

Bulletin of the Tohoku University Museum

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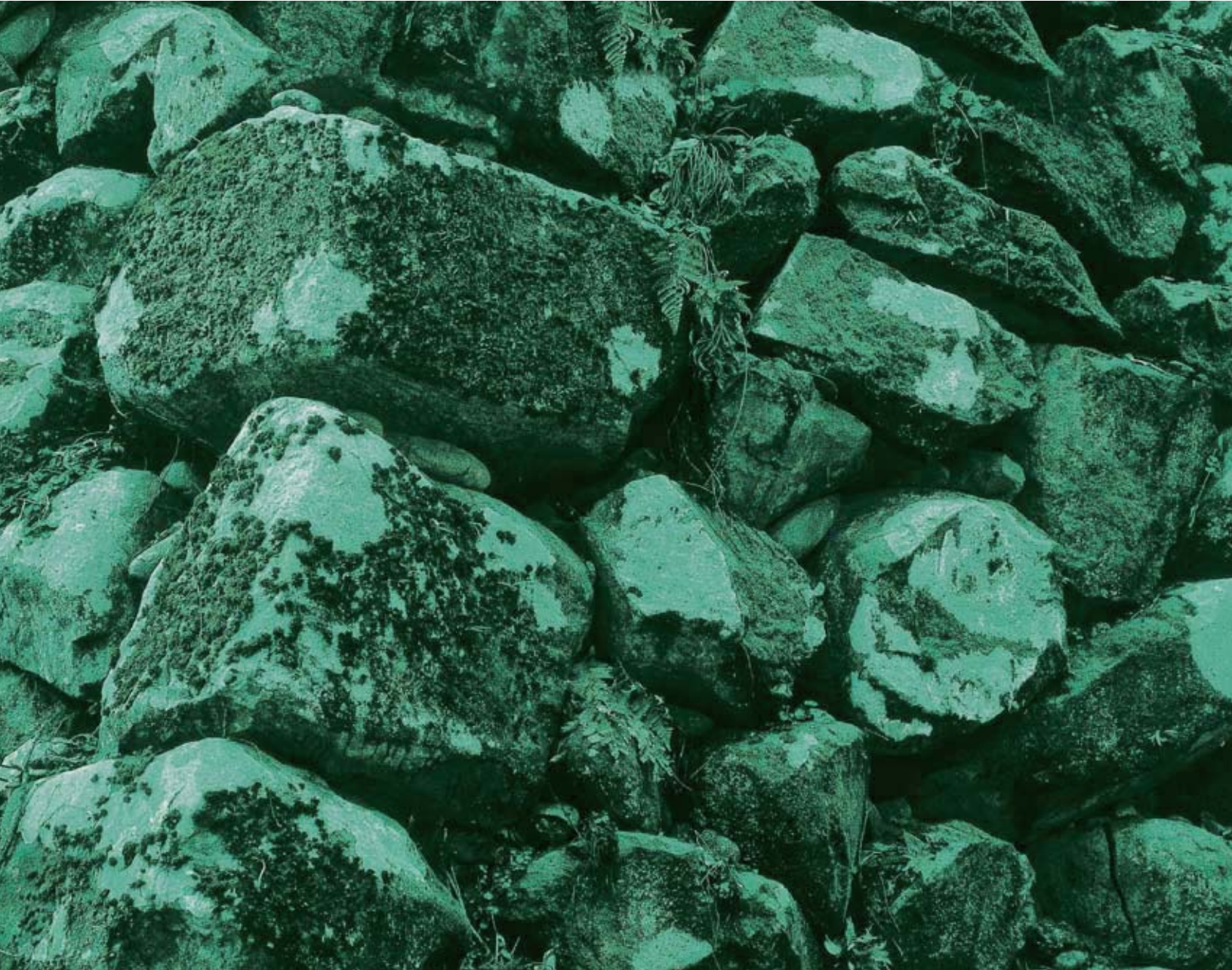
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Cover: Moss-overgrown ramparts of the Sendai-jo (castle) ruins,
cornerstones of the past; base for transitions into a new century.
Sendai-jo is often called Aoba-jo (Green Leaves Castle).



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東北大学文学研究科

考古学陳列館所蔵大木冨貝塚出土基準資料

—— 山内清男編年基準資料 ——

早瀬亮介・菅野智則・須藤 隆

Type Artifacts of the Daigi Types of Jomon Pottery Excavated from the Daigi-gakoi Shell Midden by Dr. Sugao Yamanouchi

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Introduction

1. Overview of the Daigi-gakoi Shell Midden
 2. Course of the Study for the Daigi Types of Jomon Pottery from the Daigi-gakoi Shell Midden
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 - (1) Overview of the Materials
 - (2) Type Artifacts of the Daigi 4 to 10 Type Pottery
 4. Character and Significance of the Materials
- ##### Conclusion

Archaeological Museum of Tohoku University exhibits many valuable materials for the study of archaeology and ethnology from Paleolithic to Early Modern period collected in Japanese islands and the neighbor area. In these materials, there are a lot of archaeological materials collected by Dr. Sadakichi Kita and Dr. Nobuo Ito of faculty of law and arts, Dr. Kotondo Hasebe and Dr. Sugao Yamanouchi of faculty of medicine in Tohoku University. The Jomon pottery, taken up in this paper, is the materials excavated at the Daigi-gakoi shell midden by Dr. Sugao Ymanouchi. He deposited them in faculty of law and arts through Dr. Ito, who excavated the site with him.

The Daigi-gakoi shell midden is located at Shichigahama Town, Miyagi County, Miyagi Prefecture, on the coastal terrace shaped like tang extending to the Shiogama Bay. The site area spreads over 140 m from east to west by 250 m from south to north. Shell strata are distributed from edge of plateau to slope. Dr. Yamanouchi excavated Location A, B, C, D, E, F, and F' with Dr. Ito in 1927 to 1929.

Dr. Yamanouchi advocated the Daigi types based on the materials of these excavations. He classified the Daigi types to 10 types, and subdivided in a and b on Daigi 2, 7, and 8 type. He examined stratigraphic relationship in the site, and parallel pottery types in other area, then he placed the Daigi 1 to 6 types on Early Jomon, and the Daigi 7a to 10 types on Middle Jomon period. In present time, the Daigi types are studied as pottery types from early stage of Early Jomon to last stage of Middle Jomon period in central and southern area of Tohoku District on the basis of the study by him.

He selected pottery of the each Daigi type from the site, and took 24 photographs of them. These photographs have been paid attention as the clue to understand the Daigi types. But nobody have actually observed and investigated these potteries until now. In this paper, we reported these type artifacts of the Daigi types. We presented photographs, scale drawings, and rubbings of 75 materials belonging to the Daigi 4 to 10 type, and observed and described pottery attributes, for example forms, shapes of parts, techniques and designs of decorations, in attribute lists. The materials were well preserved, so we could

observe techniques and processes of shape formation, decoration, and surface finishing in pottery making.

The result of these examinations proved that Dr. Yamanouchi grasped the characters of each type in detail, and selected typical materials. In addition, it was noticeable that he selected pottery carried from other area. Furthermore, we investigated the letters written in back of pottery sherds, which showed locations and strata in the excavations. Remarkably, we confirmed that the evolution from the Daigi 8a to 10 type had been understood in the stratigraphic relationship at Location B by him.

Standing on these studies, we indicated 3 points about the research method of Dr. Sugao Yamanouchi, who established basis of Japanese prehistory. 1. His chronological and typological studies based on stratigraphic relationships. 2. He understood evolution of pottery types through examinations for hoards excavated from one site. 3. He noticed pottery carried from other area, and investigated chronology of pottery types in relation between each other areas from the wide field of vision. These materials show that he appropriately understood the Daigi types by these excellent method, so those will be considered as basic materials for the study of the Daigi types in future.

はじめに

東北大学文学研究科には石巻市沼津貝塚出土骨角器、土器、土版、動物形土製品、名取市経ノ塚古墳出土鎧形、家形埴輪、円筒埴輪などの国指定重要文化財をはじめとし、旧石器時代から近世まで、日本列島と周囲の地域の多様な考古資料、民族資料が収集、保管されている。

これらの文化財は、本学の考古学、歴史学研究を開発、発展させた喜田貞吉教授、伊東信雄名誉教授、芹沢長介名誉教授が中心となって調査・研究された学術資料、並びに資料価値の極めて高い学術資料が体系的に整理され、考古学、歴史学、民族学の重要基準資料として一貫して研究の発展に寄与しつづけたものである。また、東北大学の様々な学問分野が学際的研究を絶えずはぐみ続け、今日の揺るぎない学風を形成した証といえる。こうした貴重な学術資料のうちには、日本の縄文文化研究の基礎を確立し、研究を推進した法文学部の喜田貞吉・伊東信雄、医学部の長谷部言人・山内清男が関わった多数の研究資料があり、本学が活用すべき貴重な学術資料の一群である。

考古学研究室では、須藤の指導のもとにこうした重要資料の由来、内容を詳細に検討し、データベース化する作業を精力的に進めてきた(須藤 2003, 2005, Suto 2004)。2005年度には、日本の縄文時代研究史にとって重要な宮城県七ヶ浜町大木囲貝塚調査資料について、資料化、画像化、資料内容の詳細な調査・研究を行った。本学術資料は、1927年から山内が大木囲貝塚の数多くの地点で発掘した土器群であり、山内とともに調査に取り組んだ伊東信雄が基準資料として寄託をうけ、東北大学考古学陳列館に収蔵、保管されてきたものである。

この資料は、東北地方中部の北上川、雄物川流域、南部の阿武隈川・阿賀野川流域にかけて分布する縄文時代前期から中期の土器型式で、山内が標識とした大木4式から10式の一括土器群である。

今日、東北地方では多数の集落跡、貝塚が調査され、前期から中期の集落構造、墓制の変遷が理解できるようになって

きた。膨大な蓄積資料にもとづいて縄文時代の社会、文化の変動を解明していく上で、土器研究も従来にまして客観的な視点での実証研究が望まれている。この大木式土器群の型式内容、その変遷についても、現在、様々な重要な研究課題が提示され、様式の変化・変異についての議論も盛んである。

東北大学文学研究科考古学研究室に寄託、収蔵されていた本資料を研究し、その型式内容を明らかにし、公開することは、現在の埋蔵文化財の調査と実証的研究に寄与するところが極めて大きいと考える。

したがって、この研究論文では、大木囲貝塚の研究の経緯と山内清男の提示した大木式基準資料の意義、そしてその各型式の装飾意匠、手法、土器の製作技術、器形、器種構成に関する観察内容、検討結果を記すとともに、基礎資料として写真・拓本・属性観察表・関連主要文献を掲載した。

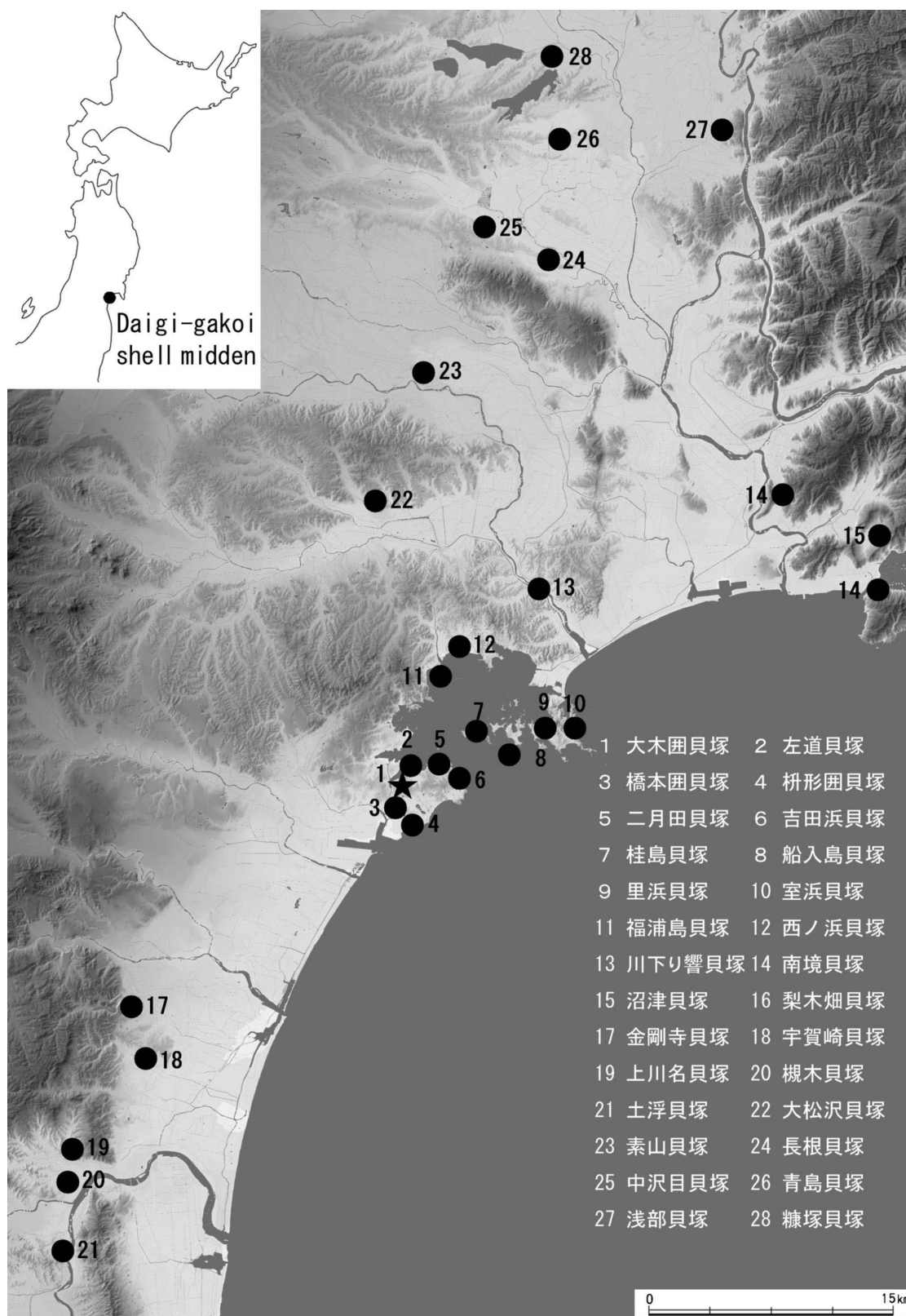
(須藤)

1. 大木囲貝塚の概要

大木囲貝塚は宮城県宮城郡七ヶ浜町東宮浜字東大木、西大木、北下方、南下方に所在し、塩釜湾に突き出す舌状海岸段丘に立地する(第1図)。貝層は台地縁辺から東・西・南斜面に広がり、北斜面では径10m弱から20m程の小貝層が群在する。そのひろがりは東西140m、南北250mに及ぶ。標高は28mから38mである(第2図)。

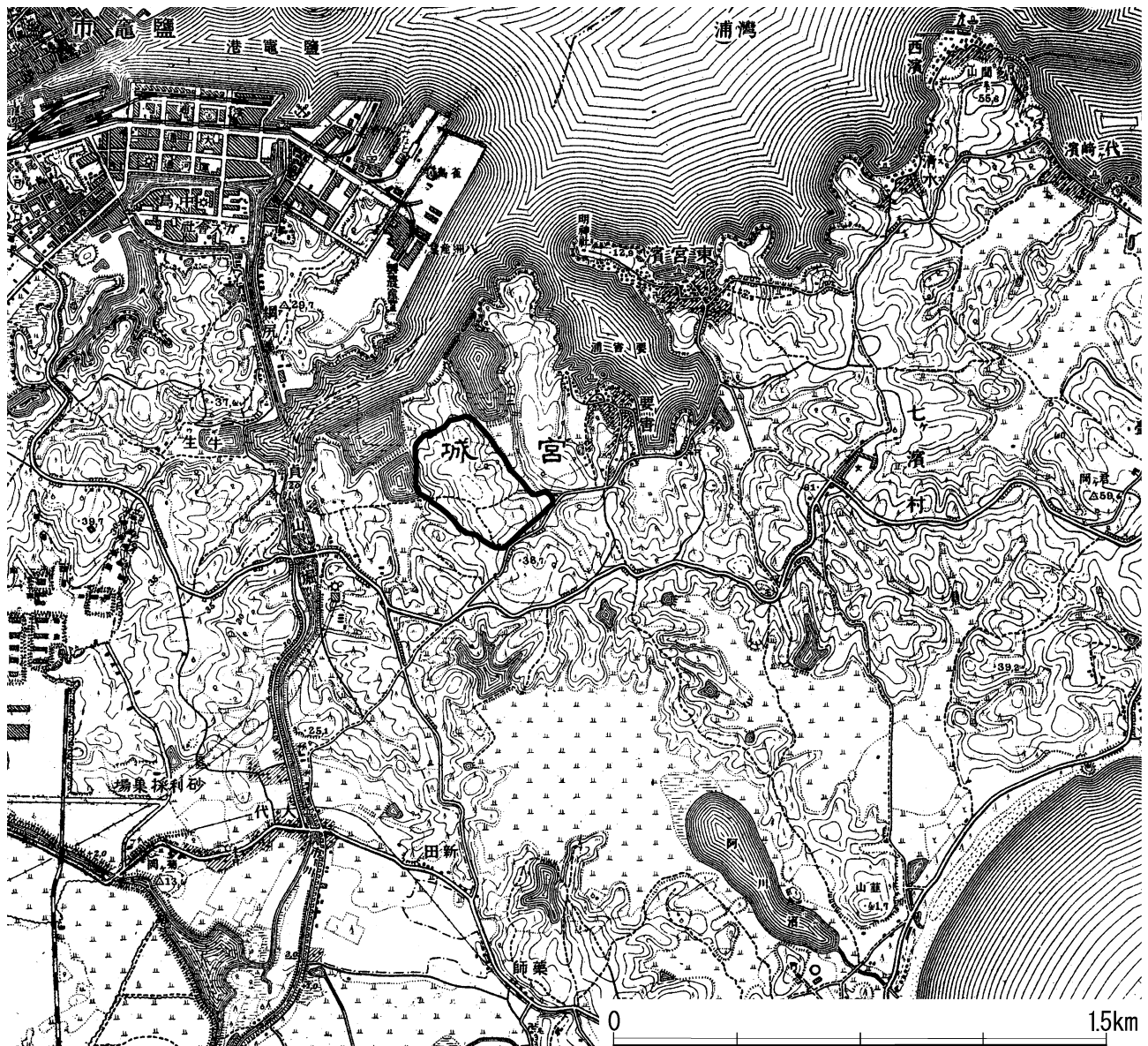
大木囲貝塚が文献上に確認できるのは1919年以降である(松本1919a~e, 長谷部1919a, 注1)。

大木囲貝塚の学術調査は、1917年の松本彦七郎による調査(松本前掲)を嚆矢とする。1918年には長谷部言人(長谷部前掲)、1925年に清野謙次(清野1925, 1969)による人類学的調査が進められた。1927年から1929年に山内清男(山内1929a)が考古学的調査に取り組み、本資料が提示されることになる。その後、1948, 1949年には鎌倉学園考古学部(原・馬目1968)、1949年に伊東信雄(福田1973, 八巻他1974)、1963, 1965年には東北大学教育学部歴史研究室の調査(小笠原1968)が行われている。1968年には国の史跡として指定告



第1図 東北地方中部主要貝塚分布図

Figure 1. Distribution of shell middens belonging to Jomon period in the eastern central area of Tohoku District



第2図 大木冨貝塚地形図

Figure 2. Topographical map of the Daigi-gakoi shell midden

示され、1972年から1978年には、七ヶ浜町教育委員会による環境整備を目的とした調査が進められた(福田1973, 八巻他1974, 1978, 1979, 1980)。しかし、このように調査件数は多いものの、調査について具体的研究成果が報告されることは少なかった。

本論文は主に、1972年から7年間、東北大学考古学研究室の指導によって七ヶ浜町が実施した調査の概報と伊東信雄の関連著作にもとづいて記述した。

山内の学術調査は7地点で行われたことを伊東信雄が述べ(八巻他1979)、A, B, C, D, E, Fの6地点名を挙げている(伊東1981)。今回調査した土器内面のラベルから、さらにF

地点の存在が明らかになった(注2)。本論では、これらの地点から出土した資料が山内によってどのように研究され、基準資料として提示されたかを検討した。

2. 大木冨貝塚出土大木式土器群研究の経緯

「大木式」という名称を初めて用いたのは、松本彦七郎と長谷部言人である。

松本(1919a~e)は彼の時期区分における第一期を大木式とした。1917年の大木冨貝塚調査資料をもとに設定したと考えられる。説明と提示された図から、山内の「大木8b式」ま

たは「大木9式」に相当すると推定される(注3)。その後松本はさらに検討を進め、多賀野式から大木式を経て青島式へ至る変遷を提唱した(松本1929, 1930a~c)。

長谷部(1919b)は大木罎貝塚出土土器に対して仮に大木式の名を与え、宮城県東松島市里浜貝塚の土器と対比して説明している。その内容から松本の大木式と類似し、中期後半の土器を指すとみられる。

山内は、伊東信雄とともに大木罎貝塚の層位的発掘を行い、その資料を検討し、前期から中期の縄文土器を大木1式から大木10式に編年した。さらに、大木2式, 7式, 8式をa, bに2分した。これらの土器型式は、東北地方南, 中部における前, 中期土器編年の基準であり、膨大な資料の蓄積によって様々な型式理解が関東, 東北地方の縄文研究者によって提示され、議論されている。

この基準資料を確保した後、山内は縄文土器編年体系の構築を進めた。「関東北に於ける繊維土器」(山内1929a)で、繊維土器が当時最古段階の土器群として関東・東北地方に広く分布することを明らかにした。大木罎貝塚の層位的発掘成果は、この研究の一翼を担うものであった。

この論文の中で山内は、1927年から1929年にかけて行った大木罎貝塚AからE地点の調査の概要、特に土器とその層位的出土状況について記述している。繊維土器には少なくとも2つの小別があるとし、「大木1」, 「大木2」として説明している。その内容から、後の大木1式, 2式に当たると考えられる。また繊維土器以後所謂厚手式(加曾利E式並行)以前の型式が少なくとも4型式知られるとし、現在の大木3式, 4式, 5式と考えられる土器について若干の説明を行っている。大木罎貝塚全体としては10余型式の存在を示唆した。しかし、大木1式から10式の各型式はなお十分に把握されていなかった(山内1929a)。

次いで「繊維土器について 追加第一」(1929b)では、宮城県東松島市川下り響貝塚の調査に関する記述で、「最下の黒色粘土層中から繊維の混入あるもの(大木1, 2), 及びその他の土器(仮に大木3, 4, 5, 6, 7, 8とする)が混出する。以上の層では大木9, 10即ち大木の一番新しい所に並行するものが主であるが、(後略)」と、初めて大木罎貝塚の土器を10区分し、その層位的関係に触れている。

また、この年に作成された山内清男の編年表には、大木1式から10式の型式名が記載され、さらに7式と8式の間に加曾利E1式並行型式の存在が書き込まれている(伊東1977)。伊東は、この編年表に槻木1, 2式があつて室浜式がないことから、宮城県柴田郡柴田町槻木貝塚2次発掘の1929年5月以後で、宮城県東松島市里浜貝塚を発掘した同年11月以前の研究段階の資料と推定している。

1936年に山内は、「日本考古学の秩序」の付表「縄文土器型式の年代的組織(假製)」において初めて大木2, 7, 8式にa, bの細別編年を示した。この時期に大木式土器の型式編年

が確立したと考えられる。さらに、早期・前期・中期・後期・晩期の5時期大別編年案が提示され、大木式は、前期前葉から中期末葉に位置づけられた(山内1936)。そして、ほぼ同じ内容の編年表「縄文土器型式の大別と細別」が1937年に公表された(山内1937)。

山内は大木式土器を設定し、その編年案を示したが、「斜行縄紋に関する二三の観察」(1930)、「日本先史土器の縄紋」(1961)、「日本原始美術」(1964)の図版解説などの中で断片的な説明が行われているにすぎず、型式の具体的内容について公表することはほとんどなかった。

大木式土器全体について体系的な説明を初めて行ったのは伊東信雄である(1957)。伊東は山内と協力して大木罎貝塚の発掘調査に取り組んだことから、その見解は山内の型式内容を具体的に示している(伊東1957)。

さらに興野義一は、大木罎貝塚や宮城県登米市糠塚貝塚などで調査あるいは採集した資料を用いて大木式土器の解説を行った。特に前期の土器型式に関しては、興野の入念な検討で明らかになった部分が多い(興野1967~1970, 1981, 1984)。本論では、伊東の「宮城県史」(1981)、興野の「画龍点睛」(1996)の記述にもとづいて山内基準資料の検討を進めた。

3. 東北大学所蔵大木式標識資料

(1) 資料の概要

山内清男が大木式土器の基準資料とした大木罎貝塚出土土器は、24枚の写真に114点の土器破片と復元土器が掲載されている(興野1996図版96~107)。東北大学文学研究科考古学陳列館と標本室には、この基準資料のうち、大木4式から大木10式までの土器78点が収蔵されていた。今回の調査・分析では、3組6破片が接合した。また、陳列館所蔵資料から写真掲載資料と接合する新資料が1点、掲載資料と同一個体と判断される破片1点を確認した。その結果、本稿で検討した資料は総計75個体分である。

標識資料には次のような墨書、朱書の書き込みがある。

①墨書 a: 「大木」、墨書 b: 「大木罎」、墨書 c: 「大木罎貝塚」。文字は細字で4~8mm、縦書きと横書きがある。主に土器破片の下半、中央に書き込まれる。aは42, bは2, cは14個体の土器に認められた。同一筆跡とみられる。

②朱書文字は「B2」, 「B3」, 「B6」, 「C8」など、アルファベットと数字で、2~4mmの細字、横書きに記される。土器片の右下隅にあり、同一筆跡で32破片ある。アルファベットが地点、数字が層位を表す。伊東の指摘のないF'地点の記載がある。

③「19」の黒スタンプ文字(資料35)。

④「山内清男氏寄託」のラベル(資料64, 65)

(2) 大木4式から10式土器の基準資料について

大木4式土器(第3図1~5, 写真図版1-1~5)

大木囲貝塚出土大木4式基準資料は総数5点である。器種は深鉢が主体で、鉢が伴う。深鉢は、口頸部がわずかに外彎する1類、口頸部が強く外彎する2類、体部が丸くふくらみ、口頸部が軽く外彎して立ち上がる3類に区分される。朱書きは3点に認められ、E地点5層(2点)、6層(1点)から出土した資料である。

資料1(「大木囲」の墨書)

わずかに場底となる底部から、体部にかけて緩やかに内彎して立ち上がり、口縁部に向かって軽く外傾する鉢形土器である。推定口径22.5cm、底径17.0cm、器高12.1cm(注4)。口縁には幅12~15mmの太いU字状の粘土帯が貼付され、2個1対の突起となる。貼付の後、口縁部から体部にかけてLR縄文が施される。そして幅3~5mmの細い粘土紐が横、縦の順に貼付され、格子状文となる。内面はなでの後、軽い磨きが行われる。器厚は8.5mmである。

資料2(「大木」の墨書, 「E5」の朱書)

頸部で緩やかにくびれ、口頸部が強く外彎してひろがる深鉢2類である。口縁部は無文で、頸部以下に縄文が施される。縄文原体は軸となる縄に附加条Lを巻きつけたものと判断した。頸部に角張った施文具による1条の連続山形文がめぐる(写真図版8-1)。内面はなで調整である。器厚9.5mm。

資料3(「E5」の朱書)

体部が比較的強くふくらみ、口頸部が緩やかに外彎する深鉢3類である。口縁端面に粘土紐が波状に貼付される。口縁部は無文で、頸部から体部にかけてLR縄文が横に回転される。縄文を施した後、3~6mmの細い粘土紐で波状文などが貼付される。粘土紐は器面に軽く貼付され、器面に押しつけた痕跡は認められない(写真図版8-2)。内面は、なでの後、軽く磨かれる。器厚は9mmである。

資料4(「大木」の墨書)

新たに同一個体破片を確認した。体部が軽くふくらみ、頸部から口縁部にかけてわずかに外彎する小型の深鉢1類である。口縁に細い粘土紐による渦巻文が貼付され、口縁部から体部にかけてLR縄文が施される。内面は横なでで、接合痕が明瞭に観察される。器厚は8mmである。

資料5(「E6」の朱書)

口縁部がわずかに外彎する深鉢1類で、文様構成は資料2と共通する。LR縄文を施した後、先の角張った施文具を用いて連続山形文が1条めぐらされる。沈線は深く、縁辺はほとんど調整されない。内面はなで。器厚は9mmである。

大木5式土器(第3図6~11, 写真図版1-6~11)

大木5式基準資料は総数6点である。器種はすべて深鉢で、体部から口縁部にかけて緩やかに外彎する1類と、強く外彎してひろがる2類、内彎する短い口縁部が立ち上がり、体

部上半が球形にふくらみ、筒形の体部下半に続く3類の3類型が認められる。

資料6(「大木」の墨書)

口縁部が肥厚し、軽く内彎する深鉢3類である。口径は推定25.0cm。装飾は、体部にLR縄文が横に回転され、さらに口縁部と肩部に2条1組の粘土紐貼付文が飾られる。粘土紐は幅2mmほどで、2条の間は沈線によって調整される。三角形、山形、杏仁形などの貼付文が横線や斜線によって連結され、複雑な意匠を構成する(写真図版8-3)。内面にはなでが施される。器厚は肥厚する口縁部で12.5mm、体部で8.5mmと変異が大きい。

資料7

深鉢2類である。口縁に粘土帯を貼付した後、口縁部から体部に縄文を施す。口縁の粘土帯に指頭押圧を加え、鋸歯状にする。所謂「鋸歯状装飾体」(興野1969)である。さらに角張った工具による沈線で連続山形文を3条めぐらせる。沈線の縁辺はほとんど調整されない。内面はなで。器厚は11mmである。

資料8

深鉢2類である。形態・装飾とも資料7に極めて類似し、同一個体と推定される。口縁部の粘土帯は、指頭押圧の後、さらに角張った工具によって刻まれ、鋸歯状となる。縄文はLRである。器厚9.5mm。

資料9(「大木」の墨書)

基準資料2点が接合した。深鉢2類である。大波状口縁の波頂部に粘土帯を貼付した後、粘土帯に刻みを入れて鋸歯状にする。口縁部にはLR縄文を施した後、3mm程の細粘土紐を貼付し横位、縦位の連続山形文が展開する。粘土紐は1cm程度の長さで折り返され、重なり合って連続する山形文となる。向かって左から右へ施文される(写真図版8-4)。内面はなでの後、軽い磨きを加えられる。器厚は7.5mmである。

資料10

深鉢1類である。縄文を斜めに回転した後、先端の角張った施文具による横位鋸歯状文、縦線文を施す。縄文原体は節と繊維の傾きから、反燃りのLRrと判断した。内面調整は横なでである。器厚8.5mm。

資料11(「大木」の墨書)

深鉢1類である。太い粘土帯を口縁端面に鋸歯状に貼付し、なでつけた後、LR縄文を施す。さらに幅2~4mm程の細い粘土紐でV字状文を施し、その上に短い粘土紐を重ね、梯子状にする。内面には貝殻によるとみられる条痕となでが施される(写真図版10-7)。器厚は8.5mmである。

大木6式土器(第4図12~16, 写真図版2-12~16)

大木6式基準資料は総数5点である。器種はすべて深鉢で、体部が緩やかにひろがり、口頸部がわずかに外彎する深鉢1類、口縁部が外反し、頸部でくびれ、体部が軽くふくら

む深鉢2類と、口縁部が短く外彎し、頸部で明瞭に屈折し、体部上半は強く球形にふくらみ、下半が筒形となる深鉢3類の3類が認められる。

資料12（「大木」の墨書）

完形に復元された深鉢3類である。推定口径27.5 cm、推定器高20.0 cm。口縁部は外面に肥厚し、端面は丸みを帯びる。平坦口縁に2個1対の山形突起が4単位配される。LR縄文が横に回転され、口縁部と体部上半に、半截竹管押しきによる横線文、弧線文、山形文、渦巻文などが展開する。さらにボタン状貼付文が飾られ、口縁端面には小突起が加えられる（写真図版8-5）。内面調整は、丁寧な軽い磨きである。器厚は肥厚する口縁部が14 mm、体部は11 mm程ある。

資料13（「大木」の墨書）

深鉢3類とみられる。大波状口縁で、短い口縁部は外面に肥厚する。端面は丁寧に磨かれ丸みを帯びる。体部にはRL縄文が横に回転される。さらに口縁部から体部上半にかけて、細い粘土紐を貼付し、半截竹管の押しきを加える。この「結節浮線文」（西川1983）の手法で、横線文、山形文、円文などが飾られる（写真図版8-6）。内面は横なでの後、磨きが行われる。器厚は8.5 mmである。

資料14（「大木」の墨書）

深鉢3類で、推定口径25.5 cmである。口縁部は短くわずかに内彎し、外面に粘土帯が貼付され3個1単位の山形突起となる。装飾は、口縁にそって鋸歯状の沈線文が施され、頸部以下に浅い無節Rの縄文が横に施される。頸部に横線の区画文、体部には山形文や縦線文が半截竹管で描かれる。内面は明瞭な擦痕の残るなでの後に、軽い磨きを加えられる。口縁部が体部より丁寧に調整される。器厚は5.5~10 mmである。

資料15

大波状口縁をもつ深鉢1類である。短い口縁部は外面に肥厚する。口縁部には、先端の丸い施文具による深く幅広い短沈線と多截竹管（佐原1981）の押し文が施される。頸部と体部に結節を伴うLR斜行縄文が横方向に施され、さらに頸部に刻みを有する粘土紐がめぐらされる。内面調整は、口縁部では横に、体部では縦または斜めになでが施され、軽い磨きを加えられる。器厚は9 mmである。

資料16（「大木冴貝塚」の墨書）

低い波状口縁を呈し、口縁全体が短く肥厚する深鉢2類である。口縁部に幅広い短沈線と楕円形の浅いくぼみが配され、その下端に指頭押圧が連続する。頸部以下には浅いLR縄文が横に回転される。頸部に半截竹管の沈線が5対10条施される。体部には半截竹管の縦線が一部確認できる。内面は丁寧な磨き調整が行われる。器厚は10 mmである。

大木7a式土器（第4図17~第5図23、写真図版2-17~写真図版3-23）

大木7a式基準資料は総数7点である。器種は深鉢が主体で、鉢形土器が1点確認できた。深鉢は、体部から口縁部にかけてほぼ直線的に立ち上がる1類、口縁部が外彎する2類、体部が強くふくらみ、短い口縁部が立ち上がる3類の3類型に区分できる。朱書きのラベルが施された土器が6点ある。これらの土器はすべてC地点出土であり、2, 4, 7, 8層から出土している。

資料17（「大木冴貝塚」の墨書、「C7」の朱書）

体部が直立し、口縁部が外彎する深鉢2類である。口縁には低い舌状の突起があり、内面に貼付による稜線を有する。口縁部文様は、半截竹管による横位押し文である。口縁部下端は外面に張り出す段となる。体部には、縦回転の浅いLR縄文が施され、半截竹管の縦線文、斜線文、円孔と半截竹管の刺突を加えられた半球形の貼付文が飾られる。口縁部の押し文と体部の沈線文には同一工具が用いられている。貼付文上を刺突する工具は異なる。内面はなで、器厚は7.5 mmである。

資料18（「大木冴貝塚」の墨書、「C」の朱書）

体部が強くふくらむ深鉢3類の体部下半である。LR縄文を縦に回転した後、多截竹管の沈線と押しきを組み合わせた方形区画文が展開し、渦巻文、懸垂文が加えられる（写真図版8-7）。内面はなでの後、幅2~4 mmの軽い磨きが施される。器厚は9 mmである。

資料19（「大木冴貝塚」の墨書、「C4」の朱書）

体部上半が内傾する鉢形土器である。口縁端部に刻み加えられる。外面全体が無文で、口縁直下に橋状把手を有する。内・外面とも丁寧ななで調整である。器厚6 mm。

資料20（「大木」の墨書、「C8」の朱書）

体部がふくらみ、短い複合口縁が直立する深鉢3類である。口縁は押圧で小波状となる。外面は無文である。内・外面の調整は横なでの後に軽く磨かれる。成形時の接合痕が残る。器厚は7.5 mmである。

資料21（「大木」の墨書、「C2」の朱書）

口縁部がわずかに外彎する深鉢2類。口縁部にはLR結節縄文が間隔を開けて横に4列施される。内面は削りの後、軽い磨きを加えられる。器厚7.5 mm。

資料22（「大木」の墨書、「C2」の朱書）

深鉢1類。口縁は平坦口縁で、複合口縁となる。口縁から体部上半にLR縄文が横に回転される（写真図版8-8）。器面調整はなでの後、軽い磨きが施される。粘土紐の接合痕が内面に明瞭に認められる（写真図版10-8）。器厚は7 mmである。

資料23（「大木」の墨書）

体部上半から頸部にかけて緩やかに外彎する深鉢2類である。頸部には横位区画貼付文がめぐり、山形の垂下貼付文が体部上半に施される。さらに貼付文の上と間に無節Lと結

節縄文Lが縦回転される。内面調整は削りの後に、幅2~4mmの横なでが施される。器厚は7.5mmである。

大木 7b 式土器 (第5図 24~29, 写真図版 3-24~29)

大木 7b 式基準資料は総数6点である。器種は深鉢と浅鉢からなる。深鉢は、口縁部が緩やかに内彎して立ち上がり、長胴の体部をもつと推定される1類と、短い口縁部が内彎し、体部が強くふくらむ2類が認められる。浅鉢は体部が強くひらき、口縁部が内彎する類型である。朱書きのラベルが施された土器が4点ある。これらの土器は、F地点4層、F'地点3層、4層から出土した資料である。

資料 24 (「大木」の墨書, 「F' 4」の朱書)

緩やかに内彎する深鉢1類の大波状口縁である。波頂部が平坦になる。口縁端部内・外面は肥厚する。波頂部下に指頭押圧の加えられる粘土紐貼付文が口縁にそい、垂下貼付文が飾られる。さらに LRL 縄文が、貼付文の上や間の器面に施される。内面は、なでの後に軽い磨きを加えられる。外面調整はなである。器厚 10 mm。

資料 25 (「大木田貝塚」の墨書, 判読不能の朱書)

資料 24 に類似した深鉢1類である。大波状口縁の平坦な波頂部に刻みが施される。断面三角形の粘土紐が横位・縦位に貼付され、上面には指頭で押圧が加えられる。貼付文の周囲に RL 縄文が施され、さらに口縁にそって沈線が飾られる。内面はなでの後に、軽く磨かれる。外面はなで調整。器厚は 9 mm である。

資料 26 (「大木田貝塚」の墨書)

体部が強くふくらみ、頸部で屈折し、口縁部が内彎する深鉢2類である。頂部が平坦な大波状口縁で、内・外面とも粘土帯が貼付され、波頂部は複雑な断面形状となる。口縁部文様は、波状突起の装飾と渦巻文、口縁にそってのびる横線文で構成される。体部には渦巻文、V字状文、弧線文など複雑な意匠が展開する。これらは、貼付文と多截竹管の沈線を平行させる手法で施文されている。貼付文上に押しきと縄文が施される場合がある。貼付文、縄文、そして沈線と押しきが施される手順となる(写真図版 9-1)。内面はなでが施される。外面無文部の調整はなである。器厚 8.5 mm。

資料 27 (「大木」の墨書, 「F' 3」の朱書)

資料 24, 25 に共通する深鉢1類である。大波状口縁で、波頂部は平坦になる。装飾は、口縁外縁に撚紐 RL の側面を押圧して短縦線が施される。口縁部には、円文と山形文が貼付された後に、1段のLを軸に0段のIを右巻きにした無節の附加条縄文が施される。内面はなでの後に軽い磨きを加えられる。外面無文部の調整はなである。器厚 8 mm。

資料 28 (「大木田貝塚」の墨書, 「F' 4」の朱書)

体部が強くひらき、口縁部が緩やかに内彎しながら立ち上がる浅鉢である。口縁端面は内削ぎで、内面に稜を形成する。口縁部文様帯に円盤状貼付文と、撚紐 L の側面圧痕による横

位楕円文が展開する。体部は無文である(写真図版 9-2)。器面調整は、なでの後に、軽い磨きを加えられる。内面は横方向、外面は右下がりに調整される。器厚は 9.5 mm である。

資料 29 (「大木田貝塚」の墨書, 「F' 4」の墨書)

資料 28 と類似した浅鉢で、口縁部がより強く内彎する。推定口径は 22.0 cm である。口縁部文様帯に「x」字状の貼付文が施され、これに沿って楕円形の沈線文が加えられる。体部は無文である。器面調整は、内・外面ともなでの後、磨き調整が行われる。器厚は 7 mm である。

大木 8a 式土器 (第6図 30~40, 写真図版 3-30~写真図版 4-40)

大木 8a 式基準資料は総数 11 点である。器種は深鉢を主体とし、鉢を伴う。深鉢は、頸部でくびれ、口縁部が強く内彎する1類、くびれが弱く、口縁部が緩やかに内彎する2類、体部が軽くふくらみ、わずかにくびれ、口縁部が立ち上がる3類、口縁部が外彎する4類が認められる。鉢は体部から口縁部に向かって外傾する器形である。「B7」の朱書きが2点みられる。

