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## **BETWEEN THE SEAS**

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## THE TERMINAL MESOLITHIC AND EARLY NEOLITHIC LOGBOATS OF STRALSUND-MISCHWASSERSPEICHER

### EVIDENCE OF EARLY WATERBORNE TRANSPORT ON THE GERMAN SOUTHERN BALTIC COAST

At the German Baltic coast excellent conditions exist for the preservation of archaeological objects, and even for organic material, wood, bark or plant fibre. Due to the worldwide sea level rise and the isostatic land sinking after the Weichselian glaciation, a regular sunken landscape with traces of human dwelling-places and other activities is preserved below the present sea level at the S.W. Baltic coast.

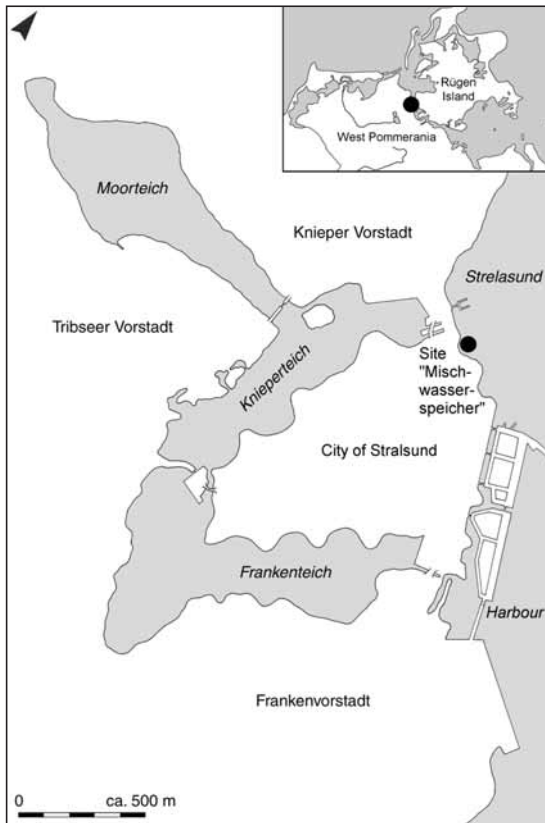
Intensive settlement activities in the terminal Mesolithic and early Neolithic along the sound *Strelasund* is demonstrated by many finds at the sites Prohn, Parow and Drigge. However, a reconstruction of the former landscape and a separation of different settlement phases have not been realized because finds were brought up to light by dredging, without options to document stratigraphies (Lübke *et al.* 2000; Terberger & Lübke 2002; Lübke & Terberger 2005).

Therefore, the discovery of a terminal Mesolithic/early Neolithic coastal site near the medieval city of Stralsund gave opportunity to observe a sequence of shore sediments (Fig. 1). As a preliminary survey of a building ground for a water supply reservoir (German: *Mischwasserspeicher*), an area of 60 to 27m to a depth of 8m (Fig. 2), was excavated by the State Authority for Culture and Protection of Monuments (Landesamt für Kultur und Denkmalpflege [LaKD]), Mecklenburg-Vorpommern. Connected to the settlement site parts of the shore sediments up to 3m beneath Kronstadt m.s.l could have been investigated (Kaute *et al.* 2005; Mandelkow *et al.* 2005).

