

Bartosz Kontny<sup>1</sup>

## LOGBOAT DISCOVERED IN LAKE LUBANOWO, WESTERN POMERANIA

### ABSTRACT

Kontny B. 2021. Logboat Discovered in Lake Lubanowo, Western Pomerania. *Sprawozdania Archeologiczne* 73/2, 203-220.

The paper presents a logboat found by an expedition from the University of Warsaw in Lake Lubanowo (north-western Poland) during an underwater archaeological survey in 2020. It is the first logboat made of beech wood (*Fagus sylvatica*) registered in the area of Poland. The conventional radiocarbon date is  $2350 \pm 30$  BP; thus, the vessel may be attributed to the Jastorf or Pomeranian culture, as it was found in the border area between the territories of both units. Only a few logboats are known from the period preceding the Middle Ages in Poland. Other untypical traits are a transom, and a carefully formed beak-shaped bow. In the prow there is a rectangular hollow with a circular perforation inside of unclear function. One may consider it a fastening of an outrigger or other kind of floating attachment but also perhaps that the bow slot was intended either for a figurehead, for mooring, or to hold a torch during night-time fishing, or even functioned as a 'stick-in-the-mud' – type anchor.

Keywords: logboat, underwater archaeology, Lake Lubanowo, Jastorf culture, early Iron Age

Received: 29.03.2021; Revised: 18.04.2021; Accepted: 01.06.2021

<sup>1</sup> Faculty of Archaeology, University of Warsaw, Krakowskie Przedmieście St. 26/28, 00-927 Warszawa, Poland; bdkontny@uw.edu.pl; ORCID 0000-0003-3627-046X

## THE SITE

Since 2014, a team of scholars and students from the Institute of Archaeology, University of Warsaw (now: Faculty of Archaeology) has been conducting an underwater survey in Lake Lubanowo (former Herrn-See) in Lubanowo (ex-Liebenow), Banie commune in Western Pomerania. Initially the research was done in collaboration with the Institute of Archaeology and Ethnology, Polish Academy of Sciences. The expedition was initially led by Tomasz Nowakiewicz, and since 2018 by Bartosz Kontny (both from the University of Warsaw). During the underwater research, weapons, potsherds, tools, and horse harness elements (including chain reins) have been found. The earliest finds date to the Bronze Age (the Lusatian culture – splintered flake) but most of them to the Roman Period and the Middle Ages (Early, High, and Late); some peculiar modern finds were also recovered, *e.g.* a copper cauldron from *ca.* 1600 AD, in which a group of painted plates had been deposited. Some of the Roman Period items bear traces of ritual destruction. The parallels to the weapons may be found in Central European *Barbaricum* (the Przeworsk culture) and, to some extent, also in Scandinavia. The site should be considered as a sacrificial military deposit, known generally from northern Europe, but almost unknown in the lands to the south of the Baltic Sea. Its extraordinary character is also manifested by the fact that so far it is the only site of that type known that is still in its ‘lake stage’, *i.e.* not a marsh or bog, into which ancient lakes have evolved due to the process of eutrophication. Most probably the site was used by local inhabitants, *i.e.* the people of the Lubusz group. The medieval finds also seem to be very important if one considers both new and old but re-interpreted finds dated to that period. The discoveries from Lake Lubanowo document not only sacrificial activities, but also the daily life of common folk, *i.e.* by the items they had lost, *e.g.* net weights, pots, tools, *etc.* Altogether, the recent research reveals a fascinating picture (Kontny *et al.* 2015; Nowakiewicz 2016; Kontny 2019a; 2019b; 2021).

In the larger part of the water basin, the artefacts lie shallowly in the sandy or stone-clayish bottom, covered with an organic sediment that is relatively shallow until a depth of about four metres (an exception is southwestern part of the basin, where, on a rather wide plateau, the layer of silt of a significant thickness overlies the lakebed right from the shore).

## METHODS OF RESEARCH

The lakebed is surveyed systematically; sectors are defined by a guide line, spread between the parallel main lines, being successively extended parallel to the shore. Scuba divers with metal detectors move along the guide line and after particular sector is surveyed, the rope is moved on one end for about 0.5-1 m (depending on the visibility); in this way a zig-zag route covered by a scuba diver allows surveying the same surface of the lake-

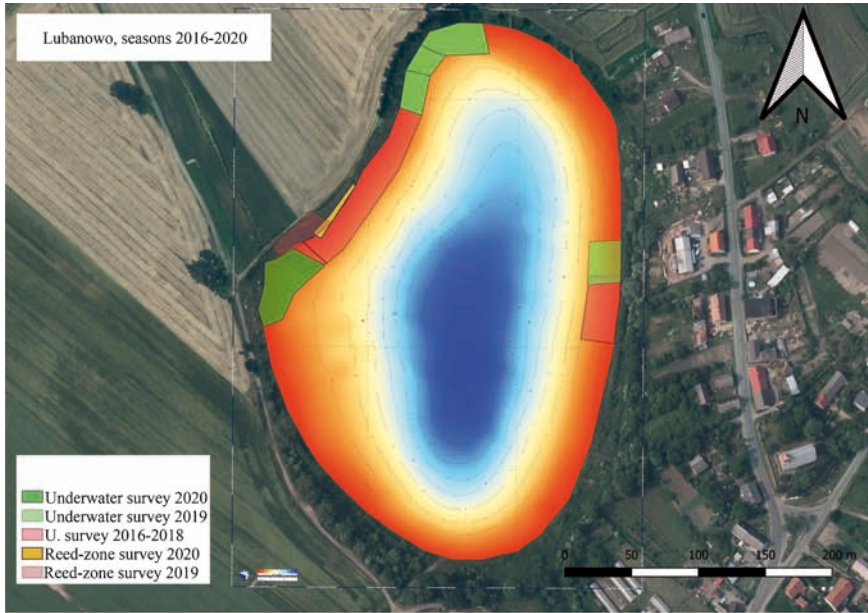
bed twice. The survey is conducted with a use of metal detectors, and signals are precisely localized with a pinpointer. Their position is established on the water surface with a Total Station, which allows developing a plan of artefact distribution across the site (Brzóska and Kontny 2016).