資料 30

わずかに内彎してひろがる鉢である。口縁端部は内・外面に肥厚する。端面に刻みが加えられる。口縁部には隆線(注5)が1条めぐり、これにそって篋による押しきが施される。体部は無文で、粗いなで調整がみられる。内面は横なで。器厚 7 mm。

資料 31 (「大木」の墨書, 「B7」の朱書)

口縁部が軽く外傾する深鉢3類。口縁端部外面に粘土帯が貼付されて肥厚し、断面三角形となる。口縁外縁には、粘土紐による連弧文が展開し、この隆帯上には撚紐 L の側面が押圧される。その下の文様帯には同じ手法で短い縦線文が並列する。内面はなでの後、軽く磨かれる(写真図版 10-6)。器厚は 8 mm である。

資料 32

口縁部がわずかに内彎して外にひろく深鉢3類である。口縁端部内・外面に粘土紐が貼付され、複雑な断面形状を呈する。口縁外縁には押し文が施される。口縁部には、「つ」字状貼付文が配され、その周囲に撚紐 RL の側面を押圧した短い縦線文列、貼付文上には押し文が加えられる。口縁部文様帯の上限は横位隆線文、下限は刻みをもつ横位隆線文で区画される。頸部には横位沈線文がめぐる。押しき、刻み、沈線は同一施文具による。隆線の断面は丸く、器面に軽く貼付され、押しやなでつけの痕跡はみられない。最初に隆線が貼付され、押しき、刻み、沈線の順に施され、最後に撚紐側面の押しきを加えられる。内面は横なでの後、軽い磨きで調整される。器厚は 7.5 mm である。

資料 33 (「大木」の墨書, 「B7」の朱書)

口縁部が外彎する深鉢4類で、緩やかな波状口縁となる。

波頂部の内面に稜がある。端面には貼付装飾が施される。口縁部は、横位隆線と縦位に並列する撚紐側面圧痕の組み合わせからなる帯状の文様2帯が上下を区画し、橋状把手が区画隆帯を連結する。内面は、なでの後に軽く磨かれる。器厚11mmと厚手である。

資料34

口縁部が内彎する波状口縁の深鉢3類。端部は内面に稜があり、外面に貼付され、断面三角形を呈する。口縁に山形突起を有し、その上面に粘土紐貼付文が施される。口縁外縁にはD字状刺突文がめぐり、これより下位はLR縄文が縦に回転され、横位沈線文が2条めぐり、内面はなでの後、軽い磨きを加えられる。器厚5mm。

資料35（「大木」の墨書、「19」のスタンプ）

体部上半から口縁部にかけて直線的にひろがる鉢形土器である。平坦口縁に角状、低い山形の突起を有する。口縁外縁に狭い無文帯がめぐり、その下には隆線と撚紐の側面圧痕で横位楕円文が飾られ、この区画文内部に円形竹管の交互刺突文が加えられる。体部には、隆線と撚紐の押圧による蕨手状などの曲線文が展開し、LRとRL（閉端を有する）による羽状縄文がその下位に施される。最初に隆線が貼付され、撚紐が押圧された後に、刺突と縄文の回転施文が行われる（写真図版9-3）。内面は軽い磨き。器厚6mmと薄手の土器である。

資料36

頸部でくびれ、口縁部が緩やかに内彎する深鉢2類である。口縁部には粘土紐が貼付され、内・外面に肥厚する。口縁部上半は横位隆線が橋状把手で連結され、楕円文が連続する。口縁部下半はLR縄文の上に三角形の貼付文が展開する文様帯となる。頸部には隆線と沈線による横線と波状文がめぐり、体部には隆線と沈線で直線文、曲線文が施される。縄文を回転した後に、隆線が施され、沈線が加えられる手順である（写真図版9-4）。内面には篋などが行われる。器厚は8.5mmである。

資料37

頸部で明瞭に屈折し、口縁部が強く内彎する深鉢1類である。端部には粘土紐や突起が盛んに貼付され、口縁にそって押し文がめぐり、口縁部下半には縄文が施され、沈線による2条1組の連弧文が展開する。頸部には横線がめぐり、内面はなで、器厚6mmである。

資料38

頸部で緩やかにくびれ、口縁部は軽く内彎する深鉢3類である。口縁に突起を有し、その上に弧線が貼付される。端面には撚紐LRが押圧され、小波状となる。口縁外縁には押し文、その下には撚紐LRの側面押圧による縦線文が並列する。頸部は3条の横位沈線文で区画される。体部は、縦回転のLR縄文の上に、沈線が屈折して展開する。手順は、縄文回転の後に、撚紐の側面が押圧され、最後に沈線文が加えられる。内

面は横なで。器厚は7.5mmである。

資料39（「大木」の墨書）

大波状口縁を有し、口縁部が内彎する深鉢2類である。口縁端面は内削ぎに整形される。口縁部の文様構成は資料36に類似する。上半は上面に沈線を伴う断面の丸い隆帯と橋状把手が貼り付けられ、下半は縦回転のLR縄文の上に渦巻状の隆線文が貼付される。把手部の隆線は器面になでつけられるが、渦巻文の隆線はほとんど調整されない。内面にはなでの後、軽い篋磨きが施される。器厚は7mmである。

資料40（「大木」の墨書）

体部は軽く膨らみ、頸部で緩やかにくびれ、口縁部がわずかに内彎する深鉢3類で、推定口径35.5cmと比較的大型である。平坦口縁で、端面には粘土紐の波状文が貼付される。口縁部は2条の横位隆線で上下が区画され、その間に粘土紐の波状文が貼付される。横位隆線は橋状把手によって連結される。頸部から体部にかけてLR縄文が縦に回転され、その上に先端の丸い施文具による3条1組の沈線で頸部の横線文、体部の直線文、曲線文が描かれる。内面は篋などが施される。器厚は10mmである。

大木8b式土器（第7図41～49、写真図版4-41～49）

大木8b式土器の基準資料は総数9点である。器種は深鉢と鉢で構成される。深鉢は、体部が軽く膨らみ、頸部で明瞭にくびれ、口縁部が強く内彎するキャリパー形深鉢(1類)と、体部がふくらみ、口頸部が緩やかに外反する深鉢(2類)に大きく区分される。鉢は体部が強くひろがり、口縁部が内彎する器形である。山内の写真は2枚に分かれており、深鉢1類のまとまりと、深鉢2類と鉢の可能性のある土器のまとまりとなっている。朱書きラベルは、「B6」(5点)と「B7」(1点)で、B地点6層と7層から出土している。

資料41（「大木冨貝塚」の墨書）

深鉢1類。推定口径29.5cm。口縁部は隆線による横線文が上下を画し、さらに2条1組の隆線が鍵の手状に屈折しながら展開する。隆線は頂部が丸く、縁辺は器面にあまりなでつけられない。頸部以下には縄文が施されるが、頸部の縄文は散漫である。内面はなでの後、軽く磨かれる。器厚9.5mm。

資料42（「大木冨貝塚」の墨書）

深鉢1類。口縁部に粘土帯が貼付され、沈線の渦巻文、弧線文が展開する。隆線頂部は軽く磨かれ、平坦になる。頸部から体部にかけて無節Lの縄文が縦に施される。内面はなでの後、軽い磨きを加えられる。器厚6mm。

資料43

深鉢1類。推定口径15.0cmと比較的小型である。口縁部文様帯、頸部無文帯、体部文様帯という文様帯構成は大木8b式の典型と言える。

口縁部の装飾は縦回転のRL縄文を施し、文様帯の上下を隆線で区画し、その間に隆線と沈線で渦巻文と曲線文を展開

する。山内清男の「I文様帯」である(山内編1964)。隆線は断面台形で、頂部は磨かれてやや丸みを帯びる。沈線は先端の丸い工具による。頸部は横方向に磨きが施され、幅広い無文帯となる(写真図版9-5)。

体部には縄文の上に2条1組の沈線による文様が施される。文様帯の上限を横線で区画し、その下に横走あるいは縦走する沈線によって渦巻文が連結され、広く展開する。山内の「II文様帯」に相当する。沈線は口縁部のもとの同一工具である。沈線部分は軽くなでられ、沈線間の縄文が一部磨り消される(写真図版9-6)。内面はなでの後、軽い磨きが施される。器厚6mm。

資料44(「大木」の墨書、「B6」の朱書)

体部上半から口縁部にかけて緩やかに内彎しながら立ち上がる深鉢。波状口縁で、端面は削りによって内削ぎとなる。波状口縁に沿って隆線が貼付される。隆線の縁辺はほとんど調整されないが、一部沈線がそう。体部にはLR縄文が縦に回転される。内面は削りの後、軽く磨かれる。器厚6mm。

資料45(「大木」の墨書、「B7」の朱書)

深鉢2類。推定口径11.5cmの小型土器である。貫通孔のある把手を有する。口縁外縁には隆帯がめぐり、これにそって沈線が加えられる。頸部から体部にかけてRL縄文が縦に回転される。内面は、なでの後軽く磨かれる。器厚5.5mm。器面に炭化物が付着し、貫通孔の中は特に著しい。

資料46(「大木」の墨書、「B6」の朱書)

深鉢2類。口縁部はナデによる無文帯で、頸部には隆線2条、沈線3条の横位区画文がめぐり、体部には縦回転のLR縄文の上に、沈線による渦巻文などが連結されて文様帯に広く展開する。隆線は断面台形、沈線は先端の丸い工具を用いる。内面には、口縁直下に凹線が1条めぐり、なでの後に軽い磨きが行われる。器厚6.5mm。

資料47(「B6」の朱書)

深鉢1類もしくは鉢形土器。口縁部には隆線と沈線を組み合わせ渦巻文と楕円文が施される。隆線は断面台形で、頂部が丁寧に磨かれ、丸みを帯びる部分がある。沈線は先端の丸い棒状工具による。体部は無文で、篋磨きが施される。内面にも篋磨きを加えられる。器厚8mm。

資料48(「大木」の墨書、「B6」の朱書)

深鉢1類か鉢形土器とみられる。口縁部に粘土帯を貼付した後、沈線で渦巻文と楕円文が描かれる。隆線は断面台形で、頂部に磨きが施され、やや丸みを帯びる。沈線は先端の丸い工具による。体部は無文で、篋磨きを加えられる。内面は軽い磨きである。器厚6mm。

資料49(「大木」の墨書、「B6」の朱書)

口縁部が外彎する深鉢2類もしくは鉢形土器。大波状口縁で、端部は粘土帯貼付により肥厚し、断面三角形となる。この口縁部隆帯には、沈線によって波頂部に渦巻文が配され、それらが横に連結されて展開する。頸部には横方向の軽い磨き

が施され、無文である。内面も軽く磨かれる。器厚8.5mm。(早瀬)

大木9式土器(第8図50~第9図64, 写真図版5-50~写真図版6-64)

大木田貝塚出土大木9式基準資料は、総数15点である。器種は、キャリパー形深鉢(1類)、口頸部が緩やかな広がりを見せる深鉢(2類)と、2種類の深鉢が主体である。さらに、頸部が強くとびれ、口縁部の広がる壺に近い深鉢が含まれ、器種の変異がうかがえる。これらの資料のうち7点に「B6」、「B45」、「B3」と朱書きがあり、B区の6層から3層にかけて出土した層位的関係が確認できる。大木9式の器種構成、意匠体系に関し、山内による層位にもとづいた型式変遷の理解をこの標識資料でうかがうことができる。

資料50(「大木田貝塚」の墨書、「B6」の朱書)

整ったキャリパー形深鉢(1類)。推定口径25.0cm、現存器高12.5cm。頸部で緩やかに外彎し、口縁は強く内彎して立ち上がる。口縁と頸部は接合部で軽く内屈している。体部は緩やかなふくらみをもつと推定される。

装飾は、口縁部文様帯に、太い粘土帯を貼付した横帯区画に唐草文状渦巻文の隆線文が施される。粘土帯は縄文を施した後に貼り付けられ、その縁を丁寧に凹線でなぞっている。頸部には幅4cmほどの無文帯がめぐり、丁寧な横方向の磨きを加えられる。頸部と体部との境には2条の太い凹線がめぐり、

体部には縄文施文後に粘土帯で楕円文が飾られ、突帯上に篋磨きを加え、両側を凹線で縁取りする。また、突帯、頸部には薄く器面に粘土を塗り、整形する。RLR縄文を縦に回転している。隆線文、器面の磨きは縄文施文後に加えられる。器厚は頸部で6mm。

資料51(「大木」の墨書、「B6」の朱書)

口縁部が緩やかに広がる2類の深鉢。低い大波状口縁をもつ。口縁に1条の太い沈線がめぐり、口縁から体部全面に渦巻文と2条1組の複雑に連繋する隆線文が展開する。RL縄文が縦に器面に施され、さらに粘土紐を貼付し、その上面、側縁を丁寧に磨いて調整している。内面は、横に磨きを加えている(写真図版10-7)。器厚は7mmで、焼成、保存状態が良好である。

資料52(「大木」の墨書、「B6」の朱書)

小型キャリパー形土器(1類)である。口頸部が緩やかに内彎する。頸部は外彎してやや強く広がる。口縁部文様帯はなく、体部文様帯が口頸部から体部を広く飾る(注6)。左、右巻きの渦巻文と派生する隆線文が複雑に展開する。渦巻文は高く突出する。RL縄文が口頸、体部に横に回転される。後に、隆帯を貼付し、その両側に凹線を加え、さらに磨いている。器厚は5mmで、比較的薄手である。

資料 53(「大木」の墨書, 「B6」の朱書)

基準資料 2 点が接合した。強いふくらみをもつキャリパー形深鉢(1 類)で、頸部以下を欠く。口縁と体部文様帯が一体となる。口縁は文様に応じて微かに波状を呈する。渦巻文を連繫する突帯が縦横にのび唐草文の意匠を構成する。渦巻文の剥脱した部分に LR 縄文が確認できる(写真図版 9-7)。縄文は口縁部に近い数段は横に、その下では縦に回転施文される。突帯は幅 8 mm、高さ 5 mm ほどあり両側を丁寧に凹線で整えている。内面は丁寧な横の太い篋磨き調整がみられる。器厚は 8.5 mm。

資料 54(「大木」の墨書)

52, 53 と類似のキャリパー形深鉢(1 類)。口縁が大きく内彎する。頸部は緩やかに外彎し、全体に口頸部のひろがり強い。平坦な口縁に渦巻文の施された突起と、太い隆帯による渦巻文、楕円文の飾られた横帯区画文が展開する。体部文様帯は、口縁部文様帯の直下に太く浅い凹線と隆帯による縦位楕円文と渦巻文が展開する。太い LR 縄文を縦方向に回転施文した後、隆帯、篋磨きを加える。内面は丁寧に横の磨きが施される。器厚は 7 mm と比較的薄手である。

資料 55(「大木」の墨書, 「B」の朱書き)

キャリパー形深鉢(1 類)。丁寧に篋磨きをした口縁端部、内彎する口縁と緩やかに外彎する頸部をもつ。口縁部には文様帯が施され、頸部は無文帯がめぐり、体部を欠く。口縁部文様帯には稜線をもつ隆帯が楕円形、波状にめぐり、RL 縄文を縦位に回転し、隆帯、篋磨き・凹線文が加えられる。器厚 6 mm。

資料 56(「大木」の墨書, 「B45」の朱書)

口縁部が緩やかに内彎するキャリパー形深鉢(1 類)。平坦口縁で内、外面に篋磨きを加えている。口縁部文様帯には、幅 4 mm ほどの篋描の楕円文が横に並び、体部文様帯は、2 条の並行する沈線で縦方向の楕円文が施されている。楕円文の区画内に LR 縄文を充填する。縄文は口縁部では横、体部では縦方向に施される。その後さらに、沈線文を描き直し、区画文の周囲を軽く篋磨きで調整している。内面には丁寧な篋磨きが施されている。頸部内面に絞りの痕跡とみられる縦方向の窪みが並列する。器厚は 8.5 mm と厚手である。

資料 57, 59(「大木」の墨書)

57 は、体部の上位で緩やかにくびれ、口縁が大きく外彎してひらく深鉢 2 類で、大波状口縁である。波状突起は推定 4 個、口縁に幅 2 cm ほどの無文帯がめぐり、丁寧な横方向の篋磨きが施される。体部文様帯の上限に幅 4 mm ほどの沈線 3 条が口縁の波形にそってめぐり、体部文様帯には篋描の楕円文、垂下する逆 U 字文が配される。さらに楕円文を横に連繫する波状文が加えられる。RL 縄文が縦方向に回転施文された後、篋描文が施されている。さらに沈線区画外と沈線を丁寧に磨く。最上段の楕円文は区画内を丁寧に磨きによってくぼめ、装飾の凹凸が顕著である。縄文は太くあらい(PL. 9-8)。

内面は丁寧な磨きが横方向に加えられ、器厚 5.5 mm、薄手で焼き締まっている。

59 は 57 と類似した大波状口縁の大型深鉢(2 類)で、共通した意匠構成をとる。口縁部の波形にそって 2 cm ほどの無文帯と 3 条の凹線がめぐり、縦長楕円文が並列し、縄文を遺した部分と丁寧に篋磨きを加えた単位がみられる。粗い RL 縄文が縦位に施されている。内面には丁寧な磨き加えられる。器厚 9 mm で厚手、焼成が良好である。

資料 58(「大木」の墨書, 「B45」の朱書)

キャリパー形深鉢(1 類)。推定口径 31.5 cm。口縁端面が内側に肥厚する。口縁部文様帯は縦位隆帯で区画される。隆帯には太く浅い刻線と円形のくぼみが施される。さらに区画内に太い凹線の楕円文が施され、その内側に 8 条の弧線が充填される(写真図版 10-1)。内面は丁寧に磨き加えられる。本資料は、搬入土器で中部地方の曾利式土器に類似する。重要な広域編年基準資料である(注 7)。

資料 60(「大木」の墨書)

緩やかに外彎して広がる口頸部をもつ深鉢(2 類)。平坦口縁でキャリパー形深鉢(1 類)とセットになる器形である。装飾は、口縁部から体部全体に展開し、太い篋描の縦位楕円文、逆 U 字状垂下文が規則的に飾られ、文様内に RL 縄文が縦に回転施文される。区画外は丁寧に篋磨きをしている。内面には篋なでがみられる。器厚は、9.0 mm で厚手の土器である。

資料 61(「大木」の墨書, 「B・」の朱書)

体部上位で強くくびれ、口縁部が緩やかにひろがる波状口縁の深鉢。資料 57, 58 の深鉢と類似した口頸部の屈曲をみせるが、頸部のくびれが強く、口径 17 cm ほどの小型土器である。壺への機能変化がうかがえる。突起は 3 個と推定され、口縁にそって太い沈線 2 条がめぐり、口縁の無文帯は軽く篋なでが加えられる。2 条の並行沈線が口縁にそって波状にめぐり、体部文様帯には縦位の楕円文、下方が開放した逆 U 字状垂下文、渦巻文、重楕円文が施される。LR 縄文は沈線区画内に認められるが、沈線の方が新しい。渦文や楕円文の間の空隙は丁寧に篋で磨かれる。内面にも丁寧な横方向の磨きがみられる。

資料 62(「大木田貝塚」の墨書, 「B・」の朱書)

体部から頸部にかけて強くくびれ、頸部は軽く外彎し、口縁部が外反する。資料 61 と共通した器形の壺ともよべる小型深鉢である。口頸部が短い。口縁に無文帯、下限に 2 条の平行線がめぐり、頸部から体部全体に文様帯が展開する。楕円文と下方に開口する逆 U 字状垂下文が交互に並列する。著しく単純化した沈線文である。RL 縄文を斜位に回転施文し、沈線文を加え、軽く楕円文・垂下文間に篋磨きを施している。内面の調整は、口頸部が狭いため、口縁付近は磨きがみられ、下半はなでにとどまる。壺の調整に近い。器厚は 4.5 mm で薄手、焼成良好な土器である。

資料 63(「大木田貝塚」墨書, 「B3」の朱書)

資料 60 と共通する 2 類深鉢。口縁は丁寧な篋磨きで整形される。文様帯は口縁から体部に展開する。LR 縄文が横、縦に施され、太い沈線による楕円文、垂下文が描かれる。文様区画外には丁寧な篋磨きを加えられる。

資料 64(「大木」の墨書, 「山内清男氏寄託」のシール)

口径 16 cm (把手部では 21.4 cm)、頸部径 10 cm ほどの深鉢。口縁は外彎してひろがり、大波状口縁に透かし孔をもつ把手 4 個がつく。頸部は強くくびれ、体部がふくらむ。広口壺に近い器形である。体部下半を欠く。口縁には太い粘土紐による渦巻文と凹線文が飾られる。頸部から体部にかけて隆帯で渦巻文が施される。多数の渦巻文が隆帯で連結され、唐草文的意匠が展開する。地文の RLR 縄文は貼付隆帯によって充填される。縄文施文後に隆帯に磨き、太い沈線による縁取りが加えられる(写真図版 10-2)。土器内面は入念な篋磨きが施される。

大木 10 式土器 (第 9 図 65~第 10 図 75, 写真図版 6-65~写真図版 7-75)

大木 10 式標識資料は、総数 14 点である。この型式の器種には、口頸部が緩やかに内彎し、大きな波状を呈するキャリパー形深鉢 1 類(注 8)と、口頸部がわずかに外彎して立ち上がり、体部中位が軽くふくらむ深鉢 2 類の 2 類型、口縁が外彎し、頸部に隆帯のめぐる鍔付広口壺、そして定型的な注口鉢、小型浅鉢が含まれる。資料 73 には B2 の朱書きがあり、B 区の 2 層から出土し、大木 9 式の上層にあることがうかがえる。

資料 65(「大木」の墨書, 「山内清男氏寄託」のシール)

小型鉢。わずかに内彎する口縁をもつ。口径 13.3 cm、底径 5.7 cm、器高 7.2 cm である。口縁に 2 個 1 組の小型突起が 1 組飾られる。幅 2 mm ほどの細沈線が口縁にそってめぐり、2 個の山形突起の下で途切れ、2 条の弧線が施される。さらに、2 個 1 対の孔があげられる。縄文は LR を横に回転している。

資料 66 (「大木」の墨書)

直線的に強くひらく浅鉢。推定口径 17.0 cm。口縁部に粘土隆帯で画された無文帯が施される。波濤文の一部とみられる。隆帯区画文には RLR 縄文が充填され、隆帯にそって磨きか加えられる。

資料 67, 68

体部上半から口縁部にかけてわずかに外彎して立ち上がり、中位で軽くふくらむ深鉢 (2 類)。資料 68, 69, 74, 75 が同類型である。この土器は山形突起をもち、突起下に鰹状の粘土帯が飾られる。口縁の内面は内削ぎになり、突起には縦位の楕円形粘土塊が貼付される。また口縁には丁寧な篋磨きによる無文帯がめぐり、体部上半には 1 段の R を軸に巻いた撚糸文が施され、粘土隆帯、縦位弧線、垂下線、磨きの順に施される。磨消縄文手法が確立している。68 (深鉢 2 類) は、隆帯、太い RL 縄文、丁寧な磨きの順に飾られる。

資料 69 (「大木田」の墨書), 70 (「大木」の墨書)

小型深鉢 69 は、資料 75 を小型にした類型 (2 類) で推定口径 12.0 cm。装飾は共通する。0 段の太い r を左巻きにした附加条縄文 (軸の原体は不明) が縦に回転され、弧状の沈線で区画文が施される。軽く内面、外面を磨いている。70 は緩やかに内彎気味に立ち上がる。口縁に突起 1 個をもつ。頂部に小さな刺突文がみられる。1 条の細い沈線がめぐり、体部の縄文は条間が広く、条・節の角度から、R を左巻きにした附加条縄文 (軸の原体は不明) を縦に回転したとみられる。

資料 71 (「大木」の墨書)

基準資料 2 点が接合した。推定口径 25.0 cm、現存器高 11.5 cm の注口鉢である。口頸部は軽く外彎して立ち上がる。体部との境は明瞭に内屈する。真っ直ぐにひろがる口縁には 4 個の山形突起をもつ。1 個は注口と対応する。注口は鉢の体部と口頸部の屈折部から立ち上がる。やや扁平の筒状を呈する。山形突起と注口部の中軸線上に粘土隆線が施される。他の突起には楕円形の大きな穿孔がある。また、鰹状の突帯が加えられ、これにそって刺突列がのびる。体部文様帯には、頂部が稜を形成する隆線による渦巻文、弧線文、波状文が横に連なり、L の撚糸文と刺突列が充填される(写真図版 10-3)。内面は篋磨きで調整される。

資料 72(「大木」の墨書)

資料 71 と類似した器形の鉢である。口頸部は軽く外彎して立ち上がる。体部と口頸部の境で明瞭に内屈する。屈折部に粘土帯がめぐり、屈折部から口縁端面に幅広い橋状把手が飾られる。口頸部はなでと磨きによって無文帯となる。橋状把手には太い刺突列点文 13 個 4 段が加えられる。また、頸部屈曲部の隆帯上に刺突文が 1 列めぐり、体部には頂部に稜をもつ粘土帯で楕円文など曲線文が飾られる。この装飾は、大木 10 式の典型的な曲線区画文とみられる。

資料 73(「B2」の朱書き)

推定口径 12.5 cm の鍔付土器。内傾する短い口縁をもち、橋状把手をもつ突帯 2 条がめぐり、樽形のふくらみをもつ体部には、篋描の沈線文、縦走の R 撚糸文が施される。充填縄文手法である。さらに篋による軽いなで仕上げられる。小型ではあるが、中期最終段階の鍔付土器で、後期の再葬墓に用いられる鍔付土器の先行型式として重要な資料である。

資料 75

推定口径 33.0 cm の大型深鉢 (2 類)。口縁は軽く外反し、内面屈折部に稜が形成される。体部上半はわずかに外彎して立ち上がり、体部はほぼ直立する。口縁に無文帯がめぐり、体部には篋描文を施し、R 縦走撚糸文を回転施文した後、隆帯を貼付しさらに沈線文の調整と篋磨きで仕上げている(写真図版 10-4)。隆帯には刻みが加えられている。意匠は逆 S 字文である。資料 74 の深鉢 (2 類) は 75 と同様な意匠構成である。L の撚糸文、沈線文、磨きの工程で施されている。

(須藤)

第1表 大木式土器標識資料の出土地点・層位（ ）内は個体数
Table 1. Excavated locations and strata of the type artifacts of the Daigi types

	B 地点	C 地点	E 地点	F 地点	F' 地点
2層	大木 10 式 (1)	大木 7a 式 (2)	-	-	-
3層	大木 9 式 (1)	-	-	-	大木 7b 式 (1)
4層	大木 9 式 (2)	大木 7a 式 (1)	-	大木 7b 式 (1)	大木 7b 式 (2)
5層		-	大木 4 式 (1)	-	-
6層	大木 9 式 (4) 大木 8b 式 (5)		大木 4 式 (2)	-	-
7層	大木 8b 式 (1) 大木 8a 式 (2)	大木 7a 式 (1)	-	-	-
8層	-	大木 7a 式 (1)	-	-	-
層位不明	大木 9 式 (3)	大木 7a 式 (1)	-	-	-

4. 大木式土器標識資料の特徴とその意義

東北大学文学研究科考古学陳列館所蔵の大木冴貝塚標識資料は、縄文文化研究の指導的研究者、山内清男が調査した一括土器群であり、現在基準となっている縄文土器編年の基本を確立した山内の研究方法を解明できる重要な資料である。

大木冴貝塚は、塩釜湾に臨み、豊かな水産資源に恵まれた大規模拠点集落が形成した貝塚である。貝層の広がりには 37,823 m² に及び、海岸段丘の斜面にきわめて保存状態の良い貝層が厚く堆積する。多くの地点貝塚と大規模な貝層が複雑に形成され、前、中期の縄文土器が豊富に出土する。

山内は、この貝塚の 7 地点で貝層を発掘し、出土した土器について、堆積層の一括性、層位関係にもとづいて、器種・器形、装飾体系の型式学的検討を進めている。

資料の内面には、朱で B, C, E, F, F' と地点名が書き込まれている。各土器型式の朱書き地点名を検討すると（第 1 表）、32 点について確認でき、B 地点から大木 8a, 8b, 9, 10 式、C 地点で大木 7a 式、E 地点で大木 4 式、F, F' 地点から大木 7b 式が出土している。B 地点出土土器には 2 層から 7 層までの記入があり、土器の型式変遷と相関する。B 地点の 7 層から大木 8a 式と 8b 式、6 層から大木 8b 式と 9 式、3, 4, 5 層から大木 9 式、2 層では大木 10 式が出土しており、層位に応じた土器型式の漸移的変遷が捉えられる。この B 地点における大木 8a 式から 10 式の層位的出土状況については、昭和 2 年秋の B 地点調査に関する伊東信雄の記述と一致している（伊東 1973）。

本論では、縄文時代前期大木 4 式から中期大木 10 式の各土器型式について、器種構成、形態、装飾意匠、装飾法のあり方と変遷を検討した。

大木 4 式の資料は、深鉢と鉢で構成される。深鉢は口頸部がわずかに外彎する 1 類深鉢、口頸部が強く外彎する 2 類深鉢と、体部の膨らむ 3 類深鉢に区分される。鉢は類例が少なく、まれな存在である。装飾は、粘土紐を貼付した波状文、格子目文などの幾何学的な意匠や、沈線による連続山形文を特徴とする。

大木 5 式では、大木 4 式の器種構成を受け継ぎ、3 類型の深鉢が認められる。1, 2 類は基本的に踏襲され、3 類は体部上半が球形にくらみ、体部下半が円筒状となる。1, 2 類には粘土紐貼付文と沈線文で連続山形文や梯子状文が施される。3 類は三角形や山形などの意匠を組み合わせた細やかで精緻な文様構成をみせる。このように深鉢の 1, 2 類と 3 類では、装飾においてもまったく異なっている。大きく 2 者の明瞭な区分が成立していると言える。1, 2 類の装飾は大木 4 式を引き継いだものとみられるが、3 類の装飾については関東、北陸地方など別の系統との関係が考えられる。

大木 6 式では、大木 5 式で成立した深鉢の類型区分が確立する。口頸部が緩やかに外彎する 1, 2 類深鉢には、肥厚する口縁部に太い沈線文、体部には縄文と半截竹管文が展開し、ボタン状貼付などが配される。これに共伴する 3 類深鉢は、半截竹管による押しきりや結節浮線文の手法で渦巻文、山形文などが展開する。3 類では他地域との関係をうかがわせる装飾が目につく。こうした 3 類深鉢を一定量共伴することがこの型式の特徴となっている。

大木 7a 式の標識資料では、大木 5, 6 式を特徴づけていた深鉢の類型構成がみられなくなる（注 9）。深鉢 1, 2 類に、体部が強くくくらむ 3 類深鉢が加わり、鉢形土器が伴う器種構成となる。深鉢には貼付文、竹管文、結節縄文などの多様な装飾がみられる。他方、複合口縁をもち、縄文のみの深鉢や無文の鉢などが目につく。装飾的な深鉢を主体とする前期の土器群と区分し、こうした鉢や無文に近い類型が定着した型式を中期に位置づけた山内の型式学的な認識を読み取ることができる。

大木 7b 式では、大波状口縁をもち、口縁部を中心に体部まで文様がひろがる装飾的な深鉢 2 類型と、平縁で口縁部に文様が展開し、縄文が施されないことが多い浅鉢を含む中期的な器種構成が確立する。装飾は大木 7a 式にみられた粘土紐貼付、竹管文に加えて、撚紐側面の押圧が多用されるようになり、渦巻文、楕円文、三角形文などの複雑に連繋する意匠が展開する。

中期中葉の大木 8a 式は、7b 式を引き継いで、深鉢と鉢、浅

鉢で構成される。深鉢の器形は4類型認められ、変化に富む。口縁部の内彎する深鉢(1, 2類)が多くみられ、キャリパー形に近い器形が現れる。口縁部文様帯には把手、突起、隆線、沈線、撚紐の押圧など多彩な手法が用いられ、幅の狭い文様帯が重畳する。体部文様帯には隆線や沈線による渦巻文や、それを連繋する直線・曲線文など入り組んだ文様が施される。形態、装飾ともに極めて多様である。

大木8b式では、キャリパー形の深鉢1類が確立し、外反口縁の深鉢2類、口縁の内彎する鉢が伴う。キャリパー形深鉢1類では、頸部の無文帯を挟んで、口縁部と体部の文様帯が明瞭に分化し、山内清男がI文様帯、II文様帯とした文様帯構成がみられる(山内編1964)。隆線と沈線の渦巻文が複雑に連結され、口縁部では横に、体部では縦横に展開する。多様な大木8a式の器形、装飾手法や意匠などを選択的に受け継ぎ、著しい定型化をみる。

大木9式土器の資料は、大木8b式から2種類の深鉢を受け継ぎ、さらに口頸部の強くくびれる壺に近い形態の深鉢が加わる。隆帯文をもつ土器群と沈線文の土器群とがあり、装飾は隆帯文と磨消縄文、充填縄文手法が発達する。山内は、この土器群のまとまりを写真に表現しており(興野1996図版104~106上段)、器形、装飾の型式内変化をすでに明らかにしている。また、B地点の4・5層から出土した搬入土器を大木9式標識資料に加えており、関東地方や中部地方の土器型式との並行関係を確認できる基準資料としている。このような資料は、山内の縄文土器研究の実証性を如実に示している。

大木10式土器は先行型式からの2種類の深鉢を主体とし、注口鉢、鏝付広口壺で構成される。装飾は、沈線、隆線による帯状の文様が展開し、磨消縄文あるいは充填縄文手法が発達する。大木9式の意匠から大きな変化がみられる。幅広い文様帯が口縁から体部中位に展開し、その構成にも変化が生じている。

このように、大木囲貝塚出土標識資料は、山内が層位的に調査した一括資料を卓越した観察力で検討し、土器型式の編年を進めたことを理解することのできる資料である。

この貴重な学術資料を検討した結果、日本先史学の基盤を確立した山内清男の編年研究、型式学研究(注10)には層位的関係が基本となっていること、1遺跡の一括資料を入念に検討し、土器組成、装飾・施文手法など型式内容とその変遷を明確にしていること、そして他地域からの搬入土器を抽出し、広域の土器型式編年について検討していることを理解できた。

む す び

山内清男の実証的研究は、膨大な調査資料が蓄積されている今日、その方法を十分に理解し、発展、継承していくことが極めて大切であると言える。また、ここで取り組んだよう

に、基礎となる資料を明確に提示していく努力が不可欠であろう。

(早瀬・菅野・須藤)

注

- (1) 『日本石器時代人民遺物発見地名表 第四版』(東京帝国大学1917)にはその名が見られず、『日本石器時代遺物発見地名表 第五版』(東京帝国大学1928)に初めて現れる。
- (2) なお、標識資料に含まれない土器破片1点に「F4」の朱書きがあり、F地点の存在も確認されている。
- (3) 松本は土器における文様帯の推移を「第一次模様」から「第四次模様」への変遷過程として捉え(松本1919d, e)、土器の図に文様帯の番号を記した(松本1919b, c)。山内清男の文様帯系統論に大きな影響を与えた研究と言える。
- (4) 法量の計測値については、口径、底径、器高を0.1cm単位で表し、推定値の場合は0.5cm単位とした。器厚は0.5mm単位で示した。
- (5) 器面に突出する文様を表す用語として、「隆線」、「隆帯」、「突帯」、「浮線」などが用いられる。山内清男の用語(山内1929a, 1939-41, 山内編1964など)を確認したところ、基本的に「隆線」を用い、「隆帯」を併用している。「隆帯」は粘土帯の上面に縄文や刻みが加えられ、帯状に展開する文様(円筒上層式など)や、横帯となって器面をめぐる粘土帯に対して用いられる傾向がある。本稿ではこのような山内の用法に従い、用語の統一をはかった。
- (6) 大木9式土器の文様帯は、II文様帯が体部全体に繰り上げられる。大木10式のII文様帯は、体部上半に展開する。下半には縄文が施される。こうした大木10式の文様帯構成は、後期の装飾のあり方へと展開していく。
- (7) この搬入土器については、中部高地、関東北部にひろく分布する曾利式土器と類似する型式特徴がみられ、こうした地域からの搬入土器と推定される。水沢教子氏から、北関東地方の可能性があるが、関連地域における資料の検討が必要であるという教示をえた。本資料と類似する土器が、福島県伊達郡飯野町和台遺跡のSK2275から、大木9式土器と共に出土している(新井2004)。
- (8) この類型は、本資料には認められない。
- (9) 前期の3類系統の深鉢は、大木7a式にも伴うことが知られている(藤沼1969, 相原1986)。前期と中期の特徴を合わせもつ器種構成は、この型式の過渡の様相を表している。
- (10) 山内清男の型式学的研究法については、『日本原始美術 1 縄文式土器』(山内編1964) pp. 148-149において論ぜられている。

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第2表 山内清男大木式土器標識資料属性表 (4)
Table 2. Attribute list of the type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi (4)

