

A cargo ship from Lake Onega and the shipbuilding tradition in Northern Russia

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Abstract: In 2018, the wreckage of a sewn ship was discovered in Lake Onega near the city of Vytegra, Russia. The wreck was dated by the dendrochronological method to the mid-17th century. The wreck included a bottom (20.6 × 1.64 m) made up of five timbers, with the bases of the stems and the frames up to 5.8 m in length, as well as two fragments of the sides of the ship. The construction style of the ship is similar to the Late Medieval North Russian ship, based on three archaeological vessels. In many respects the Vytegra ship corresponds to the design of the lodia, described in documents from the 17th and 18th centuries.

Keywords: Vytegra, Russia, Onega Lake, Late Middle Ages, sewn vessels, lodia

1. The Vytegra vessel

In late autumn 2018, the shipwreck was beached ashore by a storm and discovered by local residents on the southern coast of Lake Onega near the mouth of the Vytegra River. The vessel was studied by us in the spring of 2019 in the city of Vytegra, where its remains were moved. It is currently being preserved under conservation in a Vytegra museum.

The shipwreck included the flat bottom with remains of floor timbers and two fragments of the sides. The bottom was preserved to its full length of 20.6 m, and the midsection of the ship was 1.64 m wide. The bottom consists of five laterally connected beams up to 35 cm wide and 26 cm thick, converging at the ends at an angle of about 22° (Fig. 1).

The central beam, in section 35 × 23–26 cm, consisted of two parts, joined together in a half lap splice in the center of hull, 9.72 m from the stem and 10.17 m from the sternpost, by two 5 cm thick treenails. Both central beam halves appear to be made from a single log of fir, ending in the bow and stern with the natural root parts of tree (kokora), which became the bases of the stem and sternpost. The ship's bow was determined based on the preserved inclination at the stem (Fig. 1). At the bow, the four lower planks, up to 30 cm wide, were fastened together and to the stem with a sewing technique (Fig. 2). The base of the stem consisted of two parts. The first, 10–12 cm thick, preserved to a height of 48 cm, is the upturned root part of a tree, which passed below into the central bottom beam. The second, on the port side, is a separate beam of stem 8–10 cm thick, installed in a rectangular groove at the central bottom beam (20.5 × 7 cm and 5.5 cm deep). It was fastened by treenails and seam with bottom. The seam also connected both parts of the stem and the adjacent ends of board planks together (Figs 1, 3). The stern of the ship, in a worse state of preservation, utilized a similar construction design.

The four side beams of the bottom converged in pairs to the central beam from 0.9 to 3.1 m distance from the pointed end of the central beam at the bow and the stern. Their outer edges were made like those of a T-shaped keel, with a protrusion in the upper part for fastening the lower planks of the sides. At the ends of the bottom beams behind the stem and stern, L-shaped profiles were hollowed out for this purpose (Figs 1, 4).

The bottom beams were joined together with the help of 16 long wooden nails hammered through holes drilled from the sides. The holes were drilled starting 1.9 m from the bow, with hole spacing varying between 0.39 m and 1.75 m. They were connected by eight iron studs as well, four on each side, with an interval of 1.3–1.5 m, at a distance of 1.3–2.9 m from the bow and stern ends.

There are three round depressions 1–2 cm deep in the central beam with diameters of 16–21 cm, two located at 2.10 m and 3.05 m from the ships bow, with the third 3.96 m from the stern. These depressions could relate to the bases of masts and anchor devices (Figs 1, 4).

