

An Approach to Byzantine Environmental History: Human-Animal Interactions

Environmental history deals with the reconstruction of past environmental conditions, human perception and appraisal of the environment, and interactions between humans and the natural world. These core tasks already indicate that a wealth of different subjects of archaeological and historical study offer points of contact with environmental history. A couple of years ago I tried to gain insight into Byzantine animal husbandry practices (a classic topic of economic history) and it proved almost impossible to find any information on Byzantine natural environments, on climate, vegetation, irrigation, and land use strategies. However, the more one knows about these conditions and the way they were counteracted, the more detailed and insightful the interpretation of the animal bone finds.

But how could it be possible to accomplish a reconstruction of environments for an empire that encompassed at times the whole eastern Mediterranean and which lasted a millennium, especially since these circumstances were constantly changing – and substantially so – because of human activity? The animal bones provide one part of the picture, the plant finds another, and palynological, pedological, geological and archaeometrical analyses, scientific dating methods, studies of written and pictorial sources, etc. further parts. Many small tesserae assemble to form a picture, which will probably remain fragmentary and which will never show an equally good resolution for all areas and periods. This interdisciplinary character of environmental history embraces not only different disciplines, but even distinct spheres of research: the sciences and the humanities. This renders environmental history a multifaceted yet cumbersome endeavour: findings from research communities with differing heuristic approaches need to be brought together under a common roof. Thanks to this conjuncture, environmental history has grown into a field of research with a comparably strong methodical, theoretical, and conceptual foundation¹. However, the integration of the findings in interdisciplinary case studies remains difficult: all parties (and these are rarely trained environmental historians) need to comprehend the heuristic potential and the basics of the methodologies applied, as well as the modes of source criticism of the other disciplines involved.

It is only recently that environmental history has become a subject within Byzantine studies. For a long time, the charac-

ter of the available sources had led Byzantine studies to fields that perhaps seemed more fruitful, more relevant, or easier to unlock. But now, research on Byzantine environments has gathered pace and various approaches are being put to the test: interdisciplinary case studies aim to comprehend the environments of local areas, studies on climate and vegetation history try to trace long-term developments in both small and large regions, and individual disciplines evaluate their sources with regard to questions of environmental history.

This paper chooses a zoo-centric approach and puts animals in focus. Even though I am a trained zooarchaeologist primarily dealing with archaeological animal bone finds, I attempt to incorporate other types of sources as well. Thereby I want to highlight how the study of human-animal relations (from whichever perspective) can contribute to an understanding of past environments and of the life people led in them – after all, animals were an integral part of everyday life. In our industrialised world, this fact has been somewhat forgotten. Hence, it seems acceptable to put a rather simple question at the centre of the following considerations: what role did animals actually play in Byzantine environments?

The examination of animals in this case is rather an examination of human-animal interactions because almost all sources at our disposal are man-made. Given the diversity of species people lived and still live together with, the interactions between »us« and »them« are manifold. The frame of this paper (and the state of research) is far from sufficient to allow for a comprehensive study of this huge variety. Instead, the paper aims to put animals back in focus and to point out their role as a small cog in a big wheel. They were so deeply entangled in all kinds of daily activities that they had an efficacy, for both society and the environment. They were agents.

Questions

The 2011 Mainz Conference put two questions into the focus: How did the Byzantines perceive their environments and in what ways did their activities lead to human-environmental interactions? The second question, especially, implicates the notion of an environment in constant flux: it does not only change through »natural« causes, but also through human

1 Winiwarter/Knoll, *Umweltgeschichte*.

activity. These changes lead to adaptations in human usage, which again have an effect on the environment, and so on.

The term »environment« was not defined prior to the conference. It can be understood in many ways. Today, the term is often associated with »destruction«. Hence, there is a tendency to romanticise »environment« as a kind of primordial »natural environment« which of course was scarcely existent in the Byzantine era. In this paper, the term is used in the direct sense of the word: the environment is what environs the individual, it is his or her realm of experience. Hence, the word encompasses the streets of the capital as well as the Negev desert, the Ionian Sea, the Thracian forests and the Cappadocian highlands. At the same time, it embraces animals in the sea as well as on land.

Against this backdrop the following questions will be investigated: 1) How did interactions with animals determine the respective environments of the Byzantines and their perceptions of them?², 2) How did these interactions affect these environments?, and 3) which tools do we have at our disposal to investigate such questions?

These questions will be illuminated for different animal groups that played major roles in the human-environment interactions of daily life. Given their pivotal importance for the everyday work of almost all people, be it as object or implement of agriculture, as riding animal, or as raw material, domestic animals will play the most prominent role. They are a means of human action within the environment, for instance in the case of the draught ox or a pastured flock of sheep. Due to their variegated usability, their large number and their impact on local to regional environments, this group of animals compelled their owners to a particularly intensive analysis of their respective eco-geographical situations. Furthermore, the human impact on landscapes resulting from the usage of this animal group was certainly comparably high because of the intensity of use – higher than with animals that were not brought into the environment by the Byzantines, but removed from it. Among these are fish, the second animal group analysed in this paper. The exploitation of fish and other water creatures was significant, both economically and with regard to environmental issues (as they open up other realms of experience, on the waves). Notable effects of a resource exploitation like fishery can be expected when the intensity of use exceeds the ability of the exploited populations to regenerate and the eco-systems are thrown out of balance. Lastly, the relevance of the remaining wild fauna will be outlined. This animal group had advantages: for instance,

those wild animals whose meat could be consumed from time to time. Yet it also comprised a range of pests. As barely controllable parts of the environment (e. g., locust infestations³), these could cause substantial devastations. In these cases, it is not the human who exploits the environment, but vice versa: »nature« takes possession of human life and resources. Depending on the destructiveness of the pests, reciprocities in this field of topics, in the form of crises or adaptation strategies, can become archaeologically graspable.

The Byzantine cultural background

Human-animal-relationships are complex and rarely straightforward, let alone logical⁴. Hence, it is barely possible to come to generalisations on a specifically Byzantine perception of animals as part of their experience⁵. Perceptions of animals depend on many factors, first and foremost on the species in question.

However, two formative aspects for the Byzantine culture will briefly be discussed, Christianity and the Roman Heritage. Byzantium was a Roman Empire transforming into a medieval Christian state. One basis of the Roman Empire's success had been the optimisation of its resource utilisation by means of an intensive study of nature and the effects on it of human activities. Based on these findings, the Romans had developed a utilitarian mode of agriculture and livestock husbandry that had raised these vital economic branches to a very high level. This can not only be learned from Roman agricultural treatises, but can also be deduced from animal bone finds from Roman sites⁶.

For this purpose, the animals had been subjected to a profit-orientated perspective. At least the economically relevant livestock species had the status of a commodity, which usually was granted as much attention as necessary in order to maintain its value and usability⁷. This can be concluded from some laws of the 5th century Codex Theodosianus which aimed to improve the treatment of animals employed at the state postal service. These were targeted at maintaining the workforce of valuable trained oxen, horses, and mules⁸. The written record from the Byzantine period provides evidence that »scientific« topics were subordinate to theology⁹. However, ancient agricultural knowledge, albeit barely expanded, was passed on: the *Geoponika* was a 10th century treatise which in large parts reproduces antique agrarian knowledge, e. g., by Palladius or Columella¹⁰. During the first millennium

2 The discussion of the first question primarily aims to shift the attention of research to the manifold interrelations between animals and Byzantine daily life. An interdisciplinary conference volume published recently already hints to a growing interest in the field of Byzantine human-animal relations: Anagnostakis/Kolias/Papadopoulou, *Animals and Environment*.

3 See the contribution by Klaus-Peter Todt and Bernd Vest in this book.

4 For an eye-opener concerning this, see the insightful book »Some We Love, Some We Hate, Some We Eat« by Hal Herzog.

5 Nevertheless, the accounts of attitudes towards animals in different eras as given by various authors in Dinzelbacher, *Mensch und Tier*, are interesting and good examples of how to approach these issues. I do not know of comparable studies that deal with the Byzantine period.

6 Joris Peters reviews the written evidence and the zooarchaeological state of research for the northern provinces: Peters, *Römische Tierhaltung und Tierzucht*.

7 Landfester, *Grundeinstellung* 140. – Bodson, *Welfare*.

8 e. g., *Cod. Th.* 8, 5, 2, see Stoffel, *Staatspost* 38.

9 Kádár, *Zoological Illuminations*.

10 Dalby, *Geoponika* 12-13.

agriculture evolved along the course set for it in the Roman centuries without major methodical or technological upheavals, and thus led the Roman agricultural tradition into the Middle Ages¹¹.

To which extent the now Christian culture influenced the daily handling of animals is hard to say. The Book of Genesis for instance combines aspects of coexistence and dominance. It depicts the Christian delight in the diversity and abundance of the paradisaical creation. At the same time, it subordinates animals to mankind, giving the latter the opportunity to put them into their service¹². To what extent animal exploitation took into account species-appropriate needs of the animals, and whether people »had mercy on them«¹³ as the Old Testament demands, remains unsolved.

Within the sphere of human-animal relations, the utilisation of most domestic and several wild species for food purposes certainly plays the major role throughout the history of mankind. In the Roman period, a culinary culture had evolved that revelled in diverse, spicy and sumptuous meals. This still forms the basis of Mediterranean cuisines. In the Byzantine centuries, those who could afford it maintained the tendency to opulence: the feasts of the high society were still marked by a plethora of delicacies¹⁴. The descriptions of these feasts stylised a culinary ideal which was far beyond reach of the majority of Byzantine people. Thus, it contributed to the halo of the imperial court and the upper strata of society. The meat of animals, particularly those from remote areas, which was among the most expensive dishes, played the leading role in these demonstrations¹⁵. To revel in meat consumption was a means to impress the masses that could not afford to eat meat at all, or at most occasionally. Fortunately, this practice did not contravene the Christian identity of the Byzantines: in contrast to other great religions, Christianity never tabooed the meat of particular species, as marked by a general consumption ban. Christian eating restrictions solely apply to periods of Lent¹⁶. Only in monasteries, where the adherence to spiritual commandments was handled most strictly, was meat generally not consumed, but at best some fish or seafood outside Lent¹⁷. A Middle Byzantine satire poem by Ptochoprodromos parodies the menu of the abbots in a Constantinopolitan monastery¹⁸. The sin of gluttony the

abbots indulge in (they are served dishes comprising no less than 18 fish species, partially in large amounts) is evocative of the antique delight in the richness of the sea¹⁹.

The abundance of wild creatures had formed the perception of nature in the Roman period. Byzantine depictions of nature are not as populated with a multitude of animals and plants as the paradisaical Nile mosaics of the Roman era were. Nevertheless, the art of the 5th and 6th centuries (especially) still draws considerably on nature motifs²⁰. In Byzantine writings of later centuries, the classical elements of the *locus amoenus* (rich vegetation, trees, shade, water, and birdsong) remain ideals, now also as characteristics of the Christian paradise²¹.

The aspects of human-animal interactions mentioned so far sketch static and controlled conditions, faunal resources people could thrive on. But these relationships also had drawbacks: the impossibility of always controlling nature reveals itself in its most frightening form in animal assaults on people (be it predator attacks or the transmission of diseases) or on their possessions (killing of livestock, harvest destruction by locusts or rodents). The Old Testament describes these calamities as a judgment from above. Accordingly, the disastrous Justinianic plague was considered by many Byzantines as a punishment for sins committed²². At the same time, faith was a source of hope in times of need²³. In the written sources, many examples can be found which illustrate how Christianity was a means to find explanations, comfort and confidence in facing the rigours of nature. At least in this respect religion certainly had an everyday relevance for the perception of nature.

Livestock

The largest part of the Byzantine population – supposedly a minimum of three quarters – were engaged in agriculture, both in animal husbandry and in arable farming. Not only in the first, but also in the latter sphere people interacted with their environment via animals. Without the use of animal labour and the manure they produced, the tilling of the soil was not possible, or only to a limited extent²⁴.