## DISCOVERY

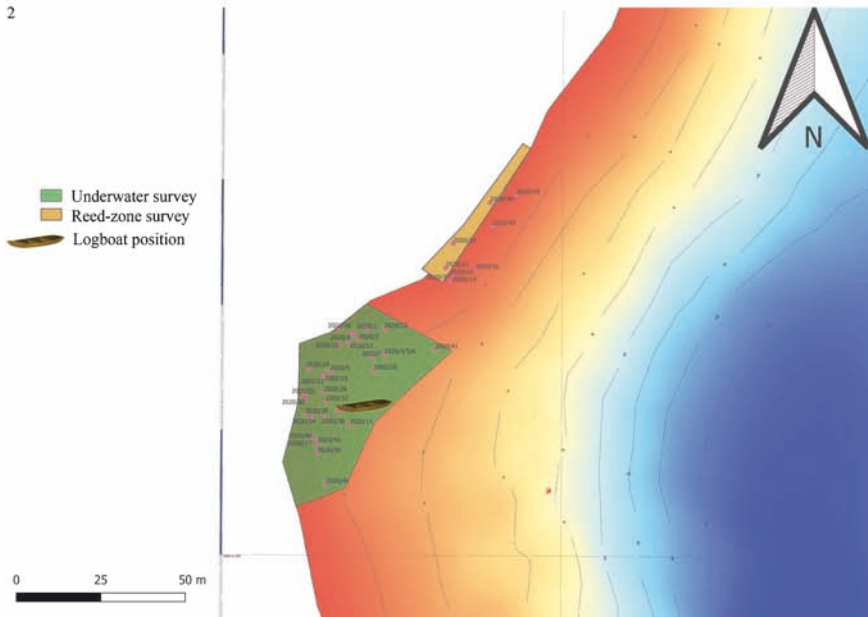
During the 2020 summer fieldwork, in the southwestern part of the basin, on the 21<sup>st</sup> of July, the researchers encountered a logboat (inv. no. 40/2020), located in the silt bottom at a depth of 1.5-1.6 metres (Fig. 1). Inside, there was an uncharacteristic sherd of a hand-shaped pottery (inv. no. 39/2020; greyish orange on the inside, and on the outside – greyish brown, with a relatively small amount of fine crushed-stone temper). According to Bartłomiej Rogalski from the National Museum in Szczecin, it is most probably a fragment of a vessel from the protohistoric period (hereby I would like to express gratitude for the consultations). The logboat was uncovered from the overlying sediment, which confirmed that it is not complete (there were large pieces missing from the aft and on the side, especially in the middle part). A series of cracks, especially transverse, were also seen in the central part. The wood is sponge-like. Observable was also the transverse groove in stern, where the transom was originally mounted. The vessel was aligned on a SSW-NNE axis (azimuth 220°), bow pointing towards the SSW. Due to the bad state of preservation, after the consultation by telephone with the Regional Heritage Office in Szczecin, the decision was made to secure the object, and initiate documentation activities after acquiring necessary means for the eventual surfacing, transport, and conservation of the boat. Beforehand, an attempt had been made to document it with a GoPro camera, using the use of Structure from Motion technique. The acquired documentation turned out to be insufficient due to the abundance of organic matter suspended in the water (algae bloom). The object was covered with silt and plastic sheet in the place of discovery, with the intention of returning to it in more beneficial weather conditions (better visibility), which would enable the preparation of more adequate documentation.

## WOOD ANALYSIS

A fragment of wood was taken from the aft part for the radiocarbon analysis (Fig. 2). The analysis was conducted with the LSC method in the Laboratory for Absolute Dating (*Laboratorium Datowań Bezwzględnych*) by Professor dr habil. Eng. Marek Krąpiec (Laboratory no. MKL-5049). The result was surprising for two reasons. Firstly, the kind of wood used for manufacturing the logboat was identified as beech – *Fagus sylvatica*. The use of this wood in the making of logboats has not been registered until now in the area of



1



2

Fig. 1. Lake Lubanowo. 1 – surveyed areas, 2 – location of the logboat.  
Prepared by Piotr Prejs

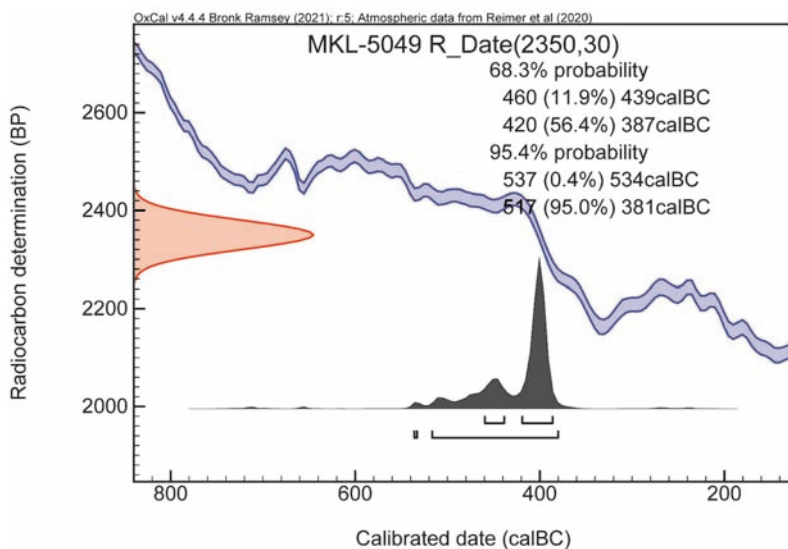


Fig. 2. Radiocarbon dating by the Laboratory for Absolute Dating of the sample from the Lubanowo monoxyle

