

RESSOURCENKULTUREN 11

WATERS

CONFERENCE PROCEEDINGS FOR 'WATERS AS A RESOURCE'
OF THE SFB 1070 RESOURCECULTURES AND DEGUWA
(DEUTSCHE GESELLSCHAFT ZUR FÖRDERUNG DER UNTER-
WASSERARCHÄOLOGIE E.V.)



Editors:

Sandra Teuber,
Anke K. Scholz,
Thomas Scholten &
Martin Bartelheim

TÜBINGEN
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Band 11

Serie's Editors:

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Gesellschaft zur Förderung der Unterwasserarchäologie e.V.)

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PRESS 

Bibliografische Information der Deutschen Nationalbibliothek

Die Deutsche Nationalbibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliografie, detaillierte bibliografische Daten sind im Internet über <http://dnb.d-nb.de> abrufbar.

Herausgeber der Reihe: Martin Bartelheim und Thomas Scholten



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<http://hdl.handle.net/10900/108250>

<http://nbn-resolving.de/urn:nbn:de:bsz:21-dspace-1082508>

<http://dx.doi.org/10.15496/publikation-49627>

1. Auflage 2020 Tübingen University Press
Universitätsbibliothek Tübingen
Wilhelmstr. 32
72074 Tübingen
tup@ub.uni-tuebingen.de
www.tuebingen-university-press.de

ISBN (Hardcover): 978-3-947251-23-0

ISBN (PDF): 978-3-947251-24-7

Redaktion: Uwe Müller, Henrike Srzednicki, Monice Timm, Hannah Maeder, Marion Etzel

Umschlaggestaltung: Marion Etzel

Titelbild: Fishing boat, North Sea

(Bildnachweis: Sandra Teuber)

Layout: Büro für Design, Martin Emrich, Lemgo

Satz und Bildnachbearbeitung: Marion Etzel

Druck & Verarbeitung: Pro Business / Unternehmensbereich der medialis Offsetdruck GmbH, Berlin

Printed in Germany

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Preface

The SFB 1070 RESOURCECULTURES organised a conference on the topic of ‘Waters as Resource’ in cooperation with DEGUWA (Deutsche Gesellschaft zur Förderung der Unterwasserarchäologie e.V.), which took place in Tübingen from March 15th to 18th 2018. The different contributions of the conference focused on the various resources provided by waters in different spatial and temporal contexts.

The term resource is often used to refer to natural raw materials, which neglects the socio-cultural dynamics connected to resource use. Therefore, the SFB 1070 RESOURCECULTURES works on an extended definition of resources. It defines resources as the tangible and intangible means by which social relations, units, or identities are created, sustained, or altered (Bartelheim et al. 2015, 39; Hardenberg et al. 2017, 14). Further, within the SFB 1070, it is acknowledged and stressed that resources are subjected to cultural construction and valuation (Bartelheim et al. 2015, 39 f.; Hardenberg et al. 2017, 14–20), and that resources are part of ResourceComplexes (Hardenberg et al. 2017, 15). This term is used to refer to a combination of things or objects, individuals, knowledge, and practices (Hardenberg et al. 2017, 15; Bartelheim et al. 2015, 40).

The present conference proceedings focus on different resources provided by waters or on the ResourceComplexes connected to specific resources. The chapter ‘Resources Redefined – Resources and ResourceComplexes’ provides a brief background on the theories and methods used within the SFB 1070 and elaborates the concept of ResourceComplexes. It is followed by ‘Conceiving Water Bodies and their Uses across Disciplines: How to Grasp Riparian Relations with the Guadalquivir and Syr Darya Rivers’ which compares conceptions of water bodies using perspectives from cultural anthropology and archaeology. The

third contribution ‘Historical Water Scarcity on the Canary Islands, 1500–1800 AD’ addresses cultural aspects connected to water(s) on islands by investigating the water management and its influences on the identity of the islanders. The fourth chapter ‘Isolation as a Resource for an Island Community in the Strait of Sicily: The Case of Linosa Island (Italy) in Late Antiquity’ also focuses on islands and shows how seclusion on islands can be an important resource for Island Communities in the Strait of Sicily. ‘Aqua Viva and the Monk in the Pond: Multi-Dimensional Water Use in Medieval Monasteries’ investigates waters as means for identity formation and includes an analysis of build structures. The sixth chapter ‘Waters, an Omnipresent and Constantly Used Food Resource in the Viking Age? A Review of Studies Regarding Dietary Preferences from the 9th to the 11th Centuries AD’ focusses on the impact of maritime food sources on Viking Life. Finally, the last study ‘From *Axeinos* to *Euxeinos*: Pontic Waters as a Resource in the Context of the ‘Great Greek Colonisation’ ’ analyses Greek settlements in the Black Sea, and addresses diverse waters, such as rivers and the sea. All contributions illustrate how a new perspective on resources opens up additional possibilities for interpretation. The seven chapters further show that scientists from different disciplines can use the resource concept developed within the SFB 1070 for their respective research questions.

Sandra Teuber, Anke K. Scholz, Thomas Scholten and Martin Bartelheim, Tübingen im Juni 2020.

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Sandra Teuber and Beat Schweizer

Resources Redefined

Resources and ResourceComplexes

Keywords: resources, ResourceComplexes, interdisciplinarity

'Earth's resources consumed in ever greater destructive volumes. Study says the date by which we consume a year's worth of resources is arriving faster.'
(The Guardian, Watts 2018)

'Ressourcen: Der Schlüssel zu den Rohstoffen. Die Jagd auf Metalle und Mineralien für die Stromquellen von morgen ist in vollem Gange. Wie lässt sich die Versorgung sichern und ein Engpass vermeiden? Ein Lagebericht.'
(Frankfurter Allgemeine Zeitung, Bilow 2013)

'The six natural resources most drained by our 7 billion people. For how long can we realistically expect to have oil? And which dwindling element is essential to plant growth?'
(The Guardian, Ruz 2011)

'Ressourcenknappheit. Machtfaktor Wasser. Im Nahen Osten zeigt sich die politische Spaltkraft von Wasser. Je knapper die Ressource in Israel wird, desto geringer die Chancen auf eine Einigung mit den Palästinensern.'
(Süddeutsche Zeitung, Schmitz 2010)

Acknowledgments

We thank the German Research Foundation (DFG) for supporting this research through the Collaborative Research Centre (SFB 1070) RESOURCECULTURES and the anonymous reviewers for their valuable remarks. Further thanks go to many members of the SFB 1070 who have discussed ideas and shared insights, among others Wulf Frauen, Roland Hardenberg, Pia Hilsberg, Mohammad Karami, Thomas Knopf, Christiane Nowak-Lipps, and Thomas Thiemeyer.

Abstract

The public perception of resources often revolves around raw materials needed for economic growth, such as iron ore or fossil fuels. Dwindling goods such as water are also seen as resources. Due to changes in the economy and the growing effect of information technology, the public further considers immaterial resources such as knowledge important. Here too, the term 'resource' is closely connected to economics and economic development. However, this notion neglects

the socio-cultural dynamics connected to resources and their use. These socio-cultural aspects are central within the SFB 1070 RESOURCECULTURES, which aims at understanding interdependencies of resource uses and formations of communities and societies. Central questions of the SFB 1070 are how resource use developed within a society, how resource use affected movements of people, goods and knowledge, and how processes of valuation are connected to resource use. Taking recourse to theoretical concepts from the humanities, the SFB 1070 definition of resources as means to create, sustain and alter identities stresses that resources cannot be investigated in isolation from other resources. The SFB 1070 developed the concept of ResourceComplexes to facilitate the analysis of these interdependencies between resources. This contribution aims to explain the concept and – using the ResourceComplex fish as an abstract example – its strengths for interdisciplinary research are discussed in an inductive way.

Introduction: Discourses on So-Called Natural Resources

The above cited newspaper headlines indicate that the public perception of resources often revolves around scarce raw materials, such as metals and minerals, wood or fossil fuels, or on dwindling vital goods such as water. The public discourses seemingly focus on so-called natural resources or rather rare and exhaustible earth resources, their relevance for economic growth and consumption or on their impact on power relations, conflicts and on the destructive effects of resource extraction and use. Of course, these perspectives address basic needs of human life but neglect that resources are socially and culturally constructed, and as such depend on cultural and social appropriation and valuation.

A recent essay on the use of the words or terms ‘resource’ and ‘resources’ between antiquity and the 21st cent. shows that until early modern times a resource was seen as something useful to overcome a personal weakness. A resource, in the singular, thus was considered a ‘structural quality of a thing or a being’ (Hausmann/Perreaux 2018, 190). Since the 18th cent., in correspondence

with the rise of capitalism and industrialisation there are discourses on resources in the plural, as ‘things external to oneself, which can be tapped, but, above all, accumulated, for various activities’ (Hausmann/Perreaux 2018, 190).

A classical definition of the economic perspective omnipresent today in relation to human needs can be found in Menger’s ‘Principles of Economics’ (originally published in 1871). As an early representative of the marginal utility school of thought Menger (2007, 52) gives four conditions for turning something into a good: ‘1. A human need. 2. Such properties as render the thing capable of being brought into a causal connection with the satisfaction of this need. 3. Human knowledge of this causal connection. 4. Command of the thing sufficient to direct it to the satisfaction of the need.’

Though talking about a good instead of a resource, Menger focused on ‘a human need’ and ‘the satisfaction of the need’, but also on ‘human knowledge’ as a causal connection between them. This seems to be near to the Oxford English Dictionary, which has a rather long list of definitions for the term ‘resource’ (Stevenson/Waite 2018), among others ‘a means of supplying a deficiency or need; something that is a source of help, information, strength, etc.’. For resources in the plural the dictionary states: ‘Stocks or reserves of money, materials, people, or some other asset, which can be drawn on when necessary’ and ‘The collective means possessed by a country or region for its own support, enrichment, or defence’ (Stevenson/Waite 2018). There the focus is again on needs, means and materials, but people are included, and ‘some other asset’, though not further specified.

However, in contemporary economic contexts, the term resource is widely used with a focus on so-called natural resources. Since Adam Smith and David Ricardo these have generally been seen as beneficial for the economic development of countries (Badeeb et al. 2017, 123 f.). Using the examples of oil, gas and hard minerals, i.e. ‘non-renewable natural resources’ only to be extracted (Badeeb et al. 2017, 124), Gelb (1988) and Auty (1993) were the first to argue, that natural resources can be a curse for economic development. Sachs and Warner (1999) then confirmed the notion of ‘the curse of natural resources’ (Sachs/

Warner 2001) with further empirical evidence. Despite a richness in raw materials such as oil, gas or minerals, it is ascertained that the economic development of countries rich in natural resources is smaller than that of countries without it, and that resource booms lead to resource dependence.

Of course, recent approaches in economy have quite differentiated views on tangible or intangible resources as factors of production and organisational requirements for economic success (see Hardenberg et al. 2017, 13). However, economic studies on resources rely in general on the economic model of a *homo oeconomicus*, who rationally chooses the best alternative to maximise the benefits of any decision. Explanations for underdevelopment also depend on the rational choice premise. While many textbooks refer to an ideal *homo oeconomicus*, Kirchgässner (2008) argues that ‘individuals act by making rational choices among the alternatives which are at their disposal’ (Kirchgässner 2008, 1). Restrictions and preferences limit the alternatives and full rationality cannot be achieved: ‘It is not necessary that the individual knows all alternatives. Generally, he knows only part of his choices and often merely a very limited one, and he is aware of only some of their consequences’ (Kirchgässner 2008, 12 f.). Still, among the available alternatives, the rational choice for any individual is to maximise their own benefits. The rational choice perspective on the economy has been widely criticised, among others by Gudeman (2001, 2; 2012, 96–98). According to Gudeman (2001, 4) economic transactions in contemporary societies do not exist in isolation. Instead, these interactions happen in two realms, in impersonal (inter-) regional or even international markets with the focus on trade and in local communities, which have common values, depend on social networks and connect people (Gudeman 2012, 98 f.). He introduced the concept of base, which consists of ‘lasting resources’ such as water or land, produced goods or things, and ‘ideational constructs’ such as knowledge, laws or customs (Gudeman 2001, 7 f.). More broadly, the base of any economy is made up of the social and material space created by a community (Gudeman 2012, 95 f.). This base is locally and historically constructed, maintained, and altered, and shapes the identity of the community (Gudeman 2012, 99).

Contrary to Kirchgässner (2008, 7 f.) who states that rational choices are made in all social interactions be it in economic or other social relations, Gudeman argues that the *homo oeconomicus* prerequisite does not account for the formation of the base.

The Concise Dictionary of Social and Cultural Anthropology (Morris 2012) has an entry explaining the *homo oeconomicus*, but none for ‘economy’ or ‘resource’. More general, it has been pointed out, that there are no entries for ‘resource’ in relevant dictionaries of human or social sciences (Hausmann/Perreux 2018, 179). This finding also suggests that the term ‘resource’ in its current use is closely connected to economics and economic development not only within contemporary society, but also in scientific contexts and – respectively – politics. To give but one example, the website of the Federal Environmental Agency of Germany on resource use and its consequences has a strong focus on raw materials. Social aspects are only present in the form of the impact resource use has on the access to clean water and food security, especially in the developing world (UBA 2018). Other resources, such as knowledge, are not mentioned. This completely neglects the socio-cultural dynamics connected to resource use (Bartelheim et al. 2015; Hardenberg et al. 2017), which are research topics of the SFB 1070 RESOURCECULTURES.

Resources Redefined: Practices, Valuations and Identities in ResourceComplexes

The SFB 1070 RESOURCECULTURES aims at understanding socio-cultural dynamics of formations and change of communities, societies and identities in relation to uses, practices and valuations of basic resources, that is, the ways these resources come into being, are used, embedded and converted within different socio-cultural units. In this perspective, resources can be seen as an analytical category for the reconstruction of socio-cultural dynamics and practices of different cultures in space and time. Main issues address the correlation of resources to developments in different social contexts, how this is connected to movements of people, goods and knowledge, and how processes of valuation are intertwined with resources that

are central for respective cultural contexts. Further, the extended conceptualisation of resources within the SFB 1070 RESOURCECULTURES sees resources as the tangible and intangible means by which social relations, units, or identities are created, sustained, or altered (Hardenberg et al. 2017, 14). Taking up Gudeman's idea of base, this indicates that besides his lasting resources ideational constructs become resources as well. According to this, intangible goods and values can have the status of resources, if they affect identity formation. An example for this is given by Klocke-Daffa (2017, 253–268), who analyses the Sambatra ritual as a resource for identity creation in Madagascar. The Sambatra is a circumcision rite for boys up to fourteen years, 'celebrated every seven years as a collective event attended by large family associations and thousands of participants' (Klocke-Daffa 2017, 253). It transforms male children 'into socially accepted members of the patriline' and the participation in the ritual remains important today to identify as a member of the community (Klocke-Daffa 2017, 259 f.). The ritual as an important resource for change of status shows moreover, that in a cultural studies perspective 'a strict dichotomy between tangible and intangible has to be avoided' (Hardenberg et al. 2017, 19), because intangible and tangible elements are combined in the performances and affect the participant's bodies and senses directly.

Resources are according to the SFB 1070 RESOURCECULTURES in particular defined as means of identity formation in a framework of cultural construction and valuation (Bartelheim et al. 2015, 39 f.; Hardenberg et al. 2017, 16–20). The resources societies value today, such as fossil fuels or rare earths, only became resources recently, due to technical and as such cultural as well as social developments. This can also be seen by looking at the different archaeological epochs, e.g. the Bronze and Iron Ages, which are defined by the use of a specific metal (Schweizer 2018, 193). Prior to these respective epochs, the minerals (e.g. iron ore) of course existed on the planet but were not seen as resources, because they were neither used nor valued. Resources are, therefore, not defined as a matter, a naturally occurring stock, but as contingent means of social practices of actors. To remain with the example of iron, resources and their

respective uses only became possible through socio-cultural changes, which led to the valuation of the resource as such (Schweizer 2018, 193). Primarily relevant are not so much notions of utility, technical innovation, or even development of civilisation but integration in social communications and exchange relationships, sacred practices, orders and representations. Considering resources as means for identity construction focusses on tangible and intangible elements. Therefore, it is not possible to understand a resource in isolation. Instead, resources depend on and interact with other resources and elements due to the cultural appropriation connected to the resource in question. Thus, the SFB 1070 RESOURCECULTURES specifies that resources are part of ResourceComplexes. This term is used in correspondence to Gudeman's base (2001, 7 f., 36), to refer to a contingent and historically grown combination of things or objects, persons or individuals, knowledge, technologies and practices (Bartelheim et al. 2015, 40; Hardenberg et al. 2017, 15), and bodies or spaces of knowledge and representation, images, monuments and mythologies, hierarchies and discourses as well. Similar to Latour's (2011) actor-network-theory (ANT) approach and his understanding of network as a mode of enquiry on how to list all the 'beings necessary for any entity to exist' (Latour 2011, 799), the ResourceComplex as an analytical tool brings to the fore the elements necessary for social practices around specific resources. Latour argues that, 'whenever you wish to define an entity (an agent, an actor) you have to deploy its attributes, that is, its network' (Latour 2011, 800). While Latour (1999, 21) focusses on how to record world-building abilities of actors systematically, the SFB 1070's ResourceComplex combines tangible and intangible resources or elements and interdependencies between them to understand the temporal and spatial development of use and valuation of specific resources and elements. With this definition of resources as contingent means of social practices and ResourceComplexes as combination of objects, persons, knowledge, technology and practices, discourses of natural and cultural resources are no longer relevant. The separation of humans and nature has been widely discussed as a cultural construct. Ingold (2011, 8), for example, states that 'human social life is not cut out on a separate

plane from the rest of nature but is part and parcel of what is going on throughout the organic world'. As early as 1993, he wrote: 'the rhythmic pattern of human activities nests within the wider pattern of activity for all animal life, which in turn nests within the pattern of activity for all so-called living things, which nests within the life-process of the world' (Ingold 1993, 164). Ingold, thus, did not separate culture from nature. A similar notion of humans and the environment is found in ecological research, as Berkes and Folke (1998, 4) showed with their work on social-ecological systems in the context of resource management. They observed that depending on the discipline, resource management – and, therefore, resource use – either focusses on social systems or on ecological systems, but rarely on both at the same time (Berkes/Folke 1998). Ostrom, thus, proposed a framework consisting of resource systems, resource units, governance systems and users, with each consisting of several variables as well, and interactions between them. This multilevel nested framework (Ostrom 2009, 420), however, as a kind of systemic thinking again divides the system in 'natural' and 'social'. Nearer to Ingold's (1993) nesting approach, the ResourceComplex on the other hand relates tangible and intangible resources and elements of different materiality – such as widely known raw materials, knowledge, spirituality, and practices – with each other, and, thus, includes social, cultural and ecological aspects of resources. It, thus, is an analytical tool through which individual researchers can explore the different elements needed to use the central resource of the investigation. This means, that the individual researcher decides which resource is central for the investigation and then tries to identify all elements that affect the resource and, thus, the social identity and relations within a society.

By looking at the Atlantic cod as a marine resource, the resource concept of SFB 1070 and the properties of the ResourceComplex can be illustrated. The Atlantic cod can be seen as one of the basic resources for fishermen today because society attributed it a certain value, which can have monetary, nutritional, or symbolic dimensions. However, the use of the resource Atlantic cod does not only depend on the quality and taste of the fish as well as on the valuation of it by society, but also

on the presence and quality of waters. It, further, requires intangible resources, such as the knowledge about the fish itself (where does it live, how does it procreate) and about techniques to catch the fish. The use of the Atlantic cod (fish in general) also requires different types of equipment and infrastructure like boats, fishing nets, or spears, which in turn influence the practices used for fishing. Other elements needed are harbours, transport vessels, technology of cooling, trade options. Depending on those practices and knowledge, symbols or myths might emerge, which in turn influence the practices and shape the intricate ResourceComplex existing around the resource Atlantic cod.

Generalising the example of the Atlantic cod, a ResourceComplex 'fish' would consist of fish as the central resource, but also of equipment, infrastructure, knowledge, practices and symbols or myths/stories, which revolve around the resource fish. Similar to the proposition of Latour (2011, 800) to record all attributes in order to define any actor, all other elements connected to the resource fish have to be assessed. But instead of investigating the network of an actor, the ResourceComplex identifies correlated material and immaterial resources or elements. Humans, thus, are part of this intricate ResourceComplex. They are building social relations and identities by turning things into resources through valuation processes. This is comparable to Ingold's (2011, 8) idea that 'human beings produce themselves and one another by establishing, through their actions, the conditions for their ongoing growth and development ... Human actions, of course, establish such conditions not only for other humans. They also do so for assorted non-humans' (Ingold 2011, 8). As part of the ResourceComplex, humans shape and transform it through their knowledge and their practices and are also transformed by it.

Fundamental for the SFB 1070 resource concept is the notion, that a ResourceComplex around a central resource forms, sustains or alters social identities, social units and social relations of fishermen. Individuals as well as social units or groups should identify themselves as fishermen in recourse to shared stories, a common attire worn for fishing, learned practices, and much more, they, thus, distinguish themselves from farmers

or other social units. However, according to the base concept of Gudeman (2001), fishing would be only one part of the base of the fishermen, which influences their economic transactions. As fishermen usually are part of a community, which also consists of people belonging to other professions, their base would not solely rest on fishing. The ResourceComplex also affects relations of the fishermen's social unit with other units of their society, depending on the structure of the broader society and the role fishing plays for that society. As part of the base, the ResourceComplex 'fish' shapes economic interactions or transactions in the market as well as in the community spheres.

ResourceComplexes in an Interdisciplinary Perspective

The briefly outlined and abstract example of a ResourceComplex 'fish' was given to show that interdependencies between a central resource and other correlated tangible and intangible resources, elements, practices and discourses have to be considered to understand socio-cultural dynamics around the construction of social identities and relations. ResourceComplexes in general make interdependencies and relations between these different elements visible. Analysing those opens up the possibility to investigate resources way beyond a purely functionalist dimension as simple problem solving means or as monocausal push and pull factors leading to reductionist explanations. Müller stated for a history of resources: 'Questions about the history of resources formulate – one could argue – the merely obvious: resources are always important, scarce, and, therefore, contested.' And: 'what exactly is the epistemological interest in researching resources?' (Müller 2018, 209). In the perspective of the SFB 1070 RESOURCECULTURES an answer to this question would be: The importance, scarcity, contestedness has to be analysed as socio-cultural constructs. The method applied is using ResourceComplexes as a kind of framing, that allows 'to focus on the extent of the embeddedness of the means' (Müller 2018, 211), on socio-cultural dynamics and on identity building. Not the resources themselves build the centre of explanation, but the correlation between resources,

elements and practices. That means firstly, these networks – or meshworks as formulated by Ingold (2011, 63–94) – conceptualised through ResourceComplexes affect social identities and relations. More generally spoken, this framing ensures the shift from an analytic etic category 'resources' to an emic point of view of each social group or actor investigated (see Danwerth et al. 2018, 223), which corresponds to the notion of resources as contingent historically and culturally bounded means.

And secondly, the comparative and inter- or transdisciplinary approach within the SFB 1070 RESOURCECULTURES is directed not on single resources, but on social 'processes, relevant in relation to resources' (Hardenberg et al. 2017, 18), be it connected to sacralisation, valuation, social change or mobility. This is in accordance with requirements of inter- or transdisciplinary research, with a strong emphasis on thematic focussing (Berger et al. 2014, 21). As Lucas argued, the issues of archaeologists as well as anthropologists are abstract subjects, generalisations about processes (Lucas 2010, 30; see Hardenberg 2017, 28). ResourceComplexes as defined here according to ideas of Gudeman, but also Latour and Ingold in an analytical perspective are situated on a lower level of generalisation, but on a higher level of concrete inter- or transdisciplinarity as differentiated by Behrendt (2004, 118 fig. 2, all contextualised within scientific contexts). He refers to interdisciplinarity as having common definitions and terms, and a jointly developed research question, however, cooperation depends on the respective disciplinary methods. Transdisciplinarity in contrast would be characterised by common development of new methods adapted to the formulation of new research questions and terms, but at the same time by an opening of disciplinary borders. ResourceComplexes as analytical tools correspond to both perspectives, otherwise usually summarised under the heading of interdisciplinarity. They offer the possibility to integrate results and findings of different disciplines or research fields as well as to extend their respective research questions. At first, the ResourceComplex facilitates interdisciplinary research: In an archaeological excavation, archaeologists may start analysing equipment, settlement spaces or images, while archaeo-zoologists and biologists study the fish bones, and cultural anthropologists

the structures of contemporary fishing communities. Historians and philologists have their focus on knowledge and myth, and environmental scientists might survey the surrounding area using soil scientific and hydrologic methods or GIS for a better understanding of the landscape and spatial connections between different regions. This would indicate an interdisciplinary perspective as proposed by Behrendt (2004, 118). However, if the involved scientists focus on a shared research question and develop a tool that facilitates their interdisciplinary collaboration, this would move the collaboration towards transdisciplinarity.

Further, ResourceComplexes can be analysed by different disciplines using different theoretical approaches. While archaeologists might focus on the development of a prehistoric fishing community next to a lake, an analogous ResourceComplex 'fish' can be used by cultural anthropologists to study networks within a contemporary fishing community. As Hardenberg (2017, 26 f.) argues: 'Anthropologists can directly ask people [...] they identify hierarchies of value and thus distinguish between more and less valuable resources. Archaeologists, on the other hand, derive social value more indirectly from the relationships between material objects in terms of context, time, quantity, quality, spatial distribution, etc. [...] they derive meaning from the contextual arrangement of artefacts, the dialectic between people and things or the relationship between material qualities and usages of objects.' Of course, due to limitations of the archaeological record, archaeologists might not be able to investigate knowledge and cultural practices in their entirety, but they can provide information on the life in the prehistoric village next to the lake. They might be able to show how the village developed and find evidence supporting the notion that fishing was an important part of the daily lives of the villagers. They can illustrate which resources were important in the village and suggest interdependencies between them by using the ResourceComplex. However, their statements about cultural practices and belief systems have to rely on theoretical models, if there are no written records. On the other hand, cultural anthropologists studying a contemporary lake settlement might focus on networks between individual fishermen, on rituals

connected to fishing, or on knowledge generation within the fishing community. They use and generate theories, which are connected to knowledge or valuation processes and to the networks between people. Despite the different foci, the ResourceComplex needed for fishing is the same in both studies. While the approach used for the investigation differs, it enables scientists from both disciplines to compare their finds, and, thus, leads to a better understanding of how the resource 'fish' affects identity formation. This is achieved because the scientists are able to use their respective scientific background for the analysis of their research interest. By using the ResourceComplex as an analytical tool, each discipline cooperates with scientists from other disciplines and considering the interactions of the different elements within a shared ResourceComplex. This is on the way to Behrendt's transdisciplinary work, exchange and discussion. For example, if in an archaeological excavation evidence connected to fishing, equipment or fish bones, is found, the focus of the investigation might be on tools or animals, but thinking of these as elements of a ResourceComplex 'fish' always requires the investigation of social and ritual practices, relationships and dynamics, and of their respective representations and orders. As intangible elements are not part of direct evidence in prehistoric archaeological sites, the ResourceComplex allows one to think about the interactions of the different tangible and intangible elements, which might lead to new interpretations of the finds.

