NORWEGIAN TEXTILE LETTER
Vol. II No.1 November, 1995

Square sails of wool

by Erik Andersen

In the Viking Age and the Middle Ages wool was the commonly used material for sails on the various Nordic ship-types. This we know from the accessible written sources. In Norway, Sweden, Finland, Iceland, the Åland islands, Shetland, the Hebrides and the Faroes, the custom of employing wool sails can be traced down to the 19th century (in some regions even into the 20th century). In some areas flax and hemp were probably also used, especially from the 11th century, as in more recent times.

The fact that sailcloth in the Viking Age and the Middle Ages usually was made of wool has naturally influenced present day evaluations of the sailing capabilities of these ships, in particular their ability to beat to windward. Svend Larsen, for example, concludes in his book *Vikingernes hav*[1] that this cannot be done with a wool sail, which is *fleecy, nappy, yielding and leaky.* We must bear in mind, however, that the many questions concerning the sail, like the entire concept of the "Viking ship", including many ship types and reaching far beyond the Viking Age, can only be answered realistically by practical testing.

When the Nordland-boat *Rana* of the Viking Ship Museum in 1976 for the first time sailed a test course in the inner Roskilde Fjord, the boat crew, together with Ole Crumlin-Pedersen, initiated the practise of experimental maritime archaeology. This line of work was to become important for the international reputation of the Viking Ship Museum, the Institute of Maritime Archaeology and more recently the Centre for Maritime Research of the Danish National Museum. The studies of the Nordland-boat and similar North European square-rigged boat-types helped us in the following years to understand more fully the principal questions regarding the hull, rig and sail tradition represented in the Skuldelev-find. In the long term these test-sailings, combined with the analysis of finds, written sources etc. were steps towards building and testing replicas of one or more of the Skuldelev ships using the "same" materials for ropes and sails as in the original ships.

Preparations started quite early for the making of a wool sail for the future Skuldelev 3 replica. The preliminary spinning and weaving tests were carried out in 1977 and at the same time collaboration in research and test-sailings and also in the wool-sail field was established with the Norwegians, in particular with Jon Bojer Godal from Rissa. It quickly became evident that the woollen material would have to be produced in Norway. There they still had enough short-tailed wild sheep to yield the right sort of wool.

From the outset we were aware of the high quality needed for this material, as evidenced in the finds as well as in two preserved 19th-century wool sails in 2/2 twill and the remains of a third sail in a very stable 2/1 twill. The problem was then, as it is now, to match the technical standard and good craftsmanship of the original sails. Here we had to face perhaps the most difficult part of the reconstruction of the Viking ship. The first step was taken in 1985 when we received a wool sail for the Skuldelev 3 replica *Roar Ege.* The material had been woven by a group of people under the direction of Solfried Aune[2] at Fosen Folkehøjskole in Norway. Later the development of woollen 2/1 twill fabric was taken over by Amy Lightfoot from Kvenvær on the island of Hitra in Norway. On Hitra they are currently working on wool sails for the Skuldelev 3 replica *Sif Ege* of Frederikssund/Denmark and the veng-boat *Sara*