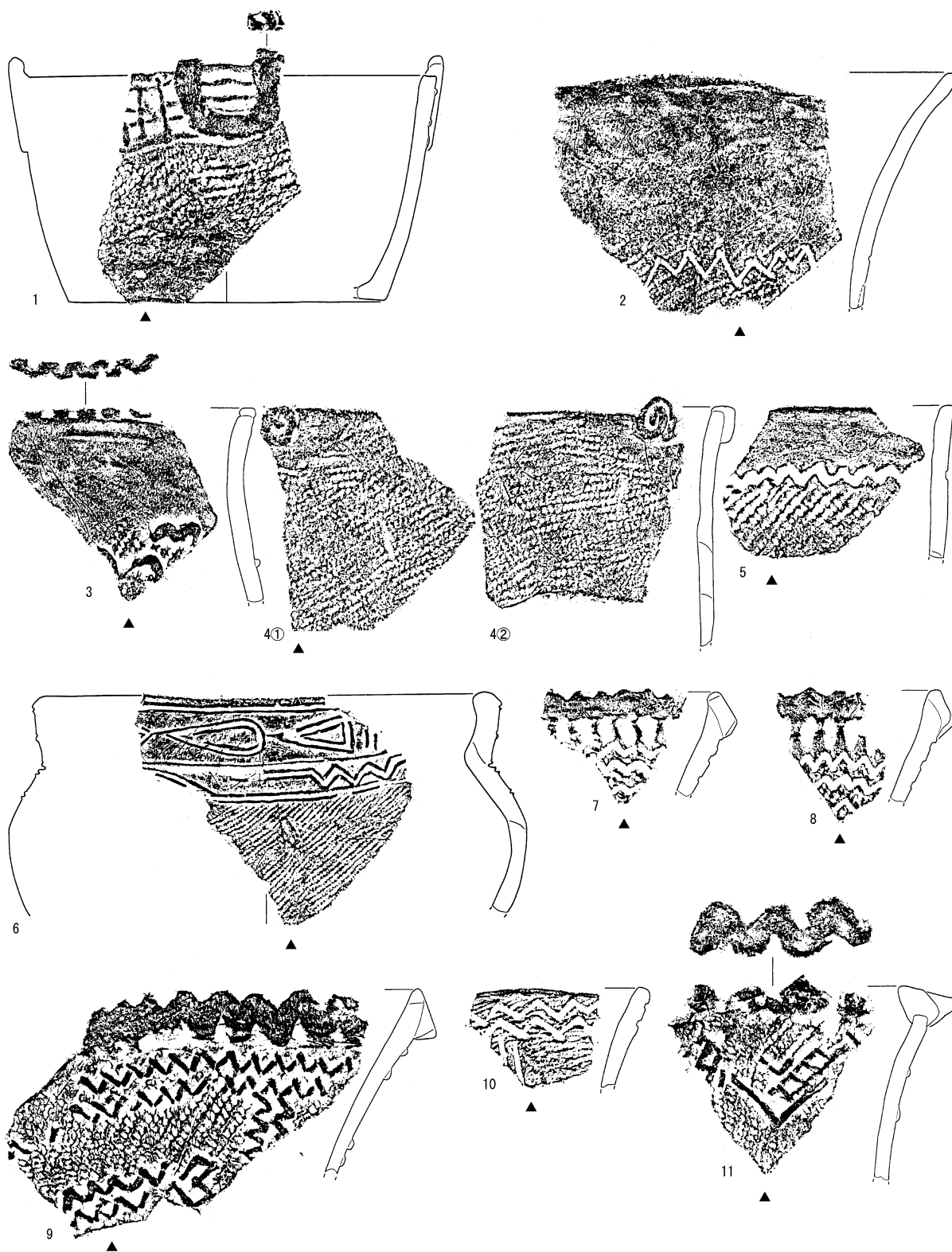
No.	型式	器種	器形	口縁の形状、調整、裝飾	口縁部、頸部の裝飾、調整	体部、底部の裝飾、調整	施文具、施文手法	施文原形、施文法	施文、調整手順	内面調整	胎土	法量	ラベル	備考
40	大木8a式	深鉢、体部は軽く、ふくらみ、頸部で腰やかにくびれ、口縁部はわずかに内側へ立ち上る(3類)。	深鉢、体部は軽く、ふくらみ、頸部で腰やかにくびれ、口縁部はわずかに内側へ立ち上る(3類)。	平坦口縁。外縁は取付帯平により肥厚する。端面は軽い磨きによって丸みを帯びる。	口縁外縁は小波状隆線文の狭い文飾帯となる。口縁部は小波状隆線文で覆われ、その間に小波状隆線文が施される。2条の区画隆線文を連結する楕円把手が配される。	体部には横文が施される。その後、縦文が3条施され、これを上段として3条1組の沈折が屈折して縦横に幅広く展開する。	隆線は頂部がやや丸みを帯び、把手部は器面をよくまでつけられるが、波状文はなでつけられない。幅3~4mmで先端の丸い工具を用いて沈折文が施される。	LRを縦に回転させて斜行溝を彫る。	押し、隆線→細文→沈折	横なで→横の軽い磨き(幅3~7mm)	径1mm以下の石英、長石を多量に含む。	口径35.5cm 器厚10mm 1/4残存	①a	
41	大木8b式	深鉢、体部は軽く、ふくらみ、頸部で腰やかにくびれ、口縁部は強く内側する(1類)。	平坦口縁。端面は軽い磨きによって丸みを帯びる。	口縁部は隆線による横線文が上段を下を囲い、縦の手状L形折すに横文が横はらに施される。	口縁部は隆線による横線文が上段を下を囲い、縦の手状L形折すに横文が横はらに施される。	体部は横文が施される。その後、縦文が3条施され、これを上段として3条1組の沈折が屈折して縦横に幅広く展開する。	幅5~10mmで頂部が丸い隆線が2条1組で施される。縁切はほとんど調整されない。	RLを縦、斜行溝を斜めに回転させる。	横なで(幅7~8mm)→横の軽い磨き	径1mm程度の石英を多量に含む。	口径29.5cm 器厚9.5mm 1/8残存	①c		
42	大木8b式	深鉢、頸部で腰やかにくびれ、口縁部は強く内側する(1類)。	平坦口縁。端面は軽い磨きによって丸みを帯びる。	隆線による流線文、別線文が展開し、沈折が平行する。隆線頂部には軽い磨きを加えられる。頸部には横文が施される。	口縁部は隆線による横線文が上段を下を囲い、縦の手状L形折すに横文が横はらに施される。	体部は横文が施される。その後、縦文が3条施され、これを上段として3条1組の沈折が屈折して縦横に幅広く展開する。	幅3~5mmで断面台形の隆線が取付され、幅4~5mmで先端の丸い工具による沈折が平行して施される。	RLを縦に回転させて斜行溝を彫る。	横なで(幅3~5mm)→軽い磨き	径1mm以下の石英など砂粒を含む。	口径17.0cm 器厚6mm 1/8残存	①c		
43	大木8b式	深鉢、体部は軽く、ふくらみ、頸部で腰やかにくびれ、口縁部は強く内側する(1類)。	平坦口縁。端面は軽い磨きによって丸みを帯びる。	口縁部には、横文が施された後、隆線による、上の横線文の間に流線文、曲線文が展開し、沈折が平行して施される。隆線頂部は磨き加えられる。横方向の磨きによる無文帯となる。	口縁部には、横文が施された後、隆線による、上の横線文の間に流線文、曲線文が展開し、沈折が平行して施される。隆線頂部は磨き加えられる。横方向の磨きによる無文帯となる。	体部には横文が施される。その後、縦文が3条施され、これを上段として3条1組の沈折が屈折して縦横に幅広く展開する。	幅2~9mmで断面台形を呈し、頂部はやや丸みを帯びる。隆線2条と、幅2~3mmで先端の丸い工具による沈折が平行して施される。同一工具による沈折は2条1組で施される。	RLを縦に回転させて斜行溝を彫る。	横なで→軽い磨き	径1mm以下の石英など砂粒を含む。	口径15.0cm 器厚6mm 1/4残存	-		
44	大木8b式	深鉢、体部上半から口縁部にかけて腰やかに内側して立ち上る。	波状口縁。端面は軽い磨きによって丸みを帯びる。口縁部は付帯により肥厚する。	波状口縁に付帯により、軽い磨きを加えられる。	波状口縁に付帯により、軽い磨きを加えられる。	体部には横文が施される。	幅10mm、断面台形で頂部がやや丸みを帯びる。隆線2条と、幅2~3mmで先端の丸い工具による沈折が部分的に平行する。隆線はあまり調整されない。	LRを縦に回転させて斜行溝を彫る。	横折り→横の軽い磨き(幅2~3mm)	径1mm以下の石英など砂粒を含む。	口径10.5cm 器厚6mm 1/8残存	①a ② [B6]		
45	大木8b式	深鉢、体部は軽く、ふくらみ、頸部で腰やかに内側する(2類)。	平坦口縁で貫通孔のある把手を有する。端面は軽い磨きによって丸みを帯びる。口縁部は付帯により肥厚する。	平坦口縁に隆帯がめぐり、沈折が平行する。頸部には横文が施される。	口縁外縁に隆帯がめぐり、沈折が平行する。頸部には横文が施される。	体部には横文が施される。	幅5~7mm、断面台形で頂部がやや丸みを帯びる。隆線2条と、幅2~3mmで先端の丸い工具による沈折が平行する。同一工具による沈折は2~3条1組の沈折が施される。	RLを縦に回転させて斜行溝を彫る。	隆帯→沈折	径1mm以下の石英など砂粒を含む。	口径11.5cm 器厚4.5mm 1/2残存	①a ② [B7]	炭化物が多量に付着する。	
46	大木8b式	深鉢、体部上半から口縁部にかけて腰やかに内側する(2類)。	平坦口縁。端面は軽い磨きによって丸みを帯びる。	口縁部は横文で、幅3mm、横方向の磨きが行われる。	口縁部は横文で、幅3mm、横方向の磨きが行われる。	体部には横文が施される。その後、縦文が3条施され、これを上段として3条1組の沈折が屈折して縦横に幅広く展開する。	幅3~4mmで断面台形の隆線2条と、幅2~3mmで先端の丸い工具による沈折が平行する。同一工具による沈折は2~3条1組の沈折が施される。	LRを縦に回転させて斜行溝を彫る。	横文→隆線→沈折	径1mm以下の石英など砂粒を多量に含む。	口径16.0cm 器厚6.5mm 1/8残存	①a ② [B6]	補修孔あり。	
47	大木8b式	深鉢(1類)もしくは鉢、縁部が腰やかに内側する。	平坦口縁。端面は軽い磨きによって丸みを帯びる。	口縁部には隆線による流線文、横文が展開し、沈折が平行する。隆線頂部には磨き加えられる。	口縁部には隆線による流線文、横文が展開し、沈折が平行する。隆線頂部には磨き加えられる。	体部は無文で、幅3mm、横方向の磨きが行われる。	幅4~6mm、断面台形で、頂部は丸みを帯びる。隆線に、幅4~5mmで先端の丸い工具による沈折が平行する。隆線頂部は付帯により丸みを帯びる。沈折文は付帯により、流線文は付帯により、磨き加えられる。	なし	隆線→沈折→調整	径1mm以下の石英を多量に含む。	口径8mm	② [B6]		
48	大木8b式	深鉢(1類)または鉢、頸部から口縁部にかけて腰やかに内側する。	大波状口縁。端面は配付により肥厚する。端面は軽い磨きにより丸みを帯び、明瞭に面をなす。	口縁部には隆線による流線文、横文が展開し、沈折が平行する。隆線頂部には磨き加えられる。	口縁部には隆線による流線文、横文が展開し、沈折が平行する。隆線頂部には磨き加えられる。	頸部は無文で、幅3mm、横方向の磨きが行われる。	幅5~7mm、断面台形で、頂部は丸みを帯びる。隆線に、幅3~5mmで先端の丸い工具による沈折が平行する。隆線頂部は付帯により丸みを帯びる。沈折文は付帯により、磨き加えられる。	なし	隆線→沈折→調整	径1mm以下の石英など砂粒を少量含む。	口径6mm	①a ② [B6]		
49	大木8b式	深鉢(2類)または鉢、頸部から口縁部にかけて腰やかに内側する。	大波状口縁。端面は配付により肥厚する。端面は軽い磨きにより丸みを帯び、明瞭に面をなす。	口縁部には隆線による流線文、横文が展開し、沈折が平行する。隆線頂部には磨き加えられる。	口縁部には隆線による流線文、横文が展開し、沈折が平行する。隆線頂部には磨き加えられる。	頸部は無文で、幅3mm、横方向の磨きが行われる。	幅5~7mm、断面台形で、頂部は丸みを帯びる。隆線に、幅3~5mmで先端の丸い工具による沈折が平行する。隆線頂部は付帯により丸みを帯びる。沈折文は付帯により、磨き加えられる。	なし	隆線→沈折→調整	径1mm以下の石英を多量に含む。	口径8.5mm	①a ② [B6]		
50	大木9式	深鉢、頸部で腰やかに外側して立ち上るが、マヤリパー形。体部は軽く、ふくらむ(1類)。	平坦口縁。端面は軽い磨きによって丸みを帯びる。付帯により外面に肥厚する。	波状口縁。端面は軽い磨きによって丸みを帯びる。付帯により外面に肥厚する。	口縁部から体部にかけて横文が施される。口縁外縁に横線文の付帯により、口縁部にかけて流線文が施される。頸部には横文が施される。頂部には磨き加えられる。	体部には横文が施される。頸部と口縁部との間に、幅3mmで先端の丸い工具による沈折が平行する。隆線の高さは変化しない。	断面が丸く磨かれた山形を呈する隆線に、幅3~5mmで先端の丸い工具による凹線が平行する。凹線の高さは変化しない。	RLを縦に回転させて斜行溝を彫る。	横文→隆線→調整	径1mm以下の石英など砂粒を少量含む。	口径25.0cm 器厚6mm 1/4残存	①c ② [B6]		
51	大木9式	深鉢、口縁部が腰やかに外側して広がる(2類)。	平坦口縁。端面は軽い磨きによって丸みを帯びる。	波状口縁。端面は軽い磨きによって丸みを帯びる。付帯により外面に肥厚する。	口縁部から体部にかけて横文が施される。口縁外縁に横線文の付帯により、口縁部にかけて流線文が施される。頸部には横文が施される。頂部には磨き加えられる。	体部は無文で、幅3mm、横方向の磨きが行われる。	断面が丸く磨かれた山形を呈する隆線に、幅3~5mmで先端の丸い工具による凹線が平行する。凹線の高さは変化しない。	RLを縦に回転させて斜行溝を彫る。	横文→隆線→調整	径1mm以下の石英を多量に含む。	口径7mm	①a ② [B6]		
52	大木9式	深鉢、体部上半から縁やかに内側して立ち上るが、マヤリパー形(1類)。	平坦口縁。端面は軽い磨きによって丸みを帯びる。	波状口縁。端面は軽い磨きによって丸みを帯びる。付帯により外面に肥厚する。	口縁部から体部にかけて横文が施される。口縁外縁に横線文の付帯により、口縁部にかけて流線文が施される。頸部には横文が施される。頂部には磨き加えられる。	体部は無文で、幅3mm、横方向の磨きが行われる。	断面が丸く磨かれた山形を呈する隆線に、幅3~5mmで先端の丸い工具による凹線が平行する。凹線の高さは変化しない。	RLを縦に回転させて斜行溝を彫る。	横文→隆線→調整	径1mm以下の石英を多量に含む。	口径5mm	①a ② [B6]		

第2表 山内清男大木式土器標識資料属性表 (5)
Table 2. Attribute list of the type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi (5)

Table with 11 columns: No., 型式, 器種, 器形, 口縁の形状, 調整, 裝飾, 口縁部, 頸部の裝飾, 調整, 体部, 体部の裝飾, 調整, 施文具, 施文手法, 施文原形, 施文, 内面調整, 胎土, 法量, ラベル, 備考. Rows 53-64 describe various pottery types like 大木9式, 大木9式, 大木9式, 大木9式, 大木9式, 大木9式, 大木9式, 大木9式.

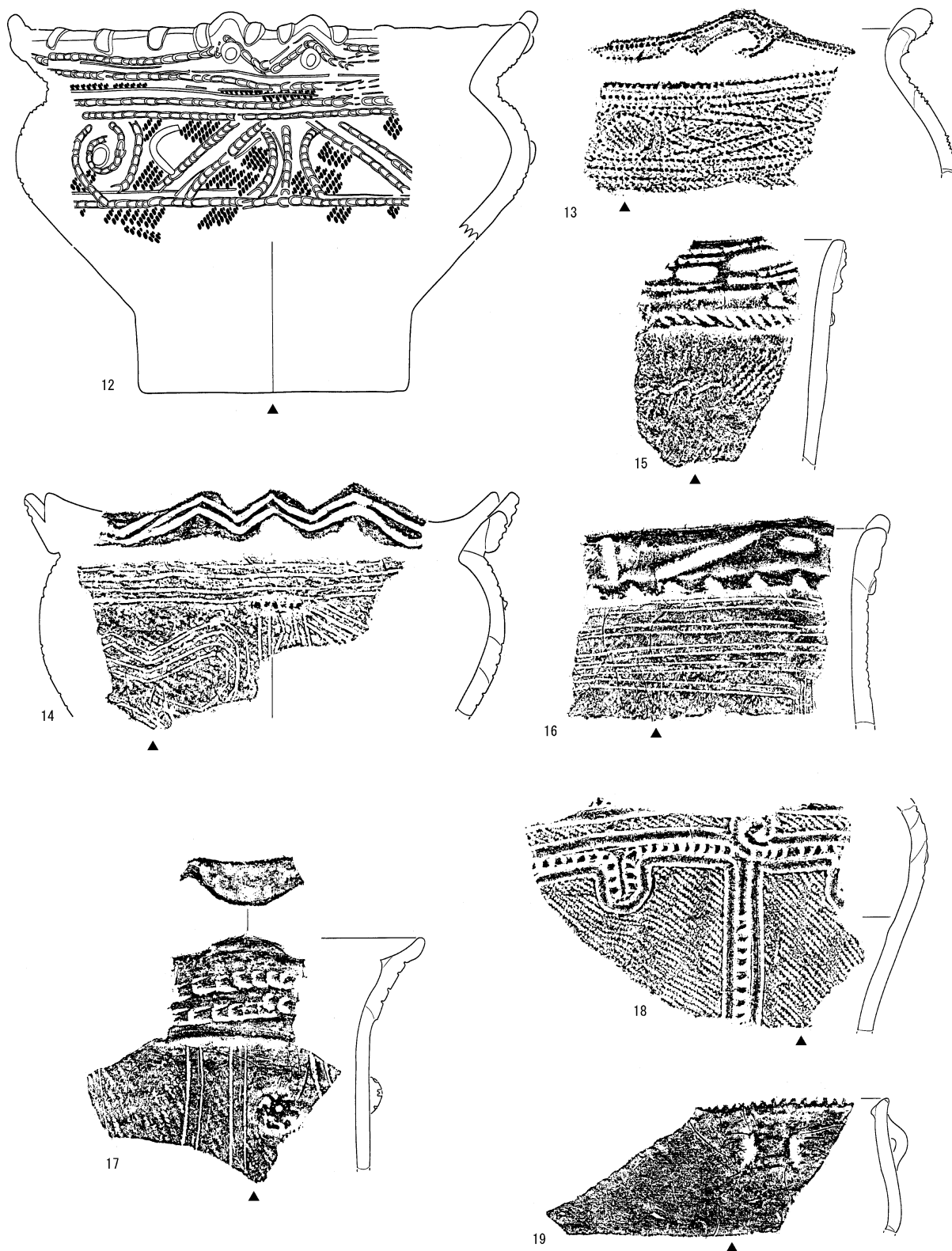
第2表 山内清男大木式土器標識資料属性表 (6)
Table 2. Attribute list of the type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi (6)

No.	型式	器種、器形	口縁の形状、調整、裝飾	口縁部、頸部の裝飾、調整	体部、底部の裝飾、調整	施文具、施文手法	縄文原形、施文法	施文、調整手順	内面調整	胎土	法量	ラベル	備考
65	大木10式	鉢、わずかな排座となる底部から口縁部にかけて緩やかに内灣して立ち上がる。	平坦口縁。正面に2個1組の小突起を有する。端部はなでによって丸みを帯びる。	口縁部に2条、1組の隆帯による無文帯の区画が展開する。区画内には流線状の筋が描かれる。無文帯の幅は約4mm、口縁部の筋の幅は約2mmである。	体部には縄文が施される。底部は無文で、なで調整される。	幅2~3mmで断面丸または縁線状の隆帯が施される。口縁部には流線状の筋が描かれる。幅5mmで先端の丸い工具を用いて、縁線が明瞭で深い流線が施される。	RLを横に回転する斜行縄文。	縄文→横位区画文、貫通孔	横なで	石英、長石など径1mm以下の砂を少量含む。器厚7.5mm、口縁3/4、底部全面残存	口径13.3cm 底径5.7cm 器高7.2~7.8cm (突起) 器厚7.5mm 口縁3/4、 底部全面残存	①a ④a ④b	
66	大木10式	深鉢。体部は直線的に強く内湾する。	平坦口縁。端面は磨きによって明瞭な面をなし、やや丸みを帯びる。	口縁部に2条、1組の隆帯による無文帯の区画が展開する。区画内には流線状の筋が描かれる。無文帯の幅は約4mm、口縁部の筋の幅は約2mmである。	体部には縄文が施される。底部は無文で、なで調整される。	幅5mmで断面丸または縁線状の隆帯が施される。口縁部には流線状の筋が描かれる。幅5mmで先端の丸い工具を用いて、縁線が明瞭で深い流線が施される。	RLを区画に回転させて充填施文する。	隆帯→縄文→口縁部	横の直磨き(幅4mm)	石英など径1mm以下の砂を少量含む。器厚17.0cm、口縁3/4残存	口径17.0cm 器厚6.5cm 1/4残存	①a	
67	大木10式	深鉢。体部は直線的に強く内湾する。	山形突起を有し、突起頂部に小突起を有する。端面は磨きによって丸みを帯び、内側が直線的になる。	口縁部から体部にかけて2条の隆帯による無文帯の区画が展開する。区画内には流線状の筋が描かれる。無文帯の幅は約4mm、口縁部の筋の幅は約2mmである。	体部下半穴掘。	幅10~12mmで断面丸または縁線状の隆帯が施される。口縁部には流線状の筋が描かれる。幅6mmで先端の丸い工具を用いて、縁線が明瞭で深い流線が施される。	Rを巻いた単軸筋を縦に回転して充填施文する。性能あり。	縄文→隆帯→流線	横なで→磨き	石英など径1mm以下の砂を少量含む。器厚8mm、1/8残存	口径33.0cm 底径10.0cm 器高34.5cm 器厚8mm、1/8残存	-	
68	大木10式	深鉢。外灣気味に口縁部が立ち上がる。(2類)。	平坦口縁。端面は丁寧な磨きで中堅になる。	口縁部から体部にかけて2条の隆帯による無文帯の区画が展開する。区画内には流線状の筋が描かれる。無文帯の幅は約4mm、口縁部の筋の幅は約2mmである。	体部下半穴掘。	幅3mmで断面丸または縁線状の隆帯が施される。口縁部には流線状の筋が描かれる。幅3mmで先端の丸い工具を用いて、縁線が明瞭で深い流線が施される。	RLを斜めに回転して充填施文する。	隆帯→縄文	横の磨き(幅3mm)	石英など径1mm以下の砂を少量含む。器厚7.5mm	口径7.5cm	①a	
69	大木10式	深鉢。体部は直線的に強く内湾する。	平坦口縁。端面は磨きによって丸みを帯びる。	口縁部から体部にかけて2条の隆帯による無文帯の区画が展開する。区画内には流線状の筋が描かれる。無文帯の幅は約4mm、口縁部の筋の幅は約2mmである。	体部全面に縄文が施される。	幅3~4mmで断面丸または縁線状の隆帯が施される。口縁部には流線状の筋が描かれる。幅3~4mmで先端の丸い工具を用いて、縁線が明瞭で深い流線が施される。	0段のRを左側に回転して充填施文する。性能あり。	縄文→流線	横なで→磨き(幅3mm)	石英など径1mm以下の砂を少量含む。器厚12.0cm、口縁3/4残存	口径12.0cm 器厚13.5mm 1/8残存	①b	
70	大木10式	深鉢。体部は直線的に強く内湾する。	波状口縁で突起を有する。端面は磨きによって丸みを帯びる。	口縁部から体部にかけて2条の隆帯による無文帯の区画が展開する。区画内には流線状の筋が描かれる。無文帯の幅は約4mm、口縁部の筋の幅は約2mmである。	体部全面に縄文が施される。	幅2~3mmで断面丸または縁線状の隆帯が施される。口縁部には流線状の筋が描かれる。幅2~3mmで先端の丸い工具を用いて、縁線が明瞭で深い流線が施される。	1段のRを左側に回転して充填施文する。性能あり。	縄文→流線	横なで→磨き(部分的)	石英など径1mm以下の砂を少量含む。器厚13.0cm、口縁3/4残存	口径13.0cm 器厚5mm 1/8残存	①a	
71	大木10式	鉢。体部は直線的に強く内湾する。	平坦口縁。端面は磨きによって丸みを帯びる。	口縁部から体部にかけて2条の隆帯による無文帯の区画が展開する。区画内には流線状の筋が描かれる。無文帯の幅は約4mm、口縁部の筋の幅は約2mmである。	体部には2条の隆帯による無文帯の区画が展開する。隆帯は流線状の筋が描かれる。無文帯の幅は約4mm、口縁部の筋の幅は約2mmである。	幅3~6mmで断面丸または縁線状の隆帯が施される。口縁部には流線状の筋が描かれる。幅3~6mmで先端の丸い工具を用いて、縁線が明瞭で深い流線が施される。	Rを巻いた単軸筋を縦に回転して充填施文する。	隆帯→縄文、刺突→なで	横なで→横磨き(幅3mm)	石英など径1mm以下の砂を少量含む。器厚25.0cm、最大径27.0cm、器厚5.5mm、1/4残存	口径25.0cm 最大径27.0cm 器厚5.5mm 1/4残存	①a	
72	大木10式	鉢。体部は直線的に強く内湾する。	平坦口縁。端面は磨きによって丸みを帯びる。	口縁部から体部にかけて2条の隆帯による無文帯の区画が展開する。区画内には流線状の筋が描かれる。無文帯の幅は約4mm、口縁部の筋の幅は約2mmである。	体部には2条の隆帯による無文帯の区画が展開する。隆帯は流線状の筋が描かれる。無文帯の幅は約4mm、口縁部の筋の幅は約2mmである。	幅3~4mmで断面丸または縁線状の隆帯が施される。口縁部には流線状の筋が描かれる。幅3~4mmで先端の丸い工具を用いて、縁線が明瞭で深い流線が施される。	なし	隆帯→流線、刺突	横なで	石英など径1mm以下の砂を少量含む。器厚8.5mm	口径8.5cm	①a	
73	大木10式	鐙付壺。体部上半は内湾し、口縁部は内湾する。	平坦口縁。端面は明瞭な面をなし、なでによりやや丸みを帯びる。横状把手を伴う磨きがある。	口縁部から体部にかけて2条の隆帯による無文帯の区画が展開する。区画内には流線状の筋が描かれる。無文帯の幅は約4mm、口縁部の筋の幅は約2mmである。	体部上半に流線による区画文が展開する。区画内には流線状の筋が描かれる。無文帯の幅は約4mm、口縁部の筋の幅は約2mmである。	幅8mmで断面丸または縁線状の隆帯が施される。口縁部には流線状の筋が描かれる。幅8mmで先端の丸い工具を用いて、縁線が明瞭で深い流線が施される。	Rを巻いた単軸筋を縦に回転して充填施文する。性能あり。	流線→縄文	横なで→横の磨き	石英など径1mm以下の砂を少量含む。器厚12.5cm、口縁3/4残存	口径12.5cm 器厚5.5mm 1/8残存	② [B2]	
74	大木10式	深鉢。体部は直線的に強く内湾する。	平坦口縁。端面は明瞭な面をなし、なでによりやや丸みを帯びる。	口縁部から体部にかけて2条の隆帯による無文帯の区画が展開する。区画内には流線状の筋が描かれる。無文帯の幅は約4mm、口縁部の筋の幅は約2mmである。	体部下半穴掘。	幅3~4mmで断面丸または縁線状の隆帯が施される。口縁部には流線状の筋が描かれる。幅3~4mmで先端の丸い工具を用いて、縁線が明瞭で深い流線が施される。	Rを巻いた単軸筋を縦に回転して充填施文する。性能あり。	縄文→流線	横なで→横の磨き	石英など径1mm以下の砂を少量含む。器厚28.0cm、口縁3/4残存	口径28.0cm 器厚7.5mm 1/8残存	①c	
75	大木10式	深鉢。口縁部はわずかに外灣する。(2類)。	平坦口縁。端面は磨きによって丸くなる。	口縁部から体部にかけて2条の隆帯による無文帯の区画が展開する。区画内には流線状の筋が描かれる。無文帯の幅は約4mm、口縁部の筋の幅は約2mmである。	体部下半穴掘。	幅8mmで断面丸または縁線状の隆帯が施される。口縁部には流線状の筋が描かれる。幅8mmで先端の丸い工具を用いて、縁線が明瞭で深い流線が施される。	Rを巻いた単軸筋を縦に回転して充填施文する。性能あり。	流線→縄文、刺突→部分沈	横なで→磨き、体部は縦	石英など径1mm以下の砂を少量含む。器厚33.0cm、口縁3/4残存	口径33.0cm 器厚13.5mm 1/8残存	-	



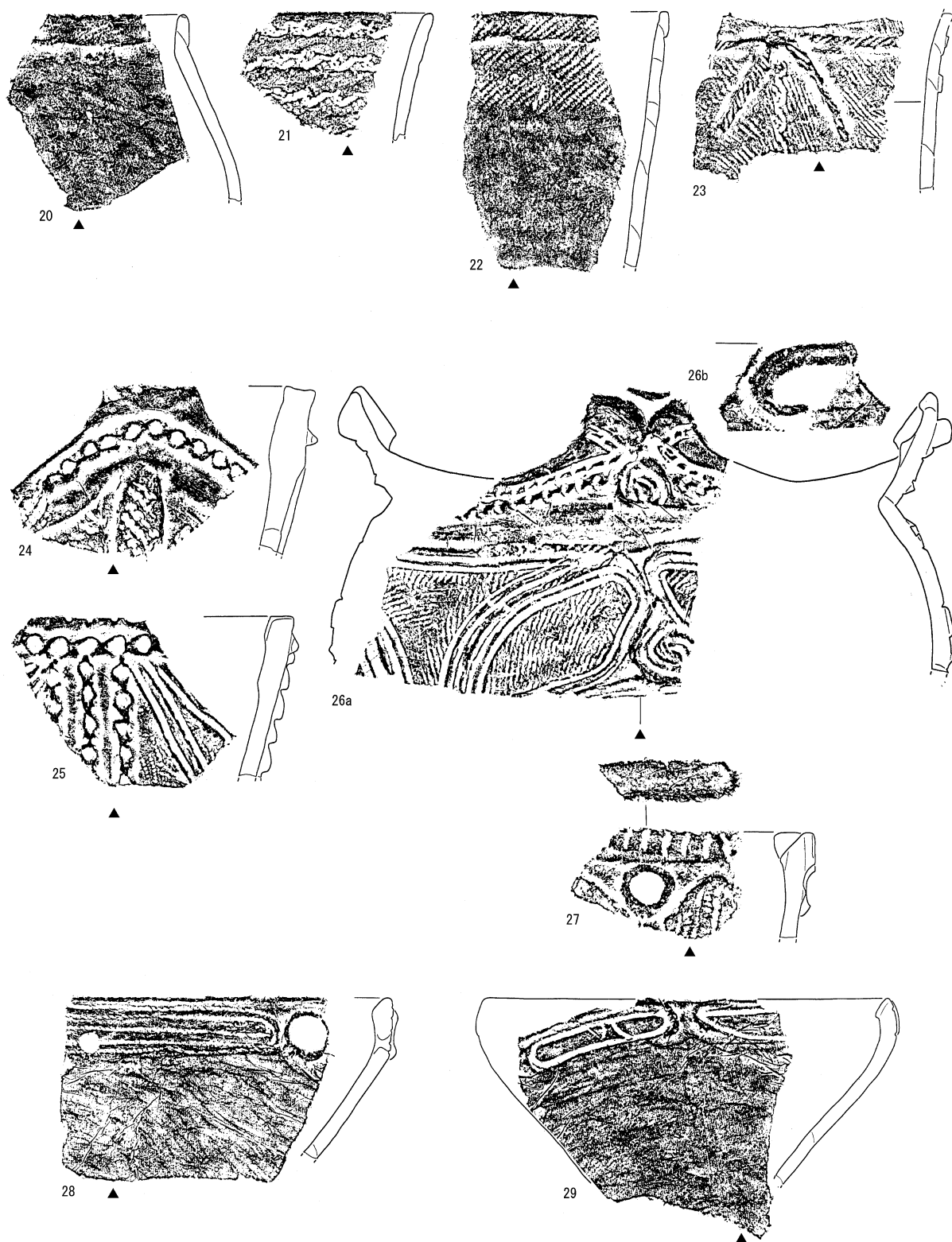
第3図 山内清男大木式土器標識資料実測図・拓影 (Scale=1:3) ▲は断面実測の位置を表す
 1~5 大木4式土器, 6~11 大木5式土器

Figure 3. Type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi



第4図 山内清男大木式土器標識資料実測図・拓影 (Scale=1:3)
 12~16 大木6式土器, 17~19 大木7a式土器

Figure 4. Type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi



第5図 山内清男大木式土器標識資料実測図・拓影 (Scale=1:3)

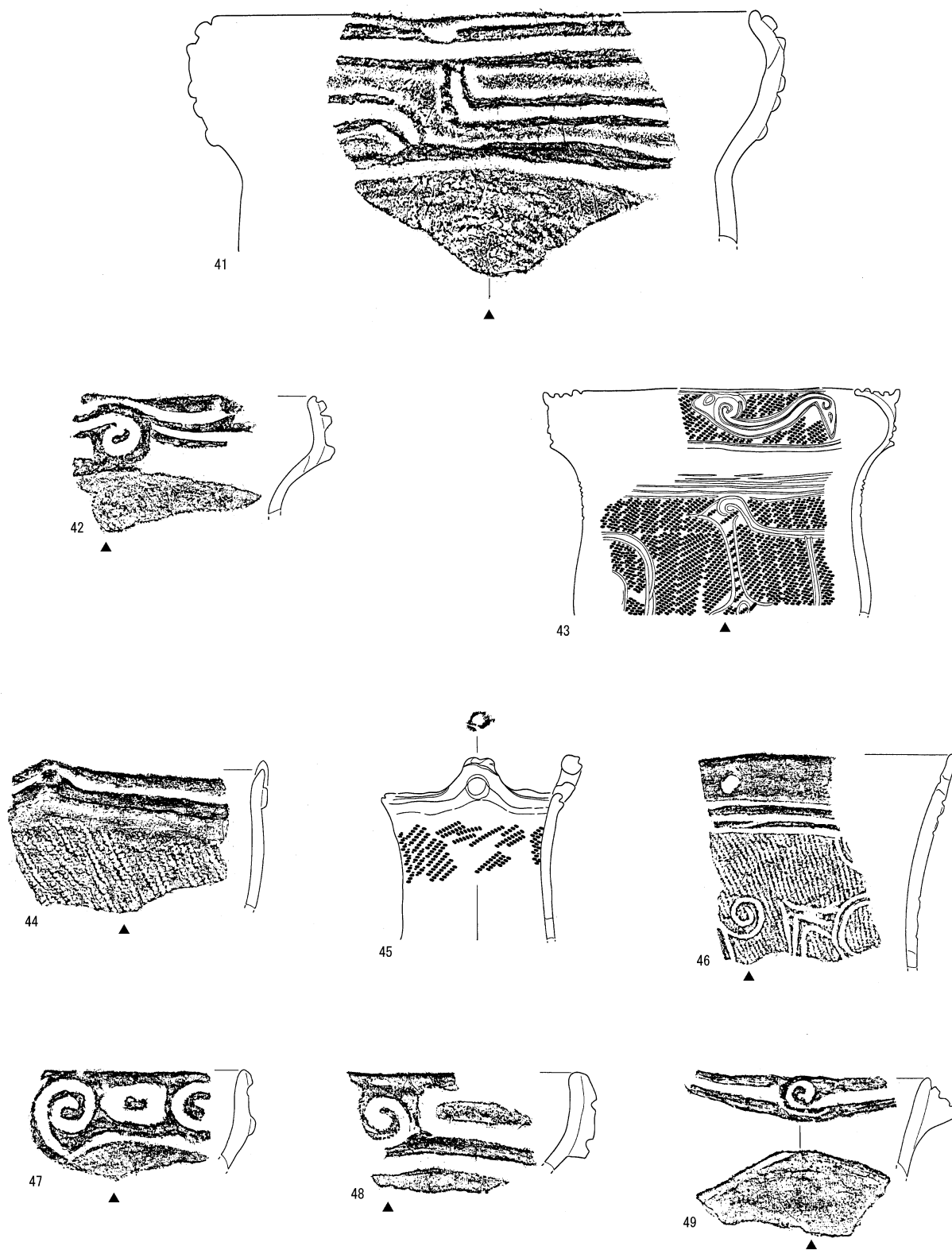
20~23 大木7a式土器, 24~29 大木7b式土器

Figure 5. Type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi



第6図 山内清男大木式土器標識資料実測図・拓影 (Scale=1:3)
30~40 大木8a式土器

Figure 6. Type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi



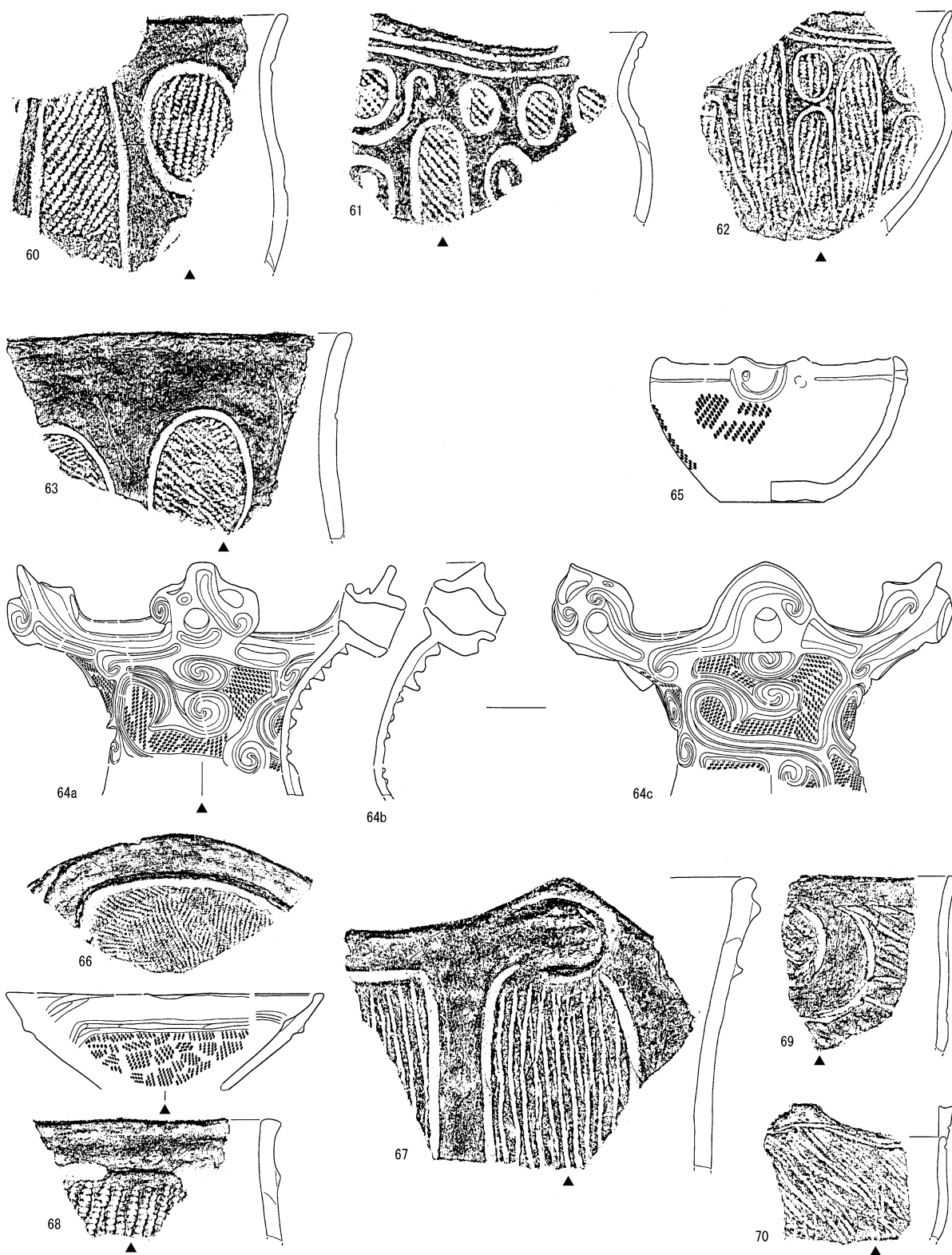
第7図 山内清男大木式土器標識資料実測図・拓影 (Scale=1:3)
41~49 大木8b式土器

Figure 7. Type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi



第 8 図 山内清男大木式土器標識資料実測図・拓影 (Scale=1:3)
50~59 大木 9 式土器

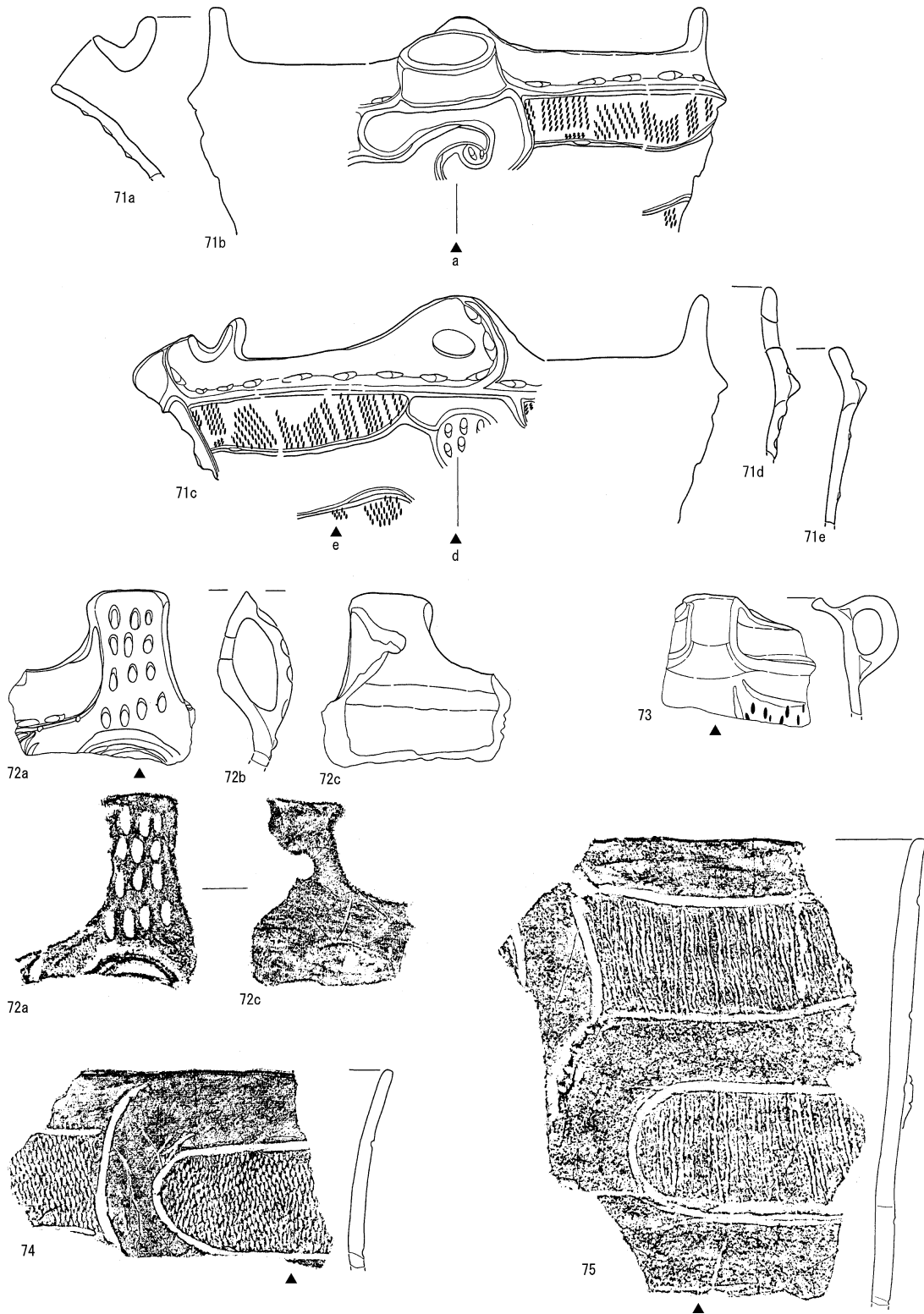
Figure 8. Type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi



第9図 山内清男大木式土器標識資料実測図・拓影 (Scale=1:3)

60~64 大木9式土器, 65~70 大木10式土器

Figure 9. Type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi



第 10 図 山内清男大木式土器標識資料実測図・拓影 (Scale=1:3)
 71~75 大木 10 式土器

Figure 10. Type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi



写真図版1 山内清男大木式土器標識資料 (Scale=1:3)

1~5 大木4式土器, 6~11 大木5式土器

Plate 1. Type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi



写真図版2 山内清男大木式土器標識資料 (Scale=1:3)