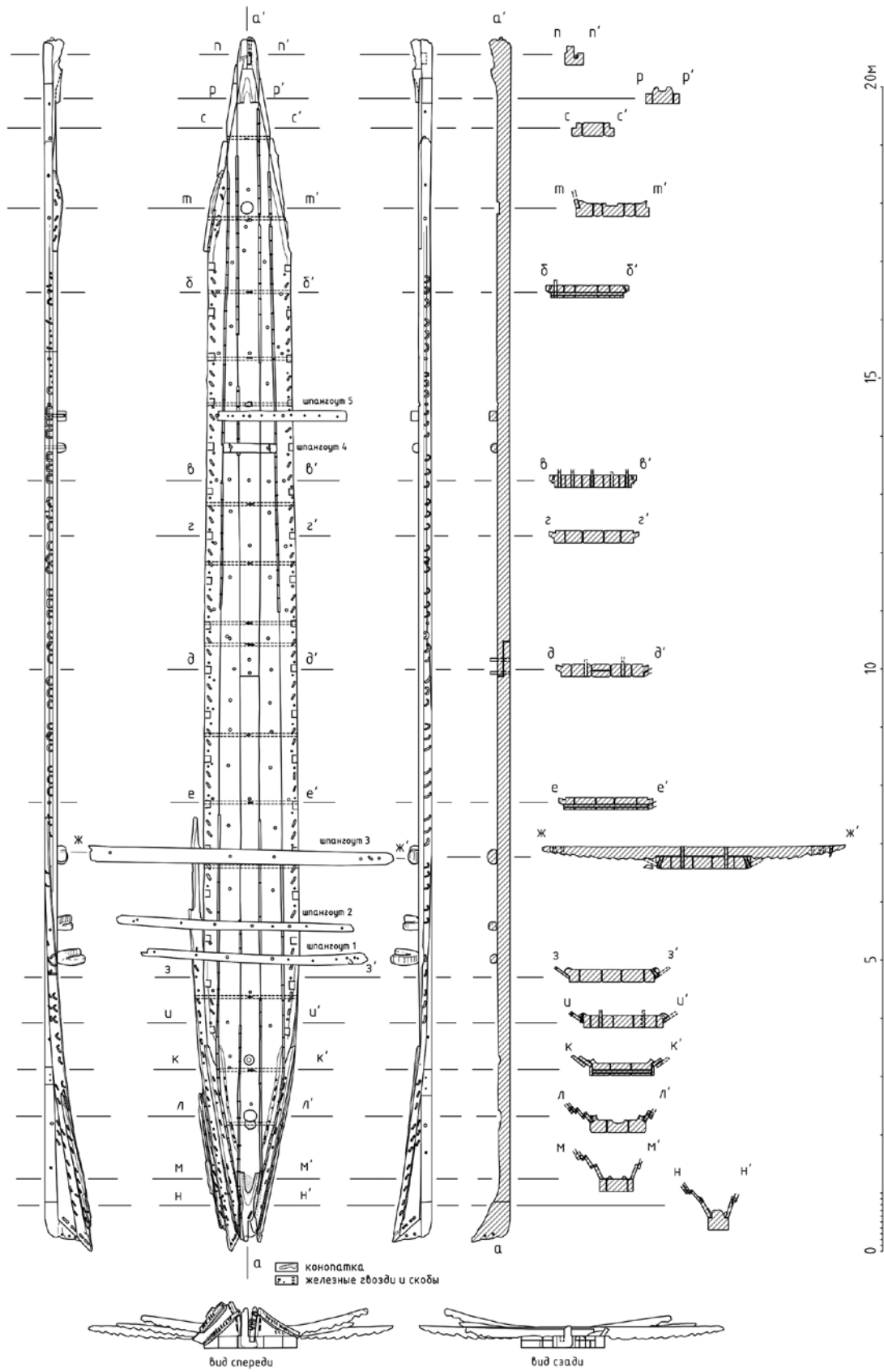


Fig. 1 Drawing of the vessel from Vytegra; plan and sections (drawing: P. Sorokin)



Fig. 2 The bow of the vessel: starboard side (photo: P. Sorokin)



Fig. 3 The bow of the vessel: stem base (photo: P. Sorokin)



Fig. 4 The bow tip of the vessel: the connection of the starboard side to the stem (photo: P. Sorokin)