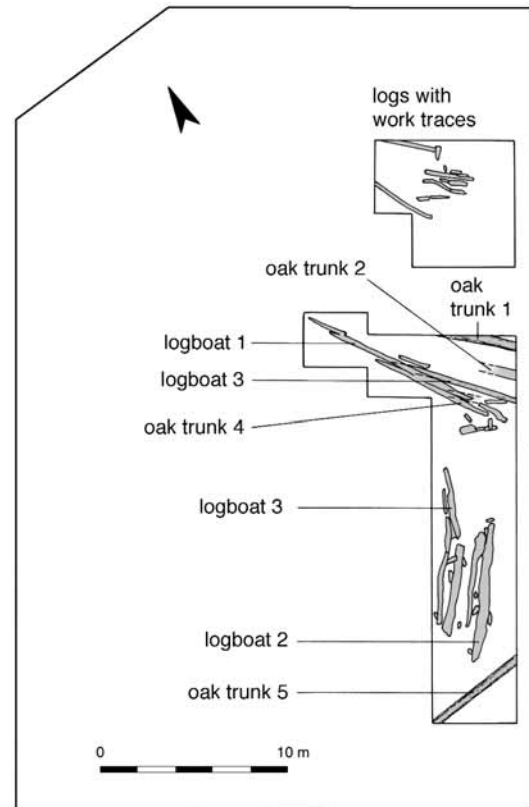
Some oak trunks from the Atlantic period have been found in a peat layer together with archaeological artefacts from flint, antler, bone and wood. The material belongs to the terminal Mesolithic phase of Ertebølle Culture dating from 5000 to 4700 B.C. The most important findings are two dugout canoes lying side by side (logboat 2 and 3). Above the peat, there were marine sand and mud layers again with terminal Mesolithic flint and bone artefacts. A third cultural layer, wherein a third logboat (logboat 1) was found belongs to the early Neolithic Funnel Beaker Culture. Extraordinary well preserved, these three up to 12m long dugout canoes are the only complete Stone Age logboats of the German Baltic coast to date.

### TOPOGRAPHY OF THE COASTAL SITE

The Mesolithic/Neolithic coastal site *Stralsund, no. 225 (Mischwasserspeicher)*, is situated at the N. W. edge of the historical town centre of Stralsund, currently situated at the bank of the sound *Strelasund* opposite to Rügen Island (Fig. 1). Seven millennia ago, the dwelling site was situated at a typical island point at the outlet of a secondary sea channel. Since the Middle Ages, a dyke separated the former channel from the sea. The archaeological cultural layers are lying today some meters below the surface, covered by sediments and especially by layers, which have been filled up at the end of the 19<sup>th</sup> c. to gain new land for the growing city. The excavation only met the fringe of the Stone Age dwelling place in the shallow waters, whereas housing structures might have existed more to the S.E.



**Fig. 1** The site at the edge of the Hanseatic City of Stralsund at the coast of the Baltic sound Strelasund opposite to Rügen Island (Digital drawing B. Froese & H. Lübke, LaKD).



**Fig. 2** Stralsund-Mischwasserspeicher. – General plan of the construction area with the excavation trenches. Logboats and oak trunks are labelled (Drawing B. Martin, LaKD).



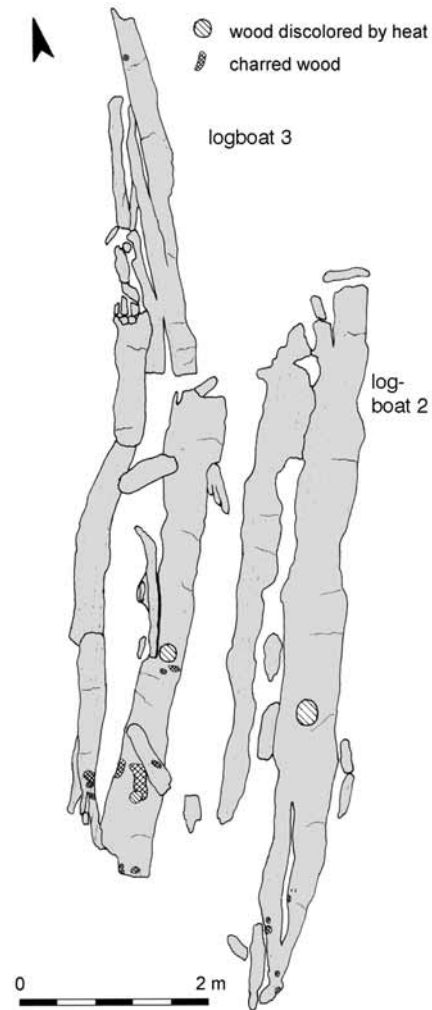
**Fig. 3** Stralsund-Mischwasserspeicher. – The two excavated Mesolithic logboats (Photo P. Kaute & G. Schindler, LaKD).

