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Michaela Weszeli

### Water Transport in 2nd Millennium BC Babylonia and Mari. Its Organization and Economic Importance

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# Water Transport in 2nd Millennium BC Babylonia and Mari. Its Organization and Economic Importance

This article studies water transport in southern Mesopotamia and along the Middle Euphrates. Based on the author's PhD thesis of 2002 with the addition of new material we discuss transported goods, boat sizes, the organization of transport and the cost particularly in the 2nd millennium. Based on established documented prices, a comparison with the costs of overland transport is attempted. In the appendix, three hitherto unpublished 'tax passes' from Babylonia similar to those known from the Mari archives are published for the first time.

water transport; organization costs; boats; taxes; overland transport; 2nd mill. Mesopotamia

Dieser Artikel untersucht Wassertransport im südlichen Mesopotamien und im Gebiet des mittleren Euphrat. Aufbauend auf ihrer Dissertation aus dem Jahre 2002 und zahlreichen neueren, auch unpublizierten Texten, bespricht die Autorin transportierte Waren, Kapazitäten der Boote, Transportorganisation und -kosten, besonders im 2. Jahrtausend. Es wird versucht, diese Kosten denen für Überlandtransport gegenüberzustellen. Im Appendix werden schlussendlich drei bisher unpublizierte 'Steuerpässe' aus Babylonien, die den aus den Mari-Archiven bekannten ähnlich sind, erstmals ediert.

Wassertransport, Organisation; Kosten; Boote; Steuern; Überlandtransport; Mesopotamien im 2. Jt.

## I Introduction

In Mesopotamia two modes of transport were known, both very much linked with the characteristic landscapes of the land between the rivers Euphrates and Tigris.<sup>1</sup> These were (a) overland transport on foot, by donkeys and/or carts and (b) water based transport on rivers and canals by boats and less often rafts, both used locally and inter-regionally. In the south, where agriculture depended on vast networks of canals fed mainly by the

1 This article is based on my (updated) PhD thesis (Weszeli 2002) on water transport in Mesopotamia. Its main concerns were the boats of Babylonia and Mari in all their facets, i.e. the philological, technical, legal and commercial aspects. So it should be kept in mind that trade and transport which are discussed here are seen from the point of view of transport by water, not from the point of view of trade, be it regional or long distance. Abbreviations used in this article are those of the *AHw* and the *Register Assyriologie* of the *Archiv für Orientforschung*. Throughout this article, "tons" mean metric tons, tonnes. Furthermore, *šiqlu* is the Akkadian form of shekel, one *šiqlu* weighs 8.3 grams, 60 shekels equal 1 mina which weighs 0.5 kilograms. All other measurements used here are explained where necessary. The chronology of the earlier periods of the era is a rather controversial matter. For our purposes, it suffices to say that the Ur III period spans roughly the last century of the 3rd millennium BC (c. 2100–2000 BC), the Old Babylonian period the first half of the 2nd millennium BC (c. 2000–1550 BC). The Neo-Babylonian to Late Babylonian periods lie in the middle of the 1st millennium BC (626–332 BC). For a thorough discussion of various questions and uncertainties concerning 2nd millennium chronology, see Pruzsinszky 2009; for the chronology of the 1st millennium, see Parker and Dubberstein 1956. Unpublished texts from the British Museum are published and cited with the kind permission of the Trustees of the British Museum. I thank Michael Jursa, who read an early version of this article.

Euphrates, river transport by water dominated, in the north, were rain-fed agriculture was possible, transport depended mainly on roads, although transport on the great rivers and their tributaries was also practiced. In this chapter we will focus on water transport in the 2nd millennium BC in southern Mesopotamia as well as on the Middle Euphrates as shown by the Mari letters, straying to other periods for supporting evidence where such is lacking in the Old Babylonian period, but available from elsewhere.<sup>2</sup>

Salonen called the Euphrates and Tigris the “Hauptstrassen Mesopotamiens, denn sie sind seit jeher die Träger des wichtigsten und umfangreichsten Verkehrs gewesen” (“the main highways of Mesopotamia for they have always been the bearers of the most important and most extensive commerce”, Transl. by M. Weszeli).<sup>3</sup> Algaze remarks, “It is clear that the courses of the rivers and other channels were the dominant factor in the settlement geography” of the southern plain.<sup>4</sup> The Euphrates and its canal network enabled the peoples of southern Mesopotamia to ship their bulky agricultural harvests very efficiently and relatively rapidly by boat from the fields to the settlements, so as to feed the population. They moved between nearby settlements as well as up and down the rivers to neighboring civilizations to make contact, exchange gifts, barter and trade. With mere transport by land that would never have been possible to this extent. This advantage of South over North Mesopotamia in the form of watery ‘highways’ also shows up in a marked difference in settlement size: while southern cities grew up to 400 ha and more (Uruk) by the end of the 4th and in the 3rd millennium, large cities in the North were mostly less than 100 or 120 ha in size.<sup>5</sup> Before texts become available only archaeology informs us of those activities, but from the Early Bronze Age onwards, i.e. from the 4th millennium, a steadily growing corpus of texts bears witness of those ‘exchanges’. But whereas the texts of the Early Middle Bronze Age inform us mainly of exchange (in whatever way) of luxury items, starting with the Middle Bronze Age, the Ur III period, texts record daily or at least regular transports of basic goods. While the Ur III state clerks and accountants mention transport by water in greater or lesser detail, their information is far from complete and not nearly detailed enough to give us a firm grasp on solid numbers.

From the Old Babylonian period onward, documentation on water transport gets richer. In addition to the archives of the royal and temple households, a wealth of texts from private archives was unearthed. Both give information on transport by boat of a rich variety in letters and letter orders, administrative and legal texts. They not only inform us that transport by boat took place, but they also give us the number of boats used, their hire, their capacity, the personnel employed, information on how those transports were organized, on taxation and various other costs, which enable us to understand the magnitude of shipments. Babylonia in the first half of the 2nd millennium will therefore be our topic here.<sup>6</sup>

2 For a characterization of the two rivers Euphrates and Tigris, see de Graeve 1981, 4–18; Michel 1996, 397–403; Stol 2004, 890, all with previous literature, as well as recently Heimpel 2014 and Bagg 2014 on the Tigris, and for a summarizing overview Wilkinson and Hritz 2013, esp. 20–23.

3 Salonen 1939, III.

4 Wilkinson, Ur, and Hritz 2013, 42 and 49, citing Algaze 2005.

5 See recently Wilkinson, Ur, and Hritz 2013, esp. 44–51, analysing older literature.

6 For an overall view on boats and water transport on the rivers and canals of Mesopotamia, see Widell 2009–2011 and Weszeli 2009–2011, Schiff und Boot. A and B respectively. There is not much information on water transport in the Middle Babylonian period. For the Neo-Babylonian period, see Weszeli 2002 and for transport costs, Weszeli 2010.

## 2 Water transport

### 2.1 Goods transported

As the boats and ‘ships’ were the main means of transport in Babylonia, everything from objects of daily need, like food items in small quantities to bulk transport of the main agricultural produce (grain and dates), as well as building materials, various tools, animals, offerings for the gods, statues, goods of commerce and last but not least civilian and military personnel were shipped on its waterways. In the texts of the Old Babylonian period the following goods are attested:<sup>7</sup>

- agricultural products, food, fodder and drink: barley, emmer, wheat, seed (*zēru*)<sup>8</sup>; dates; legumes (*gú.sum<sup>sar</sup>*, 9 *kurru* = 2700 liters),<sup>9</sup> (olive<sup>10</sup> and sesame) oil; sesame; spices (*kamūnu*, cumin, 10 liters;<sup>11</sup> 20 liters<sup>12</sup>) and herbs (cress); figs, salt, onions, garlic; bread (*akalum*); beer (*billatum*, *šikarum*), wine (*karānum*); flour; fish sauce (*šiqqum*), vinegar; *isimmānūm* (a malt preparation, basic ingredient for beer); pistachios<sup>13</sup>; grass (*šammum*), dry fodder reeds (*gi.zi.è.a*)<sup>14</sup>
- (agricultural) tools and implements and their parts: a plough, parts of ploughs; grinding slabs (200 pieces;<sup>15</sup> 56 pieces<sup>16</sup>); carts and parts of carts (*gis mar.gid.da*); a measuring container of 1 *pānum*
- containers: vats, pots, bowls, baskets, various chests
- animals: cattle, a fattened ox (1 *gu<sub>4</sub> še sag*),<sup>17</sup> sheep (and goats), ewes and rams; a lion; turtles, fish (? 300 *kamāru*),<sup>18</sup> locusts (100 animals;<sup>19</sup> 1 *kurru* [= 300 liters]<sup>20</sup>)
- metal: lead, iron, tin (*annaku*, 10 *biltu* = 300 kilos;<sup>21</sup> 14 *biltu* = 420 kilos,<sup>22</sup> in sacks of 30 minas = 15 kilos each), copper/bronze (*werūm*),<sup>23</sup> silver, gold
- (precious) stones (*abnum*, one leather bag full<sup>24</sup>)
- timber and rushes etc. in all forms: beams and logs (*amrū*, *ansūm*), boards, branches: fir/pine (*ašūbum*, 60 pieces, 3 and 6 metres long;<sup>25</sup> 40 logs to 3 m each<sup>26</sup>), cedar, *elam-makkum*, Euphrates poplar (*sarbatu*, 60, suitable for upper door pivots – *šigammu*), date palm and its (fibrous) parts, myrtle; cypress; boxtree, leaves (*hāmū*); reed (in bundles), sweet reed, straw (*tibnum*)

7 For a detailed list, see Weszeli 2002, chapter 2.2.8.

8 *AbB* 5, 30: 7'.