Poland (*cf.* Ossowski 1999). The second surprise was the conventional radiocarbon date:  $2350 \pm 30$ BP. After calibration, with the 95% confidence, it gives a date of 515 BC or 375 BC, with a median 400 BC (calibration software – adamwalanus.pl). Only a few similar objects are known from the period preceding the Middle Ages. One cannot overlook the possibility that the date is erroneous, resulting from the proximity of the acquired data to the Hallstatt plateau in the radiocarbon dating, which causes even the most precisely dated and calibrated samples from the time span 800-400 cal BC to appear to be nearly the same (Van der Plicht 2004; Reimer *et al.* 2004). It is a problem to establish the border of the Hallstatt plateau precisely. One cannot fully exclude that the object is in fact even older.

## DOCUMENTATION

With such an intriguing dating, a decision was made to prepare the documentation of the logboat as quickly as possible. The work was conducted at the end of February 2021 (it lasted three days) by a team lead by dr habil. Bartosz Kontny, prof. UW, which also included Artur Brzóska, M.A. (both Faculty of Archaeology, University of Warsaw) and Piotr Prejs, M.A. with Tomasz Budziszewski (both from the *Stowarzyszenie Archeologów Jutra*). The choice for the season of the year was dictated by a hope that the underwater visibility would be good enough to perform documentation. The conditions of work in the

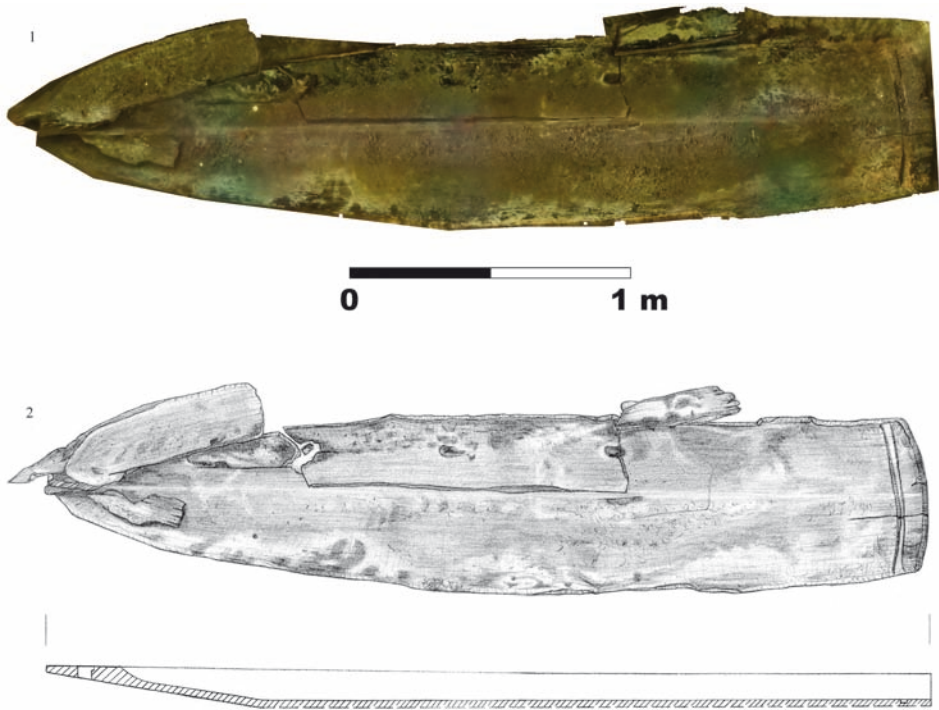


Fig. 3. Logboat from Lake Lubanowo. 1 – photomosaic (by Piotr Prejs), 2 – drawing (by Tomasz Budziszewski)

water basin included 0.5-1 m visibility and ice cover – initially about 10 cm thick (at the end of the work – after some rainfall, and then intensive insolation – it had melted). The location of the wreck was established from the surface of the ice, with the use of GPS. Dives were conducted with proper safety measures: the diver was safeguarded from the surface with the use of a rope, self-emergency equipment (reels with ice screws), and a scuba diver-rescuer ready for assistance. Having uncovered the boat from sediments and removed the protective plastic sheet used in July 2020, the photographic documentation of details was done (camera Canon 550D in a dedicated Ikelite housing and a range of takes with two GoPro cameras, counting on the use of documentation with the Structure from Motion technique (Fig. 3), which this time was a success (the picture was acquired with the application of Meta Shape software). Loose elements (three fragments of the right side and transom as well as the right part of the bow) were brought to the surface for a short time and documented photographically, acquiring the data for the 3D picture (Fig. 4). The surfaced fragments of the logboat construction were put back in the original place and then the entire boat was once again protected with plastic sheet and sand.