11 Toubert, *Agrarian Civilization* 379-380.

12 Gen 1:28. – See, e.g., John Chrysostom in his 9th homily; Maguire, *Earth and Ocean* 68-69.

13 For the attitude of the Christian Latin West, see Dinzelbacher, *Mensch und Tier* 266-269.

14 Malmberg, *Dazzling Dining*.

15 See the accounts of the »World on a plate« in Malmberg, *Dazzling Dining* 76: The emperor showed his far-reaching influence by serving delicacies from remote places.

16 Only monks subjected themselves often all year long to a Lenten diet, see Talbot, *Mealtime*. The wish of Christian ascetics to abjure meat completely can be seen as an amplification of Christian Lent rules, as their extension to the whole year.

17 Talbot, *Mealtime* 114. – This was a reason why the monasteries began to cultivate fish ponds, and, so it seems, quite profitably, see Dagron, *Poissons* 59.

18 Eideneier, *Tafelfreud*.

19 With the exception of the carp and the anadromous sturgeon, the abbots are served exclusively sea fish. The common monk only receives a fowl piece of tuna.

20 Maguire, *Earth and Ocean* 1.

21 See the contribution by Carolina Cupane in this book.

22 Stathakopoulos, *Crime and Punishment* 106. – For the utilisation of such crises for the legitimization of pagan and Christian beliefs in the Early Byzantine period, see Stathakopoulos, *Famine* 75-76.

23 Gilbert Dagron recounts an episode from the life of Luke the Stylite: some gillnet fishermen from Constantinople, who had suffered from empty nets for some time, called on the saint and asked him to pray for a better catch. Thereupon the nets were full again and the saint received his tithe (*apodekatosis*). The reason for the filled nets were probably rather the seasonal scombrid migrations than divine aid, as Dagron puts it. However, this is irrelevant because both sides profited. – Dagron, *Poissons* 61.

24 Bryer, *Means*.

The influence of the environment on animal husbandry strategies

Apart from domestic poultry, the main pillars of Byzantine animal husbandry were cattle, pigs, sheep and goats. The largest portion of meat consumed as well as numerous other raw materials was obtained from these species. Equids and camels, however, were usually kept only in small numbers²⁵.

All domestic species have their specific usages and thus their advantages. However, they also make demands concerning food, water, and care. These primarily environmental factors had to be taken into account for the layout of local modes of animal husbandry. Of course, a complex society like the Byzantine Empire had the possibility to compensate for deficient environmental conditions, e.g., through irrigation techniques or pasture strategies²⁶. But still it was necessary to consider the two poles »What do I want?« and »What is feasible here?« in order to engage in reasonably crisis-proof and efficient livestock farming.

According to the animal bone finds from archaeological excavations, sheep and goats were the main domestic livestock species in the Byzantine Empire. They are frugal and can be kept almost everywhere without effort (fig. 1)²⁷. Small ruminants are ideally suited to the climates and vegetations of the Mediterranean area, and they are already profitable during their lifetime: they are prolific and yield milk, wool, and hair.

The pig, on the contrary, can almost be considered a luxury animal because it demands energy-rich food and is replaceable. As it has no notable advantages during its lifetime, it was primarily raised for meat. Hence there was no usage that could not be made up for by other domestic species. One or two pigs can be kept conveniently at the house or farm because they can be fed with garbage. The animals produce comparably large litters. The piglets grow quickly and can be sold or killed in order to produce salt meat – there is no meat more suitable for this purpose than pork²⁸. Hence it comes as no surprise that in faunal materials throughout the empire pigs always appear in small to medium shares (fig. 1)²⁹. In the Roman centuries, the pig was the main provider of meat for urban populations³⁰. This clear primacy fades: between the 4th and the 6th century the inhabitants of Byzantine urban centres go over to primarily consuming sheep and goats³¹.

Given their suitability for heavy-duty labour, the keeping of cattle was always and everywhere desirable, if only in small

numbers. Until the invention of the horse collar no other animal was able to effect a comparable traction force. The degree to which the availability of draught cattle determined the economic power of the peasants can be deduced from the double meaning of the term *zeugarion*: It denotes a pair of oxen as well as the amount of land that can be farmed with it³². This tight correlation between the possession of labour animals and the crop yield was utilised by the state to assess the tax load for landowners³³. For the Early Byzantine there is not much documentary evidence. It is known, however, that Middle Byzantine peasants could rarely afford a pair of oxen. Often, they had only one, or no oxen at all and had to coordinate the use of oxen with other peasants³⁴. Hence it is likely that cattle were usually bred for labour purposes and that primarily surplus animals or those no longer suitable for labour were used for meat. The 10th century Book of the Eparch contains many regulations for the trade in sheep and pigs for meat purposes but none for the cattle meat market. This has sparked a debate about the Byzantine appreciation of beef³⁵. It seems that in Constantinople cattle was only secondarily the subject of a meat market but primarily the subject of a working animal market which employed special consultants, the *bothroi*³⁶. Still, young cattle that were never used for labour feature regularly in small numbers in Byzantine animal bone assemblages³⁷. Where the environmental conditions were too deficient to keep cattle, compromises had to be found, for instance the utilisation of equids, especially of mules and hinnies; in the Near East and North Africa also of dromedaries³⁸. Every piece of work the animals could not perform had to be made up for by human labour.

In cattle husbandry, the dependence of livestock breeding on environmental conditions becomes very clear: large herds could only be kept where enough pasture and water were available. A perennial supplementary feeding would have rendered cattle breeding inefficient. With the exception of the lush and mild Danube area, in the mountainous and sparsely vegetated Mediterranean these requirements presumably were met only occasionally (fig. 1)³⁹. In some arid areas beyond the influence of the Mediterranean climate such as the Eastern Desert on the Red Sea coast, cattle could not be kept at all⁴⁰.

For animal husbandry, the balancing act between environmental resources and the economic target was decisive. Local vegetation covers, the availability of fresh water and the general topographical situation influenced the composition

25 Kroll, *Tiere* 149-156. – Kaplan, *L'activité pastorale*.

26 See the contributions by Marlia Mundell Mango and Rainer Schreg in this book.

27 Kroll, *Tiere* 149-151.

28 Accordingly, the *Geoponika* deals only briefly with the pig and the salting of its meat, close to the chapter on salting fish, *Geop.* 19, 6-7; Dalby, *Geoponika* 336-338.

29 Kroll, *Tiere* 156-158.

30 King, *Diet*.

31 Kroll, *Tiere* 150.

32 Bartusis, *Zeugarion*.

33 In the 10th and 11th c. a *zeugaratos* who owned a pair of oxen had a fiscal value of 24 *nomismata*. A *boيداتos* owning one ox amounted to 12 *nomismata* and an *aktemon*, a landowner with no oxen at his disposal had a value of 6 *nomismata*, see Oikonomides, *Role of the State* 997.

34 Laiou, *Agrarian Economy* 340. – Lefort, *Rural Economy* 245-246.

35 Schmitt, *Fleischversorgung*. – Koder, *Rindfleisch*.

36 *Lib. praefecti* 21, 1-9 (german transl. 135-139). – Koder, *Bothros*.

37 Kroll, *Tiere* 162-163.

38 Kroll, *Tiere* 168-174.

39 Kroll, *Tiere* 161-165.

40 Van Neer/Lentacker, *Berenike* 348.



Fig. 1 Proportions of the domestic species sheep and goat (totalled), pig, and cattle in Byzantine animal bone assemblages. For the data sources see the bibliography. – (H. Baron, RGZM).

of the herds considerably⁴¹. Accordingly, the typical eastern Mediterranean livestock breeding tradition with its emphasis on sheep and goats and comparably low shares of pigs and cattle, was formed substantially by the environments which the Byzantines sought to use as efficiently as possible⁴².

Pastoral economy and overgrazing

The task of providing sustenance for livestock prescribed the activity zones of the rural population at least in part. Pastoral economy was such a vital part of agriculture that the treasury exploited it as a source of revenue by taxing communal pastures⁴³. For the Byzantine period, the degree to which local and transhumant pastoral strategies were applied is difficult to assess⁴⁴. Transhumant pasturing with its distant summer

and winter pasturages was feasible when the animals were primarily kept for meat and wool, and it suggested itself when the neighbouring pastures were meagre or limited. A continuous utilisation of fresh milk, however, was impossible because in the summer the animals were kept far from the consumers. Given the presumably high significance of sheep and goat milk in Byzantine dairying⁴⁵, probably at least part of the herds was pastured near the settlements. The *Nomos georgikos*, a 7th or 8th century compilation of rural laws from Asia Minor, gives an explicit indication of this⁴⁶. One of the laws deals with the delict of a hired shepherd milking sheep without the permission of their owner. It imposes the punishment of whipping and the withholding of the delinquent's pay⁴⁷. Most of these regulations apply to the care of cattle and donkeys. This can be seen as an implicit hint that small ruminants were often pastured transhumantly⁴⁸. This was not

41 Kroll, *Tiere* 149-154.

42 See the phrase »growing into the environment« in Teall, *Byzantine Agricultural Tradition* 36. Although a strong correlation between animal husbandry strategies and environmental conditions seems logical, there is a tendency in archaeology to generally refuse any environmental determinism. I would propound a comparably light form of such a determinism: the eco-geographical circumstances simply set the frame the agriculture could unfold in – making use of amelioration, irrigation, etc. – or not.

43 In the 10th and 11th c., the pasture tax *ennomion* amounted to 1 nomisma for 100 small ruminants or 1/3 or 1/12 nomisma for an oxen or a buffalo. The tax was also called *dekateia* and occasionally summer and winter pasturages are discriminated. This could be a hint to transhumance but it might also have other

explanations. From 12th sources the first mentions of a pasture tax for bees are known, *melissoennomion*. A comprehensive account of these taxes can be found in Oikonomides, *Role of the State* 998.

44 Toubert, *Agrarian Civilization*. – Lefort, *Rural Economy* 265.

45 Dalby, *Flavours* 144; 147.

46 Ashburner, *Farmer's Law*. – Górecki, *Rural Community*.

47 Ashburner, *Farmer's Law*. – Justinian's Institutes discriminate the usage rights of sheep on the one hand, and their produce, i. e. milk, wool, and lambs on the other hand, *Inst. lust.* 2, 5, 4, Birks/McLeod, *Institutes* 63.

48 The focus on labour animals could result from their higher value and the correspondingly higher loss.

feasible for labour animals because they were indispensable for agricultural purposes and had to be pastured locally. Hence, they were handed over to hired herdsmen in the morning who grouped the animals and brought them to local fallows, unworked land, or forests⁴⁹. The laws also regularise how to proceed if animals were lost during the pasture times, for instance when they were killed by wolves or had wandered off from the herd. Given the value especially of the labour animals entrusted to the care of the herdsmen, such losses were grave. Nevertheless, the presumption of innocence seems to have been legally applicable and the herdsmen had nothing to fear if they immediately reported the loss. This testifies to a good legal protection for the herdsmen. However, in the case where animals caused damage to cultivated land, the herdsman had to compensate for it⁵⁰. This regulation is an indication that the animals were pastured in the direct vicinity of towns and settlements, in the surrounding patchwork of gardens, fields, groves, vineyards, and fallows that expanded partially well within the city walls⁵¹.

In parts of the eastern Mediterranean a transhumant pastoralism is still practised today. In the Byzantine dominion, it was established presumably not later than the 10th/11th century⁵². In the North of the Empire the Vlachs, a shepherd tribe from the area of today's Romania, were formative in this process. They initiated a transhumance in the area of the Balkan Mountains and sold animals to the Byzantines⁵³. This work mode required a life for the shepherds extremely »close to nature«. They ranged mostly in the uncultivated hinterland, which was often mountainous and unexplored as regards infrastructures. Besides ethnic reservations, this outdoor life beyond civilisation contributed to the formation of a large societal chasm: »Pastoral nomadism and the development of seasonal grazing made the shepherds' world a closed society, with its primitive temporary settlements, migration routes, and unwritten laws. At this time, pastoral banditry and, in particular, cattle rustling constituted the common characteristic of a Mediterranean rural society marked everywhere by a great divide between shepherds and peasants«⁵⁴. This perception of transhumant shepherds as misfits or even criminals is in stark contrast to the trustworthy image of locally working herdsmen which the *Nomos georgikos* implies.

