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## Changes on the Coast

### *Towards a Terraqueous Environmental History*

▼ **ABSTRACT** The introduction of this issue devoted to the history of coastal environments proposes to go beyond the 'great divide' between land and sea, which still largely shapes the field of environmental history, and to rethink their interactions within the framework of a 'terraqueous' environmental history. The coasts are a privileged terrain for tackling this dichotomous vision. Because they are the hybrid product of natural and social dynamics, their study allows us to historicise and contextualise the construction, both materially and symbolically, of the existing boundaries between land and sea. It furthermore allows us to show the always liminal, shifting and permeable character of the coast, which functions more as an interface than as a border. Finally, because of their position on the edge, coasts have a 'mirroring' power which invites us to pay more attention to the symmetry between land and sea.

▼ **KEYWORDS** Environmental history, Coastal history, Land, Sea, Shore


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## Introduction

According to island and coastal historian John Gillis, environmental history has so far remained ‘a remarkably landlocked discipline’. One ‘that largely ignores [that] seven-tenths of our globe’s surface [is] covered by salt water’. Nevertheless, this salt water ecosystem is estimated to constitute ninety-eight percent of our biosphere (Gillis, 2011: 16; see also McNeill, 2003: 33; van Sittert, 2005: 107; MacKenzie, 2013: 8; Rozwadowski, 2013: 136-137). As a consequence of this ‘terracentric’ or ‘continental’ bias (Wigen, 2007: 1; Gillis, 2012: 5; Paine, 2013: 4), some authors even speak of a ‘blue hole’ (Gillis-Torma, 2011; Heidbrink, 2017). To fill this so-called ‘blue hole’ several new sub-fields of research, such as marine environmental history (Holm et al., 2001; Bolster, 2006 and 2008; Chiarappa-McKenzie, 2013; Gillis-Torma, 2015; Schwerdtner Máñez-Poulsen, 2016) or water history (Mukherjee, 2014) have emerged in the past decades.

Although it focusses on coastal environmental history, this issue of the *Journal for the History of Environment and Society* does not want to replace ‘terracentrism’ with a new ‘aquacentrism’ (Buschmann, 2004). Rather it aims to combine these two perspectives and create a less compartmentalized framework, in order to go beyond the ‘great divide’ between land and sea that still dominates and shapes the field of environmental history. This more integrated and dialectical approach, or ‘terraqueous’ environmental history, enables us to rethink the interactions between land and sea. The adjective ‘terraqueous’ was frequently used during the early modern period to describe the globe with all its components. The term has been recently updated by Alison Bashford in an article in which she seeks to merge ‘land and sea, earth and ocean, imperial and naval [...] into a new historiographical and conceptual formation’ or – indeed – ‘terraqueous history’ (Bashford, 2017: 255; see also, in political ecology the concept of ‘terraqueous territoriality’ coined by Campling-Colás, 2018: 778-780). Like islands, coasts constitute ideal case studies for tackling this dichotomous vision, since they are the hybrid product of both natural and social developments. It is therefore possible to study and analyse how their liminal functions between land and sea evolve over time. What is striking, is that these liminal, shifting and permeable boundaries behave more like an interface than a strict and (water)tight border. Finally, because of their position on the edge, coasts have a mirroring power which invites us to reflect on the symmetry between land and sea.

While our proposal is clearly inspired by Bashford, it is also influenced by the research of coastal historians, such as Michael Pearson (Pearson, 2006), John Gillis (Gillis, 2012) and Isaac Land (Land, 2017). Their work makes up the most visible part of a fast-growing subfield known as ‘new coastal history’ (Land, 2007), which aims to ‘examine the past from a



littoral perspective' (Worthington, 2017: 3). Its novelty is nevertheless quite relative, as coastal history has ancient roots in some historiographic traditions, notably in Belgium (Verhulst, 1965 and 1995), the Netherlands (Gottschalk, 1971-1977) and France (Corbin, 1990; Cabantous, 1993; Le Bouëdec, 1997). In these countries coastal history is traditionally situated on the crossroads of maritime, rural and urban history. The growing interest in this subfield is certainly due to the general and increasing awareness of environmental issues (Thoen et al., 2013; Holm-Brady, 2019; Demuth, 2019). As a matter of fact, coastal areas are facing the most catastrophic consequences of global warming (from sea level rise to the intensification of extreme weather phenomena), thus adding a new chapter to the long history of interactions between coastal societies and their maritime *and* terrestrial environment.

