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Tybrind Vig

A Preliminary Report on a Submerged Ertebølle Settlement on the West Coast of Fyn

by SØREN H. ANDERSEN

The late Mesolithic Ertebølle Culture in Denmark c. 4,600–3,200 b.c. (conv. C-14) is one of the most thoroughly investigated mesolithic cultures in Northern Europe. Our knowledge of Ertebølle economy and settlement types is, however, still limited by the fact, that almost all the excavated settlements are 1) located along the coast and 2) situated in the north-north-eastern part of Denmark.

Since the end of the last glaciation, c. 13,000 b.c., the relationship between the land and the sea in Denmark has undergone great changes. The modern extent of Denmark is a result of a series of eustatic and isostatic movements during the late- and postglacial 13,000–500 b.c. (see K. Strand Petersen, this volume). As a result, today the prehistoric coastlines are exposed and lying far inland in northern Denmark, while the opposite situation is the case in Central and South/South-West Denmark; here late glacial and Mesolithic coastal sites are now submerged, and are either completely eroded away or very difficult to discover. In these areas of Denmark excavation of such sites is only possible by means of underwater archaeological techniques (Mertz 1924. C. Christensen 1982).

That these eu- and isostatic changes, and thereby the old coastlines, have a special interest for archaeologists is connected with our present knowledge of the settlement pattern of Mesolithic man: the coastal sites of the Kongemose (6,000–4,600 b.c.) and the Ertebølle cultures (4,600–3,200 b.c.) always lie adjacent to the beaches, the shallow water off the sites frequently producing immense numbers of wasters and artifacts – either because the adjacent waters have been used as a sort of 'dump area' or because the material has been washed out by wave action or high tides.

So far we just have very few traces of late glacial and Boreal coastal sites in the south Scandinavian area (L. Larsson 1983: 283–301). If we turn our attention to the Kongemose and Ertebølle periods the situation is quite different, which is understandable because the late Mesolithic coastlines are just 1–10 m below modern sealevel.

From the Ertebølle period we have several regional studies clearly indicating that the number of submerged sites are in hundreds or thousands in the south-southeastern parts of Denmark (Fischer & Sørensen 1983, Skaarup, 1983).

This environmental factor explains the special distribution of the Ertebølle-sites, and why the well known coastal sites are all found in the north-northeastern part of Denmark. These circumstances must always be taken into consideration in studies concerning the extension and the settlement-pattern of this culture.

That the southern part of Denmark has had a coastal settlement also, is shown by incidental finds, which have appeared from dredges of harbours etc. (Mestorf 1904, Norling-Christensen & Brøste 1945).

In many respects this situation is very unsatisfactory; we are not only lacking the most basic information of the Ertebølle Culture in this area, but the lack of excavated sites in such a large part of Denmark makes it very difficult to identify regional differentiation and influences/contacts between late Mesolithic cultures in Denmark and contemporary Neolithic cultures further to the south on the Continent (Andersen 1973).

History of investigation

It has therefore long been desirable to examine Ertebølle settlements in this part of Denmark. In view of this, the discovery in 1978 of a hitherto unknown submerged Ertebølle settlement in Tybrind Vig (Danish vig = cove or small bay), in western Fyn, aroused particular interest. The settlement, discovered by amateur divers, lies today on the seafloor some 250 m from the present day beach – an indication of the position of the prehistoric coastline (fig. 1).

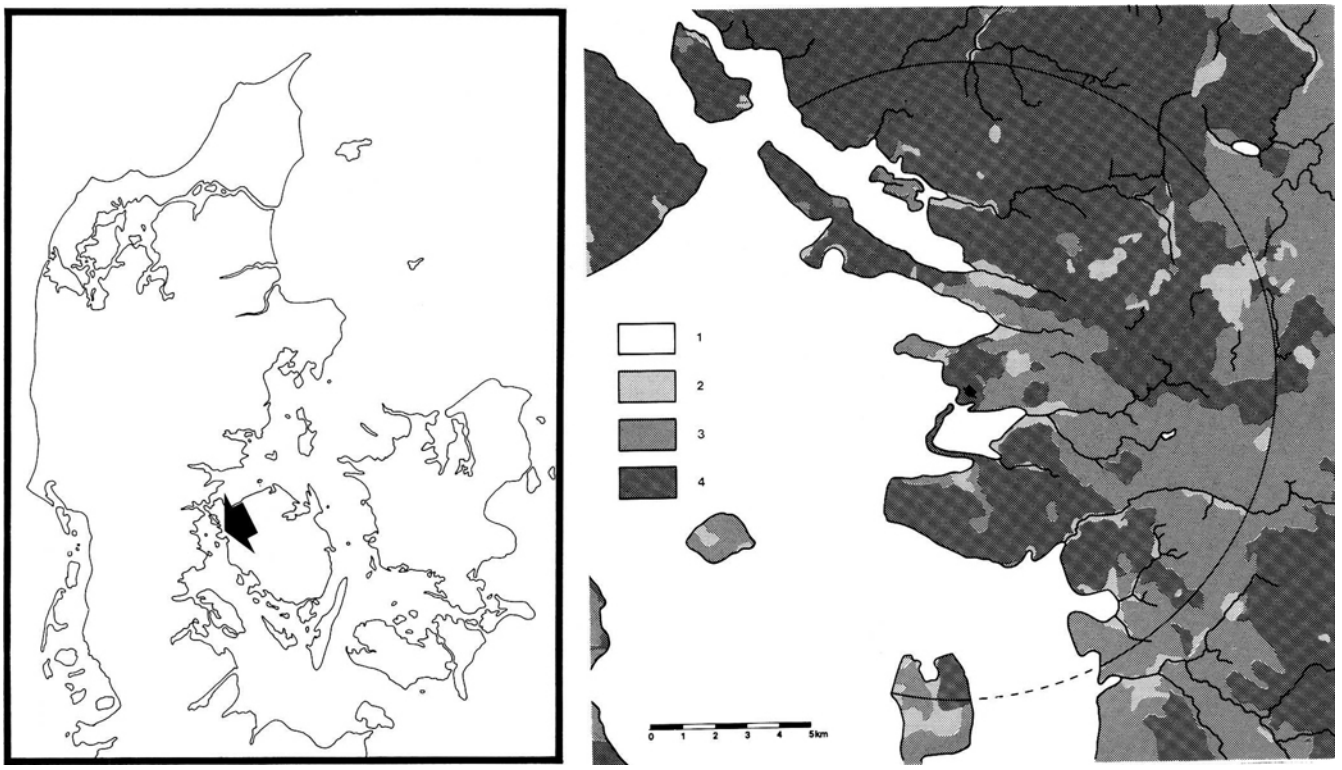


Fig. 1. The position of Tybrind Vig and the distribution of various resource types and coastline c. 3,200 bc (conv. C-14 years). (1) Sea and freshwater lakes. (2) Waterlogged areas. (3) Sandy soil. (4) Other soils. (Elsebeth Morville *del.*)

A trial excavation revealed that the seabed consisted of a layer of 1–2 m deep, undisturbed gyttja with artifacts, animal bones, antler, wood, leaves, fruits, seeds, and branches of trees and tree trunks. The gyttja layer – a prehistoric marine sediment – had been deposited just outside of the habitatin area (in the calm basin during a gradual rise in sealevel).

The position of the site indicates that the Tybrind area has sunk 2–3 m since the late Mesolithic, meaning that all items that, for whatever reason, ended up in the gyttja of the bay, have always lain in wet surroundings. Conditions of preservation for organic materials are therefore the most ideal yet encountered, as will be seen from the following.

As it became apparent that the site was unique, excavation was undertaken and subsequently developed into the first and largest systematic excavation of a submerged settlement ever carried out in Denmark. Therefore, we litterally had to start from "the bottom": to develope the nescessary technique and equipment and to solve a lot of problems, mainly technical ones, and to learn by our own mistakes. In addition, there was the big overriding question: Was it at all possible to accomplish an underwater excavation in Danish muddy and stormy waters? The answer is yes, but it took a lot of time, money, mistakes and experiences, and it has only been possible because the gyttja layer is soft, but nevertheless firm, while the waters of the cove were relatively calm (1).

