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THE END OF THE LAKE-DWELLING SETTLEMENTS
OF THE NORTH-WESTERN ALPS

More than 700 lakeside dwellings of the Stone and Bronze Age have been discovered around the Alps since the discovery of the pile dwellings at Lake Zurich in 1854¹. During the first 100 years, up to the middle of the 20th century, the discussion among scientists regarding the chronological and historical arrangement and classification of the settlements was quite controversial². Initially they were thought to be Celtic settlements. However, in the discourse of early times and based on ancient written sources, «Phoenician trade colonies», Germanic and Helvetian or even Roman strongholds soon were mentioned. Based on repeatedly observed burnt layers, it could at first be assumed that the end of the pile dwellings had been a violent one. Later, with the knowledge of fluctuating lake levels, it became plausible that the abandonment of the dwellings had most likely been due to climatic events, such as floods similar to the «biblical deluge»³. Aside from the «diluvian myth», and supported by single finds, landslides, earthquakes, epidemics, shortage of natural resources, and other destabilizing factors are until today still a possible cause for the numerously interrupted settlement patterns in a «risk landscape».

By way of typological method and the applied imported chronologies of the southern regions⁴, interpretations refined themselves to an explanation of the phenomena. Foreign war tribes and elites were being discussed. They provided, just like a possible occasional shortage of salt, tin, and bronze, an explanation for the obvious change that followed the construction era of the lake-dwellings during the transition to the developed Hallstatt era⁵. In areas of a higher density of discovered locations within one region – such as in Bavaria, and in spite of the distinct changes of the archeological finds, archaeology assumes a population continuation in form of a gradual change of habitat from the Hallstatt B to Hallstatt C phase. Thereby most of the interpretations rely on settlement and grave finds in mineral-bound soil and less on set-

¹ KELLER 1856; DELLA CASA 2005; DUNNING - HAFNER 2005.

² PALLMANN 1866; KAESER 2004; ANTIQUARISCHE GESELLSCHAFT IN ZÜRICH 2004; SCHÖBEL 2004; 2006b; DELLA CASA 2005; RUOFF 2006.

³ SCHMIDLE 1941; WEBER 1925; REINERTH 1936, p. 139 f; GAMS - NORDHAGEN 1923; GRADMANN 1924;

SMOLLA 1954; KOSSACK 1959, pp. 57 ff.

⁴ MÜLLER-KARPE 1959; KIMMIG 1964; DUNNING - RYCHNER 1994; SPERBER 1987; PERONI 1995; WINGHART 1999; IRRLINGER 2002; TRACHSEL 1999.

⁵ PARE 2000, p. 32; DUNNING - RYCHNER 1994, pp. 90 ff.

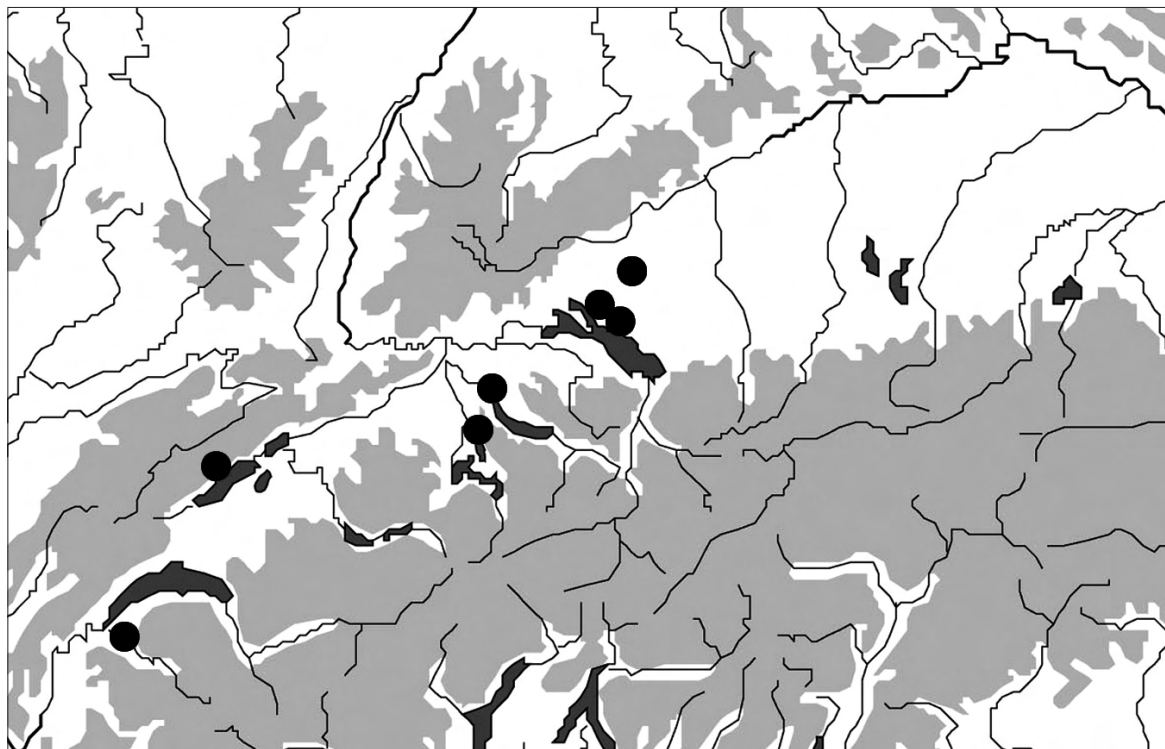


Fig. 1. – The position of reference settlements within the examined region from West to East: Grésine, Lac de Bourget, France; Cortaillod, Lac du Neuchâtel, Switzerland; Steinhausen-Chollerpark, Lake Zug; Zurich, Alpenquai, Lake Zurich, Switzerland; Unteruhldingen, Lake Constance, Germany; Hagnau, Lake Constance, Germany; Bad Buchau «Wasserburg», Federsee, Germany (Schöbel, Pfahlbaumuseum - Unteruhldingen).

tlement from wetland sites with their rich natural science potentials, which were found to be exceptions in the colonization of prehistoric landscapes.

Here you find the state of research at five neighboring regions about the shore settlement, which, notwithstanding their different research traditions, represent the core regions of the investigations at the northern lake-dwellings (fig. 1). My presentation briefly highlights eastern France with Savoy, then West Switzerland with the Lake Neuchâtel, the Swiss Midlands with Zurich and Zug, a bit more detailed the Upper Swabian Swamp at Bad Buchau, and finally the Lake Constance region. In this area northwest of the Alps between Danube, Rhine and Rhône is characterized by a periodic and non-continuous colonization between 4000 and 850 B.C. I will focus on settlements appearing during the transition period of the North Alpine Bronze Age and Pleistocene at the end of the 9th century B.C.

With the absence of written sources for their own territory of investigation, archaeology first attempted to build a typological-chronological structure based on data imported from better documented regions. The Middle European Urnfields and Hallstatt chronology therefore, as is well known, endeavored initially to synchronize the appearances of Bronze and Iron Age grave finds from the Mediterranean region with those north of the

Alps⁶. By nature, the emerging of the first iron finds in the lake-dwellings were of great interest (fig. 2a, b). Iron inserted in needles or iron blades in bronze mountings are significant for the Hallstatt phase B3, and simultaneously for the dating of the late period. They evidence an extraordinary valuable natural resource and a reason for the role of the pile dwellings. The existence of sword graves or wood-chambered graves below mounds, reminded of warrior clans. Horse harnesses in bronze from the Thrako-Cimmerian connection in the Southern Russian steppe, bridle elements from the Danube region or carriage parts brought migrations from East to West to mind. In the course of the research discussion, also the hoards finds ashore⁷, that seemed to have accumulated regionally until the 9th century, played a role. In addition, the numerous incidence of jewelry objects and needles in the lake dwellings allowed for far reaching conclusions with regard to trade contacts or migration of population groups⁸. It is possible that here the bronzes of the lake-dwellings are indeed hoards finds, which, once washed away by water, surfaced again millenniums later.

Numerous theories developed in an effort to explain why the waterbird, as a religious symbol, often appearing in areas of the late Urnfield Culture and obviously linked to the Danube region and the Mediterranean, was replaced towards the end by other animal symbols. The question arises whether another culture, one that carried the horse or bull in its emblem, toward the end of the late Bronze Age gradually overshadowed the old religious images of the Urnfield Culture.

The «bull-bird» (fig. 3) or the hybrid creature of water and land animal, represented regionally a gradual to abrupt change, which, induced extraneously, could have manifested itself away from the lakes to the hinterland where there existed better soil conditions. In scholarly discussions, a new type of ceramics and large barrow cemeteries of the later Hallstatt-C culture starting 750 B.C. had long substantiated the transition to the fully developed Iron Age. On one side stood the pile dweller as the Urnfield Man of the late Bronze Age in the Lake and on the other side stood the Hallstatt warriors with their large cattle as landowners on their manors and the first evidenced princely residences (Princedom).