## DESCRIPTION OF THE LOGBOAT FROM LAKE LUBANOWO

The boat was made of beech wood (*Fagus sylvatica*). It has been preserved to a large extent: there are major missing areas on the right side, especially in the aft section; there is also no transom (it was ultimately found during the summer expedition in July 2021). In addition to that, the state of preservation is poor. The wood is chipped, sponge-like, and delicate, while the bow is broken along the main axis, and its right part is slightly displaced



Fig. 4. Details of the bow fragment surfaced for a short time (by Piotr Prejs)



1



2

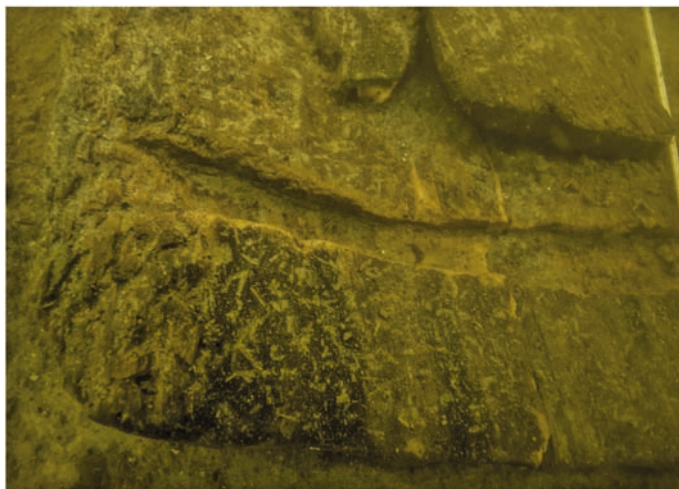


3

Fig. 5. Lake Lubanowo – area of the monoxyle find in the late 1960s (1) and today (2–3). 1 – photo from the private collection of Arkadiusz Wiśniewski, 2–3 – photo by Bartosz Kontny



– extracting the vessel as a whole was going to be impossible. The condition might have been influenced by a past incident, described by an inhabitant of the nearby Tywica, Mr Arkadiusz Wiśniewski (Fig. 5: 1 – in the middle, 5: 3 – on the left). While visiting the place of the archaeological fieldwork, he told that in the 1970s, as a child, along with a few of his peers, he had discovered a boat in this part of the water basin (this area had been used as a communal beach). The craft had been located at a shallower depth, and noticed from the



1



2

**Fig. 6.** Detail of the logboat. 1 – transom groove, 2 – hollow and perforation in the bow (photo by Artur Brzóska)

shore. Children had attempted to make it float and use it, which did not succeed – the vessel had been sinking too quickly. Discouraged, they had abandoned the drowning boat. It is very probable that the craft mentioned in the story is in fact the analyzed vessel; however, this is not certain, because Mr Wiśniewski was not able to describe the construction and did not exclude that the vessel from his story could have been a plank boat. The concurrence of the site of the logboat's discovery and the area where a boat previously retrieved from the lake had been abandoned in the 1970s is however rather intriguing (Fig. 5).

The dimensions of the boat (Fig. 3) are the following: overall length – 320 cm, preserved aft breadth – 55 cm, maximum breadth at the midship – 60 cm. In the aft part there is a groove (three-centimetre-wide and 1-1.5 cm in depth), in a place where the transom (not preserved *in situ*) had been situated (Fig. 6: 1); the hull ends 8 cm further (preserved genuine stern ending). The sides are low (height preserved in the aft part is 12 cm, in the mid-ship and bow – 15 cm) and the bottom is visibly flattened, also in the bow part, where it fluently changes into the flat bilge (Fig. 4). The bow had been narrowed from the underside and both broadsides to form a 'nose'. The 'nose' is accentuated with singular undercuts at its base (at the level 25 cm from the highest point), situated in the upper part – in the place where the sides develop into a bow. Within the bow, in its centre, there is a rectangular hollow (4 cm × 8 cm), inside – at the depth of 4 cm – gradually evolving into a 3 cm × 6 cm perforation (Fig. 3; 6: 2). The thickness of the vessel's sides is diversified – from 2.5 cm to 4.5 cm (the smallest amidships). Inside the hull one can notice the traces of woodworking. Two openings in the bottom, located in the area of a crack, are of a natural character (the effect of decay).

## ANALYSIS

The monoxyle from Lubanowo (reconstruction: Fig. 7) can be ranked among the small vessels, type 1 – considering the criteria developed for the finds from the proto-historic period from Slusegård on Bornholm (Crumlin-Pedersen 1991, 173, 174, 183-185, 252, table 1-4).

The function of the side notches and the central opening in the prow is unclear. The former might have theoretically been used for tying the mooring line or towrope at the bow, but such role is usually ascribed to thickened protrusions, left on the bow at the phase of its forming (*cf.* Ossowski 1999, 39, fig. 9: B). They cannot be considered accidental traces of woodworking, because the bow has been manufactured with unusual accuracy (although it is possible to encounter similar examples, see *e.g.* certain expanded logboats from the Roman-period cemetery at Slusegård – Crumlin-Pedersen 1991, 170, fig. 91: 6 – or medieval logboat no I from Lake Lednica – Ossowski 2014, fig. 1). It is not out of the question, that it was specifically carved in order to emphasise the aforementioned 'bowsprit' more distinctly, maybe giving the vessel certain zoomorphic features (an 'animal-snout' form).

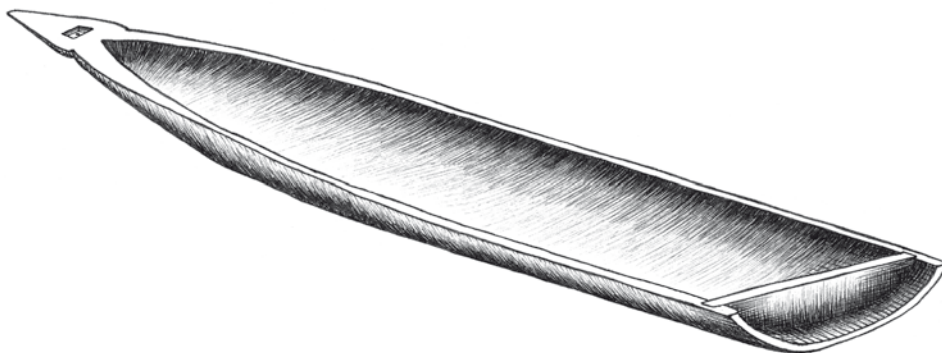


Fig. 7. Reconstruction of the logboat  
(drawn by Tomasz Budziszewski, elaborated by Piotr Prejs and Bartosz Kontny)



