Thinking outside the Box: Life beyond 'House – Farmstead – Village' in Neolithic Wetland Sites

Eda Gross & Renata Huber

Abstract – The approach to analyse Neolithic settlement structures only on a strict scale of 'house – farmstead – village' is unrewarding in our opinion. Even individualisation, and therefore reconstruction, of separate houses in Neolithic wetland sites is much more problematic than commonly assumed (e.g. distinction of architectural units, rate of dated vs. undated piles, scarce evidence for superstructures and their connection to the house layout). Many current reconstructions of houses and village layouts are mostly based on unproven presumptions. Taphonomic complexity in wetland layers is so difficult to understand that trivial connections between layers and architectural structures cannot be assumed. Concerning its basic hypothesis and the consequential economical and social implications, this paper focuses on discussing settlement patterns in the Canton of Zug (Switzerland) and highlighting two examples of current research in pile dwellings at Lake Zug (Cham-Eslen, Zug-Riedmatt). The high density of (potentially) contemporary sites in certain periods as well as the evidence of specialised – and possibly only or predominantly seasonal – lake dwellings speak in favour of complex patterns of settlement, exploitation and communication structured on a large scale as opposed to small, economically autarchic and self-contained village units. Hence we would like to contrast the traditional hierarchical model ('house – farmstead – village'), based on historic analogies, incorrectly perceived as obvious, with a relational network-model, which is close-knit especially in the bodies of water as lifelines (routes of transport and communication, important food resources). This approach opens a broad interpretive framework regarding the results of many disciplines like archaeology of economies, demography and settlement geography.

Key words – archaeology; lake dwelling; pile dwelling; wetland site; low-level food production; autarky; network model; bodies of water as lifelines; seasonality

Titel – Blick über den Dorfzaun: Leben am Wasser jenseits der Skala 'Haus – Hof – Dorf'

Zusammenfassung – Aufgrund unserer Erfahrungen mit zirkumalpinen Ufersiedlungen stellen wir den Ansatz, Siedlungsstrukturen des Neolithikums auf der Skala 'Haus – Hof – Dorf' untersuchen zu wollen, grundsätzlich in Frage. Nur schon die Ansprache und infolgedessen die Rekonstruktion einzelner Gebäude ist im Ufersiedlungsneolithikum problematischer als es ein erster Blick auf die Forschungslage suggerieren mag: Die Abgrenzung der architektonischen Einheiten zueinander, der Anteil datierter bzw. undatierter Pfähle, mangelhafte Informationen zur Gestaltung des Oberbaus bzw. dessen Bezug zum Grundriss – all diese Umstände erschweren die Lesbarkeit der Pfahlpläne. Viele der aktuellen Rekonstruktionen von Einzelhäusern sowie von gesamten Siedlungsplänen beruhen auf unbewiesenen Vorannahmen. Die taphonomischen Probleme in den Ufersiedlungen erweisen sich als derart komplex, dass ein Zusammenhang zwischen Schichteinheiten und architektonischen Strukturen nicht einfach und eindeutig hergestellt werden kann. Diese Skizze muss sich bezüglich der Grundthese und den wirtschaftlichen und gesellschaftlichen Konsequenzen auf die Diskussion der Fundverteilung im Kanton Zug (Schweiz) und hier auf zwei aktuelle Beispiele, nämlich die Ufersiedlungen Cham-Eslen und Zug-Riedmatt, beschränken. Die zum Teil hohe Dichte von (potentiell oder tatsächlich) gleichzeitigen und die Nachweise von spezialisierten (möglicherweise ausschliesslich oder schwergewichtig saisonal genutzten) Siedlungsplätzen an den Seeufern sprechen für komplex und grossräumig strukturierte Siedlungs-, Nutzungs- und Kommunikationsmuster und nicht für kleinräumig territorial organisierte, ökonomisch autarke, in sich abgeschlossene Dorfeinheiten. Deshalb möchten wir dem traditionell hierarchischen Modell ('Haus – Hof – Dorf'), das sich an uns naheliegenden historischen Analogien orientiert, ein relationales Netzwerk-Modell gegenüberstellen, das sich im Bereich der Gewässer als Lebensadern, als Verkehrs- und Kommunikationswege und als Quelle wichtiger Nahrungsressourcen besonders dicht knüpft. Dieser Ansatz öffnet den Interpretationsrahmen in Bezug auf die Untersuchungsergebnisse zahlreicher Disziplinen wie Wirtschaftsarchäologie, Demografie oder Siedlungsgeographie.

Schlüsselwörter – Archäologie; Seeufersiedlung; Pfahlbau; Feuchtbodenfundstelle; Low-Level Food Production; Autarkie; Netzwerkmodell; Gewässer als Lebensadern; Saisonalität

Neolithic 'House – Farmstead – Village' as an Actualistic Concept

The conference topic of the *Arbeitsgemeinschaft Neolithikum's* 2014 session[1] explicitly focused on Herbert Jankuhn's notions of 'House – Farmstead – Village'. These notions and the different ways in which they have been interpreted throughout the history of archaeological research are explained in the texts from the colloquium *Haus und Hof in ur- und frühgeschichtlicher Zeit* ('House and Farmstead in Pre- and Protohistoric Times'; published by Beck & Steuer, 1997, as a commemorative volume in honour of Herbert Jankuhn). In the epilogue Heiko Steuer summarises this approach as follows: *"The Neolithisation of society leads to the formation of house and farmstead; and this agricultural way of earning one's livelihood by producing one's own food […] persisted […] until the Middle Ages as the prevalent way of living"* (Steuer, 1997, 539).[2]

In other words, Steuer assumes that the concept of 'House – Farmstead – Village' persevered from the Neolithisation until the Middle Ages. He asserts that, throughout the entirety of this time,

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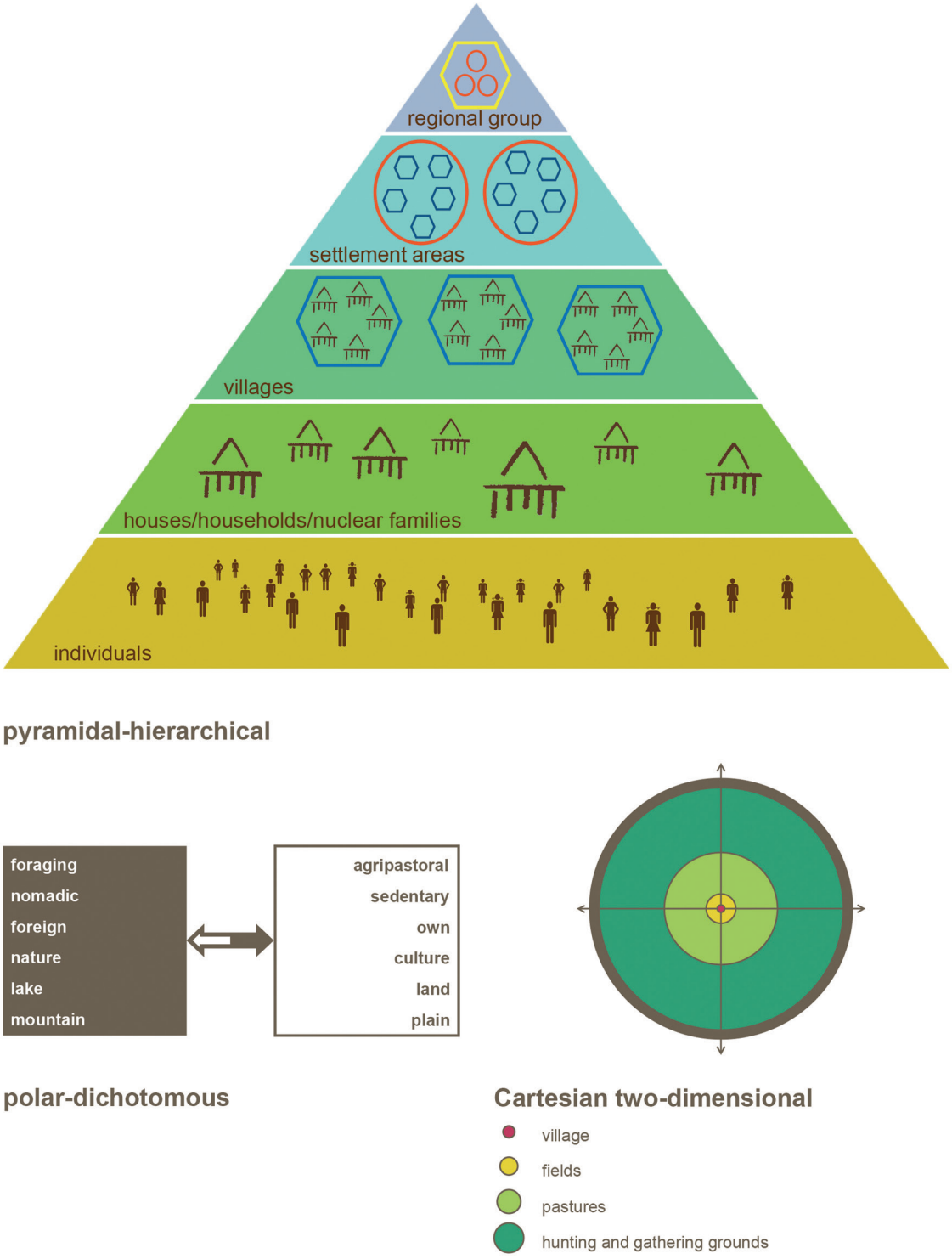

Fig. 1 Traditional thought patterns that substantially shaped the discourse on settlement and catchment areas in the research of Neolithic lake sites (Amt für Denkmalpflege und Archäologie des Kantons Zug, Direktion des Innern, graphic: Salvatore Pungitore, Archiv Archäologie).

house and farmstead were the centre of social and economic life. The tightly organised and close-knit community was structured in hierarchical settlement patterns, the individual elements of which functioned largely in an autarkical way (Steuer, 1997, 543).