The articles collected in this issue discuss the natural and social dynamics involved in the historical construction of this terraqueous environment. From a chronological point of view, the articles cover a period from the early Middle Ages to the nineteenth century, when the land/sea boundary tends to become both more marked and more rectilinear (at least in people's minds and on paper). This period also matches the gradual decline of what has been called 'amphibious' societies or ways of life (Pearson, 2006: 373; Gillis, 2012: 40; van Dam, 2016: 89) based on the complementarity of coastal ecosystems (shallow waters, wetlands, shores, dunes, etc.). However, in the context of this introduction, we will also give examples of specific nineteenth and twentieth century coastal areas in order to show the historical depth of certain issues, like flooding, pollution of coastal waters, exhaustion of fishing grounds, the development of marine farming or coastal tourism (which can be traced back to the end of the eighteenth century). From a geographical point of view, the different articles give a good idea of the European seascapes' diversity: from Venice to Ostend via the French Atlantic coast and then on to the Limfjord in Denmark. It is a whole range of coastal environments, all more or less liminal, shifting, hybrid – whether rural or urban – and permeable.

## **Liminal coasts**

Terraqueous environmental history firstly delves into and explores the contact zones between land and sea, in other words the coastline, the harbours, the coastal towns, but also the estuaries and the tidal marshes. It focusses not only on the encounter between the 'solid' and the 'liquid', but also on where fresh and salt water meet. In short, its primary field of inquiry is the coast, which should be understood in its broadest sense. The coast should thus be seen as a zone unfolding on either side of the shore, with unclear, often contested and varying boundaries depending

very much on political, juridical, economic or ecological criteria, or for that matter emic or etic points of view. Following Isaac Land's advice and eschewing a sterile debate about where exactly the coast starts and finishes (Land, 2017), we will look instead at its most salient characteristics.

It must be noted that this land/sea interface should not be understood as a clear and clean-cut line of demarcation separating oceans from continents. Instead this interface should be viewed as a fringe or a zone, much like the Carolingian marches and borderlands (Gillis-Torma, 2015: 9). Based on this observation, anthropologist Bonnie McCay has defended the heuristic value of 'liminality' as a concept to analyse the complexity of coastal spaces (McCay, 2008: 7-12). In fact, the understanding of shores as a liminal space makes it possible to insist first and foremost on the ambivalent nature of all that is at play at the contact of land and sea. As such, it is an invitation to take a closer look at those amphibious territories shaped by the interpenetration of land and marine environments, like lagoons, fjords, tidal marshes, or even deltas and estuaries (Worthington, 2017: 13-16). But it also stresses the very materiality of coastal environments, including a vast range of nuances between what is solid and what is liquid, or what should be considered fresh and what should be considered salt water. Silt, peat, sand and ice belong, like concrete, to particular categories of solid material that range from 'wet' for some (McLean, 2011; Peters-Steinberg, 2019) to 'fluid' for others (Simonetti-Ingold, 2018). Like brackish waters, these are all liminal objects of research, which environmental history could systematically analyse to gain a better understanding of the 'great divide' between land and sea. Indeed, this dualistic representation is the product of a fundamentally continental, but also modern and Western ontology, which is far from being universally shared and therefore deserves to be further historicised (Reyes-Garineaud-Chlous, 2018). For example, the Tongan anthropologist and poet Epeli Hau'ofa highlighted how nineteenth century imperialist logic reduced Oceania to a mosaic of tiny 'islands in a far sea', whereas the local population conceived Oceania as 'a sea of islands'. Central to the continental ontology was the notion of 'insularity'. According to this notion the Oceanian population was almost viewed as captives, isolated as they were on their tiny, remote and constricted islands (Baldacchino, 2004: 272). Instead, the islanders' 'universe comprised not only land surfaces, but [also] the surrounding ocean as far as they could traverse and exploit it' (Hau'Ofa, 2008: 31; Hayward, 2012). In other words, the land/sea distinction is completely inappropriate within the Oceanian context. It cannot, for instance, explain how a Polynesian institution, such as the *Rahui*, works, since it regulates the access to both marine and terrestrial resources based on a tenure system which extends on both sides of the lagoon's shores (D'Arcy, 2006: 98-104; Bainbridge, 2016).



The concept of liminality also summons the idea of a threshold, a transition, an in-between or an edge. It is therefore well suited to the description of the coast, which is by definition an ecotone, which is a place where two ecosystems overlap and create a unique environment different from both (Gillis, 2012: 3). Far from being a mere limit, the coast is indeed an environment in its own right, and even a continuum of distinct environments ranging from inshore waters to the sea-influenced mainland. Finally, the concept of liminality, as explained by McCay, evokes a transitory condition, not just in space but also in time. As such, liminality constantly repositions coastal areas in the course of time. It turns them – so to speak – into ever-changing territories with an extractive, touristic, industrial, etc. nature. In constant development, these dynamic territories or *frontiers* gave and still give rise to numerous access and usage conflicts.