Fig. 8. Bow of the monoxyle from Loch Arthur in Edinburgh Museum (photo by Bartosz Kontny)

This would not be strange for a watercraft, for example in the Nordic Circle in the Bronze Age, zoomorphic decorations were placed on the stem- or sternpost; one might also recollect the Phoenician *hippoi*, with the horsehead-shaped figureheads, the depictions of eyes placed on ancient warships, or the modern figureheads or painted decorations on the prows of metal-hulled vessels. Zoomorphism/anthropomorphism could have applied also to the logboats, bows were sometimes given animal shapes (see: craft no. 1 from Loch Arthur/Lotus Loch – Fig. 8 – in Scotland with a transom and bow of ‘animal-snout’ form, dated to  $101 \pm 80$  BC), but *oculi* were recorded also in the case of crafts from Errol 2 ( $485/430 \pm 45$  AD) and Loch of Kinnordy ( $735 \pm 40$  AD) in Scotland (see Mowat 1999, 34-37; Gregory 1997, 105, 106). Naturally, it is hard to settle this question unambiguously

(*cf.* a similar discussion on the bow of the early medieval logboat no. I from Lake Lednica – Ossowski 2014, 250, with further literature).

Equally unclear is the function of the hollow in the bow. One should rather exclude the function as a mooring ring (ascribed often to openings placed analogically in other logboats, see Ossowski 1999, 40), due to the diversified shape of the opening's cross-section (redundant in such a purpose) and also the lack of wear traces on the walls of the perforation. In the case of a similarly-made opening in the logboat no. 1 from Kolín in the Czech Republic (Rogers 2011, 177, fig. 4), taken from the Elbe River, dated to the Middle Ages (cal AD 990-1160), it has been suggested that it might have been the place to fit an outrigger attachment, but one cannot exclude that the bow slot was intended either for a figurehead or to hold a torch during night-time fishing (Niederle 1923, 34). However, the first possibility seems improbable, because outrigger booms tend to be placed closer to the midship, not to lose the stability and the benefits of the hydrodynamic shape of the bow, especially visible in the case of the analyzed example. Apart from that, the evidence for the existence of local traditions of using outriggers in middle-European logboats is scarce (however, winged-canoes were built here, having the horizontal balance planks mounted in the lower parts of sides, parallel to the surface of water – Ossowski 1999, 41, 42, fig. 13). It is a similar situation in the case of sails (Szymczak 1997, 107), as fitting a mast on a bow is rather excluded due to questions of stability. Also attaching a figurehead, although tempting (*cf.* Hein 2012, fig. 1), does not have any analogies among the logboats for now, although such possibility has been proposed for a Scottish monoxyle from Errol (Hutcheson 1897, 266, 267). However, if the potential intent to give the bow zoomorphic features is considered, it does not seem out of the question. On the other hand, the idea of attaching a torch is again opposed by the diversified cross-section of the feature, simply not useful for such a humdrum use. It cannot be rejected however in the case of the desire to make here a more durable connection, though because the socket is rectangular, this would exclude rotation of the added part. This does not exclude attaching a figurehead.

It seems that one should also consider the possibility of using the opening for joining a number of analogical hulls into a larger unit in the form of paired hulls, as a catamaran, or a raft, resembling the solutions used by rafters on the Dunajec River in the Pieniny Mountains (southern Poland). The latter solution is known from the territory of Poland in the Roman Period and the beginning of the Migration Period as the 'Lewin type' (Ossowski 1999, 83-88; 2010, 22, 23). The logboats of this type have been confirmed in southern Poland, and they were discovered mostly in the waters of the Eastern Neisse (Nysa Kłodzka) and Oder River. They are distinguished by low sides (in which they resemble the find from Lubanowo), but their afts and bows are wide and flat, which has been initially interpreted for the facilitation of rolling the barrels on board (Ossowski 1999, 88). Attention is also paid to their use for rafting goods or as ferries, possibly for transporting ores in the Brzeg metallurgic region (Pazda 1994; *cf.* Ossowski 2010, 23; Kontny 2016, 206). However, it has to be noted that similar means of transport have appeared not only in southwestern Poland

but also in central Germany, as seen in the find from the Late Roman sanctuary SR1 in Oberdorla (Kontny 2019, footnote 7; see Behm-Blancke 2002, 204, pl. 109: 7). A lot of analogical logboats of the ferry constructions (similar to those known from the region of the Pieniny Mountains, but also composed of pairs of hulls, between which a transport platform was placed) from the Medieval and Modern Periods were discovered in the River Main (Kröger 2010; 2011, 116-119), the Weser (Kröger 2011, 119, 120), and also in France (Lagadec 1983), Britain (McGrail 1978, 44, 45), or in Mazovia and south-eastern Poland (Ossowski 1999, 106-108, 155-158, fig. 62, 140). Therefore, those are solutions occurring convergently in various regions and periods. The watercraft from Lubanowo is low, thus of a little water displacement, but significant stability (flat bottom), which makes the above-mentioned idea probable. The doubts, however, are connected with the fact that attaching the boom to the narrow and thin bow would cause a risk of breaking it (unlike in the case of the wide prows of the Lewin-type monoxyles). Moreover, in this case the advantage of the carefully elaborated streamlined shape would be lost. Besides, a function as a ferry on the relatively small Lake Lubanowo does not seem to have a point.