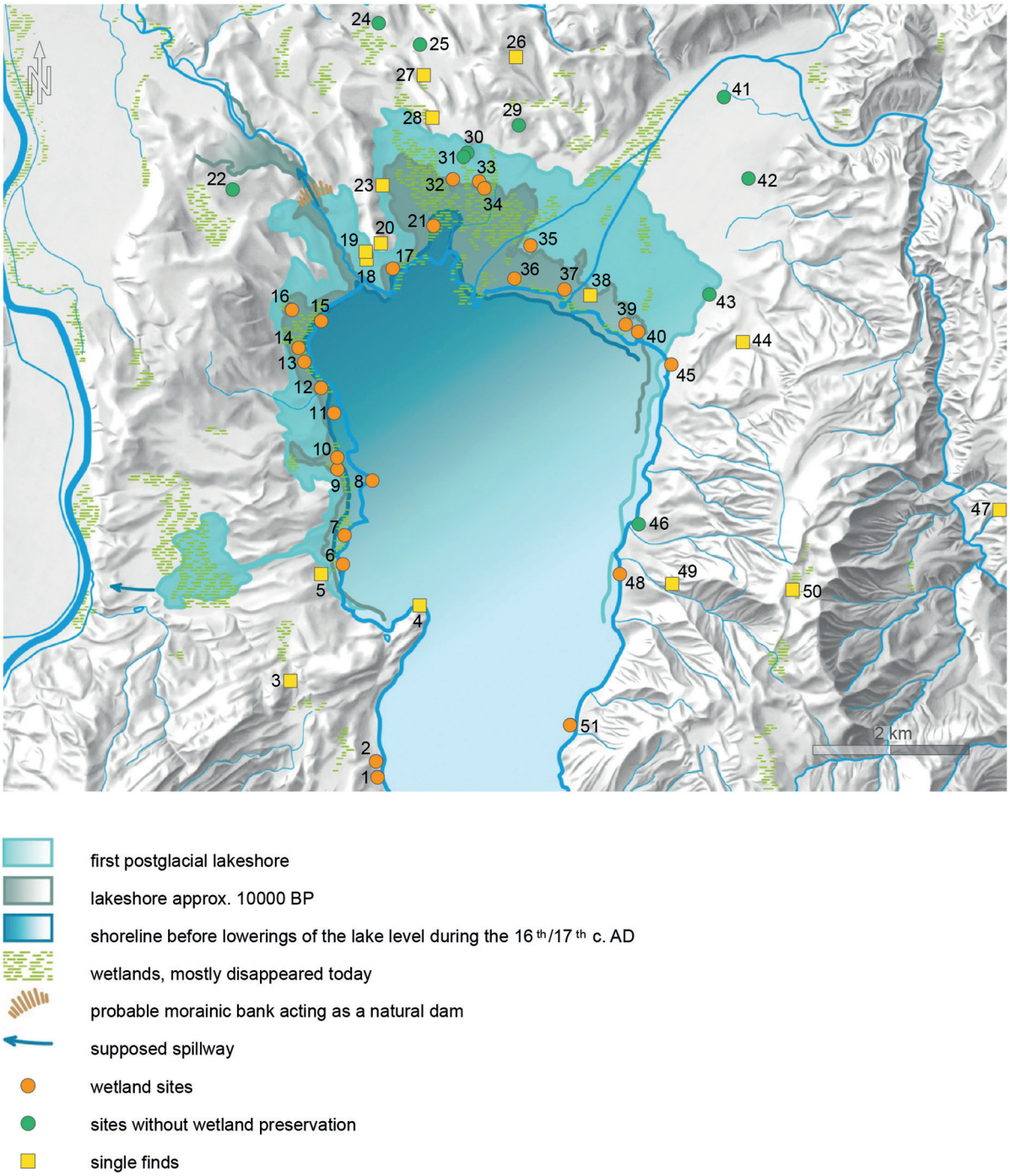

Fig. 2 Neolithic sites and the shorelines of Lake Zug since the end of the last ice age. Geological data according to Ammann (1993); however, the map has been adapted to include waters and wetlands that still existed in 1890 according to a map of historic waters of Canton Zug (Baudirektion des Kantons Zug, 1993).
1: Risch-Oberrisch, Aabach; 2: Risch-Oberrisch, Nord; 3: Risch-Brüglen; 4: Risch-Buonas, Bootshaus; 5: Risch-Gibel; 6: Risch-Buonas; 7: Risch-Zweieren; 8: Risch-Unterer Freudenberg, See; 9: Risch-Schwarzbach, Süd; 10: Risch-Schwarzbach, Nord; 11: Risch-Alznach; 12: Risch-Hechtmattli; 13: Hünenberg-Strandbad; 14: Hünenberg-Dersbach; 15: Cham-Eslen; 16: Hünenberg-Wildenbach; 17: Cham-St. Andreas; 18: Cham-Tormatt; 19: Cham-Ottenweg; 20: Cham-Parkweg; 21: Cham-Bachgraben; 22: Cham-Lindencham, Moosmatt; 23: Cham-Stumpen; 24: Cham-Oberwil, Seematt; 25: Cham-Bibersee; 26: Steinhausen-Bann; 27: Steinhausen-Heidmoos; 28: Steinhausen-Letten; 29: Steinhausen-Eschenmatt; 30: Steinhausen-Schlossberg, Rigiblick; 31: Steinhausen-Schlossberg; 32: Steinhausen-Rotenbach; 33: Steinhausen-Sennweid West; 34: Steinhausen-Sennweid Ost; 35: Zug-Riedmatt; 36: Zug-Galgen; 37: Zug-Brüggli; 38: Zug-Herti; 39: Zug-Schutzengel; 40: Zug-Schützenmatt; 41: Baar-Früebergstrasse; 42: Baar-Matthof; 43: Zug-Lauried; 44: Zug-Weinbergstrasse; 45: Zug-Vorstadt; 46: Zug-Oberwil, Tellenmatt; 47: Menzingen-Teuftänndlibach; 48: Zug-Oberwil; 49: Zug-Oberwil, Stutz; 50: Zug-Zugerberg, Vordergeissboden; 51: Zug-Oterswil, Insel Eielen (Amt für Denkmalpflege und Archäologie des Kantons Zug, Direktion des Innern; drawing: Eva Kläui and Salvatore Pungitore, Archiv Archäologie).

1591/92	first hydrotechnical lowering of the lake level
1st half of 17th c.	second lowering of the lake level (in steps), in total ca. in total ca. 2.5 m (including the first event)
1840s	first finds recorded, not recognised as prehistoric
1859 – 1900	discovery of 12 sites
1905 – 1950	discovery of 11 sites
1950 until late 1980s	discovery of 1 site
late 1980s – 2016	discovery of in total 8 sites
(i.a. diving prospection 1996)	(discovery of 4 sites)

Fig. 3 Historical data concerning the lake level of Lake Zug (Ammann, 1993; Hoppe, 2013) and the discovery of Neolithic and Bronze Age lake sites.

These basic assumptions correspond for the most part to the ideas about wetland sites in the Alpine foothills that was advocated about 20 years ago (Hasenfratz & Gross-Klee, 1995, 228-229). According to this view, the house is home to one nuclear family of about 5 people. This household is occupied throughout the whole year as a permanent residence and is economically autonomous to a great extent. Several households of such sedentary nuclear families form a village, which is at the 'bull's eye' of the site catchment. As the seat of a closed rural community, the village is delimited economically and legally from other villages. The fence is a visible sign of this territorial delimitation and the village's integrity.

We have since come to realise that these ideas are largely not grounded on observed phenomena; instead they derive mainly from concepts about more modern societies that were retrojected onto the past (Gross & Röder, 2014). The thought patterns behind these views were pyramidal-hierarchical, Cartesian two-dimensional, and polar-dichotomous – all three of which are static (**fig. 1**). Thus, from a post-processual perspective, they are not suitable analytical instruments.