The coastal areas' three liminal dimensions, i.e. as ambivalent, transitional and transitioning areas, are at the heart of Solène Rivoal's research on the eighteenth century Venetian lagoon. Her research is based upon documents from the *Giustizia Vecchia's* archives. The *Giustizia Vecchia* had an amphibious jurisdiction, with an exclusive competence on the *materia del pesce*. This competence encompassed everything from the lagoon's fishing grounds to the fish markets in the city. Partially closed by barrier peninsulas mitigating the Adriatic Sea's marine influences, the Venetian lagoon with its islands, sand banks, subsidiary rivers, marshlands, turbid waters and wetlands represents a typical terraqueous environment. The limits between land and water were so unstable and muddled that even the authorities often had difficulty in legally qualifying the areas that were subject to ownership conflicts. In this 'kaleidoscopic' universe made up of a mosaic of 'microecologies' (Horden-Purcell, 2000: 77-80), local actors resorted to two competing exploitation practices towards appropriating local fish resources: on the one side fishing, whether on foot or by boat, in the *acque pubbliche*, which was the monopoly of professional fishermen; and on the other, intensive fish farming (eel, bream and mullet) in the so-called *valli da pesca*. These fish farms, referred to as *campi d'acqua* in the sources, were leased to farmer-fishermen who worked both land and sea. In the past these *valli* had been gradually subtracted from the public lagoon's marshy rim through a process of long-term private enclosure, which the Venetian authorities chose to encourage in the eighteenth century in order to secure the city's supply of fresh fish.

Much as the wetlands mentioned in Rivoal's article, peat bogs, dunes, shores and beaches have long been an integral part of the coastal communities' territory. These various, but complementary ecosystems have been exploited by these communities in an 'agro-littoral' (Le Bouëdec, 2020: 173) or 'protomaritime' (Gillis, 2012: 75-78) economy. In his contribution to a recent collective work on rural coasts (Sarrazin-Sauzeau, 2020), Tim Soens described a genuine 'maritime peasantry' which, between the

eleventh and fourteenth century, built its prosperity on a ‘pluri-active’ lifestyle (Soens, 2020: 105-125; see also Soens, 2009). This maritime peasantry alternated between periods working on the land and periods exploiting the coastal resources. The exploitation of these coastal resources consisted of fishing, gathering algae from the sea (to make fertiliser), burning peat from the wetlands to obtain salt or collecting wood and fodder in the dunes. Although this pattern of ‘symbiosis between land and sea’ (Soens, 2020: 123) started to wane in coastal Flanders by the end of the Middle Ages, it was maintained in many other European coastal areas well into the twentieth century.

In the northern Low Countries, this model continued to develop between the fourteenth and the sixteenth century, largely contributing to the growth of the maritime sector. In time, this growth played a major role in the United Provinces’ success story. For, as a result of peat compaction, a reverse mutation took place: foregoing crop culture, the population of the wetlands in Holland re-converted to an economy based on shipping and dairy. This economy combined activities like the breeding of milking cows for cheese-making to fishing and long-distance tramping (van der Woude, 1972). Likewise, the population of remote islands such as the Shetlands (Beaudouin, 2015), the Orkneys (Neeson, 2006) or the islands off the coast of Brittany, e.g. Ushant, Sein, Molène, etc. (Brigand, 2002: 191-251) long drew their livelihood from the combined resources of the land, the shore and the sea. This might be called the agro-fishery-pastoral system. It is only because of the fisheries’ industrialisation (steam trawlers, canning), the development of seaside resorts and the introduction of chemical fertilisers (which replaced fertilisers of marine origin, such as seaweed or maerl) that this agro-fishery-pastoral system came to an end along the French Atlantic coasts and the French side of the Channel. The maritime and the rural world were separated and two distinct entities emerged (Le Bouëdec et al., 2004; Garner, 2005). At the same time, during the first decades of the twentieth century, the many shore-based fishing facilities known as ‘fish weirs and ponds’ along the North Atlantic coast disappeared as well, after having experienced a new boom in the previous century (McKenzie, 2010; Grancher, 2020).

A nostalgic proclivity incites some coastal historians (e.g. Land, 2017: 33-34) to suggest that the joint exploitation of land and sea is the hallmark of genuine pre-modern littoral (or liminal) societies (Pearson, 2006: 356-364; Gillis, 2012: 75-78). For they had not only settled *on* the coast, as is the case nowadays, but they had also learned to live *with* the coast (Gillis, 2012: 2). As such they knew how to take advantage of all the resources of this ecotone, while also being familiar with its hazards. Hazards from which they had learned to protect themselves by adapting to a way of life deflecting the effects of such events as storms, tidal surges or floods (Sundberg, 2015; Freitas-Dias, 2017; Soens, 2018). This coping capacity



represents a second important characteristic often conferred on ancient coastal societies. It is such an important component, that Dutch historian Petra van Dam has labelled them ‘amphibious cultures’ (van Dam, 2016: 89; Gillis, 2012: 69-73). Along with the decline of ‘agro-littoral’ economies, the disappearance – in the course of the nineteenth century – of this specific culture trait has been perceived as a tendency amongst coastal dwellers to turn away from the sea, resulting nowadays in a more distant and occasional relationship, mainly limited to leisure activities and tinged with nostalgia (Serruys, 2011: 124-125).

