CLAUDIU MUNTEANU

ROMAN MILITARY PONTOONS SUSTAINED ON INFLATED ANIMAL SKINS

In ancient times, more numerous and widely distributed were swimming floats made from the skin of various animals, goats and oxen most commonly (Hornell 1946, 6). Assyrian bas-reliefs frequently represent the skin float; soldiers being depicted as swimming through rivers supported by small inflated skins (Hornell 1946, 6 f.). From the record preserved for us in these Assyrian sculptures it is clear that all Mesopotamian soldiers of old time, whether Assyrian, Babylonian or Elamite, carried as an essential part of their field equipment, a deflated goat skin, ready for inflation and usage whenever a river crossing had to be negotiated (Hornell 1946, 7). This equipment had a wide distribution in ancient times, as mentioned in Caesar's account of his campaign in Spain, where »bladders« were used to cross the Segre river (Caes. civ. I, XLVIII, 7). Although it cannot be identified the moment when inflated skins began to be utilised (Bockius 2007, 13), these were used in ancient, medieval or modern times, for military or civilian purposes in China, Russia, Mongolia, Vancouver, Africa, Arabia, Northern India, South America and parts of Europe such as Hungary and Albania (Hornell 1946, 8-17).

It is certain that no more practical device than this was available to an army commander in former times for the emergent transport of a body of troops across an obstructive river, seeing how buoyant an inflated skin float is and what a small space it would occupy in a soldier's kit when deflated (Hornell 1946, 8). Where particular geographical conditions or special requirements demanded something better, a more sophisticated form of raft came onto being, the buoyed raft (Casson 1971, 4). Rafts buoyed by inflated skins had a very wide distribution and were still used several years ago, as a picture taken on the Huang He river/Yellow River in China demonstrates (**fig. 1**; Bockius 2007, 13). They are or have been found wherever the use of inflated skins as swimming floats has been noted (Hornell 1946, 20). To ensure stability and more rapid transport, the inflated skins would be combined into groups, probably into four, linked together into a true raft by means of ropes and poles (Hornell 1946, 22). The size varies widely and is regulated

Fig. 1 Raft buoyed by inflated skins on the Huang He river in 2002. – (After Bockius 2007, 13 fig. 6).

according to requirement, for this type of raft it may be enlarged as necessary within a few minutes by adding a number of extra skins with their complement of pole connections (Hornell 1946, 23).

ROMAN WRITTEN SOURCES

During Roman times, Ammianus Marcellinus mentions several times in his texts watercrossing with inflated skins. The first text reports on crossing over the Tigris river on improvised rafts or inflated skins (Amm. XXV, 8, 2). The second text mentions Papa, king of the Armenians, escaping the custody of Valens and crossing the Euphrates river on several wooden beds, each with two inflated skins attached (Amm. XXX, 1, 9). Two other stories from Julian's campaign from 363 relate to the usage of inflated skins on the construction of a bridge in a swamp (Amm. XXIV, 3, 11) and the construction of a pontoon bridge sustained on cowhide bellows (Amm. XXV, 6, 15). During the campaign in Mesopotamia, the successor of Julian, Jovian, tried unsuccessfully to build an immense floating bridge »supported by the inflated skins of sheep, oxen and goats, covered with a floor of earth and fascines« (Hornell 1946, 29).

But the most important text is *De rebus bellicis* (Anonymi Auctoris De rebus bellicis. Recensuit Robert I. Ireland [Leipzig 1984]), with informations that raise several problems. The text contains a proposal for the construction and transport by troops or animals of a mobile bridge sustained on watertight inflated skins, set in a »Arabic« manner called *ascogefrus*:

> »*Ne interdum necessario itineri exercitus fluviorum, quod plerumque evenit, occursus impediat, remedium ad hanc remet compendio facile et usus praecipuum repperit ingeniosa necessitas, quod tali ratione componitur. Vitulinis pellibus arabica arte mollitis est enim apud eos praecipua confectionis cura propter aquam de puteis follibus hauriendam, his igitur ut dictum est diligenter sutis fiunt utres in magnitudinem trium et semis pedum, ita ut, cum idem utres spiritu inflati tumuerint, non extollant uterum, sed aequalitate quadam plenitudo ipsa utrium spatia plana perficiat, ex quorum lateribus loris subter adnexis invicem colligantur; desuper autem una parte circulis exstantibus, ex altera immittuntur uncini; et ita, in formam pontis adsociata partibus explicatur integritas. Sed hoc idem opus obliquo fluvio propter impetum meatus facilius usque ad alteram explicabitur ripam; quod fixis in utraque ripa ferreis palis et funibus validis in medio quidem sub ipsis utribus propter incedentium sustinendum pondus, in marginibus autem firmitatis gratia desuper extensis, transeundi per fluvium novo quodam et peregrino itineris apparatu, intra breve temporis spatium praebebit liberam facultatem. Admonendi praeterea sumus quod super utrium compaginationem cilicia sunt incedentium substernenda vestigiis, ne lubrica pellium confectium insistendi deneget firmitatem. In utraque tamen ripa erunt manuballistae dispositae, ne hostilis manus pontem operantibus impedimento consistat.*« (Anonymus, *De rebus bellicis* 3, 19-20)
>
> »To prevent encounters with rivers from delaying (as very often happens) a march which it is sometimes necessary for the army to make, inventive necessity has discovered a remedy against this difficulty, at once economically simple and outstandingly effective; it is made in the following manner. Calfskins are softened by the Arabian process – because in that country there is a particularly well-developed technique of treatment, as a result of their need to lift water from wells in buckets – skins of the sort that I have mentioned, then, are stitched together carefully to form bladders 3.5 feet across, in such a way that, when these bladders are filled with air and swell up, they do not bulge outwards, but instead the inflation of the bladders produces flat surfaces by a kind of equal stretching: they are tied to each other, side by side, by means of thongs knotted underneath; on top, small loops project on one side, and hooks are slipped into these from the other; and thus the whole thing, put together in the form of a bridge, is built up complete in its parts. But this structure will be more easily built out towards the other

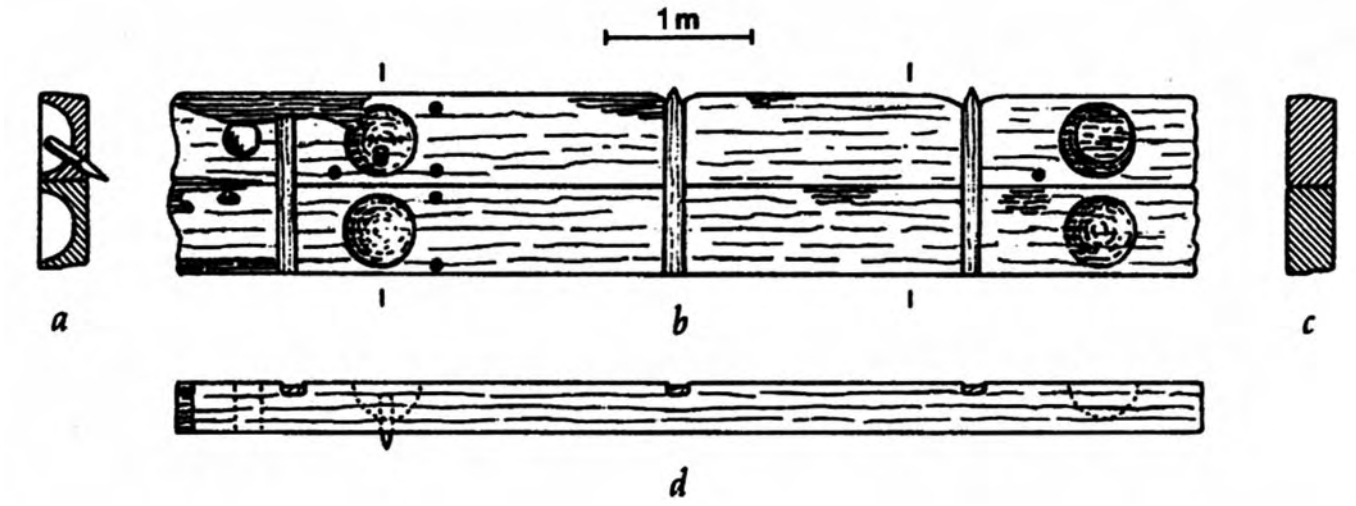

Fig. 2 Raft no. 2 found near Strasbourg-Königshofen (dép. Bas-Rhin/F). – (After McGrail 1987, 54 fig. 5, 7).