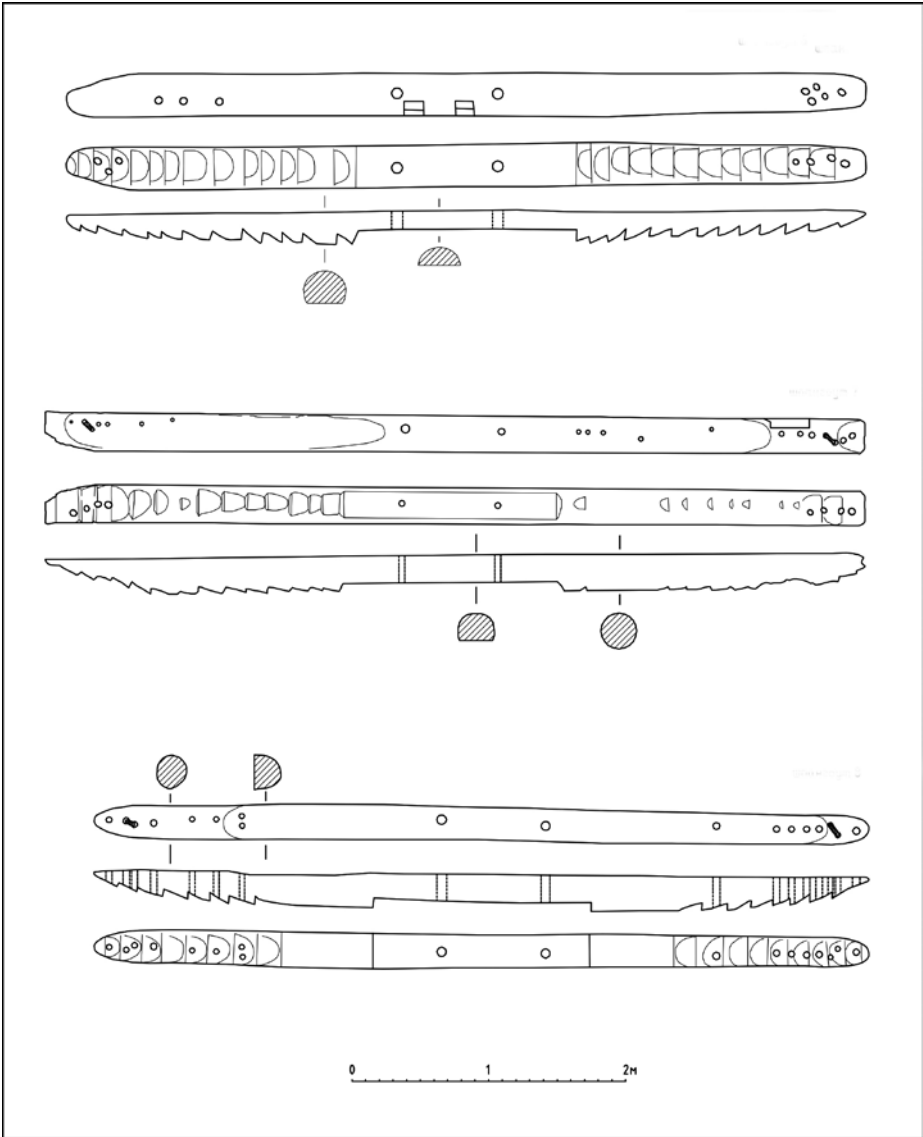
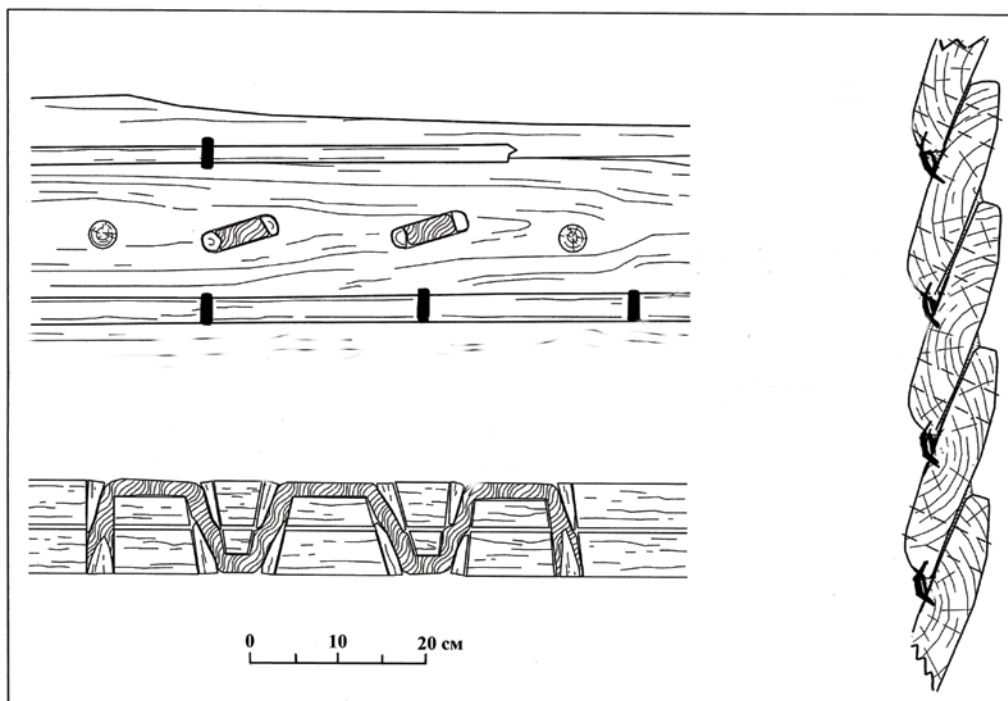