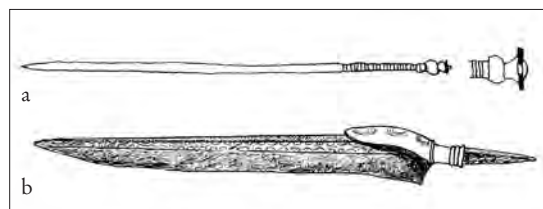


Fig. 2. – a. Vase-headed pin with iron head plate, Zurich; b. Alpenquai; hilt tang knife with iron blade, St. Aubin/ Neuchâtel.



Fig. 3. – «Bull-bird», bronze, Hagnau-Burg, Lake Constance (SCHÖBEL 1996, Fig. 80,6).

⁶ MÜLLER-KARPE 1959; KIMMIG 1982; KOSSACK 1995; AMANN 2005.

⁷ STEIN 1979.

⁸ PRIMAS 1995.

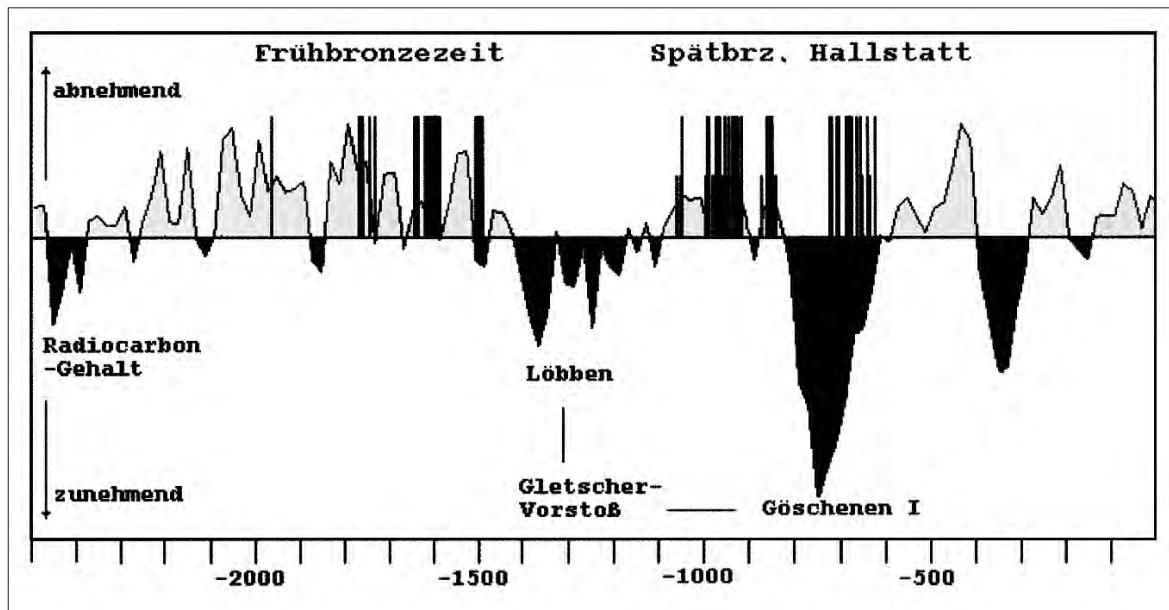


Fig. 4. – Radiocarbon content within the atmosphere compared to the cutting phases of the wood proved in the lake settlements north of the Alps (according to BILLAMBOZ 1997, p. 52).

It would have been too nice, if the two clashing scenarios of social patterns, technology or religions, could have been substantiated. However, the blur of time – archaeological resources partially lay apart more than 200 years – and the different archaeological principles stood against this. The more exact dating techniques there are, the better the chances that changes within one region can be recognized and/or be compared in various regions on the same level. In analysis and interpretation, the potential of the natural science plays an ever-growing role parallel to archaeology.

An agricultural community operating animal husbandry (fig. 4) depends strongly on the climatic development, which expresses itself in small and large changes, good harvests, bad harvests, a healthy animal existence, and existing or missing human diseases. Such developments can be illustrated archaeologically. For example, the developments of the alpine glaciers and the changes of the cosmic radiation over thousands of years, measurable by ^{14}C content in the atmosphere, show degradations and improvements of settlement conditions that can be evaluated and rated⁹.

Briefly, according to available data there is, as you can see in the illustration, an intensified settlement activity during the 11th to 9th century in climatically favoured phases with a higher ^{14}C -production during dry and warm times. Simultaneously, there is an obvious retreat of the settlements during times, when glacier margins extended out, which indicates cold and wet conditions. Through analysis of wood, in particular the width of the annual rings, it can meanwhile be determined via dendrochronology (fig. 5) that clear climatic fluctuations took

⁹ LAMB 1981; VAN GEEL *et al.* 1998; MAISE 1998; JOCKENHÖVEL 1998; TINNER *et al.* 2005; BILLAMBOZ

2003; 2007; WEFER *et al.* 2002; RÖSCH 2005.

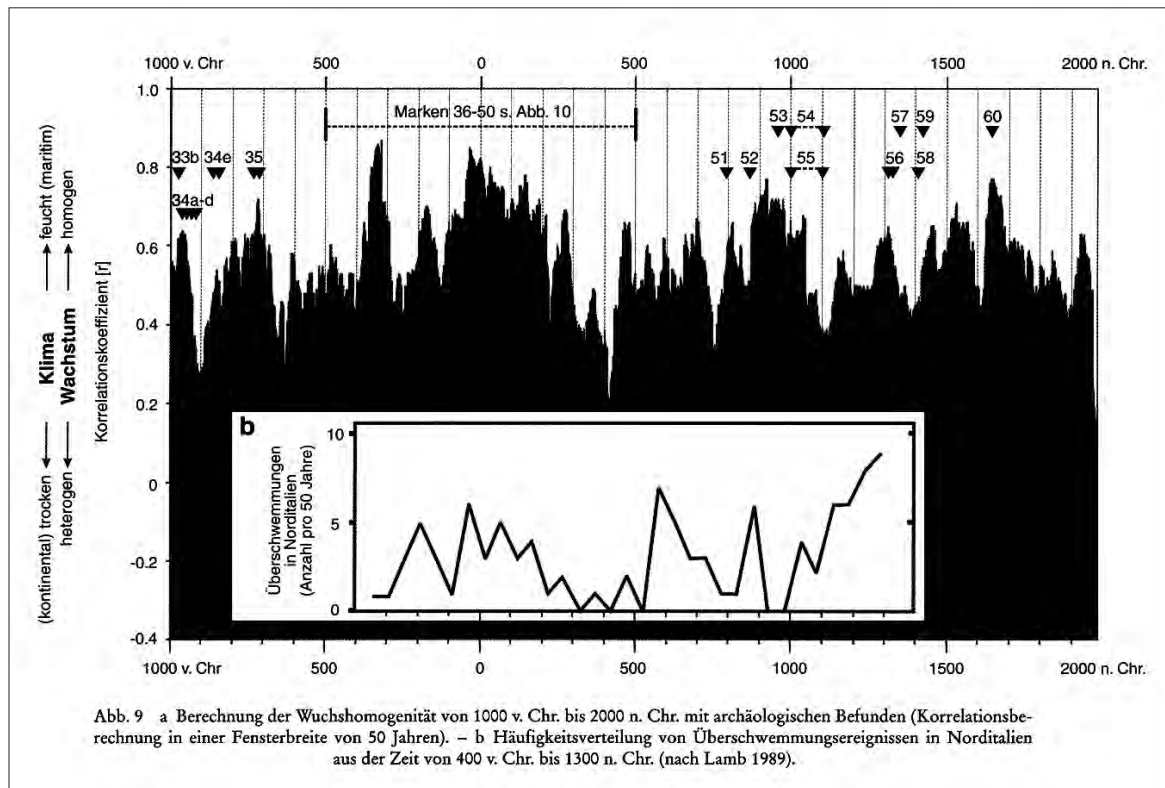


Fig. 5. – Calculation of the homogeneity of growth for trees from 1000 B.C. until 2000 AD according to the archaeological finds. a. With a frequency scale of flooding incidents in Northern Italy from 400 B.C. until 1300 AD (according to LAMB 1989); b. According to SCHMIDT - GRUHLE 2003.

place during the last 7000 years starting from the time of Linear Pottery until today¹⁰. Through comparisons of historical grain crops and the correlation to changes in tree growth that were drawn by the dendrochronological method of homogeneity growth analysis, today interesting propositions can be made. Considering historical data during a 50-years span, a clear correlation is noticeable between the more dry-warm and wet-cool conditions and the settlement occupation in the lake-dwellings. It becomes clear that a larger number of settlements was constructed during times of declining precipitation (decrease of the lake levels), and that during times of extraordinarily good water supply for trees, i.e. higher precipitation rates and a tendential rise of the lake level, the end of a settlement phase followed soon. It will be very exciting to expand this research further and to connect it to other independent indicators of climatic development¹¹.

In addition to these interesting results of the glacial geology, climatic research, and physics, there are also amplified botanical investigations, which, in the context of pollen analyses, provide

¹⁰ SCHMIDT - GRUHLE 2005.

GRUHLE 2003; WEISS - BRADLEY 2001.