Interactions and Interdependencies between ResourceComplexes

Resources and ResourceComplexes are not static. Instead, they are subjected to changes, which can be analysed in connection to other resources and their respective ResourceComplexes within broader socio-cultural contexts or within a base, as conceptualised by Gudeman. Concerning the example, the ResourceComplex 'fish' in modern societies cannot be seen without referring to trade, which as a ResourceComplex includes the goods being traded, different modes of transportation (ships, horse carriages, trucks, trains, planes), networks between traders, and trading practices. Change of

valuations and practices around resources then affect connected ResourceComplexes and consequently social dynamics of identity building. The ResourceComplex approach can be used on different scales of social units and identities. Resources and elements in one ResourceComplex might gain the status of a central resource in another ResourceComplex. That is in a certain sense in line with Latour, who states that ‘any entity can be seized either as an actor [...] or as a network [...]. It is in this complete reversibility – an actor is nothing but a network, except that a network is nothing but actors – that resides the main originality of this theory’ (Latour 2011, 800). However, differently to Latour, not all elements of a ResourceComplex are a resource. The same is true for the resource fish, which is central for the ResourceComplex ‘fish’, but only one of the resources provided by waters in general. Waters also provide transportation and, thus, the prerequisite for trade with the elements water and wind currents, ships, boats, navigational knowledge, and more, which influences the identity of tradesmen. It also affects cultural practices. Under the heading ‘Mediterranization’ Morris (2005) presented a historical perspective for the increasing interconnection of the Mediterranean as a corrective against essentialist notions of mediterraneanism. Mediterraneanization thereby referred to a kind of ‘globalised’ mediterranean identity that came into existence in correspondence to the different local or regional social and cultural spaces around the Mediterranean. Cultural phenomena, e.g. types of monuments and distributed things as well as specific types of sacred places, some of which connected to forms of mobility, interaction and trade (Schweizer 2015) can be seen as resources or ResourceComplexes of the Mediterranean identity as well as of different local or regional identities. In the case of rivers or freshwater lakes, potable as well as irrigation water is also a resource provided by waters. For some societies, environmental conditions can be related to socio-cultural practices, which lead to dependencies on this resource. In Egypt, for example, the agrarian use of the regularly occurring floods in the Nile Valley led to a prospering society that made use of the floodwater and the nutrients and soil material it provided. However, the floodwater is not the relevant factor for turning it into a

resource in the definition of SFB 1070. Instead, the practices of distributing it onto the field, as well as the building of irrigational channels and other mechanisms needed to make use of the central resource floodwater, sustained the society in the Nile Valley and affected the social relations and identities of the people. Waters, thus, can be analysed as a ResourceComplex with different central resources, e.g. fish, trade, politics or religion related to mobility and processes of valuation. This can be useful to understand the importance of a specific water body. Waters can be the overarching ResourceComplex with several smaller, but no less relevant ones.

Conclusion

The SFB 1070 RESOURCECULTURES introduced a new resource concept. This concept aims at understanding the development of resource use and its effect on the creation of identities and social relations. The concept is useful to understand what turns things into resources, by considering valuation processes in social units. By analysing these processes, ResourceComplexes emerge, because any resource requires other elements for its use.

The ResourceComplex as an analytical tool enables scientists to investigate interactions and interdependencies of different elements to make use of a central resource. These resources and the connected ResourceComplexes affect identity formation by creating or altering social units. If changes within ResourceComplexes occur, this alters social relations and identities. Therefore, simple models are insufficient to understand the complex developments connected to resource use. Intricate connections between tangible and intangible objects and resources exist and influence identities and social units. While these units interact in markets and exchange, thus, participate in economic transactions, focusing on an economic perspective with the rational choice premise does not explain, how things become resources and how these in turn affect social identities. This also neglects the different socio-cultural dimensions that resource use has within a social unit. The extended conceptualisation of resources within SFB 1070 RESOURCECULTURES adds social and cultural

perspectives to the current debate about resources. By investigating all elements needed to make use of a specific resource through the ResourceComplex concept, individual researchers can determine the central resource and investigate its interactions with other elements. This enables interdisciplinary exchanges, as scientists from different disciplines have intricate knowledge of the different elements of a ResourceComplex and can, thus, contribute to a better understanding of identity formation. Further, the ResourceComplex is an approach that could be used to develop new research questions and enable not only collaboration between disciplines but inter- or transdisciplinary perspectives.

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Conceiving Water Bodies and their Uses across Disciplines

How to Grasp Riparian Relations with the Guadalquivir and Syr Darya Rivers

Keywords: Guadalquivir, Syr Darya, water thinking, resources, networks.

Abstract

In this article we examine the usefulness and limits of concepts developed by the SFB 1070 RESOURCECULTURES for studying water bodies as a basis of social life. We use an archaeological case-study of the Guadalquivir and an ethnographic study of the Syr Darya river to draw out the benefits and disadvantages of working through these concepts. We also chart other approaches to ‘water thinking’ in the social sciences and humanities, discussing their relationships and the research landscape that influence them. Our conclusion highlights the oscillation between constructivist and water-use oriented research, and contemporary attempts to take account of the non-human agencies involved in river life.

1. Introduction

Water appeals to humanities and social scientists with an irresistible combination: it seems to be both universally relevant and familiar. We encounter it in puddles and coastlines, monsoons and endless ice-fields. Liquid H₂O occurs in a variety of ‘containers’ in human societies: among those are sacred springs, desert wells, garden wells, rivers, lakes and oceans providing fish,

transport routes and much more. Because of this central role, Orlove and Catton call water a ‘comprehensive social fact’, that is a phenomenon that connects most areas of human life (Orlove/Catton 2010, 402). Ranging from examinations of water-related metaphors in our thinking (MacLeod 2013) to calculations of a virtual ‘water footprint’ in exporting commodities (Ray et al. 2018), there are multiple ways in which research on ancient and contemporary societies has explored water as a crucial basis of human life. Although it is essential for the functioning of human bodies and societies, it can also change in familiar, mystical and attractive ways. The formula H₂O is very simple in itself, but shows a great variety of forms in reaction to temperature (weather), or in its ability to mix with other chemical elements (Strang 2015).

From the point of view of an archaeologist and a social anthropologist, we here compare two particularly important ‘water containers’: the Guadalquivir river in Spain and the Syr Darya (Jaxartes) in Central Asia (*fig. 1*). Both are large rivers in summer-dry landscapes that carry very old settlement and irrigation patterns. Our intention here is not to compare these river-systems as such, or give a full-fledged account of their comparative histories. We bring in these particular examples to illustrate the usefulness of specific interpretive frameworks: to what extent can such water bodies be understood as ‘resources’ for human use that combine material and immaterial aspects? How well is an examination of these large rivers served by treating them as a ResourceComplex? Lastly,



Fig. 1. Map of Eurasia with the rivers Syr Darya and Guadalquivir.

we compare this approach to other concepts applied to large rivers, such as the ‘enviro-technical-system’ (Pritchard 2011) and ‘organic machine’ (White 1995). Before examining these approaches in the context of the Guadalquivir and Syr Darya, we first contextualise ‘water thinking’ in the social sciences and humanities more broadly, and how political practices and cultural ideas about rivers may influence them. We aim to encourage a reflection across disciplines about the underlying assumptions of our research epistemologies. This reflection is not only relevant to our sample rivers and the water topic, but important for judging any lens of analysis, as a world-making practice.

2. Water and Water Bodies as Research Objects: The Connection Between Politics, *Zeitgeist* and Scientific Epistemologies

How the question ‘what is a river’ is answered, can have far-reaching consequences. The approach of Environmental System Services, for instance, seeks to determine the monetary value of particular natural environments to humans. This approach may be effective in giving ‘nature’ any kind of visibility and value at all, to policy-making units that can only conceive of value in monetary and quantitative terms. But this approach is also widely criticised for its anthropocentric outlook (what is the monetary value of a river to a heron?),

the difficulty in assessing uncertain future value of environments, and impossibility of including environmental ‘services’ such as beauty or a sense of home. In short, the Environmental Systems Services approach to rivers or other natural entities is adapted to dealing with late capitalist modes of governance of the early 21st cent., and to an audience conversant in a language of governance dominated by financialised economics.¹ This example serves to highlight the underlying world-views and assumptions behind particular river concepts: the epistemology of water bodies is guided by purpose, audiences and research questions oriented to a certain *Zeitgeist*.

The following section examines current trends in the study of human relationships to water in the social sciences and humanities, with a particular focus on environmental history and anthropology. We do not pretend to give a comprehensive overview of water studies, but an outline of influential schools of thought and the influence of the political concerns of the 21st cent. on water. We note a strong focus in this research on seas and rivers. Such bodies of water display a complexity that is challenging and concrete, but at the same time not too demanding: these are tangible research objects. We can conclude: if water currently seems ‘good to think with’, rivers and oceans are

¹ For an overview of the debate, see Schröter et al. 2014.

apparently even better suited as fields of enquiry in the humanities. Below, we identify two ways of approaching seas and rivers: first, the examination of water-related practices through studies of water ‘utility’. Second, we note studies on cultural ideas about water: water ‘constructions’. In the following we show a certain tension between constructivist investigations of the nature of water, and approaches that regard ‘water’ as an unquestioned natural element and fact of life. The Environmental Systems Services approach is a clear example of the ‘water utility’ approach.

2.1. Utility Approach: Accessing, Distributing and Putting Water to Work

Given the widespread fears of a global water crisis associated with rising temperatures and human consumption, as well as the pollution of available water sources, it is not surprising that there is currently a strong research interest in large water bodies such as rivers. International non-governmental organisations warn of imminent ‘water wars’, a fear that has put a new focus on ‘water diplomacy’ in the political sciences (Pohl et al. 2014). Historically however, there are very few cases in which a lack of available water alone triggered armed conflicts: water problems often function as *casus belli* in the context of other political disputes. In fact, it is easier to identify political conflicts that cause water scarcity than vice versa: this is the case both in Central Asia and in Spain.² The much-discussed global water crisis is, in fact, about the felt scarcity of a particular **kind** of water: clean, fresh water. This is reflected in the research corpus on water: salty, brackish or frozen water, swamps or heavily polluted water are regarded as special cases.³ These ‘marginal’ or ‘chaotic’ species of water generate research attention primarily as ‘problem zones’ or ‘future potential’:

they are usually left to development experts and applied natural scientists. If we study water from the perspective of this water crisis, research comes to focus on bodies of **sweet water** as an everyday common good, whose rights of use are often highly controversial (Utility Approach). Rivers in particular often represent common transboundary spaces, where several groups of actors are involved in the use and administration. Rivers generate dams, pollution, fish industries and shipping. These fluid fields thus pose more complex questions than many other forms of environment or property. This view of the problems leads researchers to ask for the power relations and distribution of this essential ‘resource’. Such studies can be found particularly in the applied social sciences, among geographers, political ecologists or in development studies (see Swyngedouw 2015; Molle et al. 2009). To take into account the role of more or less powerful human actors in controlling water movement and use, Linton and Budds have proposed thinking of the water cycle as a ‘hydro-social cycle’ (Linton/Budds 2014).

For archaeologists, the topic of water supply is primarily associated with the inflow and outflow of water and the creation of artificial water bodies for its use. The regulation of the water balance, in particular the creation of reservoirs and access to them, has been a basic cultural technique since humans became sedentary and is causally closely linked to it (Eichmann/Klimescha 2012). The main focus here is on the investigation of artificial water bodies (wells, cisterns or canals, such as the early medieval Karlsgraben [Ettel et al. 2014]), and artificial watercourses (mill races, monastery installations, gardens, irrigation systems, drainage, sewage systems) (Klimescha et al. 2012). In examining the relationship between water distribution and power, it is difficult to circumvent Karl Wittfogel’s much discussed notion of the ‘hydraulic society’ (Wittfogel 1957). Wittfogel was of the opinion that water supply is such an important issue for large-scale agriculture, that the control of irrigation plays a special role in enabling a dominant centralised state. Although Wittfogel’s detailed reasoning has received much criticism for his orientalist assumptions, this very generalised view is widely accepted. And indeed, we find hydraulic engineering and infrastructure for controlling

² For an overview of the arguments for water scarcity catalysing violent conflict in the past, and the effect of such fears on current and future tensions, see Rahaman 2012.

³ Research from the humanities, which has recently been concerned with less ‘clear’ freshwater relevance, can be found, for example, in swamp and delta studies (e.g. Ogden 2011; Krause 2018). Marine research is discussed below.

the distribution and access of water through aqueducts, dams, canals, ports and drinking water systems as integral parts of large (state-organised) human communities with specialised crafts, increased agricultural production and a preference for mechanical technologies.⁴ Such expertise and power relations are linked to certain scientific ways of describing water flows: political geographers, development researchers and water engineers often study water or river catchment areas, i.e. the entire geographical area drained by a river and its tributaries. In contrast to these water management theories, it is not so common for the water catchment area to be recognised and treated by affected societies as a clear ‘object in the world’. River communities tend to name water currents rather than water bodies: a river or river section, a lagoon, a lake or a coast. The contrast between these ontologies of water brings us to the second approach pursued by water research in the humanities and social sciences.

2.2. Constructivist Approach: Analysing the Meaning and Experience of Water Bodies

Above, we already began examining the ‘river-basin’ approach as an example of a river concept linked to types of governance and management-oriented world-views. Asking such a question is, of course, already a ‘constructivist’ move that does not treat water as a given ‘fact’. The school of water research taking this approach is more associated with the humanities than applied social sciences. Permanent water bodies such as large rivers or seas, with clear boundaries, names and life-promoting properties are of particular interest to the humanities.⁵ Thus, historians such as Costlow and Rosenholm (2017) or Tvedt and

Jacobsson (2006) explore the significance of water in the context of wider world-views, which in turn shape practices and conflicts. The importance of water bodies is often framed in culturally specific ways, e.g. as embodying ‘purity’, a powerful and unpredictable entity that both drowns and feeds people, or as a site of commemoration. In consequence, anthropologist Stefan Helmreich recommends that models of the world – including our concepts of water – be regarded as ‘thought technologies’ (Helmreich 2011, 139). A particularly strong example of this effect is the question of water quality of the Ganges. Kelly Alley has documented that here the ritual notion of purity obliterates the possibility of seeing the Ganges – at the same time – as dangerously polluted by chemicals (Alley 2002). The link between meaning-making around bodies of water, and their uses is well illustrated by Tanya Richardson’s work. She notes that the simple question of whether the point at which the Danube meets the Black Sea in Ukraine is a ‘lagoon’ or a ‘lake’ has profound environmental consequences. Some groups such as conservationists argue that the ‘lagoon’ is indeed part of the Black Sea and should be treated as such, while government planners insist that the walled lagoon is an economically productive ‘lake’ (Richardson 2014). Identifying this water body as a single entity entails two different versions of environmental care, institutions and profiteers on the terrain. Richardson argues:

‘...if we assume in advance what water is and what its properties are, we can see neither how it comes to be connective or disconnected, fluid or stagnant, singularized or multiple, nor the practices and relations that make it exist in one way and not another’ (Richardson 2014, 5).

2.3. Scarcity of Evidence – Scarcity of Meaning and Constructivist Approaches?

Overall, it is clear that it is both the disciplinary ‘world-view’ (set of research questions and

⁴ This is not to say that such technologies cannot exist without a centralised state: there are multiple counter-examples, as in Bali (Lansing 1987), South India (Mosse 2003) or ancient Central Asia (Stride et al. 2009).

⁵ Rivers and oceans seem to attract a lot of attention, more than lakes of any size. We suspect two reasons for this popularity: first, they seem to suggest a narrative thread through their flow patterns. From the source to the mouth: isn’t that a story that almost tells itself? Second, oceans were mostly conceived as empty fields and obstacles for human societies in these sciences. Only more recently have they been treated

as connecting spaces (for example Gilroy’s ‘Black Atlantic’ [1995] and Pearson [2003] on ‘The Indian Ocean’).

assumptions) as well as the available material, that determines how much a study takes up an ‘utility’ or ‘constructivist’ approach to water. Thus, for archaeologists, the manifold forms in which water bodies have been dealt with since the early epochs of human history can only be reconstructed to some extent by corresponding finds. In the absence, for example, of written statements on the understanding of oceans and rivers, the data situation generally causes a focus on water uses instead of water ideas, and promotes less constructivist approaches. Archaeologists have had little to say, for example, on how a society probably understood the Guadalquivir river in antiquity. Nevertheless, the available source material suggests that water bodies, beyond the mere satisfaction of physical needs, represented places and objects with complex and specific purposes since time immemorial. In connection with water, investigations concentrate primarily on three thematic areas: a) water supply, b) use of water-specific properties for economic purposes, and c) finds and features in water bodies. Archaeologists investigate the use of water-specific properties for economic purposes, above all with regard to carrying capacity, current and habitats for aquatic creatures through water transport, energy generation (Liebert 2015) and fisheries. In this field, archaeology probably has a strongly filtered record due to the special preservation and finding conditions in the water context. On the one hand, water installations and watercrafts are eroded mainly by currents and biological destruction, on the other hand, organic materials (especially wood) are excellently preserved under permanent exclusion of air (Günther et al. 2016). The uses of water have thus been investigated through such special finding conditions, but also via indirect evidence (e.g. shiploads under water, imports and movements of persons between and across islands, pictorial representations of ships and fish, finds of fishhooks, nets and fish bones on land) (Catsambis et al. 2011). In a similar way, knowledge about other water-related finds and features such as architecture on and in the water (particularly pile dwellings or palisades), deposits or loss finds in water bodies is also affected by the specific conservation conditions (Menotti 2014). The archaeology of water bodies also includes important

environmental archives in the form of pollen profiles from standing water and wetlands, which can give us extensive information about their use, about the near and far surroundings and also about corresponding climatic conditions (Mainberger et al. 2015). Having pursued several of the factors influencing the choice of water concepts, and the distinction between concentrating on water ‘constructs’ and ‘uses’, we now discuss one particular attempt to resolve this tension. In the following, we focus on the advantages and disadvantages of thinking of a water body as a resource, and as a ResourceComplex.

3. Water Bodies as a Resource

How can water bodies become a resource? According to the definition of SFB 1070 RESOURCECULTURES, resources are the basis for social dynamics within the framework of culturally shaped ideas and practices (Hardenberg et al. 2017). This concept focuses on resources as the fundamental elements that societies have needed from early history to the present day in order to emerge, survive and change. Such elements include both material things and immaterial concepts and relations, which form the basis of actions. In this view, resources are not static and essentially unchangeable ‘things’ that trigger social processes, but are subject to constant transformations and changing assessments, which are above all, culturally shaped. From the perspective of Hardenberg et al., conceptualising a water body as a resource opens a way to describe how they become usable for humans through a specific combination of knowledge, objects and persons. Thus, resources are not used in isolation, but usually in the context of **ResourceComplexes**. These are networks around resources that consist of knowledge, technologies, objects, places and people and must interlock in a certain way so that resources can be put to use by a community. Putting resources to use, social processes are promoted that manifest themselves, for example, in political developments, wars, social mobility or migration. In the SFB’s conception of a resource, its definition depends on what societies consider to be particularly precious, how they deal with these valuables and how the associated negotiations shape



Fig. 2. Suburbs of Naryn town on the Naryn river, Kyrgyzstan (Photo by Jeanne Féaux de la Croix).



Fig. 3. Syr Darya in Tajikistan, in the middle of the city of Khojand (formerly Alexandria Eschate) (Photo by Mohira Suyarkulova).

up. Taking into account the cultural and social dimensions of such elements, draws ‘resources’ away from an essentialist view of them – i.e. generally a modern Western view – and thus enables the recognition of alternative concepts and forms of use. Water bodies come in various forms, ranging from natural (mainly oceans, lagoons, lakes, rivers, streams, wetlands) to artificial (e.g. waterways/channels, ponds and wells). From a primarily functionalist (i.e. modern Western) perspective, water bodies as varied as streams, canals, lagoons or oceans can function as resources for equally varied purposes: transport, energy production, supply of drinking water, salt, fish or as leisure locations. Although the associated notions for these uses vary, they focus mostly on economic aspects (‘utility’). Alternative perspectives on water bodies as resources are linked to world-making around water (‘constructivist’) and often aim at their function as places for transcendental projections. Here water is perceived e.g. as the site of spiritual forces as we can see it in antique nymphaea like that of Ephesos (Quatember 2011). Water bodies could also serve as a means for physical and/or mental healing, as for instance the hot springs of Hierapolis (Şimşek/D’Andria 2017). Big rivers like the Guadalquivir as well as lakes often function as a source of identity for the residents of their areas (Peral López 2018). In these contexts, the value and use of water bodies becomes more clearly associated with water notions such as sanctity or danger, and analysable in the ‘constructivist’ mode. Taking the perspective of viewing

water bodies as a means to an end (a resource perspective) further, we can identify a variety of corresponding ResourceComplexes, which are needed to create access and value to rivers. In the economic sector, for example, the areas of fishing, ship-building and salt extraction are often closely interwoven, as they depend on each other for the optimal use of water as a source of food or fishing ground. This ResourceComplex is activated, as is traditionally the case in the estuary area of the southern Spanish Guadalquivir, by networks of fishermen, ship-builders and salt boilers, the latter extracting the salt traditionally required for the conservation of fish (Agudo Torrico 1991). The same dynamic applies to other complexes such as shipping, which includes ship-building, wood/metal production and export/import industries, activated by constellations of sailors, ship-builders, wood craftsmen/metallurgists and merchants (Odriozola Oyarbide 1996; Rieth 2016). With regard to alternative concepts of water bodies as resources, the area of the healing power of water can be understood as a ResourceComplex consisting of water sources, often with thermal properties and/or ascribed spiritual powers and institutions like churches, temples or sanatoria as in contemporary Central Asia (Aitpaeva 2007). In this case, the complex includes the special sites of these sources, the associated religious ideas or myths as well as contemporary medical or religious specialists and their clients. We now turn to our case-studies, to highlight what a description of large rivers as ResourceComplexes allows us to understand and

what alternative modes of analysis might reveal. The Central Asian case is based on primarily contemporary ethnographic work across five field-sites (*fig. 2–4*), as well as 20th cent. historiography of the Syr Darya. The archaeological case-study on the Guadalquivir draws on four site studies from Chalcolithic until Roman times.

4. The Syr Darya as a ResourceComplex

To the scribes of Alexander the Great, this river was known as the Jaxartes. The ‘Syr’ or ‘mysterious’ river (as its name is sometimes interpreted) transports the snowmelt from the heights of the Tian Shan Mountains on the Chinese border to the West (*fig. 3*). Flowing down from Kyrgyzstan through densely populated agricultural oases in Uzbekistan and Tajikistan, after 3000km it reaches the vestiges of the once huge Aral Sea in western Kazakhstan. As most large rivers with a heavy sediment load and strong fluctuations in water levels, this river continuously shifted its river-bed, causing ancient cities for example, to periodically flourish, die, or relocate (Andrianov 2016; Härke/Arzhantseva 2016).⁶ Since the early Soviet period, the population and economy of the region have been increasingly linked by the construction of large hydroelectric power plants and irrigation canals in the Soviet republics of Central Asia (*fig. 4*). In the post-WW II period, two interdependent, river-oriented ResourceComplexes were controlled from central administrative facilities in Tashkent: on the one hand, the massively developed irrigation system for grain, tobacco, vegetables and – queen of crops – cotton. On the other hand, dams in the highlands, which secured the water for irrigation in the lowlands, were also designed as an important source of electricity for the region (Kalinovsky 2018; Menga 2018). This transformation of the Syr Darya and other rivers had radical consequences: at least some post-war Soviet scientists knew and accepted that the tapping of the Aral Sea tributaries would lead to



Fig. 4. Uch Kurgan dam on the Kyrgyz-Uzbek border, overlooking dense agriculture in the Ferghana valley (Photo by Jeanne Féaux de la Croix).



Fig. 5. Stranded fishing boat on a former Aral seabed (Photo by William Wheeler).

a massive reduction of its surface (*fig. 5*). The ecological, economic and health effects of the evaporation of 90% of the lake and the decline of the fishing industry are well documented (Vinogradov/Mamedov 1991). In the Glasnost era, the fate of the Aral Sea and other environmental disasters such as Chernobyl were at the forefront of public discussion: few could imagine that the Soviet system would not survive this criticism alongside the economic crisis. For the river and its inhabitants, however, the dissolution of the interlocking of the energy and irrigation ResourceComplex based on this river, has not led to a fairer distribution or less pressure on the river’s resources. When the centralised planned economy collapsed, the crucial regional form of exchange by sending irrigation water downstream and other forms of energy such as gas and oil upstream, also disintegrated. In the 1990s, borders between riparian neighbours Kyrgyzstan, Uzbekistan, Tajikistan and (to a lesser extent) Kazakhstan were militarised and bridges

⁶ There is evidence of Karakalpak populations adapting their livelihood strategies specifically to this fluctuation, moving between agriculture and pastoralism and migrating along the lower Syr Darya (Jacquesson 2002).



Fig. 6. Lower course of the Guadalquivir near Seville (Photo by Martin Bartelheim).

destroyed. This affected cross-river and regional relations of many multilingual Tajik, Uzbek, Kyrgyz, and Kazakh family networks separated along the river. New lines of tension arose between neighbouring farming communities in need of water in summer and electricity-dependent consumers in winter (International Crisis Group 2014). In the case of the Syr Darya's Soviet and post-Soviet transformations, the concept of these constellations as a ResourceComplex does useful work. It illustrates the networking of these resource systems beyond the river into electricity supply, agriculture and the fishing industry. These ResourceComplexes are all promoted by a broader and more specific RESOURCECULTURE. Cultural ideas backing this way of harnessing the river include a modernist idea of subjugating nature (in Soviet parlance 'taming the river'). But the cultural context also includes the need for a cotton supply independent of the rival great power – the U.S.A., and the notion of a competition between the socialist and the capitalist race for development (e.g. dam-building records, successes in electrification). These goals are linked to particular technologies of knowing a river e.g. the concept of water management specialists and geographers of a 'river basin' or catchment area. This way of conceptualising a river is currently promoted by international organisations as (relatively) decentralised 'integrated water resource management' through 'water user associations'.⁷

⁷ Description and critique of this blueprint for water management can be found, among others, in Mosse 2003; Wagner 2013; Wegerich/Warner 2010.

In other words, the catchment area model creates new lines of command in regulating water distribution, and notions of rights and responsibilities e.g. around regulating the seasonal flow of water through dams, or limiting the pollution caused by the run-off from upriver communities. Our ethnographic investigations have however revealed that this kind of regional and managerial view is quite different from the more localised notions of river systems (and thus responsibilities) of most riparian residents. So, for residents of the largest tributary of the Syr Darya, the Naryn in Kyrgyzstan, the river is primarily an electricity provider, and a drainage ditch for water used by households and agriculture. We have also researched communities that conduct animal sacrifices on the river banks in the Ferghana valley (Uzbekistan) and western Kazakhstan: these communities expect rain and water to be assisted through ritual practice, rather than Water User Associations or ministries (Féaux de la Croix 2017).