Fig. 5 The floor timbers of the vessel (drawing: P. Sorokin)



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Fig. 6 The sewing and caulking technique of the boards planking of the vessel: 1) the system of connecting and sealing the seams of the board planking; 2) photo of a fragment of the ship's side (drawing and photo: P. Sorokin)

Judging by the preserved exemplars (4–5.8 m long) and nail holes in the bottom planks, there were about 29–30 frames, with frame spacing of 0.4 to 0.6 m. The frames were fastened to the bottom with two wooden nails 4 cm thick in the center and with a sewing technique at the ends. The shape and dimensions of the five partially preserved frames indicate the width and contours of the vessel's base. The five partially preserved frames had central cross-sections that varied between 12–18 × 14–25 cm (Figs 1, 5). Based on the cuts along the bottoms of the preserved frames, it is clear that the frames were shaped to adjust to the already-sewn bottom part of the ship's hull, assembled in shell-first technique.

Two fragments of the vessel's sides, measuring 11.4 × 1.05 m and 3.4 × 0.5 m respectively, included seven and four board planks 6–8 cm thick (Fig. 6). The planking was fastened in clinker overlapping construction with a sewing technique. The planks, cut from the outer parts of young pine trunks, had a rounded external profile. The joints between the planks of the bottom and sides inside the vessel, and in some places outside the vessel, were caulked by moss, then

covered by laths secured with sintels, then tarred. The moss was laid in grooves about one cm deep and pressed by a flat or triangular in cross-section lath 2–3 cm wide. The laths were fixed every 20–25 cm with iron sintels (Fig. 6.1). The planks were sewn together by fir tree branches or roots (*vica*) about 2 cm thick with short seams – three stitches – each 7–10 cm long, with intervals of 10–15 cm. The gaps between the seams were 20–25 cm. The stitches, placed at an angle of 25–45° to the plank's edge, have sunk into the cutout grooves 2 cm deep (Fig. 6.2). Each stitch was fixed both inside and outside the ship's sides with wooden pegs 2 cm thick.