¹¹ GOLLNISCH - MOOS 1999, pp. 184 ff; SCHMIDT -

reference relative to the continuity problem. For example, in the Lake Constance area standard pollen analysis show a concrete indication of change within the landscape that was affected by forest clearings and the cultivation of crops. Based on moorland profiles in dead-ice holes, dated C-14, it can be inferred that the landscape was increasingly opened since the Neolithic, and with the beginning of the Bronze Age remained continuously open for farming. Grain pollen and meadow indicators do not point to serious changes in contrast to the dendrochronological sequence. It is only noticeable that the meadow surfaces and field weeds increased strongly starting in the Bronze Age. Together with other indicators, this speaks for an increase of intensive land use, which meantime can be evidenced likewise for the region north and south of the Alps¹².

In order to ensure the factors around of the changes in the 9th century, a to the year-exact dissolution of the features exact to the year is necessary, which due to missing written resources in our region north of the Alps is only possible with the help of the dendrochronology (fig. 6). The current regional phase classification for Upper Swabian, Lake Constance, East Switzerland, West Switzerland and East France clearly points to the middle of the 9th century, a time of strongly decreasing C-14 radiation and thus weather degradations, for an end of the lake-dwellings. A lingering of this occurrence in the French Alps beyond 850 B.C. was observed in the West Alps at Savoy. While so far, the Germans and Swiss settlements show a clear hiatus (in-

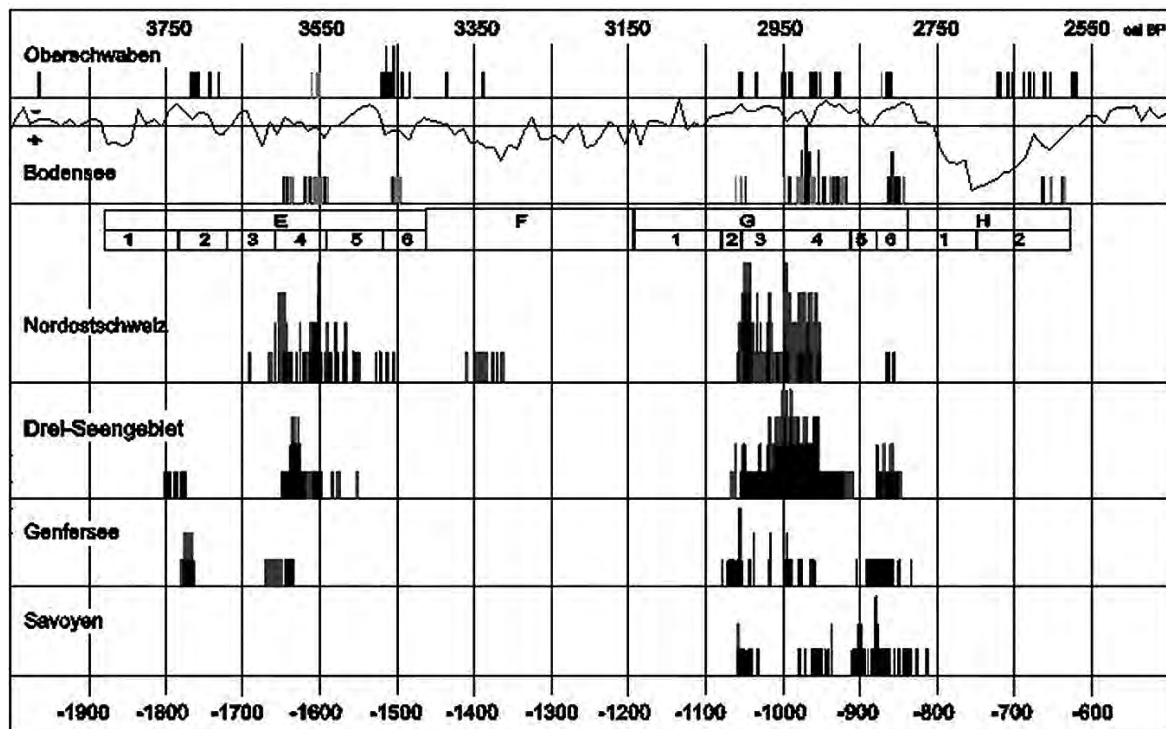


Fig. 6. – Comparison of the regional phases classification with the net of dendrochronological data north of the Alps (according to BILLAMBOZ 2007, p. 90, Abb. 110).

¹² RÖSCH 2005, p. 109.

terruption) around 900 B.C. and an end soon after 850 B.C., in the West the breakdown seems to have taken place only after 813 B.C. Based on DC dates, this suggests a delayed reaction due to external influences or a larger tolerance of the settlers, a reaction that perhaps has to do with lower oscillation at these smaller lakes and did not have such serious effects initially. A higher regional resolution of all available archaeological results in Botany and Zoology, including location factors such as altitude, settlement size, ecological and economic bases, could here provide explanations that are more accurate within the context of the broad research process.

Let us take a brief look at the presented regions, in order to trace the reason for the abandonment of the lake settlements. In the Sea Alps at the Lac de Bourget (fig. 7), at the station Grésine-Est and Grésine-Ouest, a typical situation exists. At the edge of shore, two settlement phases enclosed by lake-sediments in two places have been found¹³. Duplex settlements in short distance to each other, one more briefly, one longer occupied, also exist at Lac d'Annecy or on the French shore of Lake Geneva. The archaeological material from ceramic to the typical form of the house floor plans can very well be compared with those in Switzerland and at Lake Constance. It remains interesting that at one location settlement still continued between 843 and 813 B.C. This indicates that in contrast to the trend in Germany and Switzerland, settlements here could still be colonized for a longer period. The explanation could be an increasingly high water

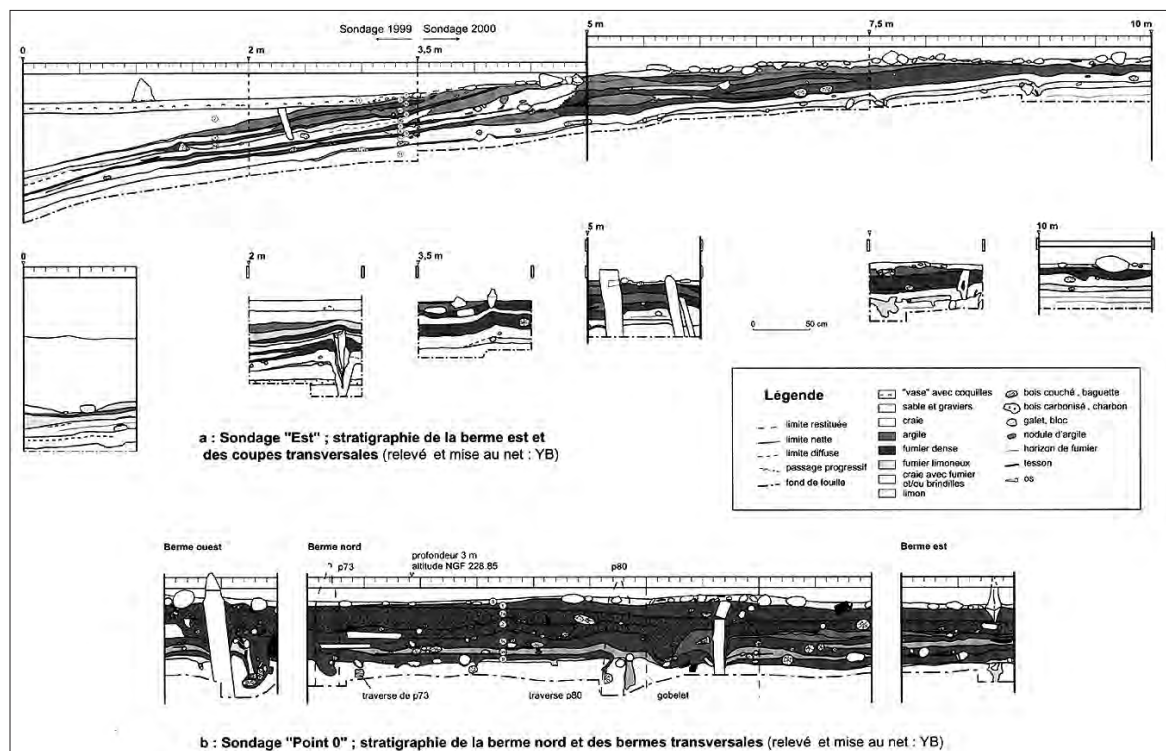


Fig. 7. – Grésine-Est, Lac de Bourget, stratigraphy of the lake settlement (according to BILLAUD - MARGUET 2005, p. 174).

¹³ BILLAUD - MARGUET 2005, p. 175; CHAPRON *et al.* 2006.