## STRATIGRAPHY

Sediment cores were taken to study the Holocene sedimentation at the site. The core analysis shows, that the Pleistocene channel at its base had late glacial sediments. Above these, sand and mud layers were deposited, which were overgrown by peat. Within the investigated area, peat grew up some decimetres at levels from -3.0m to -2.2m. Several oak trunks dated by dendrochronology, sunk into the peat layers. They also contained archaeological artefacts from the Terminal Mesolithic, two logboats inclusive. According to radiocarbon dating, both boats were built in the Atlantic period, between 5000 and 4700B.C.

During the Littorina Transgression the described area was floated and overlaid by a sequence of marine sand and mud. At the top of this sequence, a small layer with some Mesolithic flint and bone artefacts occurred, and directly above a 0.5m thick layer of fine marine sand with artefacts of the Early Neolithic Funnel Beaker Culture and the third logboat embedded.

The Early Neolithic layer was overlain by strand border deposits. Also a winged arrow-head with a concave base from the transitional period Late Neolithic/Early Bronze Age was discovered there. The stratigraphical sequence is closed by modern dump deposited to drain the place in the 19<sup>th</sup> c.



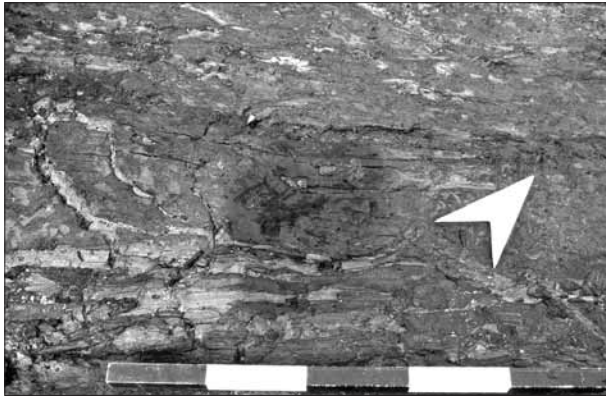
**Fig. 4** Stralsund-Mischwasserspeicher. – Plan of the Mesolithic logboats 2 and 3. Charred parts of the boats are marked (Drawing B. Martin, LaKD).