5. The Guadalquivir as a ResourceComplex

Despite its location in a very different geographical region on the western edge of Eurasia and an estuary towards the Atlantic, the Guadalquivir in today's southern Spanish region of Andalusia bears also some resemblances to the contemporary uses of the Syr Darya. The Guadalquivir is also a large river bearing water consistently in a partly semi-arid, at least summer-dry landscape and having significant importance for regional irrigation systems and energy generation. The Guadalquivir has long represented a reference point of supra-regional importance for the use of water as a resource in Andalusia (*fig. 6*). In addition to the pure supply of water for humans, animals and plants, today, as in the past, it forms an important traffic route, an important fishing ground (Granado Lorenzo/Sánchez Royo 1985), an energy source, a recreation area, a site for transcendental ideas and, last but not least, an important component of the regional identity e.g. due to the longstanding role of Seville and its port as a major gate to the world, which left deep traces in the city and its surroundings (Peral López 2018). As in the Syr Darya case, in the Guadalquivir valley we find a

combination of people, knowledge, things and forces linked for the use of these aspects of the river as a resource. These manifest themselves in historical times, in administrative units such as the Confederación Hidrográfica del Guadalquivir (the central water management institution for the catchment area). This can clearly be described as a ResourceComplex for particular ways of exploiting the river. The location of most of the major cities of Andalusia, Seville, Córdoba, Granada and Jaén on the Guadalquivir and its tributaries, which were the most important at least since the Roman period, indicates the fundamental social and economic relevance of the ResourceComplex 'river Guadalquivir' for the greater region of Andalusia. The good navigability of the Guadalquivir in its lower course facilitated far-reaching contacts, particularly in the Mediterranean and to North Africa. In addition to favourable agricultural conditions and a good supply of raw materials, this is probably an important reason why supra-regionally important settlement centres could develop in the estuary area, as we can observe above all in Valencina de la Concepción in the 3rd mill. BC (García Sanjuán et al. 2013) or in Seville possibly already at the beginning of the 1st mill., but certainly from Roman times onwards (González Acuña 2011; Beltrán Fortés/Rodríguez Gutierrez 2018; Escacena Carrasco et al. 2018). The permanent access to water, good agricultural conditions in the surrounding area and the crossing of important transport routes by water and land have also led to the development of an economic, cultural and power centre in Córdoba on the central Guadalquivir in Roman times, which in early Islamic times gained outstanding importance for the entire Islamic world (Valedón Baruque 2001). The emergence of these places was associated with a great economic, political and cultural brilliance, which played an important role in the social development of the entire region. The Guadalquivir was also of particular importance for the advent of the Phoenicians in the early 1st mill. BC (Ferrer Albelda 2018). They were attracted by the rich silver and copper ore deposits in the mountainous hinterland of the Sierra Morena and by the favourable agricultural conditions in the valley and settled on the southern Iberian coast in proximity to the Guadalquivir mouth. The use of the ore deposits – in the way

required by the Phoenicians – was ensured above all by the good transport facilities in the estuary area of the river and the supply logistics provided by agriculture in the Guadalquivir valley. The Phoenicians had not only brought with them the necessary knowledge to increase the effectiveness of metallurgy and agriculture, but also cultural techniques such as new forms of construction, cultic expressions and burial forms. All these elements were quickly adapted by the local population and had a lasting influence on the social and cultural development of the region (Bartelheim 2007, 109–118). With their different cultural and economic background, the Phoenicians established a new RESOURCECULTURE that varied significantly from the previous approach of the indigenous population to the production and use of metals as well as to agriculture (Bartelheim 2007, 109–150). In the ResourceComplex around silver and copper ores, the Guadalquivir played a crucial role by offering water for ore processing, transport facilities, harbour locations and a basis as food supply for the metal production system. However, generally for most prehistoric periods (i.e. pre-Roman times), the importance of water as a resource, or its ResourceComplexes can only be indirectly explored, because of a lack of written evidence. Significant research results have however recently been obtained in particular from the lower reaches of the river, which help to shed light on aspects of its use. Valencina de la Concepción is a particularly important site situated in the direct western neighbourhood of Seville, above a former arm of the Guadalquivir estuary lagoon, the Lacus Ligustinus (Borja Barrera 2013; Arteaga et al. 2016b). This is the largest archaeological site of the 3rd mill. BC on the Iberian Peninsula, with an area of over 400 hectares. It has revealed not only large tomb monuments but also significant settlement remains (García Sanjuán et al. 2017). Plant remains on a larger scale appear as evidence of irrigated agriculture (Llargo López et al. 2013), aquatic fauna (Martínez Sánchez 2013, 40 f.; Pajuelo Pando/López Aldana 2013, 450) as well as significant quantities of imported objects from overseas (Schuhmacher et al. 2013; Schuhmacher 2017; Fernández Flores et al. 2016; García Sanjuán 2017). These provide evidence of the use of the Guadalquivir and its estuary as an important



Fig. 7. Entrance to the megalithic tomb La Pastora in Valencina de la Concepción, province Sevilla (Photo by Martin Bartelheim).



Fig. 8. Bivalves on a stone slab in the megalithic tomb La Pastora (Photo by Martin Bartelheim).

interregional transport route in this period. Port facilities from Roman times in the immediate vicinity of the site indicate that the estuary lagoon could be used for navigation for a longer period of time (Arteaga et al. 2016a). There are also finds of remains of salt extraction in the immediate vicinity (Escacena Carrasco et al. 1996) and in Roman

times the Guadalquivir became the subject of poetic songs because of its significance as a watercourse (Abad Casal 1975, 55 f.). In addition to these primarily ‘utilitarian’ indications of the use of the Guadalquivir and its estuary as a landscape that provided raw materials and transport capacities, there are also indications of the spiritual role that this largely ‘amphibious’ (wetland) region, played in the life of its inhabitants in the 3rd mill. BC. In prehistoric Europe, it is naturally difficult to track down references to transcendental concepts, since one of the main characteristics of this cultural zone is the almost complete absence of interpretable evidence, since only material data are available. One of the few possible exceptions could be the recently published evidence from the megalithic tomb of La Pastora within the complex of Valencina de la Concepción (Cáceres Puro et al. 2014; 2019). This monumental collective tomb consists of a burial chamber with a long corridor (*fig. 7*), built of small limestone blocks of local origin and covered with a series of large stone slabs. Most of these slabs are made of calcareous sandstone and show small shells of the species *Petricola lithophaga* on the surface exposed to the corridor (*fig. 8*). These bivalves live in the surf zone of the sea and cause bioerosion in the rocks (endolithic organisms). The very good state of conservation of the shells in the stone slabs of La Pastora shows that they were not fossil, but died shortly before the slabs were installed. The nearest occurrence of these sandstone slabs is in Puebla del Río, about 15km away, directly on the shore of Lacus Ligustinus. Other suitable building materials would have been available near La Pastora, such as limestone slabs (Vargas Jiménez et al. 2015), but these sandstone slabs were deliberately selected for use on this site. In addition, the sandstone slabs in the Tholos tomb were inverted to make the former tops face towards the inner part of the corridor, so that they were visible. Both show that it is very likely that in such a prominent place, presumably closely associated with a group identity, the presence of these plates with bivalve shells as representatives of the element water was intentional. It seems conceivable that the water body of the Guadalquivir estuary with this particular type of shell played an important role in the identity, or other transcendental ideas of the group that buried their

remains in this Megalithic tomb, a role which is reflected in the tomb's construction.⁸ Taken together, this and the other evidence presented, provide clear indications that as early as the 3rd mill. BC, the Guadalquivir as a water body had the character of a ResourceComplex in which tangible and intangible aspects of water use like irrigation, fishing, salt production, transport or transcendental projections were interwoven in a complex way.

6. Potential, Limits and Alternatives: Grasping Rivers as ResourceComplexes

Both examples of water bodies discussed here, the Syr Darya and the Guadalquivir, reveal complex patterns of use and meaning that go far beyond a 'pure' function as water sources. While both have been important for irrigation and fishing since prehistoric times, water power at the Syr Darya is a major focus in modern times. Unlike the Syr Darya, the Guadalquivir is also a well-known transport route, not least because it flows into the sea. In both cases the outstanding importance of these rivers in their respective catchment areas, which are characterised by frequent water shortages, is reflected in practices that are not purely 'utilitarian' and graspable by economic or political ecology approaches. For example, we observe contemporary river sacrifices in western Kazakhstan, alongside an identification with large dams as collective and individual achievements. We can also conjecture a special role of riparian elements in the burial rites of 3rd mill. BC Guadalquivir residents or in Roman era poetic songs reflecting its life-giving function (Abad Casal 1975, 55 f.). However, these examples demonstrate that not every river 'resource' is venerated and explicitly celebrated: in the case of the Syr Darya, the sacrifices on river banks do not highlight the river *per se*, as the most important actor: it is thought of in fact mostly as part of a wider ResourceComplex of seasonal water supply. Value is not necessarily

celebrated in the river itself, but in certain elements of its ResourceComplex, such as dams in the river system. On the Guadalquivir, in view of the variety of its manifestations, characteristics and forms of use from its origin in the mountains of the Sierra de Cazorla along the lower course to the estuary zone with the brackish prehistoric Lacus Ligustinus, it is likely that in pre-modern times hardly anyone had conceptually embraced the river in its entirety – if they identified with it, as appears to be the case in the megalithic tomb of La Pastora in Valencina de la Concepción. Similar to what Richardson describes for the lower Danube, different concepts of the same body of water may have prevailed, depending on personal, social and political perspectives. The case studies outlined here reveal that in addition to satisfying economic needs, both rivers have long taken on central functions in regional social developments. The above outlined favourable transport connections and agricultural conditions as well as a good supply of raw materials in the middle and lower Guadalquivir area led to the rise of supra-regionally important settlement centres like Valencina in the Chalcolithic, Sevilla in Roman times and Córdoba in early Islamic times. The acculturation processes in relation to the Phoenician presence in the estuary zone of the Guadalquivir, however, had a lasting influence on the social and cultural development of southern Iberia until far inland. It becomes clear that, in line with the concept of resources as culturally shaped, it can be very helpful to think of water bodies as a 'resource' that combines material and immaterial aspects. Depending on the source base, be it part of the material culture, oral or written traditions, the key factors of resource use and the role of water bodies in the corresponding social strata can be identified. ResourceComplexes for the use of water bodies are not always easily detectable, but can often be explored and help to answer questions about the connections between the use of several resources and the networks that activate them. In the case of the Syr Darya and Guadalquivir, these networks take the form of different groups of beneficiaries of water bodies, consisting of changing constellations of economic stakeholders (such as fishermen, skippers,

⁸ From an archaeological point of view, it is interesting to note that the freshness of the shells can contribute to dating the construction of the tomb, since the dating of the shells above ¹⁴C, which marks their death, may be close to that of the tomb (Cáceres Puro et al. 2014, 443).

builders, electricity companies), political communities and religious/spiritual groups. In order to highlight the potential and limits of the understanding a ResourceComplex perspective on water bodies generates, we close by contrasting two other ways of conceptualising rivers: as ‘enviro-technical systems’ and as ‘organic machines’. Sara Pritchard traces the history of the Rhône in the 20th cent. AD by depicting the idea of the river and the associated nuclear power plants as an ‘enviro-technical system’. In this view, the river system encompasses not only ecological habitats and direct users such as fishermen or bridge users in Lyon. Understanding the river as an enviro-technical system keeps the natural and technical components of this complex in balance and includes artefacts, people and capabilities in the system (Pritchard 2011, 15 f.). This perspective is quite closely aligned to the notion of ResourceComplex, and also to the managerial approaches of Soviet energy and irrigation exchange systems. However, Pritchard proposes greater recognition to elements such as the river itself, but also technologies and non-human beings as actors independent of human purposes. Second, Richard White presents an alternative river description in his study of the Columbia River on the American Pacific coast. Here, the river is described as an ‘organic machine’, a form of energy that encounters other forms of energy, such as human labour. White criticises modernist and mechanistic visions of the river consisting of elements such as salmon breeding ponds and dams that can be arbitrarily transformed (White 1995, 112). For White, the ‘organic machine’ is embedded in living complexes that humans never fully understand: we cannot predict the alternating effects of these connections and the full effect of our plans. For Pritchard and White, a river is in fact not a unit, but an interplay of different actors such as nuclear engineers, Native Americans, the first white settlers, the salmon. To see a river this way means to recognise a purpose beyond human experiences, controls and dreams. These concepts are thus aligned with post-humanist schools of thought that seek to move away from an overly anthropocentric description of worlds and agency (Barad 2003; Haraway 2016; Kirksey/Helmreich 2010).

This riverine concept finds resonances among participants in Syr Darya sacrifice rituals invoking plentiful water, which involve more than the river, and more than human actors. In comparison, the term ResourceComplex within RESOURCE-CULTURES aims at purely human perspectives and a very targeted use of their environment. If we compare these approaches with the concept of a river as an enviro-technical system or organic machine, disadvantages also become visible: to grasp large water bodies as resources and elements of ResourceComplexes means strongly privileging human intentions and actors, and to keep in the background other action spaces, such as those of the great salmon migrations or a natural history of coastal zones. What the concepts developed by the SFB address instead, is a closer possible integration of ‘utilitarian’ and ‘constructivist’ approaches to variegated human interactions with riverine possibilities: ore, shells and transport on the Guadalquivir, electricity, irrigation and reed beds on the Naryn-Syr Darya rivers. These concepts are thus one possibility of working across the disciplinary preferences and horizons described above. Testing these against an archaeological and an ethnographic example of riparian life also clearly show up the practical limitations and disciplinary conventions moulding our work in re-envisioning human and non-human worlds.

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Laura Dierksmeier

Historical Water Scarcity on the Canary Islands, 1500–1800 AD¹

Keywords: freshwater, hydraulic resources, water scarcity, historical water management, Canary Islands

Abstract

This essay focuses on historical strategies to manage water scarcity on the Canary Islands. Volcanic islands are an ideal location to study the history of freshwater management, since a lack of clean groundwater often stimulated solutions not found on the mainland. During the early modern period, approximately 1500–1800 AD, the Canary Islands connected the main trade routes from the Spanish peninsula to the ‘New World’, serving as supply stations for food and water. Effective water management was indispensable, directly for the islanders themselves, and indirectly for the economy of the Spanish Empire and its trade partners. To maximize water supplies, infrastructure improvements (e.g. canal repairs), community controls (e.g. a water police force), as well as religious and cultural traditions (e.g. public processions praying for rain) were employed simultaneously.

Introduction

Water scarcity on the Canary Islands, as with many small volcanic islands, is a standard trait resulting from the insularity or ‘islandness’ of the

physically disconnected landmasses surrounded by saltwater. A lack of absolute or usable groundwater hinders the establishment of back-up water supplies, making freshwater management a daily concern of many island residents. This study on water scarcity is one example of SFB 1070’s work on resources as culturally embedded elements tied to and dependent upon social relations.²

After a brief introduction to the topic, this paper proceeds by first examining regulations and community struggles to manage water on the Canary Islands (Part I: Historical Water Laws and Conflicts). In particular, water laws, reforms, a water police force, and social conflicts due to water scarcity will be discussed. Next, the range of solutions considered to confront problems of water scarcity is presented, along with religious and community traditions to increase water supplies (Part II: Efforts to Mitigate Water Scarcity). This text ends with conclusions on historical island water management and reflects on current-day struggles.

Water is part of an intricate ResourceComplex, defined by SFB 1070 as a combination of objects, individuals, knowledge and practices needed to use a given resource. The ResourceComplex of water on the Canary Islands consists of several elements that affect how water is perceived, used, valued and distributed. The terminology used to describe sources of water on the Spanish islands immediately reveals their perceived social value. The main water sources were referred to as mothers of water (*madres de agua*) such as those in the Orotava Valley of Tenerife (Gómez Gómez 2000,

¹ I am indebted to Miriam Kroiher, Sandra Teuber, Marion Etzel, Uwe Müller, María Hernández-Ojeda, and A. José Farrujia de la Rosa who gave important suggestions for the improvement of this essay. I also thank Miguel Ángel Gómez Gómez and Carlos Rodríguez Morales for their kind assistance in accessing archive sources in the Canary Islands.

² For more examples, see Bartelheim et al. 2017; Hardenberg 2017; Krätschmer et al. 2017; Schön/Töpfer 2017.

148–152; Trapero/Coseriu 1999). This term denotes the life-giving function of water, the centrality of its existence, and reliance on it for sustenance and growth. In addition to water terminology, an important component is agriculture (sugarcane, viniculture) that depends on water in high quantities. Further elements shaping the Resource-Complex are trade (exports), infrastructure (cisterns and irrigation canals), oversight (water police), knowledge (of water accumulating plants and of technology for water access), as well as religious and cultural traditions (*rogativas* for water). When freshwater is studied as part of a Resource-Complex, rather than as the chemical compound H₂O or as an economic commodity alone, it becomes apparent that the use and distribution of water influenced local identities (both self-understandings and outside perceptions). The scarcity of the resource of freshwater on the Canary Islands led to specific historical developments with social and cultural dimensions outlined below.

Historical Water Laws and Conflicts

Following the Spanish conquest of the Canary Islands in the 15th cent. AD water laws at first mirrored those of Castilian Spain (*el sistema ribereño*). Based on the Castilian legal code from the 13th cent. AD, the Seven-Part Code (*las siete partidas*), water by default belonged to the public (Gómez Gómez 2000, 115–119; Guimerá Peraza 1960, 27; Fernández-Armesto 1997). In the third section of the *siete partidas*, in section 28, law three, it is written: ‘The things which communally belong to all beings that live in this world are these: the air, the waters of rain and the sea and its shores; thus any living being can use each of these things according to their need [...]’.³ Only in specific cases

3 *Siete Partidas*. Translation by the author. Original text: Partida Tercera, Título 28: De cómo gana hombre el señorío en las cosas de cualquier naturaleza que sea, Ley 3: Las cosas que comunamente pertenecen a todas las criaturas que viven en este mundo son estas: el aire y las aguas de la lluvia y el mar y su ribera, pues cualquier criatura que viva puede usar de cada una de estas cosas según le fuere menester, y por ello todo hombre se puede aprovechar del mar y de su ribera, pescando y navegando y haciendo allí todas las cosas que entendiere que a su provecho serán. (Alfonso X [13. Cent AD] 2017).

was private domain over water granted as an incentive, such as for colonisers to migrate from the peninsula (Macías Hernández 2005). Agricultural workers were also granted private access to specific amounts of water per day, according to the size of the land they worked and the type of crop they grew. A continuous and reliable water supply was necessary to incentivise farmers who otherwise would not endure the risk of crop failure (Martín Martín 2003; Cruz García 2004).

Eventually, exceptions for the private ownership of larger amounts of hydraulic resources were granted to incentivise new investors to grow sugarcane, the ‘white gold’.⁴ These exceptions were considered necessary because few other crops require more litres of water per kilo to produce. Sugarcane became the monoculture of the Canary Islands (Pérez Herrero 2006).⁵ Primary sources demonstrate that when given the chance, local islanders preferred a more diversified agricultural landscape, where they could grow their own basic food supplies without the need for imports.⁶

Foreign owners, with previous sugar production experience were Italian, Flemish, Portuguese, British, and German (specifically the German banking family of the Welsers), among others. These investors with control over the water supply enjoyed a status of their own and were known as waterlords (*señores de agua*). On Tenerife in the 16th cent. AD, control of water supplies was in the hands of predominately four people, who owned about 80% of the total supply (Macías Hernández 2005).⁷ The islands of Gran Canaria, La Palma, and Tenerife, governed by the Spanish Crown (*islas de realengo*), were more densely colonised. The islands of Gomera, Fuerteventura, Lanzarote,

4 See Archivo Histórico Provincial de Santa Cruz de Tenerife 2006.

5 Monoculture crops were typical for island colonies, examples include: Madeira, Saint Thomas and Cyprus (sugarcane), Ibiza and Naxos (salt), Chios (mastic), Elba (iron), Djerba (olive oil), some of the Cyclades (garlic and onions), and Crete, Corfu, and the Venetian islands (viniculture). Braudel 2008, 155–158; Sicking 2014, 501.

6 Louis Sicking also gives the example of Corsicans who petitioned for a closed economy against Genoese authorities to avoid a monoculture and exploitation, see Sicking 2014.

7 For Gran Canaria, see Hernández Ramos 2004. Water supplies were located for example in the Orotava Valley.



Fig. 1. Map of the governance of the Canary Islands in the Early Modern Era (Image in the Public Domain).

and El Hierro, which were initially conquered by the Norman French and remained islands under dominion of lords (*islas de señorío*) until the 19th cent. AD, had communal water ownership (fig. 1).⁸ Settlement patterns often reflected access to freshwater, as was the case with La Laguna on Tenerife (fig. 2), which had a lagoon that had been long used by indigenous Guanches to maintain their goats and sheep (Pérez Herrero 1961).⁹

Each time new water sources were found, sugar production grew, until those sources had been depleted, eventually leading to an unmet demand (Hausen 1954). Desperate residents without water access emigrated in large numbers to the Spanish Caribbean, using their expertise to run sugarcane plantations in Jamaica, the Dominican Republic, and Cuba (Hernández González 1995; Rodríguez Morales 2010; Luxán Meléndez/Viña Brito 2006). The productivity and knowledge of Canarian emigrants on American islands eventually contributed to the decline of the Canarian sugarcane industry. In the second half of the 17th



Fig. 2. The lagoon of Tenerife, based on Leonardo Torriani's 1588 map (Photo by Laura Dierksmeier).

cent. AD, the main Canarian crop changed from sugarcane to wine.¹⁰

In the meantime, entire municipalities could, and did, obtain licenses to convert their public waters into private shares that they could, in turn, sell to sugarcane or viticulture vendors for profit (Macías Hernández 2005, 183; Hernández González 1986). This occurred, for instance, in 1520 AD in the Orotava Valley, the location of the

⁸ *Islas de señorío* refers to the ownership of the islands by feudal lords who eventually sold their rights to the crown of Castile.

⁹ For a reconstruction of the lagoon on a current day map, see Gómez Gómez 2016. The indigenous toponym is *aguere*, which means lake, lagoon (Criado Hernández 2002; Farrujia de la Rosa 2014).

¹⁰ This was the case until the end of the 18th cent. AD, when water supplies and trade liberation increased under Charles III, and cotton, tobacco, and silk were replenished. Wine production required far less water than sugarcane. Especially Malvasia, a sweet dessert wine, was produced. Portuguese and Madeiran wines were the main competitors to Malvasia throughout the 17th and 18th cent. AD (Macías Hernández 2005, 190).



Fig. 3. Early Modern water piping, Tenerife (Photo by Laura Dierksmeier).

most important water source in Tenerife (Macías Hernández 2009, 736).¹¹ Contracts specified not only the transfer of ownership but also the name of the person who would be in charge of maintaining the piping; only timely repairs could prevent leakage and waste (Gómez Gómez 2016). The privatisation of public waters, while initially intended to take money from sugarcane vendors for the public, started an irreversible process, however (Macías Hernández 2005, 185). Water, once a public good became a commodity for sale.

The most dramatic change to water ownership came when Canarian law required land and water rights to be sold separately from one another. A person could thus own a plot of land without the rights to access the water below the surface. This discrepancy demonstrates the value of water access as a privilege to be purchased separately, rather than a resource that could be taken for granted. Water reforms were initiated after lawsuits denounced landowners extracting more than the approved amount of water from their landholdings.¹² Community reform initiatives failed, though, due to protests of wealthy elites with political influence (Gómez Gómez 2000, 342–349; Suárez Grimón 1987). In their stead, water commissions (*heredamientos de aguas*) with water regulations (*ordenanzas de las aguas*) were established in the 16th cent. AD. Two new positions, a water mayor (*alcalde de aguas*) and a water allocator (*adulado*)

were installed.¹³ The water mayor kept track of the total amount of available freshwater, in addition to the water quality, and waste drainage that could potentially pollute the water supply.¹⁴ The water mayor was elected by the local municipal authorities and had an enforcement ability of the police. The water allocator, on the other hand, was in charge of the distribution of water. Allocators were nominated by the insular councils and confirmed by the King. The hiring distinction for water posts demonstrates that the King felt the need personally to approve of the people with control over water. Residents with water control sustained influence over island finances and politics. A few people controlled the fate of the rest.

Due to the uneven control of water resources, conflicts abounded (Suárez Grimón 1991; Gómez Gómez 2000; Martí y Martín Fernández 1968). Of the total recorded disputes in 18th cent. AD Tenerife, approximately 20% pertained to disagreements over water, and that does not include related agricultural disputes.¹⁵ In one representative instance, a resident filed a formal complaint because construction ended after a major aqueduct was built in his region, but no satellite piping existed to distribute the water to the individual towns.¹⁶ This particular case highlights a point of general importance: The totality of the physical resource of water available for use is always more scarce than the absolute water in existence, as each water supply requires not only a source, but also a means of conveyance from the source, and a means of distribution (*fig. 3*).¹⁷ For this reason, water access has a social dimension, in this instance dependent on colonial regulations, island investors, and local decisions, for example, to build or not build satellite irrigation channels. The decisions of Spanish authorities on where to invest in

¹¹ For first-hand accounts from the 18th cent. AD about the hydraulic resources of the Orotava Valley, see Schön/Dierksmeier forthcoming.

¹² For examples, see the lawsuits in the Archivo Histórico Provincial de Santa Cruz, 1518: Her 1–23; 1558: Her 1–27.

¹³ For the list of people named as *alcaldes del agua*, see Archivo Histórico Provincial de Santa Cruz, Her 23/Her 13–1.

¹⁴ Archivo Municipal de La Laguna, Cartas diversas, C-V, 1785. Alcalde de aguas; Archivo Municipal de La Laguna, C-VIII, 1780. Abastecimiento de aguas; Archivo Municipal de La Laguna, C-VIII, 1783. Desagüe a las calles de aguas sucias.

¹⁵ Based on the extant sources in the Archivo Municipal de La Laguna.

¹⁶ Archivo Municipal de La Laguna, Fábricas públicas, F-II, 1785.

¹⁷ For historical means of water conveyance, see Pérez García 2003.

access, transport, quality control, and distribution of water always advantaged certain individuals over others. Landowners uphill, for instance, had the advantage of water access with which they could, negligently or intentionally, cut off water access to those residing below them.

Many lawsuits of the time indicate the theft of water, from simple schemes where water was carried away discreetly in buckets, to complex channel perforations to deviate water elsewhere without the owner's notice.¹⁸ Water transport is cumbersome, awkward, and water is relatively heavy to carry (Cola Benítez 2010). Especially in cases where someone transported small amounts of water illegally, one grasps the desperation associated with water scarcity. Conflicts at times dragged on over generations and conflicts sometimes led to brutal countryside murders with farm tools (Suárez Viera 2009). Desperation pushed struggling communities into local conflicts. A lack of fresh water was continuously the source of social conflict and crime.¹⁹

Efforts to Mitigate Water Scarcity

In order to protect the precious and limited hydraulic resources, communities discussed how to best preserve and revitalise the mountain areas and ravines, which yielded rich hydric resources. Pine forests in the mountains were valued for fog harvesting, as water collection occurred not only through the roots, as with most trees, but also through the pine needles (Marzol Jaén 2005; Martín Medina 2008). Pine trees were considered so crucial that a religious cult formed in their honour. The Virgin of the Pine Tree (*la Virgen del Pino*) became the patron saint of Gran Canaria. This was also the case on other Canarian Islands. Residents venerated, for example, a specific tree known as 'the Garoé tree' on the island of El Hierro. The

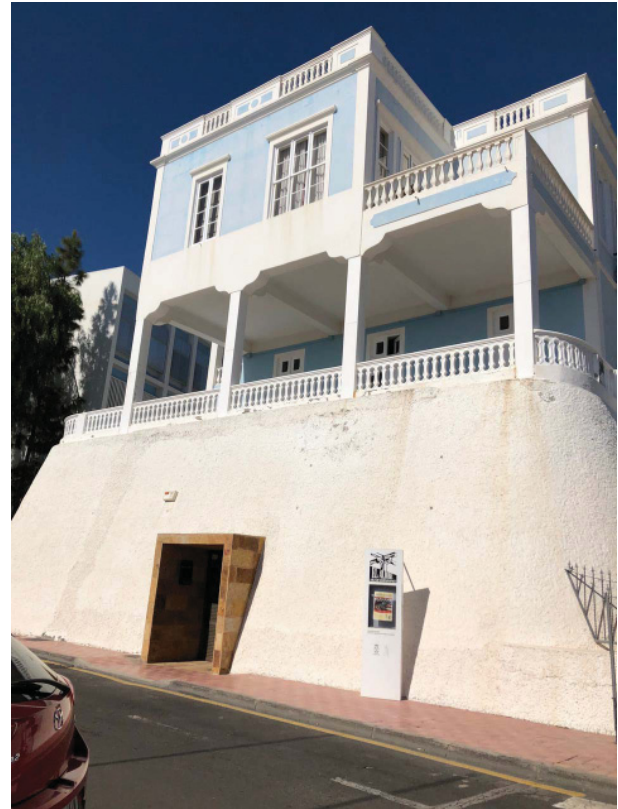


Fig. 4. Town Hall built on top of a cistern, San Miguel de Abona, Tenerife (Photograph by Laura Dirksmeier).

tree's mysterious and awe-inspiring ability to collect enough water with its leaves to supply the entire island's population prompted locals to venerate it as holy (Sánchez García 2007).²⁰

Water was also amassed from the harvesting of snow on the peak of the Teide on Tenerife, Spain's highest mountain (3,700m/12,000ft).²¹ Snow is the purest source of water because its solid state, unlike rainwater, does not contain dissolved gases, carbon dioxide, chloride, sulphate,

¹⁸ On Gran Canaria, where there was more irrigated land and thus more sugar plantations than on Tenerife, even higher levels of social tension and community conflict arose (Macías Hernández 2005, 194).