bank if the river strikes it obliquely, because of the push of the current; and then, with iron stakes fixed in both banks, and with strong ropes running both centrally under the bladders to take the weight of those walking on them and also offer an easy means of crossing a river in a short space of time by means of a new and unfamiliar item of marching-equipment. In addition, we need to remember that hair mats have to be placed above the assembly of bladders where those walking across will tread, so that the greasy dressing of the skins does not prevent a firm foothold being taken. Again, hand-ballistae will be stationed on both banks, so that an enemy detachment cannot get in the way of those working on the bridge.« (Translation: R. I. Ireland, 1984)

An important information appears – an inflated skin was about 103 cm in circumference because one foot (*pes*) equals 29.6 cm. These bellows were to be fastened horizontally under the structure with leather straps, then attached on the extremities to hooks. Because of the water stream, the bridge would be built more easily from one bank to the other most likely in an oblique direction. On each bank they needed to fix metal pillars and a strong cordage was installed below and above the inflated skin assembly. The entire assembly had to support the weight of the crossing soldiers. Thus, in a short time, this unusual arrangement allowed the river crossing.

Instead of being subjected to threats, troops would transport skins, ropes, poles and beams needed to construct such bridges, as well as coverlets supposed to facilitate the movement (Rougé 1959, 304). Nevertheless, the issue remains unclear, so we decided to approach this problem from another perspective, namely the iconography and the archaeological source. This is also important because only little analytical work has been done regarding rafts (McGrail 1987, 5) and these crafts are poorly documented (McGrail 1987, 44).

ARCHAEOLOGICAL SOURCES

Two rafts were found in 1938 near Strasbourg-Königshofen (dép. Bas-Rhin/F). One of them, raft no. 2 (**fig. 2**), was more fragmentary and consisted of two squared logs each 62 cm × 33 cm in cross-section and

