

Daniel Groß · Harald Lübke · John Meadows · Detlef Jantzen (eds.)

# Working at the Sharp End: From Bone and Antler to Early Mesolithic Life in Northern Europe



10

Untersuchungen und Materialien  
zur Steinzeit in Schleswig-Holstein  
und im Ostseeraum

**UNTERSUCHUNGEN UND MATERIALIEN ZUR STEINZEIT  
IN SCHLESWIG-HOLSTEIN UND IM OSTSEERAUM**

**BAND 10**

Untersuchungen und Materialien zur Steinzeit in Schleswig-Holstein und im Ostseeraum  
aus dem Museum für Archäologie Schloss Gottorf und dem Zentrum für Baltische und Skandinavische  
Archäologie  
in der Stiftung Schleswig-Holsteinische Landesmuseen Schloss Gottorf  
Band 10

Begründet von  
Jürgen Hoika †

Herausgegeben von  
Sönke Hartz und Harald Lübke

Working at the Sharp End:  
From Bone and Antler to Early Mesolithic  
Life in Northern Europe

Daniel Groß, Harald Lübke, John Meadows and Detlef Jantzen (eds.)

*Wachholtz*



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Laserscan of the wooden sign that was attached to the excavation hut during the Hohen Viecheln excavations ('To the sharp harpoon'; Laserscan: J. Nowotny, ZBSA).

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# VORWORT DER HERAUSGEBER

Die Schriftenreihe „Untersuchungen und Materialien zur Steinzeit in Schleswig-Holstein“ wurde von dem ursprünglichen Herausgeber Jürgen Hoika vor mittlerweile 25 Jahren im Jahre 1994 begründet, um am damaligen Archäologischen Landesmuseum Schleswig (ALM) und heutigem Museum für Archäologie Schloss Gottorf (MfA) ein Publikationsorgan für die Veröffentlichung von Forschungsergebnissen zur Steinzeit Schleswig-Holsteins zu schaffen. Dabei sollte es sich zum einen um Sammelwerke mit Beiträgen von vorzugsweise auf Schloss Gottorf veranstalteten Symposien, Workshops und Tagungen mit steinzeitlicher Thematik und zum anderen um zumeist in Dissertationen zusammengestellte ausführliche Materialvorlagen handeln. Entsprechend enthielt der 1994 vorgelegte erste Band der Reihe die Beiträge zum 1. Internationalen Trichterbechersymposium, welches, von Jürgen Hoika gemeinsam mit Jutta Meurers-Balke initiiert, 1984 am Archäologischen Landesmuseum in Schleswig stattgefunden hatte. In der Folge wurden dann aber beginnend mit den Arbeiten der beiden heutigen Herausgeber nunmehr acht überwiegend am Institut für Ur- und Frühgeschichte der Christian-Albrechts-Universität zu Kiel fertiggestellte Dissertationen veröffentlicht, die ganz wesentlich mit der wissenschaftlichen Vorlage und Auswertung von Forschungsgrabungen in Schleswig-Holstein und – seit der Beteiligung des Zentrums für Baltische und Skandinavische Archäologie an der Herausgeberschaft – aus dem gesamten Ostseeraum befasst sind.

Deshalb ist es eine besondere Freude für die Herausgeber, mit dem vorliegenden Band 10 „Working at the Sharp End: From Bone and Antler to Early Mesolithic Life in Northern Europe“ der Schriftenreihe „Untersuchungen und Materialien zur Steinzeit in Schleswig-Holstein und im Ostseeraum“ wiederum einen Sammelband mit den Beiträgen eines Workshops vorlegen zu können, der vom 14. bis 16. März 2016 auf Schloss Gottorf stattgefunden hat. Dabei handelt es sich um den Abschlussworkshop des von der Deutschen Forschungsgemeinschaft geförderten Projektes „Neubewertung von Chronologie und Stratigraphie des frühholozänen Fundplatzes Hohen Viecheln (Mecklenburg-Vorpommern) unter besonderer Berücksichtigung der diagnostischen Knochenartefakte“ (DFG-Projektnummer 271652103) unter Leitung von Daniel Groß, Harald Lübke, John Meadows (alle ZBSA) und Detlef Jantzen (Landesamt für Kultur und Denkmalpflege Mecklenburg-Vorpommern; Landesarchäologie). Entsprechend enthält dieser Band neben dem Abschlussbericht des Forschungsprojektes insgesamt 17 Beiträge der eingeladenen Workshop-Teilnehmer, die entweder ergänzende Studien zum Fundplatz Hohen Viecheln enthalten oder sich grundsätzlich mit verwandten Themen zur Erforschung des frühholozänen Mesolithikums im nördlichen Europa befassen.

Alle Beiträge wurden nach internationalem Standard von jeweils zwei anonymen Gutachtern in einem Peer-review-Verfahren bewertet und danach den Autoren zur erneuten Überarbeitung übergeben, bevor die abschließende redaktionelle Bearbeitung der Manuskripte erfolgte. Die Textredaktion für alle Beiträge wurde von Gundula Lidke durchgeführt, Jana Elisa Freigang und Jorna Titel leisteten dabei unterstützende Arbeiten. Das Layout übernahm Daniel Groß, Titelbild und Umschlag entwarf Jürgen Schüller. Die meisten Karten und Zeichnungen wurden von den Autoren selbst bereitgestellt. In einzelnen Fällen erfolgte eine Überarbeitung durch Daniel Groß. Allen sei dafür an dieser Stelle herzlich gedankt.

Neu im Rahmen der Schriftenreihe ist, dass die Beiträge unmittelbar nach Fertigstellung und Freigabe der Autoren in einem „online-first“-Verfahren auf der Homepage des Verlages im Open Access zum freien Download bereitgestellt wurden. Für die Umsetzung dieser Forderung der Herausgeber danken wir dem Wachholtz Verlag, insbesondere Herrn Henner Wachholtz, sehr.

Besonderer Dank gilt dem Vorstand des Zentrums für Baltische und Skandinavische Archäologie Schleswig, besonders dem Direktor, Claus von Carnap-Bornheim, und der Forschungsleiterin, Berit Valentin Eriksen, die die Veröffentlichung dieses Bandes durch die Bereitstellung der erforderlichen Mittel für den Druck der Arbeit maßgeblich unterstützten.

Sönke Hartz und Harald Lübke  
Schleswig, im Oktober 2019

## EDITORS' PREFACE

The series 'Untersuchungen und Materialien zur Steinzeit in Schleswig-Holstein' was founded by its first editor, Jürgen Hoika, in 1994, 25 years ago, in order to establish a possibility to publish Stone Age research results from Schleswig-Holstein at the then Archaeological State Museum (Archäologisches Landesmuseum [ALM]), today's Museum for Archaeology (Museum für Archäologie, Schloss Gottorf [Mfa]). Publications should, on the one hand, reflect proceedings of symposia, conferences and workshops with Stone Age topics primarily held at Gottorf Castle, on the other hand, dissertations presenting comprehensive material. According to that, the first volume, published in 1994, contained the contributions to the 1<sup>st</sup> International Funnelbeaker Symposium, which, initiated by Jürgen Hoika and Jutta Meurers-Balke, had taken place at the Archaeological State Museum in 1984. Following that, eight dissertations, mainly accomplished at the Institute for Pre- and early History at the Christian-Abrechts-University Kiel, were published, starting with those by today's editors. All these volumes contributed substantially to the scientific presentation and analysis of excavation materials from Schleswig-Holstein and – since 2012, when the Centre for Baltic and Scandinavian Archaeology (ZBSA) also became involved in editing the series – the whole of the Baltic Sea area.

Therefore the editors are especially happy to once more present conference proceedings with volume 10 of the series 'Untersuchungen und Materialien zur Steinzeit in Schleswig-Holstein und im Ostseeraum': 'Working at the Sharp End: From Bone and Antler to Early Mesolithic Life in Northern Europe' collects contributions to a workshop held at Gottorf Castle on 14<sup>th</sup>–16<sup>th</sup> March, 2016. This represented the closing workshop of the DFG-funded project 'Neubewertung von Chronologie und Stratigraphie des frühholozänen Fundplatzes Hohen Viecheln (Mecklenburg-Vorpommern) unter besonderer Berücksichtigung der diagnostischen Knochenartefakte' (DFG project no. 271652103), directed by Daniel Groß, Harald Lübke, John Meadows (all ZBSA) und Detlef Jantzen (Landesamt für Kultur und Denkmalpflege Mecklenburg-Vorpommern; Landesarchäologie). In addition to the project's final report the volume contains 17 papers by researchers invited to participate in the workshop, representing either additional studies on material from the site Hohen Viecheln or related topics in research of the early Holocene Mesolithic in northern Europe.

Each paper was, according to international standards, peer-reviewed by two anonymous reviewers and then returned to the author for reworking before final editorial work. Copy-editing was performed by Gundula Lide, supported by Jana Elisa Freigang and Jorna Titel. Daniel Groß realised the layout; cover and cover illustration were designed by Jürgen Schüller. Most maps and figures were provided by the authors themselves, some were reworked by Daniel Groß. We express our sincere thanks to all involved!

It is a novelty for the series to have papers published online first immediately after completion and authors' approval in open access for free download on the website of Wachholtz Publishers. We would like to thank Henner Wachholtz, Wachholtz Publishers, very much for making this possible!

Special thanks are due to the board of the Centre for Baltic and Scandinavian Archaeology (ZBSA) Schleswig, particularly to the director, Claus von Carnap-Bornheim, and the head-of-research, Berit Valentin Eriksen, who substantially supported this publication by providing financial means for its printing.

Sönke Hartz and Harald Lübke  
Schleswig, October 2019

# GRUSSWORT DES LANDESARCHÄOLOGEN VON MECKLENBURG-VORPOMMERN

Mit seinen großflächigen, oft noch weitgehend unberührten Niederungen und Binnengewässern bietet Mecklenburg-Vorpommern beste Voraussetzungen, um die gewässeraffinen Kulturen des Mesolithikums zu erforschen. Die Überreste ihrer Wohn- und Jagdstationen sind im feuchten Milieu hervorragend erhalten geblieben. Störungen durch Torfabbau, Begradiung von Gewässern oder Meliorationsmaßnahmen blieben im Wesentlichen auf das 19. und 20. Jahrhundert beschränkt. Sie haben zwar einen gewissen Schaden angerichtet, aber, weil sie zumindest im 20. Jahrhundert oft von aufmerksamen ehrenamtlichen Bodendenkmalpflegern beobachtet wurden, überhaupt erst zur Entdeckung vieler Fundstellen geführt.

Welche Fundstellen eingehender erforscht werden und damit das Bild einer Epoche besonders prägen, unterliegt oft dem Zufall. Hohen Viecheln rückte in den Fokus der Forschung, weil die Entdeckung mehrerer Knochenharpunen zu Beginn der 1950er Jahre auf eine günstige Konstellation traf: 1953 war aus der Vorgeschichtlichen Abteilung des Staatlichen Museums das Museum für Ur- und Frühgeschichte Schwerin entstanden, das auch für die Bodendenkmalpflege in den drei Nordbezirken der DDR zuständig war. Der ehrgeizige Direktor des Museums, Ewald Schuldt, hatte sich durch Ausgrabungen auf der Burgwallinsel Teterow einen Namen gemacht und war nun auf der Suche nach einem geeigneten Fundplatz für ein eigenes Forschungsprojekt.

Wegen der sehr guten Erhaltungsbedingungen versprach Hohen Viecheln, zusätzlich zu dem bekannten Spektrum an Steinartefakten auch ein umfangreiches Geräteinventar aus organischen Materialien bergen zu können. Die ebenfalls ausgezeichnet erhaltenen Tierknochen sollten Aufschluss über das Jagdwild geben. Hinzu kam die Aussicht, aus der Stratigraphie neue Erkenntnisse zur Chronologie und zu den Veränderungen der naturräumlichen Verhältnisse zu gewinnen. Diese Erwartungen wurden nicht enttäuscht: Hohen Viecheln entwickelte sich zu einem der bedeutendsten Plätze mesolithischer Forschung, gleichrangig mit Duvensee, und inspirierte weitere Forschungen, u. a. in Friesack und Rothenklempenow.

Hohen Viecheln gehört nach wie vor zu den legendären archäologischen Fundstellen in Mecklenburg-Vorpommern, auch wenn es aus heutiger Sicht nicht mehr so einzigartig dasteht. Dank einer intensiv betriebenen ehrenamtlichen Bodendenkmalpflege ist die Zahl der bekannten mesolithischen Fundplätze im Land deutlich gestiegen, von denen vermutlich mehrere ein ähnliches Potenzial wie Hohen Viecheln aufweisen. Verändert haben sich aber nicht nur die Verbreitungskarten, sondern auch die Möglichkeiten archäologischer Forschung. Es drängte sich deshalb geradezu auf, Hohen Viecheln noch einmal unter die Lupe zu nehmen, bisherige Erkenntnisse kritisch zu prüfen und neue hinzuzufügen. Der DFG und allen Projektpartnern gebührt herzlicher Dank dafür, dass sie das ermöglicht haben.

So wird Hohen Viecheln auch weiterhin als exemplarischer Fundplatz für das Mesolithikum in der norddeutschen Tiefebene stehen – eine hochinteressante Umbruchszeit, in der Klimawandel, Anstieg des Meeresspiegels und andere Veränderungen eine ständige Anpassung der Menschen an ihre Umwelt erzwangen.

Detlef Jantzen  
Schwerin, im September 2019

# WELCOME ADDRESS BY THE STATE ARCHAEOLOGIST OF MECKLENBURG-WESTERN POMERANIA

Mecklenburg-Western Pomerania with its large, often unspoiled lowlands and inland waters offers outstanding possibilities for research into the water-oriented cultural groups of the Mesolithic. Remains of their settlement and hunting sites are often well preserved in wet conditions. Disturbances by peat extraction, straightening of watercourses or melioration measures mainly took place during the 19<sup>th</sup> and 20<sup>th</sup> centuries. They did some damage, but – as at least during the 20<sup>th</sup> century they were often supervised by vigilant amateur archaeologists – many sites were discovered this way in the first place.

But often it is left to chance which sites can be thoroughly investigated to largely characterise the picture of a whole timespan. Hohen Viecheln became the focal point of research interest under favourable circumstances: the discovery of several bone points there at the beginning of the 1950s fell together with the establishment of the Museum of Pre- and Early History in Schwerin (out of the former Department of Prehistory at the State Museum) which was also responsible for the preservation and care of field monuments in the three northern districts of the GDR.

