distinguishable yet overlapping, they both appear to share the noble dream of Donald Worster (*The ends of the earth: Perspectives on modern environmental history*, 1988) that sound and serious environmental history is investigating the mutual links between human perceptions of the physical world, the way in which man and nature engage in modes of production, and not least the dynamics presented by the natural world.

## **2. Material Marine Environmental History**

### **2.1. Shifting Baselines and Taking Stock**

Within marine environmental history, especially the more material sides of the field are a relative late-comer within global environmental history. Only during the 1990s did researchers around the globe start investigating the material aspects of the historical relationship between the man and the sea. The initial interest arose from marine scientists trying to solve mysteries on how to manage late 20<sup>th</sup> century stocks of fish and

marine mammals suffering greatly from decades of human exploitation. Since World War II technological innovations such as sonar, nylon gear and ever bigger and more powerful vessels and engines had made the battle for fish and whales into an almost no contest win for humans versus marine life. This much was realized by marine scientist; Daniel Pauly when in 1995 he published a much cited paper entitled 'Anecdotes and the shifting baselines syndrome of fisheries'. The idea was that the World's fisheries management had a very limited vision of past fisheries, when looking at trends in catches and fishing effort spanning only a couple of decades back from the present. Hereby, the reference point, or baseline, for when a fishery had been in a healthy state often became the year, when a particular time series or assessment had begun. This means that the possible overexploitation of marine resources occurring in a more remote past would not be detected. Modern marine science realized a need for obtaining information from outside of their traditional realm of data and scientific practices.

One of the first and a much cited study of historical marine ecology is Jeremy Jackson's reconstruction of how Caribbean coral reef ecosystems functioned, when the region was first exploited by European colonizers 500 years ago. Through calculations of how many turtles and turtle shells of the Jamaican, green turtle (*Chelonia myda*) Europeans had exported to Europe, Jackson found that by the time Columbus arrived millions of turtles were grazing the coral reefs, which maintained a careful balance in the entire ecosystem. However, when they were removed, a careful top-down control was distorted. This means that while the detrimental effects of pollution, eutrophication and overfishing of recent decades surely have had disastrous effects on the coral reefs ecosystems, no man alive today has ever seen an unspoiled coral reef.

This type research came about through novel uses of historical paper documents from colonial archives. The likes of Pauly and Jackson though would not label this work marine environmental history, but instead talk of historical marine ecology. The two concepts though came into coexistence with the onset of the History of Marine Animal Populations programme of the Census of Marine Life. This research programme sponsored principally by the American A. P. Sloan Foundation for a decade from 2000-2010, has been credited as a 'first' in terms of bringing together natural sciences and historians in a quest to find out "What lived in the oceans", as the headline of this project ran. Indeed the label 'marine environmental history' was coined in the agenda of this research programme. Therefore this particular programme deserves special mentioning. The HMAP programme was unusual considering that traditionally the natural sciences and humanities do not often work closely together. This is what C. P. Snow already in 1959 described as an unfortunate, but almost unbridgeable gap between two separate scientific cultures. Yet, what crystalized conceptually from this project is that it became indeed possible to combine environmental history and ecology in an interdisciplinary effort to the benefit of both, and the creation of what tentatively is a new sub-discipline in the sciences. More than 100 scientists contributed over the years to several hundred publications. Looking back it seems that what turned out to be the only necessary difference between historical marine ecology and marine environmental history in the various studies of the HMAP programme is that while historical ecology is ultimately driven by a question concerning a natural phenomenon, marine environmental history came to be distinguishable from historical ecology only by having an anthropogenic issue at stake as the driving research question. Apart from

that several of the individual studies proved to address both issues of anthropogenic and natural history interest in an interdisciplinary fashion. Here are a few examples:

One of the more popular methods has been the so called *Catch per unit effort*, (CPUE), which is defined as the size of catch one can reap with a given unit of fishing effort. This is a well-established method for establishing indicators of trends in abundance of a particular species within marine ecology, especially used when the so-called mass balance models and acoustic surveys are not available. When reconstructing historical reference points for species abundance more than 50 years ago, such data are never available. This has made CPUE-techniques popular within marine environmental history, where they form a crucial tie between what happens above and below the surface of the sea.