Bucolic scenes featuring shepherds play a role in Byzantine art, too⁵⁵. The way the herdsmen perceived their environment, however, certainly had little in common with these romantic scenes. It must have been formed by the necessity to

safely find food and fresh water for the herds. Apart from the risk of losing animals in difficult terrain or to wild predators, the herdsmen had to take care of health issues caused by, e. g., indigestible food, parasites, hoof afflictions, complications in pregnancy and birth, or injuries.

For many tasks, especially holding together the flock, well-trained herding dogs were indispensable⁵⁶. They certainly were an essential part of the shepherds' living environments and, more than that, presumably often their only companions on the summer pasturages.

As regards reciprocities between humans, animals, and the environment, especially in the field of pastoral economies, overgrazing immediately springs to mind. The resilience of many Mediterranean landscapes, i. e. the resistance and ability to recover, was rather low⁵⁷. This can be deduced from the fact that the native oak forests of the Mediterranean have formed different stages of degradation (Macchie, Garigue), due to intensive timber and firewood production, massive pasturing, and fires. However, these alterations to the vegetation are difficult to date. Hence there are almost no reliable proofs of a heavy strain on landscapes which occurred explicitly or mainly in the Byzantine period. It is presumably impossible to gain clear proof solely by means of zooarchaeology for specifically Byzantine overgrazing, even though animal bone finds can give indications. In the case of the settlement Eléftherna on Crete (dim. Rethymno/GR), diachronic changes in the shares of the livestock species were interpreted as a sign of deforestation. A decline of pig shares in the Early Byzantine period combined with lower withers heights is ascribed to a potential local decline of oaks⁵⁸. Interdisciplinary studies with a decidedly environmental research focus, which take into account archaeobiological and geological field data as well as remote-sensing and survey results, are certainly the best methodological approach to this field of research⁵⁹. For the Byzantine Empire, there is still room for pioneer work.

Other domestic animals

The sustenance of other domestic animals required less effort than the ungulates because they could be kept at home, demanded less water and food and could be fed food residues (or they even fed themselves). Among these, the chicken certainly played a significant role because it could be kept al-

49 On the interpretation of the *Nomos georgikos* as regards pasturing areas, see Kaplan, *L'activité pastorale*.

50 »If a herdsman receives an ox from a farmer in the morning and goes off and the ox gets separated from the mass of oxen and goes off and goes into cultivated plots or vineyards and does harm, let him not lose his wages, but let him make good the harm done.« Ashburner, *Farmer's Law*.

51 Koder, *Gemüse* 67-73. – Ljungkvist et al., *Sustainability*.

52 Toubert, *Agrarian Civilization* 382-383. – Lefort, *Rural Economy* 265.

53 Lefort, *Rural Economy* 265-266.

54 Toubert, *Agrarian Civilization* 383.

55 e. g., in the Great Palace of Constantinople, see Cimok, *Mosaics Istanbul* 15. – Furthermore, there is the well-known depiction of King David playing harp in the Paris Psalter, Par. gr. 139 fol. 1^v.

56 The high value of a trained sheep dog is apparent in one law of the *Nomos georgikos* which inflicts the punishment of 100 strokes and a double reimbursement of the dog's price for poisoning a sheep dog (Beck, *Byzantinisches Lesebuch* 111).

57 Geyer, *Landscape* 43.

58 Nobis, *Eléftherna* 415-418.

59 A comparable approach was carried out for the Roman period of Sagalassos, Kaptijn et al., *Sagalassos* 88-90. – See also the contribution by Katie Green in this book.

Fig. 2 Dovecotes on the front of rock-hewn dwellings in Göreme/TR. In the Early and Middle Byzantine Era many churches and large dwelling complexes were built into the tuff mountains of Cappadokia. Partially these have multiple storeys and are dozens of meters deep. They also comprise facilities like mills and stables. – (After Germanidou, Dovecotes 45 fig. 9).



most everywhere at low cost, was prolific, and produced eggs quite continuously. The latter could allow for some degree of subsistence, even in bad times⁶⁰. Unfortunately, the extent of Byzantine chicken husbandry is not assessable on the basis of the available sources⁶¹. These nondescript and ubiquitous creatures are barely mentioned in Byzantine writings and their zooarchaeological investigation is still undeveloped in the eastern Mediterranean. Often bones of this size are not recovered or remain unidentified due to the high biodiversity in this faunal class. Accordingly, the same of course applies to other birds, be they domestic or wild.

In some areas, definitely in the Levant and in Cappadocia (but presumably elsewhere as well), pigeons were kept intensively⁶². In Israel dovecotes were found that point to large-scale pigeon and dung production⁶³ and the rock-hewn cities of Cappadocia feature numerous nesting holes (fig. 2)⁶⁴. The *Geoponika* mentions pigeon dung as the best manure⁶⁵. Together with garbage accumulating in and around the buildings it was swept up from time to time⁶⁶ and scattered on the fields after a phase of rotting. The sherd-scatters that cover agricultural fields in some areas can be seen as remains of this practise⁶⁷.

Another bird which could be kept in the yard or brought to pastures was the goose⁶⁸. According to the *Geoponika*,

geese were fed with soaked wheat and barley in order to fatten their livers⁶⁹.

Such poultry was part of the domestic experience realm. It was omnipresent, always available and its feeding and care was part of daily routine. And more than that, via the grain it consumed and the dung it produced it interacted with the gardens and productive areas in the surroundings of the settlement. Hence, these animals were part of a complex material cycle, which had to be maintained in order to ensure a constant (if naturally unsteady) agricultural yield. As guardians of livestock and harvest, dogs and cats fit into this cycle as well as the domestic environment. Of course, these animals sometimes had an emotional special role to play. Especially the dog, which is due to its submissive social behaviour often perceived as particularly loyal and which can be of tremendous utility, always had an exceptional status amongst domestic animals⁷⁰. And the cat, too, which was according to the bone finds much rarer, found some devotees in the course of the Byzantine centuries, even though its image was not the best, as Byzantine writings show⁷¹. A large share of these prolific animals, however, ran wild. Even today, great efforts are made in the Mediterranean to cope with stray dogs and cats (fig. 3): apart from reproductive control by means of castration, animal-proof garbage bins are used

60 John III. (Emperor of Nicaea 1222-1253) gave his wife Irene a jewelled coronet which went down in history as the »egg crown« because he expended the profits of his egg sales for it, Hendy, *Monetary Economy* 55.

61 Kroll, *Tiere* 177-179.

62 Germanidou, *Dovecotes*.

63 Hirschfeld/Tepper, *Shivta*.

64 Çorağan Karakaya, *Rock-hewn Structures*.

65 *Geop.* 2, 21; Dalby, *Geoponika* 86. – A street pigeon produces about 12 kg faeces annually, Ineichen/Klausnitzer/Ruckstuhl, *Stadtfauna* 342. – In the dovecotes part of which could shelter more than 1000 animals, large amounts of dung must have accumulated. It is assumed that each of the dovecotes around Shivta (Southern distr./IL) housed about 1200 pigeons hatching annually c. 7500 chicks and producing c. 15t of dung, Hirschfeld/Tepper, *Shivta* 113.

66 *Geop.* 14, 6. – Dalby, *Geoponika* 283.

67 Wilkinson, *Sherd Scatters*.

68 The bones of the wild and domestic forms of geese and pigeons respectively are barely discriminable. Hence, zooarchaeological materials comprise unknown numbers of wild and domestic pigeons and geese. Given the lack of reliable osteological distinguishing features, high find numbers are often seen as an indication of the domestic forms. For further information, see Kroll, *Tiere* 179-181.

69 *Geop.* 14, 22. – Dalby, *Geoponika* 292-293.

70 Compare how the dog itself describes its relation to humans in the Late Byzantine Tale of the Quadrupeds: Nicholas/Baloglou, *Quadrupeds Z.* 249-259.

71 Kislinger, *Cats*.



Fig. 3 Stray cat at the Roman Celsus-library of Ephesos/TR. In the ruins of this antique city countless strays live – tolerated, partially even cared for. – (Photo H. Baron).

to limit the availability of food. Given the fact that neither method was applied in the Byzantine Empire, it comes as no surprise that the medical handbook by Dioscurides prescribes numerous remedies for dog bites⁷². Wild stray dogs certainly were a common sight, especially in the cities that produced, at least by contemporary standards, particularly high amounts of garbage. The Early Byzantine garbage dump excavated at the Via Carminiello ai Mannesi in Naples (Città metropolitana Napoli/I) accordingly yielded a large amount of dog bones, stemming almost certainly from wild animals scavenging the dump for food and rats⁷³.

Urban animal husbandry

The cohabitation with animals was not limited to the countryside. In Late Antiquity, the large cities experienced a population decline. Presumably this made it a period of thriving urban agriculture⁷⁴. In vacant parts of the cities, especially towards their margins, kitchen gardens were installed and probably livestock was kept, too⁷⁵. It almost goes without saying that some poultry was kept in the cities, but ungulates like pigs lived there as well. Pigs are very suitable for urban animal husbandry because they can be kept in confined spaces.

They do not demand extensive pasture but small amounts of energy-rich food. Urban pig keeping is known for 10th to 12th century Constantinople: the pig trade regulations of the Book of the Eparch even hint at a black market for pigs raised within the walls of the capital⁷⁶. That means that living pigs were part of the urban experience – not only on the markets but in the dwellings of officials⁷⁷. The animals were even kept on higher storeys, as a letter by John Tzetzes proves⁷⁸.

Sheep and goats, however, require adequate pasturage, amongst others in order to prevent the spread of endoparasitic infestations (through faeces swallowed while grazing) and to ensure sufficient nutrient uptake. These animals could be penned in the peripheries of the cities. From there they could either be led to new pastures every once in a while, or they could be entrusted to a shepherd in order to pasture them outside the city walls.

The extent of urban agriculture is not assessable at this point. Within the course of the centuries and within the vast domain of the Empire it certainly varied considerably, depending on population density, environmental and historical circumstances. After all, an urban animal husbandry has the benefit that livestock was safe from raids of the unprotected countryside and it guaranteed a certain subsistence in case of a siege⁷⁹.

72 Dioscurides' compendium dates back to the 1st c. but was still in use in the Byzantine era as manuscripts show. – Berendes, Dioskurides.

73 King, Napoli 387. – See also Paul Arthur's contribution to this volume.

74 Morrison/Sodini, Sixth-Century Economy 173. – For instance for Naples ruralisation was considered: Arthur, Napoli 435. For further examples, see Kroll, Tiere 155 with ann. 1050.

75 Koder, Gemüse. In Constantinople the marginal areas between the Theodosian and the Constantinian city walls were used, *ibidem* 72 fig. 1.

76 Lib. praefecti 16, 1-6 (german transl. 125-127).

77 Lib. praefecti 16, 4 (german transl. 127).

78 In a 12th c. letter from Constantinople, John Tzetzes complains about the urinating pigs a priest keeps in the apartment above him, Grünbart, Preservation 47. – Furthermore, people brought their animals into churches, as a regulation of the Quinisext Council of the year 692 shows, which aimed to ban this practice, Beck, Byzantisches Lesebuch 348-349.

79 Barthel/Isendahl, Urban Gardens. – Ljungkvist et al., Sustainability. – On the source »De obsidione toleranda« which gives advice on how to pull through sieges, see Kolias, Versorgung des Marktes 185.

Fig. 4 Live chickens are brought to the market, fixed to the roof of a car. Ethiopia 2016. – (Photo D. Imhäuser, Hofheim a. T.).



The way to the market: moving into other realms of experience

From an economic point of view, the second stage of the value chain, the trade with animals and animal produce, was no less significant than the primary production itself. Not only peasants were employed in the purchase, the processing, and the resale of animals and animal products, but also a multitude of other professions in trade and craft. Thus, animals and their raw materials formed the activities and hence the environments of large parts of the Byzantine population.