Excavation

The excavation was carried out by frogmen at a depth of 2–3 m (fig. 2–3). Very quickly we found out that work had to be organized almost as on dry land, though with a few exceptions. A measuring-system was laid out and nailed in a fixed position on the sea floor. In other words, individual square meters were excavated and all finds were plotted three dimensionally with absolute depth measured relative to average sea level. The actual excavation was performed either by meticulous scraping with trowels or by careful "waving" or "whisking" of the hand. Very fragile finds were always exposed and excavated by means of a water spray, and recorded *in*

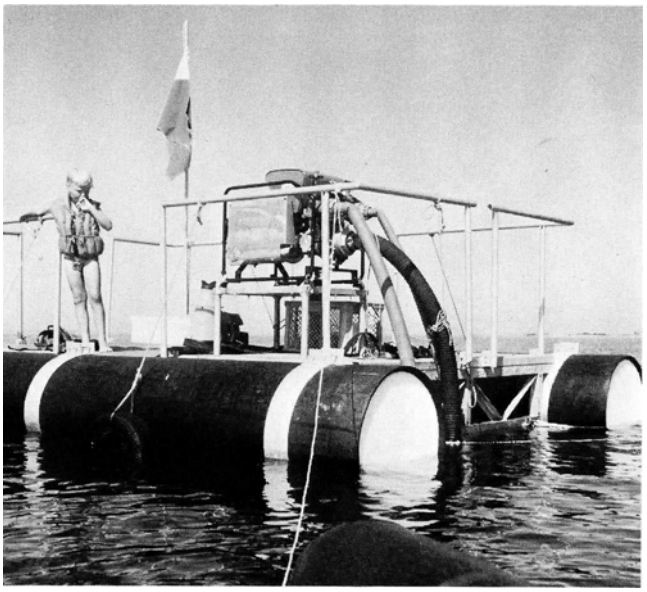


Fig. 2. Pontoon positioned over the site which lies c. 3 m below the surface of the water. The steel platform which measures 5 × 4 m carries a compressor for the pumps used to clear the digging area on the sea floor. (Photo S.H. Andersen)

situ before lifting for conservation. During work the squares were cleaned by means of pumps connected to a compressor mounted on a pontoon positioned over the site by means of large anchors in the four corners, fig. 2. Because of the composition of the deposits, vertical sections of the 1.5 m of organic layers could be cut and maintained – not only during a whole summer's campaign, but also from year to year. Horizontal plans and sections were measured and drawn, and C-14, pollen, seed, and wood samples were taken (fig. 5).

Today, after 7 years of work – c. 100 m^2 have been excavated which corresponds roughly to 20% of the site (fig. 4).

Tybrind Vig in the Mesolithic

About 6,000 years ago the inner part of Tybrind Vig was presumably very different from today and formed a large, bowl-shaped cove, cut off and well-protected from the Little Belt by a semi-circular reef or chain of small islands (fig. 1). The surrounding area was covered by dense oak forest, with sporadic lime, elm, and fir. Hazel, elder, and birch thickets lined the shore of the bay. In the Mesolithic the bay was a calm, shallow area surrounded by reeds (2). Only to the northwest there was a connection with the Little Belt, through a narrow opening which can be seen on the sea bed today as a deep, steepsided channel, originally cut by tidal erosion (fig. 1).

From the hilly areas to the east several freshwater streams had their outflow in the cove, whose water must have been brakish. Just at the opening, it was salty enough for molluscs as indicated by many shells of marine molluscs in the deposits of the cove.

Other Mesolithic sites have been found along the shores of Tybrind Vig. They all belong to the Ertebølle Culture (Albrectsen 1960: 147–151).

The site (arrow on fig. 1) was situated on the southwestern end of a peninsula, just at the opening which connected the cove with the open sea. This was the most suitable position for hunting, both in the surrounding forest and out on open sea, as well as for

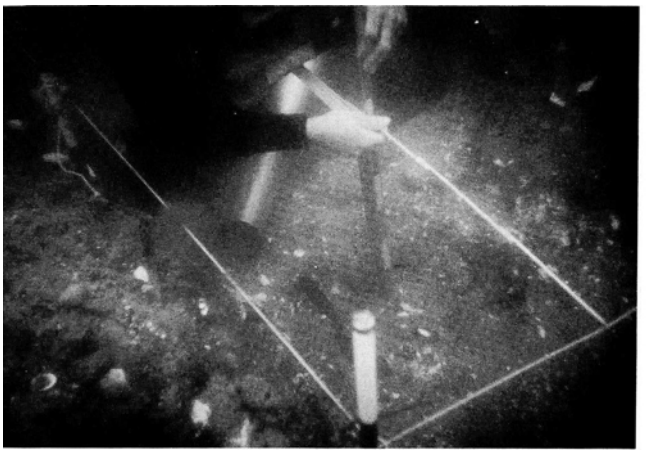


Fig. 3. Excavation by frogmen on the sea floor. (Photo H. Dal)

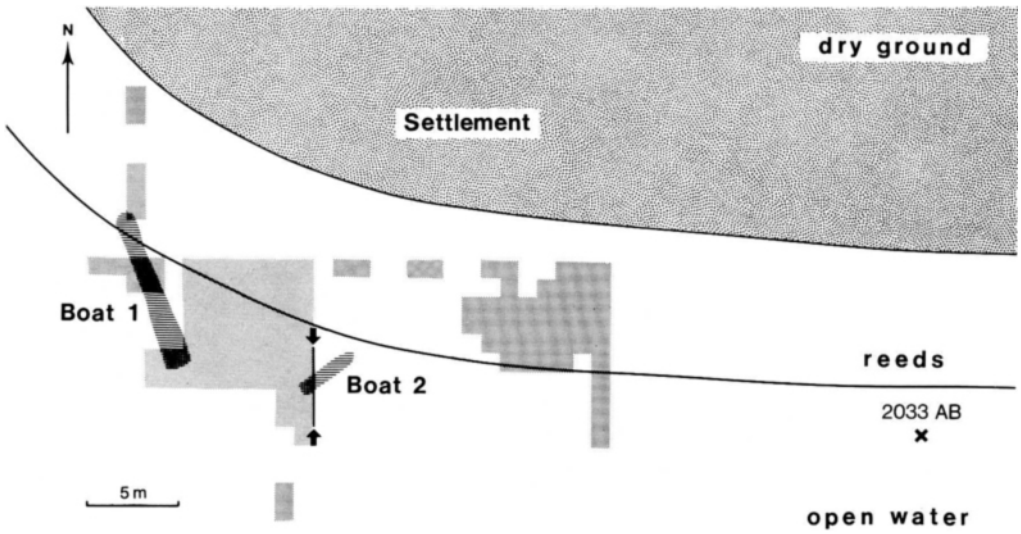


Fig. 4. Plan of the excavated area (shaded) and the position of the two boats in the reed area just outside the prehistoric seashore. (J. Kirkeby *del.*)

gathering and fowling. Next to the settlement was the channel, bay, and sea with all their possibilities for fishing.

Unfortunately, most of the habitation area has been eroded away when the site was flooded by the sea; only a part of the northwestern settlement area remains, as well as the beach, and the deposits from the shallow water off the coastline. 'In situ' finds occur in the marine layers in a zone some 50 m long (E-W) and 10 m wide (N-S) along the shore of the former bay (fig. 4). These finds consist of a mixture of discarded waste and tools, which were primarily fishing equipment lost in the bay during use. Along the shore there were traces of thick posts and a cobbled area going from the site out through the reeds, probably functioning as a dock for the beaching of boats (fig. 4). Also rows of pointed hazel sticks were found placed vertically, probably the remains of fish traps, and in at least one place, several leister prongs were found standing vertically or at an angle, presumably lost during fishing outside the reed area. In addition, several fish hooks were recovered. Everything here suggests the presence of an Ertebølle 'fishing location' which lay just off the settlement (Andersen 1980). Thus, this area was not just a "rubbish deposit" – a midden – of the sort known from many other huntergatherer settlements, but a combination of inshore fishing "activity area" and scattered settlement refuse.

Stratigraphy

The marine sediments deposited in the shallow waters adjacent to the site reflect a gradual rise in the prehistoric sea level during the period of occupation. However, it is not possible to say whether this was a continuous process or not. The bottom part of the section is made up of intermixed layers of sandy gyttja with marine molluscs, large boulders, branches, and tree trunks, while the top horizon consists of a thick homogeneous layer of fine, brown gyttja without sand, and with fewer mulluscs (fig. 5).

The explanation of this difference in sediments and what it means in terms of environmental change is so far unknown.

An analysis of the sections demonstrates that they probably reflect two or three well defined horizons of big stones, tree trunks and archaeological material. These levels, which are easily distinguishable – both as a horizontal and a vertical stratigraphical series (fig. 5) – most probably reflect a series of stages (beaches) – each attached to a period of occupation – during the gradual rise in sea level.

Dating and cultural context

The finds reveal that the site belongs to the Ertebølle Culture, and the C-14 analysis delimits the occupation from 4,600 to 3,200 b.c., i.e. the whole Ertebølle period.