¹⁹ More examples can be found in the Archivo Histórico Provincial de Santa Cruz, Water theft through deviation of irrigation channels: Her 4/Her 2–13; Misc. water theft: Her 5/Her 3–9.

²⁰ The Garoé tree was a water resource since the indigenous period, until in 1697 a hurricane destroyed it. Still today the legacy of the tree for its harvesting of horizontal rain is commemorated with a 16km walk with information about the water history of El Hierro.

²¹ If measured from the ocean floor, the Teide is 7,500m (24,600ft) high; it is among the highest volcanos in the world from the seabed to the peak. The pit collections of snow are described in the *datas por el adelantado y el cabildo* of the Archivo Municipal de La Laguna.

nitrate, ammonia, and dust.²² In addition to snow collection, mountain ravines channelled melted snow and rainwater into cisterns, where sand was used for decontamination and to prevent evaporation. Underground cisterns provided a cool location to store water, preventing the growth of bacteria that would naturally occur in water stored aboveground in a warm climate. The importance of cisterns can be seen from the town hall building of San Miguel de Abona on Tenerife, constructed on top of a large cistern from the 17th cent. AD (fig. 4). The architecture of a local government office built on a water collection facility highlights the importance for local communities to access and control water supplies.

When technology could not prevent water stress, communities participated in *rogativas*, or public prayer processions to beseech God for water.²³ As Mariano Barriendos has demonstrated, rogation ceremonies were carried out across early modern Spain to confront various societal and environmental changes, including epidemics, torrential rain, drought, storms, and excessive cold (Barriendos 2005). On Tenerife, rogations also took place to attempt to ward off ‘the misery produced by volcanic eruptions’ (Archivo Municipal de La Laguna, 1726, A-X, 29). In addition, *rogativas* were one of few religious rituals recorded by secular authorities and submitted, with an official seal, to the Spanish monarch. At a time when commoners had no direct channel of communication to the main government, residents possibly increased their religious processions to communicate their lack of

water to the insular government (*cabildo insular*), and from there to the King of Spain.

Extent sources suggest the largest number of rogation ceremonies took place to combat droughts and floods. Especially in light of the ample conflicts over water discussed in part one, rogatives fulfilled an important social and cultural function to unify townspeople in their communal suffering. Large statues of saints and Marian representatives, such as the Virgin of Remedies (*Virgen de Remedios*) were paraded on the shoulders of the townspeople (Archivo Municipal de La Laguna, 1761, A-IX, 7). Rogation ceremonies for water scarcity were deemed by many as an effective remedy for public needs and followed by ceremonies of gratitude after it had rained (Archivo Municipal de La Laguna, A-IX, 13). Processions for rain were conducted not only in the dry season from April to September, but also during periods normally characterised by predictable rainfall, such as February; this points to evidence of unpredictable climate and environmental changes during specific years based on these church records.

Historical rogation sources also reveal that the Canary Islands suffered the flip side of drought: torrential rains that fell with such a pace and quantity that they created more destruction than relief. One archive source from Tenerife records: ‘The continuous rains have submerged many people, trees, and houses and carry away soil, for which reason many have been left in destitution. Due to this cause, the fruit grows in shorter seasons ... they cannot produce enough tonnage that is permitted to transport them to the different ports of the Americas ... such as Campeche, Havana, Caracas, Puerto Rico, Trinidad, Cumana, and S[anto] Domingo.’ (Archivo Municipal de La Laguna, 1726, A-X, 29). Both the long-term scarcity and short-term excess of fresh water supplies created hardship for daily survival and commercial viability.

Conclusion

The case of the Canary Islands demonstrates that political constellations diminished already scarce resources from local access when water moved from public to private control. A small number of

²² In general, springs, stream water, and lakes in mountainous regions are relatively unpolluted, although they can still contain dissolved salts. Upland water sources often have better quality than those below because of their lower number of inhabitants.

²³ Water stress is defined as demand for water that exceeds the amount of available water during a certain time period.

Archivo Municipal de La Laguna, *Asuntos eclesiásticos*. A-IX, 1761. *Rogativa por la sequía*; Archivo Municipal de la Laguna, *Asuntos eclesiásticos* A-IX, 1779. *Acción de gracias por haber llovido*. For more information on the *rogativas* of Tenerife, see Gómez Gómez 2000, 354–357. The first written sources about the Canary Islands refer to the existence of religious practices among the Canarian indigenous people, with the same purpose: *rogativas* for water. I am indebted to Prof. A. José Farrujia de la Rosa from the University of La Laguna in Tenerife for this point.

foreign investors, pursuing profits through monocultures, exploited colonial structures for financial gain. Colonial exploitation of local resources had both direct consequences, such as less absolute water for local use, and indirect results, including conflicts and adapted cultural customs. Communities employed creative tactics to confront diminished hydraulic resources, such as the institution of a separate water police force, the implementation of extensive water cisterns, and the harvesting of fog and snow. The use of religious and cultural traditions as an outlet of communal suffering also likely served to communicate local needs to secular authorities, who recorded the frequency of public processions. In short, access to water on the Canary Islands depended on more factors than rainfall alone. Which island residents had more water access was often a reflection of power structures. People lacking water employed a wide range of water-gathering techniques, which they supplemented with water-specific cultural and religious traditions.

Looking ahead to today, the Canary Islands continue to struggle with water management. The

islands currently desalinate more water than the entire Spanish peninsula, using moisture nets to collect droplets of precipitation (Prieto González 2003; García Padrón 1982). Recognizing the imminent problems, the Canarian Foundation for Sustainability reported: ‘water is a resource that we cannot permit ourselves to waste because with each drop we lose or contaminate, we take a step towards our own self-destruction.’ The complication of water management on volcanic islands continues to be of high relevance today, warranting future research into historical solutions.

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Isolation as a Resource for an Island Community in the Strait of Sicily

The Case of Linosa Island (Italy) in Late Antiquity

Keywords: insularity, Strait of Sicily, Linosa Island, monasticism, Late Antiquity

Abstract

Running between Sicily and Tunisia, the Strait of Sicily today is seen as a waterway that connects the eastern and the western Mediterranean basins as well as a maritime frontier that separates the African and the European coasts. The emphasis on either connecting or dividing properties of this strait is strongly influenced by cultural evaluations and recent political developments. In other periods of history, the perceptions of the Strait of Sicily were different. This can be demonstrated by focussing on settlement dynamics on the islands in the Strait of Sicily, where periods of increased connectivity with the surrounding coasts and periods of relative isolation are crucial for understanding the islands' histories. Based on archaeological and historical sources, this paper presents a case study on the colonisation and appeal of isolation for settlers of Linosa Island (Pelagic Islands/Italy) in Late Antiquity. This example is analysed before the backdrop of recent theoretical discussions about island isolation from the fields of 'Island Studies' and 'Island Archaeology'. The aim is to show how isolation can be understood as an intangible resource for an island community to explain settlement dynamics in the broader context of Central Mediterranean history.

Introduction

Running between Sicily and Tunisia, the Strait of Sicily today is seen as a waterway that connects the eastern and the western Mediterranean basins as well as a maritime frontier that separates the African and the European coasts. The emphasis on connecting or dividing properties are strongly influenced by cultural evaluations and recent political developments. Thinking about the Strait of Sicily today, one might consider it as one of the most important waterways in the Mediterranean with hundreds of container-vessels passing the Strait every month. We might also reflect on it as a focal point for recent migration processes, more and more prevented by an iron curtain of European naval vessels, or we might think of a beautiful region for summer vacation on a nice little holiday boat. In other periods of history, the perceptions of the Strait of Sicily were likely different. This can be demonstrated by focussing on settlement dynamics on the islands in the Strait of Sicily, where periods of increased connectivity with the surrounding coasts and periods of relative isolation are crucial for understanding the islands' histories. Based on archaeological and historical sources, this paper presents a case study on colonisation processes of the insular landscape of Linosa Island (Pelagic Islands, Italy) in Antiquity. For the life on this island – as everywhere else – the availability of fresh water as a tangible resource is of crucial



Fig. 1. The Strait of Sicily and its islands.

importance.¹ This contribution argues that beyond the availability of fresh water, in Late Antiquity the geographical status of Linosa as an island, as a land mass surrounded by water, became an intangible resource in its own right that enabled the life of a particular community. With this view on the water, the analytical framework of water as a resource can be broadened. For this purpose, recent theoretical discussions in the academic fields of ‘Island Studies’ and ‘Island Archaeology’ will be considered for their perception of islands. The aim is to show, how isolation – defined here as one major aspect of **insularity** – can be seen as an essential resource for an island community in order to understand settlement dynamics in context of the wider Central Mediterranean history.

The Sicilian Narrows: Physical Description

The Strait of Sicily is the waterway between the southern shore of Sicily and the eastern shore of present-day Tunisia, that divides the eastern and

¹ For the water supply on Linosa Island in comparison to the neighbouring Island of Pantelleria see Schön 2014.

the western basins of the Mediterranean or on a more regional scale: the Tyrrhenian Sea in the North, the Sea of Sardinia in the West, the Libyan Sea in the South and the Ionian or Adriatic Sea in the East. Between the Tunisian Cap Bon and the Western tip of Sicily the Strait is around 145km wide; the maximum depth is 316m.² The surface currents flow from west to east.³

Several islands or archipelagos can be used to give the Strait of Sicily a more detailed geographical structure (fig. 1): the southern coast of Sicily is the northern limit of the Strait; in the north-western part there is the island of Pantelleria in the middle of the Strait, half way between Sicily and Cap Bon. Together with Zembra and Zembretta, north of Cape Bon and the Aegadian Islands west of Sicily, these islands constitute the western rim of the Strait – one might add here also the Rocks of the Skerki Banks, a reef system north-west of the Sicilian Narrows (McCann/Oleson 2004),⁴ – in the south-eastern part the loose belt of the Kerkennah Islands, the Pelagic Islands and the Maltese Islands is narrowing the Strait. The southern or south-western limit is defined by the Tunisian shore and its offshore islands of Djerba, the Kneiss archipelago, the Kerkennah Islands, the Galite Islands and the Kuriat Islands. Using the main islands as geographical markers, the Strait can further be divided into three channels: The Malta Channel north of Malta (north of a line between Malta and Pantelleria), the Sicily Channel (between Pantelleria and Sicily) and the Pantelleria Channel (between Pantelleria and Cape Bon) (Arnaud 2008, 22–24).

Perception of the Sicilian Narrows

The modern perception of the Strait of Sicily is strongly shaped by current geographic knowledge and cartographic visualisation techniques,

² For sea-level change in the (Central) Mediterranean see Lambeck et al. 2004; Lambeck/Purcell 2005; Lambeck et al. 2011; for Malta see Furlani et al. 2013; for the coasts of North Africa see Anzidei et al. 2011; for south-eastern Sicily see Scicchitano et al. 2008.

³ For the regime of currents see Gasparini et al. 2004.

⁴ For a discussion on the identification of the Skerki Bank with the Altars of Neptune see Giusti 2014.



Fig. 2. Perceptions of the Sicilian Narrows. Left: Map-based upon Ptolemaios' work Giovanni Antonio Magini (Venedig 1597); right: Map-based upon nautical charts Abraham Ortelius (Antwerpen 1574).

like satellite imaging. Pre-modern perceptions of this region varied remarkably (see Arnaud 2008). The modern perception of the Sicilian Narrows as a connecting zone between the eastern and the western Mediterranean, for example, is very different from the perception of ancient Greek and Roman geography. For Greek geographers, the Strait of Messina between Sicily and the Italian mainland was much more important to connect the Mediterranean East with the West (see Vallet 1988). Eratosthenes in the 3rd cent. BC, for instance, thought about an 'equator', a straight line from Rhodes to Cape Matapan (the southernmost point of mainland Greece on the Southern Peloponnese), the straits of Messina, cape Caralis (Cagliari), the columns of Herakles (Gibraltar) and Gades (Cádiz). The condition for such an organisation of the Mediterranean was the completely wrong orientation of the coasts of Sicily. The same mis-orientation is found also in the work of Ptolemy in the 2nd cent. AD and it was common to ancient as well as medieval geography and was only corrected when in late-medieval and early modern period nautical charts, based on empirical knowledge, came into use (fig. 2) (Arnaud 2014, 55).⁵ In terms of isolation or connectivity of the communities living on the islands in the Strait this could mean that in Antiquity the Strait of Sicily compared to the Strait of Messina was much less central than one would

expect with a view on a modern map. Of course, it is difficult to compare this more theoretical geographical knowledge with empirical knowledge of ancient seafarers in this region. However, one should expect that this perception of the Strait of Sicily also influenced the perception of the islands in the Strait in a way that they were thought to be much more isolated.

Insularity, Islandness and Isolation

The relative isolation influenced by the perception of this region is an important property for the degree of the **insularity** of the islands in the Strait. Here, **insularity** as a term is used not only as a geographical definition to describe that a piece of land is surrounded by water, but it is also used to specify social and cultural dynamics connected with or attributed to islands. To frame the archaeological case study of the Late Roman colonisation of Linosa Island, it seems necessary to consider the theoretical discussion of how islands are conceptualised. As units of research, especially small islands seem to have a high potential to study social and cultural dynamics like colonisation processes, because islands are clearly separated by their shores from the surrounding world. At the same time, they seem to be 'special' because their 'geographical precision' facilitates a (unique) sense of place' (Baldacchino 2005, 35). As the Geographer, P. Hay pointed out: '(...) islands – real islands, real geographical entities – attract affection, loyalty, identification. And what do you get

⁵ See the edition of Stückelberger/Graßhoff 2006 for Ptolemaios. For Early Modern charts of the Strait see Gambin 2008.

when you take a bounded geographical entity and add an investment of human attachment, loyalty and meaning? You get the phenomenon known as ‘place’. Islands are places – special places, paradigmatic places, topographies of meaning in which the qualities that construct place are dramatically distilled’ (Hay 2006, 31). If this is correct, islands can be seen as precisely defined, bounded places with certain – maybe distinct – meanings, qualities and properties.

The meanings, qualities and properties of islands one might call **insularity** or **islandness**. At this point, the terminology needs clarification because the terms are controversial and strongly influenced by connotations in different academic languages and disciplinary traditions.⁶ The Maltese Social Anthropologist G. Baldacchino, one of the leading scholars in the field of ‘Island Studies’, prefers the term **islandness**, a neologism, ‘a word that is preferred to the more commonly used term of insularity. The latter has unwittingly come along with a semantic baggage of separation and backwardness. This negativism does not mete out fair justice to the subject matter’ (Baldacchino 2004, 272). In contrast, the term **islandness** is an intervening variable that does not determine, but contours and conditions physical and social events in distinct, and distinctly relevant, ways’ (Baldacchino 2004, 278).⁷ This negativism is strongly connected to the history of the term **insularity** in the English language. As O. Ronström pointed out, around the middle of the 18th cent. ‘island became a metaphor for isolation and alienation’, in this sense insularity started to mean ‘narrow’ or ‘prejudiced’ (Ronström 2009, 168; see also Gillis 2004, 112). One reason for this development might have been changed perspectives on islands as a result of the ‘continental turn’ in European history in this period, ‘when Atlantic islands moved from central to remote and peripheral and became ‘islanded’ in the modern sense’ (Ronström 2009, 170). This continental turn led to a shortened definition of

insularity as isolation, while **islandness** is seen as ‘separation from the rest of the world and thus describing ‘a space that is not part of space, a place that is not part of time, a naked place, an absolute place’ (Bonnemaison 1990, transl. Tagliolini 2011, 47). This ‘absolute place’, then is connected to a specific identity, in which, according to the Australian Geographer E. Stratford, ‘islandness is a complex expression of identity that attaches to places smaller than continents and surrounded entirely by water’ (Stratford 2008, 160). Stratford’s definition of **islandness** is very similar to that one of **insularity** given by the German Cultural Anthropologist I.-M. Greverus, who is focussing the term as well on a certain identity connected to islands: ‘Grenzraum Insel. [...] Inseln haben ihre von den kontinentalen Machtzentren abhängige spezifische Geschichte, aber sie haben auch Vergleichbares, das zu jenem Fokus Grenzraum Insel führt, in dem Insularität als Fremdbild und Selbstbild des ‚Lebens auf Inseln‘ und der Mentalität der Inselbewohner gesehen wird. Es bleibt das Andere, das Besondere, das sie vom Festland unterscheidet’ (Greverus 2009, 484).

Also in the influential work of the French Historian F. Braudel **insularity** is closely connected to the aspect of isolation, but here the term is defined much more openly: ‘That the sea surrounds the islands and cuts them off from the rest of the world more effectively than any other environment is certainly true whenever they are really situated outside the normal sea routes. But when they are integrated into shipping routes, and for one reason or another (often external and quite gratuitous reasons) become one of the links in a chain, they are on the contrary actively involved in the dealings of the outside world, less cut off from them than some inaccessible mountain areas [...] ‘Isolation’ is a relative phenomenon [...] simultaneously with this isolation and in striking contrast, some accidental change of ruler or of fortune may bring to the island’s shores an entirely different civilization and way of life’ (Braudel 1995, 150).

For the German Philologist A. E. Wilkens **insularity** is the entirety of all cultural island perceptions, bringing together clichés like islands are manageable, controllable, distinct places, bounded, isolated and therefore timeless. She suggests differentiating between studying islands

⁶ For the terminology see also von Bendemann et al. 2016, 7–41.

⁷ In a similar way the terms islandness and insularity are used e.g. by Fitzpatrick 2007 or Grydehøj 2017. On islandness see also Foley 2018, 219, who pointed out, that a single and coherent definition of this term is elusive.

and insularity. If the term insularity is similar to isolation or phenomena of isolation, geographical islands are not necessarily insular. On the other hand, insularity could be seen as a property of the islandness (*Insel-Sein*) of an island, following out of this status and not possible on a different kind of place or a non-island (Wilkins 2011, 62; see also Ronström 2013).

In archaeology, the term insularity is used mostly without these negative connotations as ‘the state or condition of being an island’ (Kouremenos 2018, 1). In this way, **insularity** and **islandness** are used often synonymously (e.g. Frieman 2008).⁸ A cultural dimension of **insularity** is emphasised by C. Broodbank, who pointed out: ‘the most apparent straightforward categories of insularity are fuzzy’ and ‘insularity is culturally constructed, open to multiple meanings in a given context, historically contingent, and therefore liable to change’ (Broodbank 2000, 17 f.).⁹ More specific and again with a focus on isolation, **insularity** was defined by A. B. Knapp as ‘the quality of being isolated as a result of being on islands, of being somewhat detached in outlook and experience. Insularity can result from personal, historical or social contingency’ and insularity ‘is contingent in both space and time, and thus may be adopted or adapted as individuals or wider social concerns dictate’ (Knapp 2008, 18).

For studying islands history and archaeology, the insight that **insularity** – as well as islandness – is culturally constructed and historically contingent is striking, because it allows one to identify and to compare specific dynamics related to these particular geographical units.¹⁰ To bring the discussion back to the Strait of Sicily and its islands, these island dynamics can be grouped according to the methodological approach of SFB 1070 RESOURCECULTURES into three main topics: DEVELOPMENTS, MOVEMENTS and EVALUATIONS (Bartelheim et al. 2015; 2016).

The islands in the Strait of Sicily had very different roles or functions in the last millennia and were studied by different scientific disciplines under very different foci.

Islands are seen as:

- places with distinct developments,
- places to study ‘isolated’ cultural development (e.g. Malta in the Neolithic: Rainbird 2007, 68–89; Bonanno 2008; Cultraro 2008; Sagona 2015),
- places of cultural persistence (e.g. Punic Malta during the Roman Empire: Zammit 2011; see also Roppa 2018 for Sardinia),
- places with a particular role in processes of movement,
- stepping stones for colonisation or migration processes (e.g. between Sicily and North Africa in Prehistory: Dawson 2014, 107, or for the Phoenician expansion into the western Mediterranean: Arnaud 2008; de Simone 2008, 37–50),
- landmarks or navigational waypoints for seafaring (e.g. Sicking 2014, 497 f.),
- provisions of shelter to passing vessels,
- bases for piracy (e.g. Malta and Djerba in Early Modern Period; for Malta see Aloisio 2003; more general Atauz 2004),
- exile places¹¹ (e.g. Linosa as an exile for reputed Mafia leaders in the 1970s, see Taylor 1971, 3; Lupo 2009, 255),
- strategical outposts (e.g. Pantelleria and Malta during the Punic Wars or during the 2nd World War: Arnaud 2008; for Pantelleria see Schäfer 2015, 87–102; Abelli 2012, for Malta see Bonanno 2011),
- objects of certain evaluations,
- places of liminality or in-betweenness (e.g. a Christian/Muslim shrine on Lampedusa, 16th cent.: Albera 2012, 16; Mercieca/Muscat 2013),
- places of desire (e.g. Lampedusa in Ariosto’s ‘Orlando Furioso’ or the nameless Island in Shakespeare’s ‘The Tempest’)¹²,

⁸ See also Lätsch 2005, 25–28, where the German terms *Insularität* and *Insellage* are used synonymously.

⁹ See also Copat et al. 2010 for the Central Mediterranean Islands in Prehistory.

¹⁰ For ‘Island Archaeology’ see Dawson 2019 with an overview.

¹¹ For islands as places of abandonment and exile in antiquity in general see Maniotti 2017.

¹² For the role of islands in literature see Billig 2010; Stephanides/Bassnett 2008; For the role of islands in contemporary literature see Dautel/Schödel 2017.



Fig. 3. Linosa Island, cave dwellings (Photos by F. Schön).

- social laboratories for studying migration and tourism (e.g. recent Lampedusa: Orsini 2015, 521–536; Melotti et al. 2017),
 - places with a distinct ‘insular’ identity (e.g. Knapp 2007; Dawson 2010; Kouremenos 2018).
- For all of these functions and meanings islands are thought to be something particular, different from

terrestrial environments; for all of these functions the body of water around the island is more or less constitutive, for some of the aspects of **insularity** can be defined as a resource in the sense of SFB 1070 RESOURCECULTURES, as a medium by which actors create, sustain or alter social relations, units or identities (Bartelheim et al. 2015; 2016).

Case Study: Linosa Island

To discuss the possible resource value of isolation or remoteness due to the surrounding sea, as one aspect of **insularity**, a brief case study should be considered as an example for insular settlement processes on the tiny Island of Linosa (province of Agrigento, Sicily/Italy), one of the Pelagic Islands in the middle of the Sicilian Narrows, 163km south of Sicily and 165km east of Cape Mahdia in Tunisia (fig. 1). In modern times, the 5.4km² small island was colonised by the Kingdom of the Two Sicilies during the mid-19th cent. AD. This colonisation is well documented in contemporary written sources (Sanvisente 1849); among other things it is described that the settlers discovered more than 150 ancient cisterns and reconstructed them for the colonies’ water supply.¹³ Due to the archival sources for the modern colonisation of Linosa Island, Tübingen University conducted an archaeological field survey, to study the ancient colonisation and

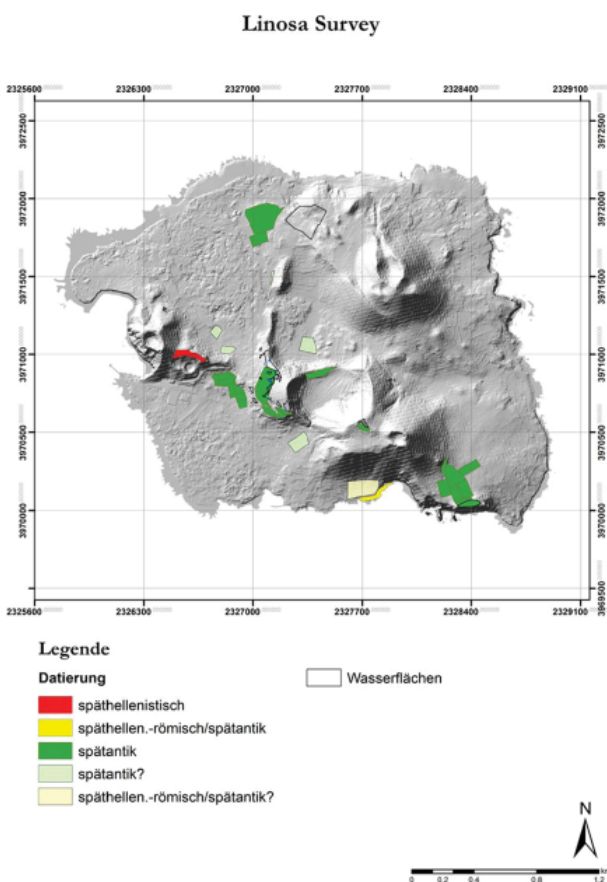


Fig. 4. Tübingen Linosa Island Survey, the spatial distribution of the chronological diagnostic pottery.

¹³ For a report of the Tübingen Linosa Island Survey with an emphasis on the ancient water supply system see Schön 2014.