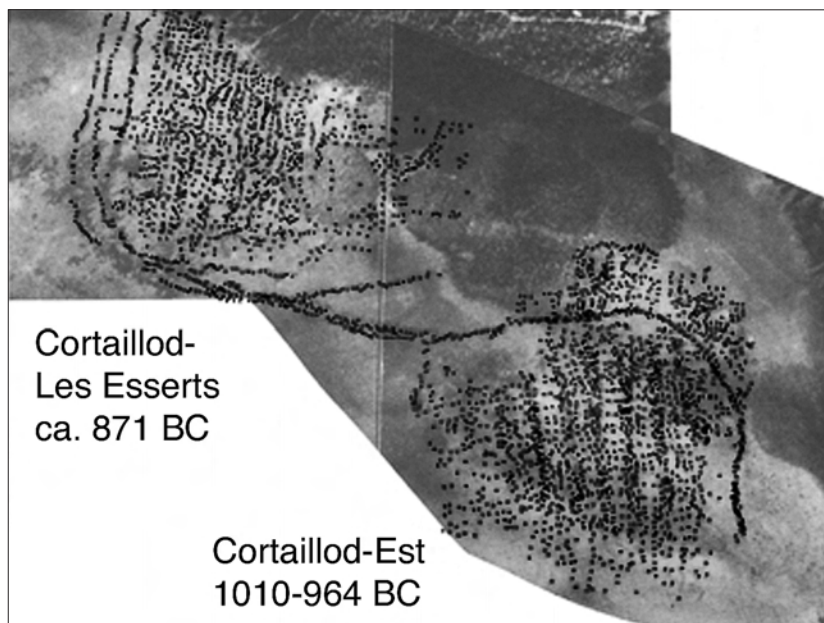


Fig. 8. – Cortaillod-Est and Cortaillod-Les Esserts (according to ARNOLD 1990, pp. 18, 67 and ARNOLD 1986, p. 17, Fig. 10).

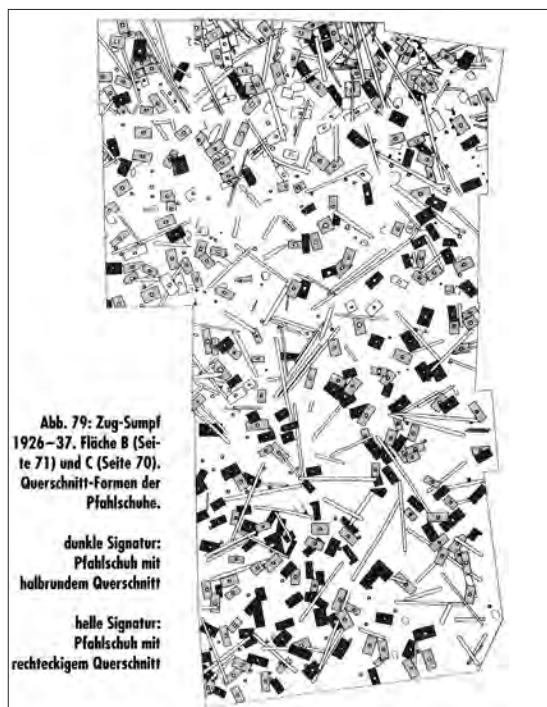


Fig. 9. – Zug-Sumpf, washed woods and pile shoes in surface C (according to SEIFERT 1996, p. 71, fig. 79).

level. The question remains, where the population moved to afterwards.

In the Three-Lake-Area, at the Neuenburger Lake in Cortaillod on Lake Neuchâtel¹⁴, are two lake-dwellings of the late Bronze Age side by side, which were constructed consecutively in the 10th and 9th century B.C. (fig. 8). It seems that the left structure, Cortaillod-Les Esserts, was built on higher ground, since the right one had to be abandoned due to a rising water level. Based on observations of Stone and Bronze Age dwellings throughout the entire settlement area, it becomes clear that palisade and house construction was always carried out corresponding to the edge of the lake, the shore.

Zug-Sumpf (fig. 9)¹⁵, a settlement in East Switzerland at the northern shore of Lake Zug was excavated between 1923 and 1937. This is a settlement built on lake sediment that was later washed away by the wa-

¹⁴ ARNOLD 1990, p. 17; GOLLNISCH-MOOS 1999, pp. 172 ff.

¹⁵ SEIFERT 1996.

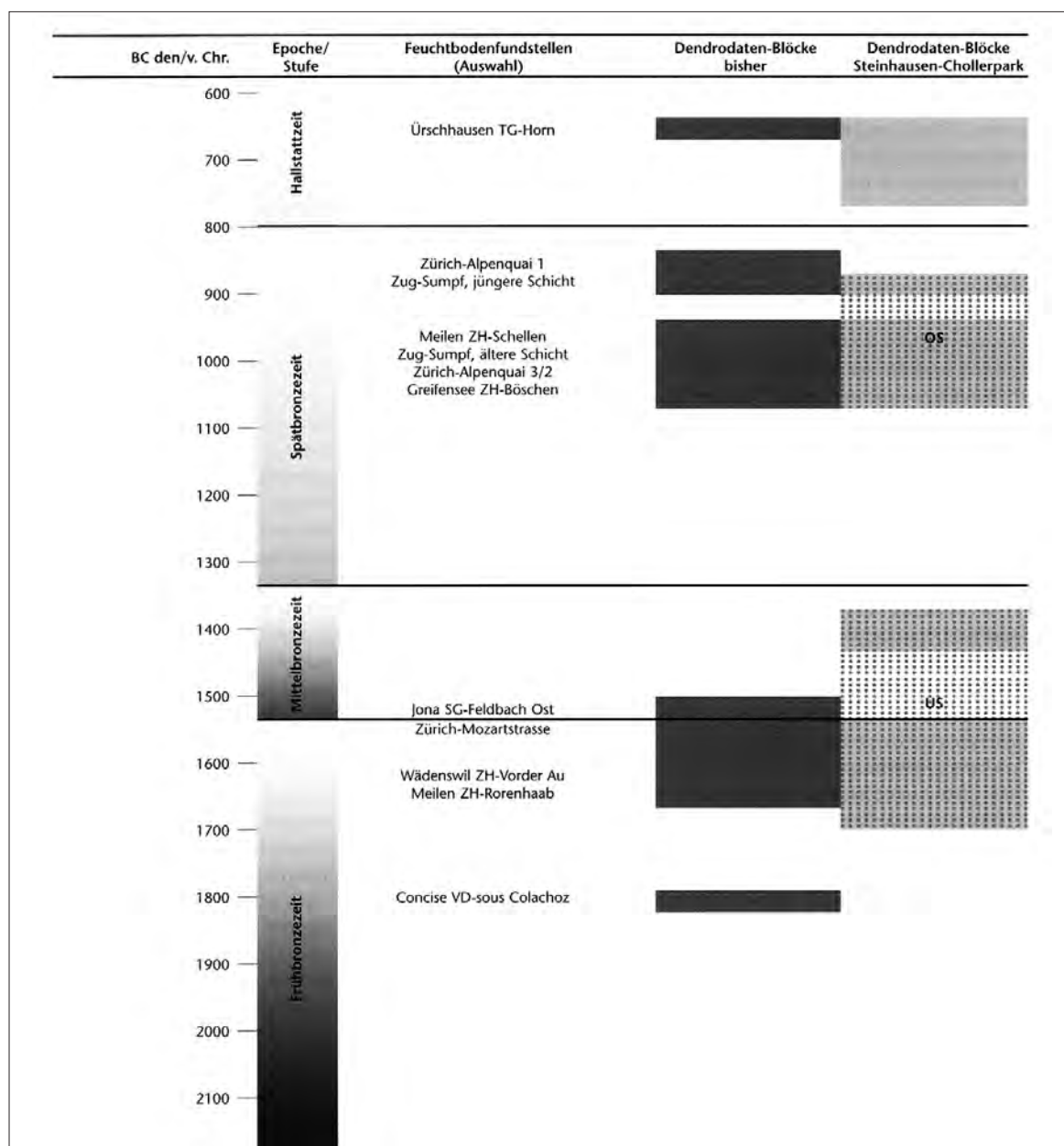


Fig. 10. – The sequences of the lake settlement Zurich Alpenquai dated by using dendrochronology, Zug-Sumpf (younger layer), Steinhausen Chollerpark and Ürschhausen-Horn in Switzerland (according to EBERSCHWEILER 2004, p. 12).

ters. Not far from it at the Steinhausen Chollerpark (fig. 10)¹⁶, in the year 2000, a succession of washed-up woods was found in form of a stratifiable «wood carpet» consisting of three

¹⁶ EBERSCHWEILER 2004.

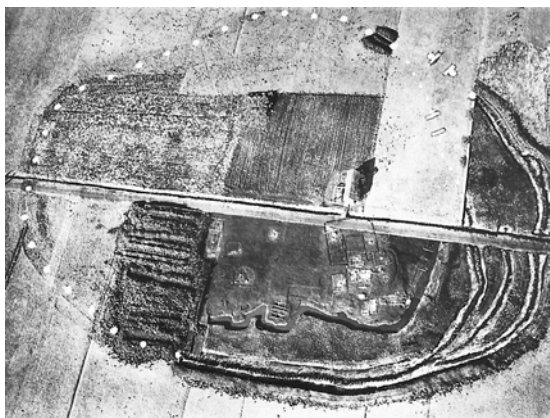


Fig. 11. – The final Bronze Age settlement «Wasserburg Buchau», aerial photograph of the complete site, excavation of 1928 (Strähle, Archiv Pfahlbaumuseum).

layers that possibly stems from a nearby settlement. These are flood seams, that can be linked to the large floods after 900 B.C.