12~16 大木6式土器, 17~19 大木7a式土器

Plate 2. Type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi



写真図版3 山内清男大木式土器標識資料 (Scale=1:3)

20~23 大木 7a 式土器, 24~29 大木 7b 式土器, 30~35 大木 8a 式土器

Plate 3. Type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi



写真図版4 山内清男大木式土器標識資料 (Scale=1:3)

36~40 大木8a式土器, 41~49 大木8b式土器

Plate 4. Type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi



写真図版5 山内清男大木式土器標識資料 (Scale=1:3)

50~59 大木9式土器

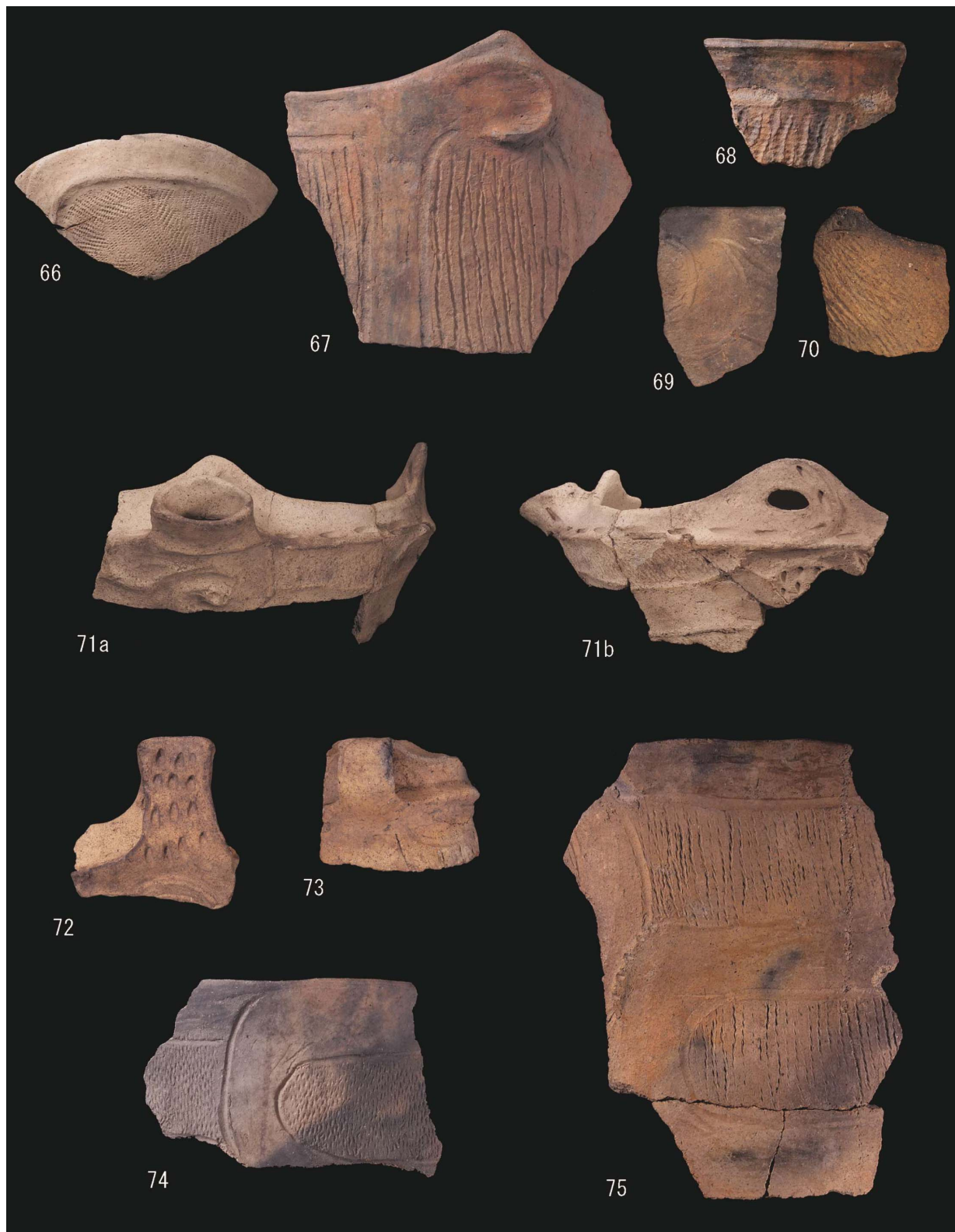
Plate 5. Type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi



写真図版 6 山内清男大木式土器標識資料 (Scale=1:3)

60~64 大木 9 式土器, 65 大木 10 式土器

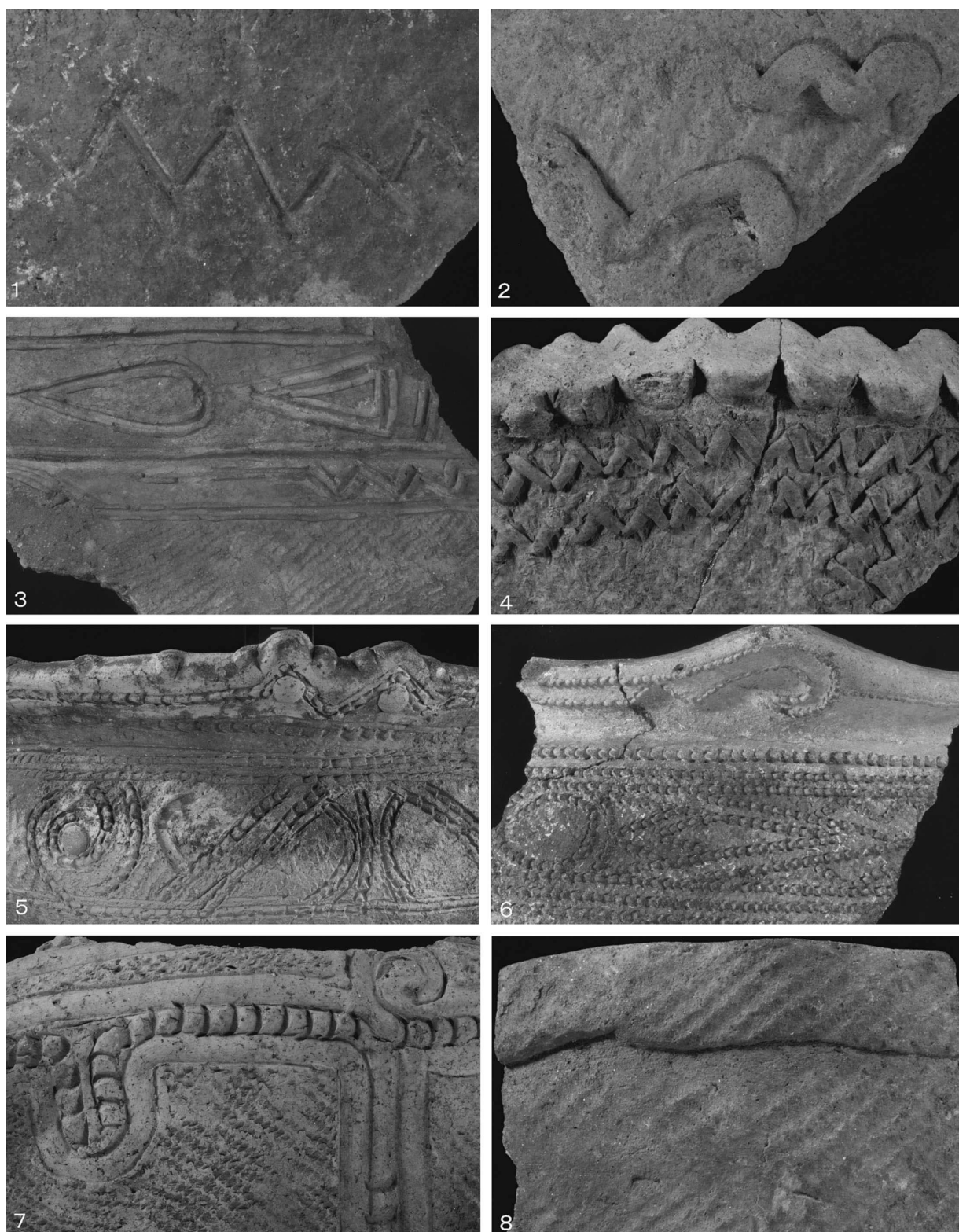
Plate 6. Type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi



写真図版7 山内清男大木式土器標識資料 (Scale=1:3)

66~75 大木10式土器

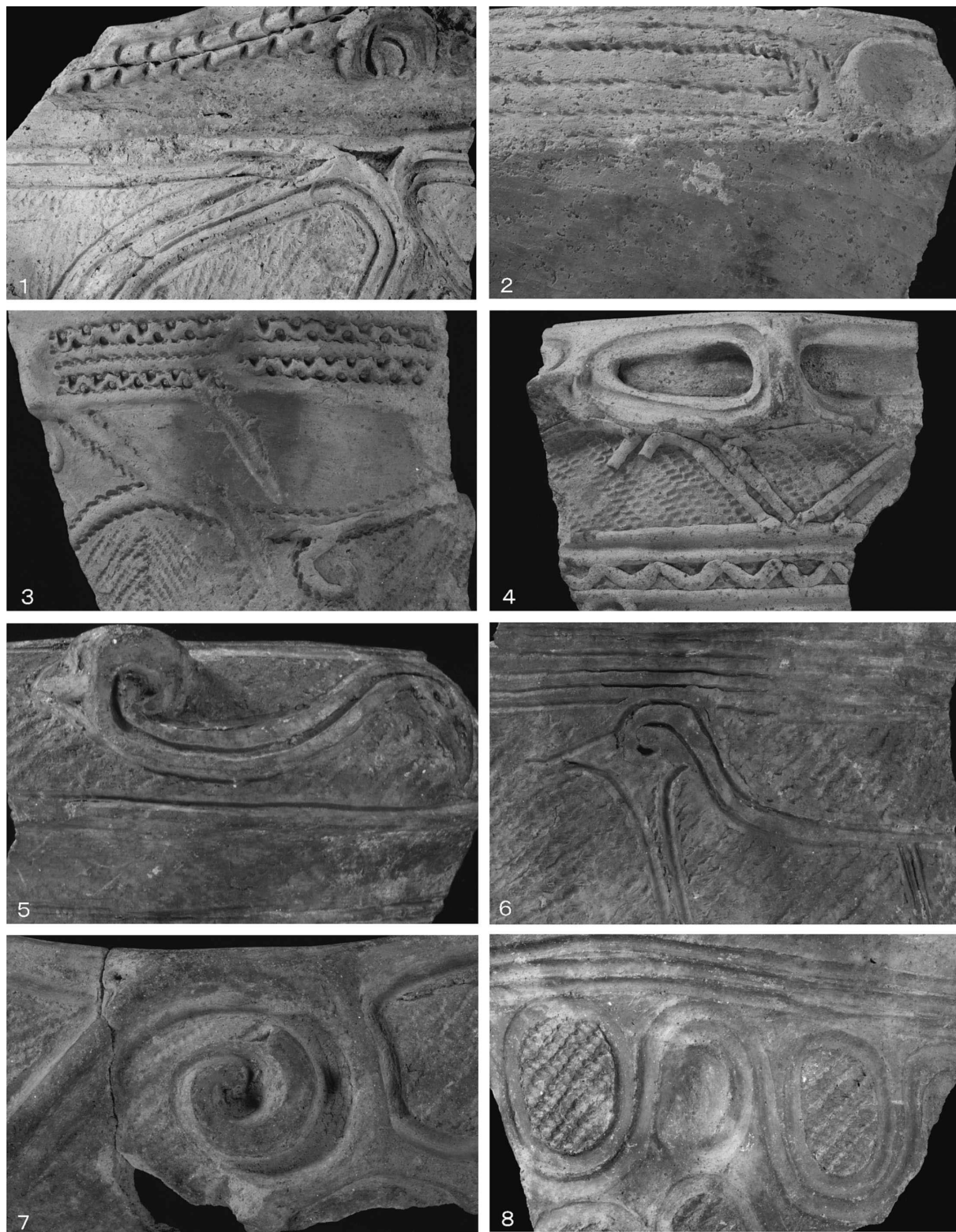
Plate 7. Type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi



写真図版 8 山内清男大木式土器標識資料細部

1. 大木 4 式 (資料 2) 2. 大木 4 式 (資料 3) 3. 大木 5 式 (資料 6) 4. 大木 5 式 (資料 9) 5. 大木 6 式 (資料 12) 6. 大木 6 式 (資料 13) 7. 大木 7a 式 (資料 18) 8. 大木 7a 式 (資料 22)

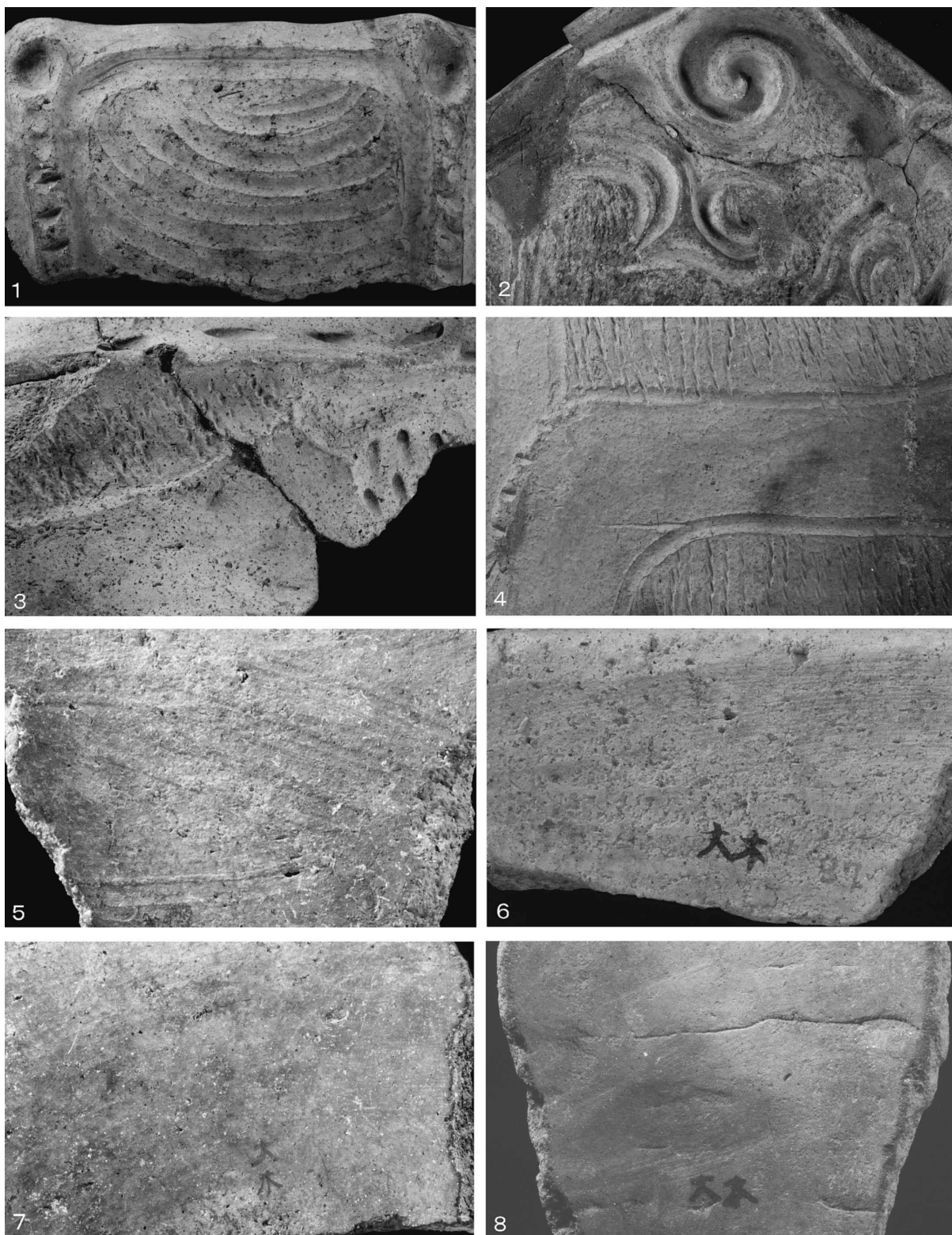
Plate 8. Details of type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi



写真図版9 山内清男大木式土器標識資料細部

1. 大木7b式(資料26) 2. 大木7b式(資料28) 3. 大木8a式(資料35) 4. 大木8a式(資料36) 5. 大木8b式(資料43口縁部) 6. 大木8b式(資料43体部) 7. 大木9式(資料53) 8. 大木9式(資料57)

Plate 9. Details of type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi



写真図版 10 山内清男大木式土器標識資料細部

1. 大木 9 式 (資料 58) 2. 大木 9 式 (資料 64) 3. 大木 10 式 (資料 71) 4. 大木 10 式 (資料 75) 5. 条痕 (資料 11) 6. なで→軽い磨き (資料 31) 7. 磨き (資料 51) 8. 接合痕 (資料 22)

Plate 10. Details of type artifacts of the Daigi types of Jomon pottery selected by Dr. Sugao Yamanouchi

Technological Wears on the Prehistoric Jades in East Asia

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Introduction

In the recent research, the author has always noticed the traces of string-sawing and pecking scars on the Neolithic jade artifacts of East Asia. According to Mou Yongkang, these traces of string-sawing should be the result of soft string-sawing with sand abrasives (Mou 1989a, 2003).¹ He named it as “gritted string sawing technique” 線切割 (Mou 1989b; Zhou & Zhang 1984) (Fig. 1). This term is taken within the archaeological circle generally and is basically correspondent to the Japanese term “ITOKIRI” derived from *Koujien* 広辭苑 (Shimura 1983)² and “string-sawing” in English. Internationally, it is defined as the use of hide or plant fiber made string being embedded with sand abrasive. The hardness and the sharp edges of the sand grains will cause abrasion when the string is moved back and forth on jades, which will then be split eventually. *Zhuo* 琢 is rendered as “kouda” 敲打 in Japanese and “pecking” in English. Pecking was a percussion technique commonly used in jade technology during the Stone Age. It is some way between flaking and grinding, but excels the former in controlling the precision of form and the latter in efficiency. After the initial blank was obtained by flaking, pecking was used to touch up the shape. During the process of pecking, stone percussors of various sizes were used to suit different situations. Usually, the percussor was held in one hand and made to strike down with a force applied to the surface of the jade in a perpendicular direction to form overlapping superimposed cones. Scars of superimposed cones on the pecked surface of artifacts are evidence of the existence of the pecking technique.

However, there is a lack of in-depth analysis of the jade surface done by both techniques in the academic circle. The main problem of this debate is due to the lack of a set of objective scientific principles for the observation of the traces left by both techniques, while a good grasp of an accurate observation of the traces left by both techniques is the key to resolve the mystery of the ancient jade manufacture. Therefore, in the paper, an overview of the string-sawing technique and the experiment results will be pro-

vided, followed by an account of the pecking technique.

1. Understanding of string-sawing on jades

According to our observation in recent years, the manufacture of the slits of the early Neolithic slit rings found in East Asia region were commonly done by string-sawing.

There are two main ways of application of the string-sawing technique — the string could either be mounted onto a bow or held by hands. As reflected from the traces left on the jades, hand-held string-sawing was mainly used in the Neolithic China. Different types of jade slices in the Neolithic China were produced in a large number for making jades of predetermined style. Many different types of secondary retouch were also done by string-sawing technique including hole enlarging, groove openings, coring, cutting, relief, etc. It can be seen that the string-sawing technique is essential to the whole procedure from extracting material to processing at the end.

In order to have a better understanding of various features of string-sawing, experiments have been conducted with the following conditions under consideration: the material, the size and length of the string, the grain size of sand, the form of weathering, the amount of water added, the structure of the object being cut, the differences of stabilizing and opening tools, the manipulation of application, the choices of sawing direction and the adjustment of the force applied. Archaeologically, the traces on the jades left by string-sawing can be used to deduce the direction of sawing; the relation between the new/old cutting surfaces and other processing traces, also, the size of string and the functional differences reflected from the cutting position on the jade.

2. Report of the experiments

a. String-sawing and blade-sawing experiments

(1) Experiment instruments

(i) Rock material for sawing

According to the past experiments, sawing jade material is very time consuming. Therefore, pyrophyllite was used as the main material in the experiments. Two forms were used here: long strip and square shape (abbreviated as I and II materials below). Sizes are 1.9 x 1 x 5.8 cm and 5.8 x 5.8 x 6.9 cm respectively.

(ii) Sawing instruments

(a) Soft string-sawing

In our experiments, hemp (*Cannbis sativa*) string

¹This paper is the first systematic explanation of the features of the string-sawn surfaces in China.

²The Japanese word 糸切 *Etokire* means string-sawing (糸で きること). Therefore it can be seen that Japan also has the tradition of string-sawing in the past. It is known by now that string-sawing had been used to produce jades and pottery implements in ancient Japan.

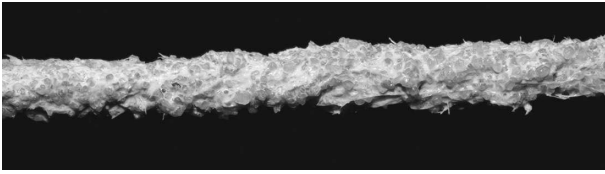


Figure 1. Grittied String

Hemp (*Cannbis sativa*) string becomes a grittied string when it is entwisted with sand slurry. Relying on the sharp edge of sand grains, jade can be cut by a grittied string.

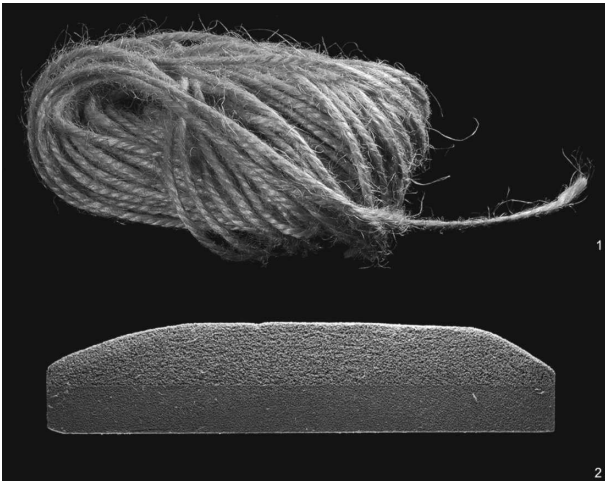


Figure 2. Sawing experiment tools

1. Hemp (*Cannbis sativa*) string : diameter of each is 0.5 cm **2.** Blade saw : made from a whetstone

(diameter of a single string is 0.15 cm) was used as sawing tool (Fig. 2 : 1). Both single string and multiple strings sewn up into one were used.

(b) Blade-sawing

It is known from the archaeological record that blade-sawing used on jades was very popular. Experiment of this was therefore also conducted for making a comparison with string-sawing. Home used whetstone was used here and was cut up by a steel saw into a long thin blade sized 8 x 2 x 0.5 cm. Its cutting edge was made by grinding (Fig. 2 : 2).

(iii) Abrasive – quartzite sand

Sand used in the experiments is from the beaches in Hong Kong. It is quartzite sand with hardness 7 in Mohs' scale. The minimum diameter of grain is 0.02 cm, the maximum is 0.15 cm.

(iv) Stabilizing tool

How to stabilize the jade during processing is a crucial factor. A modern industrial used pliers was used in the experiments here.

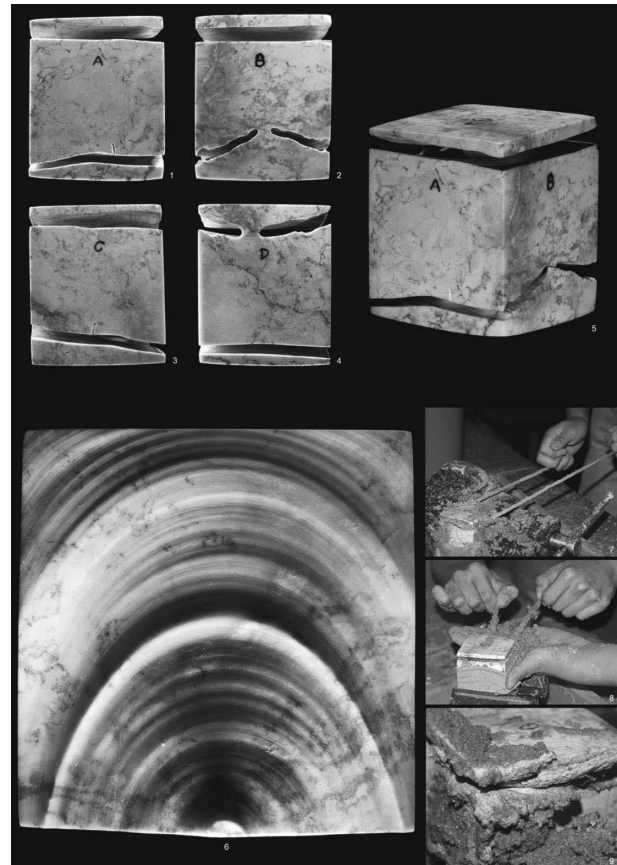


Figure 3. Experiment (Slicing by one-way string-sawing)

1-5. various cutting surfaces after refitting of the slices and the parent rock material : uneven cutting edge is one of the typical features of hand-held string-sawing.

6. morphology of cutting surface.

7. sawing : tightened the string, sawing horizontally.

8. sand adding : putting sand slurry at the mouth where the grittied string is moved along to ensure the sand slurry would not permeate into the cutting surface.

9. sand slurry flows along the grittied string as paste.

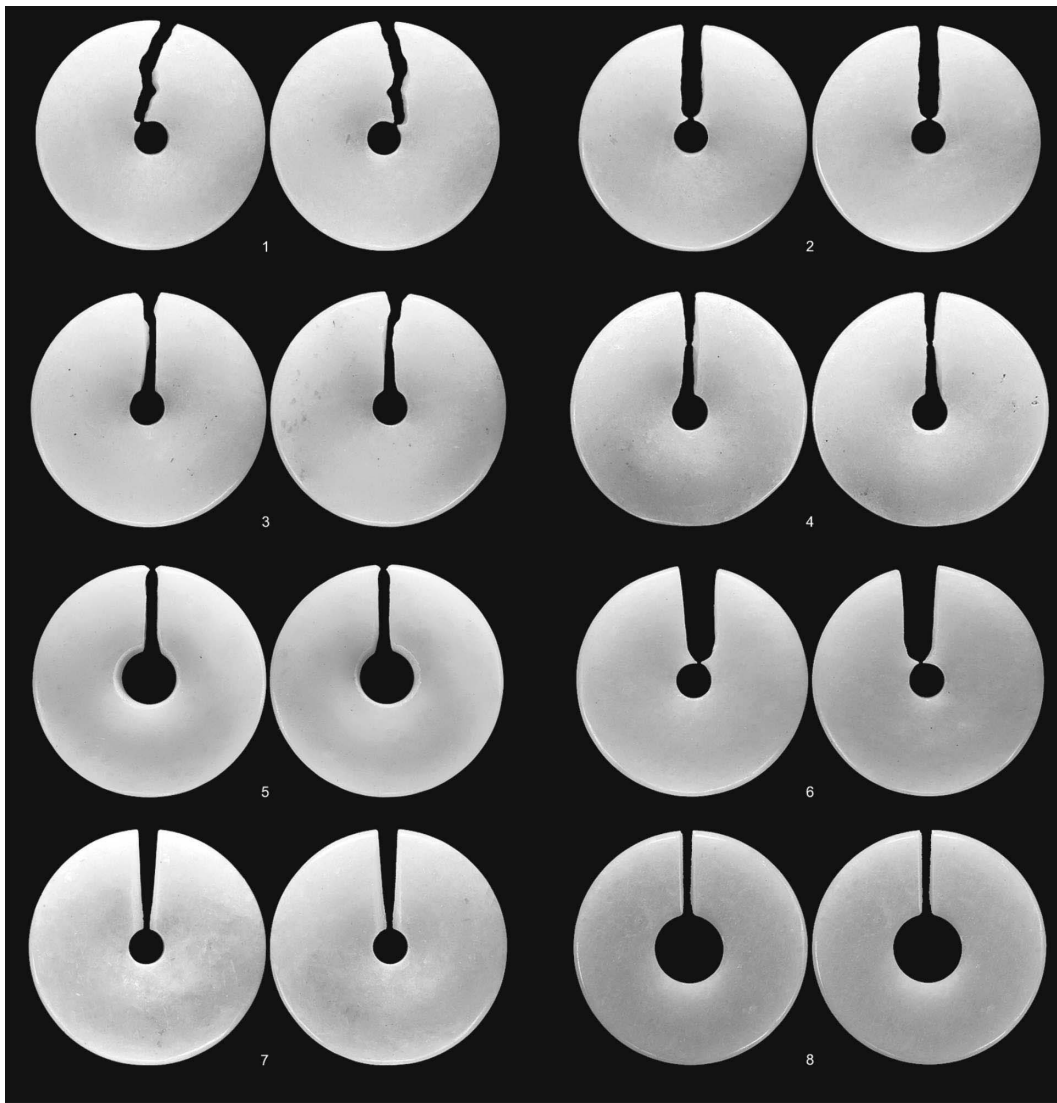


Figure 4. Experiment of slit rings manufacture : slits opened by string-sawing samples from 1-5 and 6-8 by blade-sawing

(2) *Experiments and Results*

Experiment : Slicing by one-way string-sawing

(i) Steps

(a) A II material was stabilized. A coarse hemp (*Cannbis sativa*) string sewn up by 4 hemp (*Cannbis sativa*) strings (0.6 cm in diameter) was pulled by one person at an average rate of 5 rounds per second. Two ends of the string always kept close (Fig. 3 : 7). Sand slurry was kept being added during sawing (Fig. 3 : 8). It can be seen that the paste formed by sand slurry and powder from the rock material flows along the string (Fig. 3 : 9).

(b) After sawing for 105 minutes, a slice was separated from the II material. For the convenience of comparison, the sawing rate was decreased to 3 rounds per second to produce a slice under the same conditions.

The slice was separated from the II material after 150 minutes.

(ii) Observation of the cutting surface

Slice (Fig. 3 : 6) : The surface is generally cambered like the ventral face of stone flakes. The thickness varies. The thinnest one measures 0.3 cm and the thickness measures 2.2 cm. The middle of the cutting point is slightly recessed and two sides are uneven. The ending point is cambered with two sides being lower but higher in the middle. The cutting surface is full of intensive undulations caused by sawing that the raised ones appear in ridge shape, and the recessed ones appear in groove shape. These ridges and grooves appear interchangeably with different intensity. An obvious raised ridge can be seen clearly in the middle of the cutting surface. It should be due to the

increased use of sand during sawing.

Sawing the parent material (Fig. 3: 1-5): It is generally similar to the blade scars on the surfaces of stone core. The edge of the cutting surface is uneven, and the traces of sawing left are similar to those of blade-sawing. The raised ridge on the slice is correspondent to the recessed grooves on the parent material.

b. Experiment on sawing different slit rings

Eight case studies have been done for this experiment. Big white marble rings were used for sawing here. They are of the same size measuring 3.5 cm in diameter. The holes measure 0.5 cm in diameter and 0.5 cm in thickness. Sawing tools (including hemp string, sand and stabilizing tool) and steps followed are the same as those mentioned above. The finished products of the five cases of string-sawing can be seen in Figure 4: 1-5 respectively.

Cases 1 and 2: sawing from the edge, but the ring in case 1 was not stabilized, while the one in case 2 was stabilized well.

Case 3: pulling string between the hole and the edge continuously along the radius of the ring.

Case 4: sawing from the edge and from the hole in the centre independently on both sides.

Case 5: sawing from the hole in the centre. It can be seen from the figures that the results were affected by different factors. Same is found in the three cases of blade-sawing as shown in Figure 4: 6-8 respectively.

Case 6: sawing from the edge towards the centre.

Case 7: opposing blade-sawing on both sides.

Case 8: one-way sawing from the hole on one side.

3. Interpretation of the fracturing surfaces and string-sawing surfaces features

The physical mechanisms of the fracturing surface of rocks formed by percussion and string-sawing are completely different. The former is brittle fracture under force. The latter is splitting by sand grinding. Nevertheless, the morphologies of both kinds of surfaces could be quite similar. Small scale of brittle fracture can often be found at the ending point of sawing under string-sawing technique. Features formed by both techniques like these will be further discussed and compared in the following.

Figures 5 and 6 show the obsidian slice produced by direct percussion with stone hammer and the pyrophyllite slice produced in string-sawing experiment respectively. They both look similar as they all have undulations on their surfaces. The striking point and termination point of string-sawing also look a bit similar. But the physical mechanisms of their formation are completely different. The whole sawing procedures of both techniques will be discussed below in order to give a clearer picture of the characteristics of the traces left by string-sawing.

a. Way of splitting

Regarding the fracturing caused by percussion, striking point is the starting point of fracturing as shown by the erillure and fissures formed by Hertizian Cone fracturing

theory (Cotterell & Kamminga 1987). Traces left by such striking point cannot be found at the cutting point of string-sawing. In the prehistoric time, string-sawing and blade-sawing were always used side by side. Blade-sawing was always used to mark a guiding line for the cutting point of string-sawing. As can be seen in our experiment, the pyrophyllite used have grooves cut on the pre-determined positions on both left and right as the cutting points of string-sawing. Gritted string was then pulled along the grooves which left some traces of curves, but the traces of blade-sawing were worn away.

b. Undulation

The fracturing surface of percussion and the cutting surface of string-sawing are always covered with undulations. They are said to be useful at inferring the direction of fracturing, level of force used and the order of inter-cutting relationship of undulations on different surfaces. Nevertheless, there is a big difference on the mechanism of undulation formation on the fracturing surface of percussion and the cutting surface of string-sawing, so as the morphologies of the ending of undulations. The erillure around the striking point of a stone flake is nearly in round shape. Those undulations in the surrounding are in slightly bow shape. The morphologies of their contraction at the left and right sides along the edge of the fracturing surface all show consistency. Generally speaking, the direction of percussion is consistent with the dispersing direction of the undulations. The formation of undulations on the cutting surface produced by string-sawing is totally determined by the pulling direction of the gritted string. Because of the contact between the gritted string and the cut object, the abrasion caused by tightly stretched gritted string is in a curve shape. Undulations were formed on the cutting surface. Since the string is pulled up and down by hands, the sawing lines formed would not be parallel. The curved endings of the sawing lines are lack of consistency. The bigger the movement and the more force applied during string-sawing, the richer the undulations are formed on the jade surface, vice versa.

c. The end of splitting

From the striking point extending to the front of the splitting axis is the edge of the termination of fracturing surface, where the undulations are generally rich. For the lithic technology, the termination occurs on the edge of an individual flake can be classified into step, hinge, feather, plunging and axial these few types. Their formations are related to the mechanism of different mechanics applied at the end of splitting. String-sawing can be done in 360° by hand and terminated at any points of the jade. Figure 6: 4 shows the termination point of string-sawing under the force of the pulling string, where a small fracturing surface is formed. Both sides of the fracturing surface are raised and recessed correspondingly without any traces of striking point. It belongs to the so called bending fracture. One of the characteristics of bending fracture is that the cone shaped fracture under the Hertizian Initiation would not occur. Such kind of bending fracture always exists at the

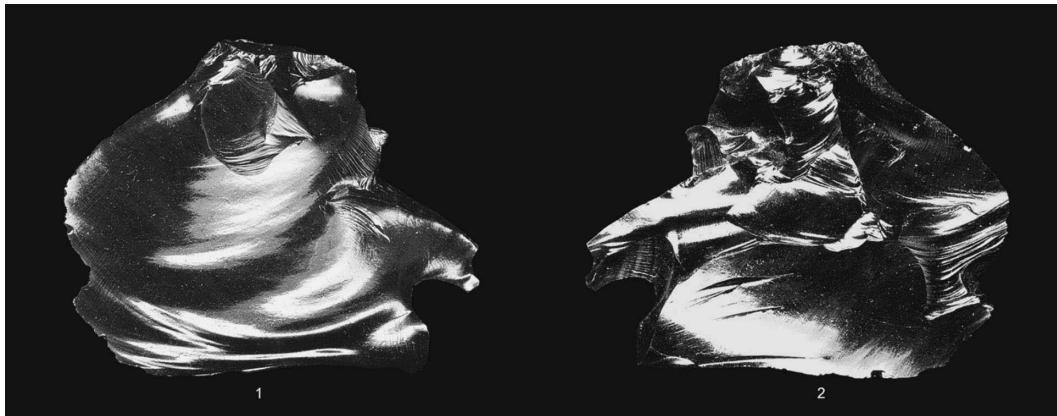


Figure 5. Obsidian flake produced by percussion 1. Ventral 2. Dorsal

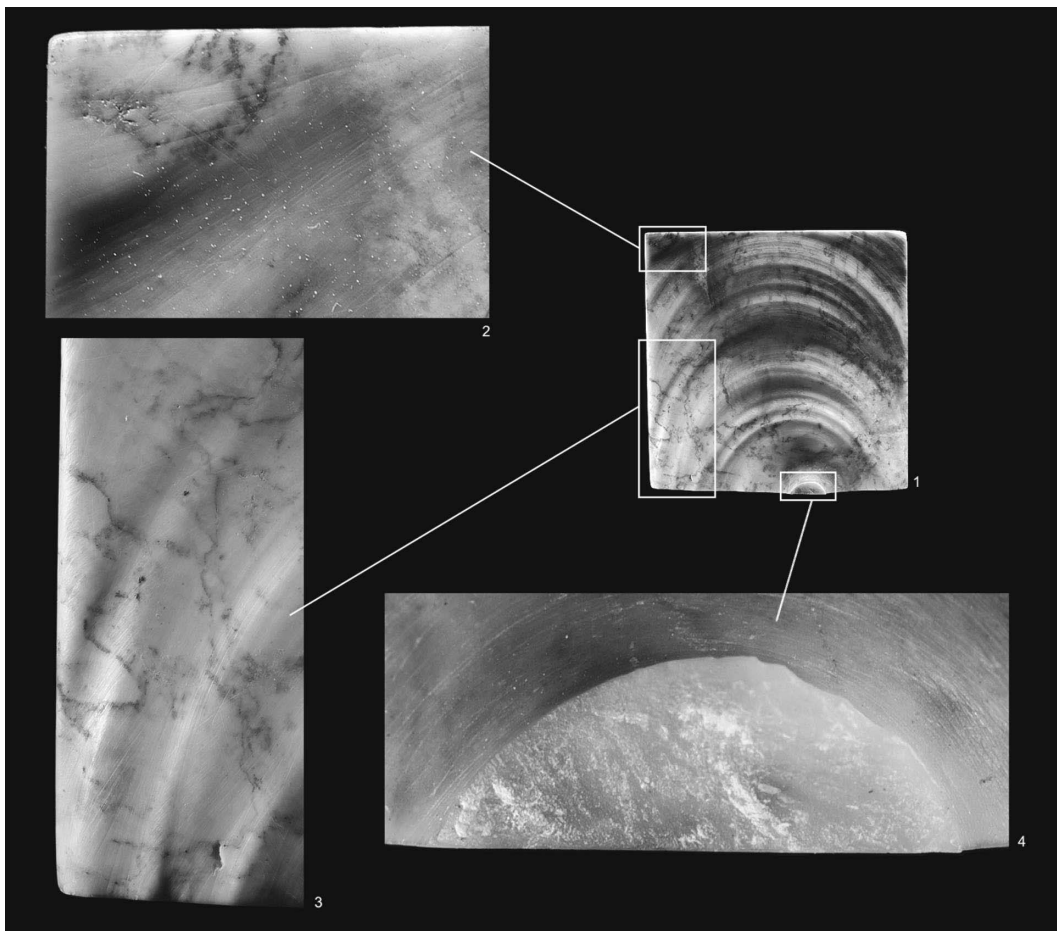


Figure 6. Cutting surfaces and details on the string-sawn pyrophyllite
1. cutting surface 2. cutting beginning
3. the sides of undulations left by sawing show contraction
4. the line traces left at the termination of sawing and the bending fracture

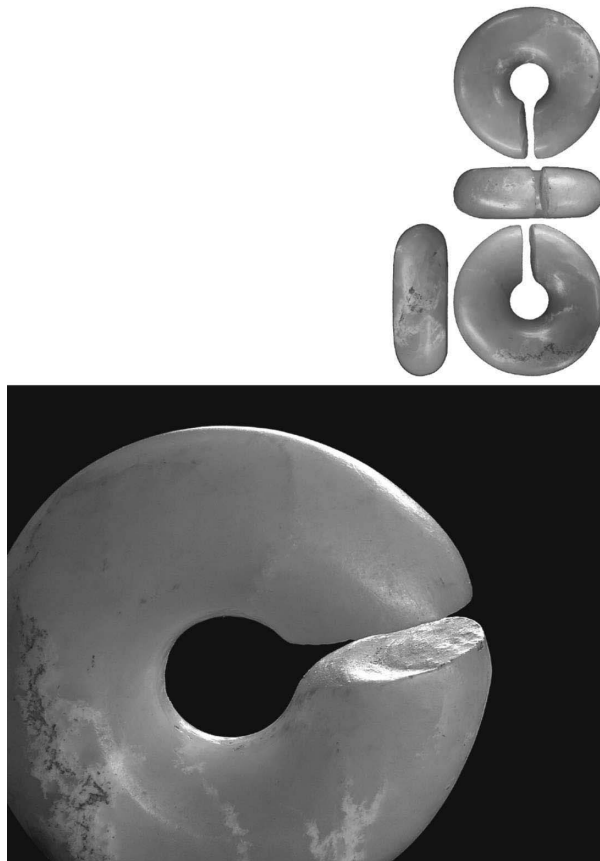


Figure 7. Traces of string-sawing technique left on a slit ring from Wangjia from Wangjiayingzi-shuiquan, Xinglongwa Culture (王家營子水泉遺址，興隆窪文化).

termination point of string-sawing, but it might be also caused by the percussion on the other areas of the cut object.

d. Morphology of two sides of the split object

Percussions under the splitting mechanism of Hertzian, Bending and Wedging all belong to brittle fracture. The parts split can be refitted again. String-sawing is the use of a gritted string to split an object by abrasion. There is a gap between the split parts, which is the movement trail of the gritted string. The width of the gap is proportional to the size of the string, but the parts split up by string-sawing cannot be refitted again.