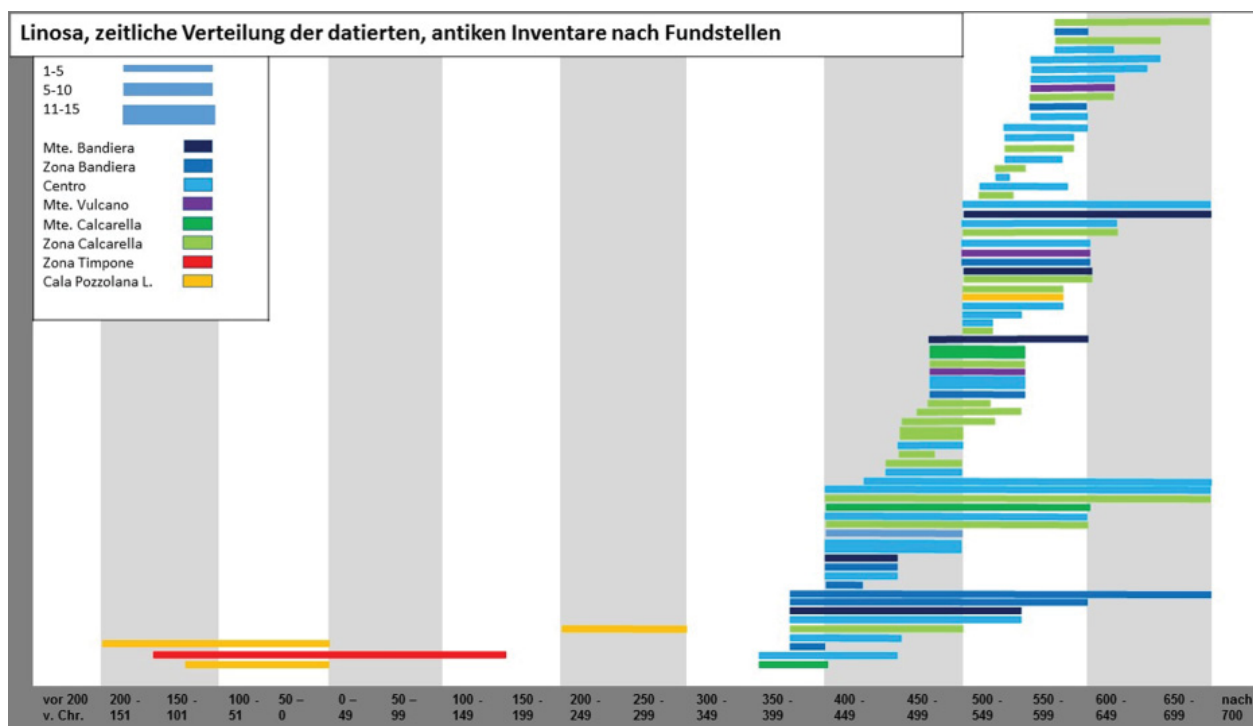


Fig. 5. Tübingen Linosa Island Survey, chronological distribution of the archaeological sites.

to bring the island back on the map of the ancient Mediterranean.¹⁴

Surveying Linosa Island

The field survey was concentrated on four areas of the island where ancient water cisterns, used as markers for ancient settlement activity, were clustered. The survey covered 10% of the island's total surface. In total around 17,000 artefacts, mainly potsherds were collected.

During the survey, nearly no architectural remains were found, just several caves exactly in the parts of the island, where also the ancient cisterns are placed and where most of the ancient archaeological material was found. These caves already existed, when the island was re-settled in the 19th cent. AD. They were cleaned and restructured by the first generations of the Italian colonisers, thus during the fieldwork, no traces of ancient use could be asserted (fig. 3). Still, these caves are found in an architectural ensemble together

with the ancient cisterns, and thus one should assume, that these caves were used in Antiquity as dwellings.

Concerning the chronology of pre-modern settlement periods, the results are quite explicit: no material neither from prehistoric periods, nor the early Iron Age, nor the Archaic or Classical Periods was found.¹⁵ Less than 5% of the diagnostic pottery is belonging to the Hellenistic and the Early or Middle Roman Imperial periods. But more than 95% of all diagnostic pottery dates to Late Antiquity into the period of the 5th to the 6th cent. AD (fig. 4–5). Because of this clear chronological distribution of the material, it seems quite plausible that Linosa Island was the arena for a process of settlement formation in Late Antiquity.

¹⁴ The monographic publication off the results of the Tübingen Linosa Island Survey is planned for 2020.

¹⁵ Bronze Age pottery of the 1st half of the 2nd mill. BC from Linosa Island, excavated in 1993, is presented in the Museo Archeologico delle Pelagie on Lampedusa Island, see Polito 2016, 13–15.

Isolation as a Resource: Colonising Linosa Island in Late Antiquity

In the following paragraphs, the question will be investigated briefly of what kind of settlement could have existed on Linosa Island in Late Antiquity. Since hardly any precise information about the type of settlement can be obtained from the archaeological survey materials themselves, the proposed interpretation of them as relicts of a monastic or hermitic settlement must be based, above all, on two aspects. First, one has to consider the simple geographical fact that the settlement was on an island. Second, the written sources, which do not mention Linosa Island itself, nevertheless offer a cultural-historical context in which the archaeological evidence on Linosa Island can be properly contextualised.

To interpret the archaeological evidence for this Late Antique settlement process, more or less contemporary written sources can be used. In the corpus of early Christian writings (*Corpus Scriptorum Ecclesiasticorum Latinorum* = CSEL), in particular in early monastic sources from the 4th to 6th cent. AD, islands and narratives about **insularity** play a distinct role.¹⁶ Ever since the beginnings of monasticism in the eastern Mediterranean, a secluded and ascetic life had been described as a means of approaching God (see Reiser 2009, 273–302). On the small islands of the central and western Mediterranean, early monks seem to have found the same ideal conditions of isolation and seclusion from the world that the desert offered in the east. Martin of Tours temporarily withdrew to the island of Gallinaria off the Ligurian coast

around 360 AD.¹⁷ Jerome reports that his friend Bonosus, after abandoning his family, settled down on an island surrounded by the roaring sea with a reputation for wrecking ships on its rocks. Its sharp cliffs, naked rock faces, and an atmosphere of loneliness attracted Bonosus, who felt like a new coloniser of paradise (ep. 3, 4, 2 [CSEL 54, 15]). In his *Hexaemeron* (a writing on God's six days of work), Ambrose of Milan praises the goodness and wisdom of God, in which on the third day the sea was created with its majestic beauty and manifold benefits for the health and welfare of mankind (hex. 3, 5, 21–24 [CSEL 32, 1, 74, 15/5, 1]). The sea also offered safe harbour against the ravages of war and provided a firm boundary against the barbarian excesses:

‘Why need I enumerate the islands, which often adorn the sea with their jewelled necklaces? Men who hide themselves there seek to escape from the world with all its inducements to intemperate living with a firm purpose to live in continence and thereby avoid the dubious conflicts of this life. The sea, then, is a hiding-place for the temperate, and abode for those who wish to practice continency, a refuge for those in distress, a haven for the secure, a place of tranquillity for the unworldly and a place in this world for the prudent and moderate. Moreover, it provides an incentive to devout living for the faithful, so that they may rival the gentle sound of lapping waters with the songs of the psalms. Thus, the islands voice their approval with their tranquil chorus of blessed waters and with the singing of pious hymns resound’ (hex. 3, 5, 23; transl. J. J. Savage 1961).

Jerome testifies to the presence of *monachorum chori* on the Tyrrhenian islands (ep. 77, 6, 5 [CSEL 55, 44]) and at the beginning of the 5th cent. AD, Rutilius Claudius Namantianus and Augustine report that the islands of Capraia and

¹⁶ See Prontera (1998, 312–328) with a compilation of the written sources and relevant literature. For Christian insular ascetism on several islands of Northern Italy, Gallia and Dalmatia see Dessi/Lauwers 2009 and Brogiolo/Ibsen 2011, 212 f. For historical or archaeological proved Island Monasteries in the Tyrrhenian sea see Mazzei/Severni 2000. This phenomenon is well known also in Northern Europe, see e.g. Picard 2009 for the Irish Islands. For early Monasticism in the West see Dey/Fentress 2011. For the early medieval phenomenon of Island Monasteries see now also Signori 2019.

¹⁷ Sulpicius Severus, *Vita Martini* 6, 5 [SC 133, 266]: ‘cedendum itaque tempori arbitratus ad insulam, cui Gallinaria nomen est, secessit comite quodam presbytero, magnarum virtutum viro.’ (‘Thinking, therefore, that it was necessary to yield to circumstances, he withdrew to the island Gallinaria, with a certain presbyter as his companion, a man of distinguished excellences.’ Transl. Roberts 1991).

Gorgona in the Tuscan Archipelago were inhabited by hermits and monks (Rutil. Nam. 1, 440/52. 512/26; August. ep. 48, 4 [CSEL 34, 140]). Monastic settlements from the Byzantine period have been attested on the islands of Pantelleria (Maurici 2005, 233–245; Sami 2010, 92 f.) and Lipari, and are also likely to have existed on Favignana and Marettimo (fig. 6). All of these settlements are thought to have their origins in Late Antiquity.¹⁸ In accordance with the ascetic models of Eastern monasticism, both the islands and the desert were able to guarantee the security and solitude that enabled the attainment of spiritual fulfilment (Hieronimus, Vita Hilarius. 23, 7 [124 Bastiansen²]). The hermit and later bishop of Ruspe, Fulgentius, in the late 5th or early 6th cent. AD founded a monastic community probably on the island of Dzirat el Laboua in the Kneiss Archipelago off the coast of Tunisia in the Lesser Syrtis (Ferrandus, Vita Fulgentii 12; Troussset et al. 1992; Troussset 2008; Dossey 2011, 151). Later he spent the last years of his life in a monastic community on the Kerkennah Islands located on top of ‘the narrow cliff of Chilmi’ (Ferrandus, Vita Fulgentii 28).

However, the early island monasticism was not uncontroversial within the church, as a letter of warning from Augustine addressed to Abbot Eudoxius as head of the monastic community on the island of Capraia shows. Accordingly, there is a great contrast between Augustine’s life, which was full of enormous turmoil, upheavals and unrest, and the quiet contemplation of the islanders (August. ep. 48 [81], see 1894, 26 with note 60). What seemed to Augustine to be insular isolation was for the pagan poet Claudius Rutilius Namatianus evidence of the monks’ pure mistrust: ‘From the high sea emerges (the island of) Capraris, where a race that fears the light of day spreads darkness. They call themselves monks with educated Greek words, because they, shying away from contact with others, choose to lead lonely lives’ (De reditu suo, 439–442, see Arnold 1894, 26 f. with note 61).

Another facet of late antique hermeticism or monasticism on the islands of the central and



Fig. 6. Monastic or hermitic settlements in the Strait of Sicily, 5th–6th cent. AD.

western Mediterranean arose in the course of the religious conflicts between Arian and Catholic Christians. The biographer of the North African bishop Fulgentius, Ferrandus, mentions that Bishop Rufinianus Victorianensis had found a place of exile on ‘a small island in the vicinity of Sicily’ (Ferrandus, Vita Fulgentii 9). Certainly, Ambrose had in mind this context when he mentioned that the sea played the ‘function’ of checking the outrages of the barbarians. After the conquest of North Africa by Arian Vandals starting in 429 AD and in particular during the second half of the 5th cent. AD, local Catholic clergy suffered from massive repressions. This led North African clergymen to flee and seek exile on the islands of the central Mediterranean (see Moderán 2009). According to Isidor of Seville’s account, ‘... fuelled by his Arian faith, he (Hunerich) persecuted Catholics throughout Africa with more zeal than his father (Geiserich), closed their churches, and banished all priests and clerics. He punished about 4,000 monks and laymen with the harshest terms of exile.’ (Isid., Hist. Vand. 78). Although the numbers mentioned in the written sources are undoubtedly exaggerated, recent research has shown that flight and exile were motives for the foundation

¹⁸ Maurici 2008, 79 f.; 2005, 233–245; Sami 2010, 92 f. (for Pantelleria). For the monastic settlements on Marettimo Island see Ardizzone et al. 2013; Ardizzone/di Liberto 2010; Ardizzone et al. 1998.

of monastic settlements. According to a historical account passed down through hagiography, Mamilianus, bishop of Palermo, was banished by the Arian Vandals together with some followers after the conquest of Sicily and he founded a hermitage, which later became a monastery, on the island of Montis Jovis (today: Montecristo) (Susi 2000; Brogiolo/Ibsen 2011, 214). The foundation of a hermitage on the island of Gozo in the Strait of Sicily is documented by followers of Augustine who had fled (Buhagiar 1997, 120 f.). The desire to seek refuge from the world and the need to flee from the Arians in Gaul led Catholic Christians to found the most famous and powerful of the island monasteries on one of the Lérins Islands located off the coast of the Provence near Cannes, in the 5th cent. AD (Dessi/Lauwers 2009, 231–279; Kasper 1991, 146–152; Prontera 1998, 326 f.).

Linosa Island, whose small size but large distance to the next land, whose dearth of raw materials, and lack of a natural harbour would have made the island an unfavourable place *par excellence* from the point of view of seafaring societies during many periods of history, but in this cultural environment it suddenly became a favoured place. In the monastic discourse of Late Antiquity, isolation became a resource to be strived for, since

it was a means of achieving spiritual perfection. In this scenario, a possible monastic or hermitic colonisation of Linosa Island could have been triggered by religious conflicts between Arians and Catholics in North Africa. At the very least, one must concede that the colonisation of the island in Late Antiquity corresponds to the Vandal period in North Africa. Linosa Island became a place that offered more than just land and refuge: Linosa Island had (following the words of Ambrose) the potential to become a chosen place to retreat from the world for those who wished to live in asceticism.

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Aqua Viva and the Monk in the Pond

Multi-Dimensional Water Use in Medieval Monasteries

Keywords: Middle Ages, monastery, water management system, ritual, identity, landscape

Abstract

For medieval monasteries, water was of great importance on different levels and was used in multi-dimensional ways. To speak in terms of our SFB, it served both as a tangible and intangible resource. On the one hand, water had an important meaning regarding salvation and was implemented in many different rituals in liturgy, which resulted in distinct building features that may be identified as material remains of rituals, still preserved in many monasteries. On the other hand, monasteries developed extremely efficient waterworks with ponds and streams improving their economy and influencing both the cloister and the wider surroundings of the monasteries. The remains of these waterworks represent social and economic structures in a spatial dimension and often are still preserved in modern landscape.

Since ancient monasteries and their surviving waterworks are visible landmarks, it should be considered that they might be seen as still used resources for the creation of a cultural landscape and a special identity.

Introduction

For medieval monasteries water was of great importance on different levels and was used in multi-dimensional ways. To speak in terms of our SFB 1070 RESOURCECULTURES, it served both as a

tangible and intangible resource (Bartelheim et al. 2015). This article wants to analyse the resource term in the context of medieval monasteries in Germany. The main point is to show how a special resource – water – was used to establish monastic life and social relations, to look at changes during the Middle Ages and differences between monasteries. What are the reasons of these differences and how are the material remains reflecting the dynamics of these processes.

In all medieval monasteries, water played a major role and was perceived in different meanings. On the one hand, water had an important meaning regarding salvation and was implemented in many liturgical rituals. In these rituals, there is a strong connection between tangible and intangible resources. The intangible meaning of water resulted in materialised details in the buildings, which are still preserved in many monasteries. Even intangible things like feelings and beliefs turn to a material expression when they are written down, are displayed in paintings or can be seen in tangible remains, which are necessary to perform rituals.

On the other hand, water was of high importance for the economic system of a monastery, especially if they wanted to be economically independent as for example the Cistercians or the Benedictines. Many monasteries of these orders developed extremely efficient water management systems with ponds and streams improving their economy and influencing both the cloister and the wider surroundings of the monasteries. The remains of these water management systems represent social and economic structures in a spatial dimension and are often still preserved in our modern landscape.



Fig. 1. Maulbronn. The monastery and some of the fishponds and its surroundings (Landesarchiv Baden-Württemberg, Abt. Hauptstaatsarchiv Stuttgart N 1 Nr. 65 Bild 2/Johann Spaeth, <<http://www.landesarchiv-bw.de/plink/?f=1-548016-2>>).

Although both kinds of water use – the spiritual and the economical – were part of the monastic life there is a big difference in their historical and current perception. While the spiritual use is well known and there has been much research on that, there has been – at least in Germany – less interest in the water management systems of monasteries in their surroundings. One reason is inherent in the available sources: buildings are often much better preserved than other structures, especially landmarks. Furthermore, there are many written sources preserved, which tell us about life and traditions inside a monastic community but do not go into detail about structures outside the monastery. To explore these structures with archaeological or geophysical methods is often difficult but our possibilities improve currently with new techniques. This is one reason why during a long period the focus was on the monastic building itself as well as on the rituals, traditions and social interactions of

people living there. On the other hand, there was research on the economic system of monasteries that looked especially on buildings, which were necessary for a self-sustaining monastic economy such as mills, bakeries and breweries and on rights. Remains in the landscape in a longer distance to the monastery were often not included in these studies. Combining these two main fields of research is only just starting in many areas. Therefore, it is important to see monasteries as a huge complex with an important influence on the nearer and wider neighbourhood. Thus, the idea of a ResourceComplex as proposed by SFB 1070 is a good way to analyse this structure. Looking on water as one element and resource in that system helps to understand the different dimensions a monastic society was dealing with. These complex systems can be analysed in a spatial, as well as in a diachronic perspective, which gives us insight into cultural dynamics in a social context.

Furthermore, the concept of Resource-Complexes allows to compare the use and function not only between single monasteries in different landscapes and societies, but also to compare the structure of monastic orders. In a historical perspective, it is important to ask how the different perceptions of water influenced social processes in medieval monasteries. It has to be focused on how water has been used to establish, preserve and change medieval monastic societies within the community itself and the world outside. But we have to go further. As monasteries are very well known objects in our landscape even today, we have to look on the consequences the multi-dimensional water use has for the modern use and identification within monasteries themselves, and how the monastic remains like basins, channels or ponds as a modern resource are creating a special identity within the old buildings or the cultural landscape.

Founding a Monastery

Even at the planning process of a monastery, water played a very important role. Because it had a high value in liturgy, everyday life and economy, it was important to make certain that these needs were guaranteed. This was very difficult indeed, as is shown in the fact that there are numerous examples of monasteries, which were founded and then relocated because the first location was not appropriate, for example because water supply was not guaranteed (Schich 1999). One example is the UNESCO-heritage monastery of Maulbronn that was first founded in 1138 AD. The difficulty of maintaining a steady supply of water is seen as a possible reason for the relocation of the monastery to a place in approximately 8km distance in 1147 AD (for the history of its foundation see Eberl 1999).¹ The new monastery, then called Maulbronn, was established and developed really well – one important basic element for this was a highly advanced water management system (*fig. 1*). The monastery

had up to 20 ponds and in its surroundings a system of channels with a length of more than 100km (Seidenspinner 1997). Not all of these structures were built and used at the same time but they are reflecting the importance of steady water supply for a monastery. That importance can also be seen in the fact that not only the well-preserved monastic building is part of the heritage but also the waterworks around it. During the last years, the waterworks were studied intensively and are of great importance for the status as UNESCO-heritage (Gillich 2018).

The importance of water for the founding of a monastery can be illustrated for the monastery of Zwiefalten. The monastery was also planned to be built at a different site than it eventually was. The chronical sources of Zwiefalten, written only 40 years after the founding in 1089 AD, refer to the difficult search for the right location and names the important factors: ‘...it is important to have healthy air, the convenience of fluid water and fertile soil. There are many trees [...] and stones to build houses ...’² (Wallach et al. 1978, 16). Here it is made clear that the people in medieval times were quite aware of the importance of certain elements and raw materials that we are discussing today. Water, soil, wood and stones were elements, which helped to establish and preserve the monastery – and thereby became vital resources. The written sources tell us even more: as early as the 11th cent. AD these elements were not only seen as building materials but also valued highly for spiritual life. In order to guarantee a monastic life according to the normative rules it was absolutely necessary to build the monastery according to a specific architectural plan, specific spatial dimensions and with an infrastructure which allowed the monastery to function independently. So, there was a very deep connection between material and spiritual ways of life – the elements were clearly

¹ The first record of 1148 says that many things which are necessary for a monastery were missing at that place: ‘Sed cum multa, quae claustrali dispositioni sunt necessaria, illinc deficere perpenderet ...’ (WUB II, 327.43).

² ‘...salubris est aere, iocundus flumine, fecundus tellure, arboribus nemorosus ac pratorum vernantia gratiosus; praeterea lapideis montibus circumsaepus: si quaelibet aedificia construere velis, etiam saxorum copiam illic habebis.’



Fig. 2. Bebenhausen. Basins in the northern part of the cloister which were used for the mandatum (Photo by Christina Vossler-Wolf).

also incorporated into the spiritual way of life and became a resource.³

Sometimes, water might pose a problem because there was too much of it. At the abbey of Altenberg the monastery was relocated, too. The first place on top of a hill in a former castle was left; even here the reason could have been the need for water. Although the new place in the valley was known to be prone to flooding, they relocated there (Untermann 2018). Good water supply seemed to be of such importance that the disadvantages were acceptable. However, it is not possible to generalise. Every monastery had its own specific situation. In Otterberg the new monastery was built at a place with many springs necessitating an elaborated drainage (Keddigkeit et al. 2014; Untermann 2018). On the other hand, the water was not directly useable for the monastic water supply and an extensive system of ponds and channels had to be developed. It is obvious that the work to establish a good water supply was sometimes quite extensive, especially when it was not possible to settle in a place with good preconditions. But this draws attention to other important resources that had to be combined with the water use: manpower and knowledge. Both were obviously available at the monasteries. What is more, even the difficulties themselves may be

³ Of course, there had been many arguments for a special place. As the monasteries mostly got their ground by a foundation of noble people it was for sure not always possible for the convent to decide due to economic, political or spiritual factors.

seen as resources: the need for work was part of a spiritual *topos*. A Cistercian monastery for example should be founded – following the normative rules – at a lonely and uncivilised place so that the monks could prove their spiritual determination already during the process of building.⁴ Although the most of the chosen places were neither lonely nor uncivilised, as many excavations have shown, much work had to be done there – in a practical but even more in a spiritual way of meaning.

Aqua Viva – Spiritual Use of Water

The spiritual meaning of water especially in its fluid – or ‘living’ – state has its origin in ancient times and Jewish tradition and was adopted and discussed by monastic authorities during all of the Middle Ages (Huber-Rebenich et al. 2017). This led to a lot of rituals in liturgy where water is used (Neuheuser 2017). One example of the symbolic meaning of water in the context of monasteries can be seen in the ritual of the Maundy (*mandatum*) in which monks wash the feet of their brothers. In the rule of St. Benedict the ritual is named and was therefore normative for most of the orders.⁵ In Cistercian monasteries the tradition became even more significant and was embedded in different rituals, which are described in detail in the *Ecclesiastica Officia*, their ‘book of use’.⁶ One of these rituals for example was the duty of the abbot to wash the feet of his monks at Holy Thursday in reminding of Jesus washing the apostle’s feet. This tradition can still be found in linguistic terms and material remains: The Thursday before Easter is also called ‘Maundy Thursday’ and special basins were built solely for this ritual. In some monasteries, these basins are still preserved as in the northern part of the cloister of Bebenhausen/

⁴ For other orders like mendicants that point was not relevant because their monasteries were founded in towns.

⁵ ‘Pedes vero tam ipse, qui egreditur, quam ille, qui intraturus est, omnibus lavent’ (Regula Benedicti 35, 9) and ‘Aquam in manibus abbas hospitibus det, pedes hospitibus omnibus tam abbas quam cuncta congregatio lavet’ (Regula Benedicti 53, 12 f.).

⁶ ‘Tunc abbas et coadiutores sui linteis precincti. lavent. tergant. et osculentur pedes omnium’ (Ecclesiastica Officia [EO] 21, 33). There are more details about the ritual in ten more rhymes.



Fig. 3. The farmyard Nessenreben 1659 (left) and 1750 (right). Around 1700 AD the place was reshaped with fountains and ponds (Landesarchiv Baden-Württemberg, Abt. Hauptstaatsarchiv Stuttgart, left: N 34 Nr. 68 <<http://www.landesarhiv-bw.de/plink/?f=1-1417355>>; right: N 34, Nr. 52, <<http://www.landesarhiv-bw.de/plink/?f=1-1417137>>).

Germany (*fig. 2*). EO 108, 41 describes in detail how the washing had to be done. The basins in Bebenhausen are dated to around 1470 AD. They reflect the rituals of the late Middle Ages. Because of their high position, it was not possible to put in a foot without showing the other one and the washer could no longer do the washing on his knees as it is described in the old texts. The position of the basins could indicate that the ritual had changed during the Middle Ages: the ritual washing was probably done by bowls of pottery or wood, while the basins were just intended to dispose of used water. Changes in traditions and less strictness is detectable in many parts of monastic life during the 15th cent. AD. An altogether different use of the basins therefore is possible.⁷ Besides these more practical thoughts, the ritual simultaneously played an important role for social interactions. In a community with a strong hierarchy and no personal contacts, it was a very special situation when the abbot washed the feet of his monks. Although it was mainly an act of humility and charity, the social structure was abandoned, even reversed at that moment. Like the historical ideal, it served to establish and stabilise the connection within the community. The water, thus, served as an immaterial resource used by certain actors to constitute and maintain social relations.

In the 16th and 17th cent. AD, the spiritual use of water took on a new dimension: the establishment

of gardens with fountains and waterfalls served as places to restore mental health and for recreation. This is better known from royal gardens, but some monastic examples are also known. For example, the abbot of Weingarten established such a recreational garden at a manor near his monastery around 1700 AD. The comparison of two maps before and after the building activities shows the new configuration of the location and the important role of water for the recreational area (*fig. 3*).

Aqua Viva – Practical Use of Water

Running water in monasteries was naturally of purely practical use as well and led to the construction of water management systems which were, compared to those in other parts of medieval society (for example villages or cities), quite advanced (Kosch 1991; 1996; Ruffer 2008). They developed separate water channels for fresh and used water. These channels or drains were planned during the building process and were partly included in foundations and walls. Their size could be very different depending on their function or their position: whereas the sewers at some places like Heisterbach (Keller 2018) or Kirkstall Abbey (Sitch 2000) are so high that people could walk inside them, those of Bebenhausen were much smaller, some had a height of only a few centimetres (*fig. 4 left*). The one of *fig. 4* was running more than 3.5m under one wall and led water from inside the garden (or perhaps the precursors of the described basins) to a water system outside the building (Vossler-Wolf 2011; 2013).

⁷ In some British monasteries there are basins in the southern part of the cloister next to the refectory which were used for handwashing and perhaps for the *mandatum* (Robinson/Harrison 2006, 154–156).



Fig. 4. Bebenhausen. Water channels in the cloister around 1200 AD. Left: in the foundation of the cloister; right: under the foundations of the western wall (Photos by Christina Vossler-Wolf).



Fig. 5. Eberbach. The complex water management system in the monastery (Liebert 2015, Abb. 30).

Another example is a drain from the 13th cent. AD that was originally running out of the monastery underneath its foundations (*fig. 4 right*). When the foundations were rebuilt in the 16th cent. AD the drain was obviously out of use and was cut by the new foundations.

Medieval monasteries also had running water in the kitchen and for the fountain, which was positioned in front of the refectory, the dining

room. The used water was led to the latrine and finally into the pond, which worked as a filter system for polluted water (Rüffer 2017). Recently, it has become possible to excavate or explore (parts of) such water management systems in the inner part of the buildings in quite a lot of monasteries like in Salem (Knapp 2011; 2020) or Eberbach (*fig. 5*, Liebert 2015). For many monasteries, written sources describe the establishment of such a management system. It is often seen as a very important achievement of an abbot, who is complimented for that work. This shows that contemporary people were aware of the significance of such a system which served as object to identify with. Even a few painted sources with monastic water management systems have been preserved. One of the oldest is the map of Canterbury from the 12th cent. AD where the entire water management system is documented. It shows in detail where the channels with fresh water are and where those with used water run. The water comes from a spring outside the monastery but water from the roofs is also collected and led into the system (Rüffer 2017).

The Monk in the Pond – Economic Use of Water

Water was of utmost importance not only in the inner part of a monastery. There were also many



Fig. 6. The ‘silent stream’ of Weingarten. The construction parallel to the hillside made it possible to control its speed (Photo by Christina Vossler-Wolf).