Deconstructing the Territorial Model

While examining and mapping the Neolithic sites of Canton Zug for an overview paper (Gross, Huber, Schaeren, de Capitani & Reinhard, 2013), doubts arose concerning the traditional territorial model commonly used to interpret settlement patterns. It became apparent that topography, hydrogeology, local research tradition, as well as the dynamics of modern exploitation of and development in the area of Lake Zug massively influence and determine the site distribution patterns that we detect today. These factors vary between the different circum-Alpine lakes. For example, though Lake Zurich is not far from Lake Zug, their situations differ considerably. Most of the lake sites discovered since the 1980s are located in the part of the lake belonging to the Canton of St. Gallen, as in that part of Lake Zurich wetland archaeological research only emerged with the technique of targeted diving prospections. In the city of Zurich, on the other hand, new sites were discovered only in places that had been covered by massive landfills from the modern period and are now being used for large-scale building projects (Bleicher et al., 2011, 20).

Most of the known lake sites of Canton Zug are situated between the post-glacial shoreline and the one we see today (**fig. 2**). Today's shoreline is largely determined by the hydrotechnical lowering of the lake's water level by about 2.5 metres in the 16th and 17th century; (Reinhard & Steiner-Osimitz, 2016, 56). This caused most of the of lake site deposits that had before been water-saturated to fall (at least partly) dry. It is unclear whether the deposits that today are below the actual average water table came to be there due to subsidence after the lowering of the lake or whether they are in their original place (Risch-Unterer Freudenberg, See [8], Cham-Eslen [15], Zug-Schützenmatt [40], Zug-Oterswil, Insel Eielen [51]; **fig. 2**). Other sites near the Lorze delta were buried several metres deep by fluvial sediments and stayed at least partly wet thanks to ground-water (Steinhausen-Sennweid [33, 34], Zug-Riedmatt [35]). These specific basic preconditions were formative for the research on pile dwellings at Lake Zug. It is necessary to enter these preconditions concerning taphonomy and history of research into the equation if we want to understand the distribution patterns and the specific conditions of the sites (**fig. 3**). The early discovery of numerous lake sites close to the surface in the second half of the 19th century led to the first boom in pile dwelling research and has influenced research ever since (Hochuli, 2009, 79-90). Due to their location, these sites were easy to find; however, as the organic layer constituents had decomposed, they were not very beneficial for archaeological research. Unfortunately, this boom did more harm than good: it rather hindered the development of later research and led to few systematic insights into the individual dwelling remains. Only from the 1980s onwards archaeological investigations have been conducted prior to construction pro-

Fig. 4 Sites between 3.250 and 2.750 cal BC at Lake Zug with site catchment circles according to Vita-Finzi et al. (1970). (Amt für Denkmalpflege und Archäologie des Kantons Zug, Direktion des Innern; graphic: Salvatore Pungitore, Archiv Archäologie).

jects on a mandatory basis. This led to sometimes quite extensive excavations of already known sites (Risch-Oberrisch, Aabach [1], Hünenberg-Strandbad/Dersbach [13, 14], Cham-Bachgraben [21], Steinhausen-Sennweid [33, 34]; **fig. 2**). Thanks to such construction projects, a number of new sites were found, some of which were situated at great depths and with stunning conditions of preservation (Zug-Riedmatt [35]; **fig. 2**). The small number of sites found during targeted diving prospections since 1996 (only four) shows that finding more sites on the shore platform beneath today's lake surface is not to be expected.

Looking at the map of historic waters (Baudirektion des Kantons Zug, 1993), it immediately becomes apparent that the area around Lake Zug, and life within this area, was shaped and characterised to a great extent by water bodies (some of which

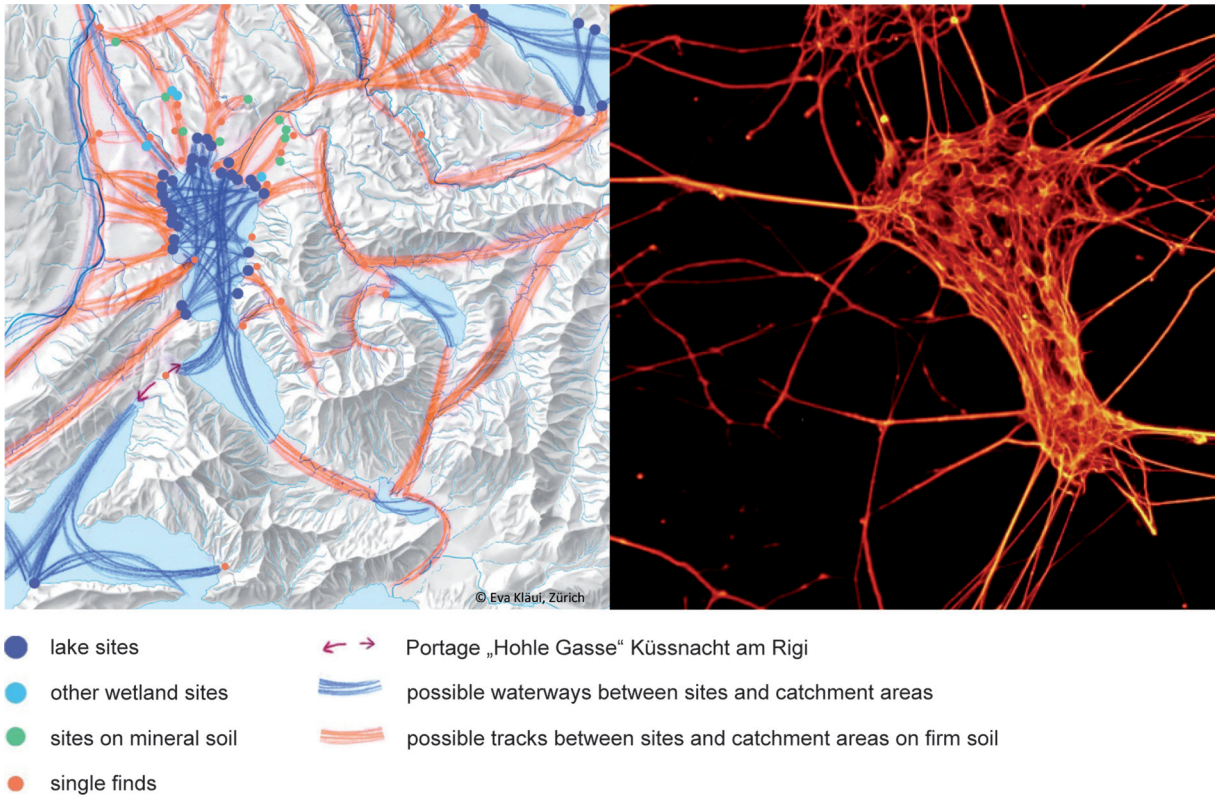

Fig. 5 A new model. Left: sketch of a possible Neolithic network with Lake Zug as the network's hub and the pile dwelling sites as nodes. Right: image detail of a neural network (left: Amt für Denkmalpflege und Archäologie des Kantons Zug, Direktion des Innern; drawing: Eva Kläui, Archiv Archäologie; right: http://www.stemcellresearch.umich.edu/news/photos.html [28.2.2017], Photo by Matt Velkey, University of Michigan).

have vanished), shores, river delta, swamps, and riparian zones (**fig. 2**). In addition, we can assume that, in Neolithic times, the wetland areas and the waters were even more dominant as the map does not show historic waters that disappeared (or were drained) before 1890. Even most of the Neolithic dwelling sites that were not directly adjacent to a lake were located in or close to wetlands, deltas, or shores and were therefore also influenced to a large extent by waters. However, it has to be noted that some of the water bodies marked on the map might have only been formed during the Little Ice Age (roughly 15th to mid-19th centuries AD) and would therefore not have existed before. It should, moreover, be noted that our archaeological record may be distorted due to the better conservation conditions in these areas (Ebersbach, 2011, 32-34). The criteria for sites to be mapped as dwelling sites in **figure 2** are the presence of waste or building structures that can be at least roughly dated. Single finds were mapped separately.