### Shifting coasts

According to John Gillis this loss of familiarity is part of a more global and deeper process heralding the entrance of coastal regions into modernity. During this process both a material and cultural sharper boundary came into existence between the land and the sea. This boundary became known as ‘the coastline’ by the end of the eighteenth century (Gillis, 2012: 99-127; see also Hardenberg, 2021: 108). During this process, the ‘shore’, that is the first, unstable and liminal, nature of the coast, has been substituted by a stable, linear and artificial ‘coastline’, which represents its ‘second nature’ if we adopt the distinction made by William Cronon (1991: xvii). The coastline now forms a clear-cut partition between the land and the sea, definitely putting an end to the coastal ecotone or gradual transition from one environment to another. In quite a few cases this new coastline is the result of new infrastructures, like embankments, groynes, jetties or sea fronts, all emblematically built with modern materials such as concrete and steel (Gillis, 2015: 13-19; Pastore, 2014: 6). However, it is important to emphasise the medieval roots of this partitioning and artificial process. In Flanders, for example, the construction of dikes as a means of defending the land against the sea dates back to the beginning of the second millennium (Rippon, 2000). It is therefore not surprising that it is in this same region, more precisely in the so-called IJsselmeerpolders (Wieringermeerpolder, Noordoostpolder, Eastern Flevoland and Southern Flevoland drained respectively in 1930, 1942, 1957 and in 1967), that this artificial process is most spectacularly displayed. Farms, motorways and even whole cities (Almere, Lelystad) were literally implanted on the very place where the ancient Zuyderzee (or Southern Sea) had been (van Dissel, 1991; van der Ham, 2007).

Somewhat reduced to its bare bones, this retelling of the transformation of shores into coastlines draws attention to the profound reconfiguration of coastal areas in the Anthropocene. Human activities in these areas have gone through an intense period of change in contemporary times. As more than half of the world’s population lives in coastal areas at the



turn of the twenty-first century, many industrial, touristic or extractive activities spurred by globalisation have taken root on the coastal front. Some of them – like offshore wind energy production and offshore drilling – have tenaciously taken hold of the continental shelf. Both on shore as under water these processes have created numerous environmental problems, like coastal litter and pollution (Mosley, 2014: 526-527; Ryan, 2015), the depletion of fishing grounds (Keiner, 2009; McKenzie, 2010, Faget, 2011; Bolster, 2012; Grancher, 2018; Jones, 2018; Hanes, 2019) or the disneyfication of ecosystems (Wills, 2013: 195-202) to mention just a few. Environmental historians have already catalogued these problems. The global phenomenon of coastal tourism alone offers another edifying example of the impact of human activities and endeavours to dominate nature, epitomising the Anthropocene. Since the nineteenth century, the development of seaside resorts and their beaches resulted in the continuous effort to stabilise seafronts by means of technological devices, upsetting for instance sediment flows and dune formation. In many cases it accelerated erosion and sometimes even necessitated the import of sand from other regions to replenish threatened natural or man-made beaches (Walton, 2011: 66; Mosley, 2014: 527-530; Devienne, 2016 and 2020: 147-151; Freitas-Dias, 2017). Furthermore, the creation of the necessary infrastructure for seaside mass tourism has frequently increased the level of pollution. Uncontrolled and sprawling urbanisation is another often occurring phenomenon, even if in some cases the development of coastal areas was carefully planned. Some coastal areas became testing grounds for developing new tools for land use planning and also for the preservation of natural sites. In France, this was the case of ‘Mission Racine’, a large-scale coastal planning project set up in the 1960s to oversee the touristic development of the Languedoc-Roussillon (Parrinello-Bécot, 2019) or even of the Conservatoire du Littoral (1975), a coastal protection agency designed to limit the negative effects induced by what Alain Corbin termed ‘the lure of the shore’ (Parrinello-Bécot, 2020).