The above interpretation of the features shown on the jades has provided the standard for differentiating brittle fracturing and the cutting surface of string-sawing. It is also helpful at understanding the change of morphology from the beginning of sawing till the end.

4. An Overview of the String-Sawing Technique in East Asia

String-sawing is one of the very important features of

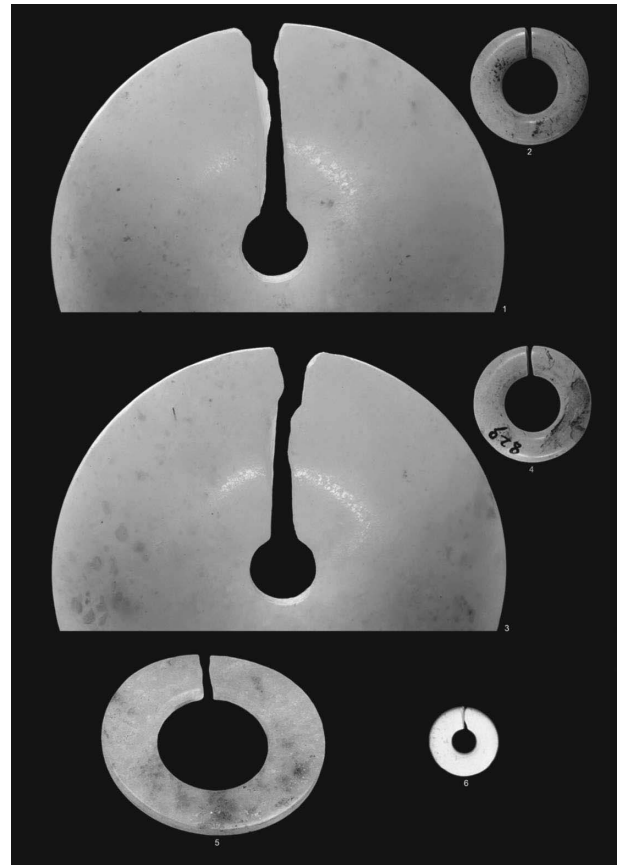


Figure 8. Comparison of slits produced by string-sawing

1, 3. string-sawing experiment : opening side, ending side

2, 4. opening side and ending side of slit rings of Hongshan Culture (after Yu Jianshe, 2004, p. 51): String-sawn slit, flat and straight opening side, raised and bending ending side

5. Wiedun jade slit ring (after Chen Lihua etc, 2004, p. 145)

6. slit ring from Kuwano site, Japan (after Harunari, Hideji Hideki, 1997, plate 158)

Neolithic jade technology in China. This paper has already given a preliminary analysis based on the characteristics of string-sawing cutting surface and slit manufacturing experiments. In the following, an attempt will be made to explore the unearthed jades of various times and regions in East Asia.

The Xinglongwa Culture of northeast China yielded the earliest string-sawn jades known in the East Asia region. Nevertheless, other than slit rings, traces of string-sawing technique are rarely found on other jades of the Xinglongwa Culture (Fig. 7). There is no way we can judge whether string-sawing had been used on slicing or not at that time (Liu 2004). The book *Hongshan Jade* (Yu Jianshe (ed.), Huhehaote: Yuan Fang Press, 2004) published recently has provided a large amount of information of the jade slit ring of

the Xinglongwa Culture. It enables us to observe the slits of some slit rings. From the jade slit ring from *Baiyinchanghan* (白音長汗) shown on page 47 of the book, it can be seen that the surfaces of both sides of its slits are uneven, which is a common feature of string-sawing technique. A jade slit ring of the Hongshan Culture unearthed from the Bayantalasumutabentaolegai (巴彥塔拉蘇木本套勒蓋) site, Aluke'erqin Qi (阿魯科爾沁旗) can be found on page 51 of the same book. The cutting of its slit is consistent to the one shown in the experiment. Both are produced by one-way string-sawing. Figure 8: 1 and 8: 2 show one side of its cutting point by string-sawing. They appear to be wider and flatter than the ending point shown in Figure 8: 3 and 8: 4. Examples of this kind of slit produced by one-way string-sawing are very common. Sites at Xudun (圩墩), Jiangsu Province (江蘇省), Yaoshan (瑤山), Zhejiang Province (浙江省), China (Fig. 8: 5) and Kuwano (桑野) in Awarashi, Japan (Karetsumachi 1995; Harunari 1997) (Fig. 8: 6), all yielded the same kind of slit ring.

The string-sawing technique had existed for a few thousand years after its first appearance in the northeast China. On those jades unearthed from the Xiaonanshan (小南山) site at Heilongjiang Province (黑龍江省), traces of string-sawing can always be found on their surfaces (Yin et al 2001). The jades of the Hongshan Culture in the northeast were beautifully made which are supposed to be processed by string-sawing. The renowned jade hoop of Hongshan Culture was made use of string-sawing for coring. Traces can be found along its edge of the inner hole and on the surface of the corresponding core. The tradition of string-sawing of the northeastern region spread slowly towards the south. The *China Cultural Relics News* recently reported the news about jades including slit ring and scoop shaped ornament dated 7000 years ago being unearthed from the Beifudi (北福地) site in Yi county (易縣) of Hebei Province (河北省) in north China. They can be understood as the important evidence of the southern dispersion of the Xinglongwa Culture. They have filled up the gap of the jade tradition between the northeast and the lower reach of the Yangtze River, which is of great significance. In 7000 – 6000 bp, both Hemudu Culture and Majiabang Culture of the lower reach of Yangtze River had inherited the string-sawing tradition from the northeast. The recent published slit ring in tub and ring shapes unearthed from the Xudun site in Changzhou city (常州), Jiangsu Province show very similar morphology and technology to those of the Xinglongwa Culture. The sample of slit ring T234(4B): 301 (Fig. 9: 1, 9: 2) in the report *Hemudu* is said to have “a slit had not been completed”. This slit is done by string-sawing in 360°, leaving a cylindrical feature in the middle of the slit surrounded by the traces of raising angles along the perimeter (Fig. 9: 3). Some of the slit rings from Majiabang were also produced by string-sawing technique. The Pengzudun (彭祖墩) site at Wuxi (無錫) excavated by the Nanjing Museum (南京博物院) in the beginning of the 21st century yielded tubular slit rings of the Majiabang Culture. Their string-sawn slits show exaggerated twisting (Fig. 10: 1, 10: 2). It is suspected to be the result of the slit rings not being well stabilized during production which led to a big twisting (Chen et al 2004; Zhejiang

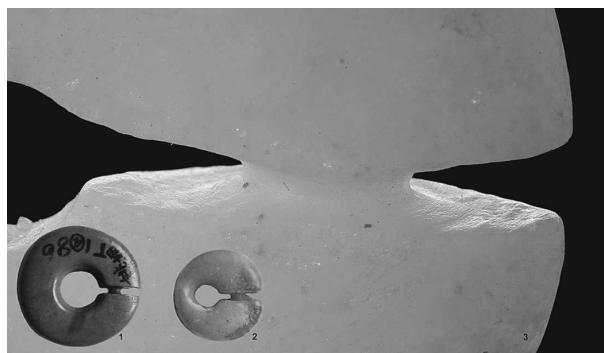


Figure 9. Comparison of slits produced by string-sawing 2

- 1, 2. Hemudu slit ring (after Sun Guopin, 2004, Colour plates 3: 2, 3: 1): A cylindrical form in the middle of the slit
3. string-sawing experiment, cylindrical form and raised angle in the middle of the slit

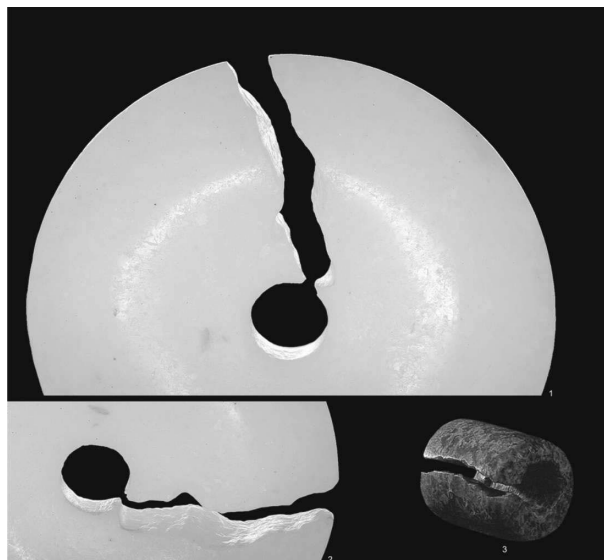


Figure 10. Comparison of slits produced by string-sawing

- 1, 2. the slit ring was not stabilized during the string-sawing process, forming a strongly twisted slit
3. a strongly twisted slit is also found on the slit ring unearthed from Peng Zudun (after Nanjiang Museum, etc, 2004, p.216)

2003; Sun 2004; Nanjing et al 2004).

String-sawing technique used on jades was prevalent in the Yangtze River region 6000 years ago. The arc shaped pendants (*Huang* 璜) of the Songze Culture always show traces of deep cutting by string-sawing. It reflects that the force used on sawing jade was very strong (Zhang 1998). The production of Lingjiatan (凌家灘) jades shows that the use of string-sawing technique on cutting out material and processing had reached the climax. The jades ranging from

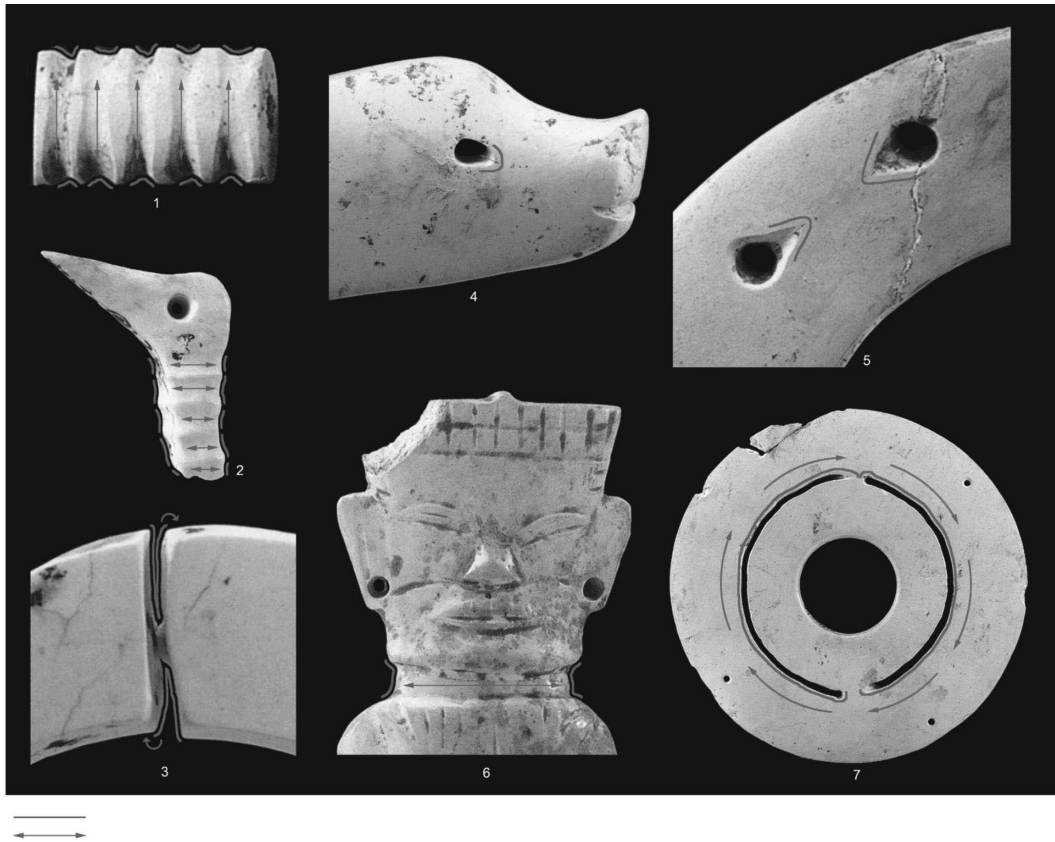


Figure 11. Secondary retouch by string-sawing on Liangjiatan jade implements (after Anhui province Cultural Relics Archaeology Centre, 2000). Red lines and arrows show the cutting area and cutting direction respectively.

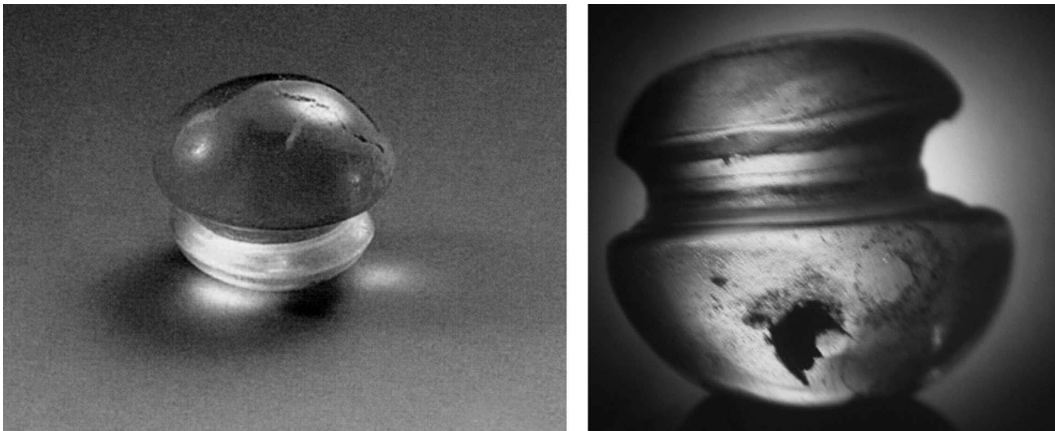


Figure 12. Close shot at the circumferential groove on the Liangjiatan crystal ear plug after secondary retouch (Photos provided by Zhang Jingguo).

large battle axe (*Yue* 鉞), medium sized ring and human-shaped jade ornament all have examples of using string-sawn jade slices as preform. The Liangjiatan site yielded a jade battle axe (*Yue*) 98M20: 30 in grayish white with some green. It measures 28.3 cm in length, 12.4 cm in width and

0.6 cm in thickness (Anhui 2000). Its surface shows traces of inter-cutting string-sawing curves which had basically been worn away by the later grinding. According to our knowledge gained from the string-sawing experiments, the gritted string used on sawing this implement should be much

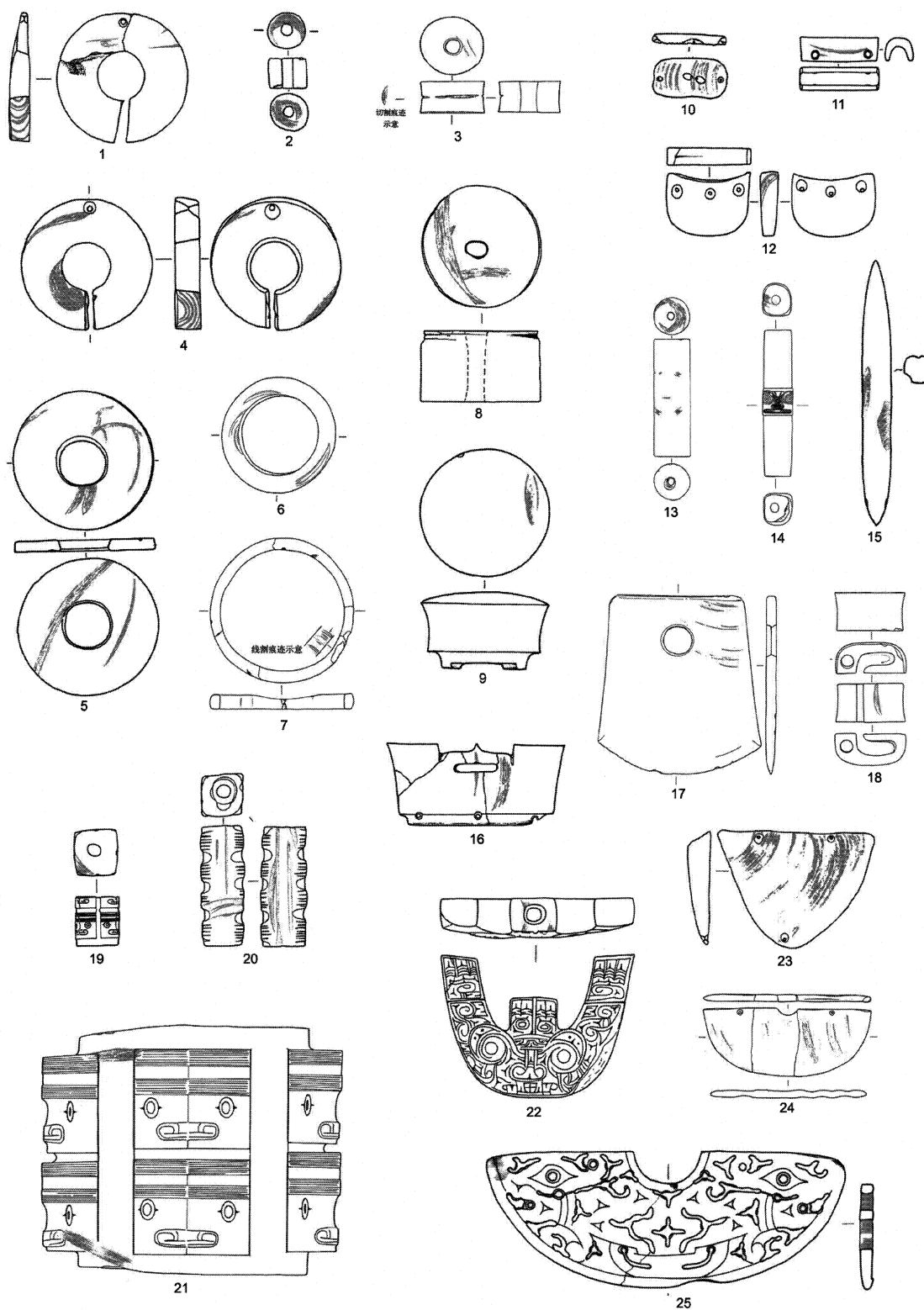


Figure 13. Examples of the application of string-sawing technique on the jades unearthed from Yaoshan site. (After Zhejiang Province Cultural Heritage Archaeology Research Centre, 2003)
Red lines represent the traces of string-sawing.

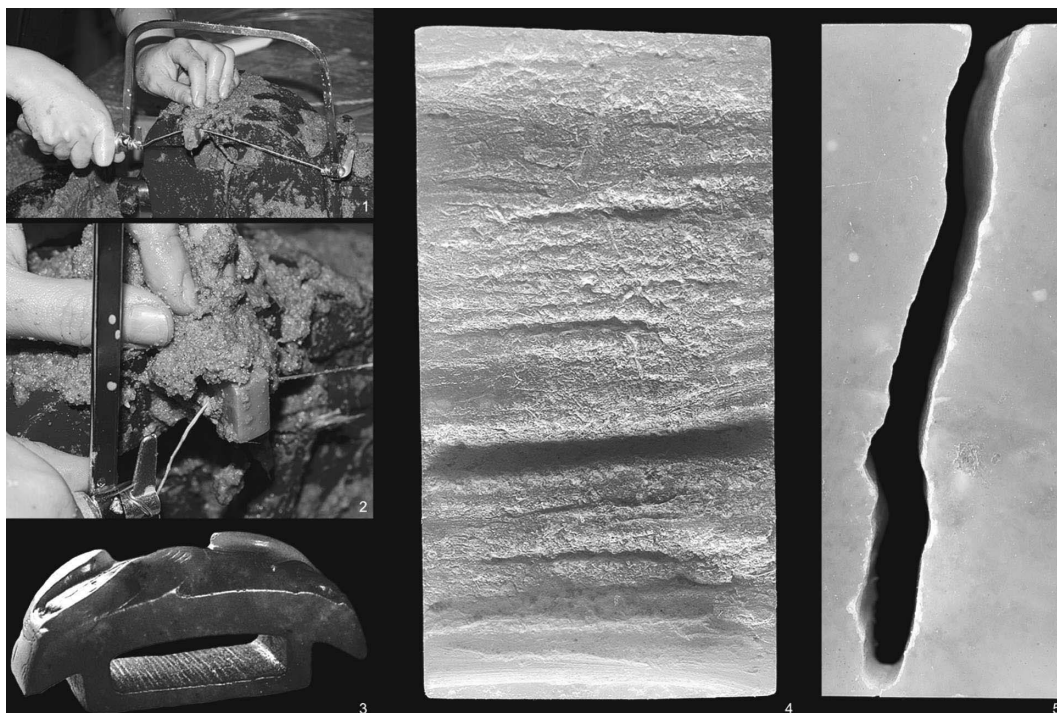


Figure 14. Metal string-sawing experiment and the so-called 'string saw'
 1, 2. metal string-sawing on pyrophyllite and a close shot at the it
 3. the sample of the Eastern Han dynasty showing the so-called 'string-sawing' (after Fu Xinian, 1995, p. 183): the traces of the straight cutting lines on which are similar to those produced in our experiment
 4, 5. cutting surface of metal string-sawing: cutting traces left on the surfaces are straight lines, the cutting bent left and right.

longer than the length of cutting surface. Say, if the gritted string is five times longer in length, its true length would be 1.5 meters long. We should notice that the radian of the curves left on 98M20: 30 is very big, and the bending of the destroyed surface at the end of string-sawing no longer exists. It is suspected that the actual size of the preform should be much larger. Base on this, we can imagine that possibly in the workshop at Lingjiatan in Anhui Province (安徽省) 5000 years ago; two people were pulling an almost 2 meters long gritted string to slice a 1 or 2 cm thick preform from a 30 or 40 cm long big jade material. They must have had worked so hard that the traces of their excellent craftsmanship raises our hope of meeting them even after a few thousand years.

The processing done by string-sawing on those jades from Lingjiatan is also impressive as shown from the following features.

1. groove opening: necklace (87M15: 52-63) (Fig. 11: 1), slit ring (87M8: 16) (Fig. 11: 3), circular groove of a crystal ear plug (87M4: 34) (Fig. 12), circular groove at the neck of a god-human figure (87M1: 1) (Fig. 11: 6), line groove at the joint of battle axe (Yue) (87M9: 18)
2. openwork: the splitting of all god-human's legs
3. hole enlarging: the eye corners of jade dragon on an arc shaped pendant (*Huang*) (87M: 918) (Fig. 11: 4), a pair of pierced holes on arc shaped pendant (*Huang*) (87N11: 4)

(Fig. 11: 5)

4. relief: both sides of the lozenge shaped lines around the neck of a bird shaped headdress (87T3(4): 2) (Fig. 11: 2)
5. splitting of perimeter: double connected disc (87T1(2): 22) (Fig. 11: 7).

String-sawing had reached the climax in the Liangzhu (良渚) Culture. The C shaped jade pieces inlaid on the lacquer implements in the recently published detailed report, *Haochuan Cemetery* (好川墓地) (Zhejiang Province Cultural Heritage Archaeology Research Centre et. al., Beijing: Cultural Relics Publishing House, 2001) are the representatives of gritted string opposite sawing technique used on slicing. The discovery of Liangzhu jade workshop sites at Tangshan (塘山) and Dingshadi (丁沙地) in recent years had uncovered many semi-finished jade products. Many of them are string-sawn slices which enable us to get closer to the truth of string-sawing on jade (Lu et al 2001; Wang et al 2002). The recent publication of the report *Yaoshan* (瑶山) shows the highest achievement of the Liangzhu Culture (Zhejiang Province Cultural Heritage Archaeology Research Centre, Beijing: Cultural Heritage Publication, 2003). As shown by the jades unearthed from the Yaoshan cemetery, string-sawing was frequently used on jade production including slicing of preforms, cutting both ends of tubes, sawing slits, coring the ring-shaped bracelets, producing the forks of three-forks implements, arc shaped pendants (*Huang*) (Fig.

13), etc. String-sawing was so widely used that it was one of the best of Liangzhu jade techniques.

Although the string-sawing technique used on the jades of Liangzhu Culture had once reached its climax, it finally disappeared along with the decline of the culture. During the late Neolithic in the Yellow River region, a new slicing technology arose around the Central Plain area which can split large jade pieces of some ten centimetres in length and a few centimetres in width. It was an unprecedented breakthrough of slicing technique (Tang 2004). The disc (*Bi* 璧) and ritual tube (*Cong* 琮) of the Qijia (齊家) Culture at the upper reach of Yellow River region is said to be originated from the Liangzhu Culture, but there is no report of the use of string-sawing technique on the jades of the Qijia Culture (Huang 1998). Similarly, The Taosi (陶寺) Culture at the middle reach of Yellow River also yielded ritual implements like ritual tube (*Cong*), disc (*Bi*) and battle axe (*Yue*). Jade disc like M1423 : 1 measures 0.2 cm only in thickness, which is the product of slicing technique. However, there is no report of the use of string-sawing in the Taosi Culture. The representative of the Longshan (龍山) Culture in Shangdong, the tomb in Zhufeng (朱封) in Linqu county (臨朐縣), yielded a jade crown. The openwork on which is very likely to be made by string-sawing. Traces of such technique are not found being used on other jade rings and battle axes (*Yue*), nor could it play a significant role at the end of Neolithic in the Yellow River region. The jade tradition after the Erlitou (二里頭) Culture was closely related to the Longshan Culture in the Central Plain region. The jade culture of Sanxingdui (三星堆), Sichuan Province (四川省) inherited the tradition of Xia and Shang dynasties. The author noticed that some jade sceptre (*Yazhang* 牙璋) finished products from Jinsha (金沙) site were horizontally sawn into thin slices by string-sawing. They can be seen as the survivors of the Liangzhu string-sawing technique, as well as the later representatives of the continuous use of this technique we know so far (Gao 1998; Han 1998; Zhu et al 2004). Limited to our knowledge, this would be temporarily regarded as the lower time limit of this technique here. Fu Xinian (傅熹年) once mentioned the use of "string saw" (線鋸) in the Eastern Han Dynasty (Fu 1995). The "string saw" used in the modern lapidary generally refers to the use of metal string. The author noticed the traces of the even and flat cut on a jade scabbard slide (Fig. 14 : 3). We have tried to use bow saw with iron string to cut pyrophyllite with the addition of sand and water. A similarly even and flat cut was formed (Fig. 14 : 1, 14 : 2, 14 : 4, 14 : 5). We therefore propose that the sawing done by metal "string-sawing" is not equivalent to the string-sawing discussed in this paper.

The dispersion of *homo sapiens* from Africa and the spread of culture is the focus of archaeology in the 21st century that the space concerned covers the whole world (Wells 2002). Now the study being restricted to one country or even one Province will surely make further research more difficult. As shown by the string-sawing technique, the area covered should be starting from the whole East Asia region at least. When we talked about the cultural exchange in the past, emphasis was always put on the comparison of the same type of implements. However, research on lapidary



Figure 15. Distribution of the string-sawing technique in East Asia.

The prehistoric string-sawing was originated in the northeast China and then spread in all directions. The northern limit of distribution of the string-sawing technique on jade implement remains obscure now, but it should have included the Amur River region extending to the northeast parts of Honshu in Japan at least. The southern limit of this technique, on the other hand, is relatively obvious. It stretches from around the Yangtze River to northern Lingnan. However, Indo-China, the Philippines and Taiwan are not included in the area of string-sawing technique.

has to surpass the morphological limit of implements and take the characteristics of the common techniques in order to connect the prehistoric cultures. The string-sawing technique mentioned in this paper is the genetic code of the jade culture of the Neolithic period in China as the route of its spread is also that of the jade culture. From the present archaeological evidence, it can be seen that string-sawing technique should be originated in the northeast and then spread in all directions. Traces of string-sawing can be found from the northeast plain at the south of Heilongjiang (Amur in Russia side), to the Shangdong (山東) area at the lower reach of the Yellow River; as far as middle and lower reach of the Yangtze River and the vast area of the Beijiang water system in the north of Guangdong (粵北北江水系). Preliminary knowledge of the southern limit of the string-sawing technique during the Neolithic has been gained but not much is known about the northern limit. According to the author's recent international communication with scholars and on-the-spot investigations, definite evidence of string-sawing applied on the prehistoric jades can be found from the Chertovoy Vorota cave at the maritime region of Russia and the Kuwano site at the Fukui Prefecture (福井縣) of Japan (Fig. 15) (Kawasaki 2003; Karetsunmachi 1995; Kinoshita 2002; Fujita 2003). From now on, further exploration and research regarding the northern limit of string-sawing technique distribution is awaiting for an international cooperation.

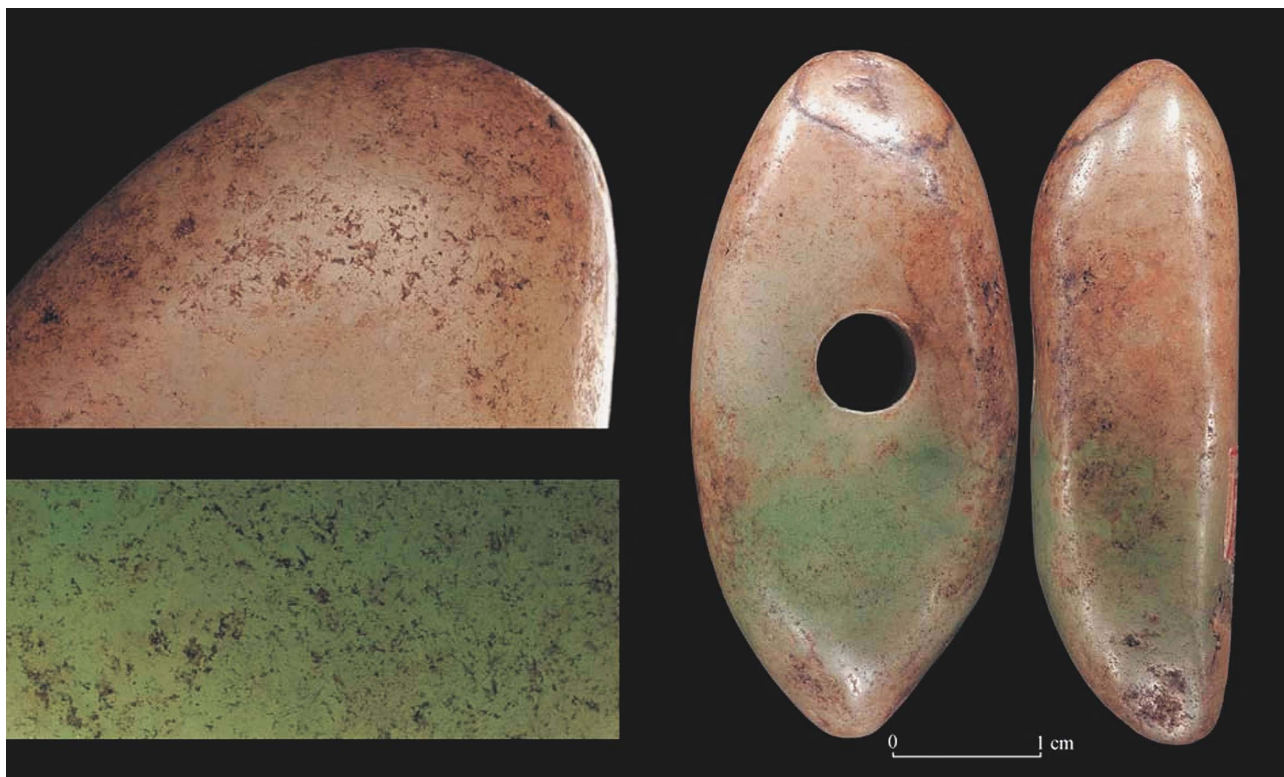


Figure 16. Jadeite pendants from Sasamori-cho, Aomori Prefecture, Jomon period. Tohoku University Collection, Japan
Pendants were made by pecking. Pecks were left along the edges of the pendant.

5. An Overview of the Pecking Technique

Concerning another technique—pecking, we might start by examining how did jade pecking come to exist. The petroglyphs found in the Upper Palaeolithic site at Foz Coa in Portugal was done by pecking. Large numbers of finely pecked stone artifacts have also been unearthed from sites of Upper Paleolithic period in East Asia. Pecking scars are shown on the eyes, nose, mouth and body of the stone human figure dating to around 23,000 BP excavated by Professor Chosuke Serizawa at the Iwato site in Oita Prefecture in Japan. In August 2004, the author had the honor of examining in a laboratory of a honorary Professor Serizawa of Tohoku University, the human figure and the roughouts unearthed from Iwato. The full figure measuring 9.5 cm in length and 3 cm in width was carved on chlorite schist. Moreover, during the Incipient Jomon period (13,600–9,200 bc), some stone axes uncovered from the Mikoshiha stone assemblage in Japan have a highly polished edge and pecking scars all over their surface. The large jadeite pendants like those from Sasamori-cho, Aomori Prefecture in the Tohoku University Collection are extremely exquisite too (Fig. 16). This kind of large jadeite pendants is distributed across the Archipelago of Japan, in particular to the east of Honshu. They have undergone various processes and pecking was definitely an important one among them. This technique found its way into the Early Neolithic period.

Some scholars believe that the assemblage of stone tools from Mikoshiha culture was originated from the Osinovka culture in the lower reaches of Amur in Russia. Among the most significant recent archaeological discoveries are some very exquisite stone querns and pestles yielded from an area extending from the coastal region of Russian Far East to North China, from the sites such as the third stage of Ustinovka (12,000 bp) and Shizitan (柿子灘) in Shanxi (山西). That these querns and pestles were largely worked out by pecking has suggested the reliance on tools in the processing of cereal food and the flourishing of the pecking technique.

The jade and stone artifacts of the Xinglongwa culture including slit rings, scoop-shaped implements, arc shaped pendants, adzes and axes have pecking scars and even flaky white marks on their surface, suggesting the important role of pecking technique in the manufacturing process.

As said, an in-depth analysis of the jade surface done by the technique is crucial to our understanding of the ancient jade manufacture. It is therefore necessary to have an accurate observation of the pecking scars. On those Xinglongwa jades, at least three ways in relation to the application of pecking technique have been found :

1. Smoothing the rough surface of roughouts worked out by flaking—as often suggested by the pecking marks on the edge of jade adzes.
2. Working out grooves—as suggested by pecking marks on

the concave surface of the scoop-shaped implements.

3. Working out perforations by two-way pecking—as with the centre perforation and the opening of slit rings.

6. Conclusion

String-sawing and pecking these two techniques undoubtedly played an important role in the true jade culture of East Asia. The traces left on the jades have vividly revealed the extraordinary craftsmanship in the period of human history as early as 8,000 years ago. A further exploration of the dispersion of both techniques would be definitely an interesting topic, which can also give us more insights into the cultural exchange of different areas at that time.

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〈要 記〉

この論文は糸切り挽きの技術とその実験結果について検討したものである。糸切り挽きの技術は、中国新石器時代の玉

文化の起源をなすものとおもわれる。実験結果から、各遺跡から発見された資料等を比較し、その起源と拡散情報について言及した。宝石細工術に関する研究は、単にその形態学的な研究では方法論的に限界があるので、それを越えた何かを見つけた方法がなければならない。筆者は、その有効な手段として実験的方法があると考えている。先史文化の技術に近づくためには共通した技術の特徴をそれによって把握し、比較す

ることが良い方法の一つと考える。この論文ではそのことを言及した。現在の考古学的な証拠から糸切り挽きの技術は北東のアジアの本土中に起源を持ち、次にあらゆる地域に拡散したものと考えた。筆者の最近の研究によると、それはロシアの Maritime 領域の Chertovy Vorota 洞窟や日本の福井県桑野遺跡から先史時代のひすいに適用された糸切り挽きの技術の明確な証拠を見ることができたからである。

The list of the Professor of Tohoku University Ito Nobuo's collections, made up in Karafuto-Sakhalin during his personal scientific trip around the Middle and Southern parts of the island in 1933-1934

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Box No. 1 HIGASHI TARAIIKA KAIZUKA (Promyslovoye-1 shell mound)

There are : bone implements (10), stone (8) and pottery fragments (23).

1.1. Among bone implements there are : three pieces of the antler of the reindeer with the traces of using a saw and an axe. One of them, a curved piece, which was used as a blank for the fishing hook. There are also a small barbed harpoon head, an arrow head of the round cross-section, a handle with the hole for rope (?), a triangular bone pin (nail?), and a part of the bone with the spiral ornament typical for the Taraika sites.

1.2. Stone tools (8). There are polished adzes (6) of the later very rough types made of the whole pebbles by polishing of the working edge (5) and one earlier type (Early Enoura or earlier) with the quadrangular cross section all polished (1). Three of them are broken. There are also two grinding stones.

1.3. Pottery (23)

Five (5) parts of the flat bottoms of the vessels of the later type, supposedly Higashi Taraika type or of the same age.

Upper parts of the vessels of the flat and curved off types, supposedly Higashi Taraika type or of the same age. There are also 3 species of the Enoura late type with the wide border in the rim and one Minami Kaizuka type pottery (with round stamps).

Comments.

1. Most of the artefacts represent the period between 9th and 14th centuries AD.

2. Between the pottery we can see, from one hand, continental, and from another- the Satsumon influence. The H-

Taraika type pottery in this box is not 100% belong to one type, maybe it is of different types also.

Box No. 2 HIGASHITARAIIKA KAIZUKA (Promyslovoye-1 shell mound)

There are : pottery fragments (24).

● Six (6) parts of the flat bottoms of the vessels of the later type, supposedly Higashi Taraika type or of the same age and one of the rounded shape of the thick ceramic fragment.

● Fragments without ornament (7).

Upper parts of the vessels including :

● Four (4) parts ornamented with the incised pattern close to Satsumon, traditionally understood as Higashi Taraika type, but in my opinion different pottery of the same age as HT, or earlier ;

● there are also 3 species of the Enoura type with the wave ornament

● four (4) Minami Kaizuka type pottery (with many long parallel lines).

Comments.

1. Pottery represent the period between 7th and 14th centuries AD.

2. Between the pottery we can see, from one hand, continental, and from another- the Satsumon influence. The H-Taraika type pottery in this box is not 100% belong to one type, maybe it is of different types also.

Box No. 3**HIGASHI TARAICA KAIZUKA UPPER LAYER. Excavated.
(Promyslovoye-1 shell mound)**

There are four smaller boxes.

3.1. Among bones there is a skull of the small animal, two vertebrae, two different pelvic bones, scapular, a lower jaw, etc.

3.2. Thick fragments of the walls (32), rim (1) and flat bottom parts (12) of the vessels close to those of the HT type. No ornament found. But some pottery is painted from inside. I am not sure this paint was ancient, maybe it was painted occasionally in the lab?

3.3. Naiji pottery (6) belong to one and the same vessel. They were packed in one paper with two shells- *Ostrea* (?) or *Spizula* (?) and *Patinopecten*-*Mizuhopecten*. 3.4. Upper layer. 26 thick walls and 2 parts of the flat bottoms of the vessels. Also 2 pieces of the M-Kaizuka pottery with the incised ornament (plastic bag). There is also a bone part with the epiphysis and a part of the shell.

3.5. Iron implements (6). Including 3 small stemmed iron knives (one of extremely good condition), a big nail and long cramp for clinging logs together. There is also one small pack of iron eliminated by corrosion.

Comments.

1. The artefacts represent two periods between 9th and 13th centuries AD (thick fragments, maybe of the HT type) and 13-17th centuries AD (Naiji doki). Iron belongs to the Ainu culture as these stemmed knives are very typical for it.

2. Between the pottery we can see, from one hand, continental, and from another- the Satsumon influence. The H-Taraika type pottery in this box is not 100% belong to one type, maybe it is of different types also.

Box No. 4.**HIGASHI TARAICA KAIZUKA SECOND LAYER.
Excavated. (Promyslovoye-1 shell mound)**

Four smaller boxes

4.1. Fragments of pottery especially chosen for some scientific work (by Prof. Ito N. ?) with the takuhon papers inside the plastic bags.