At Lake Zurich most structures evidence successions of occupational layers affected by terrestrial and limnic systems. White lake sediments are followed by black occupational layers¹⁷. Their investigation shows typologically the phases Hallstatt A2 - B1 to Hallstatt B3, although, they can chronologically not absolutely be correlated with these. Thus, dendrochronological dated layers of the 11th century already indicate types of typological stages following thereafter. Here the strengths and the weaknesses

of relative and absolute chronology and the difficulty of comparing different systems become apparent. Towards the end of the first half of the 9th century, also here the known lake-dwellings break off.

The «Water Castle Buchau» in the Upper-Swabian Federseemoor (fig. 11) that was formerly also situated at the edge of a heavily aggradated lake, was explored during the years 1921 to 1937. The Lake Dwelling Museum in co-operation with the museums at Vienna and Modena, again investigated them in 1998-99 within the context of the European project Archaeolive¹⁸. The old excavation, under Hans Reinert¹⁹, had recognized a two-phase village with 38 older rectangular and nine younger, horseshoe-formed buildings stretched over a total area of 152 x 110 m (fig. 12). Already at that time, concomitant scientific investigations by Peat Geology (C.A. Weber), Botany (K. Bertsch), Wood Analysis (E. Neuweiler), Zoology (R. Vogel), Mollusk Science (D. Geyer), Tree-Ring Science (B. Huber). Aerial photography archaeology and surface images of the structure's ground plan and palisades reflect the already advanced status of methodical investigation at that time. According to the reports of the first excavators, the site had been constructed in the damp moorland and later, during or after the settlement supported by the lake and two hinterland brooks, had been transformed into a village island (fig. 13). Around the entire island, a shore situation could be recognized. For a long time it remained unclear when exactly this island situation had developed – still during or after the settlement. The site was surrounded by a pine palisade consisting of 15.000 lumbers (fig. 14) that had been added onto several times by additional tiers at the periphery of the island. In some places, wood walls from segmented oak planks showed up. Due to the secondary excavation and via modern methodology, in the southwest and northeast units, remains of house floor plans, and broken-in gates (fig. 15) could additionally be uncovered and given

¹⁷ EBERSCHWEILER 2004, p. 12.

¹⁸ SCHÖBEL 2000; 2005; 2006b; BARTH *et al.* 2003.

¹⁹ REINERTH 1936.

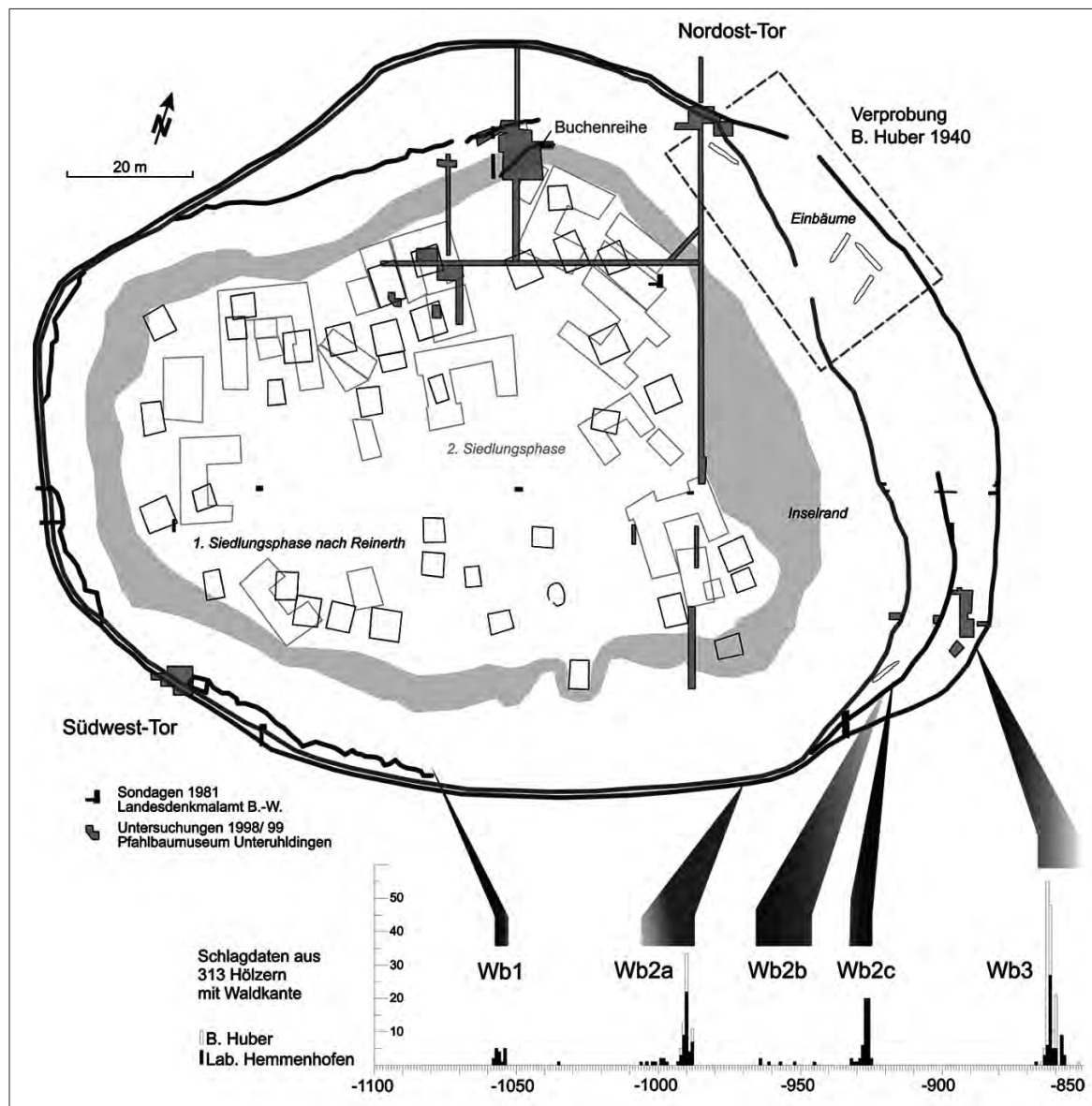


Fig. 12. – The final Bronze Age settlement «Wasserburg Buchau». The development of the lake settlement according to the current state of analysis by dendrochronology (according to BILLAMBOZ 2005).

over to dendrochronological analysis. Thereby special attention was paid to the settlement border situation (figg. 16-17), which here clearly evidences a multi-phased site and very strong flooding, recognizable from pulled out peat clods and distinct lake-sediments that overlaid the peat²⁰. Piles had been driven into the ground for shore stabilization at the edge of this site.

²⁰ SCHÖBEL 2006a, p. 14; WEBER 1925.

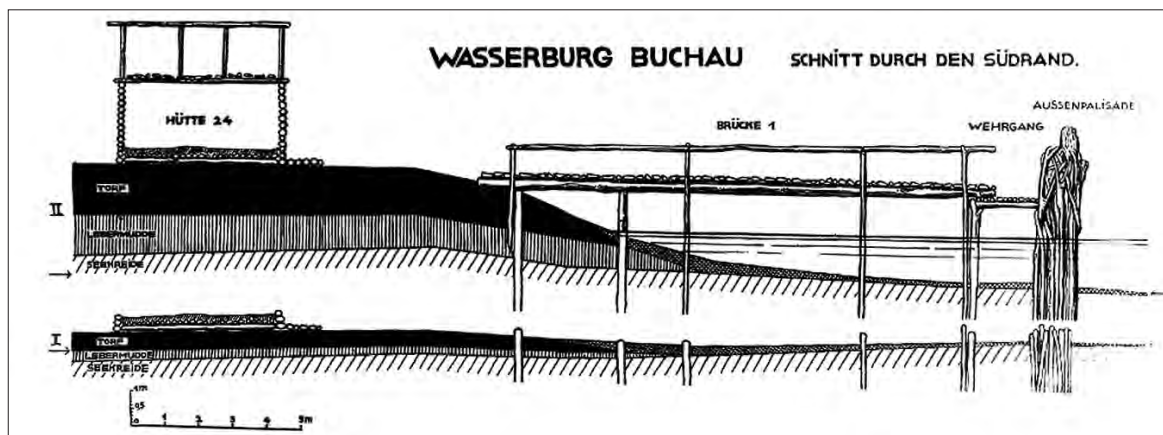


Fig. 13. – Idealized lateral view of the reconstructed bank situation of the «Wasserburg Buchau» during the settlement and during the excavation 1928 (according to REINERTH 1928, p. 36, fig 8).



Fig. 14. – The bank palisade of the final Bronze Age settlement «Wasserburg Buchau» on the western and northern side (according to REINERTH 1936, fig. 27).



Fig. 15. – The south-western gate during the re-excavation of the «Wasserburg Buchau» 1998 (Schöbel, Archiv Pfahlbaumuseum).



Fig. 16. – Profile view of the eastern cross profile «Wasserburg Buchau» 1937. Visible are the washed bank and a pile of the bank pilings (according to SCHÖBEL 2000, p. 92 fig. 9).



Fig. 17. – Profile view, re-excavation 1998. The transition between light and dark sediment marks the washing limit at the edge of the island (Schöbel, Archiv Pfahlbaumuseum).