Yet, retracing the history of coastal changes under the single lens of ‘the ecological impact of human activities’ comes with the risk of reducing the littoral to a mere stage. As Geoffrey Parker reminds us, historians should not deny the link between nature and ‘human affairs’, meaning that it is of primordial importance to understand the forces of nature in environmental history (Parker, 2017: xiii). Shores are dynamic environments, particularly recalcitrant to any project devised to change and dominate them. The rising sea levels and wave action – increasingly intensifying as a result of climate change – vividly testify of the shores’ resistance to the efforts deployed by coastal societies to settle and contain them (Doody, 2013). A study on the nineteenth and twentieth century Mediterranean coast led by Giacomo Parrinello has suggested the term ‘shifting shores’ to describe this endless play between sea and land (Parrinello et al.,



2019). Mathias Tranchant's article on the environmental history of the ports along the French Atlantic façade between the eleventh and fifteenth centuries, is a good example of what Parinello and his team (2019) have called the 'interaction between stabilisation and instability'. Mindful of coastal geomorphological diversity, Tranchant shows how medieval harbours constantly faced new challenges, some of which threatened their very existence. Beyond extreme weather conditions, like storms, already well documented by natural disaster historians (Garnier-Surville, 2010; de Kraker, 2013), the unsettledness of harbour environments was essentially due to erosion or sedimentation processes. These caused the collapse of a cliff, the damming of a shipping channel or the silting-up of a harbour. Quite a few harbours became inaccessible for shipping and sometimes whole villages had to be abandoned as they became engulfed by drifting sands. Those were, however, extreme cases. Tranchant shows that already in the Middle Ages there were a number of available technical solutions to prevent or palliate the unremitting assaults from wind and sea. Archival sources bear witness of a number of methods and techniques to clear shipping channels from silt and other debris, like the use of dredgers or flushing systems. The construction of breakwaters, moles and jetties to curb alluvial deposits and reinforce harbour infrastructures were also widely used in the Middle Ages.

## Hybrid coasts

If it is true that the medieval harbours described by Tranchant were often in a precarious state, it is necessary to recall that 'even the engineered coasts of the Anthropocene remain hardly stable, as they are continuously belaboured by the interaction of winds, currents, sediments, nutrients, non-human species, human infrastructures and activities' (Parinello et al., 2019). It is important to take into consideration the full range of these natural and social components within the same analytical framework, this in order to historicise the dynamics at work on the land-sea interface. In recent years diverse approaches have been developed with this in mind, for instance for harbours (Rawson, 2009), rivers (Pritchard, 2011; Winiwarter-Schmid-Dressel, 2013), bays (Pastore, 2014) and dunes (Fretitas, 2020): all of them invite us to consider coasts as both unsettled as well as hybrid 'assemblages' (Tsing, 2015: 22), shaped by long-standing interactions between natural processes and social practices on the one hand, and human and non-human life forms on the other.

This is the approach used by Bo Poulsen in his article for this issue. He adopted Verena Winiwarter and Martin Schmid's concept of the 'socio-natural site' (Winiwarter-Schmid, 2020) to explain how the 1825 North Sea storm surge 'affected the entangled nature and society in nineteenth

century North West Jutland and how both the natural system and the social system responded'. Successively analysed from the angle of disaster history, economic history and marine environmental history, this natural event set a chain reaction in motion with a decisive impact on the history of North-Western Denmark. Although there were no victims in that part of Denmark, this storm surge deeply altered the morphology of the Limfjord, when the dune ridge which had so far separated the North Sea from the Limfjord was breached during the night of 3 to 4 February 1825. Where it had hitherto been a fjord with a single outlet on the Kattegat, the Limfjord became a sound overnight, henceforward connecting the Kattegat with the North Sea. This resulted in a global reconfiguration of the Limfjord's terraqueous environment, enabling 'the destruction, development and transformation of several socio-ecological niches'. From an economic point of view, the 1825 storm surge certainly reconfigured the regional connectivity in depth, as new commercial opportunities became available for the communities living along the Limfjord's western part. After a long period of relative isolation, these communities enjoyed a direct access to the North Sea from the 1860s onwards. This access was gradually stabilised through a system of canals and groynes, initiating the development of a new socio-technical environment, connected to world markets. From an ecological point of view, the influx of salt water into the Limfjord's hitherto brackish waters had a significant impact on both its marine fauna and flora, which in turn affected the long-standing fishing communities in the area. Possibly already depleted by overfishing practices since the end of the eighteenth century, herring stocks fell even more following the rise in salinity levels, not to mention the disruption of currents and a subsequent jellyfish infestation coming from the North Sea. Likewise, freshwater species like whitefish were unable to adapt to their new natural surroundings and soon disappeared. At the same time, however, new species such as oysters, lobsters, plaice and common flounder arrived, making it possible for some fishermen to keep up their activity by adapting their practices or by inventing new techniques, such as the Danish seine. This last invention – a net pivoting around an anchor with a very high fishing efficiency – was rapidly adopted around the world.