There are :

- 411- a big fragment (1+1+1) of the thick wall of the vessel of the Early middle age pottery, called by Mr. Fedorchuk as "Ostrovnyaya type" (Fedorchuk V.D. *Keramika poseleniya s rakovinnymi kuchamisevernogo poberezhia zaliva Terpeniya in Vestnik Sakhal ; inskogo muzeya.*-1995.-Yuzhno-Sakhalinsk, 1998.- PP. 143-162.)
- 412- 3 fragments of the thick wall of the vessel of the Early middle age pottery, called by Mr. Fedorchuk as "Ostrovnyaya type", supposedly from same vessel
- 413- a big fragment of the wall and upper part of the vessel of the Early middle age pottery of the Higashi Taraika type but by ornament close to M-Kaizuka type
- 414- 2 fragments of the upper part of the vessel of the Early middle age pottery of the H-Taraika type (typical ornament)

- 415- a small fragment of the upper part of the vessel of the Early middle age pottery of the M-Kaizuka type (typical)

- 416-418 – typical late Enoura type of pottery (3 fragments)

- 419- – typical late Enoura type of pottery (1 fragment of the upper part and the wall) BUT the triangular ornament is such as if it was transferred from the Northern Satsumon ornament field. I suppose this pottery to be a kind of the prove that there was a mixture of the traditions of Enoura and Satsumon in the Taraika area. The latter was a kind of a contact zone.

- 420- typical M-Kaizuka type ornamented fragment

- 421- Enoura late type pottery

- 422- M-Kaizuka type pottery

4.2. Fragments of pottery No ornament found.

4.3. Fragments of pottery No ornament found.

Comments.

To my mind Prof. Ito N. collected this pottery in the box to study the mixture of the traditions of the "net" and "wave" ornaments within the decoration sphere of the North Eastern Asia of the Okhotsk circle on the example of the H-Taraika kaizuka.

Box No. 5**HIGASHI TARAICA KAIZUKA
(Promyslovoye-1 shell mound)**

There are : bone implements (2 boxes), and pottery fragments (2 boxes).

5.1. Pottery fragments without ornament. Supposedly Minami Kaizuka and other E.M-Age types.

5.2. Pottery of the different vessels of the clear M-Kaizuka type with the typical ornament of the lines and stamps.

5.3-5.4. Among bone implements there are pieces of the antler of the reindeer with the traces of using a saw and an axe. And also a skull of the reindeer with the antlers cut off. Some jaws and other bones seem to belong to a pig and other home and wild animals.

ENOURA. A & B. *Etalon collection.*

Basical position. When here the A and B letters are used, it means that I mention loci A and B of the Enoura site. As far as there is a discussion between scholars about the A and B types of Enoura, I use the terms Early and Late types of Enoura pottery.

Box No. 6**Enoura A. Surface collection.**

6.1. Collection of 58 upper parts of the Enoura type pottery of good quality with broad borders, which served as fields for the decoration- incised lines, stamps and low relief. Typical pottery of the developed stage of the Enoura culture.

6.2. About 60 parts of the vessels including flat bottoms, upper parts and walls' fragments of Enoura type and also one fragment of the broken adze of the quadrangular cross section.

6.3. In the box there are tooth and parts of the jaws, vertebrates (2) and a fang of the pig(s); Enoura pottery

sherds (bottoms, upper parts, walls).

There is also a broken vessel (6.3.1), which has a flat bottom, wide body, no neck, the upper part is broader than the equator of the container. There is a broad low relief border around the rim, which is typical for the later Enoura type. The decoration is simple — the row of the "WARABI"-like spiral impressions around the equator of the vessel. The idea of the ornament is very typical for Enoura — it is the wave curve. There is also a carbonised wood piece and a pack of the clay of the "kamado"-type stove surface. The latter are of the very low quality — the impressions of the branches forming the structure of the stove are seen in the clay fragments. For Enoura such artefacts are unknown yet, but possible.

Box No. 7

Enoura location 1 (A). Surface collection.

There are 11 boxes.

7.1. there are 18 implements, including pigs' teeth, fangs, smaller ribs and also a stemmed bone tool. The latter looks as a mattock for the sea shells digging. One bone has traces of cutting and possibly was used as a blank for some tools.

7.2. There are 10 stone bifacial retouched arrow heads, one stone bifacial retouched stemmed knife, one small piece of amber and one Ainu ceramic pipe. Tools look as if they originate from Susuya period, especially a knife. There is a piece of coal or jet of black colour.

7.3. Enoura A locality pottery (17). Some pottery of the earlier and some, of the later types. Also there are pig bones: upper jaw front part, lower jaw right side part and one more broken pig's leg bone.

7.4. The animal bones (vertebrates, ribs, etc.).

Box 7.5. About 60 fragments of pottery, including early and developed types of pottery. All from loci A. One fragment is painted pink colour.

7.6. Pottery fragments without ornament. Supposedly, Enoura type.

7.7. Pottery fragments without ornament. Supposedly, Enoura type.

7.8. Teeth and parts of jaws of the pigs. Also there are two shells (*Ostrea*?)

7.9. Pottery fragments without ornament, including flat bottoms. Supposedly, Enoura type.

Box No. 8

Enoura location A. Surface collection.

Only pottery fragments without ornament. Supposedly, Enoura type, all from loci A of Enoura site.

Box No. 9

Enoura location B. Surface collection.

9.1. There is a very rare example of the pottery, which is basically close to Mokhe (Makkatsu) pottery by quality, morphology and ornament. There are the vessel upper and shoulder parts of the black colour, ornamented with the low-

incised relief on the rim wide border and the band of the parallel to each other comb stamps on the shoulder under the neck. It is clearly seen that the body and the upper part were done separately and then connected together in one model. Probably the pottery vessel is an example of the developed stage of the Enoura culture.

There are also 5 fragments of the better quality pottery of black colour. Maybe there was a better potter, who made good pottery, or it was imported from somewhere.

One separate fragment of pottery has an incised net ornament close both, to Satsumon and Higashi Taraika types. But the curve of the neck in the upper part of this fragment seem to hint on the Enoura type formula of the vessel morphology. Rare example of mixture.

9.2. Flat bottoms and parts of the walls of the Enoura pottery.

Box 9.3. Parts of the walls and upper parts of the Enoura pottery, some with neck. The peculiarities of the pottery Enoura (developed stage) collected in the box are such as:

1. there is pottery of the vessels with the wide equator, neck and wider upper part
2. among those there are fragments decorated by the rows of the comb (KUSIME) pattern. This pottery has much in common with makkatsu traditions.

9.4. Enoura shell midden.

There are 11 leaf shaped and triangular arrow heads with bifacial retouch, two blanks and one obsidian scraper (?).

9.5. Enoura B. Pieces of broken and fired stones and of two retouched tools.

9.6. Enoura B. Fangs, teeth and bones of pigs.

9.7. Parts of the walls of the Enoura pottery. No ornament found.

SUSUYA SHELL MOUND. KITA KAIZUKA.

Etalon collection

Kita kaizuka (after the village name) or Susuya (after the river name) is situated in the mouth of the Susuya river not far from Solovievka (Kita kaizuka) village in Korsakov (Otomari) district in Sakhalin. It is one of the most important sites for the study of the Early Iron age cultures in Sakhalin. Discovered first by Dr. Ivan Polyakov in 1882, it was investigated many times by all scholars, both, Russia and Japan, including Kieno Districtji (1924), Ito Nobuo (1934), Rimma Kozyreva (1953-1955), Valery Golubev and Ruslan Vasil'jevski (1967-1973). The collection of Ito Nobuo is a basis for the study of Susuya type pottery, because it was distinguished by this Professor.

Box No. 10

SUSUYA SHELL MOUND.

There are 8 boxes.

10.1. Fragments of Susuya type pottery with the rope impressions (3) and stamps (closer to Nabil type) (1) and one semi — produced

10.2. There are round bottoms close to conical and parabolic shapes and two parts of the Susuya vessel with the decor consisted of 4 parallel lines and 4 or 5 looped stamps

of the rope (string like) impressions.

10.3. Kita Kaizuka 'A' pottery fragments, two bottoms- flat and half conical, upper parts ornamented by rope (Susuya type) and incised line and the bulbs (Towada or Enoura type). There are also three typical for Susuya and Okhotsk cultures stemmed points, usually used as heads of the bone harpoons (3) and one sharp tooth of the animal (fang).

10.4. Flat and oval bottoms of the vessels, upper parts decorated by the rope (Susuya), incised lines (Enoura late), comb pattern (Nabil type), incised holes under the curved neck (Aniwa type?).

10.5. The stone implements (11). The net weight, the biface, the bifacial leaf shaped point, the polished adzes (6), a flake.

10.6. Flat and parabola bottoms of the vessels, 2 upper parts decorated by the rope (Susuya), walls without ornament.

10.7. Susuya A 2 layer. Usually Prof. Ito named boxes 2 or 3 when he indicated the layer of the excavated site.

So, in this box there are fragments of pottery without ornament and earlier type rim decorated with the holes and bulbs on the inner side of the jag (Aniwa type?). There is also a piece of jet or coal and a tooth of the animal.

10.8. Susuya A 4 layer. There are fragments of pottery without ornament and two with the typical Susuya type rope impressions.

10.9. Susuya A LOWER layer The flat bottom of the vessel with the wide flange (edge) and the fragments of pottery without ornament.

10.10. The stone inventory (13). There are: grinding stone, ice-pick, adzes of quadrangular or oval wide cross section (6) and flat adzes.

Box No. 11 SUSUYA SHELL MOUND. Layer III

There are 4 boxes. And one iron hook

11.1. Conical small vessel of the Nabil type with the ornament of the vertical comb stamps. Before 2004 such pottery was understood as a Susuya subtype.

11.12. One lower part of the vessel with the flat bottom and widening walls for a kind of a bowl (goblet), which is typical for Towada.

11.2. Collection of the different parts of the vessels of different types as the layer is heavily mixed. There are flat and half conical bottoms and upper parts decorated by the lines of the comb pattern (before 2004 Susuya subtype, now close to Nabil type), comb stamps (Towada or Nabil) and incised ornament (Enoura). There are also three flakes (one could be understood as a not regular blade) and a scapula bone of animal.

11.3. Big parts of the conical vessel including bottom and walls. There are also some typical Susuya type decorated rims and non decorated pottery.

11.4. Skulls of the smaller animals, a vertebrate and ashell.

11.5. Iron fish hook with the leather belt lashing. Supposedly early 20th century (Japanese? Ainu?).

Conclusion. Through Susuya collection of the layer 3 we suppose the layer 3 to be mixed.

Box No. 12 SUSUYA SHELL MOUND. LOWER LAYER and 5 layer

There are 4 boxes.

12.1. Bone implements. Lower layer. Different tools or their parts made of sea mammal bones of lower quality. Two are the intermediates for the hunting or fishing tools (sticks of the round cross section). One should be a part of the long curved spear head of bone. One (big and flat with sharp proximal end and divided distal end) is definitely a tool, function is hardly known. Maybe it was a part of the spade or of the mattock (hoe) for sea shell digging. There is something reminding incised ornamentation.

12.2. Pottery. Walls and bottoms of the sharp, round (parabola) and flat bottomed vessels of Susuya and other types. A fragment of comb pattern and rope impression pottery. Lower layer

12.3. Pottery. A broken vessel with the flat bottom and linear stamp relief produced by the rolling of the fish vertebrate. Layer 5.

12.4. Bones of the different animals and fish (?): vertebrates, ribs, jaw, teeth, parts of skulls.

Conclusion.

Collection introduces the mixed condition of the shell mound in its low parts. Most of the artefacts are to be of Susuya origin and of other culture with the comb pattern pottery.

Box No. 13 SUSUYA SHELL MOUND. LOWER LAYER

There are 4 boxes.

13.1. Pottery. About 60 fragments of typical Susuya rope impressions pottery- upper parts of the vessels

13.2. Pottery. Parts of the vessels without ornament.

13.3. Stone implements of the different layers, but mostly from 2 and lower.

There are adzes and their parts (5), broken and fired stones, also 10 leaf shaped (some with the triangular stem) knives and points, semi production included. Impression- some of them surely belong to Susuya culture and some to earlier period (asymmetrical stemmed knife with a very good retouch)

13.4. The comb pattern decorated upper parts of the vessels of the Nabil and maybe Towada (???) or some other type. Look very different from Susuya rope pattern pottery.

Conclusion.

Collection introduces the mixed condition of the shell mound in its low parts. Most of the artefacts are to be of Susuya origin and of other culture with the comb pattern pottery.

Box No. 14 Kashiwahama 2. Pit dwellings No 2 and 3.

Kashiwahama was a part of the village of Sakaehama to the South from small lake and from famous site of Starodubskoye 2, now Starodubskoye village of Dolinsk district.

There are two sites around the lake, Kashiwahama is

already eliminated by the village (football field and gardens), and another is Starodubskoye 2, which is still preserved in the northern limit of the village. Some of the Russian archaeologists do not name the broken site, understanding them together as one area. And some call them Starodubskoye 2 and 1. According to this Kashiwahama of Prof. Ito seemed to have been both, the Starodubskoye 1 & 2 sites. It is possible that the site was bigger that time and included both loci and then was divided by village in Showa ages or earlier. Basically in both sites there are pit dwellings, which belong to such cultures as Susuya and Enoura.

We suppose that Prof. Ito excavated three pit dwellings on that big site near the lake and called it Kashiwahama 1-2 to show the difference of the loci 1 and 2 (or the Starodubskoye 1- 2) site. The ? is opened.

Pit dwellings No 2 & 3

Box 141. House 2.

Stone implements. Two axes with the broken blades across, two smaller chisels and small obsidian bifacial tool. All artefacts look like Susuya, but the bigger axe.

Box. 14.2. A half conical vessel with the narrow bottom, widening body and wider mouth with the collar curved off. The ornament is close to that of Taraika "Ostrovnyaya type" by V.Fedorchuk. It is incised linear relief with inclined parallel lines. The age has to be about the VI-VII cent. AD, the pottery seem to be simultaneous to Towada or early Enoura.

Box. 14.4. 6 bottoms- sharp sub conical, oval and parabolic. Seem to belong to Susuya, Ostrovnyaya and other early Iron types of vessels. There are upper parts of the vessels ornamented unexpectedly different types of comb pattern, including stamps, some oval stamps close to Towada type, but not Towada, then Enoura type wave ornament and rope impressions of Susuya type.

Boxes 14.3. Four boxes of not ornamented pottery and one fragment with Susuya decor all excavated from houses 2 and 3 - the numbers can be seen easily on the artifacts codes.

BOX No. 15

KASHIWAHAMA 1. Pit dwelling No 1

Box 15.1. The stone inventory looks rather older than the pottery. At least one half polished chipped adze is definitely of the Early or Middle Neolithic origin (grey basalt or rhyolite), same about obsidian flake- they seem belong to Otsunaoka site which is 2 km from Kashiwahama. A narrow chisel of green stone also looks older, at least it belongs to Susuya, or earlier tradition. The other stones look quite indifferent to the time- but, I suppose belong to the later stages.

Box 15.2. There are walls, two half conical bottoms and upper parts of the vessels ornamented with the comb pattern in the style of Ostrovnyaya type and Early Enoura. The proposed age is VI-VII cent. AD.

BOX No. 16

KASHIWAHAMA (SAKAEHAMA) surface collection

Consists of 5 boxes.

16.1. Pottery of the VI-VII cent. AD. With the comb pattern and inclined incised short lines on the rim. And non decorated fragments.

16.2. Stone implements (6). Triangular and quadrangular polished adzes and chisels, also of quadrangular wide cross section (Susuya type).

There is one screblo-like tool of the oval shape.

16.3. Stone implements (16). The arrow and harpoon heads of the triangular, rhomboid and leaf shape. Typical for the Early Iron cultures of Sakhalin in Susuya- Towada times.

16.4. Stone implements (17). Four angular polished adzes, most of quadrangular wide cross section (Susuya type) and flat adzes with the narrow cross section. Typical for the Early Iron cultures of Sakhalin in Susuya- Towada times.

16.5. Stone implements (12). Four polished adzes, 2 of quadrangular wide cross section (Susuya type) and 2 flat adzes with the narrow cross section. There are also 8 grinding stones.

BOX No. 17

RAICHISHI SUSUYATYPE PIT DWELLING AND AINU DOKI

The Raichishi site is situated not far from the town of Krasnogorsk of Tomary district in the place called by the locals "Ust'-Ainskoye". The site consists of the cultural layer near the river around the bridge and also on the sand dunes around. The cemetery of Ainu is situated a little to the south from the bridge and the main site.

Box 17.1. Naiji pottery (supposedly from the Ainu cemetery?) which is close to the south from the main site. Includes parts of 4 - 5 vessels with the inner handles. Typical Naiji of the XII-XVII centuries.

17.2. Pottery - upper parts of the vessels (16) with the comb pattern of two types- lines and stamps. Both mostly belong to the Nabil type synchronous to Susuya.

17.3. Pottery - upper parts of the vessels (5) with the comb pattern of two types- lines and stamps. Both mostly belong to the Nabil type synchronous to Susuya. They have the very same compositions of comb pattern as Susuya rope decor and one fragment is ornamented both- rope and comb stamp.

17.4. Pottery - upper parts of the vessels (about 25-30) with the typical variations pattern of the rope Susuya pattern.

BOX No. 18

RAICHISHI

18.1. Pit dwelling floor.

Includes pottery fragment 18.11 which is very unusual for Sakhalin. The pottery compound is very different from local

types and the ornament- long direct parallel comb stamps between two lines look more as a continental type. The brown colour is also different from local types. The age is unknown.

18.12- 4 fragments of the walls of the vessel of the late Enoura ? type with the row of the inclined short incisions on the shoulder of the body.

The others are the fragments of pottery of the Susuya and Nabil type vessels with rope and comb patterns. There is also sharp conical bottom of the Susuya vessel.

18.2. Collected on the road. Among the typical Nabil-Susuya pottery (15) there are three unusual fragments of two unknown types- combination of impressed lines and not deep cavities (depressions) (2) and (1) decorated by the parallel lines of the impressions made with the barbed wheel. The latter seems to be of North Sakhalin origin.

18.3. One obsidian flake and about 20 fragments of typical Nabil-Susuya pottery and two reconstructed big parts of the vessel of Susuya type with 5 parallel lines on the rim and many smaller prints of the two inclined incisions of rope. Reminds the Epi-Jomon pattern or Oncoromanai an Krylyon type pottery.

18.4. The SURFACE collection of Susuya pottery along the sea side - walls, sharp conical bottom, etc. About 50 samples.

BOX No. 19 RAICHISHI

Consists of two boxes- excavated from pit dwelling.

19.1. In this box there are fragments of pottery (about 20 fragments) with the Nabil and Susuya pottery and about 20 parts of one Susuya vessel decorated by the rope impressions.

19.2. In this box there are fragments of pottery (about 50 fragments) with the Nabil and Susuya design and one adze of quadrangular wide cross section (Susuya type).

ESUTORU COLLECTION BOX No. 20

Esutoru was a town near the Russian-Japanese border in the middle part of Sakhalin. The collection originates from the mouth of Ulegorka river (Niioka_Utagawa_1990, P. 10-11) Collection consists of three boxes, 20.1., 20.2., 20.3.

20.1. Stone implements. About 60 tools, including leaf shaped, stemmed arrow and harpoon heads, stemmed knives, one polished chisel, one polished stone slender column (rod) with the groove in the medium part and a very unexpected in this collection scraper with the short stem and "knob". The latter is different, as all of the tools are closer to Susuya-Nabil- Esutoru traditions. The latter seems to be of Neolithic origin.

20.2. Pottery - upper parts of the vessels (5), of which 4 are of Susuya rope decor type and one with the comb pattern consisted of lines of prints. Both types have the very same compositions of Susuya-Esutoru- Nabil style.

20.3. Pottery. There are 2 small vessels with the round

(parabolic) bottom. One decorated by the rows of prints of the small bone (round stamp). Another has the finger traces around the mouth and ornamented by the row of the vertical comb stamp. The tradition is far from Susuya and much closer to Esutoru as a separate phenomenon.

There are also about 10 upper parts of the vessels, of which most part are of Esutoru - Nabil type comb patterned (33). There is some smaller part of the pottery with the rope compositions of Susuya style (15). Between others there are 2 fragments- one looks as if it was Towada pottery and one is closer to a jar with wide neck, convex shoulder and possibly oval base. The parallel incised lines and small incisions are impressed on the neck of the fragment. The pottery must be of the same age as Towada and Ostrovnyaya types.

Conclusion.

This collection is important for understanding the distribution of Esutoru_Nabil types of pottery in Sakhalin. Historically the site was the place where Niioka Takehiko distinguished the Esutoru type pottery.

Box No. 21 RAKUMA collection.

Rakuma (Yablochnoye) in Kholmsk (Maoka) district. There were many shell mounds and ancient settlements near the seaside crashed by the civil construction early XX century. The collection looks as if it was collected long time by amateur ; we suppose that it was given to Ito Nobuo by local amateur. Because there are only artefacts preserved in good condition. Usually professional archaeologists collect all, even not ornamented pottery and flakes. There are no flakes.

21.1. Stone implements (24). Chisels and adzes of the flat 4-angular and thick quadrangular (1) cross section and also middle sized stemmed and rhomboid- leaf shaped points.

21.2. Stone (about 120) and bone (2) implements. About 120 tools, including leaf shaped, stemmed arrow and harpoon heads, stemmed knives, one polished stone net needle with the grooves in the medium part and in a proximal end. The bone tools are arrow heads- a stemmed one and a triangular one. The stone tools are sure to be of different origin- Susuya and Neolithic. Bone tools are closer to Okhotsk cultures as well as to Susuya.

21.3. Pottery. The typical Enoura (all stages), Susuya and Naiji pottery preserved (12).

Box No. 22 Tonnai

22. Only stone implements (24) including adzes and axes of the flat 4- angular, oval and thick quadrangular cross section typical for Susuya and Towada. There are also three big ice-picks (for crashing ice in the holes in winter fishing) and one big stone plate from the local mountain (name of the mountain is VYGODA). The outcrop of such stone was used by Okhotsk people and Ainu.

Box No. 23
Rakuma ?

- 23.1. Pottery (31) of all types (Susuya, Towada, Enoura, Minami)- upper parts of good quality.
23.2. Pottery (47) of all types (Susuya, Esutoru, Towada, all types of Enoura, Minami) – upper parts of good quality.

BOX No. 24

HOROCHI (PORECHIE), Kita Usu, Naiko, Muri of ESUTORU (UGLEGORSK) DISTRICT, Arakuri, Nagahama of Otomari (Korsakov) district.

The box consists of 9 smaller boxes including Horochi (3 boxes) and also Kita Usu, Naiko, Muri of ESUTORU (UGLEGORSK) DISTRICT, Arakuri, Nagahama and Mummio of Otomari (Korsakov) district.

24.1. *Horochi Kawaguchi*. (Now Porechie village) The site in the mouth of Horochi- Pokosnaya river- Porechie_1 site. Rope impressions, comb pattern and incised pottery sgeds of the Susuya, Esutoru and Enoura types (14). Also a stone round plate with the 2 concentricly exposed circumferences.

24.2. *Horochi Murakami Bokujo*. Possibly Porechie 5 ("Rodnik") near the sea side to the North from the river mouth near the water spring.

Enoura type pottery- 5 fragments, including one bottom and 5 upper parts.

24.3. *Horochi Shogakku*. Pottery (21) including lower (1) and upper parts of the Enoura pottery. One fragment of the Enoura vase type vessel (with neck and inclined incisions and relief in the rim) is remarkable. Also there is a small fragment of pottery with the smaller incised *waffle comb pattern* which is sure to be of the Neolithic or Bronze-Early Iron continental type. A very rare sample in Sakhalin.

24.4. *Kita Usu (Now Senogorie)*. There are two groups of artifacts. One is simply- Kita Usu. Another one is – southern side near the seaside (two fragments of Enoura pottery and a grinding stone). The first group includes eight fragments of Enoura pottery, two axes of the oval cross section, one broken chisel, blue glass bead (Ainu ?) and one stone pestle.

24.5. Naiko (Now Olshanka). 15 upper parts of Enoura pottery, one flat stone chisel and a grinding stone plate.

24.6. *A place near Muri*. Three fragments of pottery. One is transitive Enoura-Minami. Or Early Minami type pottery with ornament- a row of the swans in the lake water.

24.7. *Arakuri* of Otomari district. (Now Arakul' of Korsakov district). About 20 small pieces of pottery of Susuya type.

24.8. *Nagahama* of Otomari district. (Now Ozersk-1 site of Korsakov district).

Stone implements (13). 3 cores and crashed pieces and flakes of andesite and siliceous chalcedony, one rhomboid point, one blanc for a point, one oval shaped knife and one adze.

One animal bone.

Pottery. Upper parts (25) and sharp bottoms (3). Types : Enoura (9), Minami (1), comb pattern pottery (4), Susuya rope printed pottery (1), others (10).

24.9. *Mummio*. Muna-ko (Now Maloye Busse lake) lake side. Pit dwelling.

About 60 small and some bigger pieces of the Minami Kaizuka and Latest Enoura types pottery.

Box No. 25
Etalon collection.

Minami Kaizuka (now Solovievka) site and Derevka (Davydovka ?) site of Otomari (now Korsakov) district.

There are 8 boxes.

25.1. *Pit dwelling N1*. A part of the crashed polished stone axe of the Susuya type (green), flakes and pieces (5), a retouched tool, knife of the leaf or oval shape, crashed stone. Chalcedony, shale, andesite. Bottom parts of M Kaizuka type pottery (5). Animal bones (12).

25.2. *Pit dwelling N1*. Ornamented parts of MK type pottery (about 25). Etalon typical samples.

25.3. *Pit dwelling N1*. Not ornamented parts of MK type pottery (about 50).

25.4. Flat bottom and ornamented parts of MK type pottery (15). Etalon typical samples and takohon chosen by Prof. Ito N.

25.5. *Pit dwelling N2*. Not ornamented (about 25) parts and 2 decorated fragments of MK type pottery excavated from pd 2.

25.6. *Pit dwelling N1*. An iron spear point of MK pd1 (rare subject) and a grinding stone.

25.7. Unknown pottery vessel parts of the type close to latest Enoura – Early Minami. It is possible that it originates from MK site or Davydovka.

25.8. Three fragments of pottery from M-K.

25.9. The finds in front of the monument to horse. Not ornamented pottery and a flake and an obsidian smaller biface.

BOX No. 26

TOBUSHI (now Lovetskoye)- northern part of Honto town (Nevelsk now) and ENOUR (1 box).

Comment. Basically Ranetoi Jinja has to have been Jinja of Tobushi village and Professor Ito Nobuo could call the site both, Ranetoi or Tobushi jinja. It was one area that time. The finds from Ranetoi were kept in Tobushi school, as T. Nioka reported.

Tobushi Jinja mae

26.1. and 26.2. *Excavated in Tobushi Jinja mae*. Typical Towada pottery (about 70 samples including decorated parts and bottoms) and 2 pottery fragments with string impressions of Susuya. There are also 2 animal bones (scull part and sea mammal rib ?) and one shell.

26.3. *Tobushi Jinja*. 7 fragments of Susuya pottery.

BOX No. 27
Tobushi

27.1. *Tobushi surface*. 10 fragments of Susuya pottery with the decor close to Epi Jomon, Towada fragments (2) and comb pattern (1) and enoura pottery fragment (1).

Stone implements include : flakes of obsidian, flint, chalcidony, a core, a part of a biface and 2 points.

27.2. *Tobushi B-1*. Seaside between two dunes. The layer 1. Excavated by Takagi-san.

There are only Enoura pottery (15) Late phase.

27.3. *Tobushi B-2*. Seaside between two dunes lower part. The layer 2. Excavated by Takagi-san.

The Susuya pottery (13) is preserved only.

27.4. *Tobushi surface*. Supposedly different from 27.1. Pottery (14) of Towada, Enoura and Minami K types. Also there are grinding stone with the incisions in the proximal part, adzes (2- one as a broken part), a very good early type (Neolithic ?) biface of the red siliceous stone and a part of obsidian biface.

27.5. *Tobushi A. Layer 2*. Stone tools. Flat adzes (3), bifacial tool's part, a stemmed point and two smaller bifacial knives.

BOX No. 28 Tobushi

28.1. *Tobushi A. Layer 1 (upper)*. 5 fragments of Enoura late phase pottery.

28.2. *Tobushi A. Layer 2 (middle)*. About 30 fragments of pottery of Susuya and one of Towada type (comb pattern).

28.3. *Tobushi A. Layer 3 (most lower)*. About 50 fragments of pottery of Susuya and Enoura types and 2 flakes.

28.4. *Tobushi A. Layer 3 (most lower)*. About 40 fragments of pottery of Enoura type and 3 flakes.

Conclusion : the layers were mixed by the Enoura people.

BOX No. 29

TOBUSHI 4-banchi, Tobushi Jinja and Enoura B site.

29.1. *TOBUSHI 4-banchi* The 13 etalon samples of Enoura type pottery developed phase. Selected by Prof. Ito N.

29.2. *Tobushi Jinja*. The 14 good samples of pottery of the Susuya, Towada, Enoura and Minami Kaizuka types. Supposedly from Tobushi Jinja, and one (MK) from Toobuchi 5 ? One fragment of pottery is unknown type and must be studied separately as a unique sample of the Early Neolithic unknown type as it has holes of an organic admixture and the incised and comb pattern. The type unknown.

29.3. *Enoura B site*. The 22 etalon samples of Enoura type pottery developed phase. Selected by Prof. Ito N.

Boxes No. 30-33.

HONTO district- Nevel'sky raion.

Box 30. Honto kaisuka excavations and surface collection.

30.1. Layer N01. 28 fragments of Enoura type pottery. Upper parts.

30.2. Layer of sand N03. Enoura type pottery, upper parts, walls, flat bottom (20).

30.3. Lower level of the shell mound. Includes different parts of Towada vessels, a stemmed point and a blank for chisel of andesite, and a polished flat adze of the oval cross section, made of some green shale or like that.

30.4. Layer of shells. Pottery only of Enoura type, includ-

ing upper parts, walls, flat bottom (25) and a tool made of sea mammal bone.

30.5. The mister *Hinako* previous collection from Honto.

Box No.31

Honto kaisuka excavations and surface collection.

31.1. Layer N04. 13 fragments of Susuya, comb pattern type and Enoura type pottery. Upper parts with ornament. Among them one which is ornamented by a rope impressions composition including such motives as arched and curved rope lines and smaller triangular holes. It is possible that the influence of epi-jomon culture reveals in this composition. Some of the Enoura pottery is glimpsing as it went through the procedure of glossing.

A very interesting subject is a long haft of a fishing hook with the groove (flute), cut in the proximal end of the tool. Such artefacts are typical for all Okhotsk cultures like Enoura or Minami Kaizuka.

31.2. Layer N04. Typical artefacts of Enoura type pottery, upper parts, walls, flat bottom (60), 2 fragments of Susuya pottery, a bone conical tool (conical nail), and a flat polished adze of the oval cross section made of green shale.

Conclusion. *The shell mound should have include Susuya (4 layer), Towada layer (3 shall layer) and two layers of Enoura culture (2 and 1).*

The most lower 4 layer is all of a sudden mixed as we can see in the box 31 pottery of all mentioned types. Most often the Enoura pottery is found.

We suppose this shell mound to be the same as MINAMI-HAMACHO Kaizuka or NEVELSK 2, later excavated by Valery Shubin.

Box No. 32

Tokonbo cemetery. (pits 1 and 2). (Now Kazakevitchi area of Nevelsk town) .

About 60 Enoura type pottery : upper parts, walls, flat bottoms, also five of them are ornamented including rows of triangular and rhomboid smaller depressions (denticulate or comb pattern) similar to those of Pokrovka type.

32.2. Tokombo. (Now Kazakevitchi area of Nevelsk town). About 20 Enoura type pottery : walls and 2 flat bottoms, no ornament found.

The site should have belong exclusively to Enoura culture.

Box No. 33

TOWADA ETALON COLLECTION.

Towada (now Pereputie) was a big village in the middle of the way from Honto to Shironushi (Nevelsk - Krylyon). As far as Professor Ito found there etalon collection of such pottery as sub conical vessels three times widening from the flat bottom to a mouth, ornamented by the high relief with ridge in the shoulder area and holes or bulbs (pearls) around the rim. The pottery of this type can be also decorated with comb stamps and incised lines, sometimes forming a décor of net or waves. This collection of pottery served to Prof. Ito

N. a kind of etalon for study of Towada type.

33.1. Towada pit dwelling. Two distal parts of the stemmed points, 1 obsidian flake and 15 fragments of Towada pottery.

33.2. 18 fragments of pottery: upper parts and walls, two parts of smaller vessel. Typical Towada.

33.3. 16 etalon samples of Towada type pottery are maybe one of the most important parts of this collection. A very interesting sample is the upper part of the vessel with the incised ornament of the net. By this motive the Towada is traditionally close, both, to Ostrovnyaya type and also to different Makkatsu pottery types.

33.4. M. Kaizuka and Towada type pottery: upper parts and walls (15). Also, there are stone implements: retouched flake, a spall, 3 chisels, and 10 points of the leaf shape, rhomboid, triangular, including those stemmed.

**Box No. 34
Towada.**

34.1. Towada type pottery, upper parts, walls (162), flat bottoms (8). A special interest inspires the small fragment of pottery with the famous décor- "footprints of bear". The origin of the pottery is unknown, only place- Towada.

Box No. 35

Honto District, many places (Shiranushi, Minami Shiranushi, Kita Shiranushi, Moshiro, Kita Moshiro, Hiretomo, Minami Kohama, Ranetoi, Akaragawa, Hon- Kotan or Moto-kotan, Hiretomo, Kaiba To, Koromo Kauru, Nishi Urui, Togushi, Minami Nayoshi)

35.1. *Moshiro and Kaiba-to*. 28 fragments of Susuya, Towada and Enoura pottery from Moshiro. Three artefacts are from Kaiba-to, including: Usu- a fragment of Enoura pottery, simply Kaiba- Susuya fragment and a simple stone (35.11.)

35.2. *Shiranushi*. Three fragments of pottery: 1- Towada vessel upper part with lines and holes, and 2 Enoura fragments.

35.3. *Minami Shiranushi*. 12 pieces of Towada pottery.

35.4. *Shiranushi*. 15 upper parts of the vessels of Enoura type including one fragment with typical M.Kaizuka décor- "broken waves"- mutually inclined incisions, producing a kind of wave line. This is one of the elements of the transition from Enoura to M. Kaizuka in this place.

35.5. *Togushi*. Susuya, Towada, Enoura, M. Kaizuka fragments of pottery in one small collection. There is also a name card of Minoru Hirono, in which the name of the site was written.

35.6. *Minami Nayoshi*. About 15 smaller pieces of Epi Jomon pottery with flat rim and "jo" (rope) impressions on the body of the vessel. There is also a haft of the stone retouched tool.

35.7. *Kita Shiranushi (Tokosa kawaguchi)*. Situated in the foot of the Krylton castle- Shiranushi dojo. Prof. Ito collected on the site. 12 upper parts of the vessels of the latest Enoura type including two fragment with typical M. Kaizuka décor- "broken waves"- mutually inclined incisions, produc-

ing a kind of wave line. This is one of the elements of the transition from Enoura to M.Kaizuka in this place. And also, in one border of the upper part fragment with such ornament there are two lines of the string impressions.

35.8. *Artefacts of 5 sites*.

35.81. *Hiretomo (Hisitomo ? Hishiku ?)*. A small fragment of pottery and a broken axe.

35.82. *Hon- Kotan or Moto-kotan*. Towada and Susuya pottery (2)

35.83. *Ranetoi*- 2 fragments of Enoura pottery.

35.84. *Minami-Kohama*- one bottom of a vessel.

35.85. *AKARAGAWA*. Susuya or Epi-Jomon pottery small parts (2) and one flat bottom of a vessel.

35.9. *Five sites artefacts*.

35.91. *Moshiro*- 25 fragments of Early Iron and Middle Age pottery- possibly Susuya?, Enoura or Minami Kaizuka. There are also 2 blanks for arrowheads and a core.

35.92. *Kita Moshiro*. Three fragments of Susuya (1) and comb pattern pottery and one flat bottom.

35.931. *Nishi Urui* One mattock made of andesite

35.93. *Kaiba To* - a stone talisman with the drilled hole in the centre.

35.10. *Kaiba To* - 12 fragments of Enoura type pottery. No name of the site is given. Possibly it is a site in the main village near the sea port.

35.11. *Koromo Kauru*. Pottery fragments of Minami Kaizuka type including upper parts and flat bottom (8).

35.12. *Unknown*. Two small vessels of Okhotsk type, possibly, Enoura. Sakhalin or Hokkaido.

35.13. *Nayhoru*. Collection of typical artefacts of Sony Neolithic culture of the V th millennium BC. The site is situated in town of Gornozavodsk (Nayhoru) in the rock western face and the summit in the slalom camp. There are: a stone tool, a retouched flake, a stone knife upper part and 15 fragments of Sony type pottery. In the book of T/ Niioka and Hiroshi Utagawa the position of this site is done as N072, but it was called by mistake as Nayhoru Kaizuka. There are no shells in this site as it is much earlier than the others in town- it belongs to early stage of Sony Culture. So the name of the site is Nayhoru and now in Russia- Gornozavodsk-3.

Box No. 36

Horona Tobuchi Usiro Anenai Tarantomari.

36.1. *Horona*. Pit dwelling.

Horona is a small place near Naiba river in Otyai (Dolinsk) district not far from Starodubskoye (Sakaehama).

Box N141 In this box there were only two artefacts, both of iron. A very well preserved stemmed knife with narrow long blade and a spear head with the wide long collar (sleeve) stem (haft) and leaf shaped blade. There is incised ornament on the spear head which seems to have some digital notion.

Conclusion.

These artefacts are extremely rare for Sakhalin and should be kept very carefully. They seem to represent the end of the Middle Age or rather New Times history. Possibly- result of Ainu trade with Northern China, or their self produc-

tion.

36.2. Tobuchi. A very important and well known collection unearthed by Prof. Ito N. from a pit dwelling in the vicinity of Muravievo village in Busse lake shore not far from the small pond (Tobuchi Lake).

Collection includes about 30 fragments of pottery of Aniva type of Early Zoku Jomon with flat bottom and jomon pattern on the body and string parallel impressions around the rim or without the latter. Both subtypes are well known from Yuzhnaya 2 site (Vasilevski A. Problems of the Pre-Okhotsk Culture in Sakhalin. in Problems of the Formative Stage of the Okhotsk Culture.-Bulletin of the Hokkaido University Museum.- No.1.- Sapporo: Hokkaido University Press, 2003.- P. 1-18.- (Japanese and English).

Another type is well known as it was distinguished by Professor Ito Nobuo (1942)- there are parts of the vessel with the decoration which consists not only of jomon pattern but also of a convex clay band between the shoulder and the neck. Supposedly the Tobuchi type is earlier than the Aniva type, even both of them belong to the Jomon tradition.

36.3. *Usiro (Orlovo) of Esutoru (Uglegorsk) district.* This is the collection of the multi strata site of Susuya, some later culture (a vessel) and Enoura cultures. The pottery (12) includes half of a vessel, bottoms and walls with typical Susuya and Enoura ornament.

Stone implements are: half of a bifacial tool, a triangular arrowhead and 2 parts of a grinding stone.

36.4. Anenai (Berezhnoye) of Mauka (Kholmsk) distr.

There are very good examples of Susuya (12) and Towada (2) pottery style.

Also there is a used as some kind of a vessel (?) the epiphysis of a whale.

36.5. Tarandomari. (Kalinino) of Maoka (Kholmsk) district.

There are 2 adzes of the Susuya type with wide quadrangular cross section and of splitting function and 2 pebble type weights with the holes and incisions for net ropes.

Box 36.6. *DEREVKA* (I think that it is a spoiled Russian village *DAVYDOVKA*? name of the Russian small group of Russian peasants' houses of the previous epoch near Solovievka village)

Anyway, it must be near the modern Solov'evka (Minami Kaizuka) village.

In the box only one artefact- asymmetrical rhomboid - leaf shaped point made of andesite or basalt. Supposedly originates from Susuya period.

Box No. 37

Sony-Kuznetsovo of Honto district - Nevel'ski raion Etalon collection

37.1. Sony Kaizuka- Kuznetsovo-1 the site situated in the mouth of the Kuznetsovka river in the sea side dune terrace. Excavated by Kimura Sinroku, Ito Nobuo, Shubin Valery, Golubev Valery, Vasilevski Alexander. A small collection (37.1) consists of 7 fragments of pottery of Enoura (6) and of Towada type (1) and a small chisel.

37.2-37.5. *Sony sawa. Kuznetsovo-5*, situated in the Sony river side near the place of its inflow into the river of Kuznetsovka.

37.2. *Sony sawa.* Stone implements. There are 4 artefacts- a propeller shape asymmetrical knife made of siliceous shale, a small retouched tool of the asymmetrical oval shape, and two well shaped grindstones (supposedly Enoura period). There is also one fragment of early Susuya or Epi-Jomon pottery with the deflector inside (in the inner side of the vessel mouth).

37.3. *Sony sawa.* About 20 fragments of Enoura pottery among which there is one fragment of Susuya (?) and two fragments are not typical ornamented- with stamp of 4- or 3-angular shape.

37.4. *Sony sawa.* About 60 fragments of the typical Enoura pottery of the late developed stage. Walls, upper parts with wide borders, stamps and incised lines- the matter we call Enoura. It was underlined by Prof. Ito in the label to this box.

37.4. *Sony sawa.* About 100 fragments of the Enoura pottery without ornament, but some thin fragments are appeared in the main group. They seem to be of earlier origin.

37.5. *Sony sawa.* About 80 fragments of the Enoura pottery without ornament, but some thin fragments are appeared in the main group. They seem to be of earlier origin.