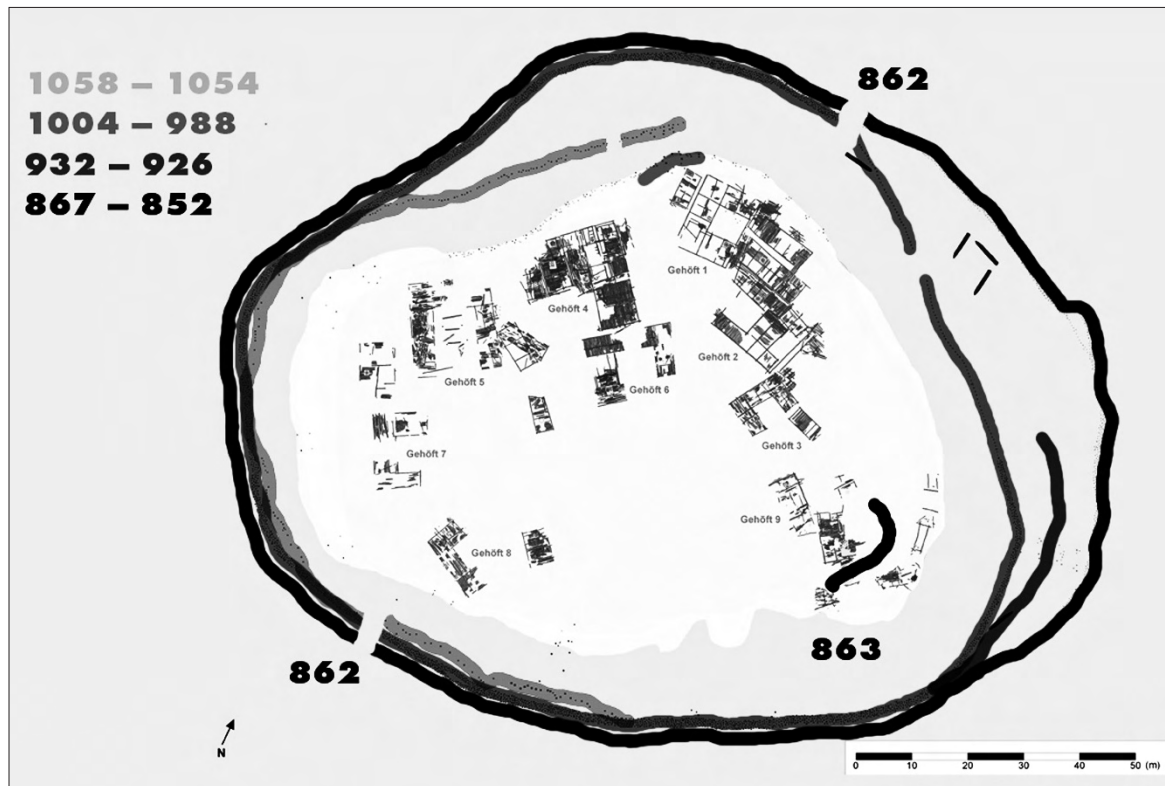


Fig. 18. – The chronologic fixation of the development stages of «Wasserburg Buchau», Federsee-bog, according to the recent dendrochronological results until its termination in the middle of the 9th century B.C. (Schöbel, Pfahlbaumuseum - Unteruhldingen).

According to current evaluations (fig. 18)²¹, the settlement Buchau starts in the 11th century around 1058 B.C. in phase 1 with house construction and the building of an inner palisade. A second expansion between 1004 and 988, followed by another one between 964 and 926 B.C., and finally a fourth expansion took place between 867 and 852 B.C. In this last phase, a caving-in of the northeast and the southwest gates of the previously strongly constructed palisade had occurred, and additional security measures in the form of segmented plank walls had been installed at the so-called edge of the island. Even if the investigations are not yet final, this suggests that at the end, after a whole series of transgressions, the settlement had to be abandoned.

In the Water Castle Buchau, the first results of the tree investigations reveal that during the gaps of colonization, the bog pine as the main building timber for palisades had great difficulties to grow and that there had been an accumulation of climatically difficult years. Botanical investigation evidences that the terrain was very damp at the time of older settlements. However, in between, during dry periods, colonization could take place with some interruptions, which at the end, still during or after the colonization, were ended by a transgression²². This speaks for the fact that only towards the end a threatening situation occurred, as we see in the following picture from Southeast Asia that illustrates a likely scenario from today's view (fig. 18).

²¹ BILLAMBOZ 2006, p. 103, fig. 106 a.

²² LIESE-KLEIBER 1991; SCHÖBEL 2006b, pp. 214 ff.

Two hidden finds from the settlement and human bones discovered within the range of the transgression levels, brought to mind that hostile assaults or general crisis periods caused the end. Nevertheless, in this direction the evidence is not strong enough within the overall context to explain the abrupt end at the middle of the 9th century as being the result of a martial fall.

At Lake Constance (fig. 19) several settlements, among them Unteruhldingen and Hagnau²³, could be examined more thoroughly by means of aerial photography and underwater archaeology. During mid-winter, with low-water levels, 1-2 hectares large pile fields (fig. 20), surrounded by palisades, with a regular inner structure and approximately 10-12 m long and 5-6 m wide houses, can be recognized. Based on investigations in underwater segments, within a large area piles and building elements of this site were assessed by dendrochronology (fig. 21). Until today three building phases in 10th and 9th century B.C. can be singled out, whereby the first phase is dated 975 and 954 B.C. (fig. 21a), the second 930 and 917 B.C. (fig. 21b), and finally the third one 863 and 850 B.C. (fig. 21c). As already seen in Buchau, in the interior, overlapping of structures that had been placed in long rows at the shore, could clearly be recognized. These are two to three-level floor plans of houses with approximately 79 m² surface. Up to 83 houses had thus been successively constructed at the shore and surrounded by a palisade over a period of 10-12 years. The development evidences that a second one after an interruption of colonization followed a first settlement of 230 m length. Although, the second settlement was built on the same ground, it expanded only over an area of 80 by 80 m. The last settlement again reached nearly the expansion of the first one. A very important result of the dendrochronological investigation is that for the house and above all the palisade construction; almost 50% of the piles still in the ground today, were driven in between 862 and 850 B.C. Thus, the palisade row 4 can be dated 862 to 860 B.C., and the palisade row 3 at the lakeside

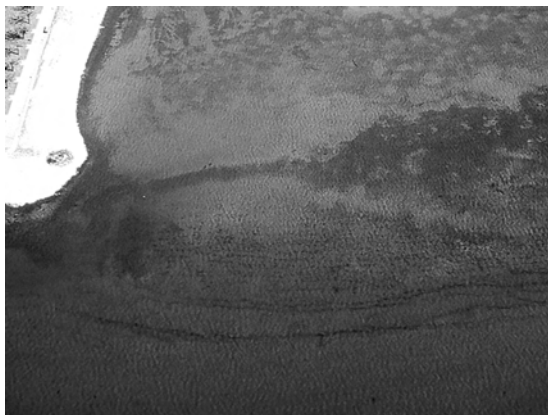


Fig. 19. – The pile field of the final Bronze Age lake-shore settlement Unteruhldingen-Stollenwiesen in the shallow water of Lake Constance (air photograph Landesdenkmalamt Baden-Württemberg, Otto Braasch).

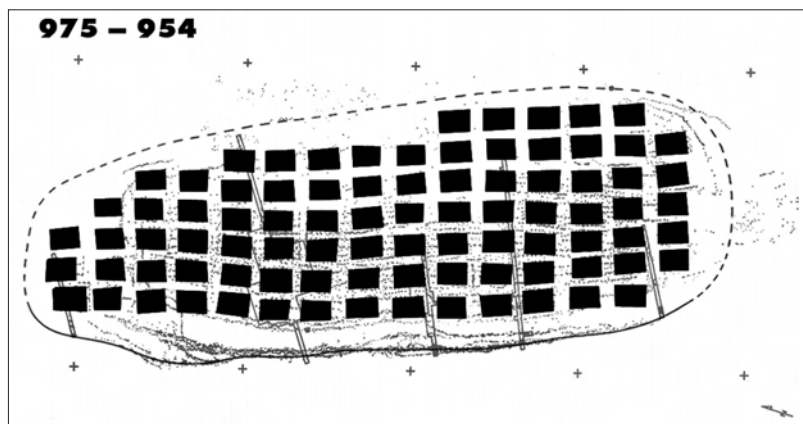


Fig. 20. – The eroded house piles of the settlement Unteruhldingen in the Lake Constance (Schöbel, Pfahlbaumuseum - Unteruhldingen).