Like Poulsen's article, Michael-W. Serruys' contribution to this issue also stems from an event symptomatic of the coastal environments' unsettled nature, in this instance the collapse of the Slyckens locks during a totally calm night in August 1752. Set upstream from the port of Ostend on the canal that linked it to Bruges, the locks kept the water level high enough to permit navigation, while holding the sea back at the same time in order to protect the Flemish lowlands from flooding. However, unlike with the North Sea storm surge in Denmark, from a disaster history viewpoint the locks' collapse is a non-event. Not only was the canal entrance blocked in time to avoid the dikes' erosion and land submersion by the sea,



as it turned out, the authorities and the populace were also fully aware of the dire state of the locks. It had been known for some years that the locks were attacked by millions of shipworms. These wormlike creatures – which are actually molluscs living in galleries dug in waterlogged wood – were significant natural actors, viewed by Serruys from two complementary angles. Studying their interaction with coastal societies, he shows how the shipworm epidemic affected the Austrian Low Countries in the 1730s. The infestation was caused by a very specific climatic conjuncture, increasing both the water temperature of the North Sea and its salinity levels. The wooden coastal infrastructures intended to protect the land from floods, were the ideal nutritional growth medium for these xylophage marine molluscs. In his analysis of the responses to this crisis, he then stresses the political blockages and the ‘play of scales’ (Revel, 1996) that impacted on both the central authorities and local communities’ ability to ward off the risk of flooding. In doing so, he points out how the governing of coastal territories necessitates knowledge but also engenders power conflicts. These aspects are both inextricably linked to the coastal areas’ ‘shifting nature’.

### **Permeable coast**

Far from being a clean, fixed and natural demarcation, the land/sea interface constitutes a liminal, unsettled and hybrid zone. In his study on the ancient coastal societies along the Indian Ocean, Michael Pearson has also stressed the ‘permeability’ of this interface, which according to him unites much more than it separates (Pearson, 2006: 356-360). These are indeed ‘societies of the ressac’ (Penrad, 1994), whose ‘amphibious’ people move endlessly to and fro between land and sea. This concept of permeability has been taken up by several authors in a more concrete sense. They consider permeability in its primary meaning, by looking how commodities flow from the foreland via harbours to the hinterland (and vice-versa) using different kinds of transport infrastructure to penetrate both ocean space (shipping) and land space (river, road and rail). Since centuries harbours (or gateways) – situated on both the edge of the land and the sea – have been the social, cultural and economic interface between these two worlds (Favero-Serruys-Sugiura, 2019: 8; Tranchant, this issue). However, in the perspective of a terraqueous environmental history the analysis cannot be restricted to the crews, their vessels and their cargoes. It must be extended to the full gamut of living species and material substances – whether of natural or man-made origin – circulating between oceans and continents, be it on the scale of a coastal interface, a river basin or the whole planet.

Quite a few species of fish are known as euryhaline (opposed to stenohaline), meaning they can both live in a saltwater or a freshwater environment. Although most euryhaline species live all their life in the waters of the coastal interface (e.g. estuaries or tide pools), several of these fish species migrate between sea and freshwater environments during their life cycle. Some, like eels, flounders or mullets are catadromous. They reproduce at sea, but mature in freshwater, sometimes thousands of kilometres away from their place of birth (Prosek, 2010). Solène Rivoal explains that the owners of the *valli da pesca* in the Venetian lagoon took advantage of this *montada* [*montata*] phenomenon to capture elvers returning to the brackish waters of the marshes, which were then farmed in pens until they reached commercial maturity. Conversely, other species, like salmon, lampreys or shads, are anadromous. When reaching their sexual maturity these fish return to the rivers where they were born to spawn. In turn, the ensuing new generation heads to the sea to mature. In order to study such species in a historical context, it is necessary to dismiss the existing binary distinction between land/freshwater and sea/saltwater. This binary distinction should be replaced by an integrated terraqueous environmental approach.

Joseph Taylor brilliantly showcased this for the Columbia River salmon fisheries in Oregon during the nineteenth century (Taylor, 1999a and 1999b). He challenged the reductive perception that industrial fishing (and thereby also the fishermen) was the only cause of the salmon's decline in the Columbia River (McEvoy, 1986: 72). Instead, Taylor proposed to explain the exhaustion of this resource by looking at it as a 'historically dynamic process', arising from the overall restructuring of the Columbia River basin, which was the result of this river basin's integration into the capitalist market economy (Taylor, 1999b: 70). True, the salmon runs' decline coincided with the growth of the canning industry in the second half of the nineteenth century, but it could not be exclusively attributed to overfishing issues, as both the 'aboriginal and industrial harvests were comparable on paper' (Taylor, 1999b: 67). In fact, it was but one factor among many other equally determinant factors affecting the resource's reproduction. As such, there was a real need to re-set this exhaustion process within the much broader environmental context of Oregon's ecological transformation. A context that would give equal weight to the 'changes in the water' as to the 'changes on the land' (after Cronon, 1983). As early as the 1810s, the growth of the fur trade had resulted in a notable reduction of the beaver population which played an important part in the shaping of riverine habitats. Until the arrival of the first settlers in the 1840s, Oregon's indigenous peoples had intensively fished salmon, but their impact on the rest of the territory had remained fairly limited. By contrast, the settlers' implantation in Oregon went hand in hand with a 'massive reorganization of nature', the impact of which was particularly damaging