9 *RA* 72, 134, 22: 1.

10 See Durand 1990, 73–74 and Durand 2000, 12–13.

11 *AbB* 6, 91.

12 *AbB* 7, 77.

13 *FM* 2, 41ff., 13: 5'.

14 Frankena 1978, 43; Waetzoldt 1992, 129–130.

15 *ARMT* 13, 82: 6.

16 *ARMT* 13, 90: 4.

17 *ARMT* 14, 5–6.

18 *UET* 5, 32: 10.

19 *AbB* 9, 15: 27.

20 *UET* 5, 32: 9.

21 *AbB* 2, 84: 26.

22 *ARMT* 25, 450: 1–4.

23 *ARMT* 26, 22: 5.

24 *AbB* 2, 84.

25 *AbB* 6, 52: 6.

26 *ARMT* 26, 71-bis: 6–7.

- bricks (*libittum*; 3 sar = 40.18 tons;<sup>27</sup> 4 sar = 53.57 tons;<sup>28</sup> and 4 sar 7.5 gín = 55.24 tons<sup>29</sup>); kiln-fired bricks (*agurrum*, 5 šar = 300 *kurru* = 55.8 tons on several boats)<sup>30</sup>
- mixed materials: ropes, a net, crude and refined bitumen, alum (*allabarum*, 0;3.3.4 *kurru*)<sup>31</sup>, soda ash/alkali
- military material: siege towers, a battering ram and other military equipment
- other things: a drum (*alûm*); various garments; earth, dung cakes; ice slabs (*šuripum*); inscribed cuneiform tablet/letter; jewellery; staff/stick/sceptre (*battum*); tent (*burupatum*); statues of goddesses (*ištarātu*);<sup>32</sup> baetylus (*abnum* “stone”);<sup>33</sup> barbers’ tools (*enūtum*)<sup>34</sup>
- persons, civilian and military

Although most of the goods in the above list were only mentioned once or twice, their transport was certainly no coincidence. They show that everything that was needed in life and needed to be transported was (although not exclusively) shipped by boat, even if this was just in small quantities like the ten liters of vinegar (*tâbatum*) and the five liters of garum (*siqqum*) in *AbB* 9, 144 or the 20 liters of cumin in *AbB* 7, 77. That they were not mentioned so often was certainly due to the fact that such small quantities were mostly not written down in letters or lists or because they were transported overland (and therefore not recorded in this study).<sup>35</sup> Where boats really made a difference was for the transport of agricultural produce, most prominently barley and dates, as well as for heavy goods, like timber, bitumen or bricks. Boats were also important for long distances where waterways offered a swifter journey than the often not very well maintained roads. The importance of water transport for agricultural produce is obvious from the number of surviving texts that concern shipments by boat in the Old Babylonian period: 55 texts for barley, 28 for oil, 12 for dates in Babylonia and Mari.<sup>36</sup>

The availability of boats, or better their non-availability, is often a matter of distress for private persons and institutions alike. The palace of Mari especially and its (agricultural) administrators and officials suffered from an inadequate number of boats for the transport of barley during harvest time, and not only then. As everyone in a region had to get the harvest from the fields to the storage facilities at the same time, a great number of boats was necessary at the same time, a demand which could not be met by the institutions – like the palace in Mari – which did not maintain a fleet. As Hammurapi said, Mari was a land of

27 *TCL* 1, 92.

28 *VS* 9, 93–97.

29 *VS* 9, 101.

30 *AbB* 12, 23: 4. For the weight of baked bricks see Powell 1982, 116–123, and Powell 1987–1990, 490–491. This weight is valid for the brick šar of Powell’s type 12 bricks, which are baked (*sig<sub>4</sub>(al.)ùr.ra* = *agurru*), of  $30 \times 30 \times 6$  šu.si = ca.  $50 \times 50 \times 10$  cm; if smaller bricks were meant, their weight would lessen according to their size. 1 brick šar of Powell’s smallest type, no. 1, would weigh only 33.33 *kurru* = 20.67 kg. Unbaked bricks (*sig<sub>4</sub> = libittu*) are estimated to be a fifth heavier than baked ones, see Robson 1999, 62–63.

31 *ZA* 72, 134, 22: 2.

32 *AbB* 2, 34.

33 *ARMT* 14, 27–29. Those baetylus are big and heavy and obviously difficult to handle; see Durand 2000, 141–150.

34 *ARMT* 6, 49: 11.

35 But see Michel 1996, 403–406, and Stol 2004, 888–893.

36 These numbers concern mention of transport by boat only, the topic here, and therefore might be said not to be significant. But texts mentioning other products, animals or objects for transport by boat rarely exceed one or two, so those numbers do show a tendency. More than two attestations for transport by boat are for the following: persons (16), sheep (10), wine (10), bricks (10), cattle (9), earth (9), straw (6), wool (5), crude bitumen (*ittum*, 5), refined bitumen (*kuprum*, 4), stone (3 concerning the same shipment, + 1), millstones (4), plant/greenery (*šammu*, 3), reedmats (3). See Weszeli 2002, chapter 2.2.8.

donkeys and carts, not of boats.<sup>37</sup> This made the palace dependent on others: merchants, fishermen and the ‘boat guild’.<sup>38</sup> The situation became urgent when rain threatened.<sup>39</sup> From the beginning of the harvest and for the following five months or so, there were no boats at all available at Imār for the transport of grain to Mari.<sup>40</sup> In this case there were two possibilities: either one could be lucky and boats still coming upstream with cargo could be used to go downstream, or one could try one’s luck with the merchants of Mari in Imār and see if one could get some boats, or at least, cargo space on their boats.<sup>41</sup> The rent of boats was at times so exorbitant that, e.g., Samsī-Addu of Upper Mesopotamia wrote to his son Yasmah-Addu in Mari to commission the construction of 60 boats in Tuttul telling him that he himself pays exorbitantly high rents for boats.<sup>42</sup>

## 2.2 Size and capacity of boats

In 2nd millennium Babylonia and Mari, only one method was used to measure the transport capacity of a boat. It was given by means of its carrying capacity (deadweight), normally measured in *kurru*, má.x.gur, but in *ugāru* in Mari, má ū x(.am) a.gār. This method was in use already in the 3rd millennium and remained in use throughout the 1st millennium. Another means of specifying the size of a boat is by giving the measurement of its broadest beam. But apart from a royal inscription of Šamaš-rēša-uṣur, governor (*šakin māti*) of Sūhu and Mari,<sup>43</sup> it is known only from legal texts of the Neo-Babylonian period.<sup>44</sup> The boats’ capacity given in Old Babylonian texts ranges from 5 *kurru* to 150 *kurru*. But the mention of quantities of barley to be loaded onto one boat shows us that boats of up to 300 *kurru* capacity were used in Babylonia.<sup>45</sup> Boats on the middle Euphrates mentioned in the Mari archives were smaller, their capacity ranged from 5 to 30 *ugāru* only. The volume capacity of 5, 150 and 300 Old Babylonian *kurru* corresponds to 0.93, 27.9 and 55.8 tons respectively,<sup>46</sup> or, converting the *kurru* into a modern capacity measure, 0.9 m<sup>3</sup> (e.g. 0.3 × 0.3 × 1 m), 27 m<sup>3</sup> (e.g. 3 × 9 × 1 m) and 54 m<sup>3</sup> (e.g. 3 × 18 × 1 m) of space.<sup>47</sup> Boats with a capacity of 10 to 60 *kurru*, i.e. 1.86–11.16 tons or 1.8 m<sup>3</sup> to 10.8 m<sup>3</sup>, were the most commonly used. This shows a strong continuum from the 3rd to the 2nd millennium and beyond.<sup>48</sup>

37 *i-du-u[m ū]a ma-ti-ku-nu anše<sup>hi.a</sup> ū giš mar.gí.d.da<sup>hi.a</sup>, ū i-du-um ū an-ni-i-tim giš mā<sup>hi.a</sup>-ma*, “The strength of your country (i.e. Mari) are the donkeys and wagons, but the strength of this (country) are the boats.” (ARMT 26/2, 468; Rs. 21f.). This argument was given in connection with the struggle about the city of Ḫit, which was renowned for its bitumen wells, the bitumen which Hammurapi dearly needed for coating the boats. Boats were not so very much needed in Mari, donkeys being preferred for most transports. This is also reflected by a statement of Šidqum-Lanasi that a boat bought in Karkemīš for 10 *šiqlu* of silver would not be worth even 1 *šiqlu* in Mari (ARMT 26/2, 538).

38 See Durand 1983, esp. 162, and Durand 1990, 66–68, as well as Michel 1996, 401.

39 ARMT 26/1, 58; see also ARMT 27, 43; ARMT 26/2, 540.

40 See Lurton Burke 1964, 96, and Durand 1990, 69–70.

41 See ARMT 13, 35 and Durand’s discussion of it (Durand 1983, 160–163) and Durand 2000, 21–22, text 858.

42 ARMT 1, 102; ARMT 1, 25. See for this problem Michel 1996, 400–402.

43 RIMB 2, 280 (S.O.1001.1): 31'ff.

44 On this and for more details on the capacity of Mesopotamian boats see Widell 2009–2011, 159–160; Weszeli 2009–2011, 161–162, and Weszeli 2002, chapter 1.1.5.