The processing of agricultural produce and its sale were essential parts of rural life. As busy trade only takes place where there are many people, the large markets were located in the cities or their immediate surroundings. Hence the animal breeders had to muster a certain degree of mobility in order to place their goods on the market: The radius of their environment was extended as far as to the next city or seasonal market. These took place outside the cities and often coincided with Christian feasts (*panegyris*). One of these was the annual »Demetria«, which took place in October close to Thessaloniki⁸⁰. Travelling overland was cumbersome, especially with animals (fig. 4) or large amounts of agricul-

tural produce (which comprised also woollen fabrics and dairy products) and, considering bandits, also dangerous⁸¹. Therefore, the trip to the market certainly was not generally a welcome change from work in the field.

For Constantinople, the existence of several inner city market places is known where different commodities, among them animals, were sold (fig. 5)⁸². In regulating the activities of different guilds, the 10th century Book of the Eparch gives insights into the governmental control of these markets⁸³. As perishable goods had to be consumed immediately, animals were always brought alive to the place of consumption and then killed there. Zooarchaeologically, this can be evidenced by the occurrence of all skeletal elements, also those which do not yield meat, in urban faunal materials⁸⁴. The Book of the Eparch recommends the slaughterers in the capital to buy sheep further away directly from the animal breeders in order to bypass the intermediaries. The latter were urged not to keep the animal breeders from bringing their sheep into the city⁸⁵. It is unclear whether such middlemen, whose added value jacked up the prices, existed in other parts of the empire, too. Possibly they were limited to the capital and perhaps a few more urban centres⁸⁶.

80 Laiou, Händler und Kaufleute.

81 Compare the comment on Symeon the New Theologian's treatise on Eph 5. 16 »Kaufet die Zeit aus; denn es ist böse Zeit« in Laiou, Händler und Kaufleute 66: A merchant does not attend to an annual fair because he wants to avoid the inconveniences of travel and fears a robbery.

82 Mundell Mango, Commercial Map. – Kislinger, Marktorte.

83 Lib. praefecti.

84 Kroll, Tiere 154-155.

85 Lib. praefecti 15, 3-4 (German transl. 125).

86 Laiou, Händler und Kaufleute 58.

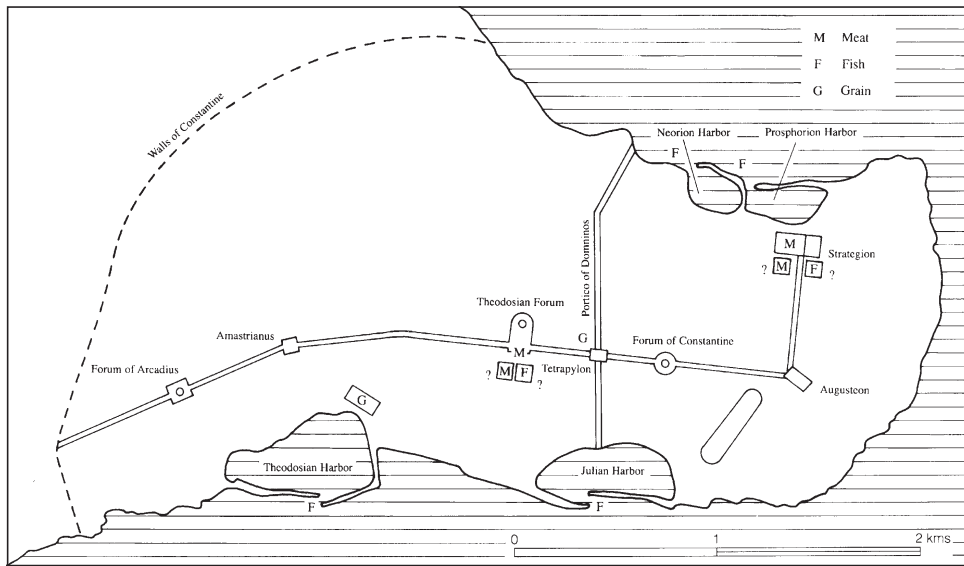


Fig. 5 Map of Constantinople depicting the food markets mentioned in the 10th century Book of the Eparch. – (After Mundell Mango, Commercial Map fig. 22).

Aquatic animals

The Mediterranean Sea was the heart of the empire. In the Early Byzantine period, it lay right in the centre of its dominion and connected the far-distant provinces with each other. Furthermore, it harboured two important resources, fish and salt. Along its shores the most important cities of the Empire were located, the busiest ports, and best infrastructures. Its centrality and its significance as a communication route outshines the other waters that were available to the Empire, amongst them in the Early Byzantine period two other inland seas: The Black Sea and the Red Sea⁸⁷. Apart from these, there was a multitude of fresh waters which were main arteries of the Empire. The major streams of the Early Byzantine period were certainly the Nile and the Danube but the resources of other rivers as well as of lakes were of regional importance, too⁸⁸. No other animal food is mentioned as often in the written sources as fish⁸⁹. Its free availability, its role as Lenten food, its culinary benefits, and finally the sheer abundance of fish contributed to it becoming such an important topic for the Byzantines.

Fish for All!

Little is known about how the Byzantines used wetlands, for instance for exploiting wood and thatch, for hunting and pasturing. Considering its abundant flora and fauna, it can be assumed that these landscapes were perceived as profitable⁹⁰. Apart from the fish, many amphibians, mammals, and

particularly various birds frequent this biotope for reproduction; they are among the most productive eco-systems of the world. At the same time settlements, villages, and cities usually mass on the shores of waters. And in the mountainous Mediterranean even the streets follow the beds the streams have dug into the landscapes (fig. 6). Wetlands and waters were essential parts of Byzantine living environments, be it in the cities or in the countryside. In his *Institutiones Justinian I.* (527-565) stipulated that running water, as well as the sea and its shores, belong to everyone, just like the air, and that everyone has the right to fish in rivers and harbours. The common area for fishery expanded to the highest winter level. One just had to keep away from other people's properties⁹¹. Wild animals on land, in the sea, or in the air belonged to whoever caught them⁹². This free availability had existed already long before Justinian's laws and was meant to persist in essence through later centuries, albeit at least for 10th century Constantinople with reservations⁹³.

Fish was a major nutritional component and as such it was of great importance for the Byzantine diet as well as the economy. The treasures of the sea were not only sources of subsistence for professional fishermen (in the case of the organised tuna fishery at the Golden Horn, perhaps even of wealth) but also allowed the poor to enrich their usually vegetarian diet from time to time with some animal protein. In times of food shortages fish could become a resource essential for survival.

The animals were caught with the usual techniques: nets, lines, traps, and fish spears, as finds like net weights, floaters,

87 For the relevance of these two seas in trade networks, see Sidebotham, Red Sea Ports; Shepard, »Mists and Portals«.

88 e. g., the Skadar Lake close to Stari Bar (opština Bar/MNE), s. Pluskowski/See-tah/Hamilton-Dyer, Stari Bar 111. – At Sagalassos (Il. Burdur/TR), fresh water fish from lakes in the vicinity was consumed, too, see Van Neer et al., Indicators.

89 Chrono-Vakalopoulos/Vakalopoulos, Fishes 123.

90 At the Mainz conference Archie Dunn, Birmingham, gave a talk about this topic, which unfortunately could not be submitted for this volume.

91 Inst. Iust. 2, 1, 1-5. – Birks/McLeod, Institutes 54-55.

92 Inst. Iust. 2, 1, 12. – Birks/McLeod, Institutes 54-57.

93 See below. – Maniatis, Fish Market 14.

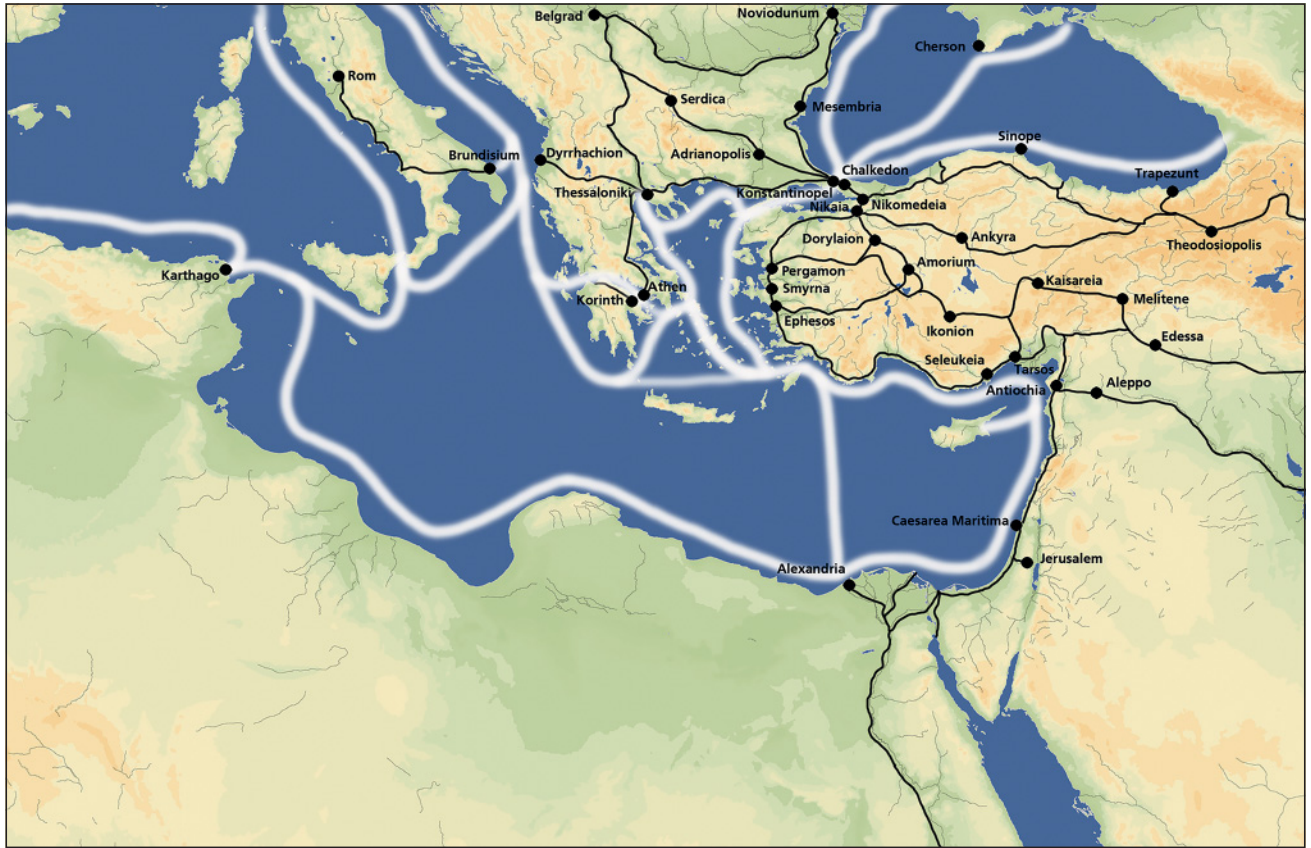


Fig. 6 Schematic map showing major communication routes of the Early and Middle Byzantine period. Especially along the Nile, Euphrates and Danube it is visible that the streets follow the river beds. – (H. Baron).

hooks, as well as Byzantine depictions show⁹⁴. A fish spear from the shipwreck of Serçe Limanı (İl. Muğla/TR) testifies to the use of this tool, probably for a small-scale catch of larger species⁹⁵.

Although perhaps not everybody owned a fish spear or a net, it was possible even for the untalented to catch a fish every once in while with simple techniques like line and hook. Suitable bait was helpful. Besides short instructions on keeping fish and producing garum, the 20th book of the *Geoponika* is dedicated principally and elaborately to bait production. The book does not only deal with bait which was meant to be fastened to hooks. It also provides recipes for attractants which were to be lowered into the water some time prior to the nets in order to attract as many creatures as possible on the spot⁹⁶. All kinds of vegetable and animal substances are recommended, from lentil soup thickened with starch, to calf blood, human faeces, locusts, snails, and ram penis⁹⁷.