Another use of the openings has been considered too – to hammer in a pole, with the purpose of stopping the vessel in a current or facing it in the desired direction (Ossowski 1999, 40; 2010, 23) or to anchor the craft. Similar accessories have been reported as a ‘stick-in-the-mud’ anchor, driven through the bottom of the hull into the bed of the river. They are used by the Chinese in river boats and occur, for example in the Dazhi wreck from the Song Dynasty (960-1279 AD; see Kimura 2011, 9, fig. 1.6) so this may serve as a technological parallel. A clear resolution of the matter of the opening’s function is, however, impossible.

The portable bulkhead or transom was evidenced in the Polish territories only from the Middle Ages, but in Europe similar examples occur from the Stone Age, for example in the Mesolithic (Hein 2012, 123, fig. 4), and also para-Neolithic examples from the Ertebølle Culture (Bailey *et al.* 2020, 62-64, fig. 3.21). The hitherto lack of finds of logboats with such elements in the area of Poland should be therefore interpreted by the state of research.

Using beechwood for building monoxyle boats is a rarity. In the area of Poland canoes made of this material have not been known until now. In the Stone Age in Europe, different kinds of softwood were preferred, easy in woodworking, such as aspen, linden, or alder, sometimes poplar; in the terminal Neolithic they were still in use, although the oakwood was used more and more commonly, and pinewood was not neglected (Ossowski 1999, 69-71). There are a number of finds from the Bronze Age, including some in the bows of which openings were made (Ossowski 1999, 76-78). Finds from the 1st millennium BC are scarce; actually, only a few examples might be ascribed to this period: a spruce canoe from Biskupin, district Żnin, dated contextually to the Hallstatt period, an aspen boat from Chwalimki, district Szczecinek (<sup>14</sup>C dates: 3090±90 BP, 3130±80 BP, 2910±35 BP), an oak-made one from Pińczów, district Pińczów (3130±70BP or after 1220 BC), one from

Lake Łażno, district Szczytno (2930±100 BP – Lanting 1998, 640, table 12), another from an unknown locality – in the collections of the Ethnography Museum (branch of the National Museum) in Poznań, inv. no. MP/E/973 (2750±150BP – Ossowski 1999, 179; probably: 2270±35 – Lanting 1998, 640, table 6). Two more finds might be added to this list, probably from the final stage of the Late Pre-Roman Period, from Kozarze by Ciechanowiec, Wysokie Mazowieckie district (2060±50BP – Ossowski 1999, 179), and an unknown locality, from the collections of the Archaeological Museum in Cracow (2050±130 BP – Ossowski 1999, 180, 181). The finds from the settlement of the Pomeranian culture in Luzino, Wejherowo district, and potentially from the Early Iron Age site at Góra-Orle, Wejherowo district, do not have – in the first case – a confirmed function, and in the second the chronology is unconfirmed (Ossowski 1999, 75-82).

Similarly dated watercraft are not recorded in large numbers also in the area of Europe, in general. A recently published list includes 35 vessels dated in the range 2700-2300 BP, manufactured nearly entirely from oakwood, while none of them is from the area of Poland, and even Eastern Germany or Schleswig (Udovič and Erič 2020, 64-66, table 2, fig. 4). The presented material is, however, not complete (*cf.* Lanting 1998, 634, 635, table 7) since one can indicate similarly dated examples of finds from Drochtersen-Ritsch, Lkr. Stade in Lower Saxony (2245±155 BP) and Garstadt/Bergheinfeld, Lkr. Schweinfurt (2230 BP, dendrodate – 260 BC), as well as the above-mentioned finds from the Polish territories.

Although the diversification of the wood species used to produce canoes in the Bronze Age and Early Iron Age is significant, one will not find here objects made of beechwood, and this applies also to the subsequent time periods. Scarce beech examples were documented, on the other hand, in Eastern Jutland – Barsø, komm. Aabenraa – 940±65 BP (Lanting 1998, table 6, with further literature), Haddebyer Noor, Kr. Schleswig-Flensburg – Cal 944±47 AD (Kröger 2014, table 1, no. 40), and in Eastern Germany – Salziger See, Lkr. Mansfeld-Südharz – dendrodate: after 1165 AD (Kröger 2014, table 1, no. 61).

The radiocarbon date allows us to associate the logboat from Lubanowo probably with the Jastorf culture and its Oder Group, sites of which on the right bank of the Oder River (phase Ib) are dated from the stage Jastorf b to the phase A2a of the Late Pre-Roman Period, matching stadium Seedorf I (Wołagiewicz 1981; 1992, 11-13, fig. 1, 4). Lubanowo is located close to the southern limit of this group (a few kilometres further to the southwest, in Żarczyn, Gryfino district, a grave of the Jastorf culture was discovered, dated to the turn of the Early and Late Pre-Roman Period – see Rogalski 2010, 420, with further literature), in the zone where the elements of the Pomeranian culture from the middle Oder might have occurred (*cf.* Rogalski 2010, 257-259, map 6; Lewczuk 2011, 49). Mechanically, one should ascribe the boat to the Jastorf c phase, according to Georg Schwantes (1950), the turn of LT A and LT B, or Jastorf Ib/c, that is the end of the Marianowo phase, cumulating elements of the Lusatian, Pomeranian, and Jastorf cultures (Wołagiewicz 1989, 314; Rogalski 2018, 53).

However, in the present state of research, it is hard to find analogies to the logboat from Lubanowo, as similar finds from the Early Iron Age are scarce. One can only assume that, due to the used material (beechwood) the Jutland and Eastern German connotations are promising; however, it is impossible to explain this fact clearly by the connections with that territories of the Jastorf culture, as the analogies are dated to much later times.

Without doubt, the discussed vessel is exceptional, not only due to the dating and material, but also the technical details, such as the presence of the movable transom, the careful elaboration of the bottom and prow, and finally: the aperture of an unknown function in the bow part of the boat. Hopefully, future discoveries will allow the determination of a wider cultural-typological context for the discovery from Lubanowo.