45 The largest boats in the Ur III period could carry as much as 360 *kurru* which equals nearly 67 tons; see Widell 2009–2011, 159.

46 To convert the ancient volume unit *kurru* to the modern weight unit metric tons, we are proceeding on the assumption that 1 *qa* equals 1 litre of barley and weighs 0.62 kilos (dates would be a bit heavier, but insignificantly so). See Powell 1984, 54; van der Spek 1998, 249–250.

47 See also Weszeli 2009–2011, 162.

48 See Widell 2009–2011, 159–160, and Branting et al. 2013, 146 (Ur III).

capacity in <i>kurru</i>	litres	tons	$m^3$	b : l = 1 : 3; d = 1 m			b : l = 1 : 6; d = 1 m		
				b	×	l	b	×	l
5	1500	0.93	1.5	0.71	×	2.12	0.5	×	3
10	3000	1.86	3	1	×	3	0.71	×	4.24
20 (= 5 <i>ugāru</i> )	6000	3.72	6	1.41	×	4.25	1	×	6
60	18000	11.16	18	2.45	×	7.35	1.73	×	10.39
120 (= 30 <i>ugāru</i> )	36000	22.32	36	3.46	×	10.39	2.45	×	14.7
150	45000	27.9	45	3.87	×	11.61	2.74	×	16.43
300	90000	55.8	90	5.48	×	16.43	3.87	×	23.24

Tab. 1 | Possible, extrapolated dimensions of hold of Old Babylonian boats (b = breadth, l = length, d = depth).

To give a more graphic picture of how the boats of these sizes might have looked, we will try and make them three dimensional. Already Salonen in his fundamental work on “Wasserfahrzeuge”<sup>49</sup> established on the basis of the dimensions we have of silver and clay models from the 3rd millennium that boats of what he called “gewöhnlichster Typus” (“most ordinary type”) had proportions of 1 : 3 – 1 : 6 of breadth to length; for another type he gives the ratio of 1 : 8 (p. 156). We have only one text (BM 30370: 1–2) from the Neo-Babylonian period that gives both the broadest beam and the length (*šubat mē* “seat on the water”) of a boat:  $b \times l = 6,5 \times 20,5$  cubits, i.e.  $3.25 \times 10.25$  m.<sup>50</sup> The proportions are 1 : 3.15, and this fits the proportions of the model boats very well. The depth of the boats Salonen gives as 0.5 metre, 1 metre, but no more than 1.25 metres, as both the Euphrates and the Tigris were shallow. Building on these parameters, we may calculate the respective boats’ dimensions, keeping in mind that the ancient capacity measures only give the carrying capacity or deadweight and are only an approximation, and that the actual boat has to be larger than that, on the one hand because the boat’s potential displacement must be larger than the weight of the cargo, crew and equipment or it would sink, on the other hand because space is needed for the ship’s furnishings and for the crew to move about. For deducing the form of the cross-section of a boat, the Neo-Babylonian legal texts might help. They give the boat’s dimension by means of the broadest beam: *ša n ina muhhi šaburru rapsu* “(boat) which is *n* at its broadest beam”.<sup>51</sup> For a boat’s beam they use the word *šaburru* which is a variant of *šuburru* “buttocks”. *šaburru* is obviously the technical term used for the cross-section of boats, ditches and canals which have the form of an isosceles trapezium standing on its shorter base.<sup>52</sup> That boats had this form is confirmed by the inscription of Šamaš-rēša-uṣur whose *rukibum*-boat is 25 cubits at its broadest beam and navigates through a canal (*atappum*) of 22 cubits (RIMB 2, 280 (S.O.1001.1): 31'ff.).

Table 1 gives dimensions for boats of 5 (the smallest boat mentioned), 10, 20 (= 5 *ugāru*), 60, 120 (= 30 *ugāru*), 150 and 300 *kurru* (the highest certain capacity of a boat). For depth we will take one metre, which falls between Salonen’s 0.25 and 1.25 metres (1939, p. 157).

In Neo-Babylonian legal texts a boat’s size is given by the broadest beam, only once this information is combined with the length of the boat (BM 30370;  $3.25 \times 10.25$  m), in a second text the width of the beam is broken away (VS 6, 320; [x]  $\times$  11.5 m) (marked grey and bold respectively in Tab. 2). In the following Tab. 2 we try to establish the volume of the cargo of these boats. We take the measurements for the broadest beam and extrapolate

49 Salonen 1939, 155–158.

50 BM 30370: 1–2; <sup>gīs</sup> má *šá* 6 1/2 kūš *ina muh-hi šá-bur-ru*, *rap-sú* 20 1/2 kūš *šu-bat me-e-šú* “One boat of 6.5 cubits its broadest beam and 20.5 cubits its ‘seat on the water.’”

51 *n* is the appropriate length measured in cubits; 1 cubit (*ammatu*)  $\approx$  50 cm.

52 This is in general the same geometric form as that of a buttocks; see, e.g., the judgement of Paris, The Three Graces, or Venus at the Mirror by Peter Paul Rubens.

the length of the boat by assuming again a ratio of breadth to length of 1 : 3 and take for the depth 1.5 m, 1 m and 0.25 m respectively; all length measures are in meters.

Text	b	x	1	$\times d = 1.5 \text{ m}$	= volume	$\times d = 1 \text{ m}$	= volume	$\times d = 0.25 \text{ m}$	= volume
BM 82788; VS 6, 99	1.75	x	5.25	= 7.88 m <sup>3</sup>	= 43.75 <i>kurru</i>	9.188 m <sup>3</sup>	= 51.04 <i>kurru</i>	2.297 m <sup>3</sup>	= 12.76 <i>kurru</i>
BM 32873; VS 6, 100	2.5	x	7.5	= 28.13	= 156.25	18.75	= 104.17	4.688	= 26.04
BM 32873	3	x	9	= 40.5	= 225	27	= 150	6.75	= 37.5
BM 30799; BM 32873; CT 4, 44a; Cyr. 310	3.25	x	9.75	= 47.53	= 264.06	31.688	= 176.04	7.922	= 44.01
BM 30370	3.25	x	10.25	= 48.75	= 270.83	32.5	= 180.56	8.125	= 45.14
AnOr 8, 59; BM 32883	3.5	x	10.5	= 55.13	= 306.25	36.75	= 204.17	9.188	= 51.04
BM 16895	3.75	x	11.25	= 63.28	= 351.56	42.188	= 234.38	10.547	= 58.59
VS 6, 320 [3.83]	x	11.5	= 65.55	= 364.167	43.7	= 242.78	10.925	= 60.69	
BM 54061	4.75	x	14.25	= 101.53	= 564.06	67.688	= 376.04	16.922	= 94.01

Tab. 2 | Possible, extrapolated dimensions of Neo-Babylonian boats and their capacity. The Neo-Babylonian *kurru* contains only 180 litres, whereas the Old Babylonian contains 300 litres. Therefore the difference in *kurru* between the boats of similar breadth and width of the two periods: Calculations:  $1.75 \times 5.25 \times 1.5 \text{ m} = 7.875 \text{ m}^3 = 7875 \text{ l} : 180 = 43.75 \text{ kurru}$  etc.

Boats of the Neo-Babylonian period are attested of a (indubitable) capacity of up to 350 *kurru*, i.e. 39.06 tons. The measurement of the broadest beam of a boat is sadly never combined with the information of the boat's carrying capacity, but if our assumptions above are correct, the boats with a depth of one metre fit the carrying capacity in the other texts of this period best. The boat of BM 30370 would then have carried somewhat

less than 180.56 *kurru*, assuming that the measurements give the actual breadth and length of the boat and not the cargo space.

## 2.3 Personnel

Only a hand-full of texts give information on the exact number of personnel needed for a transport and their profession or function. When they do, they do not always distinguish between sailors (<sup>lú</sup>má.lah<sub>5/6</sub> *malābum*) and other personnel (hirelings <sup>lú</sup>ḥun.gá, workers érin *sābu*, foreman *sāpiru*) that go on a boat. Mentioned mostly apart are boat towers (*sādīdum*, *sādīd aślim*, má.gíd.da, <sup>lú</sup>éš.gíd), stevedores or porters (<sup>lú</sup>še.il etc.) and soldiers (aga.us<sup>mēš</sup> etc.). Although only remarked upon sporadically, it can be shown that boats between 10 and 60 *kurru* were worked by one to six people.<sup>53</sup> The Enki temple in Larsa seems to have operated on a basis of four sailors to one 60 *kurru* boat, see below.