The regionality of Byzantine fishery

Faunal assemblages from all parts of the empire testify to an exploitation of the respective local fish populations, be they marine or limnic. In the coastal areas, often both fresh water and sea fish can be identified (fig. 7)⁹⁸. Due to the variable water eco-systems and their respective fish populations, the diverse regional fisheries of the Byzantine Empire were multifaceted.

A Constantinople fisherman could exploit the fishing grounds of the Sea of Marmara and the Black Sea. For this city, however, no larger fish bone assemblages have so far been analysed and published which could contribute to our understanding of the general layout of the fisheries in the capital. The excavations in Cherson (Sevastopol, Crimea), however, testify to a Black Sea fishery targeting species that can still be found in Istanbul fish markets: the anchovy *Engraulis encrasicolus* and the brill *Scophthalmus rhombus*⁹⁹.

94 Examples from the *Cynegetika*: Cod. Ven. Marc. gr. Z. 479 fol. 2: Fishery scene, presumably with lines. – Cod. Ven. Marc. gr. Z. 479 fol. 59: Night fishery using a torch to attract fish and two kinds of nets. – Cod. Ven. Marc. gr. Z. 479 fol. 61: Fishery with traps; see Spatharakis, *Cynegetika*, table 1. 122. 124.

95 Bass et al., Serçe Limanı 430 fig. 22-18.

96 These recipes were complex and rich mixtures, Geop. 20, 2-4; Dalby, *Geoponika* 339f.

97 Geop. 20, 10: Calf blood and veal for riverine fish; Geop. 20, 16: baked ram penis for grey mullets; Geop. 20, 26: lentil soup as »general bait«; Geop. 20, 28: »human dung« amongst others for fish traps; Geop. 20, 29: Roman snails for fish traps; Geop. 20, 32: Locusts and worms among others for sea breams; Dalby, *Geoponika* 339-349.

98 e.g., in Ephesos (İl. Izmir/TR), Forstenpointner/Galik/Weissengruber, Ephesos Vediusgymnasium.

99 Van Neer/Ervynck, Cherson.

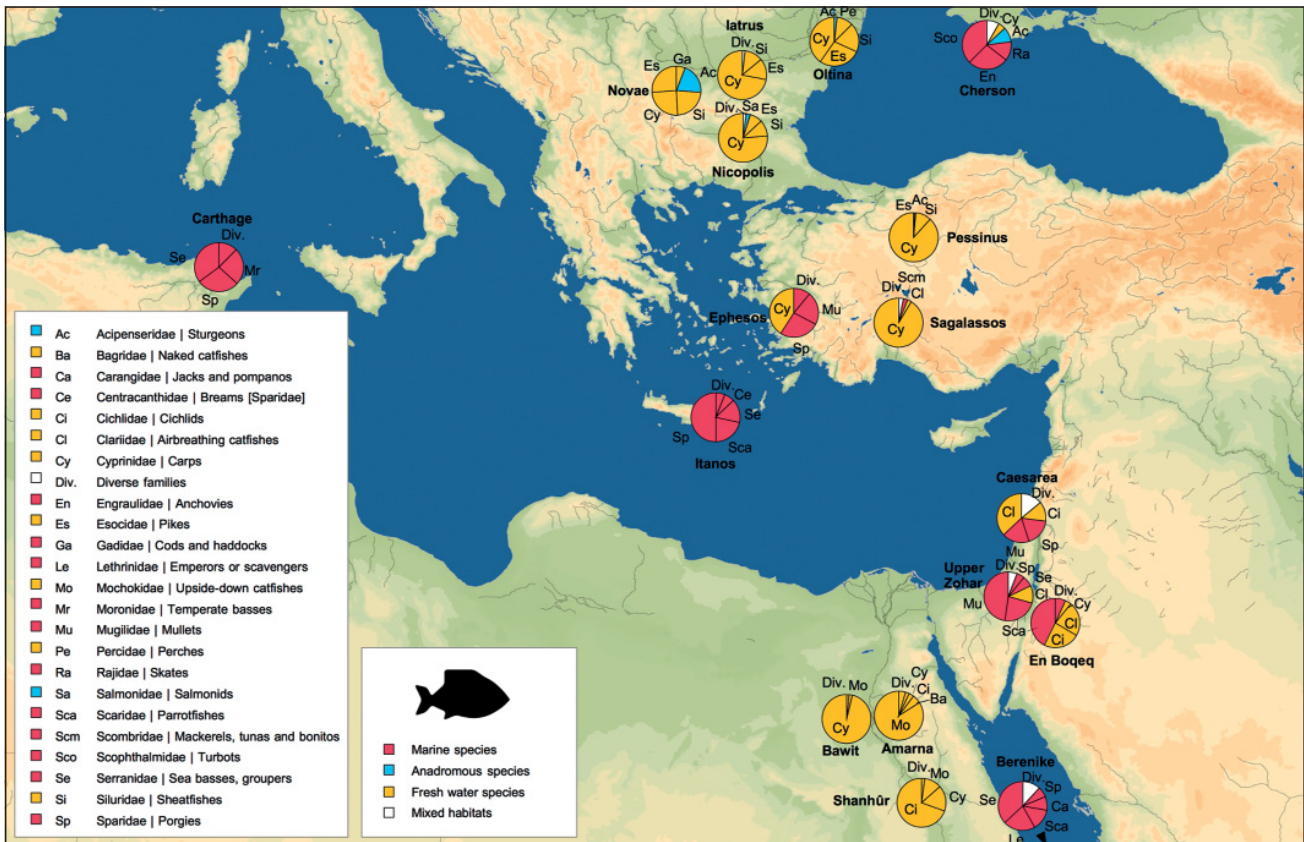


Fig. 7 The most common fish families in Byzantine fish bone assemblages (sieved and unsieved). For the data sources see the bibliography. – (H. Baron).

Furthermore, numerous thornback rays *Raja clavata* were caught in Cherson. The specific hydrological circumstances of this marginal sea deriving from its salinity, temperature, and a certain vertical stratification linked to these factors, resulted in a fauna differing notably from the adjacent Mediterranean Sea.

Nevertheless, there is an exchange between these two seas, which Constantinople benefited from a lot: seasonally on their migrations, mackerels and tuna traversed the Bosphorus strait and could be caught in masses in fixed net systems, the so-called *epochai*¹⁰⁰. This practice survived into modern times but by now the tuna populations have collapsed (fig. 8). Apart from an urban agriculture and a resilient storage strategy, the regular tuna migrations were a local factor which contributed decisively to the sustainability of the Byzantine capital¹⁰¹. Furthermore, these periods of mass catches allowed a surplus to build up that helped to save the garum industry from a collapse in the post-Roman era¹⁰².

Further north, along the ever-contested Danube border of the Empire, lies the area of Europe which is most rich in fish species. The Danube and its tributaries were fished intensively as numerous fish bones prove which stem from excavations

where systematic sieving was carried out¹⁰³. Generally, remains of cyprinid species prevail (fig. 7), amongst which the now almost extinct wild carp *Cyprinus carpio* appears most frequently. Among the other cyprinids detected are crucian carp *Carassius carassius*, asp *Aspius aspius*, common bream *Abramis brama*, common nase *Chondrostoma nasus*, tench *Tinca tinca*, and European chub *Leuciscus cephalus*. Apart from the cyprinids pike *Esox lucius* and catfish *Silurus glanis* were often caught. Species of the family Percidae, i. e. zander *Stizostedion lucioperca* and European perch *Perca fluviatilis*, are already rarer and salmonids as well as sturgeons (family Acipenseridae) only appear sporadically. A directed fishery targeting sturgeons presumably set in the Middle Byzantine period, when caviar began to play a role¹⁰⁴.

At the opposite end of the Early Byzantine dominion, the Nile flowed into the Mediterranean, the second mighty stream of the Empire and also of high, albeit different strategic significance from the Danube.

Already in Roman times fascination with the wonders of this river had found reflection in Nile mosaics. In Sepphoris in today's Israel (Northern district) a late example dating to the Early Byzantine period was unearthed, which among

100 On the *epochai*, see Trapp, *Epochai*. – Dagrón, *Poissons*.

101 Ljungkvist et al., *Sustainability* 382.

102 *Lib. praefecti* 17, 2 determines that only surplus fish that remain unsold in the evenings shall be used for salting. (German transl.: Koder, *Eparchenbuch* 127).

103 For an overview on Byzantine fish bone spectra on the Lower Danube and further information on occurrences of the mentioned species, see Kroll, *Tiere* 55-56. – See also Stanc/Bejenaru, *Fishing*.

104 Jacoby, *Caviar*.

Fig. 8 In Sicily the »mattanza«, literally the »slaughtering«, of tuna caught in fixed nets has a long tradition. In Solanto, a tuna station (»tonnara«) whose origins date back to the Phoenician period survived until modern times. However, innovative fishing technologies rendered it uncompetitive and it had to be given up in 1961, after 2800 years. – (After Lo Coco, Tonnara 123).



Fig. 9 Detail of the Nile mosaic from Sepphoris, c. 5th century, which shows a fisherman with his catch. – (After Netzer/Weiss, Zippori 48).

other motifs shows a fisherman (fig. 9). In Byzantine times the Nilotic fishery could already look back on a long tradition which presumably was not subject to notable disruptions.



Fig. 10 Mural in the tomb of Mereruka in Sakkara, which shows fishery with a hand net. On closer inspection the species diversity springs to the eye. – (After Sahrhage, Fischfang table 13, 2).

On ancient Egyptian reliefs as well as on the Nile mosaics of the later periods the river is depicted in all its plenitude in animals and plants. The older depictions are very accurate and the species pictured are readily identifiable (fig. 10). They show the same species or families which were found in the few Byzantine fish bone materials from the Nile¹⁰⁵. These faunal materials show homogeneous species spectra albeit with a clear focus on a specific family or species respectively (fig. 7), either catfish of the genus *Synodontis* (family Mochokidae), or cyprinids of the *Labeo* and *Barbus* genera, or

105 Kroll, Tiere 124-129.



Fig. 11 Parrotfish on a fish market in western Turkey. The Mediterranean Sea harbours only one species of this family, the Mediterranean parrotfish *Sparisoma cretense*. The Red Sea is populated by a wide variety of this colourful family. They are among the most common species which can be found on fish markets on the Red Sea coast. – (Photo H. Baron).

Tilapia of the family Cichlidae¹⁰⁶. The state of research is still fragmentary, but at this point it seems as though the Coptic monasteries on the Nile had engaged in an organised fishery targeting single species or families. Partially the finds stem from storage rooms, and from other parts of the Empire there are isolated indications for an import of Nilotic fish. Hence the fish were certainly dried, perhaps also salted, and traded long-distance¹⁰⁷.

A bit more to the East, on the Red Sea Shore, the coastal coral reefs were intensively exploited. This marginal sea of the Indian ocean harbours considerably more fish species than the Mediterranean, many of which are endemics. In contrast to the Nile which transforms its wide bed into an oasis of fertility, in the Red Sea a stunning cornucopia of fish and other sea creatures lies hidden under the waves, in the mid-

dle of barren deserts. Consequently, these populations were intensively exploited. The excavations at Berenike (gouv. al-Bahr al-ahmar/EG) brought to light thousands of fish bones that give evidence of a wide species spectrum. Frequently, specimens of the basses and groupers Serranidae, parrot fish Scaridae, emperors Lethrinidae, jack mackerels Carangidae and sea breams Sparidae were found (fig. 7)¹⁰⁸.

Even though the state of research for the Byzantine period does not yet allow for comparative analyses, it can be assumed that the Red Sea catches differed from place to place. The catches depended on the type of the sea bed, whether sandy or rocky, the hiding places and marine vegetation the coral reefs offered, and the applied fishing technique¹⁰⁹.