The ambitious museum director, Ewald Schuldt, had already gained reputation through his excavations of the Slavic ring wall island near Teterow, and he was looking for a suitable site for another research project. Due to the very good preservation conditions at the site, Hohen Viecheln promised, in addition to the spectrum of artefacts known from other places, a substantial organic inventory. The well-preserved animal bones were expected to shed light on game species and hunting strategies. Furthermore, important results were expected concerning chronology and environmental changes. These hopes were not disappointed: Hohen Viecheln has become, alongside Duvensee, one of the most important sites for Mesolithic research, and research there has inspired further excavations, e.g. at Friesack or Rothenklempenow.

Hohen Viecheln is still one of the legendary archaeological sites in Mecklenburg-Western Pomerania, even if it no longer stands alone. Thanks to intensive voluntary archaeological surveys the number of Mesolithic sites has increased significantly; and several of these may have a potential similar to that of Hohen Viecheln. But not only distribution maps have changed during the last years, but also the possibilities of archaeological research. Therefore, the idea to have another look at Hohen Viecheln, to challenge old results and add new ones, suggested itself. I want to thank the German Research Foundation (DFG) and all project contributors for having made this possible. In this way, Hohen Viecheln will continue to be an exemplary North German Lowland site of the Mesolithic – a highly interesting time when climate change, sea-level rise and other changes enforced constant human adaptions to the environment.

Detlef Jantzen  
Schwerin, September 2019

## ACKNOWLEDGEMENTS

This volume of the series ‘Untersuchungen und Materialien zur Steinzeit in Schleswig-Holstein und im Ostseeraum’ represents the proceedings of a workshop held at the Centre for Baltic and Scandinavian Archaeology (ZBSA) in Schleswig in March 2016. It is a part of the editors’ project ‘Neubewertung von Chronologie und Stratigraphie des frühholozänen Fundplatzes Hohen Viecheln (Mecklenburg-Vorpommern) unter besonderer Berücksichtigung der diagnostischen Knochenartefakte’, funded by the German Research Foundation (DFG) under the project number 271652103.

While the project was dealing with the re-evaluation of the site Hohen Viecheln 1 for chronological and stratigraphical aspects, this volume does not only cover its final publication but comprises additional modern studies about the site by different scholars. These are furthermore embedded into the international research landscape by adjacent studies covering an area from modern day Britain in the west to the Urals in the east.

All contributions are representing the authors’ point of view and respective terminologies. Therefore differences in the vocabulary may appear to the careful reader. While a homogenisation of terms and data recording is relevant for comparative studies, it was beyond the scope and means of this project. As a consequence, terminologies may differ between the contributions, as exemplified by the terms ‘uni-serial’ and ‘uni-lateral’ bone points: both are characterised by barbs or notches on one lateral side. At the British site Star Carr those have ever since been named uni-serial, whereas uni-lateral is a more common term in other parts of Europe.

We, as editors, would like to thank all contributors for being part of this volume and their interesting and high-quality articles; also we are grateful for the voluntary support of all anonymous peer-reviewers and their help in improving the articles. Furthermore, we thank the German Research Foundation (DFG) for funding our research and the workshop as well as the Centre for Baltic and Scandinavian Archaeology represented by its director, Claus von Carnap-Bornheim, and the head-of-research, Berit Valentin Eriksen, for support of the project and its presentation in the current form. A tremendous help in the course of making this book was Gundula Lidke who was responsible for text editing, proofreading, and correspondence with the authors and publishers. Thank you very much! Further editorial support was provided by Jana Elisa Freigang, Jorna Titel, Matthias Bolte, Isabel Sonnenschein and Jürgen Schüller. The latter is also responsible for the cover drawing. Much help and support was provided by Peter Teichert-Köster with respect to handling the finds and accessing them in the depot of the Landesamt für Kultur und Denkmalpflege Mecklenburg-Vorpommern; Landesarchäologie in Schwerin. Close collaboration with Mathieu Boudin of the Royal Institute for Cultural Heritage, Brussels, improved our radiocarbon measurements and the analysis of the consolidant.

We thank all people, mentioned and unmentioned here, who were involved in this book and the different research projects, who helped by further pushing the boundaries of our understanding of the cultural remains and chronologies of the past.

Daniel Groß, Harald Lübke, John Meadows, Detlef Jantzen  
Schleswig, October 2019

# EARLY MESOLITHIC BONE POINTS FROM SCHLESWIG-HOLSTEIN

Sönke Hartz, Harald Lübke and Daniel Groß

## Abstract

*The present study deals with notched and fine-barbed bone points from the area of today's Schleswig-Holstein, including finds from the Gottorf Archaeological Museum's collection, local museums' collections and from private collections. In Schleswig-Holstein, such bone points were first recorded by G. Schwantes *in situ* at the Mesolithic Duvensee sites in the 1920s. About 20 years later, similar points were discovered by H. Schwabedissen during new excavations at Duvensee. Since then, they have been named 'Duvensee points' or 'type 2' points according to J. G. D. CLARK's typology (1936). A number of single finds have been found since then; however, excavations of early Mesolithic sites of substantive importance due to the preservation of organic cultural remains outside of the Duvensee peat bog are still lacking in Schleswig-Holstein. In general, notched bone points are associated with the early Mesolithic Maglemose culture in Southern Scandinavia and Northern Germany (Northern European lowland), but only a small number has been directly dated by radiocarbon analysis yet. The points presented here were classified metrically and morphologically, similar to the method presented in the study of points from Hohen Viecheln (GROSS et al., this volume). Moreover, due to the importance of the material as a possible marker of social territories, a complete mapping of 49 finds from c. 30 sites was realised, and twelve points were directly dated.*

## 1 Introduction

Since excavations of submerged sites from the terminal Mesolithic at the Northern German Baltic coast have yielded large inventories of bone and antler tools (GLYKOU 2015; TERBERGER 2006; VIELSTICH 1992), this material is increasingly becoming a topic of interest for specific studies (BRÜHL 2014; HARTZ/ZHILIN 2018; WASCHKE 2019). However, bone and antler tools from the early Mesolithic in Northern Germany were only found in larger numbers at a few excavated sites (Hohen Viecheln, Friesack, Rothenklempenow), during dredging or melioration activities (CZIESLA 2006; GRAMSCH 1965; KEILING 1987; PRATSCH 2006; 2011).

In Schleswig-Holstein and Mecklenburg-Western Pomerania, early Mesolithic bone and antler tools occur mainly as single finds from waterlogged sediments (DELLBRÜGGE 2002; GROSS/LÜBKE 2019; HEIDELK-SCHACHT 1983). This is not remarkable since much of the current land surface in Northern Germany is very conducive to the preservation of organic artefacts (GROSS/LÜBKE 2019; RUST 1943; SCHWABEDISSEN 1949; SCHWANTES 1939). However, due to the find circumstances, i.e. chance finds

during dredging or melioration, these artefacts regularly lack detailed information about their site context, palaeo-environmental setting and age.

Notched or fine-barbed bone points represent one specific tool of the Mesolithic bone industry. As a widespread and typical implement, these artefacts can be seen as a part of the common tool kit used by Early Mesolithic hunter-gatherers. Even though such points had a wide distribution in the North German Lowland, Southern Scandinavia and the Netherlands, regional differences in type and technology provide a useful and suitable topic for over-regional studies of contact, exchange and traditions (CZIESLA 1999; CLARK 1936; GRAMSCH 1973; 1993; 2009/2010; VERHART 1988).

Schwantes developed the first typology for bone points in 1928 when he characterised different types by the methods and techniques of forming the notches. One type with a one-sided (uni-lateral) row of finely toothed notches (also found at Duvensee) he distinguished from points with deeper and more oblique barbs, situated mainly at the distal part of the point (type Pritzerbe). Later CLARK (1936) mentioned eight main types of notched and barbed bone points from Southern Scandinavia and the Baltic area. He differentiated, among others, the ones from Duvensee as type 2, Pritzerbe as type 7 and a third group with oblique grooves as Kunda points (type 4). In the latest publication of bone points from Brandenburg (CZIESLA 1999) and northwestern Poland (GALIŃSKI 2013) the finely notched points of type 2 were categorised as Duvensee points. During the 1950s to 1990s large numbers of Duvensee points were dredged up from the rivers in Brandenburg and excavated at Mesolithic settlements like Friesack and Hohen Viecheln in Northern Germany (CZIESLA 1999; GRAMSCH 2009/2010). From Denmark, similar bone points are known from the Danish islands (Mullerup [SARAUW 1903], Skottemarke [FISCHER 1996; MØHL 1980; SØRENSEN 1980] or Barmose I [JOHANSSON 1990]) and from Jutland (Klosterlund [MATHIASSEN 1948]). However, in Schleswig-Holstein and western Denmark Duvensee points are usually found as unstratified single finds (DELLBRÜGGE 2002, Taf. 23; KÜHL 1978; MATHIASSEN 1948; SCHWANTES 1939; TROMNAU 1973).

In this case study notched and barbed bone points from a limited region between the Danish border and the River Elbe are presented (see Appendix). General overviews for this specific tool type are only partly published yet (CZIESLA 1999; TROMNAU 1973). Our studies show that inhabitation of this region by Early Mesolithic hunter-gatherers was far denser than suggested by lithic remains alone. Some clusters of bone points in the Angeln area (around the Schlei fjord) and in southeastern Holstein (upper Trave region) may also indicate preferred settlement areas during the early Maglemose period.

## 2 Regional distribution of notched bone points in Schleswig-Holstein

It has to be stated that the original distribution of bone points (Fig. 1) is difficult to assess and the state of research primarily depends on preservation conditions, excavation activities, and the collecting amateurs' commitment. Therefore, the number of recorded bone points as well as their distribution is not necessarily representative but more or less coincidental. It is obvious that osseous tools are the predominant finds when collectors search in dredged organic sediments, whereas they usually do not focus on flint and other stone artefacts or animal bones.

Illustrative examples are represented by three single points from Tinglev (cat. no. 1), Bov (Bau) (cat. no. 2; Plate 3), both in southern Jutland, and Wyk on the Island of Föhr (cat. no. 3, Plates 1; 3). There is only moderate information on all find circumstances. For instance, it is noted in the archive that the complete bone point from Bov was found in the early 20<sup>th</sup> century near the village of Bov on the property of Christiansens farm. It was not embedded in organic sediments but in mineral soils, encountered presumably during digging a marl pit. No information is given for the complete Tinglev point, which is

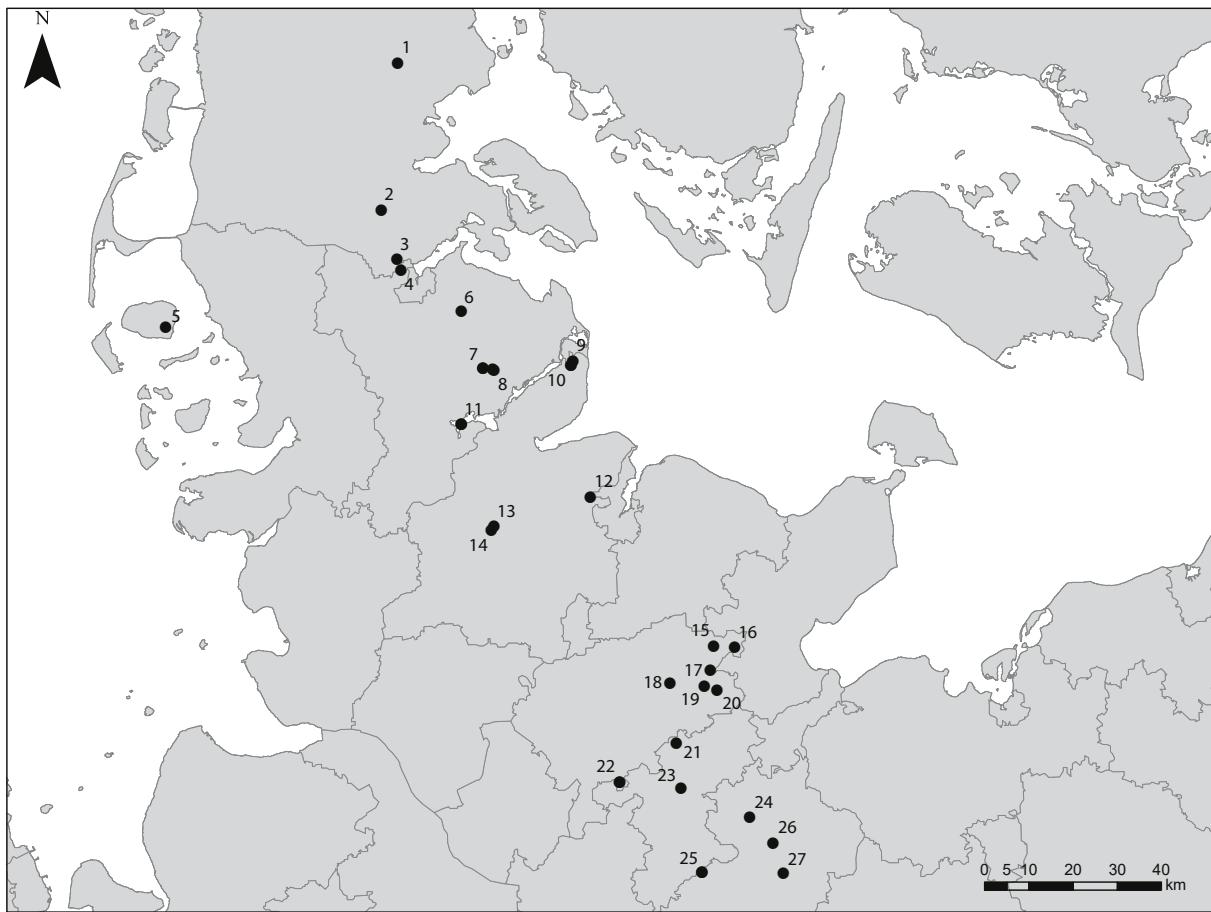


Fig. 1. Sites with notched or barbed bone points in Schleswig-Holstein (and southern Jutland). The catalogue numbers are indicated in square brackets behind the site names. Sites located close to each other are grouped together. 1 Törning [45]; 2 Tinglev [1]; 3 Bov [2]; 4 Harrislee [45]; 5 Wyk/Föhr [3]; 6 Gammelby [47–48]; 7 Buschau [6–7]; 8 Boholzau [4–5]; 9 Karby [10–11]; 10 Brodersby [49]; 11 Fahrdorf [8–9]; 12 Quarnbek [12]; 13 Rendsburg [13]; 14 Osterrönfeld [14]; 15 Seedorf [16]; 16 Glasau [15]; 17 Travenort [17–19]; 18 Groß Rönnau [22]; 19 Rohlstorf [21]; 20 Pronstorf [20]; 21 Travenbrück [23–24]; 22 Kayhude [26–27]; 23 Bad Oldesloe [25]; 24 Duvensee Bog [28–34]; 25 Grande [42–43]; 26 Mölln [35–41]; 27 Woltersdorf [44].

today housed in the Stadtmuseum Flensburg. The Wyk bone point was found 1907 in a peat layer on a brickyard in a depth of 4.5 m below muddy sediments. The piece is broken at its base and originally had a length between 20 and 25 cm. We assume that this piece is the 'Barbed bone point of Kunda type' listed by CLARK (1936, 237) and subsequently e.g. mapped by LOUWE KOIJMANS (1970) and VERHART (1988; 1990) under 'Amrum Island' in the collection of the former Kiel Museum (Schleswig-Holsteinisches Museum für Vaterländische Altertümer zu Kiel). However, such an object does not exist in today's collection and cannot be found in the museum's old catalogues. Although CLARK (1936, 239) also listed the bone point of Wyk on the neighbouring island of Föhr separately, in this case he did not mention the Kiel collection as evidence, but quoted Sophus MÜLLER (1919). Therefore, we assume that both pieces are identical and that the locality 'Amrum Island' is an error.