## 2.4 Using the waterways

In the Old Babylonian period the royal households and to a far lesser degree the temples are the biggest shippers of agricultural bulk goods. Only in the 1st millennium did the temples and private entrepreneurs become equally important. This is in part due to the quality of archives unearthed and published. The only temple archive we know of from the Old Babylonian period that left detailed records on grain transports is the archive of the temple of Enki in Larsa (see below). Private persons shipping their goods by boat are amply documented, especially in the letters, but we have only a handful of archives which have been studied (among the 29 000 texts).<sup>54</sup> From the Neo-Babylonian period no archive of the royal household exists (only some ration lists), but the archives of the Ebabbar temple in Sippar (35 000) and the Eanna temple in Uruk (8 000+) make up the majority of excavated texts; there are many private archives, but their size is in comparison tiny – the biggest being the archive of the Egibi/Nûr-Sîn clan of Babylon (1 700).<sup>55</sup> The royal households, the temples and private business men used boats to ship their goods through the country as needed, but the documentation of their activities on water is unbalanced in quality and in quantity throughout Mesopotamian history.

## 2.5 Organization of transports

For military operations, construction work or in emergencies, the palace could always have recourse to its soldiers and subjects, if needed by force.<sup>56</sup> Letters from the Neo-Assyrian period document that, e.g., building material was shipped twice over a period of five months successfully, seemingly with people from the palace, overland from Syria down the Euphrates, then overland to the Tigris and the Tigris upstream to Assur and

<sup>53</sup> Scheil 1900, 153 (Ur III): 6 people (guruš) – boat of 60 *kurru*; PBS 8, 242: 4 hirelings, 2 sailors – boat of 40 *kurru*. BRM 3, 190 gives hire for 14 people/workers (érin) and one boat, with no specifications as to their work. See also the Neo-Babylonian contract TMH 2/3, 34 that reckons with 4 sailors for the boat. This number can be deduced from the rations given. No capacity for the boat is given. If the boat is not that big, one person could be enough to handle it, e.g. YOS 12, 546; A. 3534 and A. 3540 (see CAD G, 91a).

<sup>54</sup> For the situation of the Old Babylonian archival texts (with the exception of literary texts) and their numbers, see Charpin 2014. His ARCHIBAB project gives the number of 29 228 fully published texts by October 2008 for the 20th–17th centuries BC (Charpin 2014, 24).

<sup>55</sup> See Jursa 2005, 1–2; Jursa 2010, 6–13; Jursa 2014, 114. All numbers concern economic and legal texts only.

<sup>56</sup> See ARMT 26/1, 56, and Villard 1990, 573–576, for Mari and *AbB* 2, 148; *AbB* 5, 162; *AbB* 11, 122 for Babylonia.

Nineveh.<sup>57</sup> But when the harvest was due to be brought to the granaries, both palaces and temples could not always accomplish this with their own personnel or boats. For the harvest therefore, boats and personnel had to be hired, as well as animals and wagons for carrying. As mentioned above, the palace of Mari was often in dire straits when boats were scarce or not available at all, but needed for an urgent transport. Private persons had the same problems, if lacking their own conveyance or personnel, they had to hire. How then, according to the texts, were transports organized, what were the steps to be taken, and what needed to be observed when shipping goods by boat?

Step one – The goods have to be transported to a harbour or a landing place for boats. For getting the goods there, porters, wagons and/or pack or draft animals had to be hired (sometimes) with their drivers, if not in one's own possession.<sup>58</sup>

In the harbour one or more boats with their crew had to be hired, if one did not possess one's own staff and vessel. From the Old Babylonian period we know of 41 boat hire contracts,<sup>59</sup> which settled all the relevant legal points of interest: capacity, name of owner, name of the charterer, purpose of hire, period of hire, route to be taken and the rental fee. Among some other points mentioned are liability for injury to or total loss of the boat and the extent of compensation to be paid. If the boat is damaged, sinks and can be salvaged,<sup>60</sup> half of the value (i.e. half of the purchase price) of the boat has to be paid, is the loss of the boat irreversible, the total value of the boat must be paid in compensation, which is one *šiqlu* of silver per 1 *kurru* carrying capacity in those few cases we know of.<sup>61</sup>

If general cargo (break bulk cargo) in consignments of small quantities or even single items, e.g. one amphora of oil, were to be shipped, only space on a boat needed to be looked for. One could send the goods along with a trustworthy person, a colleague, a family member or hand them over to the boatman, who would even deliver them to the house of the consignee.<sup>62</sup> How this was organized in detail, if there were boatmen who specialized in transporting mixed cargo or if all boats transporting bulk cargo also took on general cargo, we do not know. What we do know is that some owners did not like to interchange goods they shipped because they thought it would harm their boat.<sup>63</sup> Information on how someone who wants to ship goods organized this on an individual basis is only obtained indirectly from letters, as the shipping of general cargo in small quantities or single items did not involve book keeping and complex administration supervised by clerks. *AbB* 6, 125 gives us a glimpse. The sender of that letter wants to ship barley by boat to Sippar, but there is no boat available at the harbour of his town (*kar uru<sup>ki</sup>*). He is therefore waiting for a boat to pass by and take the barley, but is out of luck. He then asks the addressee for a boat and crew to be hired and sent to him so that he can ship the barley. Purchases of boats are mentioned rarely in this period<sup>64</sup> and we know of only two unpublished sale contracts from the Archive of Inanna-mansum.<sup>65</sup>

57 Fales 1993, 81–82, and Favaro 2007, 9–10.

58 ARMT 14, 44 (wagons); SLB 1/III, 160 (oxen); Robertson 1981, 284–285 (driver); Riftin 1937, 113, 4 (donkeys, wagons).

59 See Stol 1993–1997, 167–169, § 2b; Weszeli 2002, chapter 3.1 and Weszeli 2019 with four new contracts.

60 For sunken boats being salvaged and bitumen being recycled, see n. 61 and *AbB* 4, 148; *AbB* 10, 41: 20–21.

61 See OECT 8, 13; YOS 5, 11; YOS 8, 2; YOS 12, 11. 119. For the regulation of liability, see the law codes, Codex Hammurapi §§ 236–238, esp. § 238 for the eventual raising of a sunken boat; Codex Lipit-Ištar § 5; YOS 1, 29 iv 11–18 § 3' (Roth 1997, 43–44); FLP 1287 iv 42–v 11 (Roth 1997, 51). For a detailed discussion of that point, see Weszeli 2002, chapter 3.1.1.2, point 4. For further points in the contracts, see Stol 1993–1997, 167–169.

62 *AbB* 12, 54 and 58 (brother of partner); *AbB* 13, 138 (?); *AbB* 7, 77: 15–16 (boatman).

63 See, e.g., the letter *AbB* 2, 98.

64 VS 22, 74 from Babylonia or ARMT 26/2, 537–539 from Mari.

65 This information was kindly given by M. Tanret; one of the texts is cited by Tanret and De Graef 2003–2004, 77 (sub 5. Varia).

Step two – Having found a boat, the goods are loaded onto the boat. Different goods are loaded and shipped differently. Barley, e.g., was either just poured (*sarāqu, tabāku*) into the boat or shipped in various containers (*makkû, maššû*<sup>66</sup>); flour was transported in various chests<sup>67</sup> or bitumen covered baskets<sup>68</sup>, in Neo-Babylonian times sacks made of goat hair<sup>69</sup> are also attested. Liquids like oil, beer or wine were transported in *karpatum-, kurkurratum-* or *našpakum*-earthenware-vessels, and beer also in *kirrum* or vats (*dannu*). Stones and logs were loaded on the boat, logs may be bound to stem and stern posts, as shown on Sargon's II reliefs in Khorsabad. For the latter we have only pictorial but no philological evidence. Smaller or more precious items were again put in sacks or boxes to keep them safe. Aromatic woods and precious stones were kept in leather sacks like *tukannum*-bags (see, e.g., *AbB* 2, 84: 28), as well as silver or tin<sup>70</sup>. Leather tarpaulins were used to keep the goods dry, as well as straw and straw mats, presumably to wrap statues and keep pieces of earthenware from knocking against one another.<sup>71</sup> But tarpaulins were obviously not standard equipment for boats as is shown by the letter *AbB* 10, 15: 30–37, where the sender Etel-pī-Marduk is anxious about his sesame which is already loaded on boats but can't be shipped off for lack of personnel. He expects rain in the near future and seemingly can't cover the sesame to protect it.

Step three – Measures to safeguard the goods, prevent or at least hinder unwanted manipulation have to be taken. The sender checks the goods and records them on a tablet which he sends with the cargo on the boat or under separate cover to the recipient; see, e.g., *AbB* 6, 122: 6–8. The goods are then made ready, sealed (*AbB* 13, 138; *ARMT* 13, 100) and sent off. Yaqqim-Addu had to send equipment to the king. The equipment was brought to him on carts, he trans-shipped them to a boat and sent the king a letter with the inventory under separate cover (*ARMT* 14, 44; cf. also *ARMT* 1, 7). Such inventories and letters are on the one hand a source of information to the recipient, on the other hand they have a legal implication. In case of theft or loss through negligence of the boatman, they are valuable and necessary proof in court. In a dispute concerning the return of stolen goods or compensation not only witnesses but written proof was needed. In the Old Babylonian letters we find, amidst other concerns, goods mentioned that were sent to the addressee, sometimes sealed.<sup>72</sup> Lacking a good case from the Old Babylonian period, we have an exceptional court case from the Neo-Babylonian period, *YOS* 19, 101 (10 Nbn), from the Egibi/Nūr-Sîn archives. Dates were shipped by Iddin-Marduk, son of Iqīšaya, descendant of Nūr-Sîn to Babylon by boat. Iddin-Marduk wrote a tablet (*šipirtu*) to his slave Nergal-rēšū'a, who was to receive them, and gave this tablet to the boatman to take it with him. When the boat arrived in Babylon, Nergal-rēšū'a checked the amount of dates against the letter and found nearly ten per cent missing. He confronted the boatman, searched the boat, but found only a minor part of the missing dates. He therefore brought his case into court. The boatman was convicted of theft and was ordered to repay the missing quantity of dates.