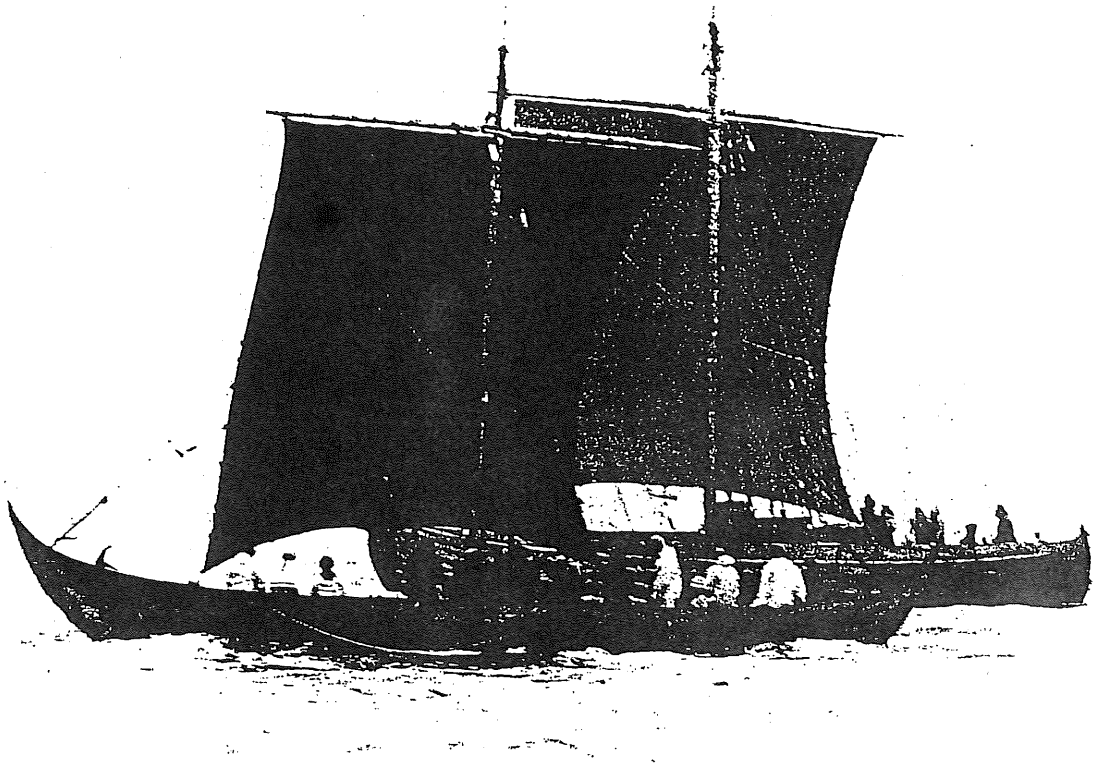


Fig. 1. The Skuldelev 3 replica *Roar Ege* with a wool sail. At the back the Skuldelev 1 replica *Saga Siglar,* that circumnavigated the globe. Photo: The Viking Ship Museum.

Kjerstine belonging to Hitra Local Museum, all in all 150 m^2 of material. In 1990 we included the Faroe Islands in the co-operative project, and in the period 1990-93 the weaver Tita Vinther from Tórshavn made a fabric in Faroese *einskeft* (tabby), which will be tested in 1994 as a square sail for one of the Faroe boats belonging to the Viking Ship Museum.

Over the years the work with these woollen fabrics, which will never be produced on machines and thereby made cheaper, has yielded many practical and hard-earned experiences. The fabrics are made from wool spun by hand or on a spinning-wheel, woven on a warp-weighted loom or a horizontal loom, and in a quality of wool and fibre that is only found on the Norwegian wild sheep[3]. Today when we build the hull of the replicas and make the rope for the rigging we can draw on advice from people who have made these tasks their profession, which means that experience and craftsmanship in these areas can be maintained and developed further. The price of a hull has found a level that matches the quality and the great amount of work involved in developing knowledge about these ships. This does not yet apply to a standing and running rigging made up of the original materials and with the correct techniques. At the turn of the century, the sail and rigging of, for instance, a square-rigged Nordlandboat would be of an equivalent value to that of the hull. This in all probability was also the case for the Nordic type of ship in the Viking period and the Middle Ages. Converted into the monetary values of today, which are so closely linked with the time spent on the work, we should find that the total cost of a wool sail of serviceable quality, for example for the Skuldelev 5 replica *Helge Ask,* produced by trained spinners and weavers (i.e. collecting the wool, sorting, combing, spinning and weaving of 56 m^2 fabric, treatment etc.) could easily amount to 1 million Danish kroner. This may seem a lot of money but the sail if properly

maintained could presumably last 40-50 years or even longer. In earlier times the fabric would be re-used for tarpaulins, wall hangings, caulking, out-of doors clothing etc. These facts must be taken into account if we are to do credible reconstruction-work and test the most important details of the sophisticated shipbuilding tradition with which we came into contact, when the Skuldelev ships were raised in 1962.

When the wool-project started in 1977, it was as part of the research into the Viking ships but it soon was evident that it would become an important supplement to the traditional research in textiles. The sail-project turned the focus on some specific fabrics that were widely used for sailmaking, material requirements and weaving techniques with which it would otherwise have been difficult to come to grips with. For the present we have found at least three types of woollen material used for sails dating from the 16th century and later. Two of these material-types are related to textile-finds from the Viking Age and the Middle Ages. In the following I shall attempt a halfway description of these fabrics and discuss the problems associated with them.

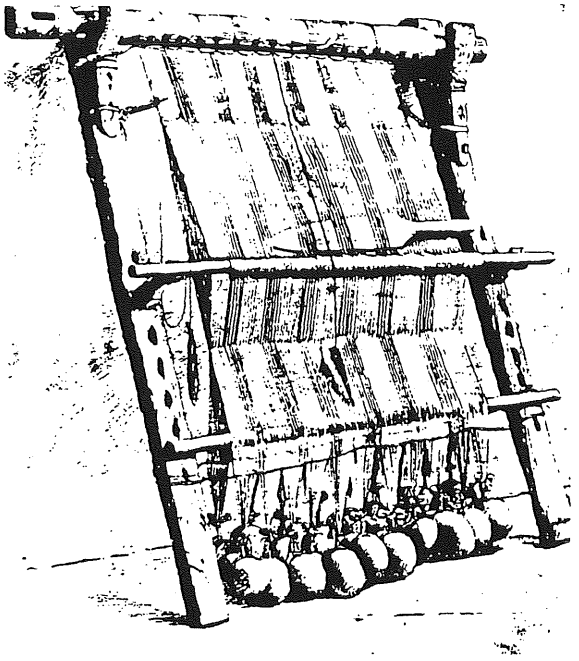


Fig. 2. Faroese warp-weighted loom. After Kjellberg 1943.

Vaðmál?