## THE MESOLITHIC FINDS

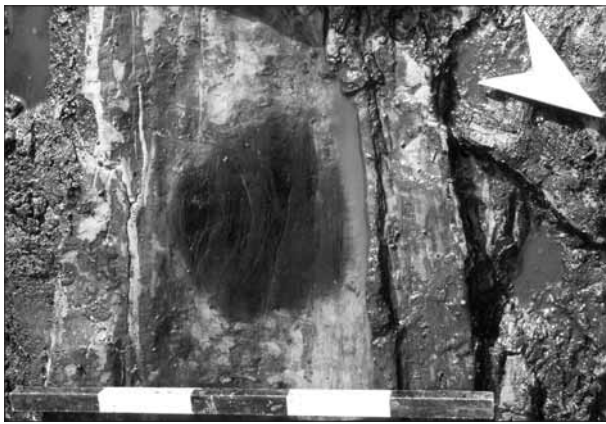
### The terminal Mesolithic logboats

Logboats 2 and 3 were lying side by side in the slight W. slope of the peat layer, orientated approx. N.S. (Figs 3-4). They were pressed totally flat by the overlying deposits. Logboat 2 was made of a large lime trunk (*Tilia sp.*), preserved on 8.0m length, 0.6 to 0.7m sided. It was broken into two substantial and several small pieces. The position of bow and stern cannot be identified. A circular spot on the bottom of the boat, not more than 0.2m in diameter, coloured dark brown from heat, indicates a fire place (Fig. 5). As such fire places usually are situated in a boat's centre, it can be concluded, that the boat's E. side was lost. The 9.0m long and 0.6 to 0.7 m wide logboat 3 was also built from lime tree. Broken into three larger and several small pieces, traces of fire are visible at two positions (Fig. 6). Distinct chopping marks of a 2.5 to 3.0cm adze blade were found specially along the bottom of the dugout (Fig. 7). Radiocarbon dates point to the same age, which corresponds to the stratigraphical situation (Lübke 2005). Logboat 2 is dated to  $4718 \pm 50$  cal.B.C.; no. 3 to  $4768 \pm 44$  cal.B.C. (Table 1).

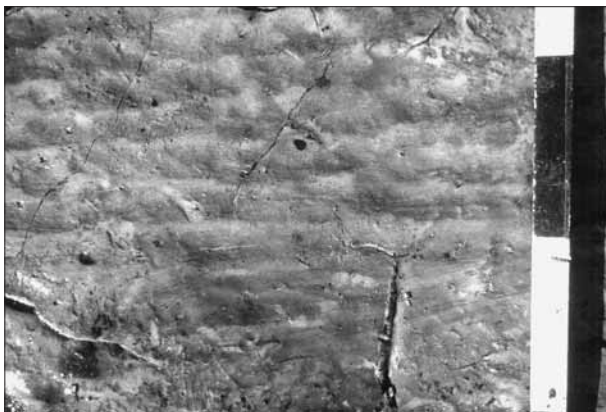




**Fig. 5** Stralsund-Mischwasserspeicher. – Detail of logboat 2. – The position of a fire place is marked by charred parts on the bottom of the boat (Photo P. Kaute & G. Schindler, LaKD).



**Fig. 6** Stralsund-Mischwasserspeicher. – Detail of logboat 3. – The position of a fire place is marked by charred parts on the bottom of the boat (Photo P. Kaute & G. Schindler, LaKD).



**Fig. 7** Stralsund-Mischwasserspeicher. – Detail of logboat 3. – Chopping marks of an adze at the bottom of the boat (Photo P. Kaute & G. Schindler, LaKD).

## Terminal Mesolithic artefacts

Several flint, bone, antler and wooden artefacts were found in the terminal Mesolithic culture layers. One of the most remarkable finds is a great T-shaped antler axe, 28cm long, with an edge on one side. The edge was damaged by a crack. Therefore, the axe might have been recycled as raw material. An antler chip was cut out at the neck, and the whole upper side of the antler is missing (Fig. 8). Dated by radiocarbon analysis to  $4883 \pm 53$  cal. B.C. (Table 1); the tool is the oldest T-shaped antler axe found in the S.W. Baltic region.

## NEOLITHIC FINDS

### The early Neolithic logboat

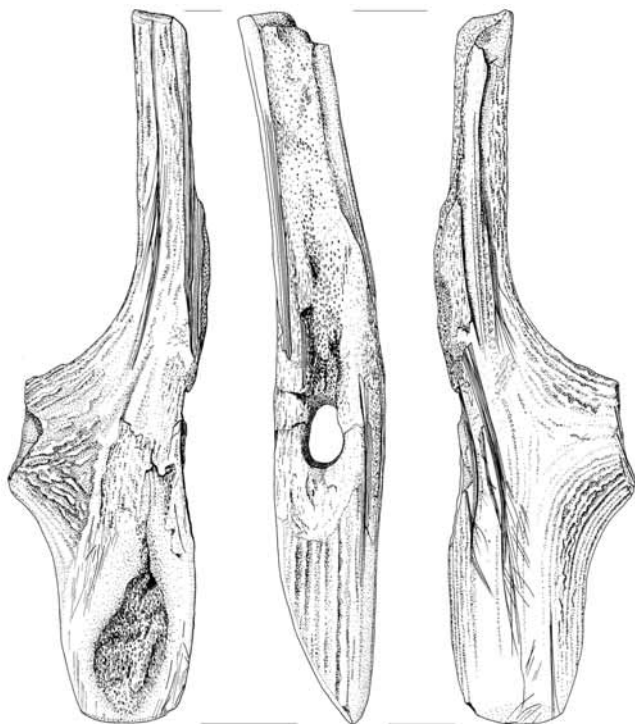
Logboat 1 was found in the sand layer with the bow pointing N.W. (Figs 9-10). Also made of a lime trunk, the dugout was preserved in two big and several small pieces. The total length of the vessel comes to 12.0m, the width to 0.6m. The boat was lying upside down so that internally no fire places or cut marks could be recognized. At the bottom side no traces of bark were visible. The sides were tired off and partly floated away, almost completely on port. At the interior side round holes of 2 to 4cm in diameter were observed in irregular distances; they might indicate repairs. Logboat 1 is dated to  $3858 \pm 63$  cal. B.C. (Lübke 2005), an age which corresponds well to the dating of a Funnel Beaker potsherd ( $3776 \pm 89$  cal. B.C.) found directly on the logboat (Table 1).