A certain heterogeneity is observable for the Mediterranean fish bone spectra, too (fig. 7): while sea breams Sparidae as well as groupers and basses Serranidae appear in all parts of the empire, the grey mullets Mugilidae and the drums Sciaenidae show a faint focus on the Levantine sea. The fish bone assemblage from Itanos on Crete (dim. Sitia/GR), however, comprised a higher share of *Sparisoma cretense*, the only parrot fish species that lives in the Mediterranean Sea (fig. 11)¹¹⁰. Generally, a coastal fishery targeting demersal fish, i.e. species living close to the bottom of the sea, becomes apparent. Pelagic species that live neither close to the shore nor close to the bottom occur only in small numbers. Most of these are tuna and mackerel species of the Scombridae family, or jack mackerels of the Carangidae family.

Although Byzantine fishing implements were basically the same throughout the Empire, the environments of the fishermen, i.e. the fish stocks, the waters with their specific underwater landscapes and currents, the local weather conditions, seasonal phenomena like inundations or fish migrations, the coastal vegetation, and other environmental factors varied considerably. As they still are today, Byzantine fishermen certainly were equipped with a deep knowledge of their respective waters and fish, which was acquired over years of practice and handed over from generation to generation. It is this what makes them successful in their profession. Not only a »nose« for good fishing grounds is needed, but also the knowledge of which fish can be caught best at which time of the day or the year, and which technique and bait should be applied¹¹¹. The fixed-net fishery of tuna mentioned above is only the most conspicuous example of these adaptations to certain species and conditions. It can be assumed that fishermen had a particularly tight bond with their environment, that they observed it particularly intensely – not only, like the peasant his soil, because good knowledge enhanced

106 Luff/Bailey, Nile. – Van Neer et al., Bawit. – Van Neer/Depraetere, Shanhûr.

107 The fish bone material from Bawit (gouv. Asyut/EG; mainly cyprinids) stems from an amphora, Van Neer et al., Bawit. An import of Nile perch *Lates niloticus* can be detected for different sites in Syria and Palestine. A long-distance trade with air-breathing catfish of the genus *Clarias* is detectable sporadically throughout the empire, Kroll, Tiere 216-219; Farbt. 16. – Van Neer et al., Indicators.

108 Van Neer/Lentacker, Berenike. This is only one example among several reports on the fauna of Berenike. For further literature see the bibliography of zooarchaeological site reports at the end of this contribution.

109 Kroll, Tiere 200-201. The appendices of the book comprise a list of the main fish species and families. Their diversity illustrates the richness and variability of the Mediterranean catches, Kroll, Tiere 261-264.

110 For an overview, see Kroll, Tiere 203-209.

111 Kroll, Tiere 200-201. – Fajen, Halieutica 153. – Bekker-Nielsen, Fishing 90-93.

the profits, but because fishery is always a danger to life and limb, even in coastal waters.

Overfishing?

It is difficult to assess how much pressure Byzantine fishery exerted on local fish populations. I know of two indications of populations under stress: 10th century laws of Leo VI. aimed to regulate local fixed-net fishery on the shores of Constantinople in order to make it more sustainable¹¹². It seems that the lack of governmental control had led to local overfishing¹¹³. In the capital, the age-long tradition that the treasures of the sea belong to those who catch them¹¹⁴ was limited in favour of sustainability (as well as profit, presumably).

The second example is related to another marine resource, sea snails of the Muricidae family. These species are common in the Mediterranean and are still popular seafood, yet they were also used to produce a luxury product, purple dye¹¹⁵. As the hypobranchial gland of a murex snail contains only a tiny amount of the mucous secretion which is used for dying, only large shell dumps can be interpreted as remains of purple dye production. Small numbers should represent food waste. Such a shell dump, presumably of the 6th century, was found in Lykian Andriake (İl. Antalya/TR). About 300m³ shells stemming from about 60 million snails mainly of the species *Hexaplex trunculus* were found¹¹⁶. A stratigraphical examination of samples from this midden disclosed a diachronic reduction of the size of the used individuals. This can be attributed to an overexploitation of the faunal resource that did not allow the populations to recover and which ultimately could have led to the decline of the local purple workshop¹¹⁷.

Apart from these glimpses, the ecological effects of the Byzantine fishery, the caviar production commencing in the Middle Byzantine era, and the water economy in general remain unexplored. For Central Europe, the question of how human action affected the lives and habitats of other species in the past has recently moved more into the focus of research. One example is the effect of the increasing use of water power towards the end of the 1st millennium on the distribution of the wild carp¹¹⁸. For the Byzantine world, comparable questions have so far rarely been posed.

Other wild animals

In its early period the Byzantine Empire encompassed the margins of three continents. The fauna living within its realms was accordingly variegated and rich. Apart from the fish, other wild living creatures were of economic usability: game like deer, wild boars, gazelles, wild goats, hares, and beavers as well as sometimes predatory animals like bears, wolves, foxes or martens. With the help of traps, snares and lime-twigs, birds were captured, too. Although hunting scenes are a comparably common topic of Byzantine art, very low game proportions in animal bone assemblages point to a minor role of game in daily life¹¹⁹. The small numbers of wild game and fowl could be remains of occasional hunting trips, lucky shots or singular purchases from the rural population¹²⁰.

Wild living animals as indicators for past landscapes and activity zones

The wild species spectra of zooarchaeological bone materials from Byzantine sites reflect, albeit in a biased way, local eco-systems which the Byzantines used (fig. 12): The high share of deer (primarily red deer and roe deer) among the wild animal bones in the North of the Byzantine Empire hints to wooded landscapes¹²¹. The hare bones, often comparably well represented, indicate occasional hunts in open landscapes. Along the Lower Danube the high share of wild boars is impressive: possibly large parts of this climatically favoured region were covered with mixed forests¹²². Just like the beavers which often appear in faunal materials of this region, these animals also inhabited the riparian forests along the river arms. Unsurprisingly, the bone assemblages from this region also yielded high amounts of waterfowl (fig. 13). These findings indicate an intensive utilisation of these riverine wetland habitats. Most of the fowl finds stem from ducks and geese (as well as a few swans) of the Anatidae family, but sometimes also large species like pelicans or herons appear, which certainly were impressive prey¹²³.

In the South of the Empire, between North Africa and the Levant, the proportions of game are lower whilst the species diversity is much higher (fig. 12). With the exception of gazelles, which were not only hunted for their meat but also in order to protect the fields, most wild animals were apparently

112 Maniatis, Fish market.

113 This seems to be an example of the sociological model of the »Tragedy of the Commons«. This holds that an overexploitation of freely available but limited resources is inevitable and that the whole community has to bear the damage; see Hardin, Tragedy of the Commons. The disastrous consequences of a free availability combined with the means for an industrial large-scale exploitation can be observed in the modern state of fish populations in the Mediterranean (and elsewhere).

114 See above. – Bekker-Nielsen, Schätze.

115 Ruscillo, Murex Purple.

116 Forstenpointner et al., Andriake.

117 Forstenpointner et al., Andriake 212.

118 Richard C. Hoffmann was a pioneer in this field, see Hoffmann, Environmental Change. – Recently on the population developments of Danube fish: Galik et al., Long-term changes.

119 Reviewing the zooarchaeological state of research: Kroll, Tiere 182-199.

120 Usually the bones of wild mammals only amount to a few percent of the animal bone finds, Kroll, Tiere 192. The share of wild birds is even lower, due to their small size, ibidem 182.

121 It must be taken into account, however, that many of the deer finds, primarily of red deer, represent antler which could also stem from shed antlers. As valuable raw material, these were brought into the towns and settlements.

122 See the contribution by Riley Snyder in this book: The Thracian landscape could have been similar.

123 Kroll, Tiere 51-52. (On detected bird families: 182 fig. 74).



Fig. 12 The most common game families in Byzantine faunal assemblages (minimum: 10 wild mammal bones). For the data sources see the bibliography. – (H. Baron).



Fig. 13 Bird families that occur in Byzantine faunal assemblages with the exception of the chicken (minimum: 10 bird bones). For the data sources see the bibliography. – (H. Baron).



Fig. 14 Oppian's *Cynegitika*, 11th century manuscript, Venice. One of the rare depictions of »useless« fauna. The small dark rodents, which are obviously attracted by the chicken food, could be black rats. The animal lying on its back looks like a dormouse. Wherever small mammals like these are, predators are not far, too: Voilà, a food chain! Cod. Ven. Marc. Gr. Z. 479 fol. 38^r. – (After Spatharakis, *Cynegitika* fig. 74).

not subject to a purposeful hunt, but rather to occasional killings: antilopes, barbary sheep, hares, deer, porcupines, rock hyraxes, weasels, at the Euphrates and the Jordan now and then a wild boar, etc.¹²⁴ Fowling, however, seems to have played a greater role in these latitudes. In the face of unfavourable conditions for animal husbandry, fowling offered the opportunity to have some meat from time to time. Close to bodies of water, waterfowl was killed, but it was primarily chukar partridges and sand partridges that were caught in the deserts and steppes¹²⁵. The dovecotes evidenced at least for Palestine to some degree, certainly attracted some wild pigeons and doves, too¹²⁶.

Whereas the wild mammal finds comprise some woodland species, these are rare amongst the wild birds, even on the comparably forested Lower Danube. This could be due to the case that birds are more difficult to catch in forests, even in open ones, than in the open country or on waters. Furthermore, in the woods wild boar and deer might have been perceived as a more attractive prey¹²⁷.

Urban ecology: Commensal hemerophiles and urban food chains

Although small animals like hares and beavers were hunted, too, and even songbirds were captured, most small species did not represent prey for mankind. They were, however, killed partially to protect seeds, crops, supplies, or livestock. Given the biodiversity within birds, reptiles, amphibians, and small mammals, it is clear that the majority of these animals was not used economically but led an autonomous life amongst the Byzantines. Animal bone assemblages from excavations where no sieving was carried out rarely contain remains of small vertebrates: all kinds of small creatures which died in the cities and settlements a natural death remain invisible. Other sources often remain silent on these animals, too (fig. 14). For this reason, only some few zooarchaeological examples for these independent animal residents of Byzantine cities exist (fig. 15)¹²⁸. Naturally, primarily those species can be detected that were able to find suitable shelter and food in manmade environments. A comprehensive discussion of these faunas only makes sense when the sites are scrutinised individually because (apart from some ubiquitous species) animals often appear that have very specific demands as regards their habitat. Therefore, the origin of the colonisation,

124 Kroll, *Tiere* 193 fig. 76.

125 Kroll, *Tiere* 186-191.

126 Hirschfeld/Tepper, *Shivta*.

127 Additionally, pigeons are difficult to identify. These animals, which often nest in forests, are difficult to identify up to species level due to the number of possible species. Hence, they cannot always be distinguished from domestic pigeons. – See also Stefan Albrecht's article in this book, esp. p. 124.

128 Almost 400 finds stemming from amphibians, reptiles and small mammals were found in the sieve residues of a layer of the Vedius bath at Ephesos. Among these were toads, snakes, lizards, sheltopusiks, rats, and bats, see Forstenpointner/Galik/Weissengruber, *Ephesos Vediusgymnasium*. – At Nicopolis ad Istrum small mammals were found, too. Apart from some voles, also hamsters, spalacids, and ground squirrels, Parfitt, *Nicopolis*. – Other sites where various small vertebrates were detected include: De Cupere, Sagalassos. – LaBianca/Driesch, *Tell Hesban*. – Harper, *Upper Zohar*. – Arthur, *Napoli*.