When the woollen material for sails is mentioned in old written sources, it is called *vaðmál* (in Norse; Old Swedish *vapmal;* Modern Swedish *vadmal;* Danish *vadmel;* Finnish *sarka*) or just *vað*[4]. There are, furthermore, a great many variants mentioned in written sources from different countries and local areas. Literally it means a measurement of home-spun woollen fabric which was used as a standard of value in the Middle Ages. In Iceland this standard of value was until recent times used at home as well as for (the large) exports, resulting in further standardization and control. In the other Nordic countries as in Iceland and on the Faroe Islands the weaving of this type of coarse fabric continued for a considerable time. The general opinion has it that from quite an early stage we are dealing with a domestic craft in which the authorities did not intervene[5]. I suggest this is a too simplified way of presenting the problem. For a long time in the Scandinavian countries coarse woollen cloth was used as a means of payment at all levels of society. In Sweden, for instance, it is possible to follow the use of these cloth-types in the sails for the navy until the beginning of the 17th century[6]. For the Middle Ages we find definite information on bindings and other technical data only in the Icelandic written sources. From them it appears that the cloth came in many qualities intended for different uses. The colours were usually the natural colours of the wool. There is mention of white *(hvítt),* red-brown *(mórautt),* iron-grey *(járngrátt),* sea-grey *(margrátt)* and sheep-black *(sauðsvart),* as well as brown-striped *(mórent)* fabric. We are talking about a fabric in plain weave from single-threaded yarn (in different thickness and quality according to type of fabric) and presumably to some degree fulled, though fabric without fulling is also mentioned[7]. Icelandic fabrics were always and right to the end a 2/2 twill, a *þriskept.* Until the 1750's this was woven on a warp-weighted loom, the same type of loom as used in the Faroes. This is probably the original weave for twills. From the 11th to the 13th century the fabrics are 2/1 twills, then called *tuskept,* which according to the finds in other North European countries seems to have been as common as the 2/2 twill. It is therefore assumed that this weave in qualities like the 2/2 twill would also have been called *vaðmál.* It has been argued that the 2/1 twill is difficult to weave on the traditional warp-weighted loom and better suited for the horizontal loom and hence its late (11th-century) appearance in Scandinavia, at approximate-

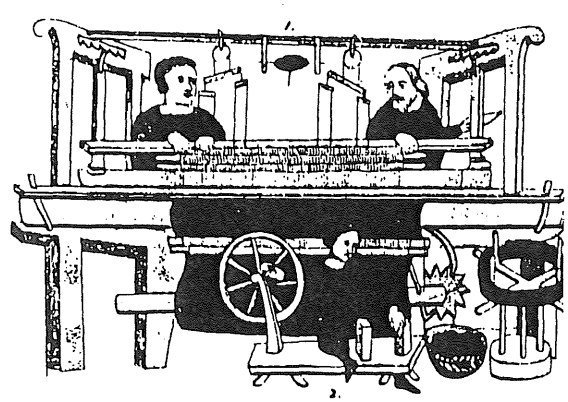
ly the same time as this loom was introduced in Denmark and Sweden[8]. However, experiments on the warp-weighted loom carried out at the Historical-Archaeological Research Centre in Lejre have demonstrated that the 2/1 twill is just as easy to weave on the warp-weighted loom as the 2/2 twill and therefore is a natural part of the warp-weighted loom-technology. Furthermore an increasing number of early 2/1 twill weaves made on horizontal looms are coming to light[9].

Besides the twill there was a large amount of home-made woollen tabby. The old and original designation *einskepta,* which is documented for the first time in 1504[10], remains in use up to this day in Iceland and in the Faroe Islands and also in some Norwegian dialects *(einskjefta).*

Tabby used for sails is mentioned for the first time in 1586[11] in Icelandic written sources. Whether or to what extent the 2/1 twill was called *vaðmál* is not yet clear. An attempt to trace the word *vaðmál* as it was used by the people or the authorities has not brought any clarification. In Troms in Northern Norway it is said: *Det var altid 4-skaft til vadmål, (vaðmál* was always 2/2 twill)[12]. Tabby and 2/1 twill were named according to the number of shafts used in the weaving process, i.e. two- or three-shaft. In Nordfjord they distinguish between twill and tabby, *vadmel* and *einskjeft*[13]. Elsewhere in Norway they mention "two-shaft" and "three-" or "four-shaft" *vaðmál* i.e. a 2/1 or 2/2 twill[14]. In the Åland islands *vadmal* always meant 2/2 twill, but there is one mention of *tuskaftvallmar* (tabby). It is interesting to note that the twill or non-fulled tabby for sails was never called *vadmel,* this seemingly only applies to fulled woollen fabrics, as was also the case in Sweden. In Denmark a distinction was drawn towards the end between "two-shaft" and "four-shaft".

In the Faroe Islands as in Iceland, Troms and Nordfjord in Norway, *vaðmál* was traditionally a 2/2 binding. At the same time the authorities and their informants use the word *vadmel* for both tabby and twill[15]. This problem is found as stated above in all sources from the Nordic countries and it is also evident in connection with the traditional fabrics for sails, tabby or twill. If we turn to the medieval written sources to see how they use the word *vadmel* in connection with sails, we again encounter problems. The sources give no direct information on the quality or the degree of fulling. Although the Icelandic and Faroese tradition is the original one, it is not possible in my opinion to determine with certainty the exact construction of the fabric called *vadmel* (or *vað*), especially when we are dealing with sources other than the Icelandic ones. The starting point for our analysis then is that in the 11th-14th centuries and according to locality, ship-type, period etc. a variety of woollen fabrics (tabby and twill) have been used for sails, many of which were probably of a quality close to the one used in later times. This means that we should talk of woollen fabrics for sails and not *vadmel,* and when citing sources

Fig. 3. Horizontal looms. Second half of the 14th century. After Kjellberg 1943.