For the 19<sup>th</sup> century, modern style fisheries statistics are increasingly hard to find, since this exercise in most Western countries only began in the decades around the 1900. Local or regional fisheries statistics though, have been collected in several countries. This enabled René Taudal Poulsen in his study of the Swedish west coast fisheries, where contrary to what was commonly believed, ling (*Molva molva*) and not cod (*Gadus morhua*) was the targeted species in this area before 1900. Ling is related to cod, but it is longer and lives in deeper waters. Investigations into hooks sizes, the number of fish caught per unit of effort, and analyses of the market all contributed to heighten our understanding of this phenomenon. In this analysis the catch per number of baited hooks set per given time period was reconstructed. This entailed finding out how large the hooks were, how many hooks were on each long line, how many long lines were operated per boat, and ideally how much time was spent per boat at sea. In a particularly data rich scenario for the Swedish West Coast fisheries c. 1840-1914 the results showed a gradual decline in CPUE over all, as well as a gradual shift of fishing grounds. The fishermen in short, fished further and further away from home in order to keep fishing the amount of fish they needed to get an income.

Results revealed that the biomass of ling, which today is considered to be of very little importance, was comparable to that of the much more prominent cod. In addition, the average length of both cod and ling diminished steadily from the 1840s until the present. This indicates one of two things or a combination thereof: Either, the fish are caught before they reach the size of previous era's or else, the fish that tended to grow to large sizes, have been largely removed from the gene pool due to the selectivity of the fishing gear employed, here hooks and more recently trawls.

Another top predator in the North Atlantic Ocean is Halibut, (*Hippoglossus hippoglossus*), which nowadays is considered commercially extinct in the Northwest Atlantic, but as Glenn Grasso's study of the 19<sup>th</sup> century fishery for halibut reveals, it was not always so. In fact in as late as the 1840s, halibut was considered a by-catch, but changes in consumer preferences in favor of the halibut, drove on a low-technology fishery, which in a span of a few decades depleted this once prolific fish from the Northwest Atlantic.

The longest time series of CPUE reconstructed is from the Dutch herring (*Clupea harengus*) fisheries in the North Sea, where the monopolistic nature of the herring

industry from the early 1500s onwards resulted in ever more regulations and paper work regarding the specifications of everything from the size of barrels, amount and quality of salt used to cure the fish, as well as the size and number of nets, the mesh size and timing of the start and end of each season. Fortunately for future reconstructions, the regulations stayed the same for more than 300 years until the fisheries were liberalized in 1857. This means that the unit of effort was remarkably stable for a very long time period. For a few port towns, uninterrupted series of records still exist showing individual landings with information on the number of barrels caught as well as the name of the skipper and the date of arrival. This has enabled the reconstruction of CPUE as amount of herring in kilograms per boat per day at sea from 1604-1850 showing how catch rates from 1600-1800 were around twice the size of catch rates in the 1800s, which in turn were larger than any time in the 20<sup>th</sup> century. This reflects the gradual decline of the stock of herring in the North Sea, although in the period until the mid-1800s, this was due to natural causes rather than over fishing.

Another example comes from Margit Eero's studies on the 20<sup>th</sup> century history of the Baltic cod (*Gadus morhua callarias*), which has caused managers and fishermen great concerns in the past decades. During the 1970s and 1980s the Baltic cod fisheries experienced an unprecedented growth and more than 400,000 tonnes were fished in peak years making it one of the World's largest cod fisheries. Investments in this fishery were heavy, so when the cod suddenly disappeared in the late 1980s the effect was detrimental, and much research has been devoted into investigations of whether or not the collapse of the fishery was solely due to overfishing or also related to natural causes. The affluence of the Baltic cod is known to be widely affected by the influx of salt water into the rather enclosed Baltic Sea, so Eero set about to investigate in a centennial perspective the relative impact on the cod coming from (i) the environment through the salt water influx, (ii) the amount of fish being fished, (iii) the abundance of natural predators of the cod such as seals, and finally (iv) the abundance of the cod itself. The novelty of this from a methodological perspective is how Eero shifted the baseline for assessing the size of the cod stock from c. 30 years to almost 100 years. Drawing on more than 10 different national fisheries statistics constructed by the countries around the Baltic during the 20<sup>th</sup> century, Eero was able to conclude that the booming cod fisheries of the 1980s came about as a consequence of a uniquely large abundance of cod. Therefore, contemporary fisheries management should not rely on the reference point of 30 years as the normal state of affairs for the Baltic cod fisheries, since this was a highly unusual phase in a centennial perspective.

Across the Atlantic, in the Scotian Shelf off New England another formerly great cod fishery tells a somewhat different environmental history. Historians and ecologists working out of University of New Hampshire estimated the total biomass of cod in the 1850s to be more than 1.2 mio. tonnes, which is a result they teased out of the individual landings of more than 200 fishing vessels, whose logbooks had been kept for posterity. In the 1990s when the cod fishery on the Scotian Shelf was in free fall the estimated biomass was a mere 50,000 tonnes, and one can imagine much more plentiful this fishery was 150 years earlier. This result was published first in a natural science context by Rosenberg et al. (2005), while the historical context and the historical methodology deployed in this investigation was flesh in a number of papers, such as Bolster *et al.* in the volume *Shifting Baselines* from 2011.