Fig. 7. Heiligkreuztal. A monk in the pond (<https://de.wikipedia.org/wiki/Datei:Klosterweiher_Wald_04.JPG>).

places where water was necessary outside of the cloister (in general Magnusson 2001), for example in the mills (Petersen/Reitemeier 2017), the brewery (Schöneweis 2018) and for farming or breeding of fish (Currie 1989; Amacher 1996). While the economic buildings of monasteries are studied quite often, the remains in the surroundings are often not even noticed. These remains have less visible structures but changed the landscape effectively and are a result of rights and possessions the monasteries had outside their main buildings. This topic shows big differences in the research of monastic landscapes within Europe. While there are many studies on landscape archaeology also concerning monastic remains for example in Britain and France (Bond 1989; Astill 1993; Brown 2006; Rouzeau 2013), there are only few of them in Germany (Herbst 1992; Liebert 2015; Gillich 2018). The reasons for this are different research traditions but also differences in preservation because of a more intensively used and therefore altered landscape in Germany. Still, there are many remains left which can be studied.

In the monastery of Weingarten for example, founded in the 10th cent. AD and Benedictian since 1056 AD, a large number of records of the 12th and 13th cent. AD have been preserved which give us an impression of the many possessions Weingarten obtained in the beginning of his existence. Some villages belonged to the facilities, as did the right to exploit the forest and some of the rivers and ponds in the surroundings. Even in that time the records tell us something about a water

management system, which was extended during the following centuries and is still preserved today known as ‘Stiller Bach’ (silent stream). The literal meaning of this name is still understandable today: the channel was constructed in a way to make sure that the water flowed very slowly rendering the stream completely silent (*fig. 6*). Through weirs it was nevertheless possible to control and change the water pressure (Herbst 1992). The system collected water from the surface, led it through different ponds and was thereby used by numerous mills and ended at the monastery itself. Today, still more than 12km of this system are preserved and used by some of the mills. This water use has an almost 1000 year old tradition and shows how the monasteries formed and changed its surroundings, thereby creating a cultural landscape. The example is quite similar to the one of Maulbronn mentioned above and still more examples are known (e.g. Ochsenhausen, Salem). It is remarkable that these monasteries are of different orders (Cistercians and Benedictians) and are located in different regions but show the same principles of water management system. Despite these similarities in structure, the knowledge about such remains and their state of preservation is differing a lot. Because they are no longer in use, particularly the remains in the surroundings are often destroyed by agriculture, new buildings and road construction or even by nature. Considering this fact, it is even more remarkable that some water management systems are still preserved to such an extent until today.

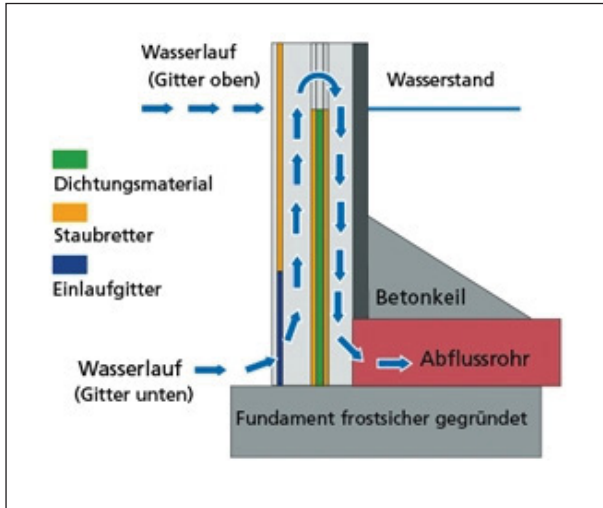


Fig. 8. Construction of a ‘monk’ (<<https://de.wikipedia.org/wiki/Datei:M%C3%B6nchsbaubauwerk4.png>>).



Fig. 9. Weingarten. Part of the ‘silent stream’-system with channels and ponds (black order) in the 18th cent. AD (Landesarchiv Baden-Württemberg, Abt. Hauptstaatsarchiv Stuttgart, N 34, Nr. 67 <<http://www.landearchiv-bw.de/plink/?f=1-1417354>>).

These water management systems include an interesting connection: a cultural and linguistic phenomenon links the monks with the ponds. Today the construction which regulates and closes the pond is called ‘monk’ (fig. 7). With the help of this monk it is possible to regulate the water depth preventing fish from leaving or entering the pond (fig. 8). For an active use of a pond the ‘monk’ is of absolute necessity (Bayr. Landesamt f. Wasserwirtsch. 2001). Even if this construction was not particularly often used during medieval times (Keller 2015) and even if the first fishponds were established by laymen (Currie 1989; Hoffmann 2000) it is an interesting cultural phenomenon

that the construction is linguistically connected to monks. It is not clear when the term was established, in the 18th cent. AD it is already known.⁸ However, there was knowledge on the importance of monasteries developing waterworks or they were at least seen in a close connection to this so that the term was established. For this it was not important whether the construction itself or the establishing of it was really done by monks. But it serves to demonstrate the importance that was attributed to monasteries, which is still affecting our image of monasteries today. In this cultural definition, water management is seen as a monastic tradition although many of the constructions were made by layman.

Water management systems also have a high importance regarding social and political structures. Not every part and every pond of the system was operated by the monastery itself. Many ponds and meadows were given away as *Lehen*. Because of up and downs in fish prices the monasteries reserved the right to take some meadows back at any time – to site a pond (Konold 1987). The creation of a new pond might have been an important economic measure to increase fish farming. But the ponds could also have been used in many other ways: the mud served as an organic fertiliser, in smaller ponds they kept flax and wooden building elements and in winter they took the ice from the pond into their cellars to use it during summer time (Vossler-Wolf 2016). Thus, the ponds and the water management system played an important role as a tangible and intangible resource which changed the landscape sustainably. But the change was not fixed, ponds could also be drained so that there was always some kind of modification in the landscape which can be demonstrated by the comparison of maps from the 18th cent. AD with today’s landscape (fig. 9).

⁸ In Grimm’s dictionary there are more than twenty different terms with monk, one of them relates to the one in the pond: ‘mönch, der in die höhe gerichtete spund oder zapfen im ablass eines teiches; aber auch manchmal der ganze ablass selbst. will man nicht am ende des damms fluthrinnen machen, so setzet man doch etliche münche (das sind hohle breite hölzer an den damm (bei teichen)’ (DWB 12, 2492 <http://woerterbuchnetz.de/cgi-bin/WBNetz/wbgui_py?sigle=DWB&mode=Vernetzung&lemid=GM06747#XGM06747> [last access 27.05.2019]).

Monastic Water as Cultural Heritage

Although water played a multi-dimensional role for monasteries the cultural value of these religious communities is mostly seen in their preserved buildings, their books and their artistic heritage such as paintings or liturgical objects. The question is in which way these remains of water use are part of the cultural memory about monasteries today. A reference to that can be seen in the official status the remains receive as cultural monuments or in sometimes as protected object.

At the monasteries of Ochsenhausen, Weingarten and Maulbronn not only the buildings but also the water management system itself is under special protection. But this step was made only long after the protection of the buildings.⁹ While the buildings and, especially, the church were designated as cultural heritage or monuments in the 19th cent. AD, the water management system and the surroundings of the monasteries have only been under protection since the 1980s or even later. This means that on the one hand nowadays we can see a positive development in recognising these water management systems and the attempt to preserve them. But on the other hand, they were not under protection for many years and a lot of structures were ultimately destroyed. Especially in regions with a high pressure of development it therefore is very important to document and protect the remaining structures.

Although much more attention has been put on these structures nowadays, the study of them in many regions is just beginning. While for example in south-west Germany the well-preserved waterworks of Weingarten, Ochsenhausen and Maulbronn have been studied during the last years, many remains of smaller monasteries have not even been documented. For all of them a lot of questions have not yet been answered. For example, we hardly know anything about the age of parts of the water management systems or details of their construction. New and better methods in research like LIDAR or specific radiocarbon dating

can help to get more information about the monastic structures outside the main buildings and remaining structures of water use can play an important role in doing so.

Conclusions

Water in medieval monasteries can be seen as a spiritual and economic resource as it had a high liturgical and economic meaning. With the help of written sources and the material remains of water use it is possible to show how the connection of different meanings of one element leads to a ResourceComplex which is used by actors – in this case the monastic community – to establish and stabilise social connections. These connections exist on the one hand between the members of the community and on the other hand between the monastery and the people living in the surroundings. Both, the rituals implementing water and the economic water management systems, are important parts in that ResourceComplex because they are part of social processes between people inside and outside a monastery. Remains of the ritual and economic use of water can be found both inside the monastic building and in the landscape. Well documented monasteries of different orders show quite similar use of water management, the idea of a more elaborated water management system of the Cistercians can – at least for south-west Germany – not be confirmed. It will be a task for further research to document and analyse water remains of smaller or less well-known monasteries to see how they used water as a resource and thereby changed their surrounding landscapes.

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⁹ Documented in the ADAB, the database of the Landesamt für Denkmalpflege in Baden-Württemberg. Many thanks to Dr. Beate Schmid for the access to that database and Dr. Jörg Widmaier for support in using it.

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Waters, an Omnipresent and Constantly Used Food Resource in the Viking Age?

A Review of Studies Regarding Dietary Preferences from the 9th to the 11th Centuries AD

Keywords: Viking Age, diet, stable isotopes, waters, resource use/neglect, sociocultural influence, bioarchaeology

Acknowledgements

I acknowledge the support by the Deutsche Forschungsgemeinschaft and SFB 1070 RESOURCECULTURES at the University of Tübingen.

Access to the human skeletal material of Hedeby is granted by the Museum für Archäologie Schloss Gottorf, Landesmuseum Schleswig-Holstein. I would like to thank Dr. Volker Hilberg (Museum für Archäologie Schloss Gottorf, Landesmuseum Schleswig-Holstein), Dr. Sven Kalmring and Dr. Thorsten Lemm (both Zentrum für Baltische und Skandinavische Archäologie) for the support and useful discussions about the site and its inhabitants.

Thanks also to Prof. Dr. Jan Storå (Department of Archaeology and Classical Studies, Stockholm) and Dr. Johnny Karlsson (Department of Archaeology and Classical Studies, Stockholm) for facilitating the examination of the human skeletal remains from Gotland.

Abstract

Hedeby, Dorestad and Ribe were well-connected trading places and burial grounds, settlements and waypoints of long-distance travel during the

Viking Age. These sites, which became leading centres in an expanding world, had one key element in common. They were located close to the coast, navigable rivers or lakes. This is not only true for early and late Viking Age towns, like Hedeby or Sigtuna, but also for settlements in the centre of the Viking Age world, like Ribe, and remote places at the periphery of the known world back then, like L'Anse aux Meadows. Waters indeed were omnipresent, but does presence alone mean they also played a main role as a food resource? What were the key factors influencing fishing activities and how were they connected to the actors, granting supply, distribution and consume of water-based food resources?

The following article summarises the recent research on aquatic food components in the Viking Age diet, focussing on the results of stable isotope analyses. Additionally, the contribution of the SFB 1070 RESOURCECULTURES' project B06 'Humans and Resources in the Viking Age – Anthropological and Bioarchaeological Analyses of the Use of Food Resources and the Detection of Migrations' to the topic is studied before the backdrop of this survey of recent literature and aims to initiate future exchange and cooperation.

1. Introduction

Many significant places of the Viking Age, like Hedeby, Dorestad and Ribe, are located close to the coast, navigable rivers or lakes. Several



Fig. 1. View on the Schlei as seen from Viking Age Hedeby. The town's position at the head of the narrow fjord hid and limited the access possibilities, becoming a valuable natural defence advantage (Photo by V. Palmowski).

sources – memorial inscriptions and depictions on rune stones, sagas of seafaring, ship finds and burials, complex harbour structures, trade goods from overseas and fish bones – demonstrate that various ways to use the omnipresent waters existed and were exploited in Norse society (*fig. 1*). The consumption of aquatic, and especially marine, species has been the object of an abundance of studies in the past two decades. Aquatic food resources were part of the Viking Age diet and – at least in some regions – considered essential for the subsistence strategy (Kosiba et al. 2007; Naumann et al. 2014; Barrett 2016a; 2016b). Comparative analyses between the Viking Age and earlier, as well as later periods, revealed that the presence of water alone was not enough to initiate its exploitation, for example as a food source (Barrett/Richards 2004). Even if successfully established as a resource, it seems that water-based food components were not accessed by everyone or distributed equally (Price et al. 2015). The following article summarises the recent research on aquatic food components in the Viking Age diet, focussing on the results of stable isotope analyses. It offers an overview of the fundamental research questions and seeks to join a selection of case studies to one big picture.

The author's work in project B06 'Humans and Resources in the Viking Age – Anthropological and Bioarchaeological Analyses of the Use of Food Resources and the Detection of Migrations'

of SFB 1070 RESOURCECULTURES also contributes to the understanding of Viking Age diet from a new perspective. SFB 1070 introduces a redefinition of the term 'resource'. While predominantly natural raw materials were labelled as resources in the past, they are now described as tangible and intangible means (Bartelheim et al. 2015; Hardenberg 2017; Scholz et al. 2017). Raw materials, objects or practices can be turned into resources by a cultural act of value construction (Klocke-Daffa 2017, 254. Compare Teuber/Schweizer in this volume). Numerous factors influence the use or neglect of resources, and sociocultural dynamics play a major role in this process. The importance of resources for societies is determined by their various connections to other means. Therefore, resources are regarded as parts of Resource-Complexes, which include objects, individuals, knowledge and practices (Hardenberg et al. 2017). This theoretical structure helps to explain, why and how water-based food components became – or rather were turned into – resources. The contribution of project B06 to the topic is analysed before the backdrop of this survey of recent literature and aims to initiate future exchange and cooperation.

2. State of Research

To fully understand how Viking Age subsistence strategies worked, what food components were included, and what role waters, as sources of food played, a holistic approach is necessary. The potential of a combination of historical, archaeological and osteological research has recently been demonstrated by Barrett (2016a; 2016b) with a comprehensive study on marine fishing from 500 to 1550 AD in Europe, in which transregional patterns and long-term trends could be illustrated.

Knowledge about past diets can be drawn from a magnitude of sources, each with their specific advantages and challenges. The distribution of aquatic food resources is documented in written sources, like the Domesday Book from 1086 AD and price lists from Norway. Unfortunately, systematic and ample evidence of fishing and the consumption of sea food is rare before the 14th cent. AD and therefore, of limited use, if a projection of

the late medieval situation onto earlier times is to be avoided (Barrett 2016b, 254).

The archaeological findings of fishing gear, like harpoons, sinkers and fishhooks, hint at hunting activities. The presence of fish bones or shells on sites offers a direct approach to gather information about which species were of relevance.

It is important to note that preservation conditions and recovery methods bias the archaeological and archaeozoological record. Organic materials, like fishing nets, can only stand the test of time in very specific and rare contexts. Fragile and small fish bones are lost if the soil cannot be bulk sieved carefully. An underestimation of the total amount of fish present at a site due to unavailable or incomplete data therefore must be factored in (Barrett 2016a, 1 f.).

Comprehensive knowledge about the past environment helps to understand subsistence patterns. For example, the mineral level of water may cause the difference between a rich and an empty river regarding wildlife. In fertilised water an abundance of midge larvae, which in their adult form serve as main food source for birds and fish, prosper. Natural barriers, like waterfalls, might stop anadromous fish species from reaching parts of freshwater systems (McGovern et al. 2006, 201).

Stable isotope analyses of human remains provide an insight into individual migration movements and food components. The application of this analyses in archaeology became popular in the early 1980s and has been described and discussed extensively ever since (Ambrose/Norr 1993; Knipper 2004; Grupe et al. 2015). Over the last two decades research on Viking Age diet has accumulated several detailed studies (for example Barrett/Richards 2004; Kosiba et al. 2007; Grupe et al. 2013; Naumann et al. 2014; Price et al. 2018).

$\delta^{13}\text{C}$ (carbon isotope) and $\delta^{15}\text{N}$ (nitrogen isotope) are particularly suitable to investigate the ratio of marine and terrestrial food components, a fundamental aspect of diet related research, assuming that the connectivity of Viking Age societies to water also might be reflected in subsistence strategies.

While $\delta^{13}\text{C}$ values in bone collagen depict long-term diet habits of an individual and – together with $\delta^{13}\text{C}$ values in tooth dentine – also the protein portion of the diet, $\delta^{13}\text{C}$ values in tooth enamel

represent dietary components from the time of enamel formation in early childhood. The $\delta^{13}\text{C}$ values correlate with the carbon sources present in the habitant's environment. For terrestrial beings the primary carbon source is the carbon dioxide of the atmosphere. $\delta^{13}\text{C}$ accumulates in the body tissue, which fore values increase from producers – plants – to consumers¹ (Ambrose/Norr 1993).

$\delta^{15}\text{N}$ is incorporated during the process of breaking down proteins. The values depend on the trophic level of a life form, meaning their distinctive place in the food chain. The higher the trophic level, the higher the $\delta^{15}\text{N}$ value. Since the food chains in aquatic environments are longer than in terrestrial environments, higher nitrogen values derive. Especially marine top predators, like garfish, which show high $\delta^{15}\text{N}$ values, are consumed by humans and cause an increase of this stable isotope value (Barrett/Richards 2004, 258).

Depending on the sample, the analysis of stable isotopes allows an individual-based snapshot in time as well as the detection of population-based big-scale changes. Baseline information and reference data from groundwater, bedrock and local animals, which remain in a small habitat all their life, need to be collected, to enable a proper interpretation of the stable isotope values (Grupe et al. 2015, 432, 464–469).

Grupe et al. 2015 summarise the challenges of interpreting stable isotope values in their article thoroughly, yet two additional aspects shall be mentioned due to their relevance for Viking Age diet reconstruction: marine food resources, like water chestnut or fish, might have been used as animal fodder and in this way added indirectly to the diet of humans. Stable isotope values measured in coastal environments can be hampered by the 'sea-spray' effect: Isotopic signals are shifted from terrestrial towards marine values. The 'sea-spray' can be taken up by terrestrial mammals

¹ Two types of plants, the so-called C_3 and C_4 plants can be distinguished. The majority of plants are C_3 plants, some species incorporating more ^{13}C than ^{12}C through their photosynthetic pathway are called C_4 plants. In aquatic environments an additional carbon source is present: the dissolved carbonate in the water itself. $\delta^{13}\text{C}$ values of marine beings are naturally higher than those of terrestrial beings (Grupe et al. 2015, 436 f.). The $\delta^{13}\text{C}$ value reflects the relative importance of C_4 plants or marine foods as dietary components.

and via drinking water, affecting sulphur, oxygen and carbon values (Göhring et al. 2019).

In the following subsections, common observations regarding Viking Age diet – and especially water-based food components – are summarised (2.1–2.4). Case studies are used to highlight results and limitations of this field of research.

2.1. (In)Significance of Site Location

Raw materials, objects or practices can be turned into resources by a cultural act of value construction (Klocke-Daffa 2017, 254). Regardless of the proximity of a site to bodies of water, they were not *per se* used to access aquatic – and especially marine – food resources on a large scale. An activation process was needed to initiate the exploitation.

In the 5th to mid-7th cent. AD, evidence of sea fishing is limited to Scandinavia alone. In other regions, like Scotland, Ireland and England, Poland and Estonia, Belgium, France and the Netherlands, sea fishing played a minor role for subsistence strategies at best (Barrett 2016b, 250 f.). Exceptions, like the early Anglo-Saxon site Lyminge, England, which revealed several bones of the Atlantic herring (*culpea harengus*) (Reynolds 2016, 215 f.), demonstrate that under certain conditions sea fish held the potential to become a pillar of food supply.

The insular or coastal setting and the access to marine fish of the Scandinavian sites does not suffice to explain the remarkable differences to other sites with similar preconditions, as for instance the coast of Scotland. It has been suggested that a marine-oriented culture, which was present only in Scandinavia at that time, explains the strict geographic limitation of marine resource use (Crumlin-Pedersen 2010; Lødøen/Mandt 2010).

From the mid-7th to the early 9th cent. AD small-scale sea fishing emerged, predominantly at coastal sites (Barrett 2016b, 251). In this case the location, and therefore opportunity to access marine food resources, all of a sudden was of importance. Evidence of marine fish catches begins to appear on sites which are labelled as ‘elite settlements’ (Reynolds 2017, 144). Factors that

caused this new development certainly need further enquiry.

In general, an increased consumption of marine food has been detected in the context of Norse expansion (Barrett 2016b, 253). In rural Iceland processed marine fish was consumed ever since the initial settlement dating back to the last quarter of the 9th cent. AD. Regional level production and exchange of preserved marine fish showed a considerable variety of species and curing techniques employed in the 9th and 10th cent. AD (McGovern et al. 2006, 203). Inland and coastal sites of Iceland (McGovern et al. 2006) and Greenland (Enghoff 2003) have been well-connected, as the remains of marine fish further inland prove.

Cases like the site Birka on the island Björkö in Lake Mälaren, Sweden, prove that exceptions existed even at the very heart of Norse territory. The local, as well as non-local inhabitants of Birka, relied on a relatively homogenous terrestrial, rather than a marine diet (Price et al. 2018, 33).

The question, if water-based food resources were deliberately exploited in newly populated areas, arises. On the one hand as an efficient survival strategy, on the other hand to demonstrate cultural identity. Site- or region-specific factors, apart from the location and availability of sea fish, played a significant role in the use and neglect of marine food resources. These factors need to be identified for every site and region to enable a large-scale comparison.

2.2. Changes over Time

Changes regarding dietary preferences and the intensity of sea fishing can be detected over time through fish bone finds, written sources and most importantly stable isotope analyses.

Two sites on the Orkney Islands, Westness and Newark Bay, demonstrate this change. Westness is situated on one of the smaller islands named Rousay. The cemetery includes burials from the Pictish Period as well as the Viking Age. Newark Bay is a multiperiod settlement and chapel on Mainland, the biggest of the Orkney Islands, and also one of the first Christian Churches in the region.

While individuals buried during the Pictish phase showed a homogenous terrestrial diet, the consumption of marine food components increased significantly during the Viking Age. In Newark Bay, the strongest marine signals belong to samples taken from burials of the 11th to the 14th cent. AD.² Late medieval burials then again return to ‘moderately marine values’, which almost resemble the values of the Viking Age (Barrett/Richards 2004, 260–264).

A study including several coastal sites in northern Norway also indicates an increase of marine food consumption from the Merovingian Period to the Viking Age and an increase of intra-population diet variation (Naumann et al. 2014, 327–329).

Hedeby, in northern Germany, became a principal trading place around 800 AD due to its location between the Frankish Empire in the south and Scandinavia in the north, the Baltic Sea in the east and the North Sea in the west amongst other things (Schietzel 1981, 47; Jankuhn 1986, 15, 53–68). Excavation campaigns from 1900 to the present revealed numerous settlement structures, for example parts of the harbour area, enclosed houses and cemeteries within and outside of the semi-circular rampart. The finds from the site include coins, tools, jewellery, ships, weapons, art objects, human and animal bones. Controlling wealthy Hedeby was very profitable. To protect it defence works, like a new part of the Danevirke, were built in the 10th cent. AD (*fig. 2*).³

To understand human dietary preferences fully, it is necessary to reconstruct and interpret food networks within the surrounding ecosystem. The environment of Hedeby encompassed various ecological niches, from terrestrial to brackish water to estuarine and marine. The results of the stable isotope analyses carried out for Viking Age Hedeby



Fig. 2. The northern part of the semi-circular rampart, enclosing Viking Age Hedeby. A connection to the Danevirke was built in the 10th cent. AD. (Photo by V. Palmowski).

and its medieval successor Schleswig revealed that in the early phases (Viking Age Hedeby and the early phase of medieval Schleswig) a marine diet (50%) with fresh water components (50%)⁴ was preferred, while in the late phase of medieval Schleswig a focus on farming and imported fish arose (Grupe et al. 2013, 154, 158, 160).⁵

The archaeozoological record produced similar results. Herring and perch were the most common species found in Hedeby. Catches mostly included fish that seasonally roam the Baltic Sea and the Schlei Fjord, except for a few large cod specimens, which must have been imported from the Atlantic. In Schleswig cod and haddock played a major role, while herring had lost its prevalent status. Due to the lack of cranial elements here, an import of gutted dried cod has been suggested

² Barrett links this to the so-called fish event horizon, a phenomenon taking place around 1000 AD, describing a remarkable increase of marine fish catches, especially herring and cod. After the mid-11th cent. AD the impact of a growing international fish trade is reflected in historical documents and the archaeological record (Barrett et al. 2004).

³ While older parts of the Danevirke, which are dating back to 700 AD, might have had another cause, the rampart built in the 10th cent. AD is of defensive character. It connected the semi-circular rampart surrounding the settlement to the main wall (Andersen 1998, 169; Dobat 2008, 37–40).

⁴ Fresh water fish was available in close proximity. The values found might also indicate a high protein terrestrial diet or a 25% freshwater, 50% terrestrial and 25% marine diet. This is caused by carbon values falling into a similar area and therefore leaving results open to interpretation (Grupe et al. 2013, 154). Regardless of the interpretation a difference to the late phase of Schleswig remains visible.

⁵ The individual dietary preferences in Hedeby and Schleswig varied from predominantly marine to terrestrial diets (Grupe et al. 2013, 158), which seems obvious, considering that people of miscellaneous origins met there for trade.



Fig. 3. Burial mounds at Birka, Sweden. Grave constructions are subject to chronological variations and trends, but also might reflect status or wealth (Photo by V. Palmowski).

(Grupe et al. 2013, 160).⁶ The increase of imported fish seems to be in accordance to the fish event horizon, also taking place elsewhere at around 1000 AD (Grupe et al. 2013, 160 f.).

Especially in the first phase of Norse migration a shift towards a more marine diet occurred in the new settlement sites (Barrett 2016b, 253). The successful Christianisation of Northern Europe, which is one defining factor for the end of the Viking Age, is considered to have much influence on dietary habits.

2.3. (In)Homogenous Diet Groups

Aquatic food resources were not consumed to the same extent by everyone. Individuals, but also groups, whose diet significantly differed from the community they belonged to, have been identified. These groups can be defined by distinct shared traits, like sex, a grave location within a particular area of a burial site or a costly grave construction. Most often studies focus on the differences between men and women, adults and children.

In Westness, Orkney, several men, buried in Scandinavian style during the Viking Age, had a far more marine diet than the contemporary buried women and their Pictish predecessors. However, there are also exceptions to this pattern. A man buried in a boat at Scar, Island of Sanday, Orkney, showed highly terrestrial stable isotope values for instance (Barrett/Richards 2014, 262).

In Galgedil on the Danish island of Funen, carbon isotope ratios documented a primarily terrestrial diet with approximately 10% to 30% marine food components during the Viking Age. Carbon and nitrogen isotope ratios demonstrated that females relied on a more homogenous and herbivore diet than males (Price et al. 2015, 12–14).

Differences between children and adults have been found in Ridanäs, Gotland, and on several coastal sites of northern Norway during the Viking Age. The results of stable isotope analyses suggest that children were fed with terrestrial food rather than marine (Kosiba et al. 2007; Naumann et al. 2014). Stable isotope analyses carried out for Viking Age Birka, Sweden, on the other hand, uncovered no difference between diets of children and adults. In this case, it is important to note that the inhabitants generally relied on a rather terrestrial diet based on domestic plants and animals (Price et al. 2018, 33).

While current studies repeatedly highlighted a difference between dietary preferences of children and adults regarding the consumption of marine resources, future studies could offer a more detailed insight. Significant questions for example entail at what age sea food became a substantial diet component and what role weaning strategies played.

In some cases, other features than age and sex have been used to identify homogenous diet groups or to explain outstanding stable isotope values of single individuals. Archaeological data, like grave goods and grave construction (*fig. 3*), as well as osteological data, for example body height and pathological changes, have been included in these considerations (Kjellström et al. 2009; Price et al. 2015; 2018).