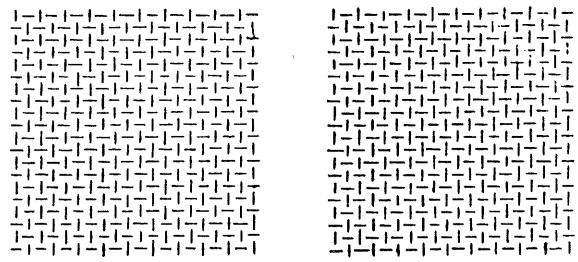
on *vadmel*, always make reservations as to the construction of the weave, the degree of fulling etc.

The three basic bindings

The three basic bindings, with which we are concerned, were originally named *þriskept, tuskept* and *einskept* and referred to the terminology of the warp-weighted loom. The modern terminology ("four-shafts", "three-shafts" and "two-shafts"), which we use here for the sake of clarity, belongs to the horizontal loom. A weave has two thread-systems: the warp, running the length of the fabric, is stretched out during the weaving, and the weft which runs across the fabric and is the "active" thread in the weaving-process[16].

"Four-shaft" and "three-shaft" are twills. The first is a 2/2 diagonal twill where the weft passes under and over two threads in the warp. There is a

Fig. 4. Three basic bindings.



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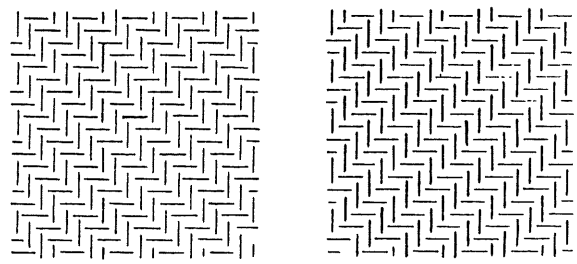

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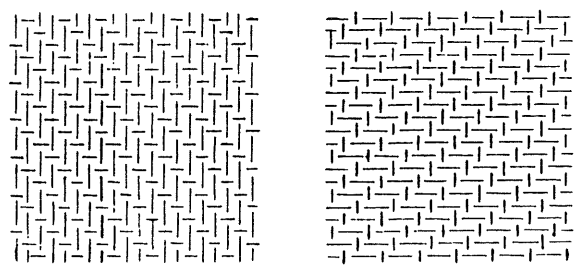

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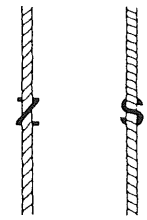

Z S

Fig. 5. The z- and s-spin.
After Bender Jørgensen 1992.

displacement of one thread for every weft passage producing a diagonal pattern on both sides of the fabric[17]. "Three-shaft", that designates a 2/1 twill, is per definition asymmetrical, the weft going over two and under one thread in the warp. This produces a diagonal pattern on one side of the weave only. The oldest of the weaves "two-shaft" or tabby is a plain weave, with the weft going over one and under one warp-thread.

There exist a number of variants to these simple basic bindings, but as they do not seem to have been used in sail-fabrics, they will not be mentioned here. The three basic bindings give ample opportunity for variations and combinations; the thickness of the thread, spin direction and quality of the spin (hard or loose) as well as fibre quality. The weave itself can be tightly beaten into a fabric that only needs a light fulling leaving the pattern of the threads still visible, or on the contrary a loose weave meant for a heavy fulling. These weaves can then again differ according to the type and quality of the thread, spin etc.

The two directions of spin, z (to the right) or s (to the left), are both culturally and technically significant. In the period we are concerned with, i.e. from the 7th-8th century to the beginning of the 20th century the general impression given by finds and other sources is that z-spin in the warp was predominant in the North Atlantic area and in North-western Europe. This is characteristic of the finds from the Viking Age and the Middle Ages as well as the two centuries just prior to the Viking Age. Further research may find s-spin in the warp to have been more common than indicated by the finds we have so far[18]. Further up in time the tradition for z-spin in the warp seems to have continued in Sweden, in the Åland islands, in Norway, Iceland and in the Faroes and probably also the old Norse regions of the British Isles, but in Denmark the later tradition remains unclear for the present. In some regions of Jutland it looks as if s-spin were the preferred spin for the warp in woollen twill[19].

Where the weft is concerned, it is possible to see some trends but we are dealing with too few finds to be able to get a general view. It is important to stress, however, that the spin in the weft and the warp combined with identical or differing fibre quality in the two systems is crucial for obtaining a fabric of the proper quality when fulled. A z-spin in the warp and a z- or s-spin in the weft was not a random choice.