The region of Angeln in northeastern Schleswig-Holstein is known for its hilly ground moraine landscape with loamy and sandy soils, numerous lakes and streams. The streams are mainly east-west orientated, following the draining channel system formed by the Weichsel glaciation. Two major water systems characterise the landscape: the Bondenau/Treene in the north and the Loiter Au/Füsinger Au in the south, the latter flowing into the Schlei fjord east of Schleswig. Both river systems have been straightened and dredged out in the last century. In the floodplains, largely drained wetland pasture is present.



Fig. 2. Pronstorf, district Segeberg. Bone point from Lake Warde [cat. no. 20] (after TROMNAU 1973).

For two bone points (cat. no. 4–5; Plates 1; 3) in the Schleswig-Holstein State museum's collection we have no further information except that they were found by the amateur archaeologist W. Jansen from Schleswig in the 1950s near the villages of Boholzau and Buschau. He made drawings of the objects and gave them to H. Schwabedissen; the illustrations were found in his legacy. The whereabouts of the two notched bone points were previously unknown, but due to the drawings it was now possible to re-identify them as the two pieces previously stored as non-stratified pieces in the find material of the 1958 excavation of Bad Oldesloe-Wolkenwehe LA 154 (HARTZ et al. 2004/2005, 22). Obviously, the finder had not only handed over the drawings, but also the objects themselves to H. Schwabedissen during this excavation. The distal end of one of the points was broken, the other one is fully preserved with a length of 14 cm. Most likely both finds derived from dredged sediments when the Wellspang Au/Boholz Au was straightened at the end of the 1950s.

Another distal end of a bone point (cat. no. 6; Plate 1) was dredged from the Loiter Au near the village of Buschau (Twedt-Buschau LA 35). It was discovered in organic sediments by the Dutch amateur P. Hurte when the river was straightened in 1976. The almost fresh break at its base suggests that the object was damaged during the dredging process and had an original length of c. 15 cm. Another finely notched bone point was found close to this find spot in dredged sediments when the Loiter Au was regulated in the middle of the 20<sup>th</sup> century (Twedt-Buschau LA 32; cat. no. 7; Plate 3). In association with this point Mesolithic flint artefacts like blades and blade scrapers were recovered but also animal bones of uncertain age, a dugout canoe made of oak, and modern pottery sherds.

At the southern border of the Angeln region two complete notched bone points (cat. no. 8–9; Plate 1) were found 1958 during gravel extraction for road construction in a water depth of c. 7 m in the inner Schlei fjord near Schleswig (RADDATZ 1967). It seems likely that they belong to a Mesolithic site previously located at a lakeshore and flooded by transgression during the Atlantic and Subboreal.

Two additional bone points with a clearly different type of notches (cat. no. 10–11; Plate 3) were collected nearby the village of Karby northeast of the Schlei fjord (SCHWANTES 1939, 118). They are complete with lengths of 12 and 14 cm and were handed over to the museum in the late 19<sup>th</sup> century by the teacher W. A. Bruhn from Karby. Unfortunately nothing more is known about the find circumstances.

Two broad and large subglacial valleys interrupted by lakes mark the direction of the rivers: the valley of Kielsau/Bondenau/Trefsee and the valley of Oxbek/Wellspanger Au/Langsee. The latter runs more or less parallel to the Schlei fjord.

During the Boreal period this aquatic situation was ideal for hunting and fishing activities using dugout canoes for exploring the territory. Judging from the Archaeological State Survey, two regions with mainly Mesolithic finds can be observed: the Satrup peat bog and its adjacent Bondenau valley. The latter is well known for its late and terminal Mesolithic (Kongemose and Ertebølle Culture) sites (BRIEL/HARTZ in press; FEULNER 2010; SCHWABEDISSEN 1957/1958), whereas the Kreuzau region at the confluence of Wellspanger/Boholzer Au and Oxbek shows a cluster of sites from the Kongemose and Maglemose period (DELLBRÜGGE 2002, fig. 8). Here, on the sandy riverbanks and shorelines of former lakes, c. ten surface sites with Mesolithic flint scatters are present. Beside this, single finds like antler base axes (DELLBRÜGGE 2002) and a radiocarbon dated zoomorphic elk antler *baton de commandement* (KABACINSKI et al. 2011) were dredged out during river regulation. Moreover, amateur collectors discovered four notched bone points from the river sediments in an area of c. 1 km around the site (Fig. 1), showing that Mesolithic hunter and fisher groups populated this landscape in the early Boreal period, too.

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The northern distribution of finely notched bone points is completed by three objects which are associated with the water system of the river Eider. Today only a few sections of the original river are preserved undisturbed in the eastern and central part of Schleswig-Holstein, large parts were incorporated into the Kiel Channel which was constructed at the end of the 19<sup>th</sup> century. Only a few sites with flints from the early Maglemose culture are known from the Eider river banks or lake shores, but it is likely that this water system was very suitable to maintain long distance networks between east and west during the Mesolithic. A. Broderek discovered a short medial bone point fragment (HARTZ/SCHMÖLCKE 2013, 22; cat. no. 12; Plate 1) on the bank of the Kiel Channel near the village of Quarnbek (LA 69) in 1986. During the channel diggings loose animal bones from Late Glacial and early Holocene as well as various flints from Stone Age sites occurred occasionally in the sediments, apart from middle Pleistocene fossil bones of mammoth (*Mammuthus primigenius*), forest elephant (*Hesperoloxodon antiquus*) and rhino (*Dicerorhinus horituelus*). The bone point from Quarnbek was found 3 to 4 m below the surface in limnic sediments next to a simple bone point, charred wood, charcoal, and various animal bones from mammals, birds, and fish. In a distance of c. 12 m, a whole skeleton of a red deer from the same find horizon was eroded, however, without any traces of human activities.

In the late 19<sup>th</sup> century, three workers discovered a small ensemble of three notched bone points near the town of Rendsburg during the building of the Kiel Channel. The find circumstances of these pieces are unclear and only one was delivered to the museum. It is c. 20 cm long and slender with an oblique base with traces of hafting (cat. no. 13; Plate 3). Thus, it seems likely that it got lost during fishing activities, or it was associated with a site originally located close to the river Eider. The same origin is assumed for two bone points from Osterrönfeld, situated only 2 km east of Rendsburg. They were found in 1893 during diggings in a depth of 2 m at the border of a sand and a peat/gyttja layer. Unfortunately, one point disappeared shortly after its discovery; at the second (cat. no. 14; Plate 3) a short part of the base was broken off, but the original length can be estimated at c. 20 cm.

Most of the notched bone points known from Schleswig-Holstein come from the southeastern part of the country with the present districts Segeberg, Stormarn and Herzogtum Lauenburg. This upper moraine landscape, formed by the last Weichselian glaciation, is one of the richest regions for the Mesolithic in Schleswig-Holstein. In addition to numerous surface sites, mainly characterised by flint artefact scatters, there are extensive organic find assemblages from the river valleys of the Trave, Alster, Bille and Stecknitz (cf. HINGST 1959; KERSTEN 1951; 1963). These include different types of antler axe types, but also numerous notched bone points as well.

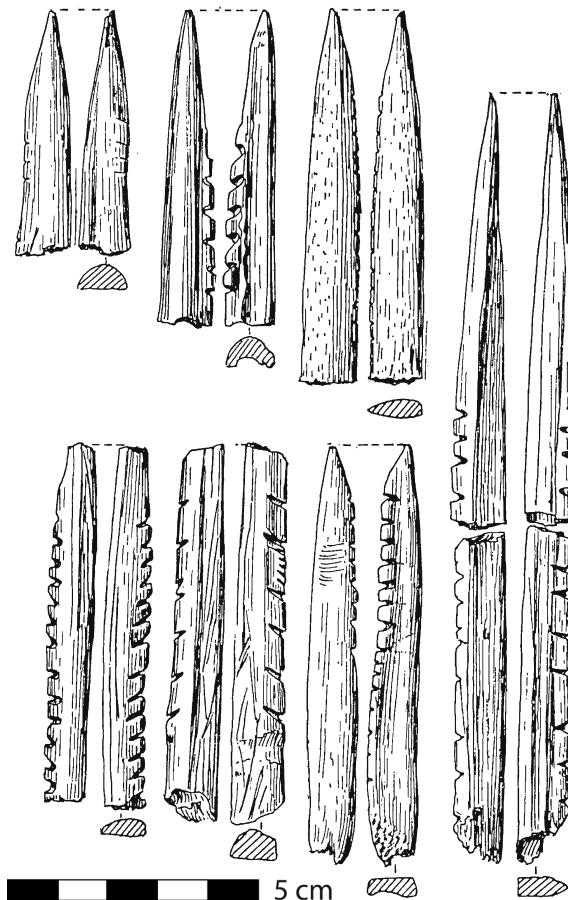


Fig. 3. Mölln LA 13, district Herzogtum Lauenburg. Bone points from dredging site Mölln 13a [cat. no. 35–41] (after KERSTEN 1963).

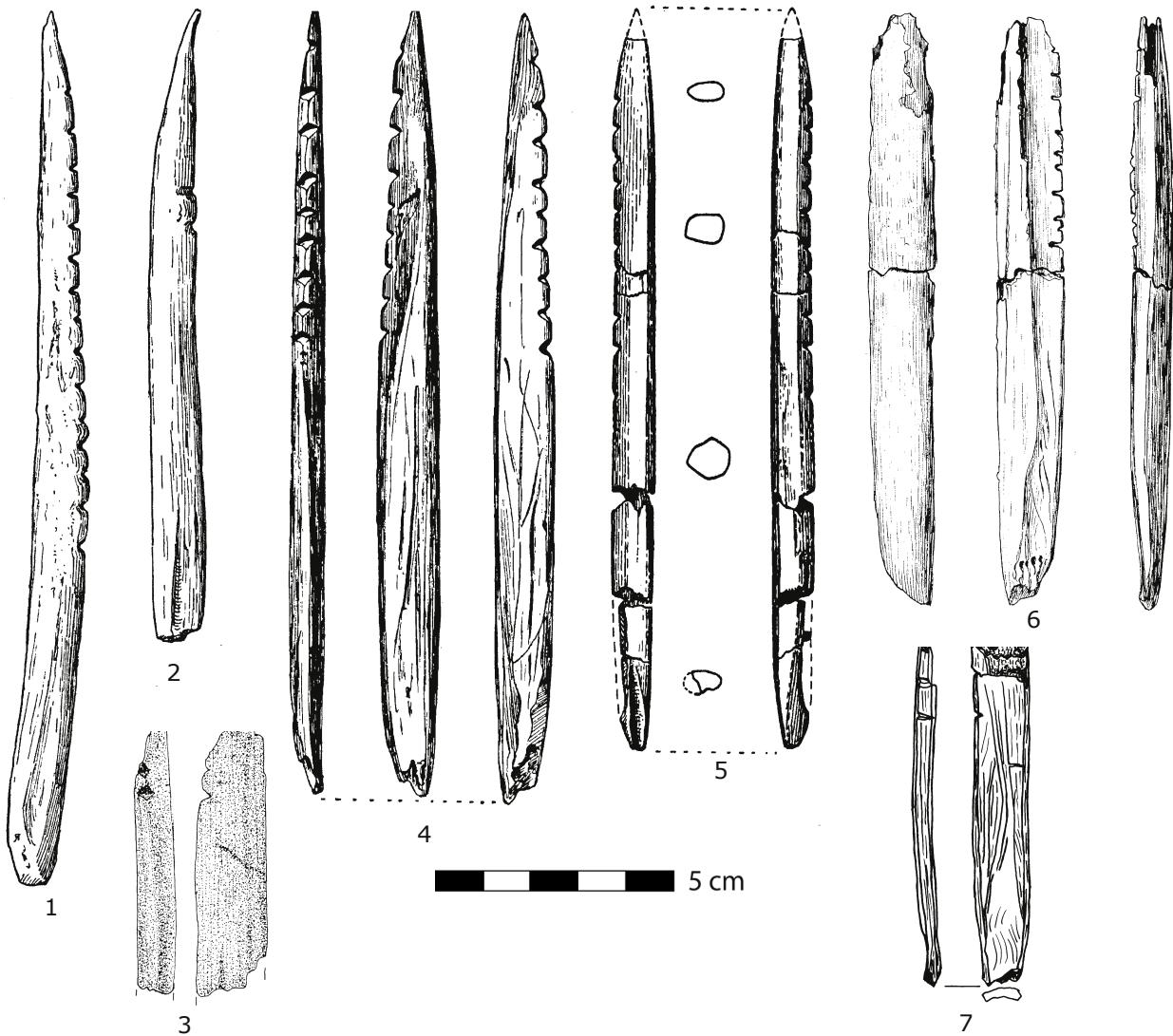


Fig. 4. Duvensee, district Herzogtum Lauenburg. Notched bone points from different sites in Duvensee bog. 1–4 Duvensee WP 2; 5–6 Duvensee WP 1; 7 Duvensee WP 18 (1–2 after SCHWANTES 1939; 4–5 after SCHWABEDISSEN 1949; 3, 6 after BOKELMANN 1969; 7 J. Titel, ZBSA).