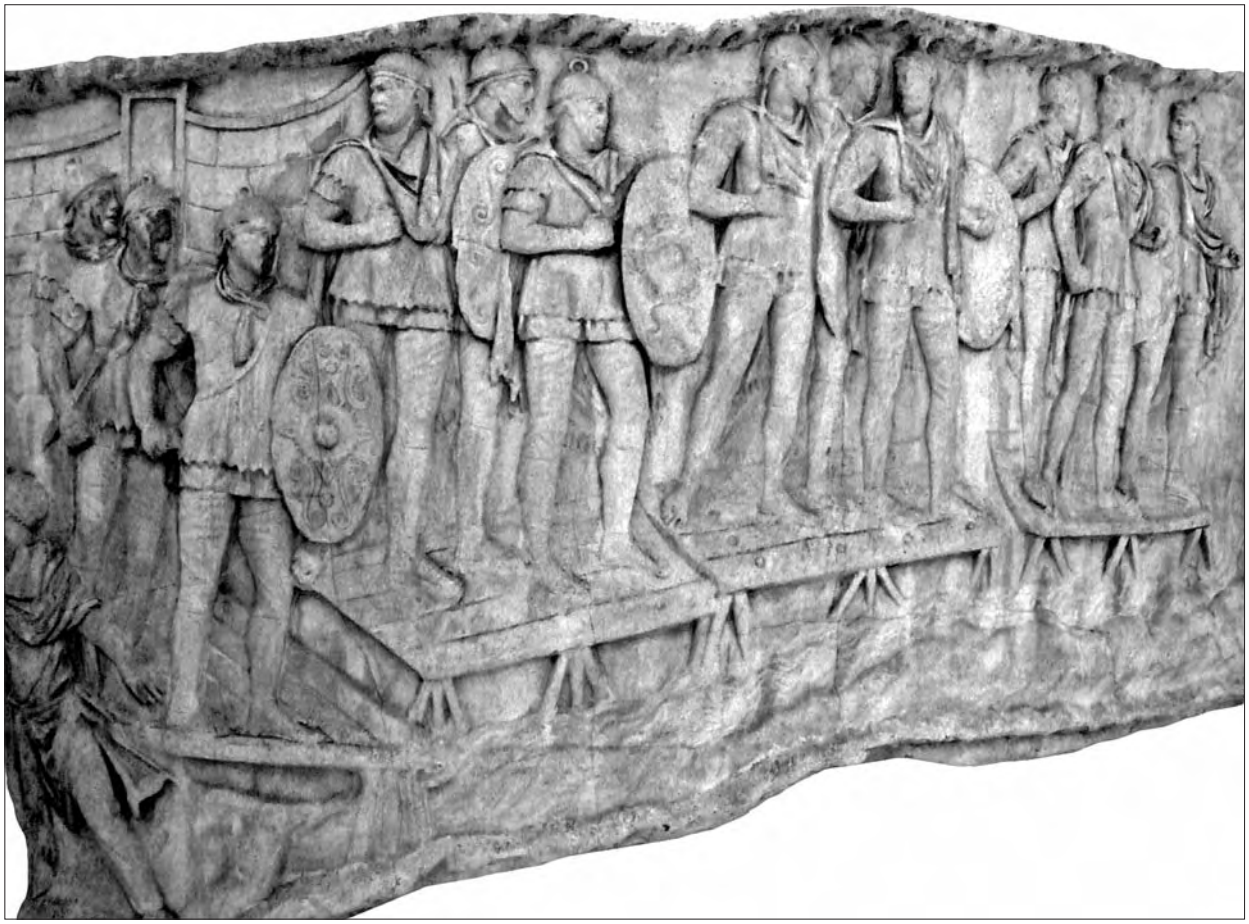

Fig. 3 Scene CXXXI on Trajan's Column. – (After Vulpe 1988, 217).

7.15 m in length (McGrail 1987, 54). Those logs have three linear, transversal carvings and two rows of hollow circular holes, each row located at the extremities of the raft. One of these holes had a deeper narrower perforation indicating the location for a nail which linked the beam with another one, originally located underneath. These logs appear to have been fastened by at least three transverse timbers about 2 m apart set into dovetail-shaped grooves in the upper surface of the logs (McGrail 1987, 54). One of the logs has, at its extremity, a circular, transversal hole, probably destined for fastening with a rope. Obviously, an unknown number of beams is missing and it is unclear if the original raft was rectangular or square-shaped.

ICONOGRAPHICAL SOURCES

It should be noted that rafts occur very rarely among thousands of ship and boats representations from the Roman era (Pekáry 1999). In scene CXXXI on Trajan's Column (**fig. 3**) three rafts appear on which auxiliary troops pass over a large river in the province of Dacia, probably the Mureş river. Each raft is square-shaped; two are composed of four beams while the first one is composed of five. The first two have small circles located in different places, forming linear rows. These are either bolts (Matei 1991, 92) or holes. Anyway, this observation would suggest the existence of another row of beams or boards underneath. Each raft appears to have an identical structure underneath. It is as follows: vertical timber slats are placed at each corner and in the middle of each side. Pairs of diagonal lines hold unspecified objects.