Woollen sail material from the 16th century and later

The finds from Norway have up to now provided woollen sail material in 2/2 twill with a z-spin in the warp and z- or s-spin in the weft, and a 2/1 twill (Nordmøre) with z-spin in the warp and s-spin in the weft[20]. Tabby has not been found yet but it is named by the boat builder Ole Sande from Nordfjord[21].

The finds show the following characteristics:

1. The fabric is tightly beaten in.
2. Warp and weft are of single threaded yarn.
3. The warp is hard and smoothly spun of long wool fibres with a large content of hair, while the weft has a large content of both wool and short hair spun quite loosely and accordingly it is thicker.
4. The warp has more threads per centimetre than the weft.

The fabrics are light to quarter-fulled, and the side of the sail which is away from the wind when sailing against the wind is quite smooth and clearly shows the weave-pattern. On the other side of the material the fulling is more or less intact. This is especially marked on the 2/1 twill. The fulling on the front side of the material has presumably been worked away by the subsequent treatment of the sail, so the wind gliding past the sail at great speed dered[22]. Both sides of the material have been light to quarter-fulled after weaving and before being sewed up into a sail. The continuous after-treatment of the sails have traditionally been carried out by rubbing the front side with sheep-tallow or horse-fat (from the part underneath the mane, with tar or train oil or some other filler added). The same treatment was used on sails not made of wool combined with a treatment with birch bark.

The 2/2 twill fabrics show a thread count of 11 and 12 threads per centimetre in the warp and 9 or 7 threads in the weft. This twill-type can be used for sails of 33-35 m^2 or larger. It is obvious that the larger the sail the heavier the material needs to be and the fewer threads you have per centimetre in warp and weft. We presume that there must have been lighter material with a larger number of threads per centimetre and altogether a larger variation than demonstrated by the few preserved sails or sail-fragments. The quality and thickness (weight) of the wool sail-material must, like the preserved linen, cotton or hemp material for sails have been dependent not only on the size of the ship and its sail but also on the type of ship, where and when it sailed, summer and/or winter sailings, more or less wear on rigging and sail etc.[23]

Before we proceed, we have to discuss the importance of the spin-direction in the weft seen in connection with the z-spin in the warp, the structure of the fibres, degree of fulling and so on, as

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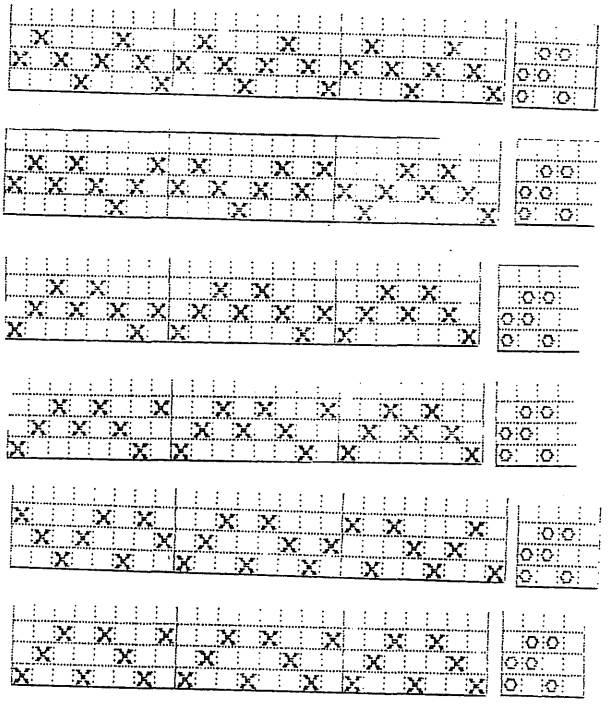
FOR THE LOOM

3-shaft krokbragd threadings from the class by Ulla Suul, Vesterheim, Summer. 1995



THE WEAVER'S FRIEND

Several NBC members have requested information about THE WEAVER'S FRIEND A Publication for Rag Rug Weavers. You can acquire this newsletter by writing to Janet Meany at 5672 North Shore Dr., Duluth, MN 55804. It is a twice yearly publication. The subscription price is $8 ($10 Canadian) per year. A free introductory copy is available.

Look for BIOGRAPHICAL NOTES in the next issue.

NORWEGIAN FOLK ART: THE MIGRATION OF A TRADITION

We promised you more information on the exhibition NORWEGIAN FOLK ART: THE MIGRATION OF A TRADITION, the 210 object show documenting the movement of Norwegian folk art from Norway to the New World, which opened September 13 at the Museum of American Folk Art in New York. At MAFA until January 6, it has received considerable attention and good reviews, including a visit from the Norwegian royal couple during their visit to the United States in October, (They also later visited Vesterheim in Decorah, where our member Laurann Figg escorted them through the textile gallery.)

Venues for the exhibit at present are June 1-October 20, 1996, State Historical Society of North Dakota, ND Heritage Center, Bismarck; November 10-February 2, 1997, Minnesota Museum of American Art, St. Paul; February-May, 1997, Norwegian Heritage Center, Seattle; and June-fall 1997, Norwegian Folk Museum, Oslo, Norway. Many lectures, tours, and other events accompany the exhibit in MAFA and that will no doubt be the case in other areas.