66 *AbB* 3, 78 (2 *kurru* barley), not necessarily shipped by boat.

67 *UET* 5, 662: 10–11 (<sup>gi</sup>pisan.dub.bi) (Old Babylonian).

68 *TÉN* 296: 1–2 (13 gi.gur of 60 litres each) (Ur III).

69 *CT* 22, 2: 7–8.

70 Stol 1980–1983, 537.

71 See Goetze 1948 for the straw mats and Sallaberger 1996, 19–22, for measures to protect earthen ware with leather and reed from damage (Ur III and early Old Babylonian).

72 E.g. *AbB* 1, 31: 10–15 or *AbB* 13, 138 (1 *kurrum* was sent sealed).

To safeguard a transport, guards and even soldiers were hired,<sup>73</sup> in the harbours or at a landing overnight someone had to sleep on the boat.<sup>74</sup> According to a Mari letter, a trader being in a foreign land receives an escort for his boat by the ruler of the same to protect him, but is told to leave as soon as possible.<sup>75</sup> Traders tend to accompany their wares personally or, if one is prevented from going, one would send a trusted person (*AbB* 12, 54 and 58). But goods are not only stolen during transport, often theft occurs before they are even on board. In *AbB* 12, 194 the supplier was made responsible for the theft of wood from the storage facilities or the quay in the harbour (the letter does not tell us which) and had to compensate the owner. Stealing from a boat (in harbour?) is even mentioned in the diagnostic omen series *Sa.gig*, where the perpetrator was then seized by the harbour god and fell ill.<sup>76</sup>

Step four – Inevitably, tax had to be paid for the goods and (sometimes) a passport needed to be organized. While in the Neo-Babylonian period several taxes were known to be paid in connection with transporting goods by boat (*miksu*, *ša kāri*, *mūšû*, *mašīru*, for anchoring or passing bridges),<sup>77</sup> the only known tax on boats for transporting goods in the Old Babylonian period is the *miksum*<sup>78</sup>. The tax collector (*mākisum*), a royal official, is entrusted with collecting the *miksum*. The texts give the following information on how it was levied. The procedures in Babylonia and Mari<sup>79</sup> seem to have been very similar and the information in the texts can be used to complement one another: The boat (1) has to call or is stopped at a check-point or at a harbour where an official steps onto the boat, inspects and assesses the cargo (*bu”um* or *bubhûm*). In Mari the latter is done by an *ebbum*, at least when there might be a problem with it.<sup>80</sup> The process of inspecting a boat is well described in a Babylonian letter<sup>81</sup> which tells us, although in a reversed way, what the normal procedure would be like. At Bašum an inspector steps onto merchant boats going up- and downstream, he inspects them and their cargoes and checks the royal permit, i.e. a “tablet of the king” (*tuppi šarri*) that allows the boat to proceed on its journey (*nuba”ama nušeteq*). If the merchant has no royal passport, he is not allowed to pass and is sent back. Although *miksum* is not explicitly mentioned, it is certainly the issue here.<sup>82</sup> (2) Next, the *miksum* will be imposed on the boat (*makāsum*) and when the *miksum* is paid correctly (*išariš apālum*)<sup>83</sup> (3) the boat is let through (*wuššurum* and *waššurum* in Mari). The dossier of Numušda-nahrārī who is stationed at Terqa, upstream from Mari,<sup>84</sup> and three letter orders or ‘tax passes’ from Babylon document this administrative process. The Babylonian ‘tax passes’ are very short documents in direct speech, they have, in contrast to the ones from Mari, no address and the sender – most probably the tax collector, but no title is ever given – is only represented by his seal. The content and form as well as the intention are the same; but while the letter orders by Numusda-nahrārī are written

73 *AbB* 2, 34: 21 (érin<sup>am</sup> *bé-eb-ra-am*); *AbB* 10, 15: 25–28 (10 aga.us<sup>mes</sup> and 10 érin<sup>mes</sup> *ēli bād*, city guards, for towing); ARMT 13, 35: 27 (60 *šābum tālīlū* “auxiliary troops”).

74 For this way of safeguarding goods, we have only Neo-Assyrian letters as evidence. Tāb-šar-Aššur, responsible for a transport of cult objects, assures king Sargon II (721–705 BC) that he will stay on the boat to guard the cultic bed until it can be delivered to the temple (SAA 1, 54–55).

75 Maul 1994, 29–31, text 8: 2'–14'.

76 *TDP* 28, 87.

77 See van Driel 2002, 274–282; Jursa 2011–2013, 174; Weszeli 2009–2011, 165.

78 See Stol 2004, 764–766; Renger 2011.

79 See Lurton Burke 1964, 93–95, who first described the process.

80 For the *ebbum* and his function, see Michel 1990, esp. 198–199, and Charpin 1999.

81 *AbB* 2, 84.

82 See Stol 2004, 895, n. 1851; Durand 1990, 87–88 n. 249. Cf. also *CT* 22, 44 from the Neo-Babylonian period, also an exception.

83 ARMT 13, 100: 5'ff. Sometimes people create problems, same text lines 8'ff., PN *ana pānīja iprikamma ušaddenni*, “PN obstructed and rebuffed me.”

84 See Durand 2000, texts 862–905.

to a known addressee, the chief of merchants in Mari, and therefore used for one specific journey only, the Babylonian ones seem to be of a more general nature without naming an addressee; they could therefore presumably be shown at every tax station or harbour that was passed on the journey, be it one or several. The letter orders/‘tax passes’ fall into two categories: one official informs the other to whom the pass is shown on the journey that either a boat has paid its tax already and is therefore to be let pass, or that the boat has not been taxed, needs to be taxed by the next tax official and then has to be set free/let pass by them. The three Babylonian passes belong to the first category; they are edited in the Appendix.

Step five – After having arrived safely with the goods at one’s destination the goods are unloaded and received by the owner or his representative. Single items of goods could be delivered to the recipient’s door by the boatman.<sup>85</sup> For organizational issues see above, step one.

## 2.6 Costs of transporting goods

Costs for transporting goods are manifold and vary from one transport to the next, depending on circumstances. They can be found in all kinds of routine texts of everyday life like letters, administrative and legal texts. They are mostly of a bland nature without much context. In settlements of accounts or statements of expenditure especially, it is often difficult to know where listings for one trip end and those for the next begin, as entries are often not in thematic or chronological order. Furthermore, statements of expenditure and similar texts are extremely scarce and limited to bulk transport, and therefore archives of institutional households. Traders as well as institutional households did transport goods in bulk so they needed to keep books or at least to make notes. One would have expected statements of expenditures in the archives of the palace of Mari similar to those that turned up in the Enki temple at Larsa and the one or the other text in the private archives. The lack of this kind of text may not be entirely coincidental in the Old Babylonian period, since private entrepreneurs did not yet exist, but is unexpected for the later periods, especially in the Neo- to Late Babylonian periods where book-keeping to some extent must have been necessary for private entrepreneurs as well. On the other hand, these account texts were rather short lived, i.e. would soon, after the transaction was completed and paid for, have lost their importance and would have then been thrown away. What is also lacking is the archive of a boat owner or carrier.<sup>86</sup> A reason might be that this trade was not plied on a grand scale, that a boatman had only one or two boats for which bookkeeping was not necessary. But we have to be grateful, as the Old Babylonian period is the first to give us comparable data for transport costs at all. Although the Ur III period at the end of the 3rd millennium is known for its vast administrative state records that do shed light on water transport and its administration, they do not give us detailed enough evaluable data on costs.<sup>87</sup>

Costs that are generated in connection with water transport can be divided into three main categories. The list below gives cost factors that are found in the texts, but these are widely spread and not one texts lists them all, not even one entry of each of the three categories:<sup>88</sup>

<sup>85</sup> *AbB* 7, 77.

<sup>86</sup> This situation has changed since the manuscript was handed in for publication in 2015. See now Weszeli 2019 for the dossiers of two boat owners from the reign of king Samsuiluna, who conducted their business i.a. by renting out boats in the region of Yahrurum šaplûm.

<sup>87</sup> See Widell 2009–2011.

<sup>88</sup> For transport costs in the Neo-Babylonian period, see Weszeli 2010, where the same three categories apply, although differing in detail.