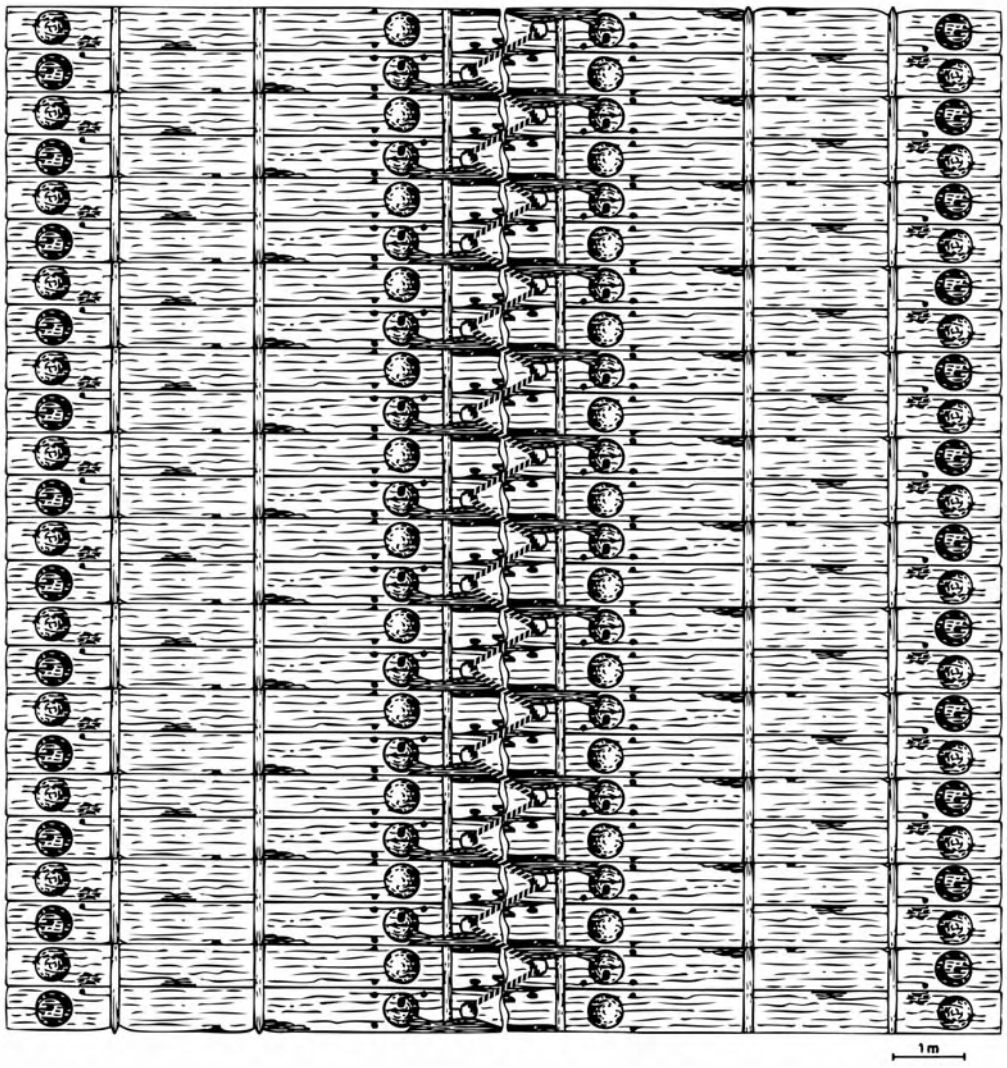

Fig. 4 Reconstruction of the pontoon. Obverse side. – (Illustration C. Munteanu).

We must remark that there is a match in the case of Strasbourg raft no. 2 and the rafts that form the bridge in the scene from Trajan's Column. On the monument, the small circles that form linear rows on the rafts, which were interpreted as heads of spikes must actually be hollow circular holes in which nails were fixed to attach the floor to rows of beams placed underneath. This is the explanation for the existence of hollow circular holes on the Strasbourg raft no. 2 and on Trajan's Column. For the three rafts, the sculptor suggested in such a manner the existence of another row of beams, impossible to represent otherwise. The lack of dovetail-shaped grooves on the relief is not relevant, probably being considered as an insignificant detail, as well as the circular holes situated at the extremities.

THE ASSEMBLY

The iconographical and archaeological evidence, together with the informations from the ancient text, allows us to recognise what this structure was and how the entire assembly was built. The rafts from