With a length of 124 km the Trave is the third largest river in Schleswig-Holstein and forms together with its main tributaries Schwartau, Stecknitz and Wakenitz the main drainage system in the region. The bone and antler artefacts found furthest upstream come from the neighbouring find sites Glasau LA 11, LA 93 and LA 95 on the northern banks of the ancient lake Heidmoor. Apart from numerous mammal bones and antlers, different types of antler base axes and T-shaped antler axes were found during dredging in the Trave riverbed in 1976. A medial fragment of a large notched bone point (cat. no. 15; Plate 1) was unearthed at Glasau LA 95. The most northern site, Glasau LA 11, is known as a surface site with many Mesolithic and Neolithic flint artefacts at the eastern bank of the river Trave.

West of the Heidmoor basin, the Lake Seekamper See is located and drained by the Berliner Au towards the river Trave. Already in the 19<sup>th</sup> century a notched bone point (Seedorf [-Seekamper See]; cat. no. 16; Plate 4) was found at the southeastern part of the lake while fishing in a water depth of 4–6 m.

Another important site that has yielded numerous animal bones and antler artefacts is situated next to the Travenort manor house about half way between the villages of Travenhorst and Gnissau. Here, just south of the manor park, the Trave flows into a former lake basin that is today used for pasture and

stretches in a southwesterly direction towards Lake Wardersee. Directly in front of the manor parkland, in addition to other Mesolithic bone and antler tools (GROSS/LÜBKE 2019) a notched bone point (cat. no. 17; Plate 4) was dredged out, that was manufactured from a split long bone. Found by M. HADENFELDT (1936, 298, fig. 7; Segeberg Collection M7) before World War II, it was later erroneously attributed to another site (Groß Rönnau) by K. HUCKE (1973, 29–30, fig. 9).

Further downstream, the surface find site of Ahrensbök (-Gnissau) LA 7 on the eastern bank yielded numerous Mesolithic finds. One notched bone point (cat. no. 19; Plates 2; 4) was found in this area in the riverbed of the Trave near the Chaussee Bridge that crosses the river here, and another one (cat. no. 18; Plate 18; Travenhorst LA 18) during the cleaning of the Garbeker Au. Furthermore, two notched bone points were fished out not far from there, near the southern banks of Lake Wardersee (Pronstorf o. F.; cat. no. 20; Fig. 2; Rohlstorf LA 57; cat. no. 21; Plate 2). This cluster of Early Mesolithic bone points is a clear indication of the intensive exploitation of the aquatic landscape at that time.

North of Bad Segeberg another notched bone point (cat. no. 22) was found in dredged sediments after a second regulation of the river on the meadow Brückenwiese north of the old bridge in the 1930s.

Before the second regulation, the Middle Trave meandered in the area between Bad Segeberg and Bad Oldesloe through a series of dried-up lake basins that were separated from each other by narrow transverse elevations. At the beginning of the Holocene, a continuous water body (lake) had initially developed, which, from the Boreal on, gradually silted up from the edges due to fen formation. Exploitation activities during the Early Mesolithic are found on knolls built up by glaciolacustrine sands in the basins which protruded from the lakes as islands, like site Bebensee LA 76 (LÜBKE 2000).

Two notched bone points were found on the site Travenbrück (-Schlamersdorf) LA 14 (cat. no. 23; Plates 2; 4) and on the site Travenbrück (-Tralauf) LA 72 (cat. no. 24; Plate 4), a third one is known from the mainly Neolithic Funnelbeaker wetland site Wolkenwehe next to Bad Oldesloe (cat. no. 25; Plate 2). HARTZ et al. (2004/2005, 22) mentioned two finds from the latter site; however, these were mistakenly attributed to Wolkenwehe and are actually the two bone points from Boholzau/Buschau (see above).

In Bad Oldesloe there is also the mouth of the river Beste, one of the few western tributaries of the Trave. When Mesolithic hunter-gatherers followed the river Beste upstream to the west, they could cross the North Sea/Baltic Sea watershed at Sülfeld and reach the Elbe valley along the river Alster. The Alster valley reveals similar intensive Mesolithic settlement traces as the Trave valley (GROSS/HARTZ 2013). It is therefore not surprising that not far from Sülfeld two Early Mesolithic notched bone points (cat. no. 26–27; Plates 2; 5) were also found during investigations of the predominantly late Mesolithic site Kayhude LA 2 (CLAUSEN 2008) in the Alster valley.

Another pathway to cross the North Sea/Baltic Sea watershed is the valley of the southern Trave tributary Stecknitz and that of the Delvenau, which flows into the river Elbe. The Elbe-Lübeck Canal runs here today. During construction work at the end of the 19<sup>th</sup> century for the extension of the canal, which was originally built in the late Middle Ages, numerous Stone Age sites were completely or partially destroyed and the excavated material was deposited along the canal embankments as soil heaps (KERSTEN 1951; 1963).



Fig. 5. Brodersby, district Rendsburg-Eckernförde. Large-barbed bone point [cat. no. 49] (photo S. Hartz, MfA).

One of the individual finds without context is a complete notched bone point from Woltersdorf LA 10 (cat. no. 44; Plates 2; 5) in the former Delvenau valley. Among the other Mesolithic sites (BOKELMANN 1981, 187), Mölln 13a is particularly noteworthy, since seven fragments of notched bone points (cat. no. 35–41; Fig. 3; Plate 5) were recovered here in addition to other osseous tools (KERSTEN 1963, 146–147). This place is especially interesting because it is located near the mouth of the small river Steinau which drains the ancient Lake Duvensee, today's Duvensee bog, that lies west of the Stecknitz river valley and is known for numerous Mesolithic sites (BOKELMANN 2012; GROSS et al. 2019).

At the ancient Lake Duvensee G. Schwantes found during his excavations in 1926 the first notched bone points in the shore zone of the site, which was later called 'Duvensee Wohnplatz (WP) 2' by K. BOKELMANN (1969). He excavated two notched bone points (cat. no. 30–31; Fig. 4; SCHWANTES 1939, 103, fig. 103; see BOKELMANN 1969, plates 102.1–2) as well as three fragments (BOKELMANN 1969, plates 102.3–5). One of these is a medial fragment with notches (cat. no. 32; Fig. 4; BOKELMANN 1969, plate 102.4). However, the other two are proximal fragments (BOKELMANN 1969, plates 102.3,5), which cannot be clearly addressed as notched points and are therefore not considered further in this study. In 1946, H. Schwabedissen recovered another complete notched bone point (cat. no. 33; Fig. 4; Plate 5) from a test trench at the edges of 'Duvensee WP 2' (BOKELMANN 1969, plates 101.1–2).

During his excavations of the immediately adjacent site 'Duvensee WP 1', H. SCHWABEDISSEN (1949; 1951) was able to recover another complete notched bone point (cat. no. 28; Fig. 4; BOKELMANN 1969, Taf. 47a–b), a larger fragment with broken-off tip (cat. no. 29; Fig. 4; BOKELMANN 1969, Taf. 48, 3; 49, 1) as well as two unspecific base fragments (Bokelmann 1969, Taf. 48, 1–2; 49, 2–3). Another unspecific base fragment was found during the excavation carried out by K. Bokelmann in 1966 (BOKELMANN 1969, 115).

Additionally, a base fragment of a notched bone point (cat. no. 34; Fig. 4; Plate 5) must be mentioned, which originates from the site 'Duvensee WP 18' in the southern part of the Duvensee bog; it was found by K. Bokelmann in the 1970s during surveys after ditch cleaning work.

In total, we today know of four complete notched bone points, two proximal fragments with broken-off tips and one medial fragment from ancient Lake Duvensee. In addition, there are five unspecific proximal fragments of bone points, which cannot be reliably assigned to the notched bone points. Unfortunately, the whereabouts of all of these finds are not clear. According to M. JENKE (2009), there is only one complete bone point left in the magazine inventory of the Helms-Museum, Hamburg, which preserves the finds of the excavations of Duvensee WP 2 carried out by G. Schwantes. The whereabouts of the second point and the fragments are unclear, although they must have been present in the 1960s when K. Bokelmann recorded the material. From the inventory of the excavations carried out by H. Schwabedissen in 1946, the complete bone point of 'Duvensee WP 1' currently cannot be identified in the Schleswig museum's collections. This had led to confusions in the meantime, so that GROSS et al. (2019, Fig. 7) assigned the two pieces depicted by Schwabedissen (1949, Fig. 7) to Duvensee WP 1. In fact, one of them is the piece excavated by H. Schwabedissen on 'Duvensee WP 2'. The missing pieces could therefore only be recorded in the study presented here, using the already existing drawings and photos. Nevertheless, the comparatively high number of bone points from ancient Lake Duvensee shows once again that at least some of the Mesolithic sites excavated there were not exclusively used for hazelnut harvesting, but that the utilisation of aquatic resources was also of importance (cf. GROSS et al. 2019).

Only a few kilometres southwest of the Duvensee bog the Koberg bog and the Linau bog are located, which already belong to the headwaters of the river Bille. Besides the Alster and Delvenau rivers, the Bille river is the third tributary of the Elbe river, which was already used as a natural communication pathway in the Mesolithic. Accordingly, numerous Mesolithic sites are listed in the Schleswig-Holstein State archive of Archaeology of the districts of Stormarn and Herzogtum Lauenburg (HINGST 1959; KERSTEN 1951; 1963) and in the State Archive of the Hanseatic town of Hamburg (SCHINDLER 1960). Of special

interest for the present work is the site Grande LA 2, which is located between the outflow of the Bille from a larger elongated lake basin, which is now overgrown, and the confluence of the Helkenbek stream, hence forming a typical location for Mesolithic sites in Northern Germany. In the 1980s, extensive earth movements took place here during the extension of Federal Highway 404. Numerous finds from different periods have been recovered in the dredged sediments from the river, which were deposited along the embankments, including fragments of two notched bone points (cat. no. 42–43; Plate 5).

This overall view of all currently known notched bone points from Schleswig-Holstein shows that their number is considerably higher than published by TROMNAU (1973) or CZIESLA (1999). Most Early Mesolithic sites, where osseous tools were found, also contain notched bone points. This is a further indication of how important this type of tool was for the hunter, fisher and gatherer communities of the time for their daily life.

### 3 Early Mesolithic large-barbed bone points from Schleswig-Holstein

Unlike the notched bone points, the large-barbed bone points from Schleswig-Holstein were already extensively discussed by ANDERSEN/PETERSEN (2009) in their paper on this Early Mesolithic tool type from Southern Scandinavia and Northern Germany (Table 1). Therefore, an intensive analysis is not intended here, but some additional remarks are necessary.

Following DELBRÜGGE (2002), ANDERSEN/PETERSEN (2009) list a total of three large-barbed bone points from Schleswig-Holstein, all of which originate from the northeastern administrative district of Schleswig-Flensburg. Besides the complete piece from the site Harrislee LA 1 (cat. no. 46; ANDERSEN/PETERSEN 2009, 22, Fig. 9,7; RÖSCHMANN 1963, Taf. 1,3) there are also one medial fragment (cat. no. 47; ANDERSEN/PETERSEN 2009, 39, Fig. 20,80; RÖSCHMANN 1963, Taf. 1,4;) and one nearly complete bone point (cat. no. 48; ANDERSEN/PETERSEN 2009, 39, Fig. 20,79; RÖSCHMANN 1963, Taf. 1,5) from the site Sörup-Gammelby LA 1. However, both DELBRÜGGE (2002, 112) and ANDERSEN/PETERSEN (2009, 40) confuse the dimensions and/or the whereabouts of the two pieces in their catalogues. While the medial fragment (KS 19808c) with a length of 12.8 cm was transferred to the Museum at Gottorf Castle after its discovery in 1946, the almost complete bone point with a length of 18.8 cm remained in a private collection (Frantzen) and is lost today. In addition, it must also be mentioned that as an old find of the 19<sup>th</sup> century, the bone point from Törning (cat. no. 45; ANDERSEN/PETERSEN 2009, 27, Fig. 12,21) in today's southern Jutland, Denmark, is also part of the collection of the Museum of Archaeology at Gottorf Castle.

Not listed, however, is another complete large-barbed bone point from Brodersby (Schwansen), district Rendsburg-Eckernförde (cat. no. 49; Fig. 5; CLARK 1936, 238; HARTZ/SCHMÖLCKE 2013, 22–23; SCHWANTES 1939, 118). It was found in the 1920s south of the Schlei Fjord at the bottom of a small bog near the village. The bone point is 20.4 cm long, 1.8 cm wide and 0.8 cm thick. Along one side, there are eight large barbs and a trapezoid shaped base knob. Due to this last attribute, the piece is according to the ANDERSEN/PETERSEN (2009) typology a large-barbed bone point of type 4.

Large-barbed bone points occur exclusively in the northeastern part of Schleswig-Holstein and thus join the Danish distribution area, where this tool type is more frequently represented. However, this picture can be misleading, since a few finds from Hohen Viecheln, Plauerhagen and Venz in Mecklenburg-Western Pomerania are also known (cf. ANDERSEN/PETERSEN 2009, 13).

ANDERSEN/PETERSEN (2009, 15) were able to prove with ten AMS <sup>14</sup>C dates of large-barbed bone points from Denmark and Sweden that this type dates over a longer period from the Preboreal to the late Boreal. This dating approach is also confirmed by two new AMS-results of North German pieces (Table 1).

Table 1. AMS  $^{14}\text{C}$  dates of large-barbed bone points from Southern Scandinavia (after ANDERSEN/PETERSEN 2009) and northern Germany calibrated with OxCal 4.3.2 (BRONK RAMSEY 2009) and the IntCal13 calibration curve (REIMER et al. 2013).