A similar pattern was derived at in a study of changes in the Newfoundland cod fishery. This fishery, first discovered by Basque 15<sup>th</sup> century fishermen, was possibly the most single most important fishery in the past 500 years, until around 1990 the heavily fished down stock was placed under a moratorium.

The moratorium is still in place 20 years later, but the cod so far has not returned in larger quantities, and possibly it is the case that, what was once the cod's firm place in the Northwest Atlantic ecosystem is now occupied by other species, while the fisheries dependent population of Newfoundland has been in steady decline. A study of the historical marine ecology of the cod revealed that until the late 1800s natural fluctuations dominated the stock size, while especially since WWII, fishing caused a series of declines leading to the final collapse of the late 1980s.

Another example of how shifting the baselines can help paint a whole new image of a marine ecosystem is marine ecologist Loren McClenachan's study of 50 years of anglers' trophy fish catches off Key West in Florida. In these waters, ecosystems are more complex than in the North Atlantic, and fisheries statistics covering for instance the 20<sup>th</sup> century are harder to come by.

McClenachan found a treasure box in one company that for half a century had taken anglers out in boats on a daily basis. Each afternoon upon the return of the boat, the day's catch was hung on a crossbar at the quay in order for the angler's to take pictures with their trophies. Sampling more than 1000 of these trophy fish, McClenachan was able to show how the size of a day's catch had greatly diminished, and also that the species composition had changed dramatically.

The 21<sup>st</sup> century trophy fish were very different from what was considered a trophy half a century earlier. The study therefore both discovered and illustrated how perceptions of what is a trophy fish as well as what was actually a trophy fish has changed dramatically.

The Mediterranean is another area, where fisheries statistics going backwards beyond WWII are largely lacking, but what has been shown for the post-war period is a pattern akin to what emerged out of the Mexican Gulf above. Some of the larger fish species have dwindled in size and in relative importance. Instead, smaller fishes from lower trophic levels have come to dominate the palate of Mediterranean fishermen, while that of the end consumer is dominated by imported fish from the Atlantic and globally from aquaculture.

In spite of the relatively poor data situation in the Mediterranean the state of the fisheries in the 19<sup>th</sup> century Adriatic has been brought to light through novel and exciting techniques. This includes Tomaso Fortibuoni's study of more than 200 writings of the natural history covering the fishes of the Western Mediterranean. In each case the fish species is placed in an ordinal scale ranging from 'very rare' to 'very common'. The study shows clearly how fish species belonging high up in the food web more and more frequently ends up with a 'rare' tag as the writers of natural history move into the 20<sup>th</sup> century.

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## Biographical Sketch

**Bo Poulsen** was born in Odense, Denmark in 1976. He holds a BA in history from Aarhus University (2000), an MA in history from University of Southern Denmark (2002) and a Ph.D. in history from University of Southern Denmark (2006). He is associate professor of environmental history at Aalborg University, Denmark. Prior to this, his was associate and assistant professor of environmental history at Roskilde University. He was the congress administrator for the 1<sup>st</sup> World Congress of Environmental History (2009) hosted by Roskilde and Malmö Universities. He has had visiting research fellowships at the International Institute for Social History in Amsterdam (2004), The Max-Planck-Institut für Geschichte, Göttingen (2006) and the Cambridge Group for the History of Population and Social Structure, University of Cambridge (2008). He has published a number of books and articles, principally *Dutch Herring. An Environmental History c. 1600-1860*, (Amsterdam: Aksant Publishers 2008) for which he was awarded the Hoogendijk Prize. Since 2001 Dr. Poulsen has taken part in the History of Animal Populations (HMAP) project of the Census of Marine Life (CoML), where from 2007 he was a member of the executive committee. In 2009 HMAP was awarded the 2009 prize for ‘Danish Research Project of the Year’ by science magazine, *Videnskab.dk*. Bo Poulsen is co-editor of the “HMAP Collection” in *PLoS*

*One* and the Danish history journal *TEMP – Tidsskrift for Historie* as well as a board member of *Nyt Selskab for Historie*. He is a member of the European Society for Environmental History (ESEH), and from 2008-2011 he co-chaired the ICES SGHIST Study Group for the History of Fish and Fisheries.