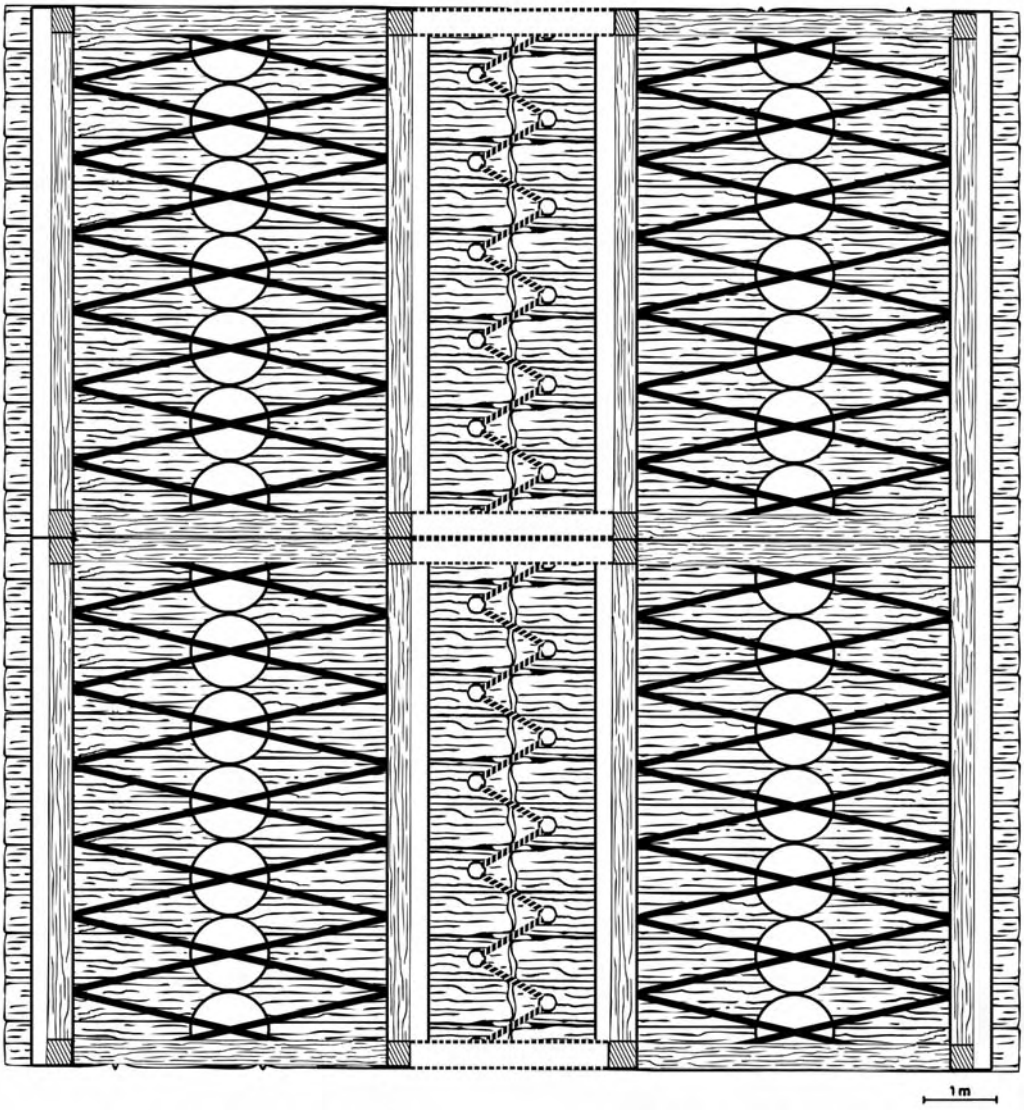

Fig. 5 Reconstruction of the pontoon. Reverse side. – (Illustration C. Munteanu).

Trajan's Column are clearly square-shaped and have (one of them) four rows of hollow circular holes. This means that the two logs from Strasbourg, with two rows of hollow circular holes, belong to a half, more specific to a smaller, rectangular raft. It is impossible that several logs with two hollow circular holes would form a squared-shaped raft because it would be too small and two rows of holes would correspond with a single inflated skin situated between two horizontal beams placed underneath the floor, in which nails from the hollow circular holes were poked. That is why the pontoon was formed by two halves, two rectangular rafts, each supported by wooden frames and a single row of inflated skins. The measurements that we have from the Strasbourg logs allow us to calculate the overall dimensions. 7.15 m in length for one log means that one side of the squared-shaped pontoon had 14.30 m. 62 cm in width means that one rectangle had 24 beams and the whole pontoon was composed of 48 such beams (**figs 4-5**). The surface of the pontoon was quite large, over 200 m^2, allowing large numbers of soldiers and quantities of material to cross the river. The two halves were fixed together by »sewing«, in fact that was the role of the transversal hole that appears at one log's extremity.

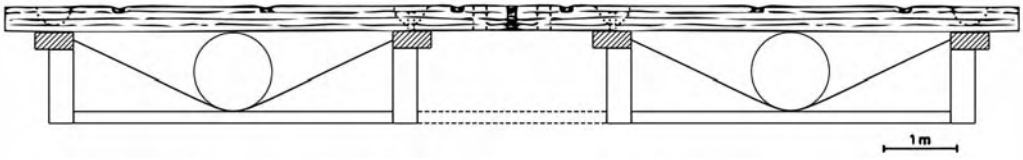

Fig. 6 Reconstruction of the pontoon. Section. – (Illustration C. Munteanu).

As partially observed on Trajan's Column, wooden frames, formed of vertical and horizontal slats were attached underneath and functioned as holder and protector of the inflated skins, already attached to the horizontal beams situated underneath the floor (figs 5-6). It was a thin wood framework, consisting of vertical timber slats, placed at each corner of the rectangular halves and in the middle, nailed with the horizontal slats. It is unclear if, beside the sewing, another slats (marked by dotted lines in the figures 5-6) were used to ensure a greater degree of stability of the entire assembly. The dovetail-shaped grooves in the upper surface were actually used for a strong cordage and not for transverse timbers, as initially supposed.