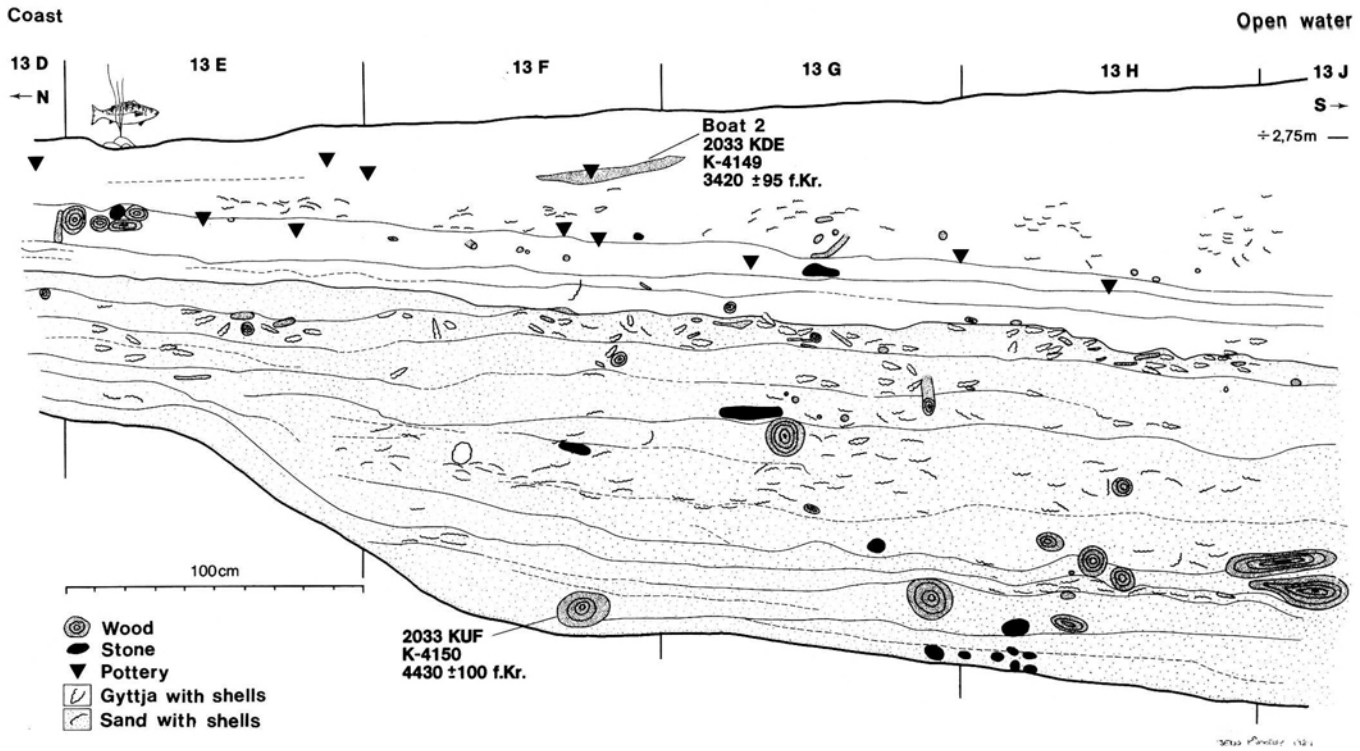


Fig. 5. N-S section through the marine deposits at right angles to the shoreline. The finds of Ertebølle pottery are plotted on the section (triangles), and the position of Boat 2 is indicated. The position of the section is indicated by arrows in fig. 4.

The deepest part of the cultural horizon contains artifacts belonging to the early or "aceramic" Ertebølle Culture, 4,600–3,700 b.c., (Dyrholmen I), while other finds, from the upper part of the gyttja layer, indicate that the site was also visited after the knowledge of pottery-making reached the area in (or around) 3,700 b.c., and right through the "ceramic" or younger, Ertebølle (Dyrholmen II) until the transition from the Mesolithic to the Neolithic c. 3,200 b.c. (Andersen 1980).

Anthropological evidence

Turning to the occupants themselves the scattered bones of at least 2–3 individuals were found, and among these, were several cranial fragments, one – probably male – with two (healed) lesions. This feature is known from other Ertebølle males skeletal remains, i.e. Korsør Nor (Norling-Christensen & Brøste 1945), and is probably an indication of stress and growing competition for land and territory in the Ertebølle period. In accordance with observations at the Ertebølle cemetery at Bøgebakken these scattered bones are best explained as the remains of an Ertebølle cemetery situated on the site, and have been eroded during the rise in sea level (Albrethsen & Brinch Petersen 1976, 1977).

This was confirmed by the finding of an inhumation grave of a young female (15–17 years) with a newborn child (1–3 month) on the remaining part of the settlement area proper (fig. 6). They have been buried in a shallow pit – the female laying in extended position with the child across her chest; unfortunately without any gravegoods. Analysis of the skeletons did not give any indication of the cause of death.

A C-14 sample dates the adult to about 4,490 b.c. (K-3558) and she is therefore one of the oldest mesolithic skeletons from Denmark (Andersen 1984b). Contemporary (and identical) graves of young females with children are also wellknown from Bøgebakken (Albrethsen & Brinch Petersen 1976: 9–10).

Analysis of the stabile isotope ^{13}C from the bones of the young female indicates that her food mainly was composed of a marine diet, i.e. fish, shellfish, seals etc. (Tauber 1981).

Our knowledge of *personal ornamentation* of the occupants of the site was extended by the finds of perforated

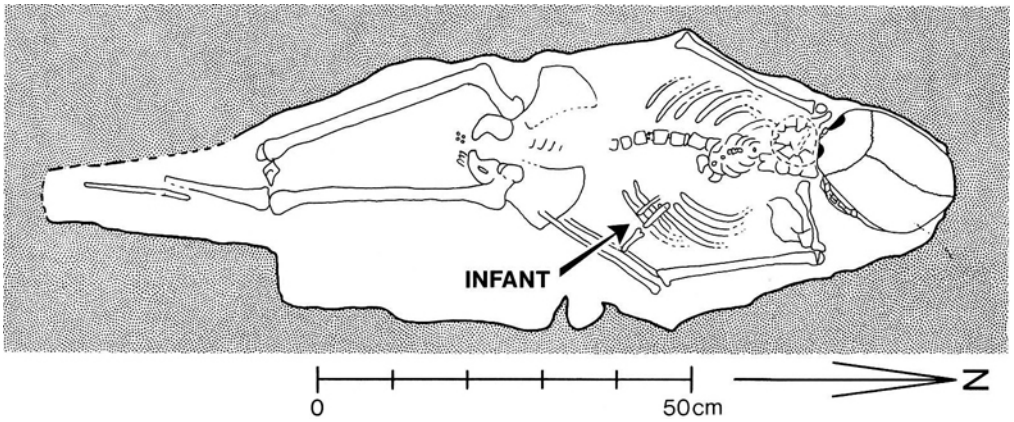


Fig. 6. Plan of the grave with the young female and the infant. (J. Kraglund *del.*)

teeth of wild boar and red deer (fig. 8) (Andersen 1984c, fig. 19).

Economy

The subsistence was based on hunting, fishing and gathering. This is well-documented by the many artifacts connected with hunting and fishing and by large numbers of animal bones, mainly of mammals and fish, while birds are few (3). In addition there are many mollusc shells, hazel nuts, and acorns. The only domesticated animal is the dog. Red deer and wild pig were the most common animals, roe deer were frequently hunted, while elk and aurochs are represented by only a few bones. Fur-bearing animals were also killed: pine marten, wildcat, fox, otter, badger, and polecat. It is interesting, that the proportion of fur-bearing animals is very high, as it is also the case in some of the other Ertebølle sites i.e. Ringkloster (pine marten) (Andersen 1975). In almost all cases the bones of fur-bearing animals lay in clusters, each representing a single animal, and hereby clearly indicating, that these animals were not eaten. Clear cutmarks on the mandibles and upper parts of the skulls were probably caused by the flint knives used for skinning; symmetrically placed depressed fractures on the rear of the skulls being either caused by the traps with which the animals were caught or stemming from the implements used to hold the animal in a fixed position during the skinning, (fig. 9).

It is remarkable that the majority of the bones from the fur-bearing animals, especially the pine marten, are only found in the top layer (gyttja). At present, however, it is impossible to tell whether this is a reflection of a general shift in the economic activities of the site, or just an "episode".

Seal, porpoise and whale were hunted at sea, and along the coast, some swans and ducks were captured. Despite the excellent conditions of preservation, it is interesting to note, that only a few bones of duck and swan are found.

That fishing has been of great importance is confirmed by the many technological items used for fishing, the large numbers of bones of small cod (30–50 cm), spurdog, and eel, the ^{13}C analysis of human bones, and food crust from the inside of the pots (Tauber 1981, Trolle-Lassen 1984, Andersen 1984b).

Gathering is documented by hazel nuts, acorns, and shells of oysters, mussels, clams and periwinkle.

As to the seasonality, a definite statement must await the final analysis by the quaternary zoologists. How-

fig. 7. Photo of the female skeleton partially exposed. (Photo H. Dal)

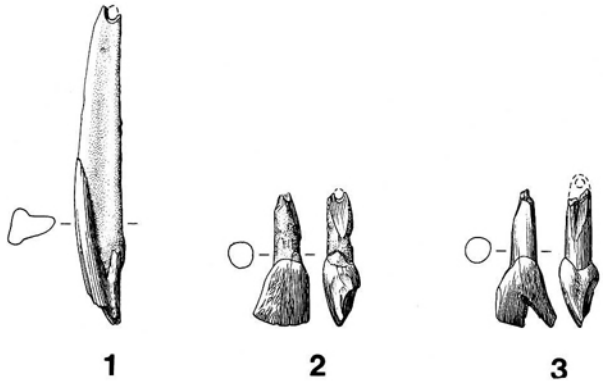


Fig. 8. Pendants of perforated teeth of wild boar (1) and red deer (2–3). 2:3. (Orla Svendsen *del.*)

ever, it is possible to state that both summer, autumn, and winter indicators are found, but it would be premature to argue for a permanent, whole year occupation.

The finds

A number of implements of flint, bone, antler and pottery of the types common for the Ertebølle Culture were found. The artifacts occur in the same types and relative proportions as known from other coastal sites covering the same time span. Due to the long duration of the habitation and the well documented stratigraphy and C-14 sequence we can observe several changes in the total artifact inventory – some of which are just gradual and minor relative changes, while others, i.e. the introduction of ceramics, are more abrupt and therefore more interesting from an cultural-historical point of view.