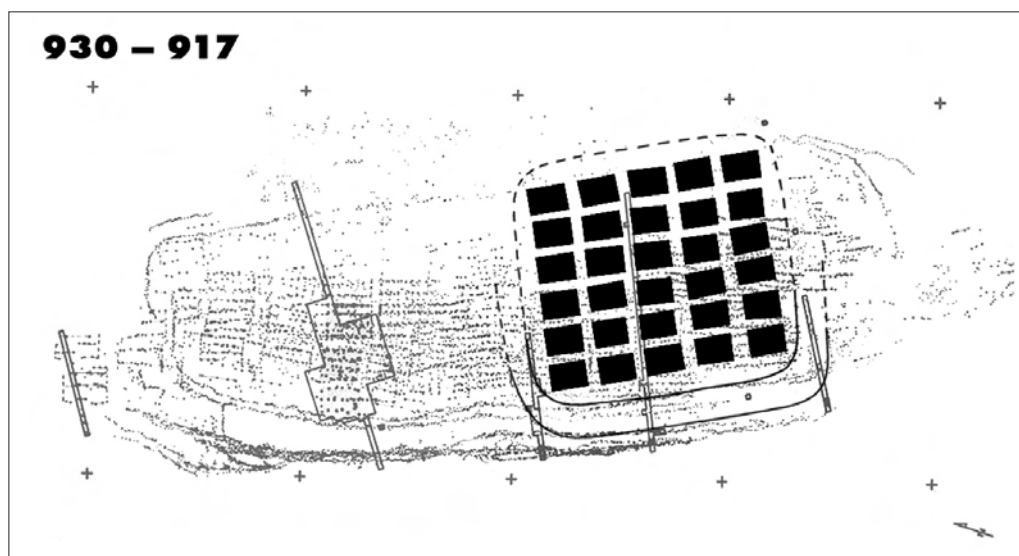
²³ SCHÖBEL 1996.

Fig. 21. – a/b/c. The development of the settlement on the basis of archaeological and dendrochronological analysis (SCHÖBEL 1996, p. 53, figg. 38-40.

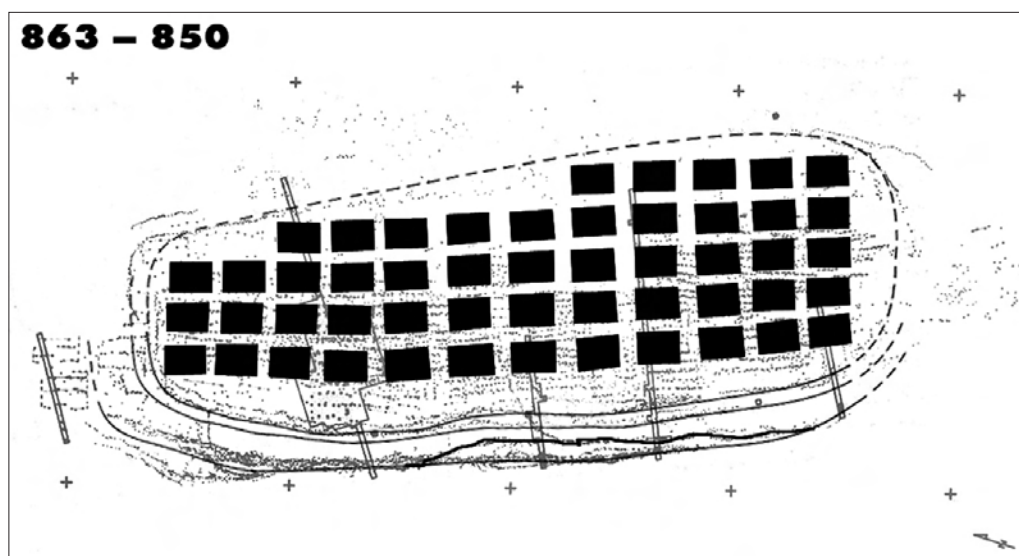
a



b



c



dates 851 to 850 B.C. It is remarkable that also here in Unteruhldingen, as already in Buchau, shortly before the end that is linked to the date 853 B.C., a small supplementary palisade from beech wood was put up as a repair piece behind the outer ring palisade, which does not at all correspond with the even oval geometry of the remaining settlement. Two younger piles dating 843 B.C. are still land inward within range of the structures. They most likely had also been used for repair. Thus, the indications solidify that also here at the middle of the 9th century due to a rising of the lake level, the last construction measures took place. Very young woods and above all the long segmented wooden planks from grape/cluster oak, which had to be dragged far down from the hills of the surrounding countryside, were used. There, contemporaneous and consecutive settlements were colonized, which either served as place of refuge or can be considered settlements related to the shore settlement communities. There is evidence for the fact that also an excessive exploitation of the land by clearings, intensive cultivation and pasturing furthered the process of ecological and economic degradation. It always must be kept in mind that a shore settlement was set on less terrain than an inland settlement.

In summary, a sediment profile from the late bronze-age settlement Hagnau-Burg at Lake Constance (fig. 22) taken in 3-5 m depth of water, can be consulted for the explanation with regards to the development at the lakes and moorlands during the work phase. A lower lake level between 1060 and 1048 B.C. apparently allowed for a colonization of the dried-up shore plates at the lakes almost up to the «slop», the rocky declivity that follows the even shore plate into deep-water to the lake bottom. Transgressions around 1000, 980, and particularly around 900 B.C., demanded, at least at Lake Constance and in East Switzerland, intermediate colonization of sites situated on higher ground, whereby botany presupposed settlements in direct proximity. In the western part of Switzerland at Lake Geneva, the time around 920 to

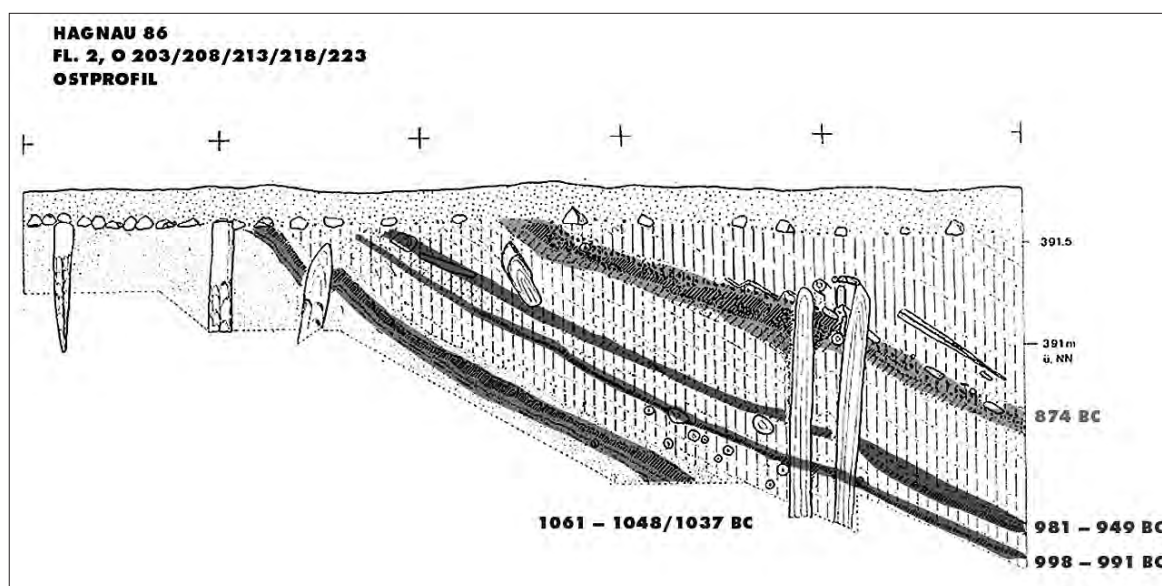
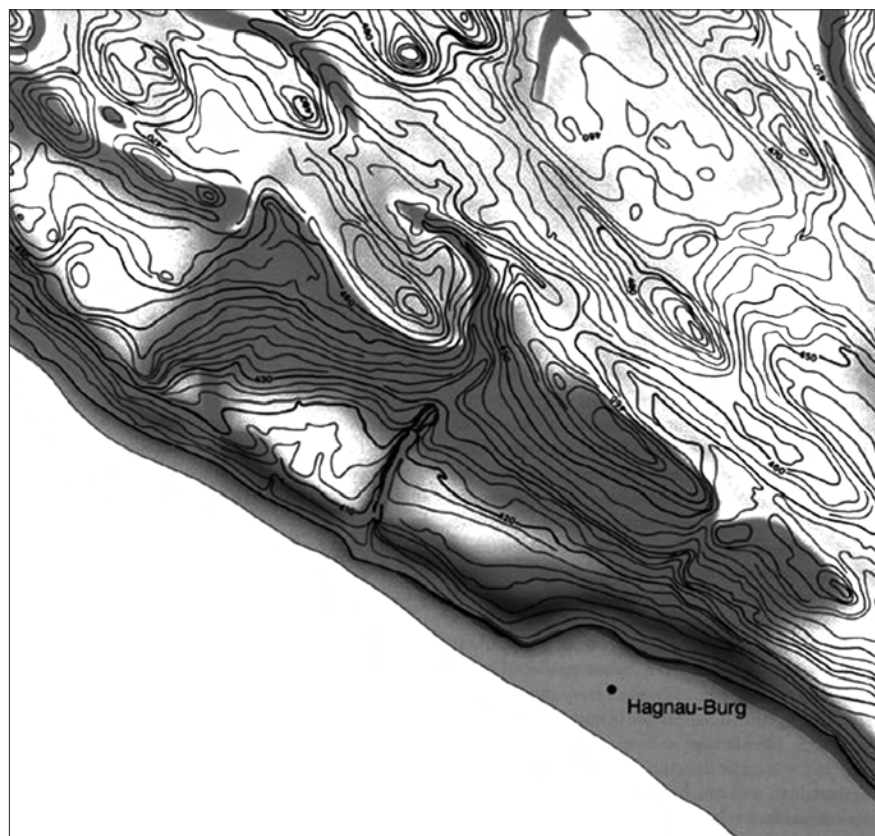


Fig. 22. – Profile view of the lakeside edge of the final Bronze Age settlement Hagnau-Burg with dendrochronological data (according to SCHÖBEL 1996, p. 65, fig. 54).