### Early Neolithic Artefacts

Several potsherds of early Neolithic Funnel Beaker ceramics were found in the upper cultural layer (Fig. 11). Among other finds, the fragment of a Funnel Beaker type E. Koch II (Koch 1998: 89) seems remarkable. It has a diameter of about 34cm and a height of at least 27cm. The rim of the beaker is decorated with a single row of irregular sharp single

find no.	sample no.	age BP	age cal B.C.	d13C	artefact
2001/2168-0209	KIA-20433	4780±31	3574±44	-27.3	wooden board
2001/2168-0383	KIA-20437	4830±30	3598±55	-19.4	human skull
2001/2168-0295	KIA-20435	4964±58	3776±89	-22.4	funnel beaker, charred food crust
2001/2168-0204	KIA-20234	5040±26	3858±63	-25.4	logboat 1
2001/2168-0294	KIA-20434	5194±30	4004±35	-20.0	funnel beaker, food crust
2001/2168-0247	KIA-20235	5853±34	4718±50	-26.1	logboat 2
2001/2168-0246	KIA-20236	5901±34	4768±44	-28.0	logboat 3
2001/2168-0382	KIA-20436	6010±35	4883±53	-24.2	T-shaped antler axe

**Table 1** Stralsund-Mischwasserspeicher. – List of radiocarbon datings. – Calibration was conducted with *Calpal* software provided by O. Jöris and B. Weninger (cf. manual *Calpal* or [www.calpal.de](http://www.calpal.de)), and based on the calibration curve Intcal98 (Stuiver *et al.* 1998).



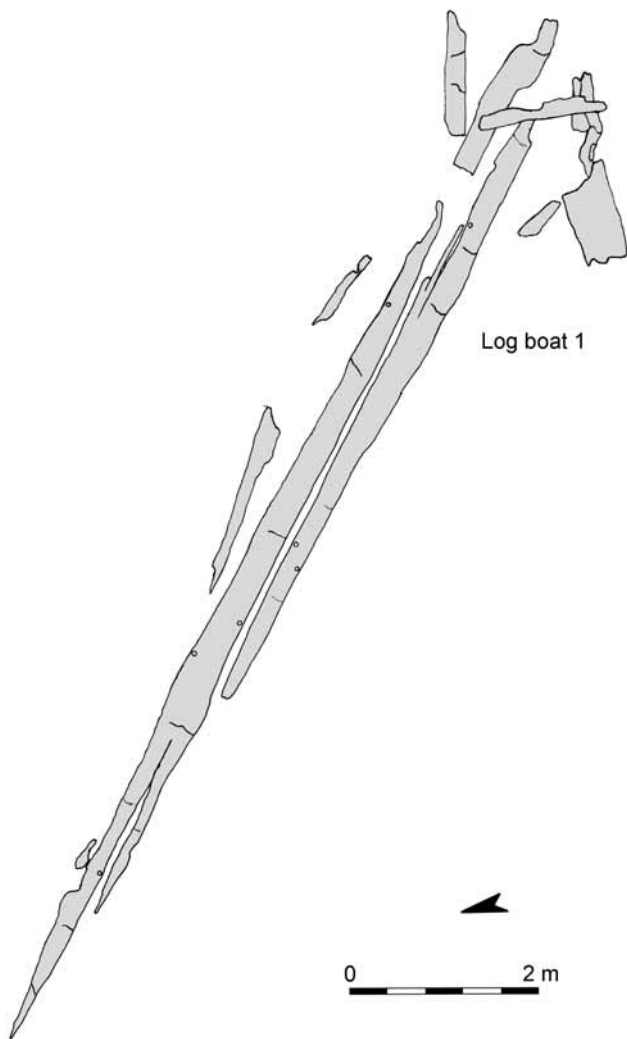
**Fig. 8** Stralsund-Mischwasserspeicher. – T-shaped Axe of red deer antler, a characteristic artefact of the terminal Mesolithic Ertebølle culture (Drawing J. Freigang, LaKD).