The flint inventory is characterised by many tools on good blades; *scrapers*, *borers*, *burins*, *truncated pieces*, and *saws* (fig. 10). Together with these types are *transverse arrowheads* and *axes* – both *flake* – and *core axes* (fig. 11). The flake axes dominate in the top layer, while the two forms are evenly represented in the bottom horizon. In addition, we have *axes made on greenstone* (Diabas). One of the differences in the flint inventary between the deepest layers at Tybrind Vig and contemporary sites in eastern and northern Jutland, is the absence of the so-called "scale worked flakes" (Andersen 1979). The lack of this type at Tybrind Vig seems to be significant and may reflect regional differentiation in the early Ertebølle.

The most interesting new artifact appearing during the habitation period is the pottery, which is found from 3,700 b.c. (fig. 5). The Ertebølle Culture is the first to introduce pottery making in South Scandinavia (Andersen 1973), and with the appearence of the earliest ceramic we find two distinctive types – *pointed-based pots* of different sizes (i.a. fig. 12) and *oval bowls* ("lamps"). The introduction of pottery is clearly reflected in the sequence of layers (fig. 5) – in which we only find ceramics in the upper part of the gyttja layer – a stratigraphical and chronological position supported by observations on other sites (Andersen 1973, 1975).

Both pointed-based pots and oval bowls were found in excellent condition – very often with layers of charred crust of foodwaste. Analyses of foodwaste from two of the pots demonstrate that the content was a mixture of grass and fish, but the main portion of the content was of an unknown substance coming from a terrestrial biotope. (Andersen & Malmros 1985).

Tools of antler and bone of the usual Ertebølle types are also common. Red deer *antler axes* were of two individually distinct types: deeper in the layer were those with the shafthole near the burr of the antler (fig. 13), while higher up, were those of the T-shaped variety with the shafthole through the base of a tine. Two of the early type of axes (dated to 4,600–4,000 b.c.) are ornamented with elaborate geometric patterns and there-

Fig. 9. Skull of a pine marten which has been skinned. The arrows point at the cut marks left by the flint knives used. (Photo P. Delholm)

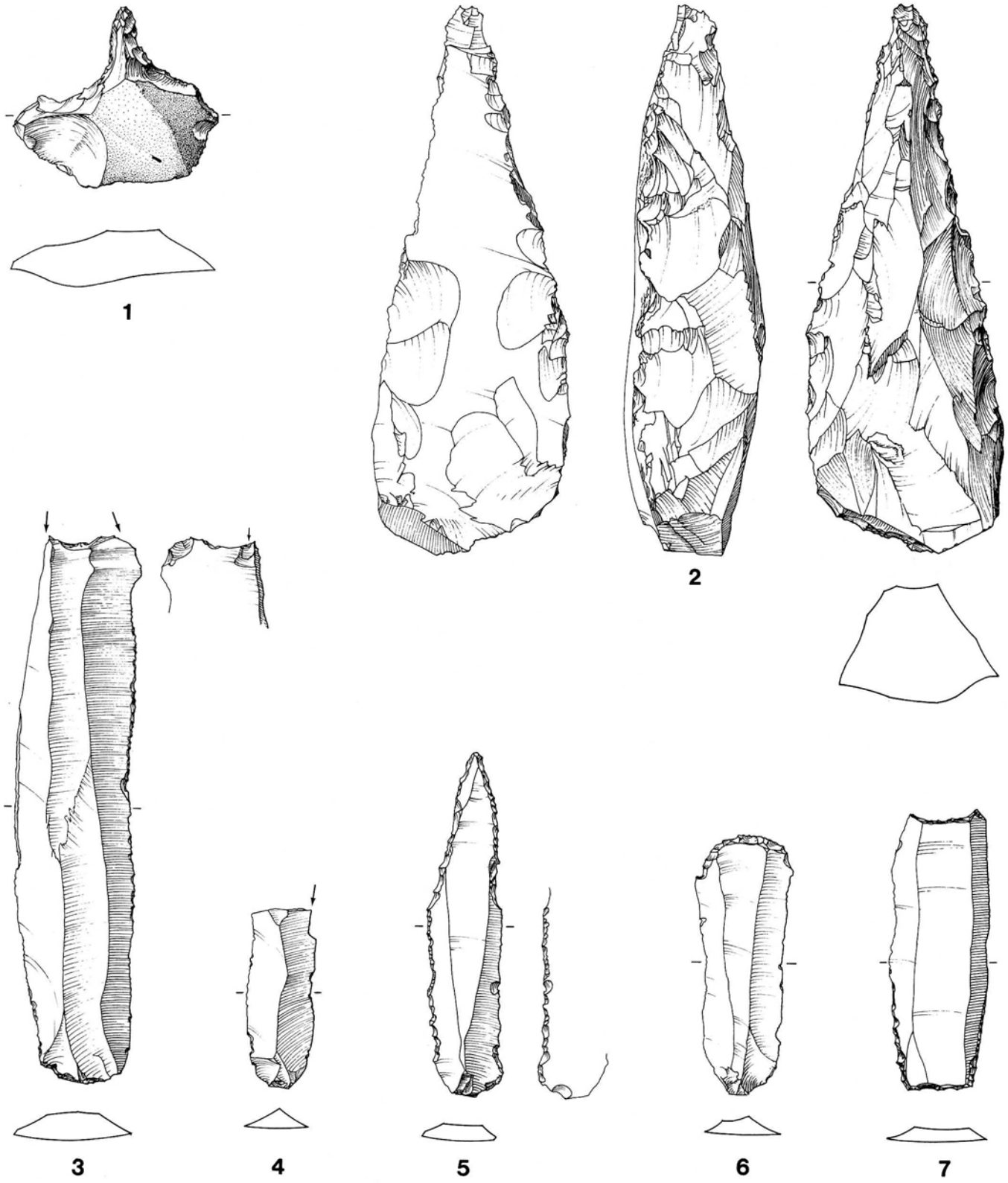


Fig. 10. Flint implements. (1) Borer on a flake. (2) Thick borer. (3) Angle burin on concave truncation. (4) Angle burin on a break. (5) Borer on a blade. (6) End scraper on a blade. (7). Blade with concave truncation. 2:3. (J. Kirkeby *del.*)

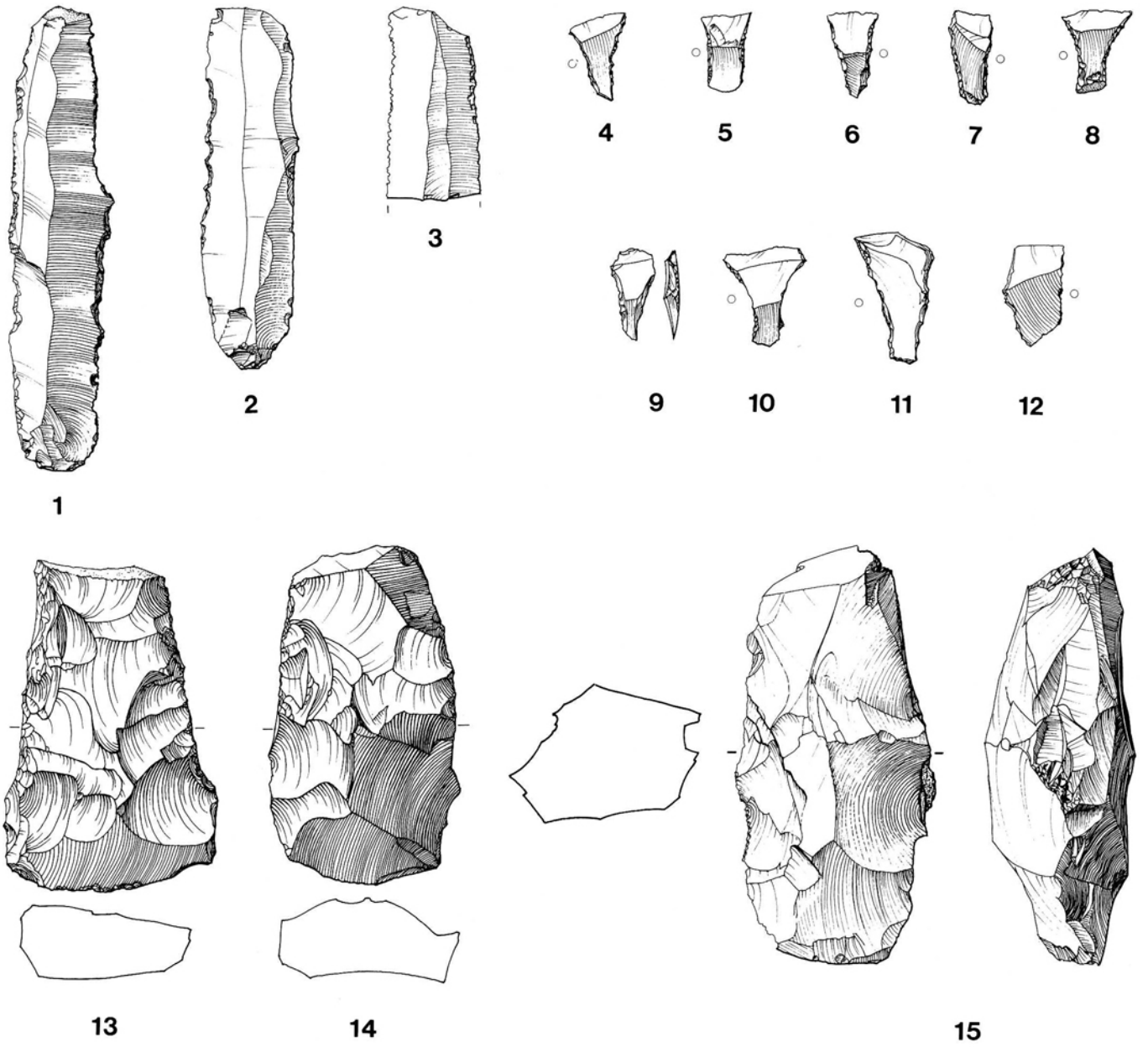


Fig. 11. Flint implements. (1–2) Denticulated blades. (3) Saw on a blade. (4–12) Transverse arrowheads. (13–14) Symmetrical flake axes. (15) Core axe 2:3. (J. Kirkeby *del.*)