Fig. 23. – The vegetation and the potential land use during the 9th century B.C. in the surrounding of the final Bronze Age settlement Hagnau-Burg, Lake Constance (according to RÖSCH 1996, p. 305, fig. 137).



930 B.C. seems to have been rather critical for this kind of settlement. The last phase of the settlement at Lake Constance and in Switzerland then starts around 900 B.C., and ends around 850 B.C. Here in the West, remnants of colonization due to differently constituted conditions can still be observed; however, these also last only until the close of the 9th century B.C. After this date, this form of the settlement breaks off. Botany's (fig. 23)²⁴, sedimentological and forest-historical data reveal that these settlements reacted quickly to climatic oscillating, independently of positive or negative changes. Favourable climate conditions therefore seem to have made the location remunerative, whereas unfavourable conditions made it very critical. An actual climatic depression at the beginning of the 9th century, that most likely developed from Atlantic weather conditions as proposed by climatologists, corresponds at the settlement Hagnau-Burg for example with the loss of warmth-loving grain plants or foxtail millet and an increase in gathering activity in an almost Neolithic manner. If we take villages and grave finds at the northwestern Lake of Constance (fig. 24) into consideration, then also settlement systems that are believed to have alternated use of locations at the shore and in the interior can be assumed to have existed. On the north shore and in the area of higher settlement density

²⁴ OSTENDORP 1996, pp. 235 ff.; RÖSCH 1996, pp. 304 ff.

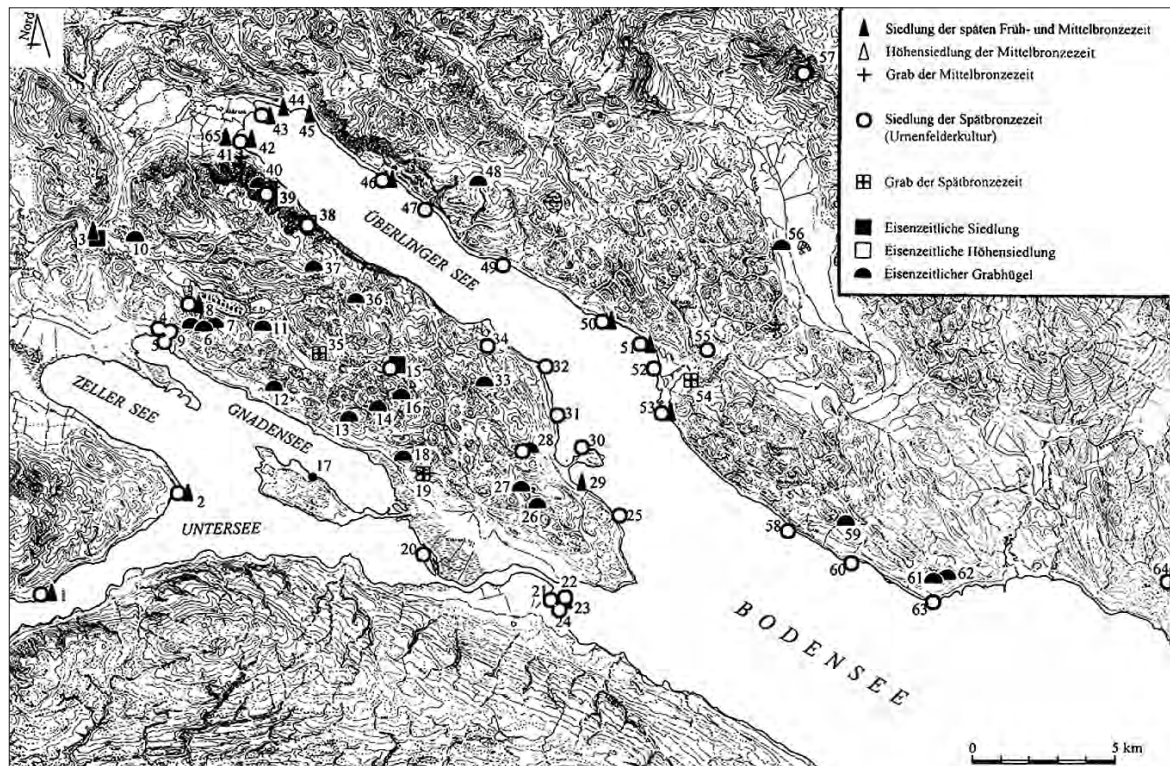
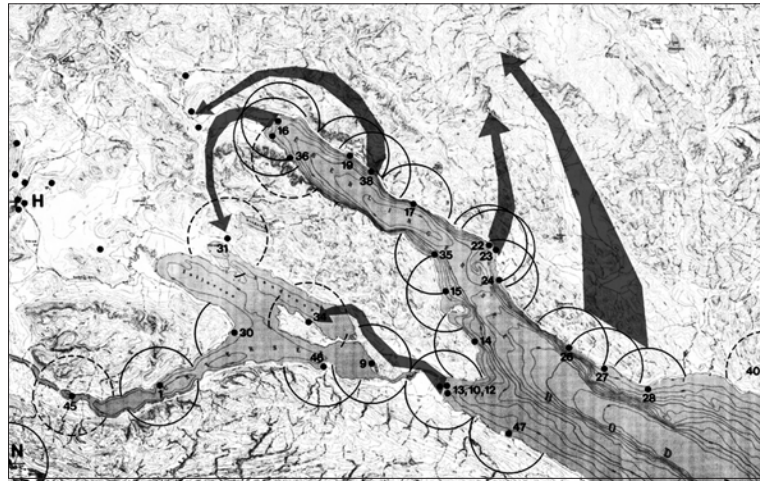


Fig. 24. – Distribution map of final Bronze Age settlements, graves and hoard finds of the 11th to 9th century B.C. on Lake Constance (Schöbel, Pfahlbaumuseum - Unteruhldingen).

a larger settlement pocket of an approximately 10 km radius seems to have been used successively, perhaps also by different groups alternately. This system does not apply, however, to the south shore, where regular distances of the settlements in a 2.5 km radius can be noted. In this case, (fig. 25) humans in the transition from the Bronze to the Iron Age were highly mobile. This is shown particularly during alternating settlement phases, between neighboring sites, and the fact that the sequences with evidenced tree clearings generally are no more than 15-20 years apart during this time. Relative to the question, where the lake-dwellers could have migrated to, a small regional model could be constructed, which, however, would not include other not dendrochronologically dated settlements in the surrounding 5-10 km area. An ecological crisis that nevertheless, could develop only during a longer period of 10-15 years, led possibly to the fact that the settling areas at the shore were left in favour of those with better farmland on higher grounds. Therefore, the reverse process precedes. Succeeding settlements are situated, as evidenced in a few cases, on high planes, on hilltops, and in the river valleys of the surrounding landscape. Seen the references so far existing, it seems that the climatic development and the occurrence of wet cold phases created a deterioration of the living conditions. It does not appear that a drastic climatic deterioration, as was still proposed around 1954 and that is repeatedly illustrated in a dramatic way such as a sudden event of a day or a week, was actually present. Most likely, here we rather deal with a process drawn over several years,

Fig. 25. – Horizontal distribution of final Bronze Age shore settlements during the period 11th to 9th century B.C. on Lake Constance. A circle with a radius of 2.5 km shows the regular distances between the settlements to each other and presents a variety of settlement systems, concentrations and hypothetic settlement changes (Schöbel, Pfahlbaumuseum - Unteruhldingen).



which, nonetheless, finally led to the abandonment of this type of settlement. Also here the anthropogenic changes might have played a role considering a very intensive use or overuse of the land, which also led gradually to resource problems and to a change of the parameters for the existing ecological and economic situation. The reactions of humans to altered systems, may it be in the settling behavior, in religion or in wars and migrations, are certainly known to us in large numbers from historical times, and probably constitute a consequence in the long term. Even if dry summers like here in June 2004, invite for a development of settlements on the beaches where we found a dry occupation layer (about 1084 B.C.), a short time later can occur a flood problem, which feigns selectively a discontinuity. Hence, for better recognizing of conditions, apart from the archaeological investigations analysis and assessments of the natural sciences based on a year-exact period in different areas are also necessary. If then the collision of different events can be proven and various important parameters change, then an ecological crisis could have been present that forced the prehistoric human to act. The settlements introduced here were more susceptible to an ecological crisis due to their location in a risky landscape than the settlement ashore. For a further evaluation of the situation, we need, however, comparable investigations along the absolute time axis in entire Europe, north and south of the Alps. Also, we need additional demographic and scientific data, which we can only compile in time through a comparative view of all regions in relation to each other.

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