### 1. General expenses

- wages for (female)<sup>89</sup> porters (<sup>lú</sup>še.íl, *bābilum*), hirelings
- expenses for various other personnel: workers (érin), soldiers (aga.uš<sup>mes</sup> etc.)
- hire of oxen with driver
- food and drink for the above

### 2. Expenses for the boat, the boatmen and personnel concerned with the boat, equipment

- hire for the boat(s)
- wages for the boatmen (*malāḥum*), crew (*rikbum*), towmen (*šādid ašlim*, <sup>lú</sup>éš.gíd.da), hirelings (<sup>lú</sup>hun.gá)
- rations (šuku) for the above
- drink (*maštūm*, *maštūm*, kaš.nag) for the above and soldiers (aga.uš<sup>mes</sup>)
- šutaptūm or šutapti eleppim<sup>90</sup>
- transport basket/vessel (*makkū*); *kirrum*-vessels for the boat (*kirri eleppim*) for drink rations
- mats, tarpaulins (*kutummu*) for protection of goods

### 3. Tax

- tax on goods (*mīksu*)
- tax collector (*mākisu*, zag.ha, <sup>lú</sup>níg.kud)

How high were transport costs in the Old Babylonian period? We have a small group of 12 texts from a dossier that belongs to the archive of the Enki temple in Larsa.<sup>91</sup> The dossier, which was first studied by Tina Breckwoldt (1995–1996), documents grain transports from various small villages around Larsa to the granaries in Larsa. Those 12 texts especially are statements of expenditures for 12 deliveries between 180 and 720 *kurru* (111.6 kg and 446.4 kg respectively) of grain in the years 6–13 of Rīm-Sîn of Larsa (1817–1810 BC). These texts are the only single uniform group of texts that belong to the same archive and were written in a short period of time allowing us to compare the transport costs without reservations. Furthermore, all the texts reflect the same situation and give detailed information on the same expense items without summarizing them into one single item “transport costs” (see, e.g., YOS 5, 166 from the same archive). There are a few other texts from Larsa, Sippar and Ur with similar information, but they do not allow an equally comprehensive reconstruction of transport costs. Unfortunately, maybe because this is a temple context, no tax is mentioned. Breckwoldt already discussed some of the peculiarities, like the fixed ratio of boat hire to drink rations of 15 : 1<sup>92</sup> and the hire for the boats that goes well together with the hire given by Codex Ešnunna § 4 (2 *qû* for one boat per day per *kurru* of cargo) and not so well with the hire given by Codex Hammurapi § 277 (1/6 *šiqlu* of silver [= 50 liters of barley] for a boat of 60 *kurru* capacity per day).<sup>93</sup> On the basis of this, Breckwoldt tried to establish a relative distance of the villages from Larsa, but more is possible.

89 Although obviously exceptional as in connection with the *gagūm* in Sippar, one has to mention the 33 female weavers who act as porters (*zābilātūm*) and are paid hire (á.bi), 12 l of barley for each woman; CT 47, 80 rev. 26'–30'.

90 Unclear; but connected with the drink rations, *maštū* or *maštūm*; see CAD Š/3, 397.

91 See Dyckhoff 1999.

92 Breckwoldt 1995–1996, 73.

93 Breckwoldt 1995–1996, 72.

Grain <i>karru</i>	Boats	Hire of boats $\%_0^{(i)}$	Boat days CH : CE	<i>mašītum</i>		Man days	Time <sub>1</sub>	Time <sub>2</sub>	Crew per boat CH : CE	<i>makkūm</i>		Porters $\%_0$	Overall transport costs			
				<i>qa</i> →	$\%$					<i>qa</i> →	$\%$					
YBC 6231	720	12	10800	5	216 : 90	720	0.33	360	18 : 7.5	7.5	1.67 : 4	190	0.09	1370	0.63	6.06 %
YOS 5,185	600	10	9000	5	180 : 75	600	0.33	300	18 : 7.5	7.5	1.67 : 4	360	0.2	1500	0.83	6.37 %
YOS 5,170	600	10	9000	5	180 : 75	600	0.33	300	18 : 7.5	7.5	1.67 : 4	—	—	470	0.26	5.59 %
YOS 5,169	600	10	[9000]	5	180 : 75	600	0.33	300	18 : 7.5	7.5	1.67 : 4	—	—	1260	0.7	6.03 %
YOS 5,182	600	10	6000	3.33	120 : 50	400	0.22	200	12 : 5	5	1.67 : 4	420	0.23	—	—	3.79 %
YOS 5,168	570	10	4860	2.84	97.2 : 40.5	504 <sup>1</sup>	0.3	252	9.72 : 4.05	6.3	2.59 : 6.22	—	—	1116	0.65	3.79 %
YOS 5,209	420	7	4680	3.71	93.6 : 39	234 <sup>1</sup>	0.19	117	13.37 : 5.57	5.57	1.25 : 3 <sup>(ii)</sup>	—	—	180	0.14	4.04 %
TCL 10,28	600	10	3600	2	72 : 30	240	0.13	120	7.2 : 3	3	1.67 : 4	120	0.07	—	—	2.2 %
SVJAD 51	240	4	3600	5	72 : 30	240	0.33	120	18 : 7.5	7.5	1.67 : 4	—	—	440	0.67	6 %
SVJAD 54	180	3	3240	6	64.8 : 27	216 <sup>1</sup>	0.4	108	21.6 : 9	9	1.67 : 4	—	—	540	1	7.4 %
YBC 6663	240	4	'2160 <sup>1</sup>	3	43.2 : 18	144	0.2	72	10.8 : 4.50	4.5	1.67 : 4	—	—	480	0.67	3.9 %
YBC 7194	240	4	1000	1.38	20 : 8.3	80	0.11	40	5 : 2.08	5	2 <sup>(iii)</sup> : 4.82	—	—	340	0.47	1.97 %

<sup>(i)</sup> % in this table means that the given amount of barley equals *n* per cent of the transported grain.

<sup>(ii)</sup> This number of crew is used in calculations.

<sup>(iii)</sup> This number of crew is used in calculations.

Tab. 3 | Transport costs – temple of Enki, Larsa, Rīm-Sīn 6–13 (1817–1810 BC).

In Tab. 3 all 12 texts are listed, broken down according to (a) the information on the individual transports they give explicitly themselves – amount of grain shipped, hire of boats, drink rations (*maštūm*), transport containers (*makkūm*), wages for porters – and (b) the information that can be generated from (a). Headers of group (a) are underlined and the columns highlighted in grey, those of (b) are not. Generation of the latter information was done on the basis of the following two parameters: (1) the employment of boats of 60 *kurru* capacity, which are commonly used in the Old Babylonian period (also in Codex Hammurapi and see above), for which (2) a hire of 120 liters (Codex Ešnunna) or 50 liters (Codex Hammurapi) each per day is paid.

With these assumptions we can calculate a journey time ( $\text{Time}_2$ ) which can, of course, only be taken as a relative reference, not an absolute one, i.e. the transports may have been organized with boats of a capacity of 120 or 30 *kurru* etc., but then the other figures need also to be adapted accordingly, e.g., there would then be less boats, a higher number of crew etc. per delivery.

Further explanatory notes to Tab. 3:

- “Grain”: amount of grain given by the texts as sag.níg.GA.ra. Contrary to Breckwoldt, we included the lá-u<sub>x</sub>(NI), “difference; surplus”, in our calculations as this amount was certainly transported on the boats. Therefore, numbers in the table differ from Breckwoldt’s calculations.
- “Boats”: number of boats, calculated by dividing the amount of grain by (boats of 60 (*kurru*)).
- “Boat days”: quotient of hire for boats divided by 50 liters (CH) vs. 120 liters (CE) hire per day.
- “Man days”: drink rations are calculated on the assumption that every crew member was allocated 2 liters per day, the lowest amount of drink rations found in the Old Babylonian texts (e.g. PBS 8/2, 242: 4, 5–6, 9–11 or BBVOT 1, 11: 5’!).
- “ $\text{Time}_1$ ”: gives journey time according to the numbers of CH vs. CE: boat days divided by number of 60 *kurru* boats amounts to journey time<sub>1</sub>.
- “ $\text{Time}_2$ ”: man days divided by number of boats (of 60 *kurru* × 4(3/2) crew) amounts to journey time<sub>2</sub>.
- Comparing time<sub>1</sub> with time<sub>2</sub> shows that most of the texts work well with the boat hire given in CE; see boat days and time<sub>1</sub>. YOS 5, 209 and YBC 7194 do not fit at first glance, but adapting the number of crew solves this ‘problem’.
- “Crew per boat”: calculated by dividing man days by boat days, which gives the crew number.

## 2.7 Summary

If we accept the basic suppositions given above, the temple household operated for its grain deliveries with boats of 60 *kurru* capacity which were ideally operated with a crew of four sailors per boat (once we have a crew of two, once a crew of three). Each crew member receives two liters drink ration per day. Hire for the boats concords mostly with the hire given in CE § 4, i.e. 2 liters per day.<sup>94</sup> Hire for the boats ranges between 1.38–1.9 % of the volume of the transported grain, drink rations for the crew between 0.11–6 %, *makkū*

<sup>94</sup> With the exception of YBC 7194. YOS 5, 168, however, does not fit into this scheme.

containers between 0.07–0.23 % and wages for the porters between 0.26–1 %. Overall transport costs amount to between 1.97 % (YBC 7194) and 7.4 %<sup>95</sup> of the transported grain volume. This gives us an average of 4.76 %, and a median of 4.82 % of the transported grain for transport costs.

Other texts from Larsa, Sippar and Ur that mention a similar pool of information and elements of expenditure are limited in number and cannot really be compared to the above, as most of them are problematic, data is missing or summarised in one entry.<sup>96</sup> All in all, the costs vary, are in part lower, in part higher than those of the Enki temple dossier. The overall costs are in the same range with the exception of Robertson, where they exceed 10 %.<sup>97</sup> But of course the number of texts for comparison is too small to be in any way representative.