In addition, a consumer's perception of certain fish species as rare, valuable or as a luxury depends on the regional and cultural context

⁶ The archaeozoological record uncovered even more differences between the two sites. While in Viking Age Hedeby swine was preferred, in medieval Schleswig cattle was the dominating species. The slaughtering age of domesticated ruminants decreased after the relocation to Schleswig.

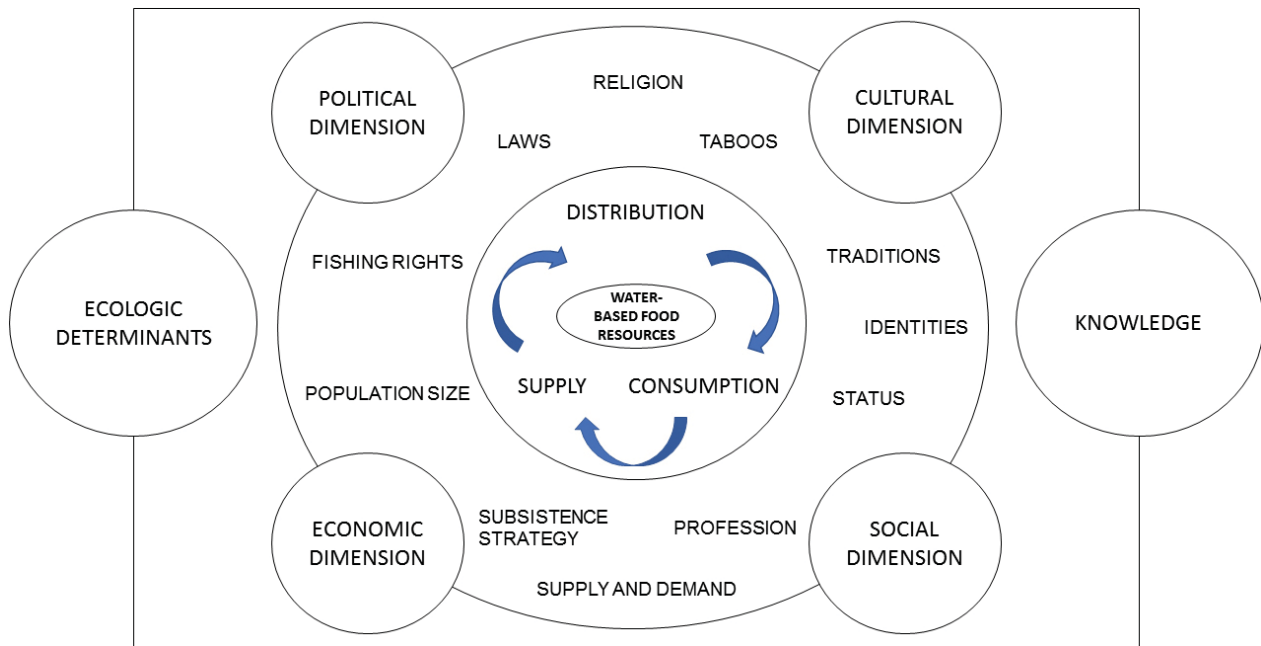


Fig. 4. The diagram illustrates how waters as part of the ResourceComplex 'diet' are connected to other means. Influencing factors might include political and economic dimensions (laws, fishing rights, supply and demand, subsistence strategy, population size and development), as well as cultural (religion, traditions, taboos) or social dimensions (status, profession, identities).

(Tsurushima 2007, 196). The appreciation or rejection of dietary components as food of certain groups of people, like the ascription of lobster as food of the rich or the poor in different European countries during the Enlightenment (Spanier et al. 2015, 13), certainly also was a part of Viking Age daily life.

2.4. Multifactorial Explanations

Various explanations why changes in dietary preferences occurred at certain times or for certain groups of people have been proposed. Water-based food resources are integrated into a complex network (ResourceComplex, *fig. 4*) of supply (fish, shellfish), distribution (fishermen, traders), consumption (fishermen, communities, but also animals fed with water-based food resources) and a multitude of factors influencing the latter three. The framework (Klocke-Daffa 2017, 254 f.) in which these processes take place is determined by ecological causes (seasonal migration of fish, climate, water conditions – like water temperature and level –, presence and abundance of fish, conditions for seafaring, availability of freshwater

sources) and knowledge (navigation and fishing techniques, boat/ship construction, but also other food supplies, depending on agricultural techniques). The case studies illustrated that even if the framework for accessing water-based food resources exists, the ResourceComplex is not automatically activated and used. Several influencing factors have been identified as crucial emitters for the Viking Age and therefore monocausal explanations are unlikely to contribute to the analysis.

For the Orkney Islands the arrival of Norsemen, which is well documented in the grave goods of the 9th cent. AD, was crucial for the beginning of accessing marine food resources. So, despite its geographic setting, sea fish played no important role before the migration of a new group of people (Barrett et al. 2001, 152; Barrett/Richards 2004, 266; Nicholson 1998, 27). The circumstances under which an adoption of these foreign eating habits by the local population took place need further inquiry.

Dietary differences between men and women are often hypothesised to derive from distinct migration patterns or the division of labour (Barrett/Richards 2004, 264). In general, the status of a person within society, the lack or presence of wealth

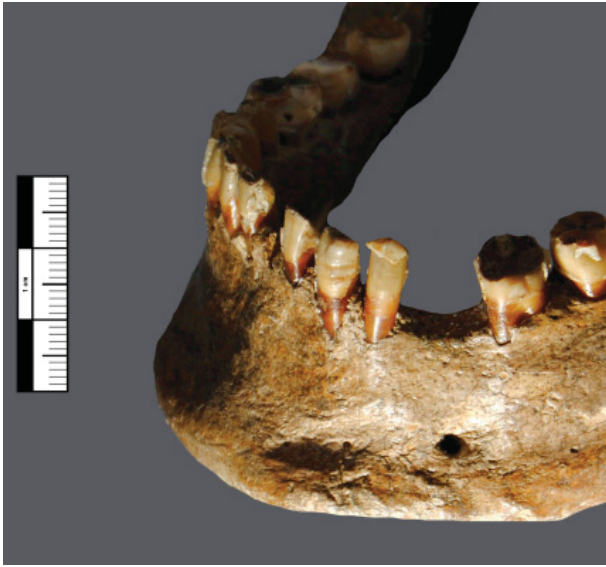


Fig. 5. Mandible of an adult male. Enamel hypoplasia, a defect of the enamel matrix formation, can be caused by diseases and malnutrition during childhood. The comparison of functional data (in this case, an early stress marker) with intentional data (e.g. grave goods) reveals information about the life development of an individual (Photo by: V. Palmowski).

and the profession – especially if it is connected to fishing – have been considered possible influencing factors of an individual’s diet (Barrett/Richards 2004, 264 f.; Naumann et al. 2014; Price et al. 2015).

Status is one example for an aspect attributed to a buried person, an interpretation of the available data, most likely based on a combination of the grave goods, health status and stable isotope values. One needs to be aware that it is a hypothesis. The question is, whether status – indicated by the grave goods – is also reflected in the osteological record and the stable isotope values (fig. 5).

In Newark Bay, Orkney, the fish event horizon has been linked to Christian fasting practices, since the consumption of fish is allowed during fasting. Another reason might be the production of stock fish for export to expanding markets. Around 1100 AD there is evidence for a rise in demand in England, for example. During the late medieval period, the land-based economic and demographic decline might have caused the dropping of $\delta^{13}\text{C}$ values to Viking Age levels (Barrett/Richards 2004, 249–251; 260–266).

For Hedeby/Schleswig, Germany, linking the shift in subsistence strategy to specific factors is a greater challenge due to the dynamic situation during the 11th cent. AD, namely the fundamental

changes in function and topography.⁷ Anthropogenic Dark Earth⁸ might have been created consciously to enable plant cultivation activity on the nutrient-poor sandy soils of Northern Germany. It is assumed to be a *conditio sine qua non* for the development of early towns with a high population density. This subsistence strategy might be of (pagan) Viking-Slavic origin, which existed distinct from the (Christian) Carolingian/Ottonian economy system (Wiedner et al. 2015, 115). Whether the reliance on anthropogenic Dark Earth was replaced by new strategies (new agricultural technology) when Hedeby was left, remains unclear, although some developments can already be traced with the help of the archaeozoological record.⁹ The change of water levels of the Schlei, which have tended towards a separation of the Schlei from the Baltic Sea for the last 4000 years, also played an important role in this process (Dörfler et al. 2009, 177).

Based on archaeological finds (like local ceramics, which show a continuity in their style and production technique) not only the transfer of Hedeby’s function, but also the transfer of its inhabitants to Schleswig is assumed. Differences are visible in import-related crafts, for example in glass processing, suggesting a change in raw material suppliers or trade relations. The resettlement was most likely controlled by a higher authority (Müller et al. 2014, 31–33) that could have influenced economic decisions as well. Christianity was already established to some extent in Hedeby, considering the findings of a church bell in the harbour area, missionary activities documented (funding of a diocese in 948 AD [Radtke 2009, 99]) and – presumably – a Christian burial ground located at the central flat grave cemetery (Kalmring 2018, 75 f.). Therefore, Christian (feasting)

⁷ The earliest building activities in Schleswig began around 1070 AD (dendrochronology) but they are assumed to date back to the middle of the 11th cent. AD (Müller et al. 2014, 27 f.). Latest activities in Hedeby are dated to the middle/late 11th cent. AD (Rösch 2018, 277).

⁸ Anthropogenic Dark Earth consists of organic wastes, faecal material and charred organic matter (Wiedner et al. 2015, 124).

⁹ See footnote 6. Cattle might have been used as source of meat and milk, but also for work power purposes.

practices influenced dietary preferences even before Schleswig was founded.

Whether the political changes documented for Hedeby affected the subsistence strategy and the use or neglect of water-based food resources is a question for future research. Also, the hypotheses about the lack of agricultural hinterland (Müller-Wille 2002) should be re-examined, considering research results such as those from Kosel (Schade 2018).

Not only environmental but also socio-cultural factors influenced the neglect, use and distribution of aquatic food resources as well as the individual (in)voluntary choice of diet.

Environmental and sociocultural factors might coexist, but also affect each other. The abundance or availability of fish, for example, depends on the amount of fishing that is carried out. Species can disappear when hunted too much. Then again one species might be seen as especially valuable due to its rareness or particular flavour and become a prestige good, as was the case in Britain when the hunt for big fish was reserved for the Anglo-Saxon elites to claim their exclusive status (Reynolds 2015, 249–252).

3. Discussion and Prospects

A selection of studies has been used to outline key aspects of water-based Viking Age dietary components. Challenges for future research continue to encompass well-known aspects, like (too) small sample sizes, especially of stable isotope analyses, limiting the transferability of results to larger scales; the necessity to gather new, and sometimes difficult to obtain data sources to track local developments over time; the need for a synopsis of published results with varying sampling strategies, recording methods and interpretation mechanisms.

Recent excavation activities on sites, covering huge areas, such as Hedeby, Germany (most recent excavation 2018) and Birka, Sweden (most recent excavation 2019), or sites, which likely have been involved in the supply and distribution of fish and shellfish, like Paviken, Gotland (excavation 2013 to 2016), might soon help to provide new insights in the topic. Additional archaeological evidence for fishing, higher quantities of faunal remains and

an even broader base of stable isotope analyses will help to confirm or discard previous observations and tackle unanswered research questions.

Reconstructions of past lifestyles and to some extent Viking Age society itself are revealed by the study of human skeletal remains,¹⁰ grave goods and grave constructions¹¹ as well as the information that can be drawn from those agents.¹² The combination of perspectives from archaeology, bioarchaeology and economic history allows a multi-layered analysis of the data at hand and provides a new database to add to the current discourse on Viking Age diet. During a first phase, project B06, ‘Humans and Resources in the Viking Age – Anthropological und Bioarchaeological Analyses of the Use of Food Resources and the Detection of Migrations’, within SFB 1070 RESOURCE-CULTURES found a correlation between grave construction, grave goods and health condition – including diet – for the Alamannic burials (5th to 8th cent. AD) of Southwest Germany.¹³

During the current, second phase, a similar approach will be tested for the Viking Age to see whether grave expenses correspond with the health condition and diet of the buried person. Differences in the alterable, intentional data – archaeological findings – and the unalterable, functional data – the osteological record and stable isotope values – reveal information about societies, their values and culture (Härke 1993).¹⁴

Regional as well as pan-European patterns of a change in the use of aquatic, and especially marine, resources manifested during the 9th and 11th centuries AD. In the beginning of the Viking Age

¹⁰ Human bones reveal information about the average age of death and body height of a population, common pathologies and how well the general physical state of people was.

¹¹ For example, the finding of tools, like fishhooks, nets or harpoons.

¹² By comparing, amongst others, body heights, the presence of unspecific stress markers or stable isotope values of whole populations, a big picture of Viking Age health and diet evolves.

¹³ Merker in preparation. Preliminary Report: <<https://uni-tuebingen.de/en/research/core-research/collaborative-research-centers/sfb-1070/research/project-divisions/projects/b06/> (last access> 15.03.2020).

¹⁴ Speith contributed to the question, whether burials with weapons attest a warriorhood lived in reality or have other, e.g. symbolic, functions (Speith 2012; Wahl et al. 2014).

a shift towards a more marine diet occurred and can be linked to the expansion of Norse culture and identity. Around 1000 AD a second wave of urbanisation took place in modern-day Scandinavia. New towns were founded and, in some cases, replaced the ones from early Viking Age (Skre 2012, 84 f.). At the same time, the fish event horizon can be tracked, for example, in Britain (see footnote 2). But how did the changes around 1000 AD affect the ResourceComplex diet? Where certain regions excluded? Which factors accompanying the second wave of urbanisation contributed to a shift in dietary preferences?

The 'location' of a site offers many more aspects for future research to analyse: Did alternative subsistence patterns exist in close proximity to each other, as the hypotheses of a (pagan) Viking-Slavic origin of the anthropogenic Dark Earth suggests? The comparison between burial sites linked to trading centres like Hedeby and smaller settlements like Kosel will help to develop strategies to answer this question. Additionally, the distance to bodies of water was not always relevant for the use or neglect of water-based resources. Comparisons between water-based diet components on islands, coasts and continental sites might reveal patterns also observed in other periods.

To answer the questions mentioned above, SFB 1070's project B06 analyses Viking Age burial sites within a long timeframe to assess local changes. The project is mainly focused on the analysis of archaeological excavations and findings, the recording of human skeletal material and stable isotope values.¹⁵ European and global patterns, regarding body height and health, will also be tracked in association with the Global History of Health Project. A comparison of various sites

located all over northern Europe, which in some cases are contemporary and in some cases are not, is intended. The research conducted by Grupe et al. 2012 will be complemented by the analysis of more human skeletons from Hedeby. Especially other burial areas (like the cemetery south of the semi-circular rampart) and homogenous population groups¹⁶ will be at the centre of attention of osteological recording and stable isotope analyses (Price et al. in preparation). A first noteworthy observation is a prominence of the muscles of mastication¹⁷ in adult and mature men and women, which possibly indicates the consumption of food being hard to chew. The human skeletal material of Kosel, a site including a settlement and contemporary cemetery close to Hedeby, will be recorded, and stable isotope samples to detect migration patterns and dietary preferences will be taken (Palmowski in preparation).

Viking Age Gotland, with its key function as a connection between east and west, north and south, will also be of major importance for the project. The archaeological and osteological analyses include the burial sites Slite and Havor, and will be used to gain a better insight in Viking Age society on Gotland, also including stable isotopes to track migration and dietary preferences.¹⁸

¹⁶ There are various possibilities to define the groups (archaeological and osteological data).

¹⁷ Especially *Musculus masseter*, *Musculus genioglossus*, *Musculus geniohyoideus*.

¹⁸ A comparison of isotope analyses ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$) from human skeletal material of archaeological sites with unique geographical situations – mainland, coast, and island – will demonstrate how the location of settlements affected subsistence strategies. More osteological data, like e.g. body height, pathological and enthesial changes, serve as indicators for individual and sociocultural factors, which might have influenced the use of maritime food resources.

¹⁵ The project is set from 2017 to 2021 under supervision of Prof. Dr. Jörg Baten, Prof. Dr. Joachim Wahl, and since 2019 also Prof. Dr. Martin Bartelheim, due to the recent and tragic loss of Prof. Dr. Jörn Staecker. Analyses of archaeology and economic history are undertaken by Dr. Matthias Toplak and Dr. Laura Maravall Buckwalter. Osteological recording and stable isotope sampling is undertaken by the author. The analysis of stable isotopes is carried out in cooperation with Dr. Corina Knipper and Sandra Kraus, M. A., from Curt-Engelhorn Zentrum Archäometrie GmbH Mannheim. First results of stable isotope analyses were received in 2019.

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Veronika Sossau

From *Axeinos* to *Euxeinos*

Pontic Waters as a Resource in the Context of the 'Great Greek Colonisation'¹

Keywords: Great Greek Colonisation, Black Sea region, estuaries, coastal marshlands, rivers, fishing, fish processing

Abstract

During the 'Great Greek Colonisation', many Ionians left their hometowns for new destinations. There they founded *apoikiai*: homes away from home. Bodies of water played a central role in this phenomenon. This paper does not so much elaborate on the role of the sea as a connector of Ionian *poleis* to their various *apoikiai*, but instead focuses on some of the many roles that waters played within one of the target-regions of early Ionian 'colonisation'. It examines how waters in the Black Sea regions were employed as resources, and asks how they may in some cases have worked as pull-factors, serving to attract newcomers. The first focus of this paper is on the estuaries of large streams. These provided favourable conditions for agriculture as well as pasture and served as connectors to the hinterland. The paper further discusses some specifics of both the currents and the wider ecosystem of the Black Sea, which provided extraordinary opportunities for the coastal fishing of large marine fish, especially in the Southern Black Sea and the Thracian Bosphorus. A

close examination of archaeological and literary sources reveals that in the archaic period, bodies of water provided a variety of resources that were beneficial for sustaining a settlement at the Black Sea coast, while there is no evidence for a surplus-production of fish products hinting to reflux-oriented systems. It is thus suggested that specific areas were perceived favourable locations for the foundation of *apoikiai* and that these were not necessarily established to compensate for a lack of resources in the respective *metropoleis* as sometimes suggested.

Migration processes characterising the phenomenon of the so-called 'Great Greek Colonisation' have been in the focus of academic research for quite some time now. They have often been seen as the result of growing *polis*-communities. In this view, population growth is assumed to have led to depleted soils and consequently to a shortage of natural resources (e.g. Lohmann 2007).² These, in turn, were sometimes thought to have led not just to economic but also to social conflict (e.g. Graham 1982, 157–159; Gorman 2001, 59 f.). Recent research, however, has demonstrated that such monocausal explanations and models for colonisation are limited in their perspective (e.g. Gorman 2001,

¹ The research for this paper was conducted as part of the project 'Search for Resources as an Incentive for Processes of Colonisation' (SFB 1070 RESOURCECULTURES, project B04) in Tübingen, 2015–2017. I would like to thank the anonymous reviewers for their helpful remarks and suggestions as well as D. Waller for proof-reading the text. Any remaining mistakes are of course my own.

² H. Lohmann developed a picture of the Milesian *chora* wherein they degraded from almost paradisiac conditions to an over-exploited natural environment during the period of time when Miletus grew into a large archaic *polis*. He believed 'Fernkolonisation', because of its 'higher economical potential', was the preferred solution to these problems of over-exploitation (Lohmann 2007, 375).

60; Tsatskhladze 2006, XVIII; Greaves 2010, 120 f.,³ Fornasier 2016, 4–6, 12–144). Nevertheless, concepts of a forced migration, i.e. as a reaction to a lack of natural resources (e.g. Graham 1982, 157–159;⁵ Zin'ko 2014, esp. 283 f.), the loss of land due to conflicts with neighbours such as the expanding Lydian empire (Greaves 2007, 17–19; Knight forthcoming), or internal conflicts (Dougherty 1993; 1998; Bernstein 2004) still dominate the discussion. It should, however, not be ignored that migration in some cases may have presented a positive opportunity for the individual actor: a means of building one's social status, increasing one's social and political self-determination or shaping and strengthening bonds with members of other elites that might also have resulted in an exchange of tangible (e.g. metals, timber, leather and pelts, fish) and intangible resources (know-how and access to networks or techniques). Applying the methodological tools elaborated in the SFB 1070 RESOURCECULTURES (at Tübingen University),⁶ a systematic examination of the ties between resource complexes and migration in the Black Sea regions was attempted. The concept of resources adopted by the SFB goes beyond a limited understanding of resources as 'raw materials' and their economic potential; it expands to include their social dimension, such that 'Resources generally are seen as means to create, sustain and alter social relations, units and identities within the framework of cultural ideas and practices. It is assumed that resources are variable not only culturally, but

chronologically as well, and are affected by historical change' (Hardenberg et al. 2017, 16). Furthermore, resources are seen in this view to occur in complexes.⁷ The present paper focuses on the manifold ways in which the Pontic waters were employed as resources during the 'Great Greek Colonisation'.

Though certain evidence from later migration phenomena suggests otherwise,⁸ work on 'Greek Colonisation' often presupposes that such processes of migration were based on long-standing networks (i.e. trade, guest-friendship/*xenia*) between members of social elites (Graham 1982; 2001; Sens 2009, 39–51; Fornasier 2016, 5). Sites like Pithekoussai in the west are good (though often complex) examples of places where the cultural transfers that resulted from these networks became visible in the archaeological record.⁹ The situation in the Black Sea regions, however – though it is sometimes assumed to be similar – remains problematic.¹⁰ In fact, there is not enough extant archaeological evidence from these regions to presuppose direct, frequent 'proto-colonial' cultural contacts.¹¹

The earliest Greek texts only vaguely outline the Black Sea region as part of the scene of various legendary tales (Ivanchik 2005, 18–109; Sens 2009, 41–46). The Homeric epics (*Iliad* 7, 467–471.

3 Greaves argues that the main motivation for migration was over-population and a lack of land due to the loss of territory to the Lydians and Persians. See also Greaves 2007.

4 J. Fornasier stresses individual or behavioural motivations for colonisation, e.g. an exploratory spirit (as suggested by Larenok/Dally 2002, 14). He also throws the idea of an organised wave of migration into doubt: 'Nichts spricht aber für die Annahme einer 'Initialzündung' zu gezielten Emigrationsvorgängen, sie sind weder historisch noch archäologisch nachweisbar' (Fornasier 2016, 14).

5 Graham believed that overpopulation and the need to create access to new agricultural and trading opportunities played a crucial role in colonisation. Regarding trade opportunities, see also Dunham 1915. In a similar fashion, A. Greaves emphasises that 'trade cannot be understood in isolation from agriculture in an agrarian society like Greece' (Greaves 2007, 18); analysed in light of colonisation, archaeologically invisible commodities have to be taken into account (Greaves 2007, 12 f.; 18 f.).

6 For theoretical works, see esp. Bartelheim et al. 2015; Hardenberg et al. 2017.

7 This corresponds with S. Gudeman's understanding of 'the base': 'consisting of entities that people appropriate, make, allocate and use in relation to one another, the base is locally and historically formed' (Gudeman 2005, 97).

8 I.e. Iceland or Greenland. I thank the anonymous reviewer for this helpful remark.

9 For Pithekoussai, e.g. Hall 2004, esp. 35; Kelley 2012.

10 Fornasier (2016, 5) argues for a continuation or renewal of Mycenaean trade networks. Objects like ox-hide ingots (Leštakov 2007), swords in Mycenaean shapes (Athanasov/Krauß 2015, 64 f.; Athanasov et al. 2012), and stone anchors (Bass 1986) were sometimes presented as evidence for cultural contacts with the Eastern Mediterranean in the Bronze Age, but most of the objects under discussion are controversial for various reasons (for ox-hide ingots, see Boer 2006/2007, 289–295. For problems with the supposed Mycenaean date of the stone anchors, see Hiller 1991, 209; Boer 2006/2007, 285–287). Regarding the absence of Mycenaean pottery in most of the Black Sea regions, see French 1982; Bouzek 1990a; 1990b; more optimistic: Greaves 2002, 104, who attempts to explain this lack of pottery by a rise in sea level and modern building activity.

11 Boer 2006/2007; Athanasov/Krauß 2015, 64, 66; Tsatskhladze 2016 deals critically with recent suggestions concerning pre/protocolonial links regarding Berezan and the Cimmerian Bosphorus by Буйских 2015a; 2015b.

21, 40 f. 23, 746 f; *Odyssey* 10, 137. 11, 254–259. 12, 59–72), as well as Hesiod's *Theogony* (956–962, 992–1002), mention the saga of the Argonauts.¹² The Trojan catalogue of ships in the *Iliad* (851–857) names several settlements on the southern coast of the Black Sea (Manolidakis 2013). In his list of large rivers, Hesiodus mentions both Istros and Phasis (Hesiodus, *Theogony* 339 f.), both of which flow into the Black Sea.¹³ The Colchis is mentioned for the first time in a work attributed to Eumelos of Corinth (Jacoby 1923–1958, 451 F1-9);¹⁴ the dating of this work, however, is highly uncertain. In a fragment attributed to Mimnermus (Nanno, Fr. 11), the Golden Fleece, Aia and Aietes, as well as Jason and Pelias, appear; finally, a 'polis of Aietes' (Αἰητας πόλις) is said to be located at the edge of *Okeanos*.¹⁵ According to Herodotus, the earliest maps of the world (probably based on Anaximander of Miletus and later refined by Hecataeus) presented an inaccurate picture of the region on the edge of the world (Herodotus, *Histories*. 2, 23. 4, 36).¹⁶ As such, Herodotus adds some further descriptions (4, 1–144). These descriptions sketch a hostile world inhabited by hostile peoples and feature highly mythological components (Жебелев 1953, 328–331; Hind 2011).

In contrast to Herodotus' fairly negative portrayal, later literary sources (as well as modern research) attempted to elaborate several possible 'pull-factors' (Lee 1966) that would have attracted

people to the newly developed target regions: tangible and intangible resources, such as access to ores (and thus metals, e.g. Копейкина 1981; Treister 1996, 31; Greaves 2002, 35; 2007, 11),¹⁷ trading networks (e.g. Manolidakis 2016), land suitable for cultivation (Лапин 1966),¹⁸ pasture, and/or hunting (Одрін 2003). Large woods provided both timber (Doonan 2002, 190–192; 2004, 19 f.; Hannestad 2007) and hunting opportunities,¹⁹ while the waters of the Danube, Dnepr, Bug, Don, Kuban, and Rioni served as fishing grounds and connectors to far-reaching networks.

Coastal Marshlands in the Estuaries of Large Rivers

It is indeed remarkable that most of the earliest Greek *apoikiai* were founded in the marshlands and lagoons of the estuaries of large rivers (*fig. 1*): Histria in the estuary of the ancient Histros (the Danube),²⁰ Borysthene/Berezan in the estuary of both Bug and Dnjepr (Hypanis and Borysthene),²¹ Pantikapaion in the estuary of the Kuban

¹² For commentaries see West 1966, 48–50, 397–399, 434–437; Braund 1998, 289 f.; Podosinov 2013; Manolidakis 2015.

¹³ For the problem of monolithic modern identifications, esp. of the Phasis, see Dan 2016.

¹⁴ Jacoby 1923–1958, F1-9 = Bernabé 1987, F1-10 = Davies 1988, T1–2, F1-12. For comments see West 2003, 118–126; Sens 2009, 42 f., ref. 40.

¹⁵ For comments, see Allen 1993, 87–93; Dräger 1993, 31–35; Sens 2009 43. For criticism of some attempts to connect the saga of the Argonauts with a hunt for gold in the Colchis see: Tsetskhladze 1994, 114 f.