Origin/site	Andersen/ Petersen type	Lab. Code	Conventional $^{14}\text{C}$ -Age (BP)	Calibrated date (cal. BC)	Reference
<b>Denmark</b>					
Sandlyng Mose NM A 39773	Type 1	AAR 9296	$9905 \pm 65$	9660–9260	ANDERSEN/ PETERSEN 2009
Vallensgård Mose NM A 22393	Type 5	AAR 9297	$9280 \pm 65$	8700–8310	ANDERSEN/ PETERSEN 2009
Skalbjerg FSM 4036	Type 2	AAR 8796	$9250 \pm 60$	8620–8310	ANDERSEN/ PETERSEN 2009
Tunebjerg Øst NM A 53046	Type 3	AAR 8800	$9050 \pm 40$	8310–8230	ANDERSEN/ PETERSEN 2009
Trunderup Mose FSM 8530	Type 3	AAR 8294	$8845 \pm 60$	8220–7750	ANDERSEN/ PETERSEN 2009
Halleby Å NM A 46132	Type 4	KA 6333	$8610 \pm 90$	7940–7520	ANDERSEN/ PETERSEN 2009
Abelskov (Abildskov) FHM 3399	Type 8	AAR 6266	$8570 \pm 65$	7740–7520	ANDERSEN/ PETERSEN 2009
Kulsø NM A 5456	Type 3	KA 6334	$8170 \pm 240$	7610–6500	ANDERSEN/ PETERSEN 2009
<b>Sweden</b>					
Aggarp Mose LUHM 4469	Type 7	OxA 2789	$8360 \pm 90$	7580–7179	LARSSON 1996
Rönneholms Mose LUHM 17532	Type 5	OxA2792	$8610 \pm 90$	7941–7516	LARSSON 1996
<b>Germany</b>					
Hohen Viecheln ID 13272	Indet.	RICH-22178	$8822 \pm 45$	8204–7745	GROSS et al., this vol.
Sörup-Gammelby LA1 KS 19808 c	Indet.	KIA-51381	$8652 \pm 54$	7810–7580	This study

In addition to the date for the fragment of a large-barbed bone point from Hohen Viecheln (RICH-22178; Gross et al., this volume)], a second result (KIA-51381) is available for the medial fragment from Sörup-Gammelby LA 1 (KS 19808 c). Both pieces date to the Boreal of the early 8<sup>th</sup> millennium and thus belong to the younger finds of this type in the southwestern Baltic region.

## 4 Formal technological description of Mesolithic notched bone points

For the analysis, 49 bone points and fragments were regarded. 35 of them were classified as Duvensee-type points, nine as Kunda-type points and five as large-barbed types with aliform or carved out barbs. The latter were not incorporated into the

Table 2. Numbers of the different bone point types.

Preservation	Complete	Medial	Distal	Proximal and medial	Medial and distal
Duvensee-type	18	4	1	5	7
Kunda-type	7	2	-	-	-
Large-barbed point	3	1	-	-	1

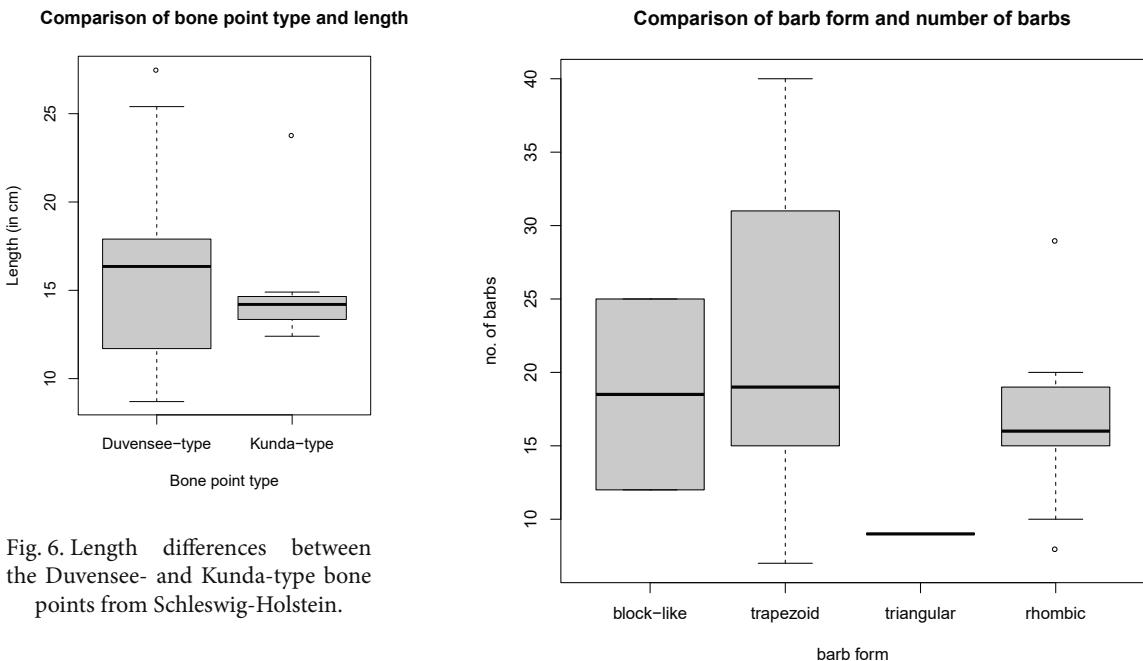


Fig. 6. Length differences between the Duvensee- and Kunda-type bone points from Schleswig-Holstein.

descriptive analysis as ANDERSEN/PETERSEN (2009) already published most of them. With 25 pieces, the majority of the notched or fine-barbed bone points were complete, five pieces have a broken tip, eight are missing their base and six pieces are medial fragments (Table 2).

The lengths of the three types in the assemblage from Schleswig-Holstein differ significantly from each other (Fig. 6, only complete specimens regarded). The Duvensee-type points cover a wide length-range (min. = 8.7 cm, max. 27.5 cm,  $\mu = 16.0$ ) whereas the Kunda-type shows a mean length of 15.2 cm due to an outlier with 23.8 cm length. The three complete large-barbed points are around 22.4 cm in length.

The barbs of the two prevailing notched or fine-barbed bone point types in Schleswig-Holstein, the Duvensee- and

Fig. 7. Trapezoid barb forms show the biggest variation in number per bone point.

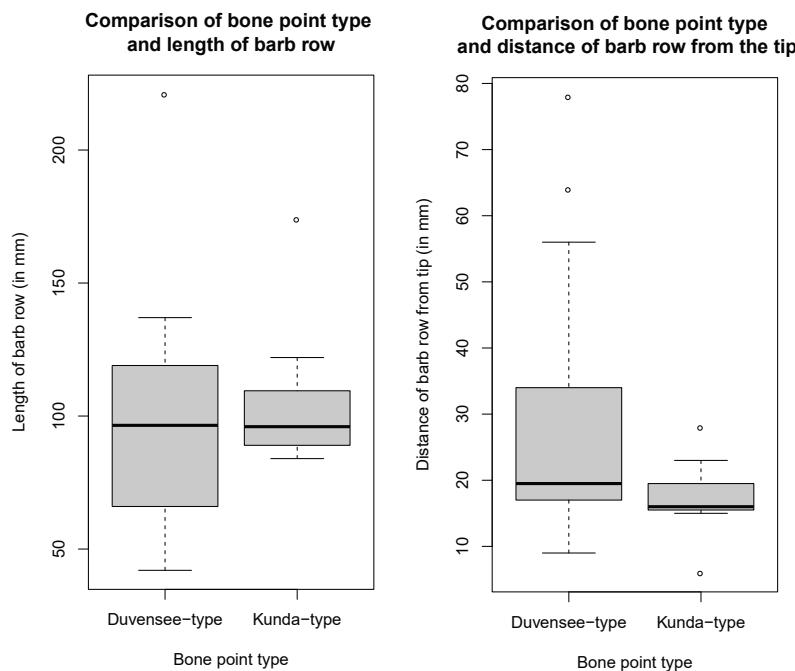


Fig. 8. The barb rows of Duvensee-type points can be longer than those of Kunda-type bone points.

Fig. 9. The distance of the barb row from the tip of the point seems to be type dependent.

Table 3. Preservation of the different bone points with regard to their dominant barb form.

Barb form	Complete	Medial	Distal	Proximal and medial	Medial and distal
block-like	2	0	1	1	0
trapezoid	13	3	0	3	6
triangular	1	0	0	0	1
rhombic	7	3	0	1	0
rhomboidic	1	0	0	0	0
rhombic, rounded	1	0	0	0	0

Kunda-type, show no clear difference with respect to the depth and width of barbs and notches (Wilcoxon signed rank test,  $p = 0.3271$ ). The mean of the depth for both types is 1.9 mm and 2.3 mm, respectively; contrary to this, the points with aliform/carved out barbs have recognisably deeper barbs ( $\mu=11.0$  mm). Clear differences (t-Test,  $p = 0.7032$ ) cannot be made out for the width of the barbs/notches for the Duvensee- ( $\mu=2.0$  mm) nor the Kunda-type points ( $\mu=1.9$  mm).

Since the types are predominantly differentiated by their barb form (Table 3), an analysis can be omitted here. However, it is clear that the Duvensee-type points and the Kunda-type points provide similar numbers of barbs (Fig. 7; only complete specimens were regarded).

While there is no disparity between the lengths of barb rows of the Duvensee- and Kunda-type points (Fig. 8; only complete specimens were regarded), the distance of the first barb/notch from the distal end of the point indicates clear differences between the Duvensee- and Kunda-type points in the sample (Fig. 9). This might point towards different purposes or uses of the bone points. However, it is difficult to determine if these artefacts were single-purpose tools (see below).

## 5 Dating of notched and fine-barbed bone points from Schleswig-Holstein

Contrary to the large-barbed bone points, the dating of which was long considered uncertain (ANDERSEN/PETERSEN 2009), the attribution of notched and fine-barbed bone points to the Early Mesolithic has been out of question for a long time. This was partly the case due to their occurrence in stratified layers of Early Mesolithic sites such as Kunda (GREWINGK 1884; INDREKO 1936), Duvensee (SCHWANTES 1928), Star Carr (CLARK 1954), Friesack 4 (GRAMSCH 1993; 2009/2010) or Friesack 27a (GRAMSCH 1991; GROSS 2017). Recently, however, direct AMS dating of individual specimens has also yielded older results, which date some of these already to the Late Glacial (CZIESLA/PETTITT 2003; SMITH/BONSALL 1991, 209). The best-known example is probably the famous uni-serially fine-barbed bone point dredged up from the Leman and Ower Bank in the North Sea in 1931 (BURKITT 1932; CLARK 1936; LOUWE KOOIJMANS 1970), and dated later to  $11.740 \pm 150$  uncal. BP (OxA-1950, SMITH/BONSALL 1991, 209).

For this reason, twelve notched bone points from the collection of the Museum of Archaeology were selected for AMS dating (Table 4; Fig. 10). One of them comes from the North Frisian Islands, two from the Eider Valley, five from the Trave Valley and four from the Stecknitz Valley. The AMS dates have provided remarkably uniform ages, ranging from 9250 to 8250 cal. BC, which for the majority of bone points can also be narrowed down to the younger Preboreal before 8710 cal. BC. Only the two pieces from Seedorf and Wyk, Island of Föhr, fall into the early Boreal up to 8250 cal. BC. There are no significant differences in the datig results of Duvensee and Kunda bone points.

The dates correspond to those known from southern Scandinavia so far. Two finds from the Rönneholm bog and one from the neighbouring Ageröd bog in Skåne, Sweden (LARSSON et al., this volume)

Table 4. AMS  $^{14}\text{C}$  dates of notched bone points from Schleswig-Holstein, Brandenburg, Saxony-Anhalt and Southern Scandinavia, calibrated with OxCal 4.3.2 (BRONK RAMSEY 2009) and the IntCal13 calibration curve (REIMER et al. 2013). The catalogue numbers of the Schleswig-Holstein pieces are indicated in square brackets behind the site names.

Origin/site	Type	Lab. Code	Conventional $^{14}\text{C}$ -Age (BP)	Calibrated date (cal. BC)	Reference
<b>Schleswig-Holstein, Germany</b>					
Wyk/Föhr, NF [3]	Duvensee	KIA-53547	9115 ± 40	8450–8250	This study
Rendsburg, RD-ECK [13]	Duvensee	KIA-53540	9415 ± 45	8800–8570	This study
Quarnbek, RD-ECK [12]	Duvensee	KIA-26277	9605 ± 40	9200–8820	HARTZ/SCHMÖLCKE 2013
Seedorf, SE [16]	Duvensee	KIA-53541	9280 ± 40	8630–8350	This study
Travenort, SE [19]	Duvensee	KIA-53542	9420 ± 45	8810–8570	This study
Travenort, SE [18]	Duvensee	KIA-53546	9465 ± 45	9120–8630	This study
Groß Rönnau, SE [22]	Duvensee	KIA-53544	9455 ± 40	9110–9630	This study
Tralau, STO [24]	Duvensee	KIA-53543	9630 ± 45	9230–8830	This study
Mölln, LAU [41]	Duvensee	KIA-52810	9521 ± 43	9140–8720	This study
Mölln, LAU [39]	Kunda	KIA-52811	9488 ± 41	9120–8640	This study
Mölln, LAU [35]	Duvensee	KIA-52812	9555 ± 41	9140–8770	This study
Woltersdorf, LAU [44]	Kunda	KIA-53545	9525 ± 45	9140–9730	This study
<b>Brandenburg, Germany</b>					
Bützsee-Altfriesack	Duvensee	OxA-8726	9505 ± 80	9170–8630	CZIESLA/PETTITT 2003
Bützsee-Altfriesack	Duvensee	OxA-8742	10185 ± 65	10190–9550	CZIESLA/PETTITT 2003
Bützsee-Altfriesack	Pritzerbe	OxA-8744	9195 ± 65	8571–8280	CZIESLA/PETTITT 2003
Bützsee-Altfriesack	Pritzerbe	OxA-8842	8830 ± 60	8220–7740	CZIESLA/PETTITT 2003
<b>Saxony-Anhalt, Germany</b>					
Königsau	Duvensee	OxA-13286	9455 ± 40	9110–8630	GRÜNBERG 2006
Kalte (Milde)	Duvensee	OxA-13285	9385 ± 40	8760–8560	GRÜNBERG 2006
Glindenberg	Pritzerbe	OxA-12212	8270 ± 45	7480–7150	GRÜNBERG 2006
<b>Denmark</b>					
Brokøb, Store Åmose		AAR-6867.1 AAR-6867.2	7890 ± 65 7940 ± 65	7030–6650	FISCHER 2004
Bodal, Store Åmose		AAR-6868	9660 ± 75	9260–8820	FISCHER 2004
Skottemarke, Lolland		OaX-4886	9570 ± 100	9250–8650	FISCHER 1996
Skottemarke, Lolland		OaX-5528	9310 ± 90	8770–8300	FISCHER 1996
<b>Sweden</b>					
Rönneholms Mosse RFP 0985	Type 1	Ua-46481	9054 ± 47	8420–8210	LARSSON et al., this volume
Rönneholms Mosse RFP 1469	Type 1	Ua-46878 LuS-10848	9208 ± 55 9375 ± 45	8700–8450	LARSSON et al., this volume
Ageröds Mosse Slabälta 2	Type 1	Ua-46486	9546 ± 76	9212–8711	LARSSON et al., this volume