On Trajan's Column the presence of inflated skins is indirectly indicated by intersecting diagonal stripes, partially sunken in the water. The diagonal stripes represent, in our opinion, strips of skins. The fastening system of these strips is that of an overlapped X for each inflated skin and considering its measurements the pontoon was supported by 28 inflated skins.

There was a certain degree of accuracy from the sculptors of the scene of Trajan's Column. The pontoon was represented square-shaped, with four rows of hollow circular holes and two rows of diagonal stripes underneath. In fact, there was a single structural element which was depicted incorrectly – three vertical slats instead of four and therefore the distance between the two rectangular halves that made the pontoon.

Rafts used on medium and long distances needed an »additional protection«, as ethnographic evidence indicates. In various parts of the world where rafts on inflated skins are still used, the structure underneath was protected by wattlework. But in this case, the reason for the lack of a side protective covering is simple. This was not a transport raft and the wooden structure was enough to protect it from drifting logs. The square-shaped rafts were pontoons and not crafts for commercial use also because, in order to give the raft a measure of directional stability it must be longer than broad (McGrail 1987, 44). We must remark that, whatever the period in which the *ascogefrus* system was imagined, J. Rougé was mistaken when saying it was unusual or new in the period of Constantius or after Julian (Rougé 1959, 303), because it seems that it was known during Trajan's reign and used on the Mureş and on the Rhine river.

References

Bockius 2007: R. Bockius, Schifffahrt und Schiffbau in der Antike. Archäologie in Deutschland, Sonderheft 2007 (Stuttgart 2007).

Casson 1971: L. Casson, Ships and Seamanship in the Ancient World (New Jersey 1971).

Hornell 1946: J. Hornell, Water Transport: Origins and Early Evolution (London 1946).

Matei 1991: Cr. Matei, Flota romană în războaiele dacice. Peuce 10/1-2, 1991, 85-96.

McGrail 1987: S. McGrail, Ancient boats in N. W. Europe. The archaeology of water transport to AD 1500 (London, New York 1987).

Pekáry 1999: I. Pekáry, Repertorium der hellenistischen und römischen Schiffsdarstellungen. Boreas Beiheft 8 (Münster 1999).

Rougé 1959: J. Rougé, Utricularii. Cahiers d'histoire [Paris] 4, 1959, 285-306.

Vulpe 1988: R. Vulpe, Columna lui Traian. Monument al etnogenezei românilor (Bucureşti 1988).

Zusammenfassung / Abstract / Résumé

Römische Militärpontons aus aufgeblasenen Tierhäuten
Flöße aus aufgeblasenen Tierhäuten sind aus der Antike nur schlecht überliefert. Ein lateinischer Text, ein archäologischer Fund aus Straßburg und eine Szene von der Trajanssäule erlauben uns zu rekonstruieren, wie ein militärischer Ponton in der römischen Kaiserzeit gebaut war. Der rechteckige Ponton bestand aus 48 Holzbalken, die auf 28 aufgeblasenen Tierhäuten ruhten; die Gesamtfläche betrug über 200 m^2.

Roman military pontoons sustained on inflated animal skins
Rafts sustained on inflated animal skins from ancient times are poorly documented. A Latin text, an archaeological discovery from Strasbourg and a scene from Trajan's Column have allowed us to reconstruct how a military pontoon from the Roman period was built. The rectangular pontoon was composed of 48 beams, supported by 28 inflated hides covering a surface of more than 200 m^2.

Pontons militaires romains en peaux animales gonflées
On ne connaît que peu de radeaux sur peaux gonflées antiques. Un texte latin, une découverte archéologique à Strasbourg et une scène de la colonne Trajane permettent de reconstituer la manière dont un ponton militaire romain était construit à l'époque impériale. Le ponton rectangulaire était composé de 48 poutres de bois qui reposaient sur 28 peaux animales gonflées; la surface totale dépassait 200 m^2. Traduction: L. Bernard

Schlüsselwörter / Keywords / Mots clés

Römische Kaiserzeit / Flussschifffahrt / Floß / Holz / Tierhaut
Roman period / river navigation / raft / wood / animal hide
Époque romaine / navigation en rivière / radeau / bois / peau