¹⁶ Herodotus openly criticises his cartographic precursors without mentioning their names. See West 1991. As to whether Herodotus is really referring to maps, see Bichler 2007, 75 f. with further references. For the map of Anaximander and Hecataeus, see Heilen 2000; Couprie 2003, 194–201 (Anaximander); Couprie 2011, 79–86 (Anaximander). On early mapping with special attention to the Pontos, see Boshnakov 2012. For the perception of space in archaic Greece, see Gehrke 2007, with Pl. 3 (reconstructed maps of Eratosthenes and Herodotus). For Herodotus more specifically, see esp. Bichler 2007 with Pl. 5: 1 (reconstructed map of Herodotus).

¹⁷ For critical arguments against metals as a driving force for colonisation, see esp. Tsetskhladze 1994, 124; Treister/Tsetskhladze 1995; Treister 1998; Tsetskhladze 2006, XXIX. Some regions were not well furnished with ore at all.

¹⁸ For Лапин (1966), the agricultural opportunities provided by the 'empty land' on the northern coast of the Black Sea was a primary motivator for colonisation. For Berezan/Olbia, see Лейпунская 1981, esp. 150. For Kerkinitis, a coastal settlement in the Crimea, see Щеглов (1978), who argues against early cultural contacts. For the north eastern shore of the Black Sea (the Don delta), see also Брашинский 1981, esp. 87 f., who argues against precolonial contacts with local inhabitants (Книпович 1949). For a critical discussion of surplus-production (which considers the time-consuming but necessary process of adaption to different soils and seeds), see esp. Одрін 2010; 2015. For the discussion if grain might have been traded from Scythians from the forest steppe see Povalachev 2008, 31 and Povalachev 2011, 89–91 with further references. For the role of grain cultivation and export in the Classical period see Moreno 2007 and Tsetskhladze 2008.

¹⁹ Apart from a fragmentary lead letter from the 6th cent. BCE (Vinogradov 1998, 157–160, Nr. 2 verso; Eidinow/Taylor 2010, 32 ref. 11. 55, E4b), which mentions clothes made of leather or pelts, most literary evidence for the trade of these commodities (Demosthenes, orationes 34, 10; Strabo 11, 2, 3) dates to later periods.

²⁰ See Vespremeanu-Stroe et al. 2013; for early Histria esp. Avram et al. 2004; 2013, 41, 54 f.

²¹ The settlement of Berezan is discussed below (with bibliographical references).

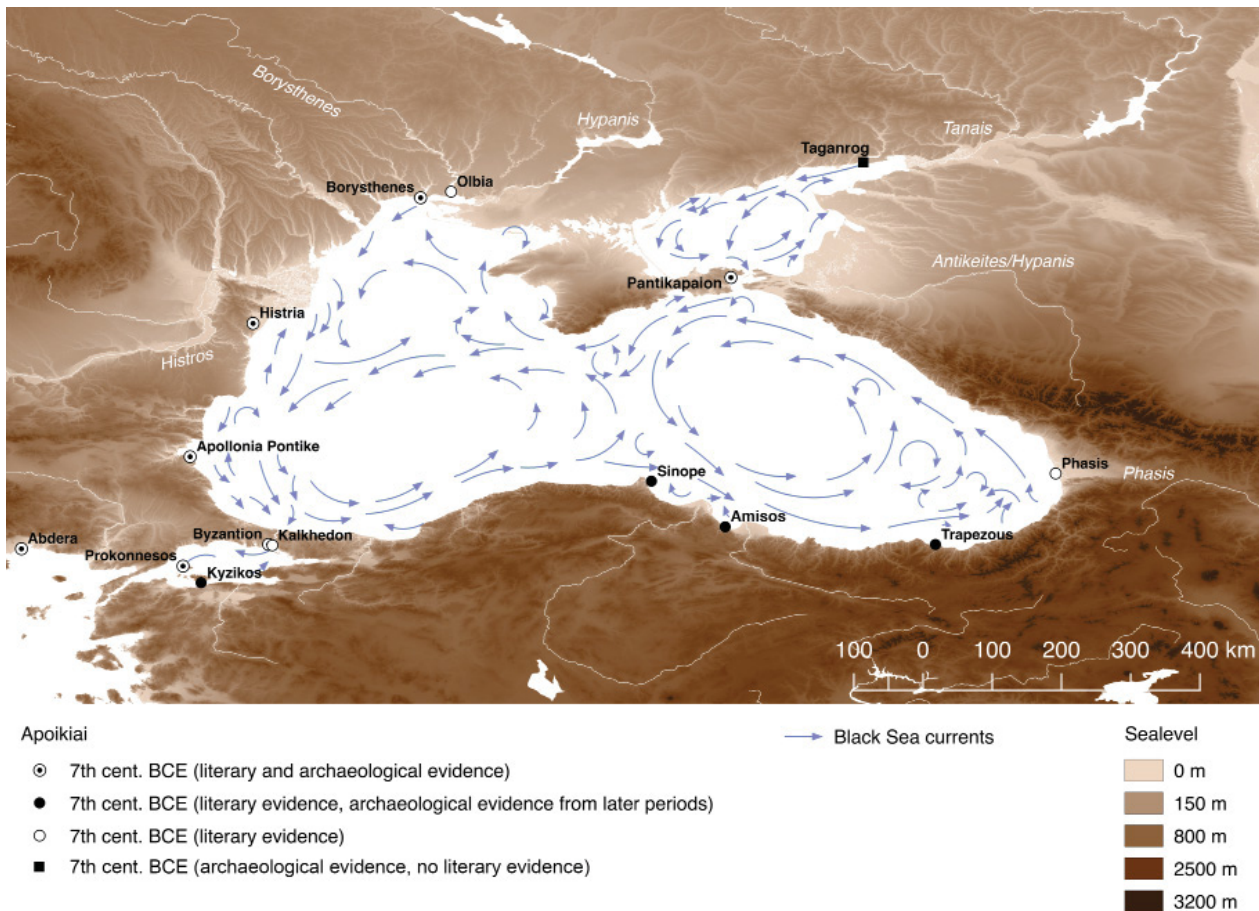


Fig. 1. Early *apoikiai* at the shores of the Black Sea and currents of the Black Sea. Map (V. Sossau) on the basis of data provided by © OpenStreetMap and pleiades.stoa.org © Ancient World Mapping Center and Institute for the Study of the Ancient World.

(Antikeites/Hypanis),²² and the only archaeologically attested settlement at Taganrog (esp. Dally et al. 2009) in the estuary of the Don (Tanais). River deltas and their wetlands were considered unfavourable environments for a long time. P. Horden and N. Purcell (2000), however, have convincingly argued that coastal marshlands in the estuaries of large rivers, in fact, offer several opportunities: they meet basic needs such as access to freshwater and salt (for salt see Højte 2005, 154–156) and provide opportunities for animal husbandry, hunting, and fishing. The latter is attested to by the late antique poet Athenaeus (*Deipnosophistae* 8, 56 = 358a):

‘οἱ δὲ τόποι τῆς θαλάσσης ὅπου ποταμοὶ
καὶ λίμναι συμβάλλουσιν, ἔτι δὲ τενάγη
μεγάλα καὶ κόλποι θαλάττης εἰσὶν, ἐνταῦθα

μὲν πάντες οἱ ἰχθύες εἰσὶν ὑγρότεροι καὶ
μᾶλλον πίονες ὑπάρχουσι καὶ ἐσθίεσθαι
μὲν εἰσὶν ἡδίους, πρὸς δὲ τὴν πέψιν καὶ
τροφὴν γίνονται χεῖρους.

Spots in the sea where rivers or marshes have outlets, or where there are large shallow areas or gulfs in the sea – the fish in these areas are all moister and fatter; they also have a better flavour, but are not as easily digested and are less nourishing’ (Translation: S. D. Olson 2008, 137–139).

The location of settlements in the estuaries of large rivers allowed a high degree of connectivity with both the hinterland and towards the sea. The redistributive engagement of micro-regions, both through low-level connectivity and larger-scale networks, also provided opportunities for coping with the risks inherent to the provision of food (agricultural, as well as hunting and gathering, see Horden/Purcell 2000, esp. 178, 377–400). In the Black Sea regions, however, it remains challenging

²² See Tolstikov et al. 2017; Толстикова et al. 2017, 94–107; 111–130 pl. 94–100.

to reconstruct the ways in which these connections (which certainly existed) came together in praxis.

It often has been suggested that the rivers in the vicinity of the early coastal *apoikiai* might have provided access to networks that reached far into the northern steppe²³ for pioneering and trading activities rather than actual migration movements (e.g. Копейкина 1979 or Щеглов 1981).²⁴ Thus the status of these settlements as *emporion* (trading centres) rather than *apoikiai* (homes away from home) has often been stressed (Bujskikh 2007, most recently Fornasier 2016, 12 f.). A strict dividing line between these types of settlement remains hard to draw, however, for while an *emporion* may at first glance require neither domestic architecture nor animal husbandry, as soon as a number of people stay in any one certain place, however temporary, they have to sustain themselves (see also Horden/Purcell 2000).

Fish are repeatedly mentioned as a natural and economic resource in ancient literary sources that refer to the Thracian Bosphorus and the Black Sea region. Though there are no mentions of fish in specific areas in the Homeric texts and the books of Hesiod, Herodotus in his Histories refers to fish in the Thracian Bosphorus (4, 88), in the Borysthenes (4, 53, 2–3), the Araxes (1, 216), as well as the praxis of frying dried fish in Thracian Chersonese (9, 120), and a salty lake full of fish close to Pistyros, Thrace (7, 109).²⁵ He also notes that the region provides salt, which is necessary for the processing and storage of fish products (Herodotus, Histories 4, 53, 2).²⁶

The *apoikia* of Borysthenes, which has often been identified with the island of Berezan, is one

of the earliest Greek settlements in the Black Sea region. The settlement was founded in the estuary of the Bug (Hypanis) and the Dnjepr (Borysthenes) rivers. Its earliest phases are characterised by so-called dugouts, simple huts that were partly dug into the soil and covered with constructions of wooden posts. These structures (some of which may have been dwellings)²⁷ have been the subject of extensive discussion in recent decades.²⁸ It has been argued that both the dugouts and the handmade pottery found within the settlement are evidence for pre-Greek inhabitants of the area (e.g. Solovyov 1999) and that the site was visited only occasionally during a ‘pioneering phase’ of Ionian exploration.²⁹ On the other hand, the handmade pottery discovered at Berezan is hardly individuated enough to attribute it to a specific group of people (Tsetsckhladze 2004, esp. 256 f.); it is also problematic to limit Ionian fine ware to Ionian settlers (Tsetsckhladze 2012). In addition, the archaeological evidence makes clear that the dugout structures not only characterise the very earliest period of the settlement but also occur in later phases. They appear alongside or maybe shortly before more elaborate structures with rectangular plans; these latter structures appear from the second half of the 6th cent. BCE (e.g. Tsetsckhladze 2004; Chistov 2016; Чистов 2017). Despite many years of excavations and research, it is still debatable whether the first Ionian pioneers founded their settlement on uninhabited land or whether they encountered local communities already living in

23 For Greek fine wares of the 7th cent. BCE in Nemirovo, a North-Scythian site in the Forest-Steppe, see Vachtina 2007, esp. 26–34.

24 Копейкина (1979, 107–109) stresses the importance of the export of Greek products in Berezan and Histria; Щеглов (1981, 211) identifies the primary goal behind the foundation of Chersonesos as the control of Black Sea trade routes (although there is no evidence for trading contacts between Greeks and Scythians in the area during the 6th and 5th cent. BCE).

25 For Borysthenes, see also Plinius maior, naturalis historia 9, 17, 45 f. Regarding the migration of fish in the Black Sea and Bosphorus, see below.

26 For a later reference, see Dio Chrysostomos 36.

27 V. D. Kuznetsov (1999) doubts the idea that the dugouts served as dwellings.

28 It is impossible to provide a comprehensive overview of the detailed discussion of dugouts here. For a recent overview with further references, see Fornasier 2016, 10–14, 27–32. For a comprehensive discussion of the different approaches, see Tsetsckhladze 2004. Also (selection): Tsetsckhladze 2002; 2016. Regarding Berezan (selection): Chistov 2016; Чистов 2017. D. Чистов (2017) considers some of the structures to be dwellings and others to be storage pits. In his opinion, the so-called ‘semi-dugouts’ (or ‘colonist’s houses’) mark the transition between a first phase (late 7th– first half of the 6th cent. BCE) and a ‘second wave of colonization’ (during which the semi-dugouts served as first, temporary shelters). Olbia: most recently Bujskikh 2017. For dugout structures at Sinop see Doonan et al. 2017.

29 Solovyov (1999, 42–52) has considered a possible Scythian influence on the building technology, but this assumption cannot be confirmed. E.g. Bujskikh 2007, 121 f.

the area.³⁰ While the ethnic or cultural identity of Berezan's inhabitants remains an unresolved question, studies of the archaeozoological remains of the archaic phases of the settlement (Журавлев 1983a; 1983b; 1987; Журавлев et al. 1990; Яниш/Каспаров 2015) give us an idea on what these people actually lived on. Consequently, this evidence can shed light on the nature of the settlement and its inhabitants.

The archaeozoological record shows that domestic animals (sheep and goats above all, which in most cases are difficult to distinguish in the record, as well as cattle), show up in high percentages (Журавлев 1983a; 1983b; 1987; Журавлев et al. 1990; Яниш/Каспаров 2015, 130, tab. 7). Coastal marshlands offer excellent opportunities for animal husbandry and it seems that the inhabitants of Berezan benefitted from that. Furthermore, a recent study shows a very high percentage of domestic animals in contrast to a low number of wild mammal's remains such as red deer, boar, hares, and fox (which may have been hunted for their furs). Given the rich hunting opportunities in coastal marshlands, it is surprising that the bones of all wild mammal species amount to only 0,5% of the total evidence (Яниш/Каспаров 2015). Birds, too, occur in very low numbers (1,1%), although this impression may be artificial and result from the poorer state of preservation of smaller animal bones in contrast to larger ones. What is striking, however, is the variety of bird species that show up in the record. These consist mainly of water birds, with an especially high percentage of cormorants and mallard ducks (Яниш/Каспаров 2015, 137 tab. 11).

All in all, the archaeozoological record thus speaks in favour of a permanent, or at least semi-permanent, settlement (as opposed to a site only occasionally visited). Another aspect evident in this study is the comparatively high amount of fish bones (9,3%: Яниш/Каспаров 2015, 130 tab. 7). Fish bones, especially those belonging to smaller species, are usually the worst-preserved

of all bones. Due to their small size, they also often tend to slip through archaeological sieves during washing. This remaining mass of bones thus suggests a high amount of fish, as suggested by О. Одрін, according to whom we may still underestimate the importance of fishing for Berezan (Одрін 2008, 71 f.).

Herodotus attests that the Borysthenes (Dnepr) was rich in high-quality fish by characterising the river as *ιχθυόεντα*, 'full of fish' (Histories 4, 53, 2). With the *ἀντακαίους* (4, 53, 3), which he describes as a large and boneless fish that was caught in the Borysthenes and subsequently salted, he probably refers to the (beluga?) sturgeon (see also Plinius, *naturalis historia* 9, 17). In fact, sturgeon bones comprise the highest proportion of fish bones discovered in Berezan (Яниш/Каспаров 2015, 126 with tab. 1). Most of the preserved bones belong to taller species, like sturgeon, carp, catfish, and pike, but this is probably a result of the greater visibility of larger species in the archaeological record (O'Connor 2000, 31) and does not necessarily reflect a preference for these species (as suggested by Højte 2005, 159 ref. 32 based on the results of Ivanova 1994). It is interesting to note, however, that only freshwater fish or fish migrating from saltwater into the large freshwater rivers appear to have been consumed. No traces of marine fish, such as pelagic fish, have been found thus far.

Literary sources, as well as extensive facilities for salting fish in the northern Black Sea region, suggest that (marine) fish products were exported from the late-classical period onwards (Højte 2005).³¹ Such exports are sometimes also presupposed for the archaic period,³² but at least until now, neither archaeological nor literary evidence support a large-scale commercial exploitation of

³⁰ For possible cultural contacts with established local communities in the northern Black Sea region see Марченко 1981, particularly for Berezan, Марченко 1979 (put into perspective in Domanskji/Marčenko 2003, 30). Contra: e.g. Лапин 1966 and Лейпунская 1981, esp. 151.

³¹ Ancient literary sources: with regard to *pelamydes* (and other fish from the Black Sea), see Aristoteles, *historia animalium* 598a. 598b. 599a; Strabo 7, 6, 2; Plinius maior, *naturalis historia* 9, 18–20; Aelianus, *de natura animalium* 9, 42. 15, 5–6. 15–10. Regarding the abundance of fish in the Black Sea and its importance as a spawning ground, see Aelianus, *de natura animalium* 4, 9, 9, 59. Mulletts from the Northern Ocean: Plinius maior, *naturalis historia* 9, 30; Strabo 7, 4, 6 (salted fish for Athens); Mackerels from the Euxine: Aelianus, *de natura animalium* 10, 6.

³² E.g. Minns 1913, 6 f.; Glover 1942, esp. 85–87. More recently Boardman 2011, who laments the current poor state of research.

fish that early. Therefore, it seems unlikely that economic considerations alone stimulated the foundation of the settlement. The resource complexes of waters in the vicinity of Berezan provided a great variety of opportunities (as described above) that might have been decisive factors in choosing the site for a new settlement.

Coastal Fishing: Black Sea Currents and Migratory Fish

The Black Sea has been famous for its rich population of marine fish, in particular both small and larger pelagic fish, for a long time.³³ It was known from antiquity that each spring, *pelamys* (bonito/bluefish/tuna?) migrated through the Thracian Bosphorus into the Black Sea to spawn. Aristoteles (*historia animalium* 598b) notes that they kept to the right as they entered, while Strabo claims that young tunny moved to the sea of Azov (Strabo 7, 6, 2). Plinius (*naturalis historiae* 8, 20, 50) and Opianus (*Halieutica* 4, 504–508) add that the fish migrated back into the Black Sea in schools down alongside the Asiatic coast, when they were growing. At Sinope they were considered big enough to be caught and salted, but it was even easier to catch them a little later, as they headed back through the Thracian Bosphorus on their way out into the Mediterranean. Frightened by a white rock at the coast of Kalchedon, the fish turned towards the other shore, were caught by the current, and driven into the shallow waters at the Golden Horn close to Byzantium,³⁴ a settlement ideally positioned at the gates of the Black sea.³⁵ The credibility of these sources was thrown into doubt by E. H. Minns, who noted that migrations

into the sea of Azov are not known of ‘any sort of tuna’ (Minns 1913, 6). However, several of the most commercially valuable fish in the Black Sea region were migratory (until recently). Among the fish that used to enter the Black Sea each spring (May–June) were large schools of mackerel-related species like *sarda*, *pomatomus*, and *thunnus*, as well as ray-finned fish like *spratella*, *sardina*, and *engraulis*. Most of these species migrated to spawn, while anchovies (*engraulis*) relocated in order to feed (Caspers 1957, 866). In autumn, these species moved back to the Sea of Marmara and the Aegean for winter, following the current along the shoreline (Caspers 1957, 866 f.; Prodanov et al. 1997, 124; Doonan 2004, 19, fig. 5–15). The highly reproductive mackerel-related bonito (*sarda*) and blue fish (*pomatomus*) attracted coastal fishers in all periods.³⁶ In contrast to the antique texts cited above, however, none of the larger mackerel-related fish are known to have entered the sea of Azov: it seems possible that the ancient authors confused young *pelamys* with the smaller species of anchovies (*engraulis*) and herrings (*caspiola* and *harengula*); alongside mullets (*mugil*) and goatfish (*mullus*), these (until recently) used to migrate to the sea of Azov through the strait of Kerch and leave it again in winter, spreading down south along the coasts of Crimea and Caucasus, where they re-joined the schools of pelamids (Caspers 1957, 866–868).

Archaeological evidence for the praxis of coastal marine fishing, such as the construction of watch towers (σκοπιά) in order to observe schools of fish (Højte 2005, 138), or the remains of installations like fish traps along the shore, have proven

³³ For an overview (based mainly on literary evidence) of the importance of marine fishing for the Black Sea, especially Sinope, see Doonan 2002, 187–189.

³⁴ Strabo 7, 6, 2; Plinius maior, *naturalis historia* 8, 20, 50; Aelianus, *de natura animalium* 9, 42, 15, 5–6. Regarding the strong current flowing down to Byzantium see Procopius, *Bellum Gothicum* 8, 6, 19–28.

³⁵ The political dimensions of the foundation of the presumably Megarian site of Byzantium in the 7th cent. BCE., which was said to have involved violent conflicts with the Thracians, has often been emphasised from ancient times, e.g. Polybios 4, 38, 43 f. (advantages), 45 (major disadvantages). See also Engster 2014.

³⁶ Between 1967 and 1992, 72,32% of the total catch of bonito was still made in the Black Sea, and 23,06% in the Sea of Marmara, while such stocks played a comparably marginal role in the Aegean (4,52%): Prodanov et al. 1997, 125. Bluefish was mostly caught in the Black Sea (69,72% of the total blue fish catch) between 1950 and 1992, primarily West of Sinop – it is assumed that these were caught mostly during their migration through the Bosphorus in spring and autumn: Prodanov et al. 1997, 126 f. Due to pollution and overfishing, the migration of these species has now almost ceased. Similar problems, alongside an increase in the numbers of a predatory comb jelly (*ctenophora*) and an increasing salination of the Sea of Azov, have resulted in several collapses of stocks of both small pelagic fish as well as freshwater species like sturgeons: Lleonart 2005, esp. 58 f.; Barros 2011, 85–87).

hard to identify (Lytle 2012, esp. 24–26, 31, 34; Russell 2017, 152–159).³⁷ Due to massive overbuilding, it is necessary to reconstruct the urban structure of Byzantium and its harbours primarily from literary sources, which do not inform us about the earliest stages of the *apoikia* (Engster 2014, esp. 390–396).

More promising evidence is to be found at Sinop. For the first settlements around the coast of Sinop (dating back to the Early Bronze Age), which are highly visible from both land and sea routes, connectivity seems to have been a central interest. O. Doonan observed an increasing orientation towards the sea at the end of the 2nd and beginning of the 1st mill. BCE, including an intensified exploitation of maritime resources (Doonan 2004, 55–67). The Greek *apoikia*, which late literary sources date to the 7th cent. BCE, was oriented towards the shore and seemingly had little contact with the hinterland until the 5th/4th cent. BCE (Doonan 2004, esp. 71 f., 76 f., 91 f.). Recent excavations have revealed a dugout structure at Sinop Kale containing handmade pottery, fish bones, animal bones, and a bone fish hook. The site was thus interpreted as a temporary fishing camp and the excavator assumes that ‘the seasonal mobility patterns of these fish populations’ were a ‘powerful determining factor that drove fishing communities to adopt mobile settlement strategies and stimulated incipient trade networks’ (Doonan et al. 2017).

It was often suggested that fish was considered one of the prime export goods of the Black Sea regions from early times (e.g. Minns 1913, 6 f.; Glover 1942, esp. 85–87; Boardman 2011). Fishing equipment (such as weights, sinkers, and harpoons and needles for the preparation and repair of nets) has been discovered at almost any given site along the shores of the Black Sea regardless of its dating (Højte 2005, 135–138.) but these objects can hardly be treated as evidence for a specialised fishing settlement (Domanskji/Marčenko 2003, 29 f.). To what extent fishing was practiced in the earlier periods remains debatable: did it serve mainly to meet the needs of local consumption, or was it practised to such an extent that it allowed for the exportation

of fish products? In Gallant’s opinion, the total catch from this area was hardly enough to supply local needs even in the 20th cent. AD (Gallant 1985, 34–36),³⁸ while other researchers have stressed the importance of the trade in fish products at an early stage of the *apoikiai*.³⁹ However, any movement toward the quantification of the total catch based on material evidence provided by archaeological contexts is problematic (Højte 2005, 139). Fish processing facilities with salting installations were discovered at a number of sites on the northern Black Sea, such as Elizavetovska near Tanais, Tyr-itake, Myrmekion, Chersonesos, and Zolotoe/Salat-chik (see Højte 2005, 141–156 with further references). But all of these date back to later periods (from the 5th cent. BCE, and there seems to have been a boom of their construction in Hellenistic/Roman times), as do most of the ancient literary references to salted fish from the Black Sea (for an extensive list see Demir 2007, 60 ref. 2). E. Lytle (2016) was only recently able to shed more light on the organisation of the trade in salted fish from the Black Sea to Athens in the 4th cent. BCE. Despite all the literary sources that stress the importance of fish for several sites along the shores of the Pontos, archaeological evidence for the processing of salted fish remains limited to the northern coast of the Black Sea (Højte 2005, 156).

Conclusion

Even though the actual scale of the exploitation of fish (especially marine fish) in the archaic period remains hard to gauge, and there is no reason to assume commercial exploitation, it seems highly probable that, at least in the case of Sinope, the migratory patterns of fish were well known. It has been suggested that sites with extraordinary good conditions for catching fish from the shore were

³⁷ Russell 2017 mostly discusses evidence from later periods.

³⁸ For an attempt to apply Gallant’s method, see Jacobsen 2005. For a critical discussion of Gallant’s arguments, see Lytle 2006, 99–104.

³⁹ Gajdukevič 1971, 184, 201, 411 f. Critical: Højte 2005, 136. E. Lytle interprets a passage in the pseudo-Aristotelian *Oeconomica* (1346 b20) as evidence for Byzantium’s claim to marine fishing rights ‘by the end of the Classical period and perhaps already in the sixth century bc’ Lytle 2012, 32. See also Lytle 2006, 108.

realised already in antiquity and deliberately chosen for the foundation of settlements – presumably alongside other considerations such as connectivity (see also Summerer 2007). In Berezan, the large Hypanis and Borysthenes rivers may have attracted newcomers for various reasons. While aspects of connectivity are hard to trace archaeologically, these most certainly played an important role. Zooarchaeological studies have shown that opportunities to exploit rich fresh water fish resources, as well as the use of coastal marches for husbandry, were taken advantage of for food supplies in the early settlements. Such resources might have played a decisive role (amongst other factors) in the choice of settlement sites. There is, however, no evidence for a surplus in production during the archaic period; consequently, it is impossible to hypothesise a reflux-oriented system

of early Pontic *apoikiai* serving their *metropoleis* as ‘supply stations’. Models suggesting a systematic establishment of *apoikiai* to exploit specific resources that were lacking in the settlers’ areas of origin thus are over-reaching.

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RESSOURCENKULTUREN 11

WATERS

This volume contains the conference contributions of scientists of the SFB 1070 presented at the conference 'Waters as a Resource', which was organized in cooperation with DEGUWA (Deutsche Gesellschaft zur Förderung der Unterwasserarchäologie e.V.) and took place in Tübingen from March 15th to 18th 2018.

The conference proceedings focus on different resources provided by waters or on the ResourceComplexes connected to them. After a brief reflection on theories and methods used within the SFB 1070 to study and understand resources, conceptions of water bodies in cultural anthropology and archaeology are compared using the examples of the Guadalquivir and Syr Darya Rivers. The third contribution investigates water management on islands and its influences on the identity of the islanders. The fourth chapter shows how seclusion on islands can be an important resource for island communities in the Strait of Sicily. Waters as means for identity formation in medieval monasteries is the focus of the fifth chapter, which is followed by a contribution that investigates the impact of maritime food sources on Viking Life. The last study analyses Greek settlements in the Black Sea. All contributions illustrate how a new perspective on resources opens up new possibilities for interpretation.



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