A New Model

The Neolithic sites lie, just like a pearl necklace, along the prehistoric northern bank of Lake Zug. Which pearls of this necklace were contemporary cannot be determined for certain yet, as it is difficult to obtain firm dendrochronological dating for sites at Lake Zug. Timber was acquired primarily from the alluvial forests, and pollarding was common practice. This impedes dendrochronological dating (Niels Bleicher, pers. comm.; see also Huber & Schaeren, 2009, 114). **Figure 4** depicts the 17 known lakeside dwellings, the three sites in the hinterland, and the single finds from the time frame between 3250 and 2750 BC. Many sites feature several settlement phases during this period – the same holds true for lake sites in Canton Zurich.[3] Our own experience and Niels Bleicher's currently on-going dendrochronological evaluations of lake sites in Canton Zug show that the more dendrochronological results we have, the more evidence there is that sites might have been occupied at the same time (Annick de Capitani & Niels Bleicher, pers. comm.). This contradicts former ex-

Fig. 6 View over Lake Zug facing south with Mount Rigi on the right. The findspot Cham-Eslen on a small shallow bank in the foreground (marked with a white pole) with divers retrieving a fragment of a dugout (Amt für Denkmalpflege und Archäologie des Kantons Zug, Direktion des Innern; photo: Jochen Reinhard, Archiv Archäologie).

pectations which assumed that new dendrochronological results would prove that the occupation of the various sites tends to fall into different time periods. Thus, it is most likely that at least some of these sites were occupied at the same time.

Ever since Josef Winiger's reflections about the prehistoric settlement history of Lake Biel (Winiger, 1989, 229-233; esp. 232, fig. 122), most Swiss scholars implicitly used Claudio Vita-Finzi et al.'s (1970) classical site-catchment model for territorial calculations about lake sites.[4] If we apply this model to the sites from 3250-2750 BC at Lake Zug, the pearl necklace becomes completely entangled (circles in **fig. 4**). Even if only some

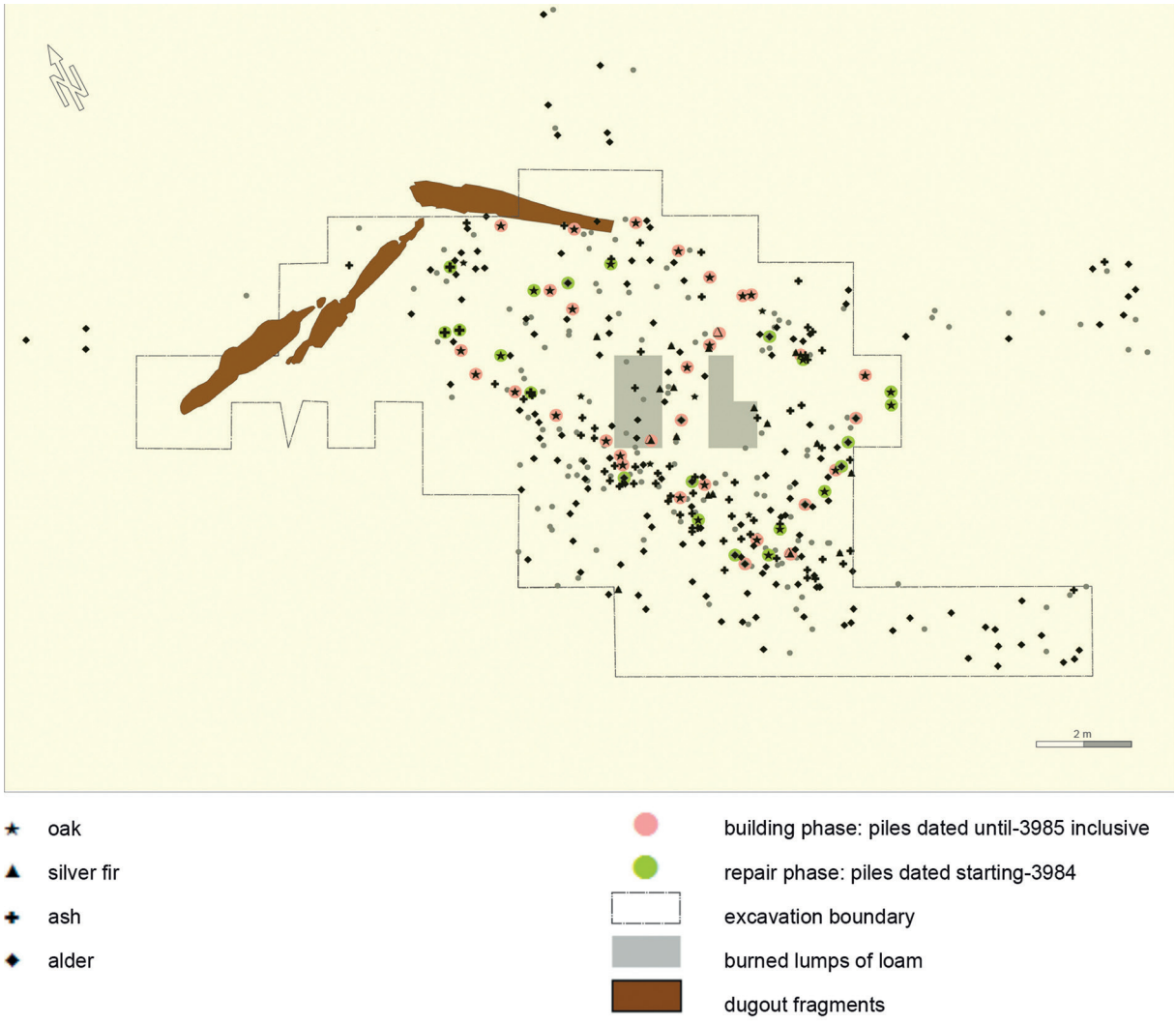

Fig. 7 Cham-Eslen: pile plan according to type of wood – oak, silver fir, ash, alder and other wood species, with dated piles (b-dates: their relative dating is ascertained, the absolute dating is not), burned lumps of loam, and fragments of dugouts (Amt für Denkmalpflege und Archäologie des Kantons Zug, Direktion des Innern; graphic: Salvatore Pungitore, Archiv Archäologie).

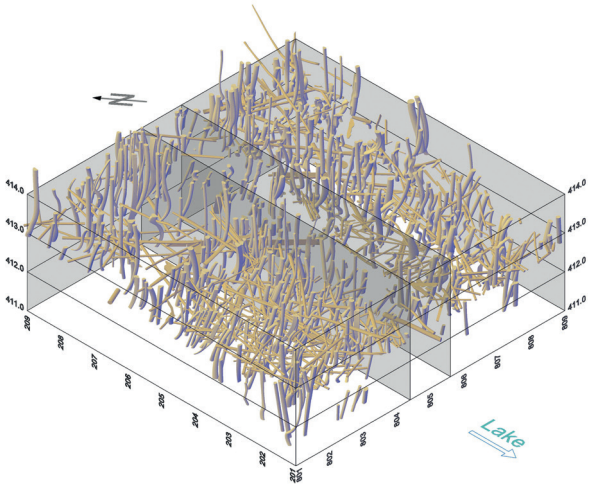

Fig. 8 Zug-Riedmatt: isometric pile plan (Amt für Denkmalpflege und Archäologie des Kantons Zug, Direktion des Innern; drawing: Silvia Hlavová, Archiv Archäologie).

dwellings coexisted with others, the overlapping areas dominate the picture. There is simply no space for clear-cut and delimited territories with self-sustaining villages.

The only way to disentangle the necklace is to consider the entire Lake Zug area and its surroundings as the frame of reference for one single population group. By doing so, the lake turns into a hub and the recorded sites become gateways and nodes between waterscapes and the landscapes, each with their individual resources (**fig. 5**). This model resembles the biological neural network: both build upon fundamental structures, change constantly, and are able to regenerate (Gross & Röder, 2014).

An enormous space emerges where individuals, whether human or not, can move around and interact with one another. Territorial delimitations and clear territorial assignments are of little importance as waterscapes connect rather than separate the different sites. Land routes between the different systems of water bodies can be used as portages, on which boats and cargo are transported by the overland route from one water system to another. In **figure 5**, one such portage in the area of William Tell's *"Hohle Gasse"* – between Immensee and Küssnacht am Rigi (both in Canton Schwyz) – is shown as the shortest and easiest land connection between Lake Zug and Lake Lucerne. The magnificent flint axe blade of the Glis-Weisweil type, which was found close to the highest part of this portage, might indicate the importance of this land connection (Pétrequin, Gauthier & Pétrequin, 2010, 246-247, 252; Speck, 1988). These ideas about the importance of aquatic ways of communication correspond largely to the reflections of Christer Westerdahl (1992), Matt Edgeworth (2011) and Martin Mainberger (2016). In other words, it is quite possible that neighbouring sites existed at the same time, and that they were at least partly occupied by the same group of people. If communities are not primarily place-bound, people from the same communities can be present in different places and in different constellations and perform different activities depending on the locale. Territorial tenures and legal claims are not restricted to one single point of reference. Thus, dwelling places – whether single buildings or entire settlements – can more easily be relocated or newly established. This corresponds to the volatile and diverse settlement dynamics that have been observed in lake sites (Ebersbach, 2010; Bleicher, 2009, 159-163). Thus, one or several members of family associations would – in the course of the seasons or their lives – dwell, build, and work in different places again and again. Since areas of resources are no longer limited to one single village, they can be used in an ideal way. The task of transporting humans, animals, and goods is a relatively simple and fast one thanks to lakes and rivers.