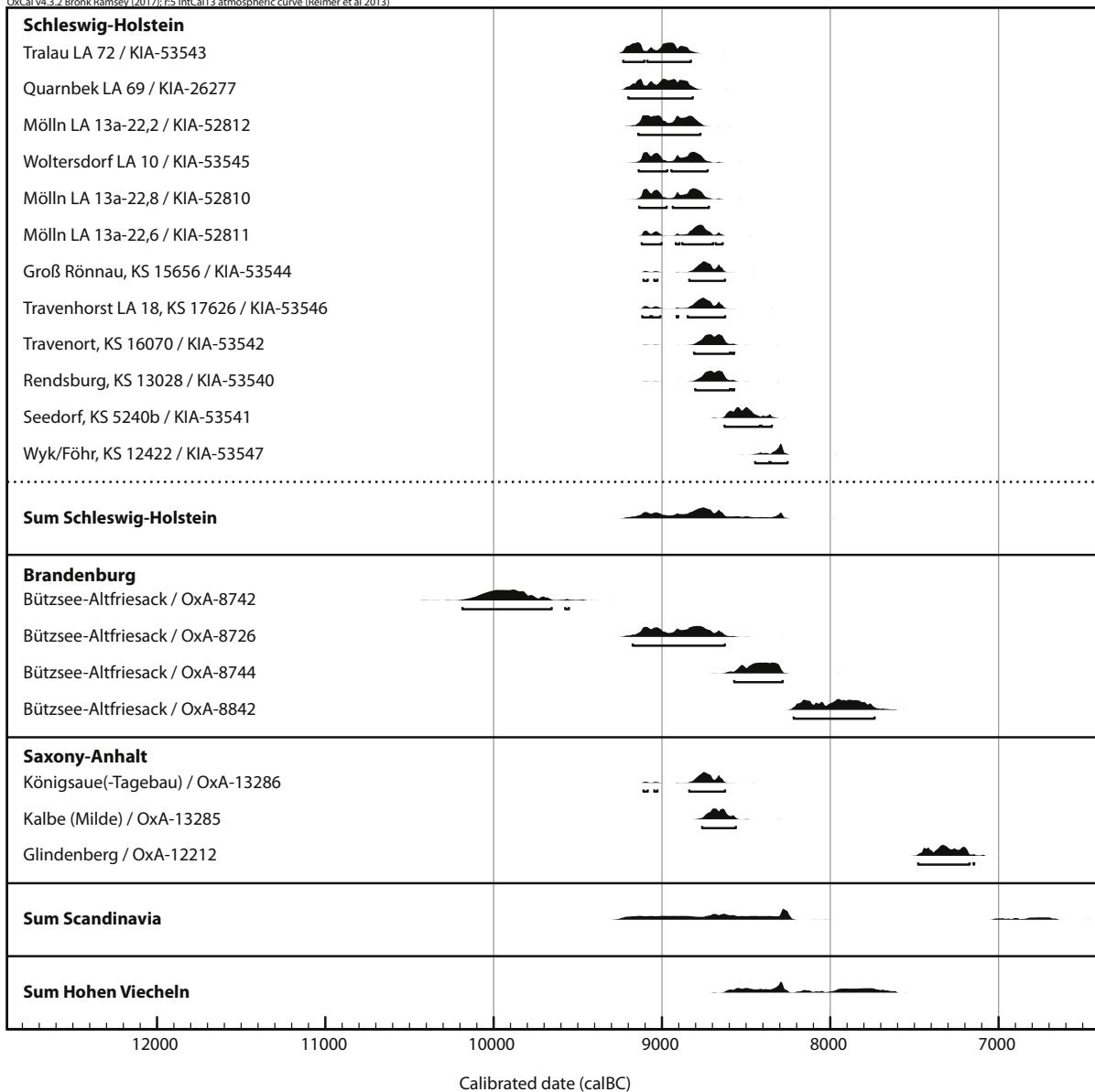


Fig. 10. Calibration of radiocarbon dates of notched and fine-barbed bone points from Schleswig-Holstein, Brandenburg, Saxony-Anhalt, compared with datasets from Southern Scandinavia (cf. Table 4) and Hohen Viecheln (GROSS et al., this volume), calibrated with OxCal 4.3.2 (BRONK RAMSEY 2009) and the IntCal13 calibration curve (REIMER et al. 2013).

as well as two bone points from Skottemarke, Lolland (FISCHER 1996), and one from the site Bodal in the Store Åmose bog, Seeland (FISCHER 2004), both Denmark, provided data which are well comparable with those from Schleswig-Holstein. Only one other bone point from the Store Aamosen from Brokøb dates much younger, around 7000 and 6600 cal. BC into the early Atlanticum, which corresponds with the typological similarity with late Mesolithic bone points of Motala-Strandvägen, Sweden (GUMMESON/MOLIN, this volume).

East and southeast of Schleswig-Holstein seven AMS results of directly dated bone points are known from Lake Bützsee near Alt-Friesack, district Ostprignitz-Ruppin, Brandenburg, Germany (CZIESLA/PETTITT 2003), and from Königsauge, district Aschersleben-Staßfurt, Kalbe (Milde), district Altmark-

kreis-Salzwedel, and Glindenberg, district Ohrkreis, all in Saxony-Anhalt (GRÜNBERG 2006). Four of them were obtained on notched bone points of type Duvensee, the other three on points of type Pritzerbe, a regional type especially distributed in northeastern Germany (CZIESLA 1999; 2006). While three of the four bone points of type Duvensee have an age comparable to that of the Schleswig-Holstein pieces, the fourth one dates much older, to the end of the Late Glacial. The three type Pritzerbe points, on the other hand, are much younger and date into the Boreal. Specimens of similar age are unknown from Schleswig-Holstein. However, comparable bone points of type Pritzerbe are documented from the site Hohen Viecheln 1, district Northwest Mecklenburg, Mecklenburg-Western Pomerania (SCHULDT 1961; GROSS et al., this volume), where they also tend to date younger than the notched bone points of type Duvensee. Their age is remarkable at Hohen Viecheln, since the AMS dating results there are generally younger than those of the Schleswig-Holstein items. A comparison with the site Friesack 4, district Havelland, Brandenburg, shows that in Northern Germany notched or fine-barbed bone points can occur at least up to the late Boreal (GRAMSCH 1990; 2009/2010). Although no AMS data of directly sampled bone points of this site are available, corresponding finds are proven from the stratified layer complexes I to III of the excavation, which date from the Preboreal to the older Boreal, and from layer complex IV, which spans a time from the late Boreal to the early Atlantic (GRAMSCH 2009/2010; MEADOWS et al. 2018). In this respect, the dating of bone points from Hohen Viecheln should be undisputed. The absence of older pieces can be explained by the fact that due to the fluctuating lake level the corresponding shore zone of the late Preboreal was not excavated during the excavations. Why, however, no younger dated bone points of the type Duvensee are proven from Schleswig-Holstein at present, must remain open for the time being.

## 6 Function

Already since the fundamental work of CLARK (1936) there has been an ongoing discussion about the function of Mesolithic bone points (CLARK 1948; CZIESLA 1999; 2006; GRAMSCH 1990; 2009/2010; VERHART 1988; 2000). CLARK (1936, 121–122; 1948, 58–59) himself, referring to the Swedish find from Siretorp (SAHLIN 1913, 271) and ethnological examples, favoured the use as a fish spear with bone points arranged in pairs or groups as a leister as suggested earlier, among others by NILSSON (1868, 27–31), RAU (1884, 72–82), SARAUW (1903, 247–252) or FRIIS JOHANSEN (1919, 197–203). However, he himself considered singly-hafted bone points as possible heads for javelins, thrusting spears or fish spears as well (CLARK 1936, 122). More recent evidence, especially from the Danish site Ulkestrup Lyng (ANDERSEN et al. 1982, 45, fig. 68), but also from Friesack 4 (GRAMSCH 2009/2010, 57–58), now shows that this was certainly the much more common form. Such pieces are also documented ethnographically at several places worldwide (BRANDT 1972, 27–32). However, in principle it is possible that they were used as leisters or harpoons as well (cf. CHRISTENSEN et al. 2016; ICKERODT 2013).

There is a consensus that small or narrower bone points were used as arrowheads, regardless of whether they were notched or not, while the larger broad shapes were used as lance or javelin heads. However, this separation is arbitrary. Whereas L. VERHART (1988, 169) considers length to be decisive and separates pieces under 85 mm in length from those over 94 mm in length, B. GRAMSCH (2009/2010, 58) differentiates between lighter and heavier bone points with a weight of 4 g. Since all complete specimens among the Schleswig-Holstein bone points have lengths of more than 84 mm and – if possible to measure – a weight of more than 4 g, it is more likely that these have been used as lance- or javelin heads than as arrowheads.

Another controversial question is whether notched bone points were used exclusively for fishing or for hunting as well. While CZIESLA (1999; 2006) largely follows Clark's view (CLARK 1936; 1948) that

these are exclusively fishspear heads, VERHART (1988; 2000), GRAMSCH (2009/2010) and P. V. PETERSEN (2009) also consider it possible to use them for fowling and/or hunting game. Important in this context are finds in which bone points were found in a direct association with the prey animal and not only in the vicinity of animal bones, i.e. in an indirect association (VERHART 2000, 115). CLARK (1936, 122; 1948, 58–59) referred for his hypothesis to one find from Esperöds Mose, Sweden (cf. GRAMSCH 2009/2010, 59; WALLENGREN 1907) and two from Kunda, Estonia (INDREKO 1936, 241–242; 1948, 48–50; THOMSON 1928, 2), in which fine-barbed bone points of type Kunda were found directly related to skeletal remains of a pike.

Other finds from former Eastern Prussia mentioned by CLARK (1948) or VERHART (1988), however, are less distinct, and they are not notched or fine-barbed either. To make the differences clear, they are mentioned here again in more detail. In the case of former Abschruten (Ksp. Mallwischken), district Pillkallen, Eastern Prussia (today Wassilkowo, district Krasnosnamensk, oblast Kaliningrad, Russia), a 10 cm long fragment of a ‘fishspearhead with square cross section’ was found on top of a layer of basin clay in 1936. It was associated with a bone dagger made of a metacarpus from aurochs or bison and several skeletons of large pikes (GROSS 1937, 77; 1938, 111). In former Zinten, district Heiligenbeil, Eastern Prussia (today Kornewo, district Bagrationowsk, oblast Kaliningrad, Russia), in 1932 a uni-serial slotted bone point and a small simple spindle-shaped bone point were recovered together with the lower jaw of an undetermined big fish (ENGEL 1935, 298–299; GROSS 1941, 34). Finally in former Upalten, district Lötzen, Eastern Prussia (today: Upalty, district Giżycki, Warmian-Masurian Voivodeship, Poland), a uni-serial slotted bone point, a long simple bone point with circular section and oblique base, and a conical tipped bone arrowhead were found together with a wild boar tooth and two stirrup bones of an undetermined fish species (ENGEL 1935, 298–299). Therefore, in all three cases there is no direct, but only an indirect association with fish remains. The same is true for the discovery of three barbed bone points of type Pritzerbe from Glindenberg (Hohenwarther Werder), district Ohrekreis, Saxony-Anhalt, which were associated with a red deer antler-base mattock and a lower jaw and other remains of pike (TOEPFER 1962).

An examination of the cited direct find associations of bone points and mammalian bones reveals a similarly indistinct result. The find from Friesack 27 is only a small tip fragment embedded in a thoracic vertebra of a red deer, so the exact type of the bone point cannot be determined (GRAMSCH 1991, Taf. 9b; 2009/2010, 58; GROSS 2017, 106). In former Kleszwen, district Lötzen, Eastern Prussia (today Kleszczewo, district Giżycki, Warmian-Masurian Voivodeship, Poland), a simple plain bone point with triangular cross section was found together with skeletal remains of a red deer during bridge construction work (ENGEL 1935, 299). On the Danish Island of Zealand at Ordrup mose a 17 cm long slotted bone point was found next to a nearly complete skeleton of a wild boar (MATHIASSEN 1938, 10–11), and from the terminal Mesolithic Ertebølle site Trylleskoven near Køge a red deer bone with an embedded small simple bone point is known (ANDERSEN 1981, 98). The find from Wehrstedt (Halberstadt), district Harz, Saxony-Anhalt, is a barbed bone arrowhead with a long foreshaft-like socket tang (HEMPRICH 1938) of late Neolithic or even younger age (cf. LUIK 2006). Consequently, these finds do not really help to answer the question of the function of notched and fine-barbed bone points.

A large-barbed point was found together with red deer remains at Hinge Sø, Jutland, Denmark, but due to the difficult find circumstances, it is uncertain if there was really a direct find association (PETERSEN 2009, 45–46). The only cases in which fine-barbed bone points have been documented in a direct association with hunting game are the elk remains of High Furlong, Poulton-le-Fylde, Lancashire, England (HALLAM et al. 1973) and of Tåderup, Falster, Denmark (CLARK 1936, 44; PETERSEN 2009, 45; ØDUM 1920). In both cases, the remains represent animals that apparently first escaped their hunters, but later drowned in a lake or died in a wetland because of their injuries. The elk from High Furlong is dated to the Late Glacial Allerød-Interstadial (OxA-150: 12400 ± 300 uncal. BP; GILLESPIE et al. 1985;



Fig. 11. Canadian Indians spearing beavers. Water colour drawing by Peter Rindisbacher 1821. Indians of the North Red River area, probably in the vicinity of old Fort Douglas, now Winnipeg, Canada (© Wisconsin Historical Society, Image ID 3884; printed with permission of the society).

JACOBI et al. 1986) and the Tåderup find to the Early Atlantic (K-2227: 7810 ± 120 uncal. BP; PEDERSEN/PETERSEN 2017, 246). Consequently, they are not of the same age as the Preboreal notched and fine-barbed bone points from Schleswig-Holstein, but distinctly show that notched or barbed bone points were not only used for fishing in the Late Glacial and Early Holocene but also for hunting large herbivores. PETERSEN (2009) describes a possible hunting strategy where elks were first shooed into the water with the help of dogs and then killed from a boat with javelins or lances with large-barbed bone points. The elk find from Tåderup shows that notched or fine-barbed bone points might also have been involved. Such spears or lances could also have been used to set the mortal blow for an animal after a chase with a bow and arrow. This would also explain why arrow-shot injuries caused by arrows fitted with microliths can be detected much more frequently in large game on Mesolithic sites like Mullerup or Lundby mose (LEDUC 2014). The aurochs of Vig (HARTZ/WINGE 1906) and Prejlerup (AARIS-SØRENSEN/PETERSEN 1986) would then be the result of such a failed chase with bow and arrow, in which the wounded animal escaped and could not be traced in order to finally kill it with a javelin or thrusting spear.