The vessel was built mostly of pine, with some details made of fir. Moss, for caulking seams, was impregnated with a mixture of birch and pine tar and possibly with inclusions of animal fat. Based on dendrochronological analysis of the ship's wood, the dates 1632–33 and 1649 were obtained. It has been suggested that the latter date is a sign of repair of the vessel (Zhavoronkov, Zhavoronkova 2019: 15–17). However, the difference in dates can also be explained by the secondary use of old parts and details. Ships built from coniferous wood, mainly pine, were short-lived. According to the documents of the 17th century, large vessels were used on the White Sea basin for up to 10 years (Frantsuzova 1994: 241). However, after a decade of use they were often disassembled and disposed of. Thus, the construction of the Vytegra vessel may date from a later time than the date of its earliest components.

2. Archaeological finds of similar vessels

The sewn vessels from Paraniha (Arkhangelsk area) and Stockholm (Skeppargatan) had technological similarities to the Vytegra ship (Cederlund 1978: 69–80; Bryzgalov *et al.* 1995). The Paraniha shipwreck, more than 15 m in length, 1.1 m in width and 0.4 m in height, was found at the mouth of the Northern Dvina River in 1991. “Four powerful beams located in the same plane were rigidly connected to each other and to the stems” (Bryzgalov *et al.* 1995: 47). The bottom beams are about 29 cm thick and 15–35 cm wide, taper to the ends, forming sharp corners. They were joined by wooden nail hammered from the sides into pre-drilled holes. The side beams had protrusions with grooves at the ends, for attaching them to the base of the stem and to the lower side's planks. The parts of four arc-shaped frames, 3.75–4.63 m long, with cutouts to fit against the bottom beams, were found separately from the bottom. They were trimmed and had two nails holes in the center, in the places corresponding to holes in the bottom. One of the fragments, preserved up to 3.75 m, had an initial length of about 6 m. Judging by the shape of the surviving frames, the contours of the bottom were rounded, like the Vytegra vessel. The wreck, interpreted as part of the *doschanik* (a ship built of planks), was dated to the end of the 18th / beginning of the 19th century, on the basis of the lack of metal fasteners in the hull (Bryzgalov *et al.* 1995: 47, Figs 1–3; Yasinsky, Ovsyannikov 1998, vol. 1: 358–363).

The remains of the Skeppargatan 4 sewn ship were discovered in Stockholm in 1896. Based on 14C and historical signs, the wreck was dated to the end of the 17th / beginning of the 18th century. The main part of the wreck, 2.4 m long, was interpreted as a fragment of the keel with the base of the stem (Cederlund 1978: 23–54, 69–80, Figs 18, 20, 25–28, Pls 1–27). According to a number of similarities, it can be attributed to the same type of vessel as the Vytegra wreck. The preserved part of the central beam of composite bottom had a width up to 35 cm, and two turn-up profiled boards (33 × 12 cm) were attached to grooves in the sides out to 1.7 m from the vessel's end. Their upper edges were deployed at an angle of about 60° to connect with the lower plank of the side. The wreck can be visualized as a fragment of the end of a composite bottom with side planking, including the base of the stem. The ship details and planks were sewn together in the clinker technique. The root part protruding at the end of the central beam, projecting upwards at an angle of 90–110°, served as the base to which the stem was fastened from the side with wooden and iron nails. The planks of the side covering, in cross-section 16–30 × 4–5 cm, have a rounded external profile. They were connected by a *vica* (a rod made of a spruce branch), 2 cm in diameter, with short seams in three stitches of 6.5–10 cm. The boards were fastened to the frames, the distances between which were 55–70 cm, with two stitches to planks.

C. O. Cederlund noted the unusual design of the vessel and suggested its Russian or Eastern Baltic origin, or possibly based on Eastern designs in use in the Swedish Navy in the 17th and beginning of the 18th century (Cederlund 1978: 28–36, 76–79).