The number of inhabitants and the composition of groups in different places are likely not to have to been constant (fission-fusion dynamics, see Aureli et al., 2008), not even for a short period of time. Scholars who used the traditional territorial model assumed that the population numbers were quite high (Hasenfratz & Gross-Klee, 1995, 198-211; 228-229), which in turn lead to major bottlenecks (Jacomet, Schibler & Gross,

Fig. 9 Provisional reconstruction of the buildings' positioning during the first settlement phase of Zug-Riedmatt in the Lorze Delta facing southwest (Amt für Denkmalpflege und Archäologie des Kantons Zug, Direktion des Innern; drawing: Eva Kläui, Archiv Archäologie).

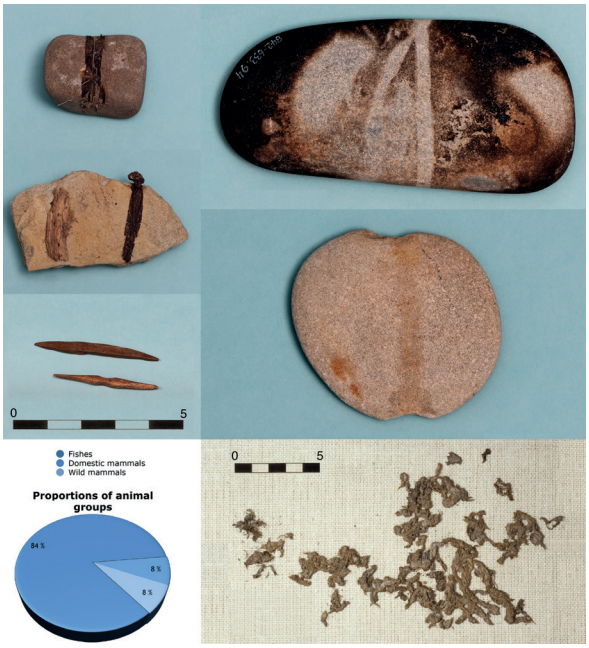

Fig. 10 Cham-Eslen: finds connected to fishing (net weights in different shapes and sizes, some with a preserved wrap made of lime tree bast *Tilia* spec., others at least with an imprint left thereof; fragments of a net made of lime tree bast; transverse fish hook (made of animal bone) and the large amount of fish bones (84 % of all animal bones, compared to only 8 % of each domestic and wild mammals) underline the importance of fishing in Cham-Eslen (Amt für Denkmalpflege und Archäologie des Kantons Zug, Direktion des Innern; photos: Res Eichenberger; layout: Salvatore Pungitore, Archiv Archäologie; Naturhistorisches Museum Bern, diagram: André Rehazek).

1990; Gross & Röder, 2014). By contrast, the new model allows for estimations of much smaller population numbers. Thus, these bottlenecks regarding supply and labour power can be broken. In considerably larger areas of resources a larger body of workers is available. We do not mean to allege that all this proceeded without conflicts or violence; however, that is a different story altogether. We can no longer talk of THE family, THE village, THE society, THE economy, or THE religion. Instead, we should imagine highly diverse activities at different points of the day or the year all of which are in one way or another connected with the aforementioned elements so as to create a kind of a net, in which the individual elements can sometimes no longer be delimited. Thus, acquiring a multi-perspective view enables us to focus upon different agents and different activities within the observed areas. There is no longer ONE prehistory but a myriad of diverse histories, which differ depending on the perspectives we acquire. We are now going to sketch out this multi-perspective view with the help of specific examples from our research in Canton Zug.

Building and Dwelling

The oldest thoroughly examined wetland site from Zug is Cham-Eslen's single building ([15]; **fig. 2**). Located on a small shallow bank (**fig. 6**) with comparatively few stilts, the building's outline (**fig. 7**) stands out quite clearly (Huber & Bleicher, 2009; Huber & Ismail-Meyer, 2012). There were two assemblages of loam; however, as they are rough-tempered, we can assume that they are not the remains of wall cladding. Furthermore, some of the their surfaces show signs of extremely hot temperatures, the like of which can usually only be reached inside an oven (Huber & Ismail-Meyer, 2012, 100).

In addition, on the landward side of the site, the remains of two or three dugout canoes were found (Huber, 2017). Already in the first year of construction the building was laid out with at least two compartments. However, unlike buildings that correspond to the traditional concept of lake site houses (Hasenfratz & Gross-Klee, 1995, 212-220), this building does not feature any convincing bays. Moreover, it is unclear whether there was a third compartment or some other construction in the north of the building. Starting

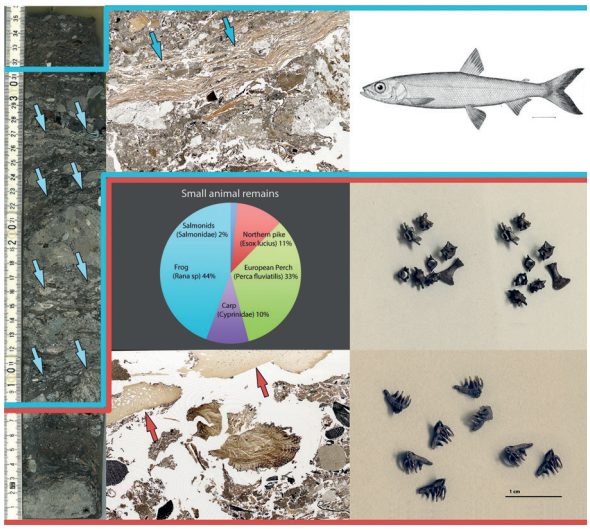

Fig. 11 Zug Riedmatt: oldest settlement phase. Microstratigraphy of the bone midden (red block) and the overlaying deposits of loam and fish scales (blue block). Left: polished section of the micromorphological sample 98 (blue arrows: layers of whitefish scales between lumps of loam). Lower middle: thin section of the bone midden (red arrows: bones). Above: a diagram of small animal and fish remains found in the bulk samples of the bone midden. Higher middle: thin section of the layers of loam and fish scales (blue arrows: whitefish scales). Bottom right: *Alburnus alburnus* bones. Above: *Rana* spec. bones (both found in the bone midden). Top right: *Coregonus*. (all photos: IPNA, Basel; *Coregonus*: by H. L. Todd [Public domain], via Wikimedia Commons; Amt für Denkmalpflege und Archäologie des Kantons Zug, Direktion des Innern; layout: Salvatore Pungitore, Archiv Archäologie).