**Fig. 9** Stralsund-Mischwasserspeicher. – The Early Neolithic logboat 1 (Photo P. Kaute & G. Schindler, LaKD).

pricks. A conical bore-hole above the beaker's shoulder indicates a repair. Charred food crusts inside the vessel have been dated by radiocarbon analysis to 4004±35 cal. B.C. (Table 1).

Two interesting wooden artefacts belong to the early Neolithic cultural layer (Fig. 12): there is a rectangular board from 13 to 38cm with rounded edges, made of alder (*Alnus* sp.). In the middle an irregular oval handle was worked out all in one piece. Two parallel holes are running through the handle and the upper



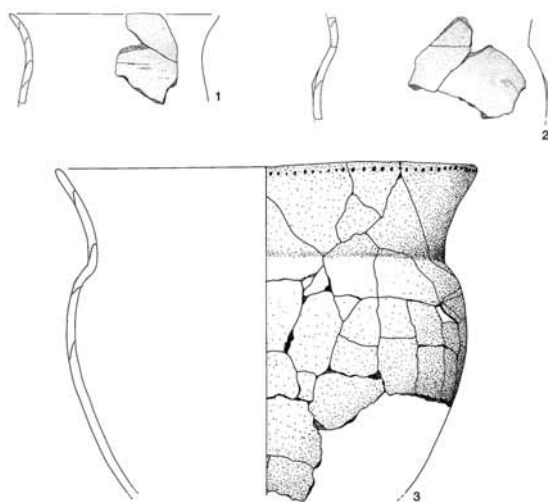
**Fig. 10** Stralsund-Mischwasserspeicher. – Plan of the Early Neolithic logboat with round holes of 2 to 4cm diameter in the boats hull (Drawing B. Martin, LaKD).

side was split off. Inside of one of the openings stuck a thin branch of a fruit-tree (*Maloideae*). At the other side of the board all the edges were sloped and carefully smoothed like the upper side (Fig. 12, 2). A radiocarbon date (AMS) gave an age of  $3574 \pm 44$  cal. B.C. (Table 1). To this object no parallel seems to exist. As functional interpretations, the cap for an unknown type of container, a repairing board for a dugout, or a removable transom, which could be fixed at the stern of a logboat, come into mind.

Furthermore, a round stick of hazel (*Corylus avellana*) was found, with some bark preserved. It has a length of 57 cm and a diameter of 3 cm. One ending shows a notch; the other was cut flat from both sides shaped to an oval hole that may have been broken through use (Fig. 12, 1). Similar sticks are known from Ertebølle sites at the S.W. Baltic coast, Wangels, Neustadt and Timmendorf-Nordmole I (Kloß in prep.). As well two of such hazel sticks are known from Tybrind Vig, where two well preserved logboats were documented (Andersen 1985: 61, fig. 19). S. H. Andersen (1995: 56, fig. 15) suggested that such wooden objects belong to the construction at the mouth of fish traps according to ethnographic record of Finnish and N. Russian populations (Sirelius 1934: fig. 254).