Claudiu Munteanu
Muzeul Național Brukenthal
Piața Mare, 4-5
RO - 550163 Sibiu
munclaiul@gmail.com

Römisch-Germanisches Zentralmuseum
Forschungsinstitut für Archäologie

R G Z M

BESTELLUNG DES ARCHÄOLOGISCHEN KORRESPONDENZBLATTS

Das Archäologische Korrespondenzblatt versteht sich als eine aktuelle wissenschaftliche Zeitschrift zu Themen der vor- und frühgeschichtlichen sowie provinzialrömischen Archäologie und ihrer Nachbarwissenschaften in Europa. Neben der aktuellen Forschungsdiskussion finden Neufunde und kurze Analysen von überregionalem Interesse hier ihren Platz. Der Umfang der Artikel beträgt bis zu 20 Druckseiten; fremdsprachige Beiträge werden ebenfalls angenommen. Unabhängige Redaktoren begutachten die eingereichten Artikel.

Kontakt für Autoren: **korrespondenzblatt@rgzm.de**

Abonnement beginnend mit dem laufenden Jahrgang; der Lieferumfang umfasst 4 Hefte pro Jahr; ältere Jahrgänge auf Anfrage; Kündigungen zum Ende eines Jahrganges.

Kontakt in Abonnement- und Bestellangelegenheiten: **verlag@rgzm.de**

Preis je Jahrgang (4 Hefte) für Direktbezieher 20,– € (16,– € bis 2007 soweit vorhanden) + Versandkosten (z. Z. Inland 5,50 €, Ausland 16,– €).

HIERMIT ABONNIERE ICH DAS ARCHÄOLOGISCHE KORRESPONDENZBLATT

Name _____

Straße _____

Postleitzahl/Ort _____

Sollte sich meine Adresse ändern, erlaube ich der Deutschen Post, meine neue Adresse mitzuteilen.

Datum _____ Unterschrift _____

Ich wünsche folgende Zahlungsweise (bitte ankreuzen):

❍ bequem und bargeldlos durch **SEPA-Lastschriftmandat** (innerhalb des Euro-Währungsraumes)

Gläubiger-Identifikationsnummer: (DE19ZZZ00000089352) Mandatsreferenz: (Kunden-Nr.) _____
Ich ermächtige hiermit das Römisch-Germanische Zentralmuseum, Zahlungen für offenstehende Forderungen von meinem Konto mittels SEPA-Lastschrift einzuziehen. Zugleich weise ich mein Kreditinstitut an, die vom Römisch-Germanischen Zentralmuseum auf mein Konto gezogenen Lastschriften einzulösen.
Hinweis: Ich kann innerhalb von acht Wochen, beginnend mit dem Belastungsdatum, die Erstattung des belasteten Betrages verlangen. Es gelten dabei die mit meinem Kreditinstitut vereinbarten Bedingungen.

Name _____

Straße _____

Postleitzahl/Ort _____

IBAN |__|__|__|__| |__|__|__|__| |__|__|__|__| |__|__|__|__| |__|__|__|__| |__|__|

Bankname _____

BIC |__|__|__|__|__|__|__|__|__|__|__|

Ort, Datum _____ Unterschrift _____

❍ durch sofortige **Überweisung** nach Erhalt der Rechnung (Deutschland und andere Länder)
Ausland: Nettopreis 20,– €, Versandkosten 12,70 €, Bankgebühren 7,70 €

Bei Verwendung von Euro-Standardüberweisungen mit IBAN- und BIC-Nummer entfallen unsere Bankgebühren (IBAN: DE 08 5519 0000 0020 9860 14; BIC: MVBM DE 55), ebenso, wenn Sie von Ihrem Postgirokonto überweisen oder durch internationale Postanweisung zahlen.
Das Römisch-Germanische Zentralmuseum ist nicht umsatzsteuerpflichtig und berechnet daher keine Mehrwertsteuer.

Senden Sie diese Abo-Bestellung bitte per Fax an: 0049 (0) 61 31 / 91 24-199, per E-Mail an **verlag@rgzm.de** oder per Post an

Römisch-Germanisches Zentralmuseum, Forschungsinstitut für Archäologie,
Archäologisches Korrespondenzblatt, Ernst-Ludwig-Platz 2, 55116 Mainz, Deutschland

1/2014