with giving a good dating of the techniques and motives of antler Ertebølle art (fig. 13). Both types were found hafted on well-preserved hazel shafts. Mention must also be made of many simple round-sectioned bone points and small bone *fishhooks* (fig. 14), of which one is completely unique as it still carries a 5 mm section of the line, which is bound around the head of the hook by means of a clove hitch (fig. 14). Preliminary analysis indicates, that it is made of a plant product, perhaps bast. The knot is tied on the front of the hook. In the beginning this was thought to be accidental, but fishing with modern replicas clearly demonstrate that this placing is necessary to get the hook to stick in the fish.

Also, in this case, we find an interesting stratigraphic difference in the frequency of fishing gear. These implements (leister prongs, fishhooks etc.) are – with a few

exceptions – only found in the top layers – an observation which fits nicely with the huge number of hazel-sticks (parts of fishtraps and -fences) in this layer.

Again we are left with an inconclusive situation with regards to an interpretation of this observation: Does it indicate a general change towards an increased relience on fishing during the occupation period, or is this a reflection of the better preservation conditions in the top layers, or a mixture of both possibilities?

Normally the flint would dominate at such a site, but for a change, here it was the wood. The muddy layers along the former shoreline contain such large quantitites of waste chips, worked wood, and wooden implements that Tybrind Vig is now one of the sites with the largest amount of preserved wood from the Mesolithic (5). The site both displays new implement types and casts essential new light on the high level of wooden technology.

The most frequent type is *leister prongs* probably lost during fishing outside the reed area (fig. 15). At Tybrind we have two variants of this type: One long and slender and another short and stubby (fig. 15). Identical forms are known from the Møllegabet site (Skaarup 1983: 148). The well-preserved *bows* are all of the same type, about 160 cm long, made from thin, split and knot-free elm trunks (fig. 16 a–b). The grip is nicely shaped and the "legs" are wide and semicircular in the crossection near the handle, while the ends are round in section. Halfway between the grip and the end of the legs is a clearly articulated "shoulder" (fig. 16 a). Tybrind, for the first time in the Mesolithic, clearly demonstrates how common the bow really was – and how frequently it broke and was discarded.

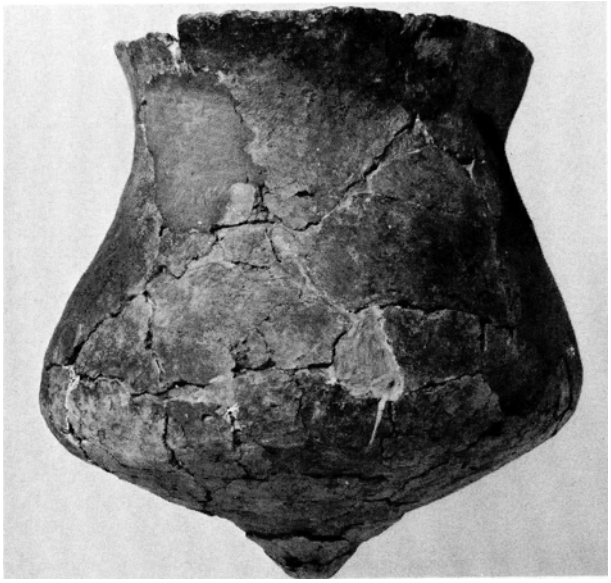


Fig. 12. Ertebølle vessel. Charred food remains encrusted on the inside of the pot were used for a C-14 analysis giving a date of 3,690 bc (K-3098). 1:5.

A *wooden arrow* (hazel) with a pearshaped point used for hunting furred animals and/or birds was also found (fig. 16c). Another arrow with a club-shaped point (hazel) is probably the front part of a composite arrow.

Two hazel sticks, round in cross-section, in whose ends were cut rectangular holes, were probably used as *thwarts* in boats (fig. 19).

Among the wooden objects there were also a *hammer*, a *fishweir* made of thin split alderbranches, a large number of long *straight stakes*, with nicely pointed tips, and several *shafts* of ash all of which were unfortunately broken. Examination of their function must therefore be left to a future date. Two of the shafts have pointed

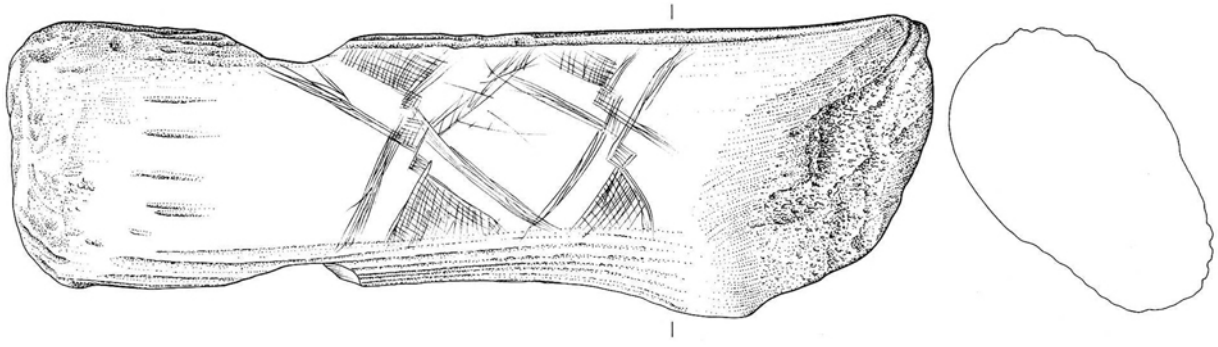


Fig. 13. Ornamented antler axe of early Ertebølle type with the shafthole near the burr of the antler. One of the very few ornamented antler axes found in a well dated settlement context. 2:3. (Orla Svendsen *del.*)

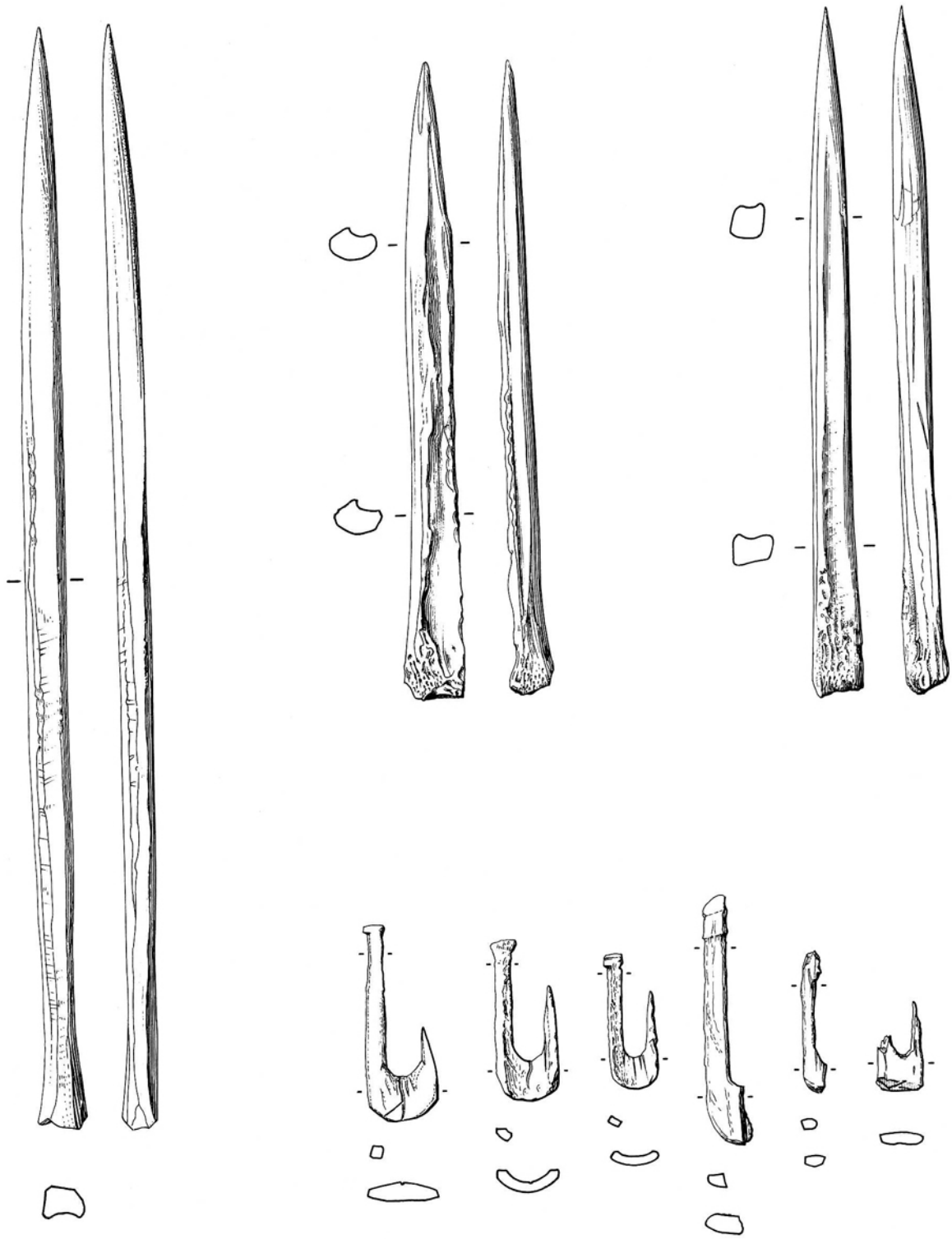


Fig. 14. Simple bone points (top) and bone fish hooks (bottom). 1:1 (J. Kirkeby *del.*)