## USE AND FUNCTION OF STONE AGE LOGBOATS

It is reasonable to believe that Mesolithic and Neolithic people who lived at the Baltic coastal waters or at lakes and rivers in N. Germany might have used watercraft for transport and communication as well as for fishing and sealing (Hartz & Lübke 2000). However, assumptions have been hard to prove in the past because of a lack of dated finds. In the meantime, more than 21 Mesolithic boats have been found in Denmark (Christensen 1997: 283) and in N. Germany, where fragments of dugouts occurred in the Wismar Bay and at the site Neustadt-Marienbad in E. Holstein (Labes 2005; Hartz 2005). In general logboats are not exceptional finds in the shore area



**Fig. 11** Stralsund-Mischwasserspeicher. – 1-3 Funnel Beaker pottery (Drawings J. Freigang, LaKD).



of terminal Mesolithic coastal settlements of the Ertebølle culture, but frequently they are considerably worse preserved than in Stralsund.

Like most of the other dugouts of the Ertebølle culture (Mertens 2000: 34-55), the Stralsund boats were made of soft wood. Lime wood can grow into large trunks, is easy to work, and compared to other wood species, it is characterized by less weight and less tendency to split. However, after their abandonment, boats broke quickly and the fragile board-shaped fragments were scarred by waves and current in the shore area of the settlements, where they are not easy to identify. Nevertheless, similar find conditions with more than one logboat preserved are known from the Danish sites Lystrup (Andersen 1994), Tybrind Vig (Andersen 1985) and Horskær/Halskov (Christensen 1997).

According to the radiocarbon analyses, the Stralsund Mesolithic logboats nos 2 and 3 are dating between 4800 and 4700 cal. B.C. Two dugouts, which show similar form, technical details and features from the Danish site Lystrup, Jutland, are a little older. The Lystrup I dugout by way of exception made of an Aspen trunk (*Populus tremula*) was dated to 5200/5000 B.C., whereas Lystrup II, which was made out of lime, is even about 300 years older (Andersen 1994; 1996). With a length of 6 to 7 m and a width of 0.6 m these two boats are only slightly smaller than the Stralsund finds.

Dated to 4300 cal. B.C. (Tybrind 2) and 4100 cal. B.C. (Tybrind 1), two dugouts from Tybrind Vig already belong to the younger Ertebølle culture (Andersen 1987). Nevertheless, the 9.5 m long and 0.65 m wide Tybrind 1 dugout shares the dimensions of the Stralsund logboats.

Distinct chopping marks from adzes with a worn edge like in Stralsund were seen throughout the interior of the Tybrind and Lystrup boats. These vessels are characterized by open sterns, where a row of holes or a similar construction shows, that their hulls originally had been closed by a transom. Other holes observed at Tybrind 2 and Lystrup I can be interpreted as traces of repairs.

Another remarkable feature of the discussed logboats are evidences of fire places. Especially the boats Tybrind 1, Lystrup 1 and Stralsund 3 are very comparable, in each where two fire places were found. In the case of Lystrup 1 the structure in the stern consisted of a clay package on top of a bed of 1 to 2 mm fine sand (Andersen 1994, 8), and in Tybrind 1 a fire place was made with an isolation layer of sandy clay (1986, 94). In both cases, each a second fire place was indicated by charred areas near the bow at the bottom of the boats.