Conclusion. The Enoura settlement of Kuznetsovo-5 - Sonysawa was built in the same place where there was a site of Epi-Jomon or Susuya.

Box No. 38

Etalon Sony Bokujo-Kuznetsovo-3-4 collection

The site is situated in the road (Kuznetsovo-4) and over the creek and the modern ponds on the pasture hill (Kuznetsovo-4). Discovered by Kimura Sinroku, Ito Nobuo, then independently re-found in 1983 and excavated in 1984-85 by Vasilevski- Golubev, in 2000-2001 the site was investigated by Prof. Suto T., Akoshima K., Yanagida T. Sony type of pottery has such features as square shape vessels, flat bottoms, grass admixture, low relief stucco mouldings as a main decoration means.

38.1. Typical pottery of Sony type chosen by Prof. Ito Nobuo for some reasons (publishing?) (17).

38.2. Typical pottery of Sony type chosen by Prof. Ito Nobuo for some reasons (publishing?) (13).

38.3. About 20 fragments of Sony type pottery.

38.4. 10 fragments of Sony type pottery including 2 bottoms and one very well preserved Sony type (Sakhalin type) ax of the bifacial strike retouch.

Conclusion. The collection I this box is a very typical etalon collection of Sony type pottery and ax.

BOX No. 39 42 OTSUNAOKA

This site is a part (loci 3) of the bigger site of Starodubskoye 3 investigated by Kono Hiromitchi, Ito Nobuo, Gorobets Viktor, Vasilevski A. and Plotnikov Nikolay (1989). The collection of Sony artefacts from Otsunaoka is the talon one for Sony culture.

BOX No. 39**39.1. OTSUNAOKA pit dwelling.**

The Enoura pottery fragments (16) and three of them are parts of a rim of a vessel decorated by two rope-like clay mouldings- looking more as a Towada rather than a n Enoura type.

39.2. OTSUNAOKA pit dwelling 1 upper layer.

The Minami Kaizuka and a little of Enoura type pottery fragments (about 50 in total) are preserved in the box. The MK pottery has very typical stamps of 3-4 angular shape.

39.3. OTSUNAOKA. Etalon collection.

15 axes, adzes of Sakhalin-Sony type, but one wholly polished seems to have been a different (Enoura?) type. Some of the axes could belong to a period older than Sony- Early Neolithic.

39.4. OTSUNAOKA. Etalon collection.

7 axes, adzes of Sakhalin-Sony type, but two wholly polished seem to have been a different (Enoura?) type. Some of the axes could belong to a period older than Sony- Early Neolithic.

39.5. OTSUNAOKA.

Sony type pottery without ornament selected by Prof. Ito N. About 60 fragments of walls, rims, bottoms.

39.6. OTSUNAOKA.

Enoura type pottery without ornament selected by Prof. Ito N. About 40 fragments of walls, rims, bottoms.

39.7. OTSUNAOKA. Stone tools.

10 flakes, three stemmed smaller points of rhomboid shape, 5 bifacial tools of the leaf shape including one big of the laurel leaf shape. There are also 2 blades- one used as a knife and end scraper and one (obsidian)- as a knife and angular scraper. The collection includes tools of the Early and early Middle Neolithic from VIII to V-th millennium AD including Sony culture.

39.8. OTSUNAOKA. Stone tools. Pit dwelling 1, layer 2.

There are two typical Sony type axes.

39.9. OTSUNAOKA. Stone tools.

A collection of stone implements consists of 2 flakes (one retouched), three stemmed points of rhomboid shape (2 smaller and one bigger shape), 3 bifacial tools of the leaf shape including one big of the laurel leaf shape and 2 smaller size. There are also 1 triangular retouched knife, 1 blade- looks as a boat shaped tool - a side scraper. There are also 2 parts of Sony type axes and grindstones and 5 parts of the stone sticks- small polished columns with the sharp ends.

The collection includes tools of the Early and early Middle Neolithic from VIII to V-th millennium AD including Sony culture.

BOX No. 40**OTSUNAOKA pit dwelling N03**

There are 4 boxes of the Minami Kaisuka pottery- total 899 fragments, including flat bottoms, walls and upper parts. The ornament is typical- lines made by divided wood stick and stamp around the body and shoulder of the vessels.

BOX No. 41**OTSUNAOKA pit dwelling N03**

There are 3 boxes of the Minami Kaisuka pottery- total 236 fragments, including flat bottoms, walls and upper parts. The ornament is typical- MK.

BOX No. 42**OTSUNAOKA pit dwelling N03**

There are 2 boxes of the Minami Kaisuka pottery- total 161 fragments, including flat bottoms, walls and upper parts. The ornament is typical- MK.

There are 3 boxes of the Minami Kaisuka pottery- total 236 fragments, including flat bottoms, walls and upper parts. The ornament is typical- MK.

BOX No. 43**RUTAKA - LUTOGA - ANIVA TOWN**

Rutaka site was discovered by some of the Japanese archaeologists in early 20 century. After that it was inspected by all who studied archaeology in Sakhalin including Academician Okladnikov A.P. from Novosibirsk and other scholars. The site in time of Ito Nobuo was much bigger then now, during the time the river is washing it off.

In the box 43 there are two groupes of artefacts. Stone implements (9): 2 adzes of the Susuya type with 4- angular cross section, one chisel and one adze with the flat oval cross section; one long leaf shaped retouched point of Susuya origin.

Bone implements: 9 bones of pig, dog (?) and sea animal. Pottery (148). Towada and Susuya types pottery: walls, rims, round and flat bottoms. One fragment of Enoura pottery and one small vessel are also kept in the box.

The archaeological Exhibition building of Tohoku University, Faculty of Arts and letters collection

It is a group of artifacts which is exposed in the glass box on the second floor. Collection includes vessels, their parts and some bone and stone artifacts from Sakhalin. As far as it was exposing separately, it is described here also separately. 221 is a number of the glass box according to the order approved for The archaeological Exhibition building of Tohoku University, Faculty of Arts and letters collection

The archaeological Exhibition building is a memorial museum - laboratory of Tohoku archaeological school of the Tohoku National University, a house where big collections of the excavations of 1930-2000-s are kept.

221.1. a vessel presented to dr.Ito Nobuo by mr.Kuhara, found in Odomari. Period- Jomon.

221.2. Karafuto. A vessel of final Enoura type.

221.4. (0646) Minami Kaizuka vessel

221.3. (0647) Randomari vessel of Susuya type

221.5. (0648) Randomari vessels of Susuya_Towada type, bottom is oval and flattened

221.6. Raichishi pit dwelling lower layer Susuya type vessel

221.7. Epi-Jomon pottery from the lower layer of Towada

site

- 221.9. (0661) 8 bifacially retouched leaf shaped points from Merei
- 221.8. (0658) A flat bottom vessel close to Susuya or Towada by morphology, but ornamented with the comb pattern lines. TARAN TOMARI site
- 221.10. (0664) A flat bottom vessel of the B-location of Raichishi site
- 221.11. (0657) an oval bottom shape (parabolic) vessel of Esutoru-Nabil type from site decorated by the 5 lines of comb pattern
- 221.12. (0656) A flat bottom vessel decorated by 3 lines of prints of an empty bone, possible age- Towada or Enoura
- 221.13. (0655) etalon vessel of the Sony type pottery- Otsuna site
- 221.14. (0653) a vessel of Susuya type with incised lines from Randomari
- 221.15. (0654) a typical vessel of developed or later phase of Enoura culture with ornament belt in equator of the container
- 221.16. (0649) flat bottom vessel from Randomari
- 221.17. (0650) Susuya type flat bottom vessel from Randomari
- 221.18. (0651) Oval cross section of container flat bottom Susuya type vessel from Randomari
- 221.19. (0652) A sharp bottom vessel from Randomari with rope impressions. Sususuya type
- 221.20. (0667) Big vessel of Naiji type from Raichishi. Peculiar feature is Etorofu type (ears- handles) of the vessel- they are outside of the vessel
- 221.21. (9990) Big vessel - frying pan of Naiji type from Raichishi. Peculiar feature is Etorofu type (ears- handles) of the vessel- they are outside of the vessel
- 221.22. (0665) a part of the typical Naiji vessel with inner handle Enoura site
- 221.23. (0679) Developed Enoura type pottery fragment and one broken and one whole polished adzes, as said in the codes on the tools and fragment- from SOLOVIEVKA village
- 221.24. (067701-02) Esutoru-Nabil type pottery fragments (4) from Raichishi and Susuya type rope impressed pottery from Susuya-2 level (2).
- 221.25. (0678) tools from Otsuna oka site : small chisels (2), adzes of Sony type (3), grindstone, small blade-like flakes (2), a flake (1), a point (1), an end scraper (1).
- 221.26. (0676) a part of splitted biface (grey stone), two half produced tools of red flint, and one blanc for a point of grey stone Otsunaoka.
- 221.27. Hokkaido shiraoui Kojehama pit dwelling pottery 6 fragments with jomon pattern, including some of Kohoku.
- 221.28. (0671 and 0672) Rakuma site stone tool made of thin plate by retouch of the margin and a pebble weight from Horochi kawaguchi site.
- 221.29. Stone implements from Enoura shell midden.
- 1/ a barbed harpoon with the oval base and a wide incised band in the medial part of the tool.
- 2/ a bone needle like tool with broken point and a hole in the distal end
- 3/ oval haft
- 4/ a bone knife like tool with sharpened as a point proximal

end and a hole in the distal end

5/ a part of a polished bone tool (0674)

221.30. (0671) Stone propeller type bifacial retouched knife (1) and polished bone tools (6) : broken big knives or swords (3) and needle like tools (2).

221.31. (0669) A harpoon is a unique example of a barbed toggle head harpoon with two holes, two barbs in the medial part and a haft incision in the distal part. There is ornament- the incised linear décor. Originates from the Higashi Taraika shell mound.

221.32. (0669) Four stone artifacts from Otsunaoka and one bone harpoon from Higashi Taraika

221.33. (0673) Two big axes of Enoura type often used as ice pics and also a very well preserved long ax with one side polished and one chipped. Arakuri site.

221.34. (0670) A small bone harpoon with one barbed spur a centered hole for haft, a hole for a rope in the medial part a copy (replica) of an iron arrow head in the proximal end and a strengthening relief along the center line. There is an incised linear relief on both sides.

There are also two fragments of Susuya and one of Esutoru type pottery from Raichishi and one fragment of Naiji pottery from as said Solovievka.

221.35. (0670 also) 1-4- stone net needles from Susuya (green and blue 2) and Rakuma (dirty colour 3). There is also a kind of ammonite- an ornament with the center long hole inside (1).

221.36. (066803) 5 polished stone adzes of wide and thick 4-angular cross section and one narrow polished stone chisel with high back and narrow high cross section of 4-angular shape. Susuya- surface collection and one of them - first layer.

221.37. (066802) 4 polished stone adzes and 3 chisels - all Susuya- surface collection and first- fourth layer.

221.38. (066804) 2 polished stone adzes of wide 4-angular and oval cross section and one bifacial chipped half produced stone chisel, all- Susuya- surface collection.

221.39. (066801) 5 bifacial retouched stone tools- leaf shaped, asymmetrical and one stemmed- knives and points. There are also 1 flake and 2 blanks for chisels. Susuya- surface collection and one of them - first layer.

Conclusion

As it was said once, his target was to prove the chronological sequence in Karafuto, on the platform of the stratigraphy of the sites. Thus his chronology created a fundament of archaeology in Sakhalin for long time. His articles of the Chinese type forts in Karafuto, the Jomon Potteries in Sakhalin and especially at the establishment of a chronology of prehistoric pottery in Sakhalin are very well known by Russian scholars and some of them have been translated and re-published in Sakhalin in 1990-s. Even now the classification of Professor Ito forms the structural system of the modern understanding of the prehistory of Sakhalin and the North of Hokkaido. This system heavily influenced archaeology of the Russian Far East, especially in the Low Amur basin, Sakhalin and the Kuriles. Even now we distinguish more then 20 type of pottery ; his system plays a role

of the Mendeleev table in our archaeology.

From this point of view the Sakhalin, Hokkaido and Kurils archaeological collection of Professor Ito Nobuo, which is kept in the Museum of Tohoku University plays a role of the typological etalon for archaeology of the Neolithic, Early Iron and Middle Age of the world of isles in the Northern Pacific. His ethnological collection has also a great importance, because those cultures of the Ainu and Uilta tribes of Sakhalin heavily changed and almost vanished since that time. That is why we understand his archaeological and ethnological collections as unique and significant phenomena which belong not only to Ainu and Japanese, but also to the Mankind.

Life and doings of such people as Professor Ito Nobuo become a bright example of the scholar's input in the world's science. He pointed a very good way for younger generations of the archaeologists, both, in Japan and Russia.

おわりに

1) 東北大学考古学陳列館には、1933・1934年に故伊東信雄博士(東北大学名誉教授)が旧樺太南部の考古学調査を実施された時の膨大な資料が保管されている。これらの遺跡と資料は、完形土器、石器、骨角器をはじめ、現在のサハリン考古学にとって、なお重要性をもつものと考えられる。サハリン島南部の先史文化についての研究は、戦前の日本人研究者による調査で編年・文化内容についての基礎的な理解がなされたが、戦後長い間、ロシア側の情報は断片的な状況にあった。1990年頃から、日ロ国際学術交流が再開され実質的な共同研究が始まりつつある。日本側では、旧ソ連時代を含めて、遺跡・遺物の現状と研究状況を理解することが求められ、それは日本列島先史時代の比較研究にとって極めて重要である。また、ロシア側にとっても、基準資料となっている旧樺太時代の調査資料の内容の把握、また日本考古学の最新の調査・分析技術を駆使した共同研究は、意義が大きく認められる現状である。1999年12月、サハリン国立大学考古学研究室のアレキサンダー・ワシリエフスキー教授(同大学歴史学科長)が来仙し、東北大学で伊東博士の調査資料を検討し、須藤隆教授(東北大学大学院文学研究科教授)・阿子島香教授(同)・柳田俊雄教授(同総合学術博物館)と、これらの遺跡・出土遺物についての日ロ共同研究の重要性と緊急性を確認した。2001年には須藤・阿子島・柳田は、ロシア連邦ウジノサ

ハリンスクを訪れ、サハリン国立大学人類科学研究所考古学研究室と東北大学大学院文学研究科考古学専攻分野との、考古学研究と調査のための相互協力協定を結び、次の事項について進めることで合意した。

1. 研究者の交流の促進
2. 共同研究の促進
3. 若手研究者の高度な訓練の支援
4. 刊行物および学術資料による情報交換

2) 1998年設置の東北大学総合学術博物館の考古学分野展示計画の中で故伊東信雄博士の調査資料が重要な貴重資料となっているため、2004年12月から2005年3月までワシリエフスキー教授を同館の客員教授として招聘し、この資料のデータベース化の基礎作業と研究を行っていただいた。

1. ここに掲載した資料は、故伊東信雄博士が1933・1934年に旧樺太中、南部で考古学調査を実施された時のものである。1933年に東海岸および亜庭湾沿岸、1934年には西海岸を調査されている。
2. これらの資料のデータベース化は、アレキサンダー・ワシリエフスキー教授が須藤隆教授、阿子島香教授、柳田俊雄教授と協議に基づいて作成したものである。また、同大学院文学研究科博士課程後期 羽石智治が作業を補佐した。
3. 作業は収納箱に整理番号を付し、当時命名された遺跡の日本名と住所を現在のロシア名と対照させ、ワシリエフスキー教授が遺跡の時期やその内容について評価を与えた。今回はその文章と表を掲載した。
4. 故伊東信雄博士が旧樺太南部で、考古学調査された遺跡について判明したものは写真地図に掲載した。
5. 掲載した土器、石器、骨角器、鉄器等の写真資料を一部掲載した。
6. 資料は収納箱に整理番号を付し東北大学考古学陳列館に所蔵・保管されている。

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 新潟武彦, 宇田川洋著 1990『サハリン南部の遺跡』

The list of the Professor of Tohoku Imperial University Ito Nobuo's collections, made up by him in Karafuto- Sakhalin during his personal scientific trip around the Middle and Southern parts of the island in 1933-1934. The collection is kept in the archaeological Exhibition building a Red Brick House in Katahira campus of Tohoku National University, Sendai, Japan

NN Of sites	NN In the map of Sakhalin	Site	Japanese name and address	Russian name and address	Archaeological culture or period & content	Box NO.	NN In Niicka/Uta Gawa book
1.	1	Higashi Taraika Kaizuka	Higashi Taraika Kaizuka in Shisuka district	Promyslovoye-1 shell mound in Poronaik district	Middle Age Pottery, shells, bones, bone tools	1-5	287-289
2.	47	Enoura Kaizuka A and B	Enoura Kaizuka in Rutaka district	Ozeretskoye site and farm in Aniwa district (district)	VII-X cc AD Pottery, shells, bones, bone tools	6-9 and 29	160
3.	48	Susuya Shell Mound	Susuya- Kita Kaizuka, Odomari district	Susuya-1, Korsakov district	V BC - X cc AD. Pottery, bones, bone an stone tools	10-12	161
4.	3	Kashiwahama	Kashiwahama site in northern part of SAKAEHAMA village in Otyai district	Starodubskoye-1 & 2 Village of Starodubskoye, Dolinsky district	VII-X cc AD Pit dwellings and surface collections.	14-16	233-234
5.	14-15	Raichishi	Raichishi, Tannai city, Esutoru district	Ust'-Ainskoye-1 site, Krasnogorsk town, Tomari district	V BC-V AD, XIII-XVII AD. Susuya or Esutiru pit dwelling and Ainu site artefacts	17-19	23
6.	6	Esutoru	Esutoru-1 Kawaguchi, Esutoru district	Ulegorsk-1, Ulegorsk town & district	V BC - V AD, surface collection-pottery	20	11-12 13-14?
7.	17	Rakuma	Rakuma, Maoka district	Mineral'noye village in Kholmsk district	surface collection of stone tools and pottery	21, 23	absent
8.	5	Tonnai	Tonnai kawaguchi, Tonnai mura, Odomari district	Okhotskoye-1, a site in the mouth of Tonaicha lake river in Okhotskoye village, Korsakov district	Stone tools, ENOURA type	22	226
9.	10	Horochi Kawaguchi	Horochi, Horochi village, Esutoru district	Porechie village, Ulegorsk district, Porechie_1 site in the mouth of Pokosnaya river	Rope and comb pattern, incised pottery of the Susuya, Esutoru and Enoura types	24.1	19
10.	9	Horochi Murakami Bokujo	Horochi Murakami Bokujo, Esutoru district	Possibly Porechie 5 ("Rodnik") on the sea side to the North from the river mouth of Porechie village, Ulegorsk district	Okhotsk culture Late Enoura and Minami Kaizuka pottery	24.2	absent
11.	11	Horochi Shogakku	Horochi Shogakku, Esutoru district	Porechie village, a site near place of Japanese school in Ulegorsk district	Enoura pottery and smaller incised <i>waffle comb pattern</i> fragment	24.3	absent
12.	7	Kita Usu	Kitausu, Esutoru district	Senogorie, Ulegorsk district	fragments of Enoura pottery, two axes, one chisel, blue glass bead (Ainu?) and a stone pestle	24.4	absent
13.	12	Naiko	Naiko, Esutoru district	Now Olshanka, Ulegorsk district	Enoura pottery	24.5	absent
14.	8	A place near Muri	Muri, Esutoru district ?	Unknown, possibly Ulegorsk district	Enoura-Minami pottery	24.6	absent
15.	54	Araguri	Araguri, Otomari district.	Now Arakul' is a place between Ozersk an Beregovoye villages of Korsakov district	Pottery of Susuya type	24.7	175
16.	53	Nagahama site	Nagahama site to the east of Nagahama village, Otomari district	Ozersk-1 site to the east of Ozersk village of Korsakov district	Stone implements, bone, pottery	24.8	173
17.	55	Mummyo	Mummyo- a living place near Muna-ko in Odomari district	Maloye Busse lake side, a campus in Korsakov district	Minami Kaizuka and Latest Enoura types pottery	24.9.	Maybe 184 or opposite side of the lake
18.	49	Minami Kaizuka	Minami Kaizuka site in Kaizuka village of Odomari district	Solovievka site in Solovievka village of Korsakov district.	Pottery of Minami Kaizuka type	25	164
19.	50	The finds in front of the religious monument to a horse	Kaizuka village of Odomari district	Solovievka site in Solovievka village of Korsakov district	Pottery and one hafted iron spear, Susuya and Okhotsk cultures	25.9	164
20.	21	Tobushi Jinja mae site	Tobushi Jinja mae or Ranetoi Jinja site in Ranetoi - a small place to the North from Tobushi, Honto district (according to Kimura Shinroku, artefacts were kept at school of Tobushi)	Solovyinyaya a small village to the North of Lovetskoye in Nevelsky district	<i>Typical Towada</i> and also Susuya pottery	26, 29	44
21.	22	Tobushi site	Tobushi gawa Ugan, Tobushi village of Honto district	Lovetskoye - a northern part of Nevelsk town	Surface collection of pottery and stone implements of the all types of Susuya and Okhotsk cultures, and also Epi-Jomon style decore.	27-28	45-46
22.	23	Tobushi 4-banchi site	Tobushi 4-banchi site, Tobushi village of Honto district	Lovetskoye-4, a valley site to the east of Lovetskoye - a northern part of Nevelsk town	surface collection of Susuya, Towada, Enoura and Minami Kaizuka types pottery and one unique Early Neolithic pottery fragment	29.	47
23.	24	Honto kaisuka site	Honto kaisuka or Minamihama - cho Kaizuka in the southern part of Honto town	NEVELSK 2 site- excavated site in the southern part of Nevelsk town	excavations of the multilayer Susuya to Okhotsk cultures and surface collection of stone, bone implements and pottery	30-31.	60
24.	25	Tokonbo site	Tokonbo site on the Japanese cemetery in the southern part of Honto town	Kazakevitchi - a southern area of Nevelsk town	Collection of Enoura type pottery from excavations of pits 1 and 2- stone, bone implements and pottery	32.	61 - : 63?
25.	30	Towada site	Towada gawa Sagan site in Towada village of Honto district	Pereputie 1 site in Pereputie- a place of a former village in the Nevelsk district in the middle of the way from Nevelsk to Krylyon	Surface collection and test pits pottery and stone tools including etalon Towada type and of Epi- Jomon	33-34	104
26.	40	Shiranushi	Shiranushi kaizuka and Shiranushi gawa Sagan under the castle of Shiranushi in Shiranushi village of Honto district	Site of the river under the Shironushi- Krylyonskoye gorodishe (castle) in Nevelsky district	Surface collection of pottery parts of Enoura type and a fragment of M. Kaizuka	35.	134-135

table 1

NN Of sites	NN In the map of Sakhalin	Site	Japanese name and address	Russian name and address	Archaeological culture or period & content	Box NO.	NN In Niioka/Uta Gawa book
27.	39	Minami Shiranushi	Minami Shiranushi site north to the Shiranushi village of Honto district	Teterevka river North side to the north from village of Krylyon in Nevelsky district	surface collections of Towada pottery	35	132
28.	38	Kita Shiranushi	Kita Shiranushi site in Shiranushi village of Honto district	Fastovka river side to the north from village of Krylyon in Nevelsky district	latest Enoura type pottery close to Minami K.	35	127-128
29.	28	Moshiro	Moshiro kaizuka site in Moshiro village of Honto district	Poyuarkovo site in Poyarkovo village of Nevelsky district	fragments of Early Iron and Middle Age pottery, stone implements	35	94
30.	27	Kita Moshiro,	Kita Moshiro site in Northern Moshiro village of Honto district	a site in a place of Ostrovki village between Poyarkovo and Volkovo villages of Nevelsky district	Pottery with rope and comb pattern	35	93
31.	26	Nayhoru	Nayhoru site in the town of Nayhoru	A site of Gornozavodskoye-3 in the slalom hill	Sony type pottery	35	72
32.	37	Hiretomo, Hisitomo? Hishiku?	Hisitomo village to the south from Sony and Kamoi, Honto district	A place in the mouth of Zamrailovka (Tuika) river, Nevelsk district	Pottery fragment and broken axe	35	125
33.	42	Minami Kohama	Kohama village near Krylyon cape in Rutaka district	A site a little to the north from Krylyon cape in Aniva district,	bottom of a vessel	35	Maybe 143
34.	20	Ranetoi	Ranetoi Kaizuka in Ranetoi village Honto district	Site in Solovynaya village of Nevelsky district near Lovetskoye	2 fragments of Enoura pottery	35	42
35.	36	Akaragawa,	Akara Kawaguchi site in Honto district between Sony and Siranushi in Neyra river	Neyra site in of Nevelsky district in Neyra river between Kuznetsovo and Krylyon	Pottery fragments of Epi-Jomon origin	35	124
36.	43	Hon-Kotan or Moto-kotan	Possibly a site of Kita Kotan in Kaiba to main seaport village place or Japanese telegraph station	Possibly place of village near the seaport in Moneron or Japanese telegraph station	Towada and Susuya pottery fragments	35	Try to look NO 137-142
37.	44	Kaiba To and Usu	Kaiba island, site unknown, possibly Japanese telegraph station (Usu?). And one more collection (Enoura pottery) must be from main seaport village place	Island of Moneron, site unknown, possibly Japanese telegraph station (Usu?). And one more collection (Enoura pottery) must be from main seaport village place	Susuya pottery fragment and one stone artefact And two more collections of Enoura pottery fragments including one from Usu	35	140
38.	45	Koromo Kauru	No information	No information	Pottery of Minami Kaizuka type	35	absent
39.	32	Nishi Urui	Nishi Urui a living place North from Sony in Honto district	A site in Vindis (Enchishi) river North from Kuznetsovo in Nevelsky district	One mattock made of andesite	35	112
40.	31	Togushi	Togushi kaizuka in Togushi small village in Honto district in the river mouth, both sides	A site in Krainyaya - former village in Selenga river in Nevelsky district	Susuya, Towada, Enoura, M.Kaizuka fragments of pottery	35	110
41.	29	Minami Nayoshi	A site in the river mouth in Minami Nayoshi town in Honto district	Site of Shebunino-1 in Shebunino village in Nevelsky district	Excavated Epi Jomon pottery fragments	35	97
42.	2	Horona	Horona is a small place near Naiba river in Otyai district between Naibuti and Sakaehama	Horona is a small place near Naiba river in Dolinsk district between Naiba bridge and Starodubskoye village	Iron spear point and a knife from Pit dwelling	36.1	411 vol. 2
43.	56	Tobuchi	Tobuchi site in the vicinity of Muraviev village of Korsakov - Odomari district in Busse lagoon shore not far from the small pond (Tobuchi lake).	Muraviev 4 site site in the vicinity of Muraviev village of Korsakov - Odomari district in Busse lagoon shore not far from the small pond (Tobuchi lake).	Pottery of Epi Jomon, types ANIVA A and TOBUCHI, stone implements	36.2	Absent Possible 178?
44.	13	Ushiro	Ushiro village of Esutoru district.	Orlovo of Ulegorsk district	Susuya and Enoura pottery and stone tools	36.3	22
45.	18	Anenai	Anenai village of Mauka district.	Berezhnoye of Kholmok district very near to the south from Zyryanskoye, to the south from the river of Sova	A bone and Susuya and Towada pottery	36.4	absent
46.	19	Tarantomari	Tarantomari village of Maoka district	Kalinino of Kholmok district	Susuya type adzes and pebble type net weights	36.5	365
47.	50	Derevka	Maybe it is a spoiled Russian word - which was a small group of Russian 1905 near Solovievka village	name of the village DAVYDOVKA ? peasants' houses of the time before	A point	36.6.	absent
48.	33	Sony Kaizuka	Sony village of Honto district	Kuznetsovo-1- the site situated in the mouth of the Kuznetsovka river in the sea side dune terrace in Kuznetsoo village of Nevelsk district	Pottery of Sony type and stone implements	37.1	113
49.	35	Sony sawa	Site of Sony sawa. in Sony village of Honto district	Kuznetsovo-5, situated in the Sony river side near the place of its inflow into the river of Kuznetsovka	Pottery of Enoura type and one fragment of Epi Jomon type	37.2-37.5	117
50.	34	Sony Bokujo	Sony Bokujo site situated in the road and on the pasture hill in Sony village of Honto district.	Kuznetsovo- 3-4 sites situated in the road (Kuznetsovo-4) and over the creek and the modern ponds on the pasture hill (Kuznetsovo-3) in Kuznetsovo village of Nevelsk district	Stone tools and pottery of Sony type	38	115
51.	4	Otsunaoka	Otsunaoka (Sakaehama chashi) is a part of the bigger site of Starodubskoye 3 in the southern part of Sakaehama village of Otyai district	A part (loci 3) of the bigger site of Starodubskoye 3 in the southern part of Starodubskoye village of Dolinsk district	Stone tools and pottery of Sony type, more earlier type and of Susuya and Okhotsk types	39_42	232
52.	46	Rutaka site	Rutaka Seikoji site in the Rutaka river side in Rutaka town	Rutaka - Lutoga site near the former hospital in the river side in Aniwa town	Stone tools and pottery of Susuya and Okhotsk types	43	375 vol. 2
53.			Odomari (precise place of the site unknown), Rantomari (NO 359 vol. 2), Raichishi (NO 32 vol. 1), Towada (NO 104 vol. 1), Meri (NO 170 vol. 1, less possible 383 vol.2), Tarantomari (NO 365 vol. 2), Otsunaoka (NO 232 vol. 1), Solovievka (NO 164 Vol 1.), Rakuma (absent), Enoura shell mound (NO 160 vol. 1), Higashi Taraika shell mound (NO 287-289 Vol 1.), Araguri (NO 175 vol. 1), Susuya (NO 161 vol. 1) artifacts are kept. Glass box 211 in the Red Brick House in Kathira				

table 2 Prepared by Vasilevski Alexander A. Tuesday, 01 March 2005

第1表 遺跡番号と所在地 (日本名)

No	地図上の位置	遺跡名 (日本名)	所在地名 (日本名)
1	1	東多来加貝塚	敷香郡敷香町字東多来加
2	47	江ノ浦貝塚 A, B	留多加郡留多加町大字河東字浜路
3	48	鈴谷貝塚	大泊郡千歳村大字貝塚
4	3	柏浜	豊栄郡栄浜村大字栄浜字栄浜
5	14-15	来知志	恵須取郡珍内町大字来知志字来知志
6	6	恵須取	恵須取郡恵須取町大字恵須取
7	17	柴磨	真岡郡真岡町
8	5	富内	大泊郡富内村大字富内字富内
9	10	幌千川口	恵須取郡鶴城村
10	9	幌千村上牧場	恵須取郡鶴城村
11	11	幌千小学校	恵須取郡鶴城村
12	7	北宇須	恵須取郡鶴城村
13	12	内湖	恵須取郡鶴城村
14	8	ムリの近傍?	恵須取郡
15	54	荒栗	大泊郡長浜村大字荒栗字荒栗
16	53	長浜	大泊郡長浜村大字長浜字東長浜
17	55	無名	大泊郡知床村
18	49	南貝塚	大泊郡千歳村大字貝塚字南貝塚
19	50	「馬の碑」前	大泊郡千歳村大字貝塚
20	21	遠節神社前	本斗郡本斗町大字遠節字遠節
21	22	遠節	本斗郡本斗町大字遠節字遠節
22	23	遠節 4 番地	本斗郡本斗町大字遠節字遠節
23	24	本斗貝塚	本斗郡本斗町
24	25	吐鯤保	本斗郡内幌町大字内幌字内幌番外地
25	30	十和田	本斗郡好仁村大字十和田字十和田
26	40	白主	本斗郡好仁村大字白主字白主
27	39	南白主	本斗郡好仁村大字白主字南白主
28	38	北白主	本斗郡好仁村大字白主字北白主
29	28	藻白	本斗郡好仁村大字白牛字藻白
30	27	北藻白	本斗郡好仁村大字白牛字藻白
31	26	内幌	本斗郡内幌町大字内幌字北浜通
32	37	菱苔	本斗郡好仁村大字白主字菱苔
33	42	南小浜	留多加郡能登呂村大字知志字小浜
34	20	良音問貝塚	本斗郡本斗町大字遠節字良音問
35	36	赤良川 (口)	本斗郡好仁村大字白主字鴨居泊
36	43	本古丹・元古丹	本斗郡海馬村大字古丹
37	44	海馬島・宇須	本斗郡海馬村大字古丹字宇須
38	45	海馬島・コロモカウイ	本斗郡海馬村
39	32	西宇類	本斗郡好仁村大字宗仁字西宇類
40	31	十串	本斗郡好仁村大字十串字十串
41	29	南名好	本斗郡好仁村大字南名好字南名好
42	2	幌名	豊栄郡栄浜村
43	56	遠淵 (ポントー?)	大泊郡遠淵村大字遠淵字遠淵
44	13	鶴城	恵須取郡鶴城村大字鶴城字鶴城
45	18	姉内	?
46	19	多蘭泊	真岡郡多蘭泊村
47	50	デレフカ	大泊郡千歳村
48	33	宗仁貝塚	本斗郡好仁村大字宗仁字宗仁
49	35	宗仁沢	本斗郡好仁村大字宗仁字宗仁
50	34	宗仁牧場	本斗郡好仁村大字宗仁字宗仁
51	4	乙名丘 (栄浜チャシ)	豊栄郡栄浜村大字栄浜字栄浜
52	46	留多加	留多加郡留多加町大字留多加字留多加
53	53	大泊	大泊郡大泊町