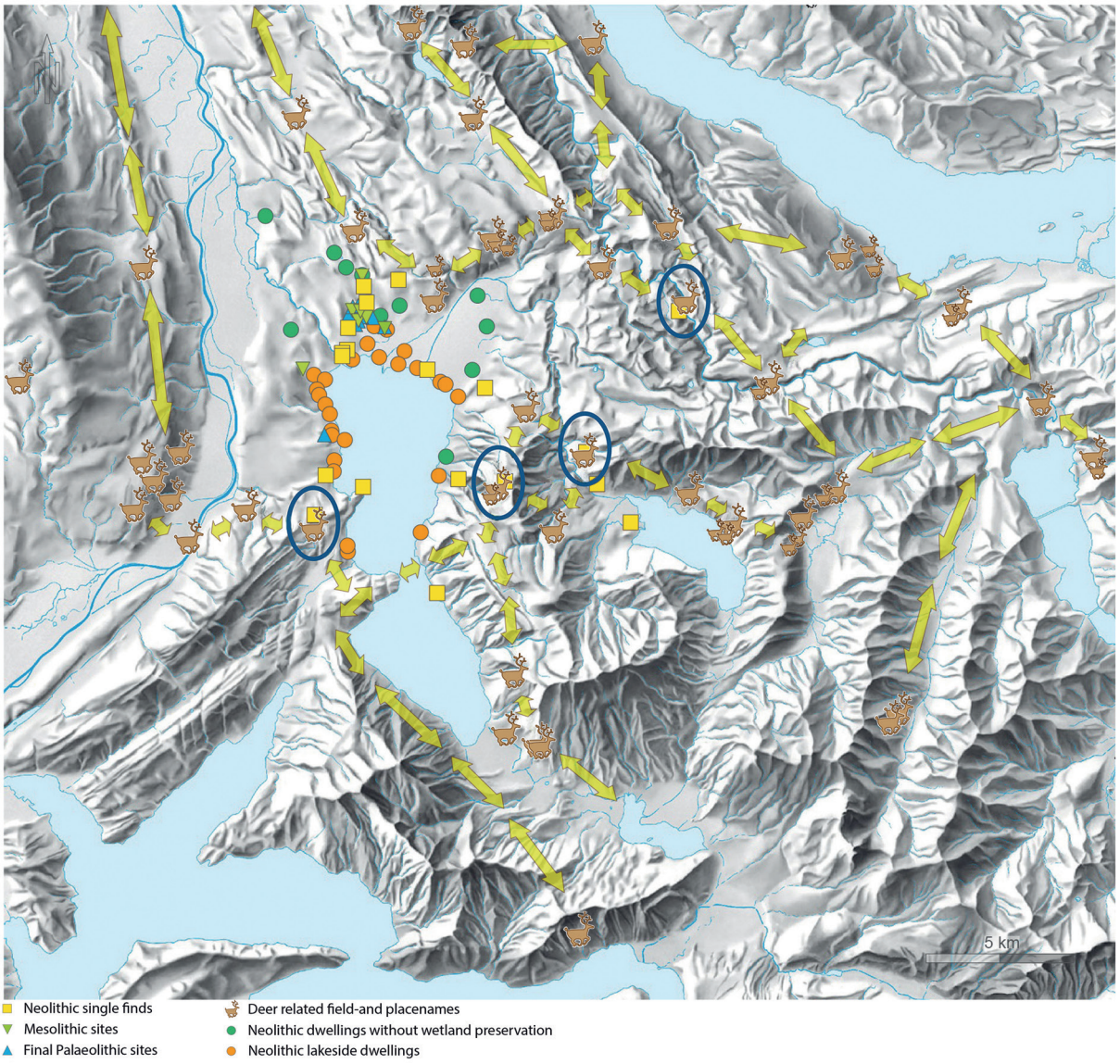

Fig. 12 By connecting field and place names associated with deer (wallows, deer crossings, springs containing salt, etc.) with one another and by taking into consideration the topography, we can model the movement axes of red deer in the area around Lake Zug. In addition, Neolithic as well as Mesolithic and Final Palaeolithic findspots in Canton Zug are marked on the map. There seems to be a connection between some single finds and the deer related field and place names (ellipses).

one year after the presumed date of construction, additional piles were added. This leads to a considerably broad high-density scattering of the stilts in the wall area. It is nearly impossible to make any conclusive assertions about the superstructure. We know neither whether the remains we found were a single permanent and coherent structure nor whether they are in fact the remains of several structural components, which were arranged differently at different times. However, this much is certain: it is an isolated building structure that was reshaped again and again during 11 years, and it was located on a shallow bank not connected to the shore and thus only accessible by boat. Furthermore, the remains of ovens or hearths found on both sides of the presumed partition indicate that the building was at least partly and temporarily roofed. The question of how to interpret the numerous additional stilts, however, remains. They could have been used as a pier or they might have been part of some fishing installation, though we cannot yet deduce their functional and temporal relation to the building.

The situation of Zug-Riedmatt is far more complex (**fig. 2**, [35]), as only a small segment of the dwelling area has been excavated and the

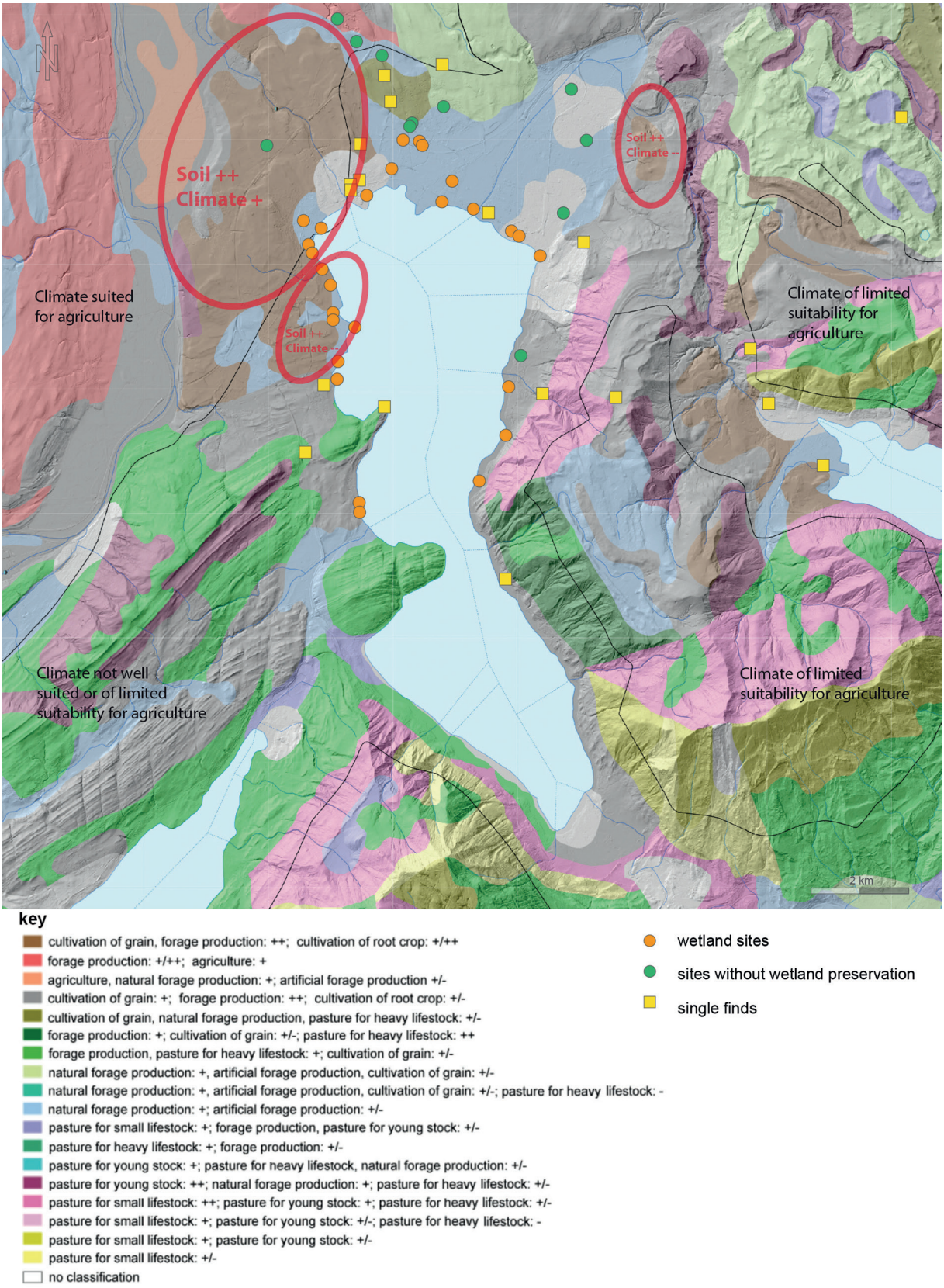

Fig. 13 The location of the Neolithic sites in Canton Zug with regard to today's crop suitability of soils (see key) and the climate (climate zones are marked with black lines on the picture). The sites are not necessarily situated in proximity of the areas that are best suited for agriculture (indicated by red ellipses) (Grundlagen zu Böden und Klima: Bundesamt für Landestopographie Swisstopo; Amt für Denkmalpflege und Archäologie des Kantons Zug, Direktion des Innern; graphic: Salvatore Pungitore, Archiv Archäologie).

layers of four settlement phases are superpositioned (Gross, Schaeren & Villa, 2017; Steiner et al., 2017). Therefore, it is hardly surprising that deciphering the confusion of stilts is currently impossible (**fig. 8**). Furthermore, the extraordinary conditions of preservation do not clarify the situation; instead, they reinforce the chaotic, fractal, and patchwork-like patterns.

Since we are lacking a large-area overview of Zug-Riedmatt that would allow us to identify regular basic structures, microscopic methods of analysis and Fredrik Fahlander's (2008) microarchaeological approach are applied. These methods promise far more informative results regarding chronology and dynamics of the activities, especially thanks to the transdisciplinary combination of results from thin section micromorphology, geochemistry, botanical macroremain analyses, palynology, and the analysis of small animal remains. We hope that by means of the Swiss National Science Foundation (SNSF) project "*Formation and Taphonomy of Archaeological Wetland Deposits*", which is run together with the institute of Integrative Prehistory and Archaeological Science (IPNA) Basel, we will gain more insight into certain aspects of the organisation (or disorganisation) of the site (Billerbeck et al., 2014). Although this approach will not clarify the architectural setting, it will shed light on the play and activities acted out on this stage. For this reason, in a provisional attempt of reconstructing the surroundings of the Zug-Riedmatt site, the oldest group of adjoining houses is still far away and hidden by smoke (**fig. 9**).

Catching Frogs and Fish

If we want to apply our new ideas, we must abandon the idea of one ascertained way of reconstructing the settlements. We have to discard the hydrophobic perspective of Swiss wetland archaeology from post-war times (Vogt, 1955) and have to consider lake sites as gates to the water instead. By adjusting our angle of view in order to bring the water into focus, we become aware of the importance of these waterscapes for the settlements' economical catchment. If we depart from the anthropocentric view of the environment as a self-service outlet, we notice how much the behaviours of all agents interact (e.g. the conduct of fish and their habitat differ depending on the season).