### 3 Costs of overland transport with donkeys

At the end of this article we will try to give a comparative assessment of transport costs of bulk goods by boat and overland with donkeys and show that the latter apart from being more cumbersome, personnel and animal intensive, was also costlier and would therefore not have been possible in the same extent as by boat.

As we have no hire rates and a nearly complete lack of prices for donkeys in the Old Babylonian period,<sup>98</sup> and the rates for the hire of boats are difficult to assess, and as structural differences in transport between the Old Babylonian and the Neo-Babylonian period do not exist, we will make our assessment on the basis of the Neo-Babylonian data (Tab. 4).

	<i>Purchase prices</i>	<i>Hire</i>
Boat (22):	6.480 š( <i>iqlu</i> )	Boat, per day (9): <sup>(i)</sup>
mean:	146.68 š	mean:
median:	114.25 š	median:
Jackass (22):	4.25–120 š	Boat, per month (35):
mean:	32.27 š	mean:
median:	30 š	median:
Jenny (13):	4.62 š	7 š
mean:	20.11 š	
median:	14.5 š	

<sup>(i)</sup> “Per day” and “per month” means rental contracts on a daily or monthly basis with hire given per day or per month respectively, see Weszeli 2002, chapter 3.2.1 and Weszeli 2009–2011, 167.

Tab. 4 | Neo-Babylonian purchase prices and hire for boats and donkeys. Evaluation of the data is made on the basis of Weszeli 2002, chapter 3.2. and 3.4 (boats) and Weszeli 1996, 476 (donkeys), with additional data for the latter (see Weszeli 2010, 117 with n. 25).

95 Riftin 1937, 54.

96 YOS 5, 166; PBS 8, 242; Robertson 1981, 284–285; BBVOT 1, 11 obv. 1'–5'; UET 5, 497 // 581, 597 (a partial copy of 497 // 581?) and 580; see Weszeli 2002, chapter 2.4.2 and 2.5.

97 Robertson 1981, 284–285.

98 YOS 13, 322 (5 1/6 š*iqlu* and 15 *ut̄etu si.bi* of silver, jenn[y]); Kleinerman and Gadotti 2014, 65 rev. 24 (4 š*iqlu* silver, jackass); CT 33, 22: 10f. (5 1/2 š*iqlu* of silver, jackass).

To start, let us take as an example the text BM 54254 ([—].18 Nebukadnezar), see Tab. 5.<sup>99</sup>

	1st and 2nd voyages		3rd voyage	
shipped barley	600;0.0	100 %	600;0.0	100 %
hire of six boats	10;0.0	1.7 %	[10;0.0]	1.7 %
rations for the boatmen	0;4.0.0	0.1 %	0;[4.0.0]	0.1 %
wages for workers	(24) 4;4.0.0	0.8 %	(6) 2;0.0.0	0.3 %
wages for porters	6;0.0.0	1 %	8';0.0.0	1.3 %
expenses	21;3.0.0	3.6 %	20;4.0.0	3.56 %

Tab. 5 | BM 54254, transport costs.

According to the Old Assyrian texts, a good donkey can carry up to 75 kg over a longer period.<sup>100</sup> For the load of 600 *kurru* of barley, which equals in this period 44.64 kilos, we would need 596 donkeys. Apart from nibbling foliage, a donkey eats ca 3 l barley per day,<sup>101</sup> we would therefore need 14.9 *kurru* of barley per day to feed 596 donkeys. As we have no going rate for the hire of donkeys in this period,<sup>102</sup> we might therefore take as a (minimum) rate the 10 l of barley per day that is given by both Codex Ešnunna § 10 and Codex Hammurapi § 269.<sup>103</sup> For 596 donkeys the hire would amount to 49.67 *kurru* per day. Feed and rent for the donkeys alone would therefore come to 64.57 *kurru* or 10.8 % of the transported goods. The donkeys needed drivers, as a driver attends to one, or mostly two animals, according to the Old Assyrian texts,<sup>104</sup> we would need at least 298 drivers. In the Neo-Babylonian period a worker employed full-time would earn about 12 liters of barley per day,<sup>105</sup> for 298 drivers wages would amount to 29.8 *kurru* per day, which equals 4.9 % of the transported barley. The costs for donkeys and their drivers would then amount to 15.7 % (at a minimum) per day. Expenses for donkeys and drivers only are already more than double the overall transport costs of the Enki temple dossier, and surpass the highest overall cost<sup>106</sup> by half as much.

This is sufficient to show that bulk transport is definitely more cost-efficient by boat than by pack donkey and that this gave the south of Mesopotamia with its vast net of waterways a huge economic advantage over the north.

99 Discussed in detail in Weszeli 2010, 143–144, with table.

100 See Dercksen 2004, 278.

101 For numbers see Weszeli 1996, 462. The fodder is much less in pre-Sargonic Mari, namely 0.2–1.67 litres per day per donkey; see Table 6 in Sallaberger 2014, 348. We are in Babylonia, so good food in the form of grain should be constantly available for the animals, contrary to the situation of caravan donkeys on their way to Anatolia.

102 See Weszeli 1996, 462–463, nn. 5 and 11.

103 Rates in the Neo-Babylonian era were certainly higher.

104 Dercksen 2004, 283.

105 See Weszeli 2010, 143, n. 836.

106 Robertson 1981, 284–285.

## 4 Appendix: The texts – Babylonian ‘tax passes’

### 4.1 BM 14203 (Fig. 1) (96-4-2, 304): 14. 2. --

Obv.	1.	<i>i giš má mun</i>	1 boat of salt (and)
	2.	<i>naga</i>	alkali-plant/potash,
	3.	<i>2 dug sag</i>	2 good earthen containers,
	4.	<i>3 ku-ur-ku¹-ra-tum</i>	3 kurkurratum containers
Edge	5.	<i>ša i.giš</i>	of oil
Rev.	6.	<i>níg.kud</i>	is taxed.
	7.	<i>wu-us⁹-še-er</i>	Let it go/pass!
Seal	8.	<i>iti gu₄.si.sá ud.</i>	
	9.	<i>14.kam</i>	
Seal:	1.	<i>it-ti⁻⁹-en.zu-mi-[il]-ki</i>	Itti-Sîn-milki,
	2.	<i>dumu ip-qu⁻⁹-ba-u</i>	son of Ipqu-Ba'u,
	3.	<i>ir⁹-mar.tu</i>	servant of Amurru.

Seal: The tablet is sealed on all sides with this one seal. The owner of the seal is here and on the other two ‘tax passes’ with virtual certainty the tax officer, *mākisum*, although no title is ever given.

Line 6: Instead of the Akkadian stative *maksat*, the Sumerian *níg.kud* is used here, which is to my knowledge not normally used as a verb, but for the profession *mākisum* “tax collector” and the tax *miksum* only. In view of the formula of these texts, *níg.kud* has to stand for the verb.

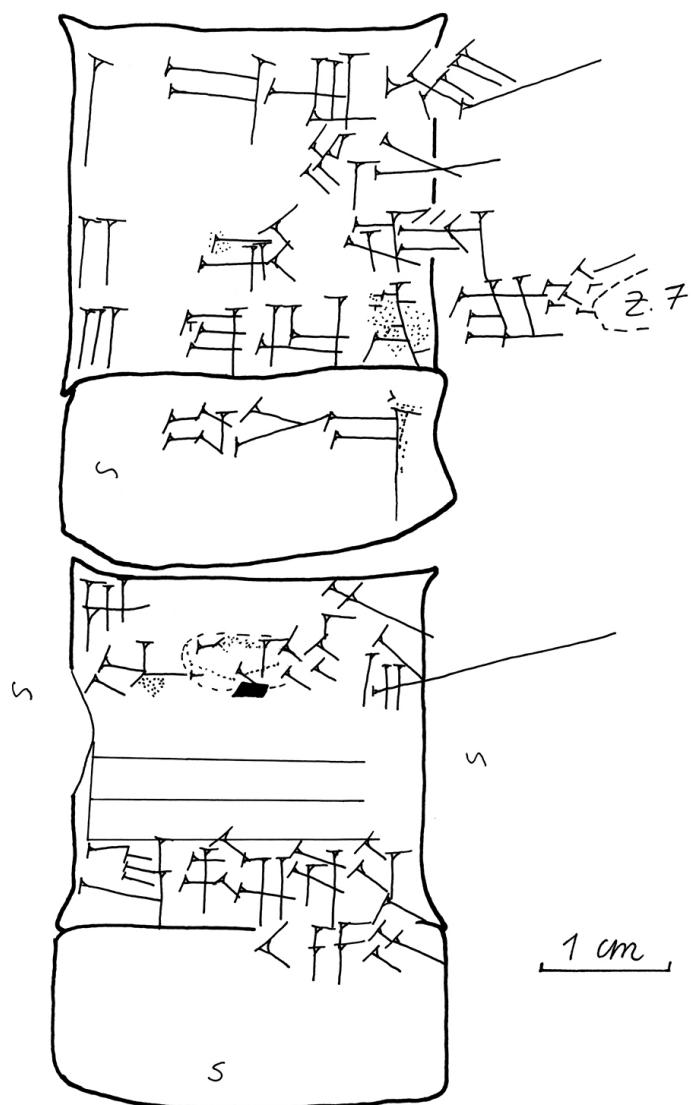


Fig. 1 | BM 14203

#### 4.2 BM 79378 (Fig. 2) (Bu. 89-4-26, 675): -, 14. 1. 40 (Ha)

Obv.	1.	<i>i giš má ²20+10?¹ [du]g i.giš</i>	i boat of ³⁰?¹ earthen [con]tainers of oil
	2.	<i>ša d.en.zu-iš-me-an-ni</i>	of Sîn-išmeanni
	3.	<i>ma-ak-sa-at</i>	is taxed.
	4.	<i>wu-uš-še-er</i>	Let it go/pass!
Rev. Seal	5.	<i>iti¹bár.zag.gar¹ ud.14.kam</i>	
	6.	<i>mu é.mes.lam</i>	

The seal was impressed/rolled on all sides with the exception of the upper edge:

1.	<i>d.utu en.uru<sub>16</sub> di[.ku<sub>5</sub>]</i>	Šamaš, mighty Lord , jud[ge],
2.	<i>ša.kúš.kalam<sup>lam</sup> di[m.gal]</i>	counsellor of the land, link/centre
3.	<i>an.ki.a išib.an.[na]</i>	of heaven and earth, purification priest of An,
4.	<i>uru zi.kal ní.tuku[.na]</i>	who guards the precious life of [his] worshipper.