Six NBC members, we are proud to report, have objects in the show which exemplify the Norwegian traditions influence in America today: they include Nancy Jackson (picture weaving), Betty Johannesen (boat rya), Jan Mostrom (aklevev), Betty Nelson (double weave pick-up), Lila Nelson (Vestfold inlay), and Mary Temple (danskbrogd).

Marion Nelson, guest curator of the show, reports that the long awaited 300 page catalogue is due to be released in both hard and soft cover by Abbeville Presss, New York, in the near future. He suggests you check with your local bookstores.

THE COVERLETS OF NORWAY WILL BE AVAILABLE SOON

Who would have thought that assembling the many photographs and illustrations for The Coverlets of Norway would be such an undertaking? For the past two years I have corresponded with a variety of museums, archives and individuals in Norway, Sweden, Denmark, Iceland, France, and Poland, and here in the United States as well. Finally the last of the nearly 300 illustrations arrived and the book has been sent to the publisher.

Primarily featured in the book are photographs of the coverlets themselves, but illustrations also include paintings of folk life in centuries past by such artists as A. Tidemand and J.C. Dahl, and photographs from the early 19th century of women engaged in the many steps of textile production. Perhaps my favorite of these is the woman from Sor-Trondelag who is sitting on the grass, shearing a sheep that she holds in her lap. Contrary to most early photographs this woman is smiling and, as far as I can tell, the sheep is smiling, too.

The Coverlets of Norway should be available in late spring of 1996 from Flower Valley Press. Unusual weather patterns you may have experienced this September were probably due to one very large sigh of relief from the Northwest.

Kay Larson

STUDY GROUP

Several NBC members have contacted Jan Mostrom, indicating their interest in a study group. They expect to begin a study of krokbragd and danskbrogd in January. Other interested individuals can contact Jan. Her address is 183 Cascade Ct.,Chanhassen, MN 55317.

CONVERGENCE 96 - PORTLAND

The second meeting of the Norwegian Breakfast Club (NBC) will meet for a no-host breakfast, Friday, July 19, 1996 during Convergence 96 in Portland. We will be sharing information about technique, research and resources relating to Norwegian textiles. We will be looking for individuals willing to focus in the following areas: future conference in Decorah, future exhibit for NBC (perhaps in Atlanta), translations, Norwegian weaving techniques, information on new books coming out of Norway and exhibits in Norway.

Come and bring your ideas. Pre-registration is not required.

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this can be seen in the woollen materials of more recent times.

The 2/2 twill that needed a heavy fulling or felting was made with s-spin in the weft, so that the core of the fabric would be completely fulled because opposite spin direction of the threads for warp and weft made for a slower fulling-process on the outer sides of the material and assisted a core-felting[24]. With a z-spin in both warp and weft (as in lightly-fulled tweeds) felting was induced on the outer side at the expense of core-felting[25]. No doubt this theme can be endlessly varied. The woollen sail-material at present available for research is not suitable for (and was not meant to be) a complete fulling because of the large content of hair in the hard-spun warp, which reduces the felting ability whereas the weft was loosely spun. This is the basis of the strength of the material and the retention of the controllable trimming elasticity which the material for a square sail must possess.

Where woollen sails or woollen sail material is mentioned for instance in Norwegian inventories in wills from Nordland, they are called *vadmul*[26]. But here again we do not know their quality, fulling or the binding. It is likely to be a similar type of material to the above-mentioned. In more recent tradition it probably would be a 2/2 twill. As far as we know, there are no finds of wool sails or fragments thereof in Sweden and the former Swedo-Finnish region. But if we turn to the written sources from c. 1500 and later, a source material that probably could be added to by thorough research in archives, we find the outlines of the problem as follows:

In the 16th century and the beginning of the 17th woollen material was as common as other kinds of material for the sails of larger ships and naval ships. On the boats of the peasantry sails of woollen material (square-sail or other types of sail) prevailed until the 19th century.

In 1535, for instance, Gustav Vasa ordered the ship *Svanen* to be rigged with sail *enten af vadhmal eller annat,* (made of vadmal or other material)[27]. Of the 4747½ *alen* of *vadmal* of different qualities that the royal clark collects or buys in the year 1541, 100 *alen* goes to the "Ship yard" for sails and tar-swabs. Another 130 *alen* is used for a sail for the Queen's pleasure-yacht (and 70 *alen* to cover her four-poster bed)[28]. Approximately at the same time the Crown pays for the production in Finland of *vadmal* for soldiers' uniforms and for sails. When the navy was rearmed in 1611, the

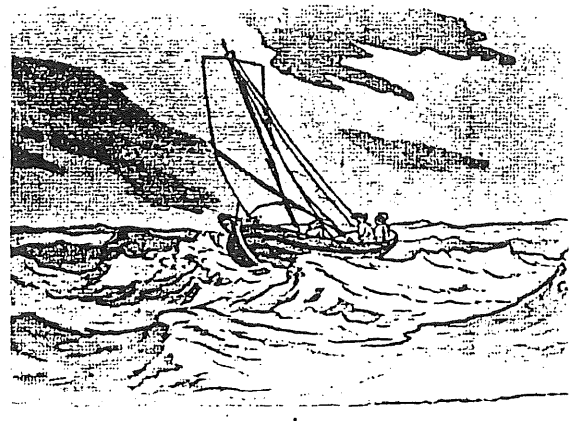

Fig. 8. A "bigboat" from the Åland islands tacking with a wool sail. Drawing after Ehrensvärd 1747.