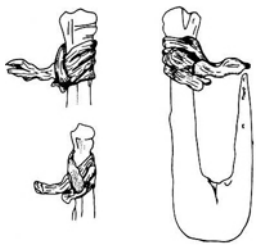
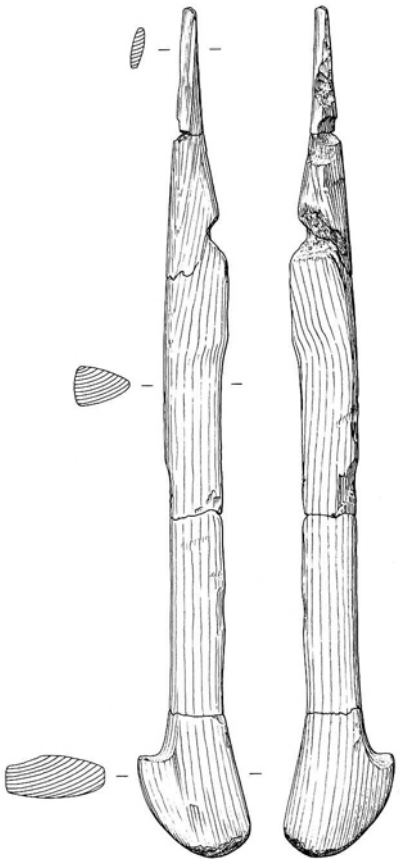


Fig. 14a. Attached to one of the fish hooks is a 5 mm section of its twine bound by means of a clove hitch. 1:1.



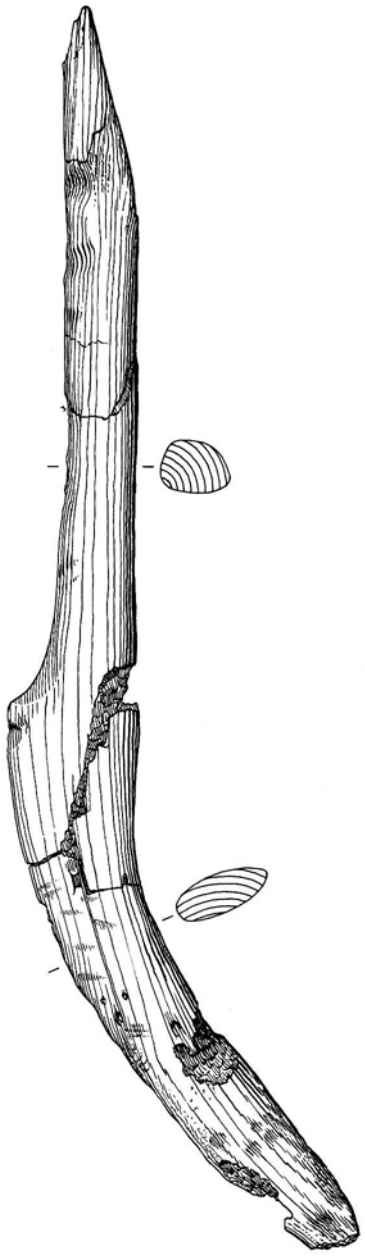
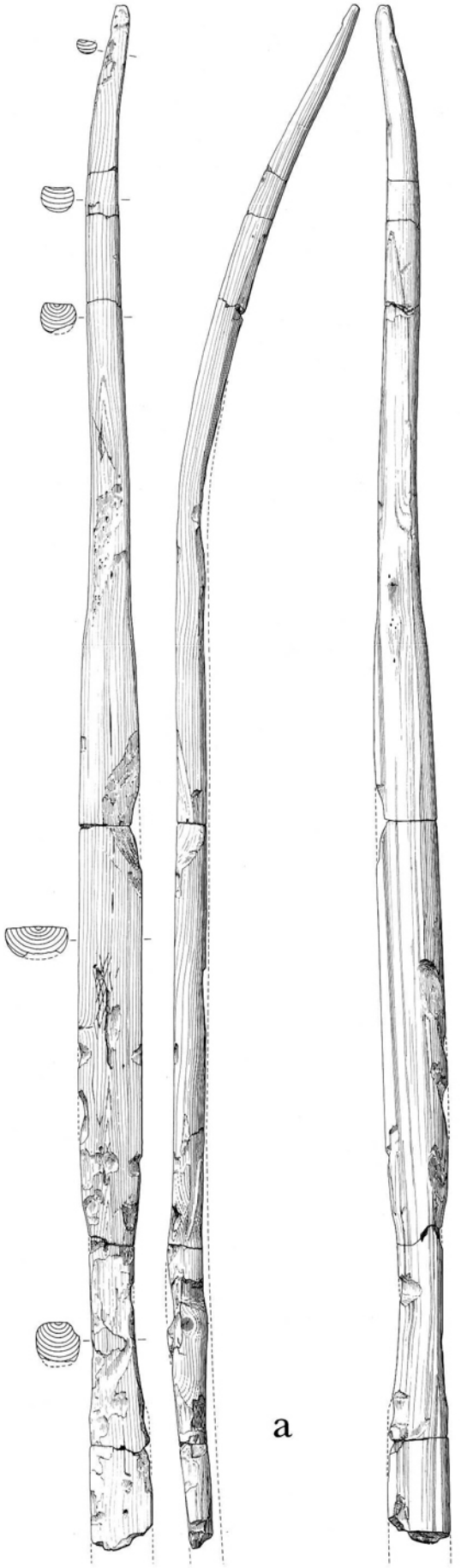
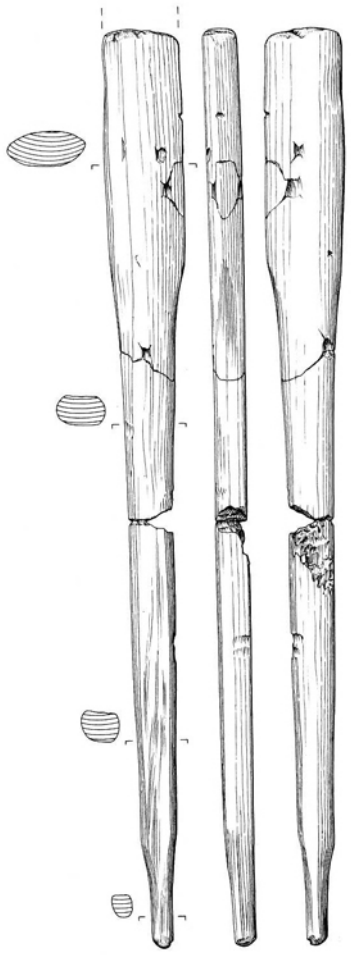


Fig. 15. Two types of leister prongs of hazelwood (*Corylus* av.). Some of the leister prongs were found standing vertically or at an angle in the mud. Presumably lost during fishing just outside the reed area off the site. 1:2. (Elsebeth Morville *del.*)

ends with a concave-convex section – a type also known from another underwater site south of Fyn (J. Skaarup 1983: 147).