*遺跡名については、新潟武彦・宇田川洋著 1990『サハリン南部の遺跡』を参照した。

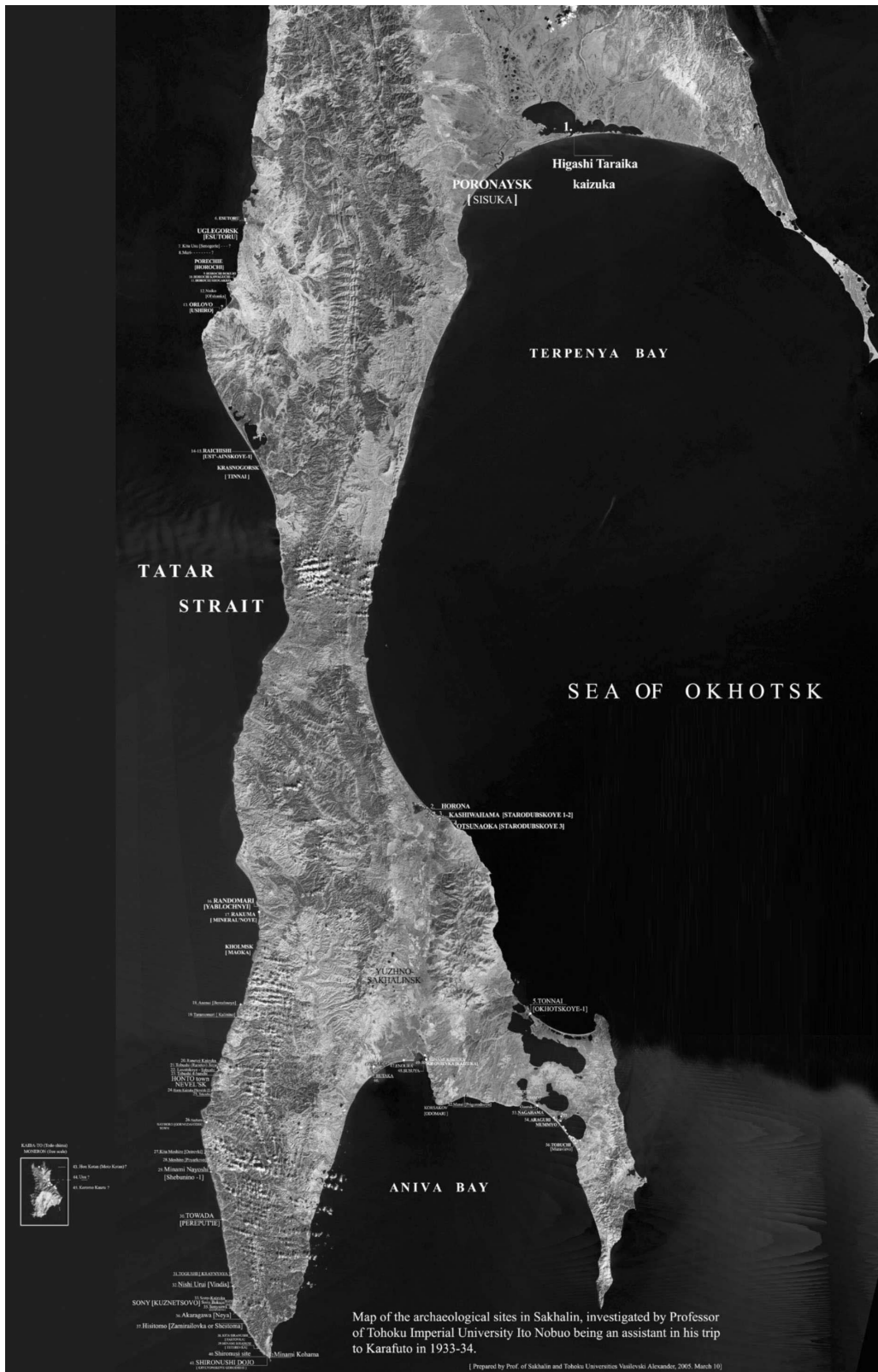


Plate 1

*The Original data is from <https://zulu.ssc.nasa.gov/mrsid/>



Plate 2

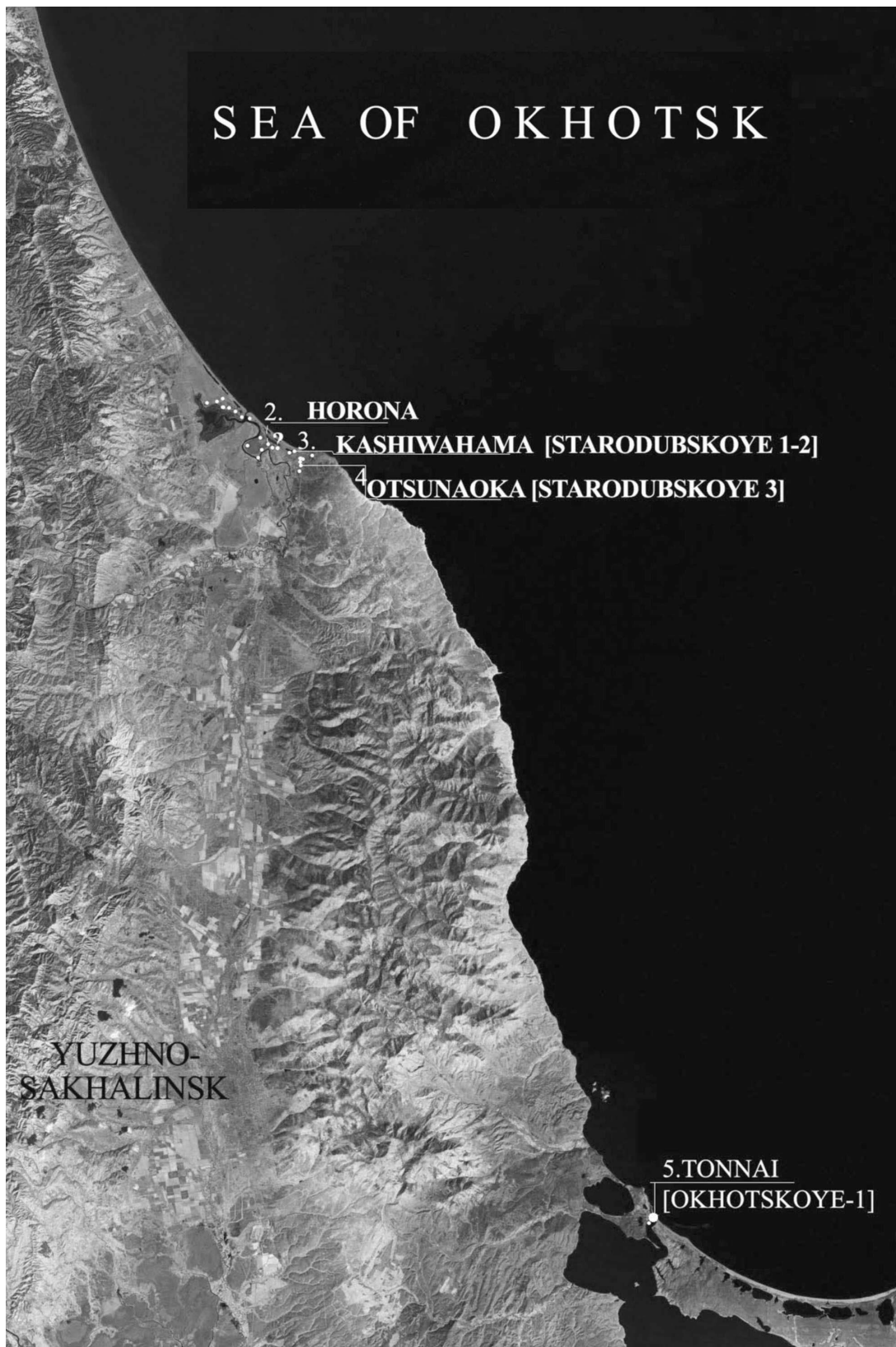


Plate 3

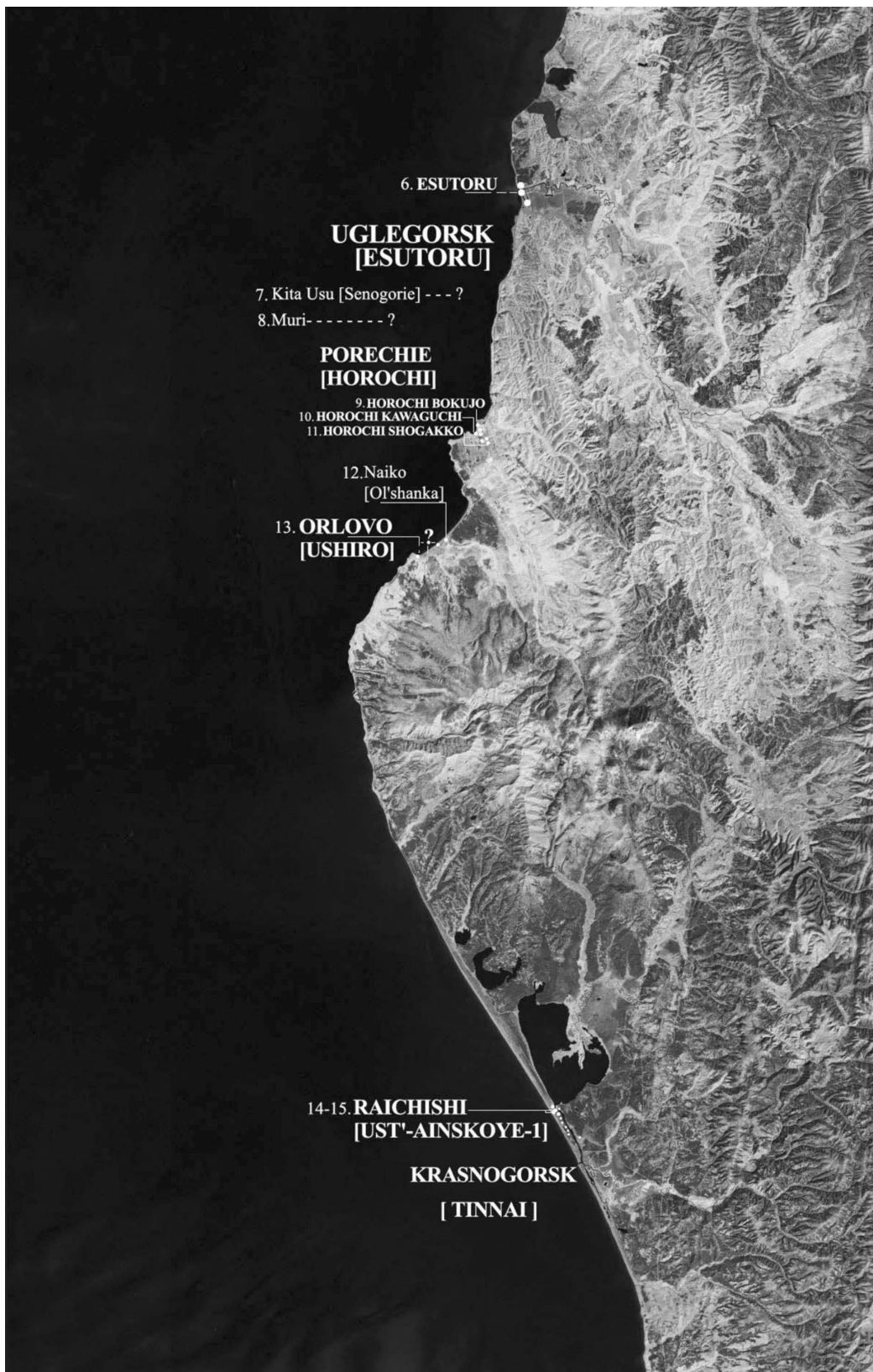


Plate 4

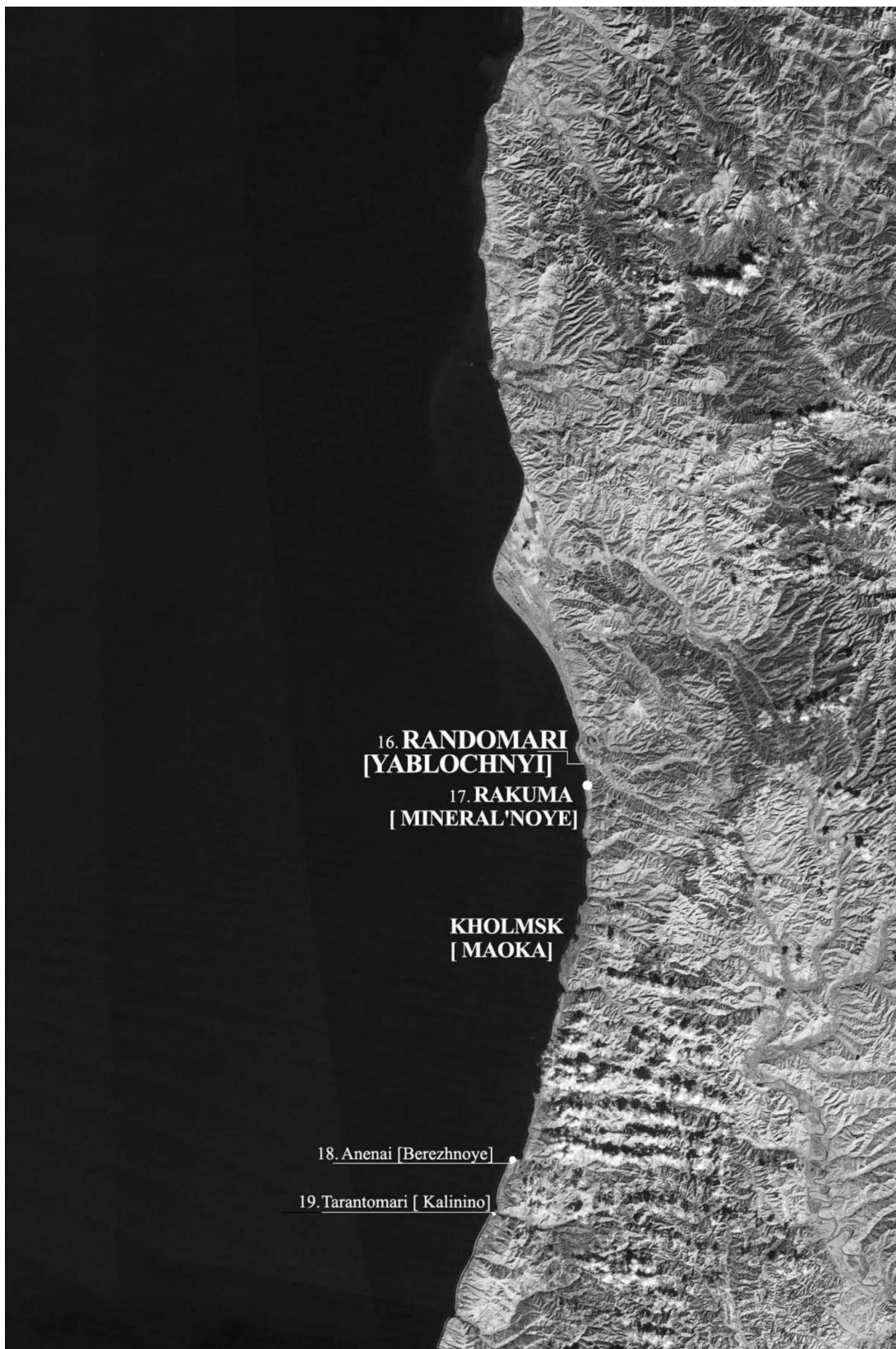


Plate 5

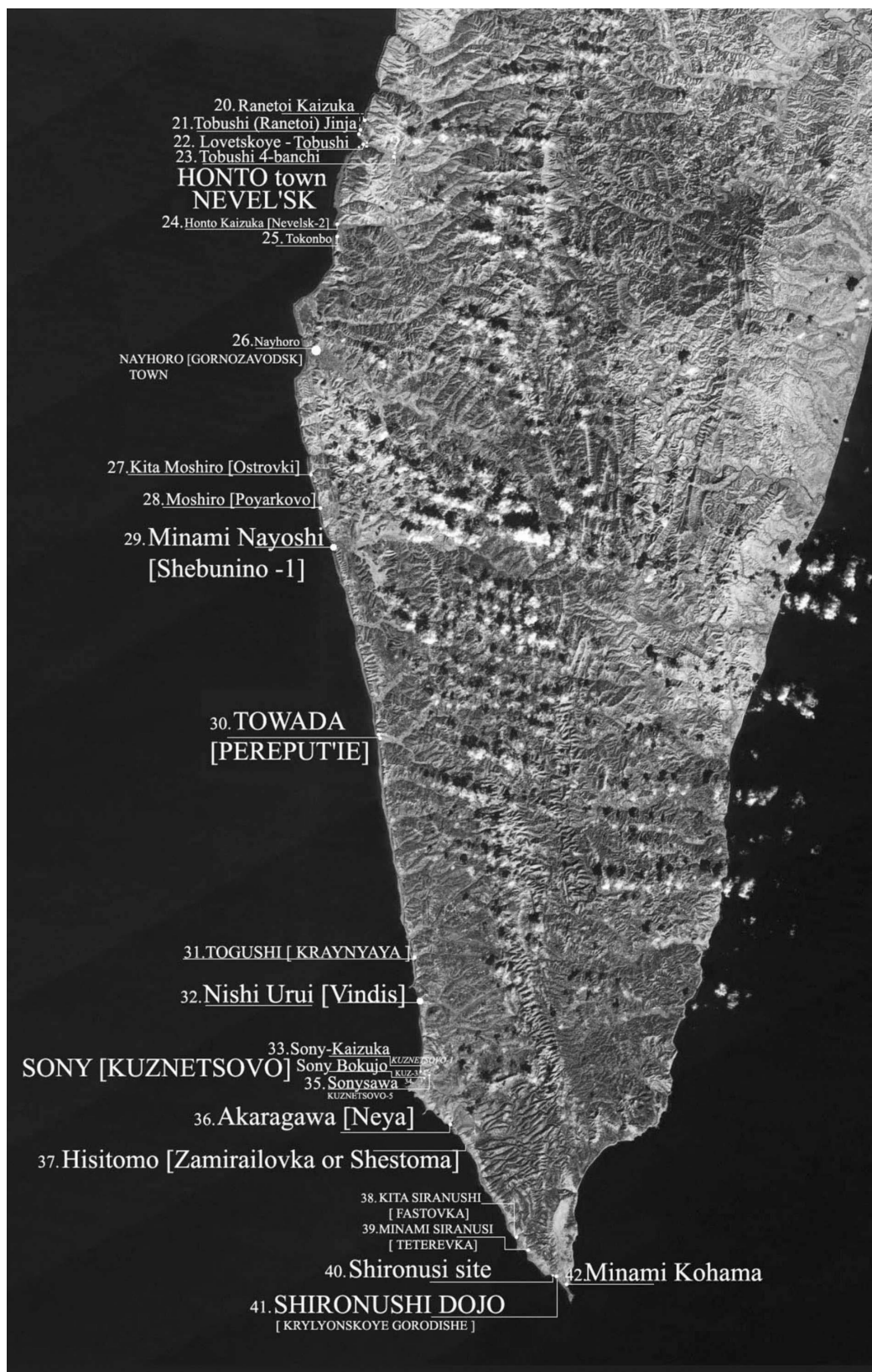
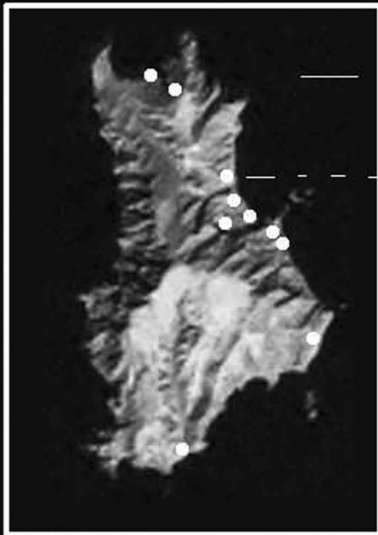


Plate 6

KAIBA-TO (Todo-shima)
MONERON (free scale)



43. Hon Kotan (Moto Kotan)?

44. Usu ?

45. Koromo Kauru ?



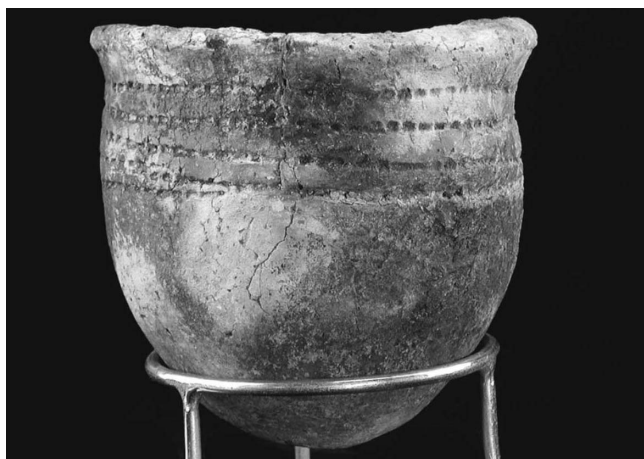
Plate 8



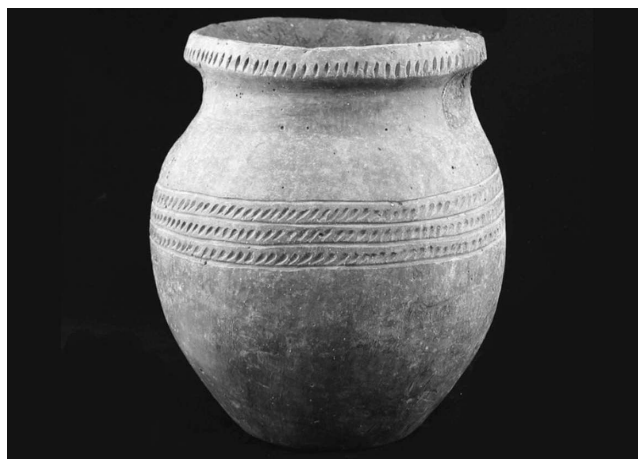
221.13-2 Otsunaoka (Soni type)
Overall height, 10.0 cm.



221.18-2 Randomari (Susuya type)
Overall height, 12.5 cm.



221.11-2 Tarantomari (Esutoru-Nabil type)
Overall height, 11.2 cm.



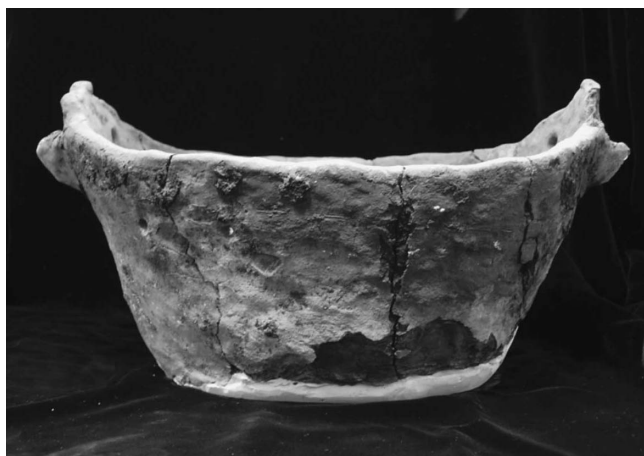
221.15-3 Kashiwahama (Enoura type)
Overall height, 15.5 cm.



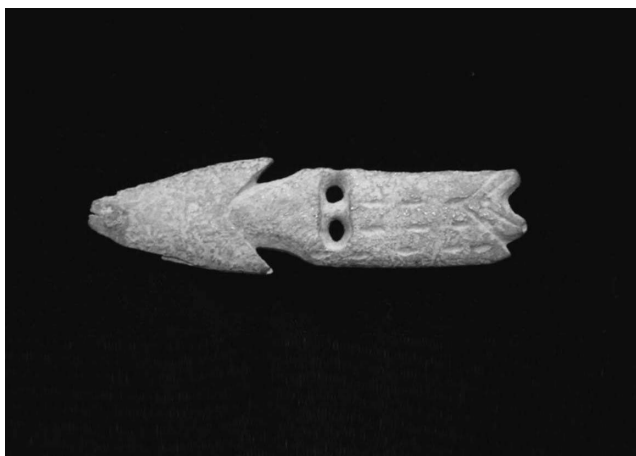
221.5-4 Randomari (Susuya-Towada type)
Overall height, 12.5 cm.



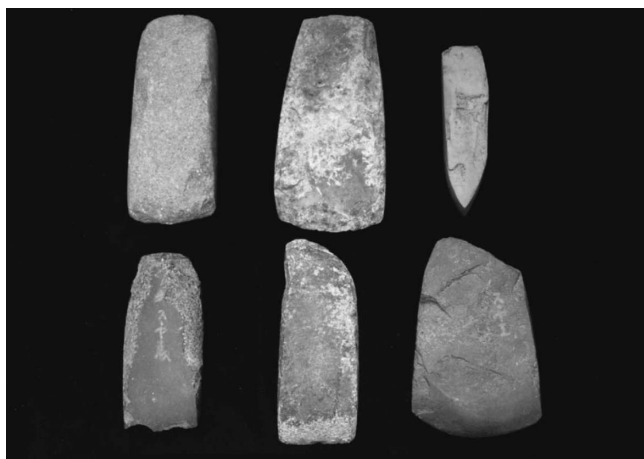
221.12-2 Tarantomari (Towada or Enouratype)
Overall height, 9 cm.



221.20-2 Raichishi (Naiji type)
Overall height, 16.5 cm.



221.31 Higashi Taraika shell mound
Length, 12 cm



221.36 Susuya shell-mound
Lower row Left, 9.2 cm.



221.30-2 Susuya shell-mound
Lower row 20.2 cm.



221.29-4 Enoura shell-mound
Right row, 13.2 cm.



36.1-3 Horona
Lower row, 21.6 cm.

Early Triassic (Olenekian) ammonoids from Khentey Province, Mongolia, and their paleobiogeographic significance

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Abstract. Early Triassic ammonoids (eight species of Kashmiritidae, Melagathiceratidae, Prionitidae, Flemingitidae ? and Palaeophyllitidae ?) from Mt. Saikhan Undur Ovoo area, Khentey Province, Mongolia are described in the first time. One new subgenus and one new species of the family Kashmiritidae (subgenus *Saikhanites* and species *Pseudoceltites (Saikhanites) khenteyensis*) are proposed. The fauna includes probable flemingitid ammonoids, common elements for Early Olenekian ammonoid faunas in both the Tethys and Boreal realms. The Early Olenekian age is also confirmed by the presence of *Juvenites* and prionitid ammonoids which closely resemble the Early Olenekian *Gurleyites* of the Tethys and *Arctopriionites* of the Boreal realm.

The ammonoid fauna of Khentey Province, consisting mainly of Tethyan type, allows us to draw a supposed Tethys–Boreal realm boundary during Early Triassic time between the Uda River (Khabarovsk region) in the north and Khentey (Mongolia) and Bolshiye Churki Range (Amur area) in the south. The presence of relatively rare typical Boreal elements in association with Tethyan ammonoids in the Olenekian ammonoid faunas of Khentey, Bolshiye Churki Range and South Primorye seems to be one of peculiarities of Olenekian sequences of peripheral parts of the Tethys. During Anisian time the Tethyan and Boreal realms seemed to be more isolated than in the Olenekian.

The existence of the ammonoid-bearing marine Triassic in Mongolia supports the idea that the Mongolia–Okhotsk Ocean between the Siberia and Mongolia–North China continents still existed during the Triassic.

Introduction

The Mongolia–Okhotsk Belt is a collision zone between the Siberia and Mongolia–North China continents, which had been separated by the Mongolia–Okhotsk Ocean (Zonenshain et al., 1990). Opinion is divided as the time of the final collision of these two continents, i.e. the closure of the Mongolia–Okhotsk Ocean: the end of the Permian (e.g., Wang, 1986; Wang and Liu, 1991), Triassic (Şengör and Natal'in, 1996), Triassic–Late Jurassic (Zonenshain et al., 1990), Early–Middle Jurassic (Zhao et al., 1990; Enkin et al., 1992) and Middle Jurassic (Zorin et al., 1995, 1998; Zorin, 1999). Wang and Liu (1991) stressed that the sediments changed from marine to terrestrial in Late Permian and Mesozoic marine sediments are lacking in the Mongolia–Okhotsk Belt. On the other hand, the Mesozoic collision concepts are supported by the paleomagnetic data and widely distributed subduction-related Mesozoic volcano–plutonic rocks along the belt. Triassic–Jurassic shallow marine sediments of the Onon and Aga–Borzya Zone (Zonenshain et al., 1990; Zorin et al., 1995, 1998; Zorin, 1999), distributed in the Russia–China–Mongolia border area, are circumstantial evidences for the surviving of the ocean between these two continents, although no Mesozoic ophiolite has been known from the Mongolia–Okhotsk Belt

in Mongolia. Shallow marine ammonoid-bearing Triassic strata have also been known in the Khentey Province of northeast Mongolia (Zonenshain et al., 1971; Badarch et al., 2002). This ammonoid-bearing Triassic is important for considering the closure time and the extent of the Mongolia–Okhotsk Ocean as well as for discussing details of Triassic ammonoid paleobiogeography of northeast Asia. Particulars about the Triassic ammonoid fauna, however, have not yet been described.

This paper contains a description of the Triassic ammonoid fauna recovered from the southern ridge of Mt. Saikhan Undur Ovoo of Khentey Province, Mongolia, and discussion on the biostratigraphic, paleobiogeographic and paleogeographic significances of the fauna.

Geological setting

In Mongolia marine Triassic strata with ammonoids have been known from two areas in the Khentey mountain region: the Mt. Saikhan Undur Ovoo area of Khentey Province and Chonyn Khudag area of Dornod Province. The Mt. Saikhan Undur Ovoo area is located in the Jargarant River basin, which is the upstream area of the Onon River (Fig. 1A). The Triassic of the area was first studied by Zonenshain et al. (1971) and later examined minutely by Akjigitov and Batmun-

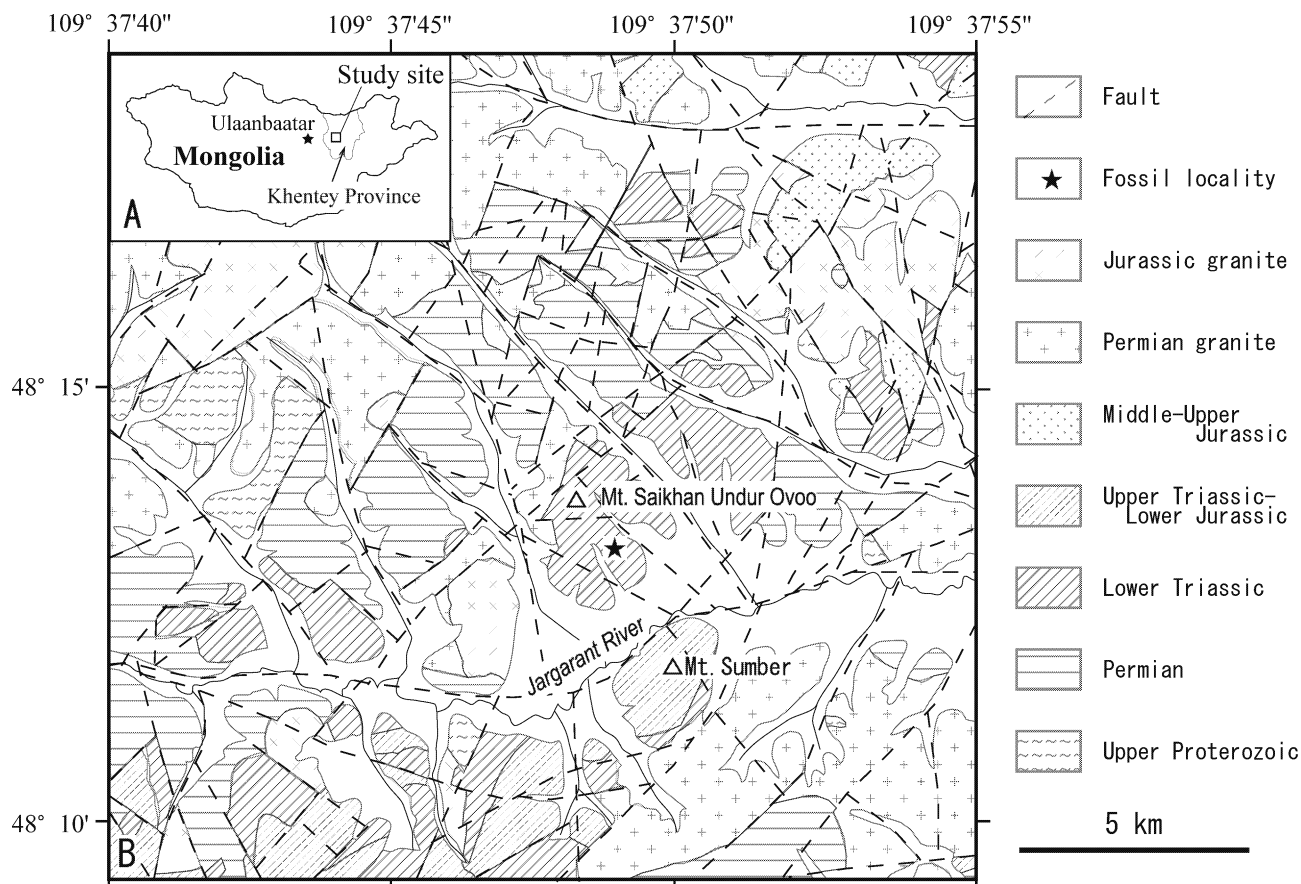


Figure 1. Index map (A) and geological map of the area around Mt. Saikhan Undur Ovoo, Umnudelger, Khentey Province, Mongolia (B) (from Akjigitov and Batmunkh, 1985).

kh (1985). Near Mt. Saikhan Undur Ovoo, north of Khentey village, Umnudelger, Khentey Province the Triassic covers unconformably the Permian sandstone and mudstone and Permian granite (Fig. 1B). It attains more than 1,000 m in thickness and consists of basal sandstone, thick sandstone, thick mudstone and their alternating beds. Full section around Mt. Saikhan Undur Ovoo area (Zonenshain *et al.*, 1971) is as follows:

1. Basal conglomerate20 m
2. Gray and pink gray, cross-bedded sandstone30 m
3. Black siltstone, with intercalated sandstone 20 m
4. Gray sandstone, with beds of black siltstone300 m
5. Black to dark gray mudstone and sandstone 40 m
6. Gray sandstone20 m
7. Black siltstone, with bivalves30 m
8. Gray, thin-bedded, siliceous sandstone, with beds of black mudstone100 m
9. Dark gray, carbonaceous mudstone, with bivalves and ammonoids5 m
10. Black mudstone and sandstone250 m
11. Alternating beds of dark gray sandstone, mudstone and siltstone10 m

12. Dark gray, fine-grained tuff10 m
13. Alternating beds of black mudstone, siltstone and sandstone250 m
14. Pink gray sandstone and black siltstone ...150 m.

We collected many ammonoid fossils in association with small bivalves from the calcareous sandy mudstone of this unnamed Triassic formation, which is the bed 9 of Zonenshain *et al.* (1971), distributed on the southern ridge of Mt. Saikhan Undur Ovoo (109°37'49"E, 48°13'16"N).

Age of the fauna

Zonenshain *et al.* (1971) listed such ammonoid species as *Euflemingites romundari* Tozer, *Anasibirites* cf. *ehimensis* Bando, *A. ? sp.*, *Prospingites* aff. *ovalis* Kiparisova and *Anakashmirites* sp. from bed 9 and concluded that the age of the fauna is Olenekian. The ammonoid specimens, however, have not yet been described.

Investigated mollusc collection by us from the southern ridge of Mt. Saikhan Undur Ovoo, Umnudelger (Khentey Province, Mongolia), is represented by eight ammonoid species of five genera belonging to Kashmiritidae, Melagathiceratidae, Prionitidae, Flemingitidae? and Palaeophyllitidae? families, one nautiloid species and some other small

STAGE	Substage	Mongolia (this paper)		South Primorye (Zakharov, 1997)	Bolshie Churki (Okuneva, 1990)	Japan (Bando, 1964; Bando and Shimoyama, 1974)	Chaohu (Tong et al., 2004)	Siberia (Dagys and Ermakova, 1993; Zakharov, 1996, 2002)		Arctic Canada (Tozer, 1994, with minor change)		
		Beds	Zone (Beds)		Zone (Beds)	Zone	Zone	Zone (Beds)		Zone		
OLENEKIAN	Upper (Russian)	—	<i>Subcolumbites multiphormis</i>	—	<i>Subcolumbites</i> Beds	<i>Subcolumbites</i>	<i>Subcolumbites</i>	<i>Olenekoceras spiniplicatus</i>	<i>Keyserling subrobustus</i> Beds	Spathian	<i>Keyserlingites subrobustus</i>	
			<i>Neocolumbites insignis</i>	—	—				<i>Parasibirites grambergi</i> Beds		<i>Subolenekites pilaticis</i>	
		Lower (Ayaxian)	—	<i>Tirolites-Amphistephanites</i>	<i>Tirolites ussuriensis</i> Beds	<i>Tirolites</i> Beds	—	<i>Columbites -Tirolites</i>	<i>Nondoplicheras contrarium</i>	<i>P. egorovi</i> <i>P. tuberculatus</i> <i>B. lenaense</i>	?	?
	<i>Bandoites dagysi</i> Beds				<i>B. ogonerense</i> <i>B. planorbis</i> <i>B. ekitensis</i>							
	<i>Pseudoceltites (Saikhanites) khenteyensis</i>		<i>Anasibirites nevolini</i>	—	<i>Anasibirites onoi</i>	<i>Anasibirites</i>	<i>Anasibirites</i>	<i>Anawasatchites tardus</i>	—	Smithian		
	INDUAN	—	—	<i>Hedenstroemia bosphorensis</i>	—	<i>Hedenstroemia bosphorensis</i>	<i>Owenites -Aspenites</i>	<i>Flemingites -Euflemingites</i>	<i>Lepiskites kolymensis</i>	<i>Hedenstroemia hedenstroemi</i>	Smithian	<i>Euflemingites romunderi</i>
Plant Beds (<i>Callipteris</i> ?)				<i>Hedenstroemia bosphorensis</i>	—	<i>Hedenstroemia bosphorensis</i>	<i>Owenites -Aspenites</i>	<i>Flemingites -Euflemingites</i>				<i>Hedenstroemia hedenstroemi</i>
—				<i>Gyronites subdharmus</i>	—	<i>Gyronites subdharmus</i>	<i>Entolium-Eumorphotis</i>	<i>Gyronites -Prionolobus</i>	—	<i>V. kuluensis</i> <i>V. (Tompoprotych) turgidus</i> <i>V. subtriang.</i>	Dienerian	<i>Vavilovites sverdrupi</i>
—				<i>Glyptoplicheras ussuriense</i> Beds	—	—			<i>Ophiceras -Lytophicerias</i>	<i>Tompophiceras morpheous</i>		<i>Bukkenites strigatus</i>
—	—	—	—	<i>Glyptoplicheras</i>	<i>Ophiceras -Lytophicerias</i>	<i>Otoceras boreale</i>	—	Gries.	<i>Otoceras boreale</i>			

Figure 3. Correlation of the Early Triassic ammonoid zones in the Tethys (Mongolia, Far East, South China) and Boreal realms. Abbreviations: *P. egorovi* - *Praesibirites egorovi*, *P. tuberculatus* - *Praesibirites tuberculatus*, *B. lenaense* - *Boreoceras lenaense*, *B. ogonerense* - *Boreoceras ogonerense*, *B. planorbis* - *Boreoceras planorbis*, *B. ekitensis* - *Boreoceras ekitensis*, *V. (Tompoprotych.) turgidus* - *Vavilovites (Tompoprotychites) turgidus*, *V. kuluensis* - *Vavilovites kuluensis*, *V. (T.) umbon.* - *Vavilovites (Tompoprotychites) umbonatus*, *V. subtriang.* - *Vavilovites subtriangularis*, Gries. - Griesbachian.

1997); *Hedenstroemia bosphorensis* (upper part) and *Anasibirites onoi* Zones of Bolshie Churki Range in Amur area (Okuneva, 1990); *Owenites-Aspenites* Zone (upper part) of the Iwai Formation at Iwai, near Tokyo (Sakagami, 1955; Kummel and Sakagami, 1960; Bando, 1964), *Anasibirites* Zone of the Taho Formation in Shikoku (Yehara, 1926; Spath, 1934; Shimizu, 1932; Shimizu and Jimbo, 1933), Japan; *Flemingites-Euflemingites* (upper part) and *Anasibirites* Zones of the Anhui Province in South China (Tong et al., 2004); *Hedenstroemia hedenstroemi* (upper part) and *Anawasatchites tardus* Zones of the Verkoyansk and Kolyma areas in Siberia (Popov, 1961; Zakharov, 1978, 1996; Dagys and Ermakova, 1993); and the *Euflemingites romunderi* and *Anawasatchites tardus* Zones of Arctic Canada (Tozer, 1994) (Fig. 3).

Paleobiogeography of the fauna

Kashmiritid genera, except for *Kashmirites*, are typical Tethyan faunistic elements of Olenekian age. Species of the genus *Kashmirites* were also widely distributed in the Tethys, but some of them have been found in the Lower Olenekian (Smithian) *Euflemingites romunderi* and *Wasat-*

chites tardus Zones of the Boreal realm (Tozer, 1994). Most of species of the Olenekian family Melagathiceratidae were distributed in both the Tethys and Boreal realms, but only species of the genus *Proharpoceras* are exclusively Tethyan ones. A part of prionitid genera (*Hemiprionites*, *Gurleyites*, ? *Albanites* and ? *Proavites*) has been found only within the Tethys, the rest (*Prionites*, *Anasibirites* and *Wasatchites*) in both the Tethys and the Boreal realms, but only two genera (*Arctoprionites* and *Anawasatchites*) (Tozer, 1994) were discovered in the Boreal realm. Prionitids from Mongolia are poorly preserved, but, as already stated previously, closely resemble *Arctoprionites* and *Gurleyites*. *Euflemingites* is a common element for both the Tethys and Boreal realms. On the other hand, *Flemingites* is restricted in the Tethys. Five genera (*Burijites*, *Paleophyllites*, *Eophyllites*, *Ussuriphyllites* and *Schizophyllites*) belonging to the Palaeophyllitidae have been discovered from the Tethys, but the rest (*Anaxenaspis* and *Leiophyllites*) from both the Tethys and Boreal realms. *Anaxenaspis* ? sp. from the Mt. Saikhan Undur Ovoo area most resembles *Anaxenaspis krafftii* Tozer (ribbing shells) from Arctic Canada, as mentioned earlier.

Thus the Olenekian ammonoid fauna from Mt. Saikhan Undur Ovoo, Khentey Province is fundamentally a Tethyan

type and the northeast Mongolia is considered to have belonged to the Tethyan faunal province during the Early Triassic. The ammonoid fauna, however, contains rare elements of the Boreal realm. The meaning of existence of the Arctic elements will be discussed in the next chapter.

Supposed position of the northern edge of the Tethys in Early Triassic time

Early Triassic ammonoid faunas of the Boreal type within the Northeast Russia area have been known from Taimir, Olenek Gulf area, Olenek River basin, Buur River basin, Lena River (lower reaches), West Verkhoyansk area, East Verkhoyansk area, Indigirka River (upper reaches), the origins of Kolyma River (Kenyelichi), Okhotsk (Taigonos) area, Zeya River (upper reaches) basin (Keyserling, 1845; Mojsisovics, 1886, 1888; Kiparisova and Popow, 1956; Popow, 1956, 1957, 1958, 1961; Domokhotov, 1960; Lazurkin and Korchinskaya, 1963; Vozin and Tikhomirova, 1964; Vavilov, 1964, 1965, 1967, 1969; Zakharov, 1969, 1970a, 1970b, 1971, 1974, 1978, 2002; Zakharov and Khudolozhkin, 1969; Vavilov and Lazovsky, 1970; Korostelev, 1972; Arkhipov, 1974; Zakharov et al., 1975; Vavilov and Zakharov, 1976; Bytchkov et al., 1976; Dagys et al., 1979; Ermakova, 1981; Dagys and Ermakova, 1988, 1990, 1996). The southern boundary of the Boreal realm is indicated to be situated not more northerly than the upper reaches of Uda River (Amur River basin) (Fig. 4), where *Olenikites* sp. (identified by one of the authors, Y.D. Zakharov), typical element of the Boreal Late Olenekian ammonoid fauna, was collected by E.P. Brudnitskaya. The occurrence of Boreal *Olenikites* in Bolshiye Churki Range, Low Khingan, another, more southern, area of the Amur River basin (Okuneva, 1990) has not been confirmed.

In eastern Asia only three regions with northern Tethyan Early Triassic ammonoid fauna had been known till now: Japan (Kitakami, Shikoku, Iwai, Nakano-tani) (Bando, 1964), South Primorye (Diener, 1895; Kiparisova, 1961; Zakharov, 1968, 1978, 1996, 1997; Zakharov et al., 2002, 2003, 2004; Markevich and Zakharov, 2004; Burij and Zharnikova, 1981) and Bolshiye Churki Range (Khabarovsk region, Lower Khingan terrane of the southern part of the Bureya Massif) (Bobylev and Okuneva, 1967; Okuneva, 1976, 1990; Zakharov, 1978). South Primorye and Bolshiye Churki Range seem to belong to a single faunistic province during the Early Triassic, because their Lower Triassic sequences are characterized by the same ammonoid species, such as *Gyronites subdarmus* Kiparisova, *Dieneroceras chaoi* Kiparisova, *Arctoceras septentrionale* (Diener), *Meekoceras boreale* Diener, *Prospiringitoides ovalis* (Kiparisova), *Parahedenstroemia nevolini* (Burij and Zharnikova) and *Euflemingites prinadai* (Kiparisova) (Okuneva, 1990), and by very similar species of such genera as *Churkites*, *Wasatchites*, *Tirolites*, *Arnautoceltites* and *Subcolumbites* (Okuneva, 1990; Zakharov, 1978; Markevich and Zakharov, 2004).

In the northern edge of the Tethys the Early Triassic ammonoid fauna consists mainly of the following genera, which have not been recovered for certain in the Boreal realm: *Ussuria*, *Parussuria*, *Metussuria*, *Parahedenstroemia*, *Epihedenstroemia*, *Churkites*, *Khvalinites*, *Dieneroceras*, *Pro-*

sphingitoides, *Pseudoprosphingites*, *Zhitkovites*, *Arnautoceltites*, *Owenites*, *Gyronites*, *Gurleyites*, *Inyoites*, *Gurleyites*, *Palaeokasachstanites*, *Proharpoceras*, *Hellenites*, *Neocolumbites*, *Columbites*, *Subcolumbites*, *Procolumbites*, *Prenkites*, *Preflorianites*, *Pseudoceltites*, *Amphistephanites*, *Tirolites*, *Bandoites*, *Tchernyshevites* and *Flemingites* ("F." *reticulatus* Tozer from British Columbia seems to be a representative of different genus). This is a strong argument in favor of significant isolation of the Boreal realm in the Early Triassic. At the same time the upper sequences of the Lower Triassic in both South Primorye (Zakharov, 1968; Zakharov et al., 2005) and Kitakami (Ehiro, 1993: described as *Keyserlingites*) contain ammonoids *Olenekoceras*, which is absent in other areas of the Tethys, but very typical for the *Olenikites spiniplicatus* Zone of Arctic Siberia. Some Keyserlingitids, closely resemble *Olenekoceras*, but with strong bituberculate sculpture, seem to be representatives of a new genus. We consider that "*Keyserlingites*" *miroshnikovii* Burij and Zornikova from South Primorye (Zakharov, 1968) and "*K.*" *stephensoni* from Idaho (Kummel, 1969) are representatives of a new genus of the family Keyserlingitidae. Besides, basal beds of the Olenekian in South Primorye yield very rare representatives of the genus *Hedenstroemia*, which is common for the Lower Olenekian in the Boreal realm and Himalayas, but absent in the tropical part of the Tethys (we do not agree with Shevyrev (1986) that *Meshedenstroemia* Zhao is a synonym of the *Hedenstroemia* Waagen). In the *Tirolites* Beds of South Primorye the ammonoid *Bajarunia* was discovered (Zakharov, 1978), which usually common for the Lower Triassic of Arctic Siberia (Dagys, 1984). These facts show that the Boreal and Tethys realms had nevertheless more or less short-term connections during Olenekian time. The presence of *Hedenstroemia*, *Olenekoceras* and, apparently, *Bajarunia* in association with typical Tethyan ammonoids seems to be one of peculiarities of Lower Triassic sequences of peripheral parts of the Tethys.

The newly described Early Triassic ammonoid fauna from Mt. Saikhan Undur Ovoo, Khentey Province in Mongolia allows us to expect the Tethys-Boreal realm boundary was located just north of the Khentey area and Bolshiye Churki Range. Because, the Mt. Saikhan Undur Ovoo ammonoid fauna is fundamentally a Tethyan type, but contains rare elements of the Boreal realm, same as those from Bolshiye Churki Range and South Primorye.

During Anisian time the Tethyan and Boreal realms seemed to be more isolated than in the Olenekian. Because, Boreal elements are more rare in the Anisian ammonoid assemblages in the Tethys. For example, the earliest Anisian ammonoid fauna of South Primorye is composed mainly of Tethyan genera, and