The close relationship between Cham-Eslen and the water is quite evident due to the remains of dugout boats and the site's location on a shallow in the littoral zone (**fig. 6**). Furthermore, more than 1200 net weights, some fragments of possible hand nets (Rast-Eicher, 2013) and simple transverse fishhooks were found in this small area (**fig. 10**). The fish spectrum – consisting mainly of European perch (*Perca fluviatilis*), cyprinids, and northern pike (*Esox lucius*; Rehazek, 2015) – indicates a seasonal emphasis on fishing in the littoral zone in spring and summer. The isolated location of the single building and the oven remains could hint at its special function for fishing and possibly its use as a smoke house (Huber & Ismail-Meyer, 2012, 92, 100; Huber & Rehazek, 2016). After catching the fish, the haul needs to be processed immediately; else it will become infested by insects (esp. fly maggots). In our latitudes and without access to large amounts of salt, another way of processing besides smoking would be fermenting (Welcomme, 1985, ch. 7).

The research on fish remains and small animal bones from the bone midden in Zug-Riedmatt so far points to a similar context but shows a completely different picture (**fig. 11**). The midden was part of the lowermost settlement layer and consisted mainly of deer, fish, and amphibian bones. The direct link between the spectra of fish and small animal remains and the findings' location in the delta is evident (analyses by Heide Hüster-Plogmann). In spring, the inhabitants of Zug-Riedmatt caught large amounts of common frogs (*Rana temporaria*) and small cyprinids (esp. common bleak, *Alburnus alburnus*) in the cut-off lakes of the Delta. Here, they could skim the animals, which else would either have perished during the drying-up period of the cut-off lakes or would have been eaten by other predators (Smith, 2009, 172). The numerous bones of European perch and northern pike found in the midden would fit the bill of the seasonal spectrum and the delta situation, as the fish had ideal spawning grounds near the lakesides at their disposal.

The overlaying stratigraphic sequence of the first settlement phase exhibits other seasonal focuses. Here, layers of burned loam assemblages alternate with close-packed layers of whitefish scales (*Coregonus* spec.) and moss (*Neckera crispa*). The predominance of whitefish scales points towards an annual succession of high-yielding hauls in winter, when the whitefish were caught in the river presumably on their spawning run or coming back from their spawning grounds. The fish scales were entangled in the moss to such an extent that the moss was matted with fish scales. Therefore, it is likely that the moss was used when processing whitefish. The lack of skeletal parts could indicate

that the non-filleted whitefish were processed immediately (be it by smoking or fermenting). However, it was not in this exact spot that the fish were eaten (Billerbeck et al., 2014). This sequence of activities represented in tiny subsequent microlayers illustrates the complexity and the dynamics of daily and seasonal activities within a few years. This leads us to question investigations of zoological and botanical remains that do not differentiate between the different parts of a site, and that regard the entire site as one set of findings. Moreover, it casts doubt on former results, especially in regard to whether a site was used permanently or only seasonally. This will have far-reaching consequences for future research.

Fig. 14 Example of activities for low-level food production of the middle ground according to Bruce Smith: The processing of maple syrup in an Ojibwa camp used exclusively for this activity ("Maple sugar industry - NARA - 285760" by Unknown or not provided - U.S. National Archives and Records Administration. Licensed under Public Domain via Wikimedia Commons - http://commons.wikimedia.org/wiki/File:Maple_sugar_industry_-_NARA_-_285760.tif#/media/File:Maple_sugar_industry_-_NARA_-_285760.tif [28.2.2017]).

Deer Crossings and Hunting Behaviour

All zooarchaeologically examined lake sites in Central Switzerland (Lake Zug and Lake Lucerne) so far distinguish themselves from sites at other lakes (e.g. Lake Zurich) by their high amount of wild animals.[5] This could suggest that hunting was of greater importance for subsistence in Central Switzerland than in areas that were better suited for agriculture (**fig. 13**). The deer bone midden found in Zug-Riedmatt mentioned above might be the offal from one or several big hunts either in spring or early summer. At least 36 red deer (MNI) were processed here. Sandra Billerbeck's (2016) osteological research indicates that the game was brought down some way from the site. The game was also partially butchered at the killing ground as indicated by the small number of ribs found in the settlement bone midden. Did the hunters already remove the bulky chest at the killing ground? Did they then transport the animals without ribs to the settlement, folding the animal into a kind of bag to make transport easier? Nevertheless, the game was skinned and disjointed on the site of Zug-Riedmatt (the relevant body parts such as skulls and lower limbs are found in abundance). By contrast, bones belonging to parts that are rich in meat (e.g. hind quarters) are but scarce. We do not know where these parts were left – whether on a part of Zug-Riedmatt that has not been excavated yet or somewhere else. However, it is certain that the bone midden is not the continuous accumulation of daily food waste from one single household.

Hunting deer efficiently requires a differentiated game management, detailed knowledge of the animals' natural behaviour in the different seasons depending on their sex and their age, as well as meticulous organisation of the hunt and planning throughout the whole year. It is probable that a great number of people were involved in such big hunts. Perhaps it was only for the hunt and the subsequent processing of the kill that the group of hunters gathered in the places suited for such tasks.[6]

In order to get an idea about how the hunt worked, earlier territorial and seasonal behaviour patterns of red deer near the sites need to be simulated; these simulations then need to be correlated with the archaeological sites. Observations concerning wildlife biology and historic sources (field and place names) referring to deer populations and deer hunt, as well as their confrontation with the archaeological findings from the area around Zug-Riedmatt look promising. However, as our research is still ongoing, for this article

Fig. 15 Example of activities for low-level food production of the middle ground according to Bruce Smith: Family under the instruction of the grandmother hunting frogs in Thailand (Captain Kimo: https://captainkimo.com/frog-hunting-with-grandma-in-thailand/ [28.2.2017]).

we can only sketch first results. **Figure 12** shows historic as well as contemporary field and place names (after Dittli, 2007; ortsnamen.ch; map.geo.admin.ch) that allude to deer and their behaviour – such as deer crossings, wallows, and springs containing salt – in relation to Neolithic and pre-Neolithic sites. We are aware that these toponyms do not represent the situation in the Neolithic, but from the Middle Ages to the early modern period. In other words, at that time the deer had already been pushed further back than they had been in prehistoric times.

Nevertheless, if we examine the location of late Palaeolithic and Mesolithic sites north of Lake Zug (see Nielsen, 2009, 583-646) or Neolithic sites with bone middens consisting largely of deer bones (e.g. Steinhausen-Sennweid; Chenal-Velarde & Fischer, 2007; Schibler 2007; and Zug-Riedmatt; Billerbeck et al., 2014), we notice that they are located close to historic toponyms that refer to deer. Furthermore, these sites are situated in an area in close proximity to the deer's bedding areas or movement axes along the (former) borders between wetlands (e.g. Lorze delta and the Lorze ravine) and woods. Only the question whether there are any killing grounds (places where the deer's means of escape could easily be reduced and from where the animals could be culled without much difficulty) nearby remains.[7] Interestingly the few Neolithic single finds from areas unsuitable for dwelling or for the cultivation of land (**fig. 13**) correspond almost exactly to the field and place names associated with deer (**fig. 12**, [ellipses]).

The cases of Cham-Eslen and Zug-Riedmatt show that the combination of different aspects (location, economic activity, taphonomy) paint a more lucid picture of the sites than the examination of the architectural units alone can ever offer. It should be added that, because of the uncertainties in relation to the architectural findings' positions, the reconstructions of these architectural units are also more strongly influenced by our preconceptions about the organisation of settlements than by unequivocally interpretable findings.

Eco-Niche-Engineering und Low-Level Food Production

So far we have addressed foraging aspects only, which might be astonishing in the given Neolithic context. However, in the case of Zug's lake sites, a focus on these foraging aspects seems like an obvious choice. The settlements' situation – lacking the optimal combination of microclimate and suitable farmland – was less than ideal for agriculture (**fig. 13**). Only very few of the lake sites are located in vicinity of areas that were suitable for cultivation. We can therefore assume that other factors were of a more decisive character when choosing the site of Zug-Riedmatt and other dwellings of similar locations. While the sites are not ideal for agriculture, the location is very well suited for certain foraging activities. Domesticates, which are usually seen as the basis of Neolithic economic systems, must not be looked at in isolation. For example, the interdependence between crop plants and domestic animals is common knowledge by now. Both groups along with the wild animals and the plant resources from the cleared forest form an interwoven net of symbiotic relations (Jacomet et al., 2016, 1870).