Comparable clay packages could not be established for the Stralsund logboats, however the dark to black-brown areas coloured by heat, but not charred, point to similar constructed fire places with an isolating bed of sand and/or clay in the forward end of the stern. Different to the findings of Lystrup 1 and Tybrind 1, in Stralsund 3 the second fire place was found near a boat end which appears to be the stern. The existence of fire places in logboats in the terminal Mesolithic is not only proven by Ertebølle findings, but also in context with the S.W. neighbouring Swifterbant culture by a dugout from the site Hardinxfeld-Giessendam De

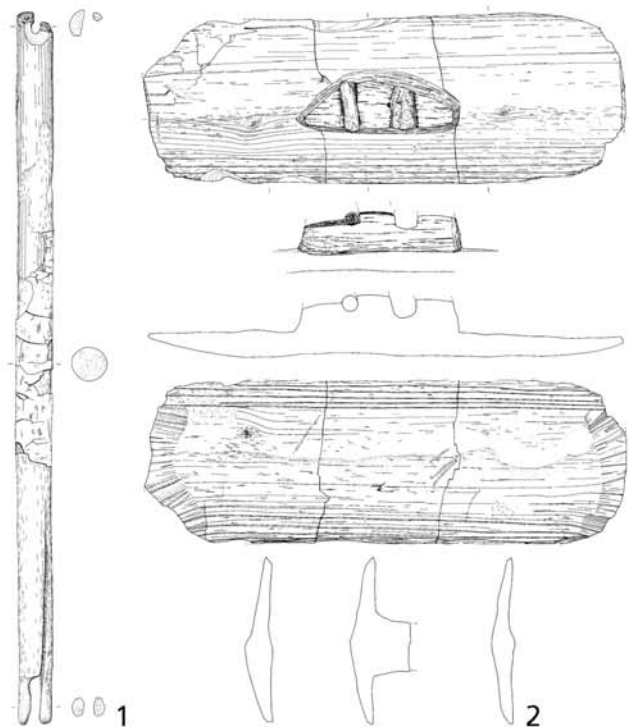


Fig. 12 Stralsund-Mischwasserspeicher. – 1 Hazel stick with worked ends. – 2 Wooden board of alder with a handle (Drawings J. Freigang, LaKD).

Bruin (Louwe Kooijmans *et al.* 2001, 455-466). Also in modern times fire places on logboats are well-known from ethnographic records, e.g. of the native inhabitants of N. America. Fire not only was used for heating or cooking on board, but also for fishing to attract fish by night (Andersen 1986: 100; 1994: 9).

Although belonging to the early Neolithic Funnel beaker culture, Stralsund 1 with an age of 3900 to 3800 cal. B.C. is just two or three centuries younger than the Tybrind 1 logboat. So, comparisons with late terminal Mesolithic boats from Denmark seem also reasonable as with the contemporary dugouts from the Åmosen in the interior of Zealand, E. Denmark (Christensen 1990). As with the two elder boats Stralsund 1 was made from lime wood, and working traces on the outer side are very similar to such from the Danish and Dutch dugouts. Although the stern was badly preserved and broken into several pieces, it looks as if it had the same straight end as the Mesolithic logboats. Therefore it seems that Stralsund 1 was build in the same boat building tradition as the finds of the Mesolithic Ertebølle culture.

Nevertheless, with a total length of approx. 12 m and a width of 0.6 m, the logboat Stralsund 1 is the longest established Stone Age log found yet in N. Middle and N. Europe. According to Andersen (1986: 99), logboats with a size of about 10 m like the Tybrind 1 boat carried six to eight persons, including equipment or cargo of comparable weight. Therefore, boats of such considerable dimensions may have been used not only for fishing or sealing, but also for long distance travel, transport and communication along the Stone Age coastline and across the Baltic to S. Scandinavia.

## CONCLUSIONS

Through the example of the logboats from Stralsund-Mischwasserspeicher one can see once more the highly developed, long tradition of building large, thin-walled dugout canoes out of lime trunks for thousands of years through the Late Mesolithic and the beginning of the Neolithic at the Baltic coast. Logboats certainly were important watercraft especially at the transition of the terminal Mesolithic Ertebølle culture and early Neolithic Funnel beaker culture. They played a decisive role for extensive fishing, sealing, communication, travel and transport along the coastline, lake shores and rivers, and were an essential part of the material culture of the Stone Age human societies in the S.W. Baltic region.

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