Fig. 15 Zooarchaeological identification work on sieve finds from 6th century Caričin Grad/SRB in progress. Presorting of skeletal elements preceding the species identification. **1** Femur, **2** Tibia, **3** Radius, **4** Ulna, **5** Pelvis, **6** Tarsalia, **7** Scapula, **8** Snails, **9** Ribs, **10** Vertebrae, **11** Amphibian and Reptile bones, **12** Humerus, **13** Phalanges, **14** Metapodia. Most of these bones stem from black rats, some from other mice and voles, shrews and dormice. – (Photo H. Baron).

the surroundings of the respective site, must be taken into consideration in order to understand how animals occupied available ecological niches. The most conspicuous examples can be found in the most extreme environments: at the Early Byzantine fort Upper Zohar in the Negev desert (Southern distr./IL) numerous small mammal bones were unearthed. Apart from black rat *Rattus rattus* bones and other rodents many skeletal elements of sand rats *Psammomys obesus* were found¹²⁹. Today the range of this species is confined to salt soils with goosefoot vegetation, circumstances given in the vicinity of the nearby Dead Sea¹³⁰. Hence, the niche these animals occupied in the fort must be assessed individually. For a less detailed but more generalised view, the ubiquitous animals can be considered. Reviewing existing literature, it strikes the eye that especially black rats appear very consistently and at some sites in comparably large numbers¹³¹. In light of the expanded state of research concerning the spread of commensals, the notion that Early Medieval cities and settlements did not shelter many rats has become obsolete¹³². For instance, in Naples, Nicopolis ad Istrum and Dichin on the Lower Danube (both obl. Weliko Tarnowo/BG), Sardis (İl. Manisa/TR) and Ephesos (İl. Izmir/TR) in Asia Minor, the

Negev fort of Upper Zohar, and in Carthage (gouv. Tunis/TN) high two-digit numbers of rat bones were found (fig. 16)¹³³. These extremely adaptable rodents are classical hemerophiles which benefit a lot from human infrastructures. Dwelling zones are truly a land of milk and honey for them: they do not only offer high amounts of good food but also ideal conditions for reproduction. However, from the human perspective, these cohabitants were very problematic because they could cause considerable damage¹³⁴. After all, the black rat (to a lesser degree perhaps the house mouse *Mus musculus*, too) played an inglorious role in the spread of the Justinianic plague because it carried the rat flea which transmitted the disease to the human host¹³⁵. As commensals («meal companions») of the humans the rats followed the grain on its way into the granaries. Thus, they carried the plague by ship all across the Mediterranean right into the urban centres with the densest populations and the highest vulnerability to epidemics. Furthermore, they spoiled the supplies in the granaries. Thus, they exacerbated the crises caused by the plague. Recently it was emphasised how crucial the stored supplies were for the survival of a city like Constantinople¹³⁶. However, it is almost impossible to estimate the storage loss caused

129 Clark, Upper Zohar.

130 Grimberger/Rudloff/Kern, Säugetiere 174-176.

131 However, this can also be ascribed to the fact that the genus *Rattus* is much easier to identify than mice because the latter comprise more genera and families that need to be distinguished. A discrimination between *Rattus rattus* and *Rattus norvegicus*, however, is more difficult.

132 As Michael McCormick has stated already in 2003 (McCormick, Rats 4-6).

133 Arthur, Napoli. – Parfitt, Nicopolis (also containing information on Dichin, which is soon to be published). – Deniz/Calislar/Özgüden, Sardis. – Forsten-

pointner/Galik/Weissengruber, Ephesos Vediusgymnasium. – Harper, Upper Zohar. – Reese, Carthage. – On further occurrences in Byzantine faunal materials, see Kroll, Tiere 267.

134 On the role of these animals for environmental history, see McCormick, Rats.

135 McCormick, Rats. – Stathakopoulos, Famine 124-134. – On the role of different murid species, see Stathakopoulos, Famine 126.

136 Barthel/Isendahl, Urban Gardens. – Ljungkvist et al., Sustainability.



Fig. 16 Rats in Byzantine faunal assemblages. The brown rat *Rattus norvegicus* spread to Europe only in the post-Byzantine era. If the bone finds mapped here are no younger intrusions, they should therefore represent black rats *Rattus rattus*. For the data sources see the bibliography. – (H. Baron).

by rodents. A range of 10 to 30 % has been proposed¹³⁷. In his compilation of recorded Early Byzantine food shortages and famines, Dionysios Stathakopoulos found (apart from a 4th century famine) only two 7th century shortages, where rodents are reported to have played a role: in 604–605 supplies in Italy, which were already afflicted by blight, were destroyed by mice; and 673–674 a rat plague is named as the only reason for a famine in Syria¹³⁸. Given the very consistent occurrence of subsistence crises in Late Antiquity and the Early Byzantine period on average every three years¹³⁹, three mentions of rodents as causes seem not to attest to severe harmfulness. But this appearance is deceptive. It can be assumed that a reduction of supplies through pests was so common that storage strategies took it into account. Hence, with the exception of the sudden cataclysms locusts caused, the pests did not cause famines. Presumably a pest infestation only led to major crises when additional factors impaired the food supply as well, for instance crop failures, natural disas-

ters, or sieges. Nevertheless, the constant damage of supplies presumably was a heavy strain for the Byzantines, the more so as it was difficult to get rid of the animals. This can be gathered from an account of Eustathios of Thessaloniki: »the mice are no parasites for us, they are katasittoi [commensals], if we could name them so, since we nourish from what they leave us with«¹⁴⁰. Even amphora suspended on strings were not save from the animals.

In Byzantine writings, the cat appears primarily as the classical opponent of mice and it can be assumed that it, as well as some mustelids, was mainly kept for the purpose of rodent control¹⁴¹. The *Geoponika* dedicates a complete chapter to pest control¹⁴². This, too, is a sign that commensals and parasites were constant companions of the Byzantines and their supplies. Not only rodents but also birds were keen on the grain which was stored in the *horrea* and the homes and which was also used as fodder. Among these, pigeons and crows are encountered most frequently in Byzantine animal

137 Müller, *Getreide* 17.

138 Stathakopoulos, *Famine* 45.

139 Stathakopoulos states that the 134 crises he found for a span of 430 years occurred on average every 3,3 years, Stathakopoulos, *Famine* 55.

140 As described in letter 6 (313, 37f.), after Grünbart, *Preservation* 42. – In the Late Byzantine poem »An Entertaining Tale of Quadrupeds«, the cat's description of the rat's flaws is very vivid: »Foul rat, there's nothing that you don't defile: / figs, raisins, buttermilk, milk, meat, and fish, / mollusks and foods like that, and grain and pulses, / and countless other goods consumed by

people, / you either eat, you filth, or piss and shit on— / what you don't spill and scatter with your feet! / And should you find a pitcher of oil unsealed, / you dip your tail and draw the oil back out, / and licking your tail, you fill your belly«, Nicholas/Baloglou, *Quadrupeds* lines 131–140.

141 Kislinger, *Cats*.

142 Presumably the pesticides recommended in book 13 of the *Geoponika* sound more effective than they actually were, Dalby, *Geoponika* 268–280.

bone materials, but a range of other birds is attested, too. The small commensals in turn attracted animals of the next rank of the food chain: raptors like falcons, buzzards and owls, furthermore foxes and martens which also preyed on domestic fowl, and even wolves, which were able to kill sheep and goats. Whereas the birds often remain undetected due to insufficient means of excavation and identification (see the weak state of research visible in **fig. 13**)¹⁴³, the classical hen thief, the fox, appears consistently in Byzantine faunal materials (the canid finds in **fig. 12** almost all stem from foxes)¹⁴⁴. Probably this is more due to the fact that the foxes sought the vicinity of the Byzantines in order to easily find food than to a purposeful hunt for its fur. In the Late Byzantine poem »An Entertaining Tale of the Quadrupeds« the fox's killing of poultry, lambs and kids is described as »great harm and major damage and infinite injustice to the poor« because these animals often were the only valuables the poor owned¹⁴⁵. In the face of all these losses the animals caused, »nature« often must have been perceived as uncontrollable – even though the Byzantines themselves had paved the way for the animals, with their larders, butcheries, dumps, and their comfortable homes.

The animals mentioned above are the first that come to mind as regards hemerophiles. However, the cities, forts, and settlements offered shelter for a multitude of other vertebrates¹⁴⁶ whose role in urban eco-systems is still poorly understood. Among these are, apart from amphibians, lizards, snakes and small mammals, again several species of birds¹⁴⁷. Urban environments primarily attract frugal generalists, so-called pioneer species, among the birds often cavity nesters and species that naturally live in rocky landscapes because these found suitable nesting places. This applies for many birds encountered today in built environments, e.g., crows, gulls, tits, sparrows, starlings, jackdaws, redstarts, stock doves, kestrels, sparrowhawks, wood owls, swifts, and swallows. Urban birds like these of course helped themselves to fruits and olives¹⁴⁸ but certainly caused less harm than commensal mammals.

In recent times, an intensive colonisation of urban habitats took place due to the effects of industrialisation. A diversified and small-scale agrarian land utilisation was replaced by large-scale monocultures which led to a depletion of cultural landscapes. The cities with their small-scale mosaic of architecture, gardens, parks, and cemeteries, as well as their ample food resources became comparably attractive habitats. From an archaeological perspective, this reorientation of species happened quite recently and it hampers the reconstruction

of earlier colonisation processes because neither these nor most of the more recent ones are documented. Whereas for instance in the case of the blackbird it is known that the first urban hatches occurred in the early 19th century¹⁴⁹, the colonisation history of other species is far from known. With the exception of some economically relevant animals, little is known about the point in time when animals began to follow humans into their cities. In this field, still much work needs to be done.

Perspectives for future research

Human-animal relations have changed dramatically in the past centuries because industrialisation revolutionised the exploitation of resources as well as agriculture and animal husbandry. Due to the replacement of animal labour and of traditional animal keeping by machines and perennial zero-grazing factory farming, farm animals did not only fall from view of the townsfolk but also of the rural population. This has led to a perceived loss of the significance that human-animal relations have for our lives. This perception also manifests itself in research.

From our 21st century perspective it is unsurprising that often not much importance is attached to the archaeological and historical investigation of animals, be it animals kept for labour or meat, other useful creatures, or vermin. It is not self-evident how much human-animal interactions have formed essential spheres of cultural history like cultural practices (e.g., in religion, daily life customs, cultural symbolism), society (e.g., as status symbols or stigmata), and especially economy (primarily as raw materials and source of energy). At the same time, the animals have had an effect on their environments.

Although the profound modern changes mentioned above are actual revolutions, they can also be seen as culminations of long-term transformation processes. They are a stage in an age-long concatenation of circumstances whose courses, influential factors, and effects can only be understood in retrospect. For this reason, the examination of human-animal relations and their implications for different spheres of human life is not only relevant for recognising present developments. It also helps to reveal and evaluate alternative modes of living, errors, and successes, in the historical experience realm.

The observable disregard for the interrelations human-animal relations have with almost all fields of archaeological

143 The faunal assemblages from Naples and Nicopolis ad Istrum are examples for excavation techniques diligent enough to produce the remains of a series of urban raptors, Arthur, Napoli; Poulter, Nicopolis.

144 On its occurrence, see Kroll, *Tiere* 197-198. 258.

145 Nicholas/Baloglou, *Quadrupeds* lines 192-193. It is the dog which judges the misdeeds of the fox.

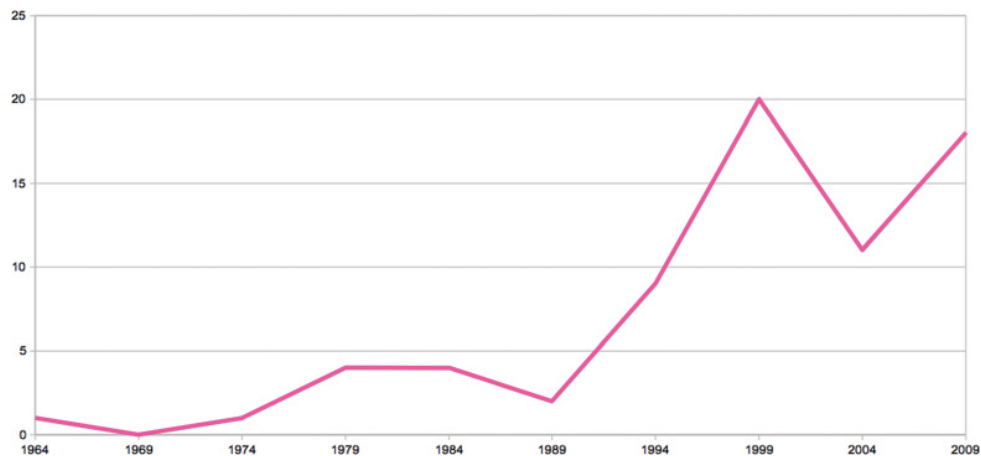
146 The multitude of invertebrates that again attracted insectivore vertebrates is not discussed here.