Bruce Smith has designed a model of these relations for the domestication processes of the American continents, which sheds an altogether different light on the phenomena observed (Smith, 2001; 2009). By leaving behind the dichotomy between foraging and agricultural societies, Smith reveals a vast *"middle ground"* of economic systems between the two extremes that can, but do not have to, include domesticated species. This middle ground is characterised by the so-called low-level food production. This kind of production uses and produces a diverse number of resources in an ideal balance between effort and sustainability (see e.g. **fig. 14** and **fig. 15**). Intensive and skillful niche construction in the different habitats optimises revenues and reduces the necessary effort. Transitions and interactions fluctuate between foraging and agri-pastoral techniques and the different economic systems complement each other. Niche construction of different animal and plant species in symbiosis with the humans' way of living can lead to a win-win situation for several actors involved.

There are several examples of such win-win situations resulting from the symbiosis between humans and other species. For instance, beavers can have a lasting effect on the ecosystem of river- and lakescapes. By damming waters, they create new eco-niches and make certain waterways navigable (Coles, 2006, 48-53). Other examples are hazel bushes and wild apple trees, as they grow and spread better when tended in cleared forests (Jacquat, 1989, 77; Antolín & Jacomet, 2015). Categorising the natural environment in a strict fashion according to phytosociological or zoocoenological aspects makes it difficult to discuss the interaction of different animate and non-animate actors. This is because the different

actors are entangled in a complex manner and that, therefore, a strict categorisation oversimplifies the circumstances. We became aware of this when observing the samples from Zug-Riedmatt. The patchy melange of these samples represents the entanglement of the different actors, and not a failure on the part of the archaeologists to make sense of the melange. All too often, the different components cannot be assigned to individual actors. For instance, the alder-catkin frequently found in the samples might have been eaten by humans as emergency food, or they could have been used as dye, or the respective branches might have been pollarded for the livestock. The complex interconnection of animal and plant remains – independent from their level of cultivation – can be described more accurately by Bruce Smith's (2001) middle ground than by the traditional picture of the European "*Neolithic package*". Accordingly, the tending of wild fruit groves can parallel the utilisation of wood. Wild plants can be boosted, sowed, planted, and transplanted in appropriate locations – be these locations of natural origin or created through clearing (e.g. controlled burning). *Brassica rapa* and white goosefoot (*Chenopodium album*), both of which were viewed as crop weeds by earlier research, are found so frequently in some find complexes, that we have to assume that they were consciously encouraged or even cultivated (Jacquat, 1989, 75-76). Every element of the melange mentioned above refers to the outside of the dwelling, towards 'natural' environments and areas of exploitation. The element has been brought into the find complex to fulfil a certain task; however, it has also had a life before this task. It is no longer possible to depict the complexity of these processes through conventional manners of representation as it would need to be four-dimensional and animated.

'Natural' environments and areas of exploitation were interspersed with human and animal infrastructures such as human settlements, beaver lodges and dams, deer crossings and wallows. Only part of them are more or less long-term dwellings of humans. These infrastructures are visible and tangible to a variable extent, which means that not all of them are always materialised in archaeological deposits. Our knowledge about human infrastructures is highly dependent on the different finding situations and the functions of the sites: while waterlogged sites are fairly well observed, mineral soil settlements less so, and all other kinds of infrastructures (e.g. paths, shelters, game and fish fences, field enclosures or groves) are not well known at all. Humans, domesticated animals and plants, wild animals, and potentially used wild plants (including gathered plants, leaf-fodder, timber, and raw materials) move (or are moved) freely in and between all these areas and elements of infrastructure.

In other words, an excavated site is not necessarily the 'centre' of these actors or their actions. In regard to the cultivated plants, it becomes apparent that these vegetal actors of the "*Neolithic package*" enact only a small – but vital (for the importance of providing sufficient carbohydrates must not be underestimated) – part in an enormous theatre play. Furthermore, it also becomes evident that foraging resources are of great importance qualitatively, and also quantitatively. The high revenues are indicative of highly developed and diverse concepts of land-use and niche construction. Moreover, it can be expected that the animal actors (especially the humans) moved through and stayed at a variety of different locations within the entire catchment area.

Conclusion and Roadmap

Our reflections initially lead to bewilderment: we are no longer capable of even depicting the processes above graphically. Many long-held views have to be re-considered. However, do we also gain something from our insights? Although the deposits rich in finds and records are nothing but palimpsests, they do contain an abundance of clear references to the area of resources in the outside world.

Our rough sketch of this area of resources and the movements that occur within strikes new paths that can be walked upon when using targeted research (such as prospection). The individual archaeological site is not an enclosed and concluded research frame. The connections between the different find spots – whether they can be assigned to unrewarding categories such as village, house or single find or not – and the localities of resources gain in importance. Non-archaeological sources such as toponomy, historical land-use plans, as well as geotechnical, hydrological and ecological data can advance this kind of research. The apt combination of the different pieces of information obtained from these sources with archaeological data opens up entirely new perspectives. The new sites and the connections between them that will be found thanks to this kind of research will complement and correct our roadmap.

In regards to the sites, we should not focus primarily on their architectural structures (which ge-

nerally cannot be deciphered clearly anyway); instead, we should turn the spotlight on repetitious practices and processes (be they induced by humans or by nature). This will generate the increase in knowledge necessary for answering decisive taphonomical questions. Furthermore, these new insights into the interaction between materials, practices, and architectural information might also lead to new unexpected perspectives on building structures. This multiperspective, kaleidoscopical way of looking at things might still be somewhat difficult to get used to. It leads to fewer definite answers than we are used to from the old models (**fig. 1**); however, the answers we obtain will broaden our view on possible realities. We still have to learn how to deal with the uncertainties resulting from this new perspective; nevertheless, only by doing so we can move on to pastures new.

Notes

[1] This text is the translation of a conference presentation given in German. The session, held in Berlin from October 6th-7th 2014, was entitled "*Haus – Hof – Dorf: Siedlungsstrukturen im Neolithikum*" and explicitly linked to Herbert Jankuhn's notions. The German version of this article has been submitted (Gross & Huber, submitted); however, its publication date has been postponed and it will not be published until after the English version.

[2] „*Die Neolithisierung der Gesellschaft führte zur Ausbildung von Haus und Hof; und diese bäuerliche Wirtschaftsweise der Sicherung des Lebensunterhalts durch eigene Produktion von Nahrungsmitteln […], blieb […] bis ins Mittelalter der allgemeine Lebensstil*".

[3] Lower basin of Lake Zurich: Hasenfratz & Gross-Klee, 1995, 203, fig. 127; Bleicher, 2015. Erlenbach-Winkel: Tobler, 2002, 18-19. Feldmeilen Vorderfeld: Winiger & Joos, 1976, 134. Meilen-Rorenhaab: Hügi, 2000, 11-21. Horgen Scheller: Eberli, Ebersbach, Favre, Akeret & Eberschweiler, 2002, 207. Pfäffikon Burg: Eberli, 2010, 32-57.

[4] Lower basin of Lake Zurich: Jacomet, Brombacher & Dick, 1989, 88-89. Bodensee-Untersee, Thurgau side: Benguerel, Brem, Hasenfratz & Leuzinger, 2010, 156-160, esp. 159, fig. 7. Margarita Primas (2004) challenged this model convincingly, albeit only for the Late Bronze Age.

[5] Canton Zug: Cham-Eslen: Rehazek, 2015; Risch-Oberrisch: Schäfer, 2006; Steinhausen-Sennweid, West: Chenal-Velarde & Fischer, 2007; Zug-Riedmatt: Billerbeck et al., 2014; Zug-Schützenmatt: Chaix, 1989; Zug-Vorstadt: Rehazek & Schibler, 2012; Canton Nidwalden: Stansstad-Kehrsiten: Michel-Tobler, Brombacher & Rehazek, 2010, 295.

[6] Descriptions of similar events in the small-scale societies of the North American woodlands can be found in Prins & Mc Bride, 2007, 35-36; 409-410; Waselkov, 1978.

[7] We thank Peter Ulman, former head official for forestry and game at the Department of the Interior of Canton Zug, for his valuable information.

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About the authors

Eda Gross is, after nearly 40 years of experience in wetland archaeology, currently employed at the Institute for Integrative Prehistory and Archaeological Science (IPNA) at the University of Basel. Renata Huber is scientific collaborator and deputy head of the department for Prehistoric Archaeology at the Amt für Denkmalpflege und Archäologie (ADA) of Canton Zug. She has participated in various wetland archaeology projects.

Eda Gross
Integrative Prähistorische und Naturwissenschaftliche Archäologie
Universität Basel
Spalenring 145
CH-4055 Basel
eda.gross@gmail.com

http://orcid.org/0000-0002-7713-9655

Renata Huber
Amt für Denkmalpflege und Archäologie
Direktion des Innern, Kanton Zug
Hofstrasse 15
CH-6300 Zug
renata.huber@zg.ch

https://orcid.org/0000-0002-4226-5918