### Acknowledgements

Hereby I would like to thank Mrs Małgorzata Rembecka and Mr Bronisław Rembecki as well as Dawid Rembecki from Nowe Czarnowo for their hospitality and invaluable organizational support, and also Mr Arkadiusz Wiśniewski from Tywica for the provided information. I would like to express gratitude to the good spirit of the fieldwork, Mrs Marianna Gałka – administrator of Lubanowo – and the members of the Polish Fishing Society (*Polski Związek Wędkarski*), Lubanowo Circle for their goodwill and patience. I would also like to thank the research team: Tomasz Budziszewski, Artur Brzóska and Piotr Prejs for accepting the challenge and doing the documentation in harsh conditions, as well as for further developing the documentation of the monoxyle from Lake Lubanowo. Translated by Małgorzata Mileszczyk.

### References

- Bailey G., Andersen S. H. and Maarleveld T. J. 2020. Denmark: Mesolithic Coastal Landscapes Submerged. In G. Bailey, N. Galanidou, H. Peeters, H., Jöns and M. Mennenga, (eds), *The Archaeology of Europe's Drowned Landscapes* (= *Coastal Research Library* 35). Cham: Springer, 39-76.
- Behm-Blancke B. 2002. *Heiligtümer der Germanen und ihrer Vorgänger in Thüringen. Die Kultstätte Oberdorla. Forschungen zum alteuropäischen Religions- und Kultwesen. Teil 2: Katalog der Heiligtümer und Funde* (= *Weimarer Monographien zur Ur- und Frühgeschichte* 38). Stuttgart: Kommissionsverlag/Konrad Theiss Verlag.
- Brzóska A. and Kontny B. 2016. Underwater Research in the Lake in Lubanowo: Methodological Aspects/Badania podwodne w lubanowskim jeziorze: aspekty metodyczne. In T. Nowakiewicz, *Starożytne miejsce ofiarne w jeziorze w Lubanowie (d. Herrn-See) na Pomorzu Zachodnim / Ancient Sacrificial Place in the Lake in Lubanowo (former Herrn-See) in West Pomerania*, Warszawa: Fundacja Przyjaciół Instytutu Archeologii UW, Instytut Archeologii Uniwersytetu Warszawskiego, 109-118.

- Crumlin-Pedersen O. 1991. Bådgrave og gravbåde på Slusegård. In S. H. Andersen, B. Lind and O. Crumlin-Pedersen (eds), *Slusegårdgravpladsen III* (= *Jysk Arkæologisk Selskabs Skrifter* 14/3). Århus: I kommission hos Aarhus Universitetsforlag, 93-266.
- Dickson J. M., Maier U., Mainberger M. and Lécrivaine G. M.-J. 2013. Mosses used for Caulking the Early Bronze Age Logboat from Degersee, Southern Germany. *Archive for Bryology* 185, 1-11.
- Gregory N. T. N. 1997. *A Comparative Study of Irish and Scottish Logboats*, unpublished PhD, University of Edinburgh.
- Hein W. 2012. Fellboot, Floß und Einbaum. Wasserfahrzeuge der Urgeschichte im Experiment. *Mitteilungen der Anthropologischen Gesellschaft in Wien* 142, 121-136.
- Hutcheson A. 1897. Notices of an Ancient Canoe, found in the River Tay, near Errol. *Proceedings of the Society of Antiquaries of Scotland* 31, 265-272.
- Kimura J. 2010. Historical development of shipbuilding technologies in East Asia. In J. Kimura (ed.), *Shipwreck ASIA: Thematic Studies in East Asian maritime archaeology*. Adelaide: Maritime Archaeology Program, 1-25.
- Kontny B. 2016. Przeworsk culture society and its long-distance contacts AD 1-350. In A. Rzeszotarska-Nowakiewicz (ed.), *The Past Societies IV: 500 BC – 500 AD*. Warszawa: Institute of Archaeology and Ethnology, Polish Academy of Sciences, 163-216.
- Kontny B. 2019a. *Archeologia wojny. Studia nad uzbrojeniem barbarzyńskiej Europy okresów wpływów rzymskich i wędrówek ludów*. Oświęcim: Napoleon V.
- Kontny B. 2019b. *Axes from Lake Lubanowo (Pomerania, Poland) and Their Possible Function on the Background of Watery Finds of the Roman Period and Middle Ages*. In A. Chołuj, M. Milewczyk and M. Nowakowska (eds), *Archaeology: Just Add Water. Underwater Research at the University of Warsaw* (= *Światowit Supplement Series U: Underwater Archaeology* 2), Warszawa: Instytut Archeologii Uniwersytetu Warszawskiego, 153-187.
- Kontny B. 2019c. O łodziach u Swionów. In K. Jakubiak (ed.), *Donum cordis. Studia poświęcone pamięci Profesora Jerzego Kolendo*. Warszawa: Wydawnictwa Uniwersytetu Warszawskiego, 168-185.
- Kontny B. 2021. Newly Found Sacrificial Weapon Deposits from the Territory of Poland. In E. Deschler-Erb and S. Hoss (eds), *Weapons in Ritual Context. Journal of Roman Military Equipment Studies* 21, forthcoming.
- Kontny B., Nowakiewicz T. and Rzeszotarska-Nowakiewicz A. 2015. The Turning Point: preliminary results of underwater research of the former Herrn-See at the vilage of Lubanowo (Western Pomerania, Poland). *Archaeologia Baltica* 23, 45-57.
- Kröger L. 2010. Untersuchungen zu mittelalterlichen und frühneuzeitlichen Einbaumföhren am Main. *Nachrichtenblatt Arbeitskreis Unterwasserarchäologie* 16, 57-61.
- Kröger L. 2011. Einbäume des Maingebietes – Föhren als verbindendes Element eines mittellalterlichen und frühneuzeitlichen Wegesystem. In (= *Siedlungs- und Küstenforschung im südlichen Nordseegebiet* 34). Rahden/Westf.: Leidorf, 115-128.
- Kröger L. 2014. Früh- und hochmittelalterliche Binnenschiffe in Mitteleuropa. Ein Überblick zum aktuellen Stand der Forschung. *Přehled výzkumů* 55/2, 91-123.