on the fishing resources (Taylor, 1999b: 60). Beyond the changes caused by the development of farming (introduction of new animal and vegetal species, soil leaching, water extraction), of logging (riparian forest destruction, bank erosion, floating of logs) and of mining (release of pollutants, increased sediment load), the construction of numerous water mills and dams contributed in obstructing the salt and fresh water flows in the river, thereby disrupting the salmon reproduction cycle. Over time, the salmon's upstream journey towards the upper reaches of the Columbia River and its subsidiaries became more and more restricted. These changes had an impact on the location of the fishing and canning activities, as these gradually resettled further and further downriver, catching and canning the salmon as soon as it reached the river's estuary.

Such an 'organic machine' (White, 1995) as the Columbia River, not only facilitates the circulation of human and non-human species between the ocean and the continent, it also functions as a conveyor belt for a whole lot of substances. The presence and concentration of these substances in the water is closely linked to the activities conducted upriver. Like cities (Tarr, 2002) or states (Magalhães et al., 2019), the land/sea interface also has its metabolism, which can be reconstituted through a detailed analysis of the substances flowing and reflowing between the landed and the marine environment. Among all these substances moving unrestrained from one environment to another, pollutants have above all caught the eye of environmental historians. For instance, the 'industrial excesses' of Marseilles' factories (Le Roux and Letté, 2013) have been the object of several interdisciplinary inquiries. These have shown how the most polluting industries have long been relegated to the *calanques*<sup>1</sup>. It was a convenient location for factories, as strong marine currents quickly dispersed their chemical waste (Faget, 2013; Daumalin-Raveux, 2016).

The algae bloom phenomenon affects coastal regions all over the world since the 1970s, which is without doubt one of the finer examples of the 'excesses' of the modern agro-industrial model. It is the result of the massive use of nitrogen and phosphate fertilisers on farmland. Over time, the nitrogen and phosphate particles trickle down into the aquifer and from here into the river system, and ultimately all the way to the sea. It is the main reason for the ongoing eutrophication of the oceans (Levain-Laval, 2018). From a historical point of view, we have a rather ironic inversion of the substance flows between land and sea. For centuries, coastal regions resorted to marine amendments to bolster their agricultural prosperity (Neeson, 2006). Brittany's north-western coast is known as the 'Ceinture

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1 A 'calanque' – from the Provençal 'calanca' – is a narrow fjord-like inlet. Unlike fjords, which have been formed by glaciers, *calanques* are the result of karstic erosion and rising sea levels (much like *rias* in Spain or *abers* in Brittany). In France, the *calanques* generally refer to an area along the coast just east of Marseilles.

dorée' or the 'Golden belt' for its bountiful production of vegetables. Over the past centuries, these lands were constantly enriched with kelp, marine clay and maerl (Charpentier, 2013: 152-160). But today this coast is badly affected by algae bloom, known as 'marée verte' or 'green tide'. It now experiences seaweed as a calamity. In the same perspective, a material flow-oriented environmental history of sand would no doubt help to better gauge what some large coastal cities owe to the seabed, the beaches or the dunes. It would also help to understand the conflicts in the coastal areas due to the excessive worldwide use of concrete, one of – if not – today's key building material (Magalhães, 2019).

## Mirroring coasts

While the interactions and circulations between land and sea explored in this issue are at the heart of terraqueous environmental history, it cannot in itself be reduced to mere coastal environmental history. On the one hand, it can serve as a framework for the analysis of other types of amphibious environments, such as islands (Gillis, 2016; Bashford, 2017), wetlands (Soens, 2009; Morera, 2011), ponds (Abad, 2006; Hoffman-Winiwarter, 2010), rivers or even irrigated land (Ingold, 2017). On the other hand, on a more theoretical level, terraqueous environmental history must also be viewed as a method for producing non-terracentric historical narratives. From this point of view, looking at the coast presents a heuristic interest. Coasts are the places where land and sea are mirrored. A study of the coast invites us to develop a symmetrical approach in which these two environments systematically intervene in equal measure.