The position of the site, and the many traces of fishing activities makes it obvious that the inhabitants must have sailed on the shallow waters of the cove; it was therefore not surprising that two *dug-out canoes* of the same type turned up. One of these is nearly complete (fig. 17–18) while the other is a large fragment of a stern. The "big" boat (Tybrind 1), the first whole canoe to be found in a Danish mesolithic settlement context, lay with the front end to the north-northwest and the rear





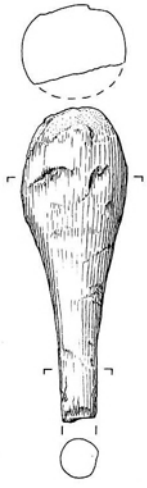


Fig. 16. (a–b) One of the bow fragments made of split, knot-free elm trunks (*Ulmus* sp.) 1:4. (F. Bau *del.*) – (c) Fragment of an arrow of hazel-wood (*Corylus* av.) with a pear-shaped head. 2:3 (Elsebeth Morville *del.*)

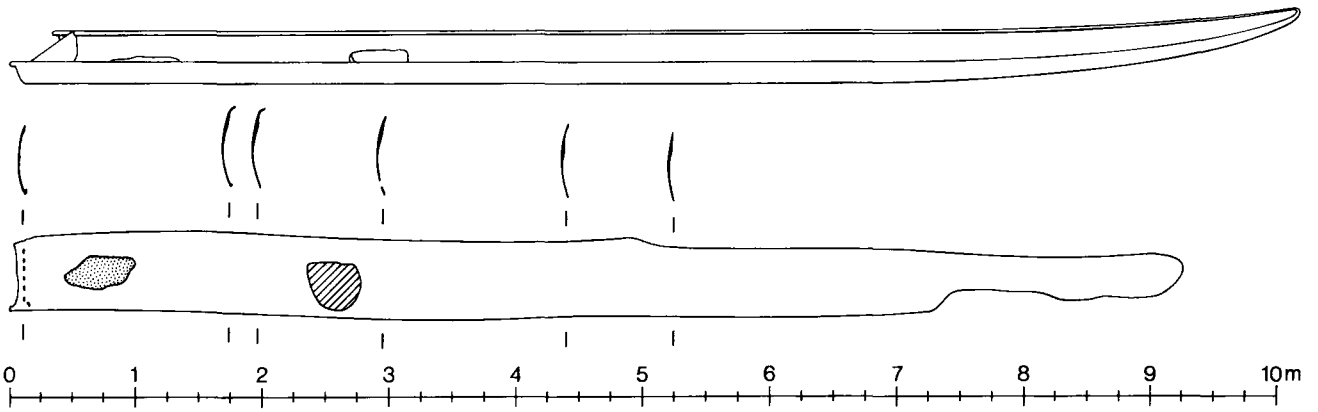


Fig. 17. Boat 1. Plan (bottom) and reconstruction (top) (Orla Svendsen *del.*).

tilting down into the gyttja, so that while the bow lay close to the surface of the sea bed, the stern was covered by about 1 m of gyttja (fig. 5). This boat is C-14 dated to 3,310 +/− 95 b.c. (K-3557).

Later a large fragment of the stern of a bigger but similar type of canoe was found (Tybrind Boat 2). This dugout also appeared in the top layer of the gyttja – a stratigraphic position supported by a C-14 dating of the boat to 3,420 +/− 95 b.c. (K-4149). The stern of this boat reveals the same typological features as Tybrind Boat 1. Both canoes are made of straight trunks of lime (*Tilia sp.*), and work was carried out with an axe or adze; chopping marks can still be seen over the entire surface.

The Tybrind Boat 1 is 9.5 m long, ca. 0.65 m wide, and with a thickness of 0.02–0.03 m (Andersen 1983). A big stone, weighing 30 kg, was found in this boat, probably put there as ballast. Despite the weight of the covering sediments, the boats are uniformly trough-shaped, with a height of at least 30 cm; the sides themselves are nicely rounded and smoothed. The stern was cut off squarely and had 7 regular holes cut out of the bottom and sides, presumably for the attachment of a board, which was not found.

An oval fireplace of sand and small stones was found half a meter inside the stern on the bottom of Boat 1 and traces of a similar fireplace were found in Boat 2. This feature is characteristic of many Danish stone age boats and is probably connected with (eel)fishing – the calm, shallow, muddy-bottomed bay must have been ideal for the use of "eel flares" in summer and autumn, an activity in which the many leister prongs would presumably also have played a part.

Such boats must have been essential items for the inhabitants – both for fishing but also for communication along the coastline and indispensable during the (seasonal) movements from site to site. Preliminary calculations indicate that such boats would have been able to carry 6–8 persons and their equipment.

Canoes of this type must have been paddled, and *paddles* were also present, some 10 examples of three different types have been recovered, several of them complete (figs. 20) (6). They are all carved in one piece from ash trunks and are of a similar type, with a short, heart-shaped blade on a shaft about 100 cm long. Blade size varies although the shape is always constant. Two of the bigger paddles are decorated on the blade (i.a. fig. 20, left). The design was cut into the surface of the wood and filled with a brown colouring matter, thereby recalling the technique used in bone and antler (Andersen 1981, 1984).

The two decorated paddles are some of the first examples of mesolithic decorated wood in Europe and such finds clearly indicate the potential of underwater sites.

The fact that we have two ornamented paddles indicates that this kind of decoration may in fact have been common. Probably many wooden items have been filled with designs. With regard to the motifs some are similar to what we know from other finds of art in bone, antler, and amber, but the dominating motifs are completely new and display a hitherto unknown kind of mesolithic art. The explanation for this is probably that we are dealing with a different material. In my opinion we should deal with different art-types (motives and

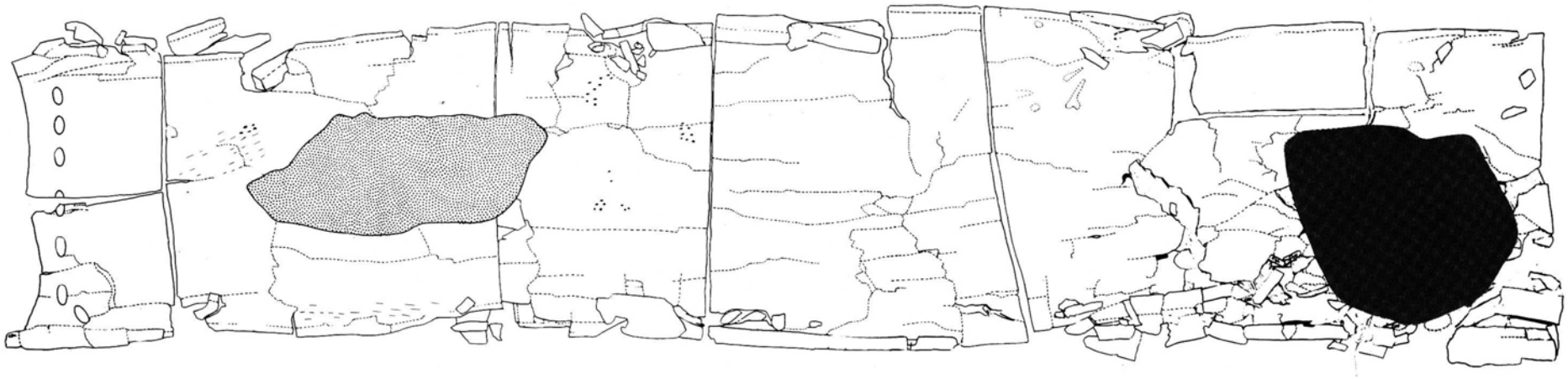


Fig. 18. The stern of Boat 1 with the fireplace and the ballast stone (dark). In the stern there are 7 holes carved out of the bottom and the sides, presumably for the attachment of a board (not found). (P. Smed Philipsen *del.*)

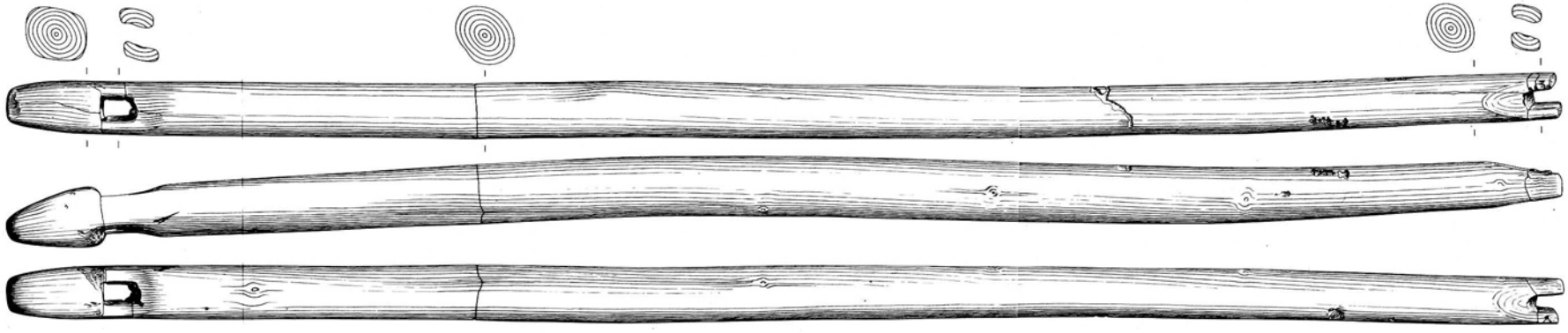


Fig. 19. An implement of hazelwood with rectangular holes in the ends, probably a thwart of a boat. 1:4 (Orla Svendsen *del.*)