3. Written sources and the types of North-Russian late medieval vessels

The ship design featured in the Vytegra vessel, the Paraniha shipwreck, and the Skeppargatan 4 ship has been known from the documents on the construction of ships in the White Sea basin in the 17th and 18th centuries. They described the connection of the bottom beams – kolod (usually three) into the expanded keel base of the ship – matica. Detailed information about the construction of the matica and its connection with the stems, corresponding to the design of the Vytegra wreck, is contained in 18th century documents on the construction of the lodia of the Solovetsky monastery, situated on an island in the White Sea. The documents indicate that the composite bottom – matica, made of several beams – kolod, is a traditional characteristic of a lodia. The descriptions of other seagoing vessels: Koch and karbas, smaller than lodia, have mentioned only one koloda – a keel and bottom apparently made from one tree (Filin 2013: 22–23; Sorokin 2021: 81–83).

The remains of North Russian Late Medieval vessels are known mainly in secondary use from excavations in Mangazeya (Vizgalov, Parkhimovich 2008: 73–75). Most of the remains, including keel fragments 15–17 m long, with a cross section of 45 × 20 cm, made from a single tree, were associated with a koch (Naimark *et al.* 2013; Filin 2013). Representations of other types of North Russian vessels, including lodia, karbas, nasad, doschanik are based on written sources. The classification of the Paraniha wreck as a cargo ship – doschanik (Bryzgalov *et al.* 1995: 47; Yasinsky, Ovsyannikov 1998, vol. 1: 358–363), is not supported by definitions in these documents.

The doschanik – the main type of cargo ship in the White Sea basin in the 16th–18th centuries, was distributed on the rivers of Western Siberia in the 17th century. A doschanik, built in 1677 in Verkhoturye (West Siberia), had length of matica 21.6 m, a thickness about 18 cm, width of the bottom in the mid vessel – 4.5 m, space – 22.5 cm (Vershinin 2001: 95). The construction of this ship and its use of kokora as floor timbers indicates that it was a typical flat-bottomed vessel – Barca type, with straight sides.

4. Conclusion

The structural and technological type of late medieval North Russian sewn vessels can be distinguished on the basis of three shipwrecks: Vytegra, Paraniha, and Skeppargatan 4. These ships are characterized by a number of features that find correspondences in historical documents: a composite bottom (matica) with a side through connection of the beams with wooden and iron nails; a composite central beam made of two trees trunks ending in root parts and one-piece side beams; a method of attaching the stems to the root parts and the boards; and connecting the boards and the ship's shell and components with a sewing technique.

The main structural elements of these vessels and their manufacturing technologies are characteristic of the Medieval (12th–15th century) shipbuilding tradition of north-western Russia (Sorokin 1997; Dubrovin 2000); however, the time and area of appearance of the described type of vessel need to be clarified.

The reconstructed dimensions of the Vytegra vessel are about 22 m in length and up to 6.5–7 m in width; the height of its sides could reach about 1.5–2 m. According to the size and design features that are consistent with historical documents, the find can be recognized as the remains of a lodia. In contrast to the Medieval period when the term was generic, in the 16th–18th centuries in the North, lodia belonged to a particular type of vessel, ranging from 18 to 22 m in length, about 6–7 m in width, with the height of the sides – 1.5–2.7 m. The lodia was a large seagoing vessel, used mainly for long fishing voyages and transportation of goods on the water routes, including internal operations in the basins of the Barents and White Seas. They have been divided into several variants, which, in addition to the construction site, could reflect the design features, sizes and areas of their use (Frantsuzova 1994; Yasinsky, Ovsyannikov 1998: 338, 352–354; Filin 2004). According to the ship inventory of 1702 from Vologda, 235 vessels were designated for transportation of large volumes of cargo, including grain, salt, and weapons; 52 lodias were mentioned (Guslistova 2004: 92–94). Dozens of trade ships from North-West Russia including the Onega Lake area sailed to Stockholm via the Baltic Sea in the 17th century (Sorokin 2021: 83). The Vytegra vessel, a large cargo shipwreck corresponding to a lodia, found on the southern coast of Onega Lake, may well be associated with 17th century trade and communications in the Baltic Sea.

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