Governor at Gripsholm sent his clerk Anders Nillson to the Strängnäs market to buy up all the cloth and canvas for sail-making he could find. In 1613 Anders Månsson, one of the merchants of the Crown, was sent out on the same errand by the same Govenor, *at upptage all den väv, som findes der, både valmar, lärft och annat,* (to buy up all the weave, that are there, both *vadmal,* canvas and other)[29].

The mid-16th-century accounts of the castle of Kastelholm (in the Finnish archipelago around the Åland islands) tells us of yearly deliveries from their stores of twill for sails, for instance 264 *alen* in 1551[30]. In the 1930s there were still many people living in the archipelago who had sailed with wool sails. This material was described as woollen "sheep-white", 2/2 twill in a tight weave. There was no knowledge of *vadmel* for sails, so the material in question must have been only lightly fulled[31]. Other information concerns a white or gray woollen material (2/2 twill), and sails made of un-fulled woollen material (tabby) is also mentioned. One source states that the word *vadmel*-sails is used interchangeably with the word woollen-sail[32]. From Kökar it is related that the most careful spinning was done when producing the threads for sail material. The thread must be thin and hard spun (for the warp)[33].

These fabrics for sails then seem very like Norwegian material. Does this also apply to the woollen material for sails that the Swedish authorities produced or bought up on markets in the 16th and 17th centuries, or that was "given out" by Kastelholm castle? In 1611, furthermore, there is a mention of "cloth", which we shall return to.

To begin with we must make it absolutely clear that there was a certain type of woollen material on the markets that was very suitable for sails, but probably also for other uses where robust material was needed. The fabric must be of a certain width to fit a sail (i.e. not too wide). On the Åland islands the woollen sail material traditionally had a width of 70-75 cm, the same as $1^1/_4$ *alen*[34]. The question is now whether the sail-material produced in Finland by the order of the Swedish Crown was of this kind, and we suggest that it was. Furthermore, were these materials the usual *vadmel,* only lightly or un-fulled fabrics, or was it the completely fulled fabric in z/s-spun threads[35]?

The many complications caused by changes in the meaning of the term *vadmel* in the course of time are perhaps best illustrated by Sven T. Kjellberg in his work *Ull og Ylle* from 1943: *by vadmel we understand in later periods a plain coarse material (2- or 4-shafts), completely fulled but not sheared or dyed. In modern terminology vadmel signifies a specific weave. This was scarcely the case in earlier times...* Earlier, i.e. the 18th and 19th centuries, cut woollen materials are often mentioned in inventories of Swedish and Finnish villages.

Back in 1611 "cloth" *(klæde)* was, as already mentioned, bought at the Strängnäs market, and this is interesting if "cloth" is meant and this is not just another word for woollen material. In the Middle Ages the term "cloth" was used for imported material of many qualities from European as well as Middle Eastern producers. Some of the material was like the burel other like the home-spun *vadmel.* To reduce the large imports and to meet the growing demands for cloth by the military and navy the Swedish authorities by the mid-1500's had established a number of cloth mills *(vantmakerier)* to produce a variety of fabrics[36]. But this would not seem to be able to explain the information of 1611, since it would be more logical for the cloth to be delivered directly from the mill and not bought at the market. We still need to know whether cloth-making in the Middle Ages and the 16th and 17th centuries was in principle the same as in 18th-century Sweden. In the later period there was a clear differentiation between "cloth" and "fabric". The latter was made of worsted, long-fibre wool that gave a smooth, round, twisted yarn not intended for fulling. The pattern of the weave could be clearly seen on this type of material. The "cloth" on the other hand was completely fulled and did not show any weave pattern. The threads were loosely spun carding wool

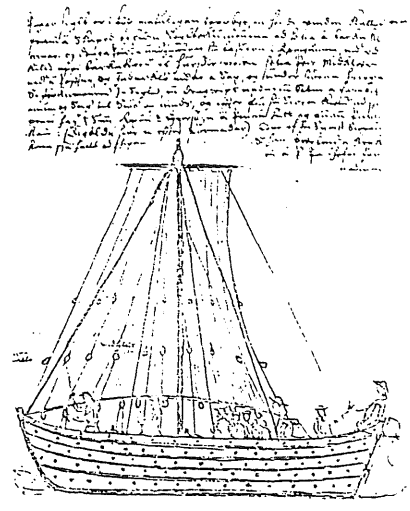

Fig. 9. Icelandic *tolffæringur.* The square sail is probably tabby, *seglaeinskeptu,* c. 1704. After Kristjánsson 1982.

giving a more fleecy material suitable for fulling. A z-spin was used for the warp and s-spin for the weft. Besides being fulled, the fabric was raised and sheared. The cloth was often dyed.