Seal: The owner of the seal is here and on the other two ‘tax passes’ with great certainty the tax officer. The inscription is a prayer to Šamaš, and in part very difficult to read due to the fact that the signs are abraded by time and wear and look rather ‘lumpy’. The copy is therefore a bit ‘idealized’. I thank M.-C. Ludwig and C.B.F. Walker for their generous help in deciphering it.

The copy of the seal is a composite drawing. For similar seals, depicting a suppliant goddess in flounced robe facing the inscription, albeit with divine headgear instead of a cap(?), see Collon 1986, pl. XLIII, figures 602–611. The goddess has both arms raised, this is shown by the impression on the left edge. In front of her head are three drill holes, at the height of her thighs a vessel, maybe a ‘vase’. We find the back of the same(!) Lamma-goddess impressed at the lower end of the seal impression (i.e. the left side of the tablet), the dress visibly reaching half way into the sign ITU, suggesting that the end of the impression of the inscription does not end were the date formula begins, but that line 5 of the tablet was written over the right side of the seal impression and therefore over the ends of the lines; this allows the additions in squared brackets.

- 1: Ludwig and Walker suggested to read one EN as uru<sub>16</sub>.
- 2: The first two signs seem clear, the third sign is not. <sup>d</sup>Šà.kúš.ù.kalam.ma is the name of one of the counsellors of Šamaš, see An = Anum 153–158 and Krebernik 2011, 603. We would therefore prefer to read the third sign kalam, and make Šamaš “counsellor of the land”, although the ù of šà.kúš.ù is missing and the fourth sign is AM instead of MA, for which we cannot find a sensible explanation.  
Another possibility would be to read the third and fourth sign sa<sub>6</sub>'.ga', and make Šamaš a “good counsellor”.<sup>107</sup>
- 3: “Purification priest of An” is a known epithet of kings (e.g. Lipit-Eštar A, etcsl<sup>108</sup> 2.5.5.1: 23; Rīm-Sîn E, etcsl 2.6.9.5: 2), but is to my knowledge not used as an epithet for gods.

<sup>107</sup> This and dim.gal at the end of the line are suggested by Ludwig and Walker; see Ludwig 1990, 121–122 on dim.gal.

<sup>108</sup> <http://etcsl.orinst.ox.ac.uk/> (visited on 03/04/2019).

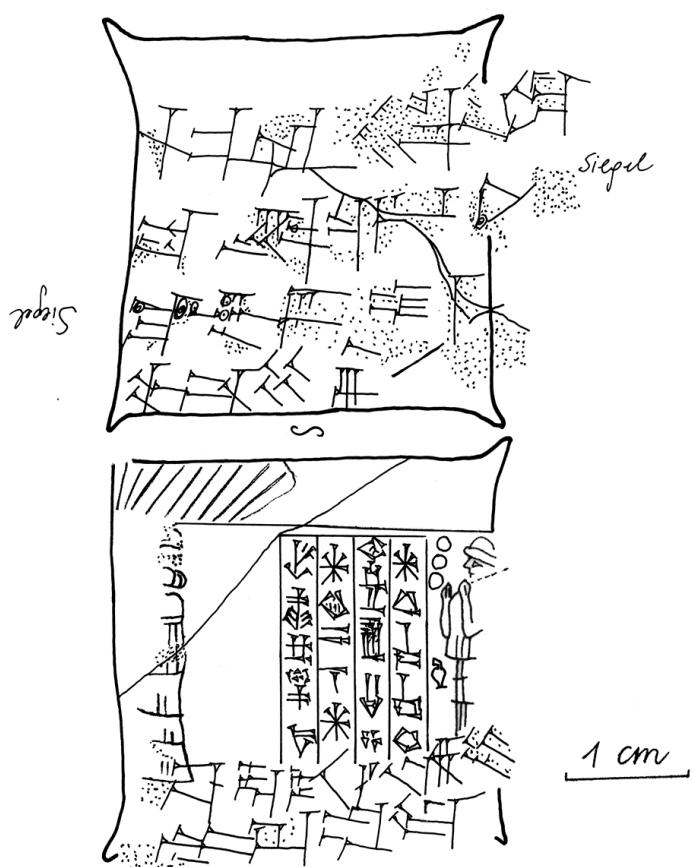


Fig. 2 | BM 79378

### 4.3 BM 79393 (Fig. 3) (Bu. 89-4-26, 690): -

- Obv. 1. 1 *giš má sum<sup>sar</sup>* 1 boat of garlic  
 2. *ma-ak-sa-at* is taxed.  
 3. *ú-še-er* Let it go/pass!

Seal: The seal is rolled over all sides of the tablet but the obverse, the seal bears no inscription. The drawing is a composite drawing, the dotted lines are not visible on the reverse, but taken from the other imprints. From left to right we see a kilted figure with one raised hand behind a goddess (with necklace counterweight) in a flounced robe and hands clasped looking to the right at a god whose hair ends in a fish tail. Back to back, in the composition certainly belonging behind the kilted figure, is a fourth figure. Between the figures are a human head, the crescent moon and below it a thymiaiterion.

1: This tablet does not give the name of the owner of the boat, which is curious.

3: For the form *usšer* instead of *wusšer*, see Kraus.<sup>109</sup>

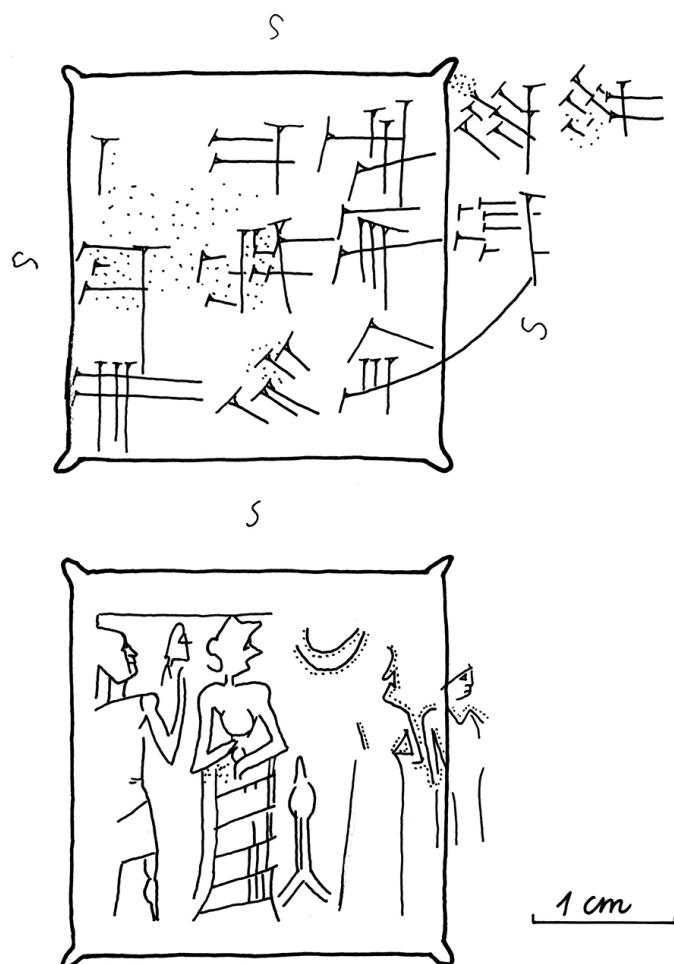


Fig. 3 | BM 79393

109 Kraus 1958, 47.

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**Michaela Weszeli**

Michaela Weszeli (PhD 2002 in Vienna, thesis on watercraft and water-borne transport in Mesopotamia) does research and teaches at the University of Vienna. Since 1992, she has been working for Archiv für Orientforschung compiling its analytical bibliography for Mesopotamia, Register Assyriologie. She became co-editor in 2019. Her research interests include the material culture of the Ancient Near East and in addition to water transport, the Mesopotamian fauna as well as legal and economic history.

Mag. Dr. Michaela Weszeli

Institut für Orientalistik

Universität Wien

Spitalgasse 2, Hof 4

1090 Wien, Austria

E-Mail: michaela.weszeli@univie.ac.at