This is not about rekindling the well-known debate about the legitimacy of such subfields like maritime history and marine anthropology, whose main defining characteristics are their research terrain rather than their theory or methodology (Russel-Bernard, 1976; Vickers, 1993; Cabantous, 2001; Rediker 2004; Land, 2017; Artaud, 2018). Since the turn of the new millennium, the dialogue on sea-related issues between historians and ecologists within the framework of the research programme on the History of Marine Animal Population (HMAP) has shown that there is a real need and scientific advantage to be gained in welding a research community around a specific environment (Starkey et al., 2008; Holm et al., 2010). However, as Daniel Vickers already warned in 1993, maritime historians should take care not to bypass 'landward history', as too narrow a specialisation may also foster compartmenting effects detrimental to grasping certain cross-environmental problems. He demonstrated this in his thesis on New England's *Farmers and Fishermen* (Vickers, 1994). By examining their labour strategies, he noticed that he benefitted from



analysing them simultaneously from both a land and sea perspective (Vickers, 1993: 424).

In order to illustrate this point, let us take the example of natural resources in pre-industrial times. We have here a fundamentally crucial object in the field of environmental history, but it has not yielded a comprehensive reflexion yet, mainly because it has so far only been addressed in a rigidly segmented way. It has hitherto been based on two axes, firstly on an animal/vegetal/mineral trichotomy, and secondly on a land/sea dichotomy. Furthermore, the dominant approach has focussed on major resource types separately, such as wood, water, coal, fish, fertiliser, etc. This resulted in an extremely rich and specialised literature, but sadly detached from each other. Thus, attempts to create a dialogue between these 'historiographies' remain rare and are often limited to land-based resources. Of course, quite a few recent publications in environmental history relating to the question of natural resources have discussed those derived from the sea (Dowling-Keyser, 2020; Locher, 2020). Nevertheless, it remains common to read works claiming a certain degree of generality, while totally ignoring the sea, without any given reason or justification. Only recently, Paul Warde wrote a riveting intellectual history on the concept of 'sustainability'. He regrettably maintained his focus on soil fertility and forest productivity, without ever mentioning that the same question regarding the exhaustion of marine resources during the same time span covered by his book, had inspired comparable investigation processes and theorisation endeavours (Warde, 2018). Furthermore, even individual or collective works that take into account marine environments, tend to reproduce this silo mind set, dedicating separate chapters to resources drawn from the ground, the underground, the forests, the swamps, the rivers and – when they get mentioned – the oceans, instead of linking these topics together from cross-cutting issues. (Urteaga, 1987; Judd, 1997; Bruce, 2010; Dowling-Keyser, 2020).

Yet there are many reasons justifying a holistic and comparative approach to this question. A closer attention to the actors of the past and their vocabulary (as can be drawn from the sources) shows that many terms were used indifferently, whether the resources came from the land or from the sea. In France at the end of the seventeenth century, the term 'conservation' was used in both forestry and fishery policies (Abad, 2016; Grancher, 2018). These policies were justified by fear of 'deforestation' on land and 'depopulation' of the fishing grounds in the sea. The ensuing policies proposed to fight the 'misuse' (*abus*) causing the 'dearth' (*disette*) of both timber and fish, by regulating the use of these resources. The general idea was to 'manage' (*ménager*) them, that is to exploit them in such a way as not to deplete them. From that angle, promoting a more symmetrical outlook on resource issues incites a certain relativism with regard to the importance that has usually been granted to forests and to wood (Grove,



1995; Scott, 1998; 11-22; Radkau, 2012; Ford, 2016). Other environments and resources can perfectly lead the way in how to think and govern nature. Thus, on the European coasts in the eighteenth century, wild oyster beds were the subject of governmental investigations into the processes of their depletion and overexploitation. These investigations are even more worthy of comparison with similar investigations of forests, as they led in some coastal regions to the design of managing systems very similar to those imposed by scientific forestry at the same time (Neild, 1995; van Ginkel, 1996).

## A terraqueous agenda for environmental history

As suggested by this example, terraqueous environmental history is not just about ‘muddying the waters’ like John Gillis said (Gillis, 2016), but also about ‘soaking up the lands’ of environmental history. Its research range goes from the micro level (silt, ice, peat) all the way to the macro level (the globe) via a whole combination of intermediary levels, like the shore, the estuary, the coast, the river basin, the island, etc. As such it is well suited for historical narratives playing with scales. It can be presented as a history of flows connecting oceans and continents, or as a comparative history of the land/sea interface, helping to identify the various levels of liminality, hybridity, unsettledness and permeability of coastal settings. Either way, the terraqueous environmental history’s cohesion and originality derives from the principle of symmetry, opposing it to the great land/sea divide. For that reason, it must be understood primarily as an enquiry-based approach, expressly highlighting the inseparable but specific landed and marine characteristics of not only coastal environments, but also, and more broadly, planet Earth.

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