The question now is whether these two types of woollen material and their non-, lightly-, half- to completely fulled varieties all can be found lumped together in the medieval and 16th-century imports of cloth (the Norse *klæði*)? If the 1611 information on the contrary refers to "cloth" in the 18th-century meaning of the term, we are talking of a completely fulled, sheared woollen material for sails. This material could incidently also have been home-spun woollen material raised and sheared as cloth[37].

In the Norwegian encyclopaedia *Illustreret Norsk Konversationsleksikon* vol. IV a distiction is made between wool for combing and wool for carding. The former had fibre lengths of no less than 80 mm and usually 120-240 mm with little curling and as a rule was much coarser than the carded wool. The latter was very fine and curly of lengths less than 100 mm. This was used for *ordinary fabrics and fabrics for fulling.* Both types of wool were at this time produced on machines and no longer with handtools. The carded wool was usually spun on a so-called woollen mule. In the book *Vœvebog for Hjemmene* (The home-weaving book, pp. 37-39) both tabby and twill are mentioned as *vadmel* or cloth made of a good quality mixed carding wool (preferably from lambs), not too tightly weaved for the sake of the subsequent

fulling process. It is also mentioned (p. 40) that serge for men's clothing is different from cloth in that the worsted yarn for the warp must be tightly packed in the reeds so that the cloth then only needs shrinking and pressing. We can see from this that *vadmel* and cloth are nearly identical and that serge is closely related to the woollen material for sails which we are looking for.

Finally, we shall go to the far north-west, to the Faroe Islands and Iceland. As Svabo writes about the old Faroese square sails, they are *made of white tabby (ajnskjefta),* and about woollen materials in the Faroes generally he says, *the most common types of material are: twill (trujskjefta) and tabby (ajnskjefta) which are usually used for sails for boats, and for shirts*[38]. Incidently Svabo makes the mistake of calling tabby *vadmel* and he translates *trujskjefta* (Old Norse *þriskept*) as three-shaft twill and not four-shaft as it is in reality. From other sources we have similar information about woollen material for sails in a plain weave (tabby)[39]. There also seems to be a single threaded yarn in the warp made from the longest and most coarse wool and a weft of finer wool. Furthermore, the white wool is plucked (not sheared) off the sheep in the spring[40]. At the Viking Ship Museum we have learned from the wool sail in tabby which we made for a Faroe boat that a z-spin probably was used in both the hard-spun warp as well as in the more loose and full weft made of a combination of short hair and wool. This is in principle like the Norwegian sail material, which is made of worsted wool from the old sheep race with long hairs in the warp. The Faroe sail material was not fulled but it must have had some kind of treatment to steady the material before it could be sewn into sails.

The square-rigged boats in Iceland to all appearance carried sails of non-fulled *seglaeinskeftu* or *togþráðareinskeftu* (tabby). This would be similar to the material for shirts worn by the peasantry, and we have one piece of information from 1739 about a supply of material *(seglaeinskeftu)* for sails for boats, wall-tapestry and chair-seats. By the turn of the century this type of woollen material was still in use for sails at Landeyjum[41]. The term *togþráðareinskeftu* means *einskeftu* (tabby) of hair. We do not know if this means a fabric made only of hair in both warp and weft, a kind of haircloth. It is a very strong and stiff material that in our experience is difficult to get sufficiently tight[42]. This deficiency, on the other hand, could perhaps be corrected with greater weaving-experience. Incidently, in Norway experiments with Norwegian wool were carried out in 1956 at an industrial school, *Statens Kvinnelige Industriskole,* which established that fabric made of hand-spun yarn of hair is unsurpassed as upholstery fabric but costly[43].

From the former Norse Østerbygd near Narsaq in Greenland we have a number of textile fragments in which the z-spun yarn in the warp is made of hair and the s-spun yarn in the weft is predominantly wool. The material is only lightly fulled, with the weave-pattern still intact. None of these fragments is probably sail-material but they all have fibre-components in the yarn etc. very like these[44].

As concerns other areas such as the Shetland Islands and the Hebrides, there is no doubt a good chance of finding information on woollen sails in archives etc., an area of research which we are now planning to get started. But for the time being Amy Lightfoot is concentrating on the old woollen materials, their qualities, treatment etc.

We have examined a large body of Danish source material with no results as yet, but we have not given up hope of finding information about wool sails and woollen material for sails.

This article first appeared in -SHIPSHAPE- Essays for Ole Crumlin-Petersen On the occasion of his 60th anniversary February 24th 1995, Vikingeskibshallen i Roskilde. Reprinted with permission.

NEWSLETTER HAS A NEW NAME

The Norwegian Breakfast Club met July 14, 1995 at the Simon Fraser Inn in Prince George, British Columbia. The occasion was the biennial conference of the Association of Northwest Weavers Guilds. At that time Karen Casselman recommended that the name of the newsletter be changed so that it will more accurately convey the nature of its content rather than appear as a collection of good Norwegian lefse recipes! Several other members have written to say that they agree with Karen. After much thought, we have re-christened the letter, it will be called the Norwegian Textile Letter. The organization will continue to be called the Norwegian Breakfast Club.