- Lagadec J.-P. 1983. Le flotteur de radeau de Flavigny-sur-Moselle (Meurthe-et-Moselle). *Gallia* 41, 201-207.
- Lanting J. N. 1998. Dates for origin and diffusion of the European logboat. *Palaeohistoria* 39/40 (1997/1998), 627-650.
- Lewczuk J. 2011. Latenizacja czy „długie trwanie”? Uwagi o przemianach kulturowych między Bałtykiem i Karpatami w ostatnich czterech wiekach p.n.e. In M. Fudziński and H. Paner (eds), *Między kulturą pomorską a kulturą oksywską. Przemiany kulturowe w okresie lateńskim*. Gdańsk: Muzeum Archeologiczne w Gdańsku, 45-55.
- McGrail S. 1978. Logboats of England and Wales with Comparative Material from European and Other Countries (= *British Archaeological Reports. British Series* 51). Oxford: British Archaeological Reports.
- Mowat R. J. C. 1999. The logboat in Scotland. *Archaeonautica* 14 (1998), 29-39.
- Niederle L. 1923. Nález člunu v Kolině. *Obzor praehistorický* 2, 32-34.
- Nowakiewicz T. (ed.) 2016. *Starożytne miejsce ofiarne w jeziorze w Lubanowie (d. Herrn-See) na Pomorzu Zachodnim / Ancient Sacrificial Place in the Lake in Lubanowo (former Herrn-See) in West Pomerania*. Warszawa: Fundacja Przyjaciół Instytutu Archeologii UW, Instytut Archeologii Uniwersytetu Warszawskiego.
- Ossowski W. 1999. *Studia nad łodziami jednopiennymi z obszaru Polski (= Prace Centralnego Muzeum Morskiego w Gdańsku X)*. Gdańsk: "Marpress".
- Ossowski W. 2010. *Przemiany w szkodnictwie rzeczonym w Polsce. Studium archeologiczne (= Prace Centralnego Muzeum Morskiego w Gdańsku B/I)*. Gdańsk: Centralne Muzeum Morskie.
- Ossowski W. 2014. Łodzie jednopiennie z Jeziora Lednickiego. In A. Kola and G. Wilke (eds), *Wczesnośredniowieczne mosty przy Ostrowie Lednickim 2: Mosty traktu poznańskiego*. Kraków: Universitas, 249-258.
- Pazda S. 1994. *Brzeski rejon starożytnej metalurgii żelaza, IV-V w. n.e.* Wrocław: Wydawnictwo Uniwersytetu Wrocławskiego.
- Reimer P. J. et al. 2004. Intcal04 Terrestrial Radiocarbon Age Calibration, 0-26 Cal Kyr Bp. *Radiocarbon* 46(3), 1029-1058.
- Rogalski B. 2010. *Przemiany kulturowe na Pomorzu Zachodnim i Przednim w młodszym okresie przedrzymskim (III-I w. p.n.e.)*. Szczecin: Muzeum Narodowe w Szczecinie.
- Rogalski B. 2018. Cmentarzysko ludności kultury jastorfskiej w Marianowie, pow. stargardzki, stan. 1. *Materiały Zachodniopomorskie. Nowa Seria* 14, 13-95.
- Rogers J. S. 2011. Czech Logboats: Early Inland Watercraft from Bohemia and Moravia. *Sborník Prací Filozofické Fakulty Brněnské Univerzity / Studia Minora Facultatis Philosophicae Universitatis Brunensis* M 16, 171-202.
- Szymczak A. 1997. W sprawie najstarszych łodzi w Polsce. *Materiały Zachodniopomorskie* 43, 99-112.
- Udovič P. P. and Erič M. 2020. Logboat Ižanska I (SI-81) from Ljubljana: New Evidence of Iron Age Transportation on the Ljubljana Marshes, Slovenia. In J. A. Rodrigues and A. Traviglia (eds), *IKUWA 6. Shared Heritage: Proceedings of the Sixth International Congress for Underwater*

- Archaeology 28 November – 2 December 2016, Western Australian Maritime Museum Fremantle, Western Australia*. Oxford: Archaeopress, 60-72.
- Van der Plicht J. 2004. Radiocarbon, the calibration curve and Scythian chronology. In M. E. Scott, A. Alekseev and G. Zaitseva (eds), *Impact of the environment on human migration in Eurasia* (= *NATO Science Series IV Earth and Environmental Sciences* 42). Victoria: Springer Nature, 45-61.
- Wołagiewicz R. 1981. Kultura jastorfska. Grupa nadodrzańska. In J. Wielowiejski (ed.), *Prahistoria ziem polskich 5: Późny okres lateński i okres rzymski*. Wrocław, Warszawa, Kraków, Gdańsk: Zakład Narodowy im. Ossolińskich, 135-178.
- Wołagiewicz R. 1989. Cmentarzysko w Marianowie i problem schyłkowej fazy kultury łużyckiej na Pomorzu. In T. Malinowski (ed.), *Problemy kultury łużyckiej na Pomorzu*. Słupsk: Wyższa Szkoła Pedagogiczna, 307-321.
- Wołagiewicz R. 1997. The Pre-Roman Iron Age in Pomerania. In J. Martens (ed.), *Chronological Problems in the Pre-Roman Iron Age of Northern Europe* (= *Arkæologiske Skrifter* 7). Copenhagen: Danmarks Universitetsforlag, 11-33.