Another possibility of using notched or barbed bone points as heads of thrusting spears when hunting mammals in an aquatic environment is the hunting of beavers (ELLIOTT 2009, 51–53). Numerous descriptions from the 18<sup>th</sup> and early 19<sup>th</sup> centuries describe the hunting of beavers. Particularly impressive in this context is a painting by the Swiss painter Peter Rindisbacher from 1821, depicting Canadian Indians breaking up a beaver's den and spearing the fleeing animals with a spear with a barbed point (Fig. 11).



Fig. 12. Spearing muskrats in winter. Water colour drawing by Seth Eastman (EASTMAN 1853). Indians of the Dakota tribe spearing muskrats in their dens in the upper Mississippi River area in winter time (Super Stock © agefotostock, Image code SSB-1095-1296; printed with permission of the agency).

However, this hunting technique was not exclusively used for beavers. There are historical reports from Tierra del Fuego where otters were driven out of their dens with the help of dogs and then killed with spears (CHRISTENSEN et al. 2016, 243). A painting by Seth Eastman from 1853 shows a winter scene in the upper Mississippi River area, Northern America, in which muskrats are speared by Indians during their winter sleep (Fig. 12; EASTMAN 1853). Although muskrats have not been present in Mesolithic Europe, the hunting of other furry animals with such techniques is quite conceivable in this context. Hares, badgers and foxes can be smoked out in their dens and then be speared during the escape attempt. All these furry animals are found in the archaeozoological collections of Early Mesolithic sites such as Hohen Viecheln (GEHL 1961), Star Carr (KNIGHT et al. 2018) or Friesack (SCHMÖLCKE 2016). Unfortunately, due to the small size of their bones, lethal traumas that might indicate the killing process of the animals are only rarely present. In principle, the hunting techniques described above are, besides trap hunting, conceivable for the Early Holocene. Javelins or thrusting spears with notched or finely barbed bone points might have been a versatile hunting weapon for Early Holocene people, used for fishing and hunting game or fur animals of various sizes.

## 7 Conclusions

The notched bone points from Schleswig-Holstein are a common type of Mesolithic inventories. However, most of them are chance finds or were discovered during the dredging of channels or rivers. This indicates on the one hand the great potential for further research as large palaeo-landscapes have yet to be investigated (cf. GROSS/LÜBKE 2019), on the other hand it also displays how much destruction has already happened and inflicted a loss on prehistoric sites. Nonetheless, such stray finds present the possibility to be more useful than to be mere exhibition objects, as they can be directly dated. This project underlines the importance of such studies as they can significantly improve our understanding of typochronological aspects of the Mesolithic. As these finds are out-of-context anyway, they are of limited value for settlement archaeological questions and thus remain a good study object when it comes to typology and direct dating.

It has also become clear that the finds from Schleswig-Holstein show distinct differences with respect to dating in comparison with the finds from Hohen Viecheln. This can be due to the sampling strategy applied at the latter site but might also display regional differences with respect to the use of specific types in different regional groups. It can be expected that the combination of more detailed studies and different approaches about specific aspects of the Mesolithic will increasingly show differences within and between various social entities.

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(Münster 2019).

Sönke Hartz  
 Museum for Archaeology (MfA)  
 Schloss Gottorf  
 24837 Schleswig  
 Germany  
 soenke.hartz@landesmuseen.sh

Harald Lübke  
 Centre for Baltic and Scandinavian Archaeology (ZBSA)  
 Schloss Gottorf  
 24837 Schleswig  
 Germany  
 harald.luebke@zbsa.eu

Daniel Groß  
 Centre for Baltic and Scandinavian Archaeology (ZBSA)  
 Schloss Gottorf  
 24837 Schleswig  
 Germany  
 daniel.gross@zbsa.eu

# APPENDIX

Please note that the recording scheme is the same like in Gross et al., this volume, and that not all bone points are depicted on the plates. The catalogue is digitally available at [www.zbsa.eu/zbsa/publications/open-access-datenmaterial](http://www.zbsa.eu/zbsa/publications/open-access-datenmaterial).

Cat. no.	Site	Whereabouts	Coordinates east	Coordinates north	EHG	GER	KA	KF
1	Tinglev, Abenraa, Southern Jutland, Denmark	Museum Flensburg	9.272555	54.925554	6	120	22	3
2	Bov, Abenraa, Southern Jutland, Denmark	MfA Schloss Gottorf [KS 13498]	9.363626	54.840932	1	125	29	4
3	Wyk/Föhr o. F., NF [-Ziegelei]	MfA Schloss Gottorf SH1907-4.1 [KS 12422]	8.569284	54.696601	1	120	20	6
4	Twedt-Boholzau o.F., SL-FL	MfA Schloss Gottorf	9.663117	54.618099	1	125	8	4
5	Twedt-Boholzau o.F., SL-FL	MfA Schloss Gottorf	9.663117	54.618099	5	120	11	2
6	Twedt-Buschau LA 35, SL-FL [-Lücke]	unknown [ex. priv. collec. Hurte]	9.698471	54.616503	6	120	16	2
7	Twedt-Buschau LA 32, SL-FL	MfA Schloss Gottorf SH1947-8.1 [KS18466 f]	9.701988	54.614260	5	120	10	4
8	Fahrdorf o. F., SL-FL [Schlei Fpl. 2]	unknown [ex. priv. collec. Nanz]	9.585883	54.505064	1	120	12	1
9	Fahrdorf o. F., SL-FL [Schlei Fpl. 2]	unknown [ex. priv. collec. Nanz]	9.585883	54.505064	1	120	18	2
10	Karby o. F., RD-ECK	MfA Schloss Gottorf SH9999-77.1 [KS 12194a]	9.972860	54.623022	1	125	17	4
11	Karby o. F., RD-ECK	SH9999-77.2 [KS 12194b]	9.972860	54.623022	1	120	9	3
12	Quarnbek LA 69, RD-ECK [Rajensdorf]	MfA Schloss Gottorf	10.033500	54.352961	3	120	3	2
13	Rendsburg o. F., RD-ECK	MfA Schloss Gottorf SH9999-79.1 [KS 13028]	9.69631	54.295992	1	120	37	2
14	Osterrönfeld o. F., RD-ECK	MfA Schloss Gottorf KWK 271	9.686725	54.287970	1	125	16	4
15	Glasau LA 95, SE	unknown [ex. priv. collec. Winkenwerder]	10.51616	54.053017	3	120	35	4

LKR	EKR	BK	TK	KNOSPD	KNOSPP	L	B	D	G	Illustration	Reference
8.6	1.9	0.3	0.3	1	0	17.2	1.2				
17.4	1.6	0.2	0.2	1	2	23.8	1.2	0.6	21.2	Plate 3,1	
11.2	1.2	0.2	0.2	1	3	17.2	1.0	0.7	14.6	Plates 1,1; 3,2	
9.7	2.3	0.3	0.3	1	3	14.2	1.0	0.6	7.9	Plates 1,2; 3,3	
4.5	999	0.1	0.2	0	6	12.2	1.3	0.8	10.1	Plates 1,3; 3,4	
6.4	1.9	0.3	0.2	1	0	9.4	1.1	0.7		Plate 1,4	
8.3	999	0.2	0.1	0	4	12.6	1.2	0.6	10.8	Plate 3,5	
5.2	2.3	0.1	0.1	1	6	11.3	1.4	0.7		Plate 1,5	RADDATZ 1967, Fig. 2e
6.0	1.7	0.1	0.2	1	1	8.7	1.0	0.5		Plate 1,6	RADDATZ 1967, Fig. 2f
9.6	1.6	0.2	0.1	1	1	12.7	1.1	0.6	8	Plate 3,6	SCHWANTES 1939, Abb. 116,1
7.4	1.8	0.6	0.3	1	1	13.9	1.1	0.7	10.7	Plate 3,7	SCHWANTES 1939, Abb. 116,2
1.7	999	0.2	0.2	0	0	5.1	1.2	0.6		Plate 1,7	HARTZ/SCHMÖLCKE 2013, Fig. 7
13.6	2.6	0.2	0.1	1	6	18.4	1.1	0.4	12	Plate 3,8	
12.2	1.6	0.6	0.1	1	1	14.4	0.8	0.5	6.5	Plate 3,9	
18.0	999	0.2	0.4	0	0	19.5	1.3	0.8		Plate 1,8	

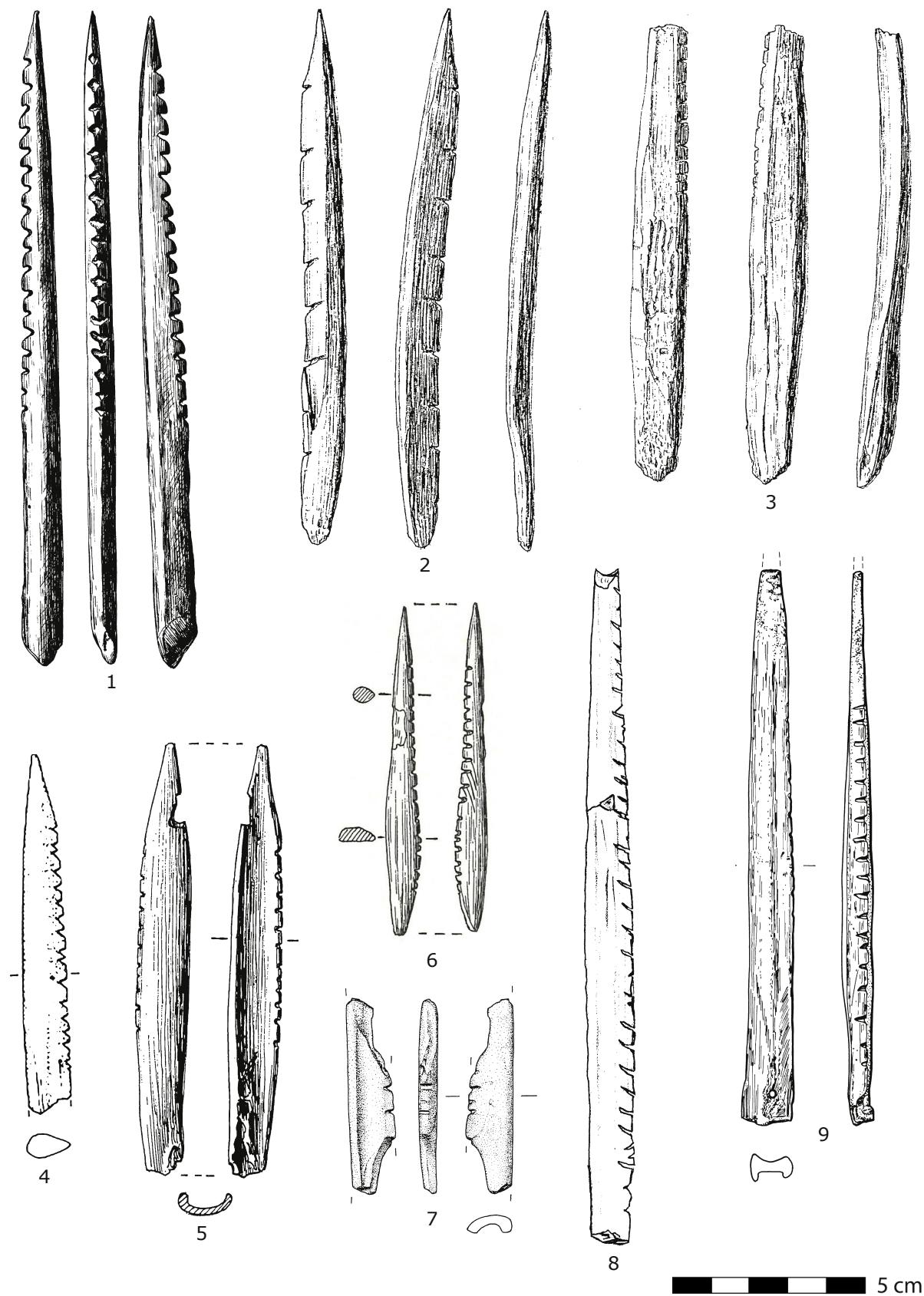
Cat. no.	Site	Whereabouts	Coordi-nates east	Coordi-nates north	EHG	GER	KA	KF
16	Seedorf o. F., SE [Seekamper See]	MfA Schloss Gottorf SH1882-3.1 [KS 5240b]	10.452803	54.046518	1	120	40	2
17	Travenhorst o. F., SE [Travenort-Gutspark]	MfA Schloss Gottorf SH1928-4.2 [Segeberg M7]	10.486785	54.019267	1	120	19	2
18	Travenhorst LA 18, SE [Travenort-Garbeker Au]	MfA Schloss Gottorf SH1937-19.1 [KS 17626]	10.452923	53.998144	1	120	19	2
19	Travenhorst o. F., SE [Travenort-Chausseebrücke]	MfA Schloss Gottorf SH9999-78.1 [KS 16070]	10.463242	54.004075	1	120	25	1
20	Pronstorf o. F., SE [Warder See]	unknown [priv. collec.]	10.460925	53.955927	5	120	17	2
21	Rohlstorf LA 57, SE [Warder See]	unknown [ex. priv.-collec. Ivens]	10.443445	53.963135	1	120	31	2
22	Groß Rönnau o. F., SE [-Brückenwiese]	MfA Schloss Gottorf SH1928-4.1 [KS 15656]	10.313888	54.000000	1	120	32	2
23	Travenbrück LA 14, STO [Schlamersdorf]	MfA Schloss Gottorf SH1987-76.1 [Fd.-Nr. 1987-122]	10.322750	53.852944	1	120	7	2
24	Travenbrück o. F., STO [Tralau nördl. LA72]	MfA Schloss Gottorf SH1977-25.2	10.315754	53.850944	1	120	15	4
25	Bad Oldesloe LA 154, STO [Wolkenwehe]	MfA Schloss Gottorf [missing]	10.346546	53.817078	1	125	19	5
26	Kayhude LA 8, SE	MfA Schloss Gottorf [Fd.-Nr. 019]	10.119346	53.773541	1	125	10	4
27	Kayhude LA 8, SE	MfA Schloss Gottorf [Fd.-Nr. 220]	10.119346	53.773541	1	120	24	2
28	Klinkrade LA 18, LAU Duvensee WP 1 - 1946, 1	MfA Schloss Gottorf [missing] [KS 23014]	10.544266	53.688224	1	120	10	2
29	Klinkrade LA 18, LAU Duvensee WP 1 - 1946, 2	MfA Schloss Gottorf [KS 23014]	10.544266	53.688224	5	120	7	2
30	Klinkrade LA 18, LAU Duvensee WP 2 - 1926, 1	Helms Museum Hamburg MfV1926.112:181	10.544266	53.688224	1	120	15	2
31	Klinkrade LA 18, LAU Duvensee WP 2 - 1926, 2	Helms Museum Hamburg [missing]	10.544266	53.688224	6	120	2	2
32	Klinkrade LA 18, LAU Duvensee WP 2 - 1926, 3	Helms Museum Hamburg [missing]	10.544266	53.688224	3	120	2	2