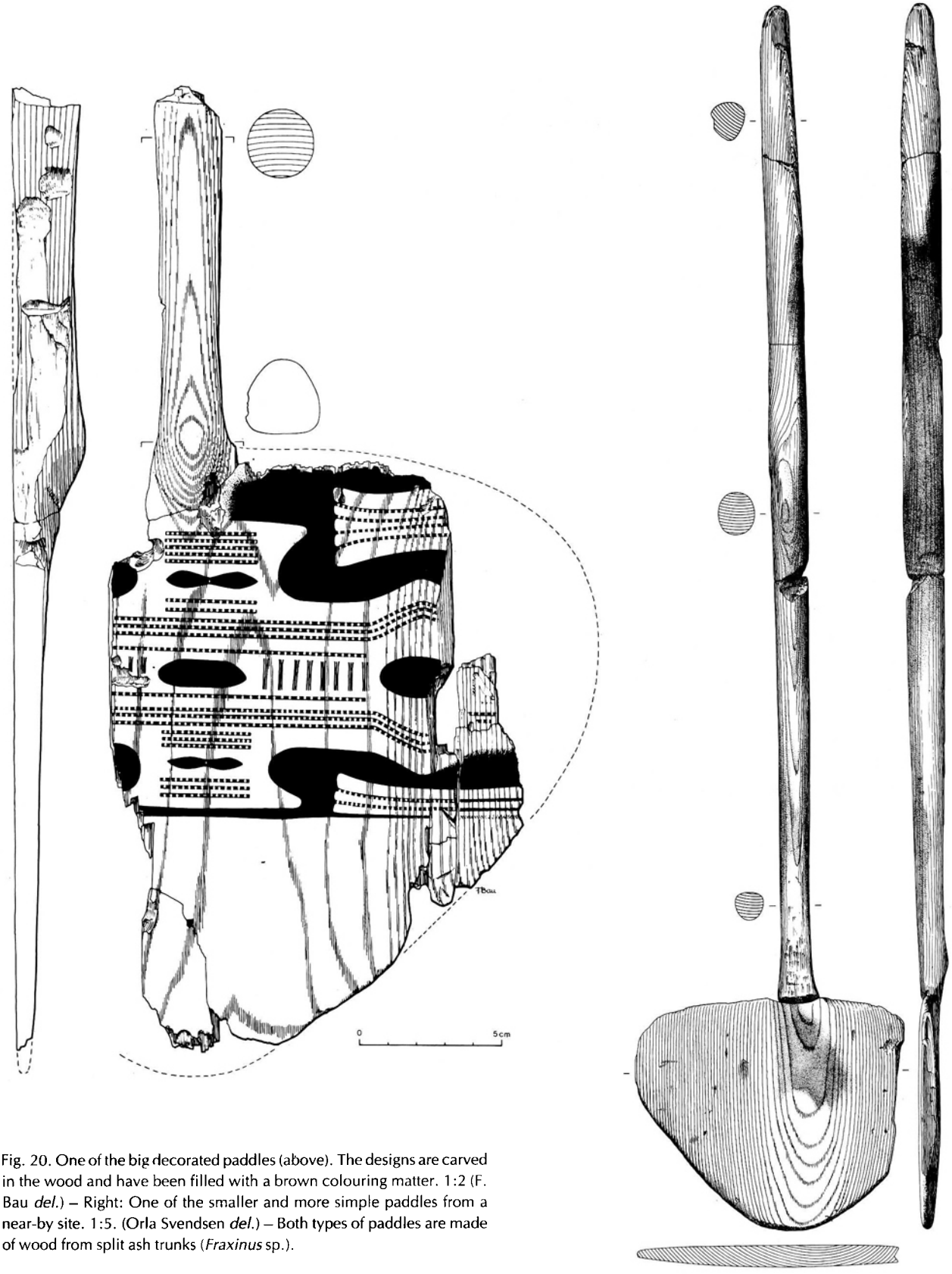


Fig. 20. One of the big decorated paddles (above). The designs are carved in the wood and have been filled with a brown colouring matter. 1:2 (F. Bau *del.*) – Right: One of the smaller and more simple paddles from a near-by site. 1:5. (Orla Svendsen *del.*) – Both types of paddles are made of wood from split ash trunks (*Fraxinus* sp.).

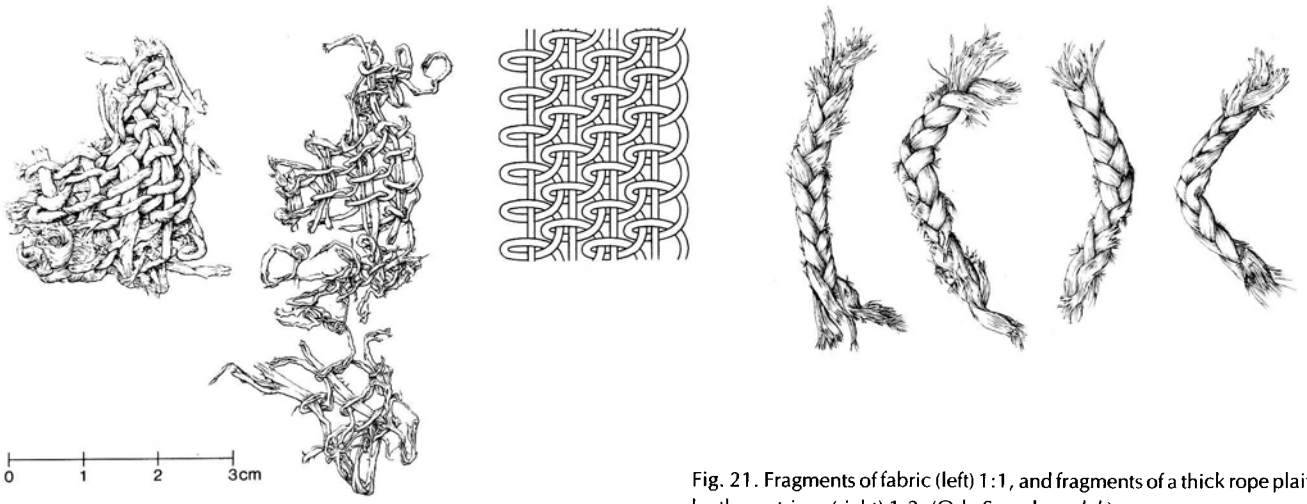


Fig. 21. Fragments of fabric (left) 1:1, and fragments of a thick rope plaited by three strings (right) 1:2. (Orla Svendsen *del.*)

compositions) in respect to the different materials.

An example of the extremely good preservation conditions for organic materials at this site is given by finds of *textiles*, and *ropes* (fig. 21). That we are dealing with a type of textiles and not basketry is demonstrated by the fact that the individual threads are spun (socalled Z-type) (Bender-Jørgensen, 1980: 4). Several small fragments (3–4 cm), each of the same type of textile, were found – all made in a technique called "needle-binding", wellknown from the Danish Bronze Age, some 2,000 years later (7). The material still awaits scientific analysis but observations suggest a type of plant fibre.

These textiles are the first from the Danish (and European) Mesolithic and give interesting insight into aspects of the material culture hitherto unknown.

It is nescessary to underline that by using the term "textiles" we are not saying anything about the origin and original use of these finds. Both clothing, belts and the like are possible origins.

Conclusion

The investigation at the submarine site at Tybrind Vig is the first systematic excavation of an Ertebølle settlement from this part of Denmark. The many well-preserved finds are significant especially because they fill gaps in our knowledge of the wood manufacturing technique.

Of great interest is the evidence of the "fishing ground" off the settlement – not just because of the good fortune involved in finding remains of *almost the complete range of equipment in one context*, (paddles, dugouts, leisters, fish weir and hooks), but more because it is possible to demonstrate that finds in the gyttja off the settlement are *not only settlement debris, but represent both rubbish and activity areas*. Tybrind Vig has therefore added a new dimension to our understanding of precisely what is found in lake and sea deposits off-shore at hunter-gatherer settlements.

The investigation has demonstrated that it is technically possible to perform underwater excavations at mesolithic sites in Danish waters. It has also shown the great potential of this type of site. If we are going to expand our knowledge of prehistoric Man, such sites may be the most profitable of all. The Tybrind site has not only expanded our knowledge of technology and material culture but the two finds of ornamented paddles have also given new insight into an art hitherto unknown. Finally, we have learned the techniques nescessary for such investigations, experiences which could be useful for other future underwater excavations in Danish or other North European waters.

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NOTES

The English text was corrected by T.G. Bibby and Brian Byrd.

1. Excavation was carried out under the direction of the Institute of Prehistoric Archeology, University of Aarhus. The daily work was performed by a group of local enthusiastic amateurs headed by Hans Dal, Fredericia, and archaeologists from the university: Jørgen

Dencker, Per Smed Philipsen, Torben Malm and Tine Trolle-Lassen.

The work has been supported by *Kreditforeningen Danmark's Fond*, The Danish Research Council for the Humanities, *Rigsantikvaren*, The ministry of Environment, and several other private donators.

2. Preliminary pollen analytical work has been carried out by Jens Ørnbøll, University of Aarhus, Moesgård.
3. The quaternary zoological investigation is carried out by Tine Trolle-Lassen, M.A., University of Aarhus, Moesgård. See also: Trolle-Lassen 1984.
4. The preliminary analyses indicated that the twine was made of sinew, but this result is today considered questionable. In the light of the preservation conditions at the site it is more reasonable to argue for some type of plant material, i.e. lime bast.
5. The wood has been determined by dr. Peter Wagner, *Botanisk Centralbibliotek*, Copenhagen, miss Jane Squirrel, and miss Veryan Heal, National Maritime Museum, Greenwich/London.
6. These implements have previously been labelled "Spades" by H. Schwabedissen (1968) and J. Troels-Smith (1960). Based on experimental archaeological tests, analysis of traces of wear, and the two new finds with ornaments, this functional explanation is refuted, cf. Andersen, 1984 a.
7. Analyses of the fabric and the technique have been performed by Lise Bender Jørgensen, University of Copenhagen.

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