147 O'Connor, *Making Themselves at Home*.

148 An ivory carving of about 400 AD depicts crows helping themselves to the fruits of olives, Volbach, *Elfenbeinarbeiten* pl. 33, 110, also pictured in Kroll, *Tiere* 110 fig. 45. – The *Geoponika* gives advice on how to keep birds off trees: with garlic, *Geop.* 10, 80; Dalby, *Geoponika* 230.

149 Ineichen/Klausnitzer/Ruckstuhl, *Stadtfauna* 359.

Fig. 17 Zooarchaeological publications on Byzantine animal bone assemblages, based on the studies I included in my 2010 overview, hence until the year 2009. – (H. Baron).



research (not only diet!) is a symptom of a scientific tunnel vision, which presumably is inevitable. It is not only because modern living conditions are so estranged from animals. It is also a result of our extremely specialised academic world, which is not even remotely comprehensible anymore. Its enormous output and its rapid methodical advance makes it already difficult to keep up with the state of research in one's own area of expertise. Accordingly, it is barely possible to familiarise oneself with the possibilities, methods, and basic aspects of source criticism of other disciplines. Hence, often little is known about the potential other disciplines have to answer specific research questions. Furthermore, the specialisation of scientific journals makes it partially difficult to assess how much these have already contributed to the respective fields of research¹⁵⁰. For this reason, studies that review the state of research of certain disciplines in a generally comprehensible way are an essential means of interdisciplinary exchange. Another is open-access publishing.

Zooarchaeological output which has been experiencing a remarkable upswing since the 1990s is a good example for the extended range of applied disciplines in Byzantine studies (fig. 17)¹⁵¹. This change can partially be ascribed to the fact that zooarchaeology has by now become an established discipline in many countries. However, this process is far from complete. In the 1970s the analyses of the animal bone finds from Tell Hesban (gouv. Madaba/JOR) had required considerable justification, as Øystein LaBianca reported¹⁵² and in some places the cultural historical significance of these sources still remains unrecognised. This applies particularly for those countries where no zooarchaeological »schools« exist that would advocate the interests of their discipline¹⁵³. However,

in many excavation projects zooarchaeological analyses are now often scheduled from the start and this comparably established field has paved the way for related younger disciplines like isotope and ancient DNA studies.

The upswing of interdisciplinarity can be ascribed to a new notion of archaeology which increasingly aims for a systemic approach: today, excavated sites are often contextualised as intensively as possible within their economic and environmental settings. For this purpose, the focus was widened and the hinterland is taken into consideration more and more. With the help of surveys, geological and palynological samplings, small-scale archaeological explorations, etc., as well as the tool box of the historical disciplines, extensive catchment areas can be explored. At the same time, the potential of on-site analyses is maximised with the help of refined excavation techniques, dense bio- and geoarchaeological sampling and the application of a wider spectrum of scientific analyses. Intensive studies like these of selected settlement areas – for instance, in and around Nicopolis ad Istrum in Bulgaria¹⁵⁴ or Sagalassos (İl. Burdur/TR) in southwest Turkey¹⁵⁵ – produced the most impressive and most vivid results and gained the deepest insights into these pasts with their political, social and economic dimensions. These projects revealed how tightly Byzantine resource exploitation and the respective events of the time were interwoven with the environments of these areas. These exciting results helped to give Byzantine archaeology new directions. More than that, they proved two things: The results of these long-term research projects were continuously used to develop and concretise research questions. Furthermore, the complete range of available

150 An example from the year 2002: »Osteology and teeth can provide evidence for kill-off patterns, and hence an indication of the size of ancient flocks, but I do not know of any specifically Byzantine sample that has been analyzed.« (Bryer, Means 103). Anthony Bryer recognised the potential but did not know the state of research. By 2001, 45 of the animal bone materials I included in my 2010 study were already published, many of them in monographs on excavations or archaeological journals, and some in zooarchaeological compilations and journals of veterinary medicine.

151 The steering of Byzantine archaeology towards the archaeological sciences of course applies for other disciplines, too.

152 LaBianca/Driesch, Tell Hesban XXIII.

153 Furthermore, a comprehensive analysis of the finds requires infrastructure. In many countries of the Mediterranean there are no zooarchaeological reference collections which also comprise wild species. Hence, bones which are difficult to identify, i. e. primarily those of the species-rich animal groups (first of all birds and fish, but also small mammals and reptiles) have to remain unidentified if an export for the purpose of identification is not permitted.

154 Poulter, Transition. – see also Andrew Poulter's contribution in this book.

155 The sixth volume of the Sagalassos series comprises a vast array of scientific analyses: Degryse/Waelkens, Sagalassos.

expertise and creativity was used in order to open up all utilisable sources¹⁵⁶.

So, where do we go from here? A future environmental history of Byzantium should contribute to an understanding of which direction the environments of the eastern Mediterranean took in these formative centuries, which potential they once had and which potential they still have. In the face of the ecological devastations of the past few centuries, key words like resilience, sustainability, ecology, and biodiversity can be found on research agendas worldwide. In examining past intermediary stages of environmental as well as economic-technological developments, and in analysing the interrelations of these spheres, Byzantine studies can contribute.

And there are more current topics concerning animals that stand at the focus of attention, particularly the effects of a globalised transport of commodities, people and animals – something that has happened on a smaller scale in the Byzantine Empire. Apart from ecological questions dealing for instance with the effects of invasive species on autochthonous faunas, this field is also relevant as regards disease control.

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All large epidemics and pandemics of the past years, from avian and swine influenza via SARS to Ebola, were zoonoses. Initially, the AIDS-virus was also transmitted from animals to humans. The Byzantine Empire was a state which lasted long enough to experience two severe plague pandemics as well as many more smaller and presumably more common zoonoses, which result from the cohabitation of humans and animals. The examination of the respective preconditions, the mechanisms of their spread and the environmental and cultural aftermaths of the large Byzantine zoonoses is being intensified at the moment and the smaller ones as well receive more attention¹⁵⁷.

Environmental history is a branch of historical research that benefits most from the long-term retrospective, as ecological effects of human action have proved to be not or barely foreseeable. In this area of research, Byzantine studies could benefit from three fortunate circumstances: a keen interest on the part of (European) politicians, the public enthusiasm for the Mediterranean, its beautiful landscapes, and cultural heritage, and a huge research gap which is ready to be filled.

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¹⁵⁶ One example is the survey of the Pisidian fish fauna meant to support the interpretation of the fish spectra from Sagalassos, Van Neer et al., *Anatolian Fish Fauna*.

¹⁵⁷ Bos et al., *Yersinia pestis*. – Harbeck et al., *Yersinia pestis*. – Schmid et al., *Black Death*. – Stathakopoulos, *Invisible Protagonists*. – Mutolo et al., *Brucellosis*.

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Zusammenfassung / Summary

Ein Zugang zur byzantinischen Umweltgeschichte: Interaktionen von Mensch und Tier

In der Byzanzforschung ist das Studium der Beziehungen zwischen Mensch und Tier kein Thema besonderen Interesses. Das gilt sowohl für den Zweig, der sich mit den archäologischen Funden befasst, als auch für jene, die sich Schrift- und Bildquellen widmen. Im Falle der Schriftquellen ist dieser Umstand maßgeblich darauf zurückzuführen, dass Tiere als Bestandteile des Alltagslebens keiner Erwähnung zu bedürfen schienen. Die Archäologie wiederum, deren Fundgut eigentlich reich an Relikten vergangener Mensch-Tier-Beziehungen ist, sah in den Knochenfunden lange Zeit keine Artefakte, und damit auch keinen kulturhistorischen Aussagewert in ihrer Analyse. Wenngleich diese Ansicht mittlerweile vielfach als überholt angesehen wird, ist dennoch jenseits der auf dieses Thema spezialisierten Kreise wenig über das Aussagepotential von Studien zur Geschichte der Beziehungen von Mensch und Tier bekannt.

Eine byzantinische Umweltgeschichte aber, lässt sich ohne menschliche Aktivitäten, die mit Tieren zusammenhängen, nicht denken. Weite Teile der Bevölkerung waren in Berufen tätig, die sie in Kontakt mit Tieren brachten, allen voran die Landwirtschaft, aber auch viele weiterverarbeitende Berufe. Man führte Tiere in die Landschaft (die Haustiere zur Weide), entnahm sie der Natur (z. B. im Falle der Fischerei) und lebte mehr oder weniger harmonisch mit ihnen zusammen (z. B. mit Hunden, Ratten und Mäusen).

Der Beitrag hat zum Ziel, im Lichte umweltgeschichtlicher Fragestellungen die Bedeutung von Tieren in der byzantinischen Lebenswelt stärker in das Bewusstsein der Forschung zu rücken. Anhand 1) der Haustiere, 2) der Fische und 3) anderer wild lebender Tiere wird aufgerollt, welche Rolle die Tiere in der byzantinischen Lebenswelt einnahmen (und welche Rolle die Naturräume für die Mensch-Tier-Beziehungen spielten). So werden die regionalen Ausprägungen von Viehwirtschaft, Fischerei und Wildfauna beleuchtet. Zudem ist eine wichtige Frage, ob diese Aktivitäten zu Wechselwirkungen zwischen Mensch, Tier und Umwelt führten, z. B. erkennbar an Übernutzungen und Anpassungsstrategien an sich verändernde Umstände (z. B. die Besiedlung der Städte durch Tiere und Strategien gegen Schädlinge). Über die Erläuterung dieser Fragestellungen, die sowohl archäologische, als auch schriftliche und bildliche Quellen heranzieht, soll aufgezeigt werden, wie verschiedene Quellen zur Beantwortung gemeinsamer Fragen beitragen können. Zum Schluss werden methodische und inhaltliche Perspektiven für eine interdisziplinäre Erforschung der byzantinischen Umweltgeschichtsforschung umrissen.

An Approach to Byzantine Environmental History: Human-Animal Interactions

In Byzantine Studies, the exploration of human-animal relationships is a topic of minor interest. This applies to the archaeological branch as well as those branches that deal with written and pictorial sources. In the case of the written sources, this is largely due to the fact that animals do not feature much in them: they were perceived as common components of everyday life that did not require mentioning. Archaeology, however, being actually rich in relics of human-animal relationships, did not perceive animal bones as cultural artefacts for a long time and thus did not see the informational value of their analysis. Even though now this perception is widely regarded as outdated, little is known about the potential of human-animal studies beyond those circles primarily targeting these issues.

An environmental history of the Byzantine Empire, however, is unthinkable without the consideration of human activities associated with animals. Large parts of the Byzantine population were engaged in professions that dealt with animals; most of all, of course, animal husbandry and agriculture, but also many processing occupations. Animals were led into the landscape (pasturing livestock), animals were taken out of nature (fishery), and people cohabited more or less harmoniously with animals (like dogs, rats, and mice).

The objective of this contribution is to raise awareness of the role of animals in the living environment of the Byzantines. Focusing on 1) domestic livestock, 2) fish, and 3) other wild creatures, this role, as well as the question of how the environment shaped human-animal relationships is investigated. Hence, regional forms of animal husbandry, fishery and the wild fauna are considered. Another important question is whether these activities led to interdependencies between man, creature and environment, which can be detected in overexploitation or adaptation strategies (for instance the colonisation of cities by animals and strategies to keep vermin at bay). The exploration of these issues includes archaeological, as well as written and pictorial sources in order to show how different sources can contribute to a common research question. In the end, some perspectives for an interdisciplinary approach to a Byzantine environmental history are sketched, with regard to method as well as content.