LKR	EKR	BK	TK	KNOSPD	KNOSPP	L	B	D	G	Illustration	Reference
22.1	5.6	0.1	0.1	1	1	27.5	1.1	0.6	20.6	Plate 4,1	
9.7	4.3	0.1	0.1	0	5	15.5	1.2	0.8	11.6	Plate 1,9; 4,3	HADENFELDT 1936, Abb. 7
12.8	7.8	0.2	0.1	1	6	25.4	1.4	0.9	36.5	Plate 4,2	
13.7	1.6	0.1	0.1	1	1	15.9	1.3	0.6	14.7	Plates 2,1; 4,5	
10.5	999	0.2	0.1	0	1	14.3	1.2			Fig. 2	
11.2	2.0	0.2	0.3	1	1	17.9	1.2	0.6		Plate 2,2	
11.9	3.4	0.1	0.2	1	1	16.3	1.1	0.6	11.9	Plate 2,8	
4.2	1.8	0.1	0.1	1	3	10.0	0.9	0.5	5.2	Plates 2,3; 4,4	
9.0	3.8	0.1	0.1	1	4	16.7	1.2	0.6	12	Plate 4,6	
8.4	0.6	0.2	0.2	1	1	12.4	1.0	0.6		Plate 2,4	HARTZ et al. 2004/2005, Abb. 12,1
8.5	1.5	0.2	0.3	0	4	14.0	1.0	0.5	7.6	Plates 2,5; 5,1	
10.3	1.2	0.3	0.3	1	3	11.7	1.1	0.8	7.7	Plates 2,6; 5,2	
6.8	2.0	0.2	0.2	1	1	16.4	1.0	0.9		Fig. 4,5	SCHWABEDISSEN 1949, Abb. 7a; BOKELMANN 1969, Taf. 47
5.5	999	0.1	0.1	0	2	12.5	1.4	0.7	9.6	Fig. 4,6	BOKELMANN 1969, Taf. 48
9.6	1.7	0.3	0.2	1	1	18.5	1.2	0.6		Fig. 4,1	SCHWANTES 1939, Abb. 103,1; BOKELMANN 1969, Taf. 102,1
1.2	3.8	0.3	0.2	1	0	13.4	1.2	1.0		Fig. 4,2	SCHWANTES 1939, Abb. 103,2; BOKELMANN 1969, Taf. 102,2
1.6	999	0.3	0.3	0	0	5.8	1.6	0.9		Fig. 4,3	BOKELMANN 1969, Taf. 102,4

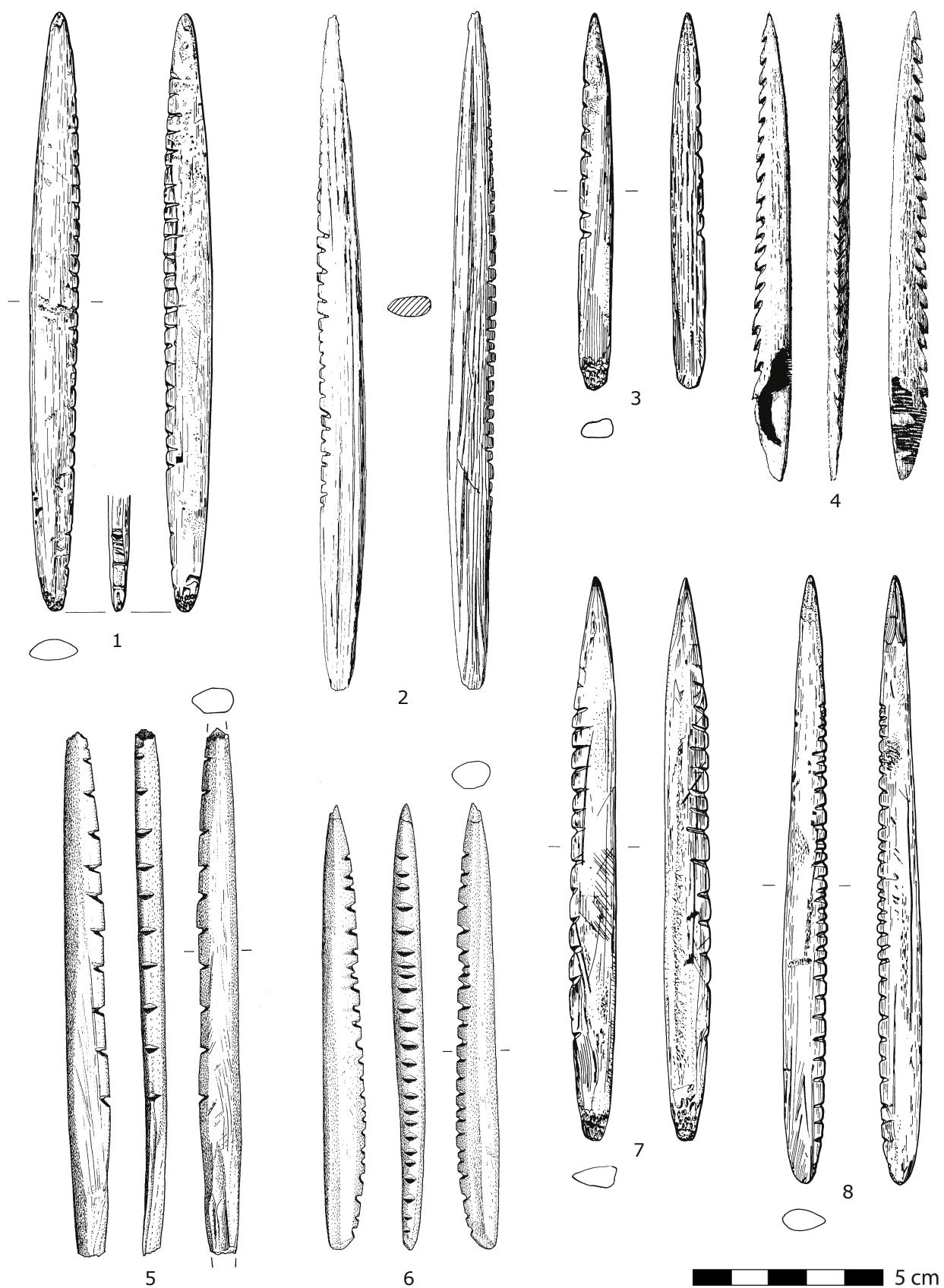
Cat. no.	Site	Whereabouts	Coordi-nates east	Coordi-nates north	EHG	GER	KA	KF
33	Klinkrade LA 18, LAU Duvensee WP 2 - 1946	MfA Schloss Gottorf [KS 23014]	10.544266	53.688224	1	120	9	2
34	Duvensee LA 20, LAU Duvensee WP 18	MfA Schloss Gottorf	10.552979	53.699435	5	120	3	1
35	Mölln LA 13, LAU [Mölln 13a, 2]	MfA Schloss Gottorf SH1950-47.10	10.648487	53.644339	4	120	5	1
36	Mölln LA 13, LAU [Mölln 13a, 3]	MfA Schloss Gottorf SH1950-47.9	10.648487	53.644339	6	120	7	2
37	Mölln LA 13, LAU [Mölln 13a, 4]	MfA Schloss Gottorf SH1950-47.11	10.648487	53.644339	3	120	2	2
38	Mölln LA 13, LAU [Mölln 13a, 5]	MfA Schloss Gottorf [missing]	10.648487	53.644339	3	125	14	4
39	Mölln LA 13, LAU [Mölln 13a, 6]	MfA Schloss Gottorf SH1950-47.8	10.648487	53.644339	3	125	8	4
40	Mölln LA 13, LAU [Mölln 13a, 7]	MfA Schloss Gottorf [missing]	10.648487	53.644339	1	120	15	2
41	Mölln LA 13, LAU [Mölln 13a, 8]	MfA Schloss Gottorf SH1950-47.7	10.648487	53.644339	6	120	12	2
42	Grande LA 2, STO	Museum Bad Oldesloe collec. Rapski 86/1B	10.396488	53.58670	6	120	11	2
43	Grande LA 2, STO	Museum Bad Oldesloe collec. Rapski 86/2B	10.396488	53.58670	6	120	18	2
44	Woltersdorf LA 10, LAU	MfA Schloss Gottorf SH2014-41.1	10.674183	53.579822	1	125	16	4
45	Törning; Haderslev Southern Jutland, Denmark	MfA Schloss Gottorf [KS 2977]	9.369735	55.239006	1	999	7	7
46	Harrislee LA 1; SL-FL [Niehuus]	Museum Flensburg	9.374106	54.821171	1	999	4	7
47	Sörup LA 1, SL-FL [Gammelby]	MfA Schloss Gottorf SH1946-13.2 [KS 19808c]	9.613123	54.710714	3	999	3	999
48	Sörup LA 1, SL-FL [Gammelby]	unknown [ex. priv.-collec. Frantzen]	9.613123	54.710714	1	999	4	7
49	Brodersby o. F., RD-ECK	MfA Schloss Gottorf [KS 12550]	9.978610	54.630294	1	999	8	7

LKR	EKR	BK	TK	KNOSPD	KNOSPP	L	B	D	G	Illustration	Reference
6.6	1.1	0.4	0.3	1	6	17.7	1.3	0.6	17	Fig. 4,4; Plate 5,3	SCHWABEDISSEN 1949, Abb. 7b; BOKELMANN 1969, Taf. 101
1.8	999	0.1	0.1	0	6	7.5	1.2	0.5	6.2	Plate 5,4	
2.6	2.4	0.1	0.3	1	0	5.0	1.1	0.5	3.0	Fig. 3,1; Plate 5,5	KERSTEN 1963, Abb. 22,2
3.9	2.6	0.3	0.3	1	0	6.5	1.1	0.7	3.4	Fig. 3,2; Plate 5,6	KERSTEN 1963, Abb. 22,3
4.3	3.5	0.2	0.1	1	0	7.8	1.0	0.4	1.8	Fig. 3,3; Plate 5,7	KERSTEN 1963, Abb. 22,4
5.9	999	0.1	0.3	0	0	7.5	1.0	0.4		Fig. 3,4	KERSTEN 1963, Abb. 22,5
5.6	999	0.1	0.4	0	0	7.6	1.1	0.5	6.1	Fig. 3,5; Plate 5,8	KERSTEN 1963, Abb. 22,6
5.9	1.1	0.2	0.3	1	6	8.7	1.1	0.4		Fig. 3,6	KERSTEN 1963, Abb. 22,7
9.0	6.4	0.2	0.3	1	0	15.4	1.1	0.5	9.6	Fig. 3,7; Plate 5,9	KERSTEN 1963, Abb. 22,8
7.0	1.3	0.3	0.3	1	0	8.3	0.9	0.5	4.3	Plate 5,10	
8.6	1.9	0.2	0.2	1	0	10.5	0.9	0.5	5.0	Plate 5,11	
9.3	2.8	0.2	0.2	1	4	14.9	1.2	0.6	11.4	Plates 2,7; 5,12	
16.0	5.8	1.1	0.9	1	999	23.4	2.2	0.7	31.5		SCHWANTES 1939, Abb. 116,3; ANDERSEN/PE- TERSEN 2009, Fig. 12,21
12.0	4.0	3.2	1.8	1	999	23.3	2.7				RÖSCHMANN 1963, Taf. 1,4; ANDERSEN/PETER- SEN 2009, Fig. 20,80
999	999			0	0	12.8					RÖSCHMANN 1963, Taf. 1,3; ANDERSEN/PETER- SEN 2009, Fig. 9,7
						18.6	2.2				RÖSCHMANN 1963, Taf. 1,5; ANDERSEN/PETER- SEN 2009, Fig. 20,79
											CLARK 1936, 238;
15.0	3.0	0.7	0.6	1	999	20.4	1.8	0.8	26.6	Fig. 5	SCHWANTES 1939, Abb. 116,4; HARTZ/SCHMÖL- CKE 2013, Fig. 8

Plate 1



1 Wyk/Föhr [3]; 2-3 Boholzau [4-5]; 4 Buschau [6]; 5-6 Fahrdorf [8-9]; 7 Quarnbek [12]; 8 Glasau [15]; 9 Travenort [17]. The catalogue numbers are indicated in square brackets behind the site names (1-3 Archive MfA; 4; 8 Archive ALSH; 5-6 after RADDATZ 1967; 7 after HARTZ/SCHMÖLCKE 2013; 9 J. E. Freigang, ZBSA).



1 Travenhorst [19]; 2 Rohlstorf [21]; 3 Travenbrück [23]; 4 Bad Oldesloe [25]; 5-6 Kayhude [26-27]; 7 Woltersdorf [44]; 8 Groß Rönnau [22]. The catalogue numbers are indicated in square brackets behind the site names (1; 3; 7-8 J. E. Freigang, ZBSA; 2 Archive ALSH; 4 after HARTZ et al. 2004/2005; 5-6 after CLAUSEN 2008).

Plate 3



1 Bov [2]; 2 Wyk/Föhr [3]; 3-4 Boholzau [4-5]; 5 Buschau [7]; 6-7 Karby [10-11]; 8 Rendsburg [13]; 9 Osterrönfeld [14]. The catalogue numbers are indicated in square brackets behind the site names (photos C. Dannenberg, SSHLM).



1 Seedorf [16]; 2, 5 Travenhorst [18–19]; 3 Travenort [17]; 4, 6 Travenbrück [23–24]. The catalogue numbers are indicated in square brackets behind the site names (photos C. Dannenberg, SSHLM).

Plate 5



1–2 Kayhude [26–27]; 3–4 Duvensee [33–34]; 5–9 Mölln [35–37, 39, 41]; 10–11 Grande [42–43]; 12 Woltersdorf [44]. The catalogue numbers are indicated in square brackets behind the site names (photos C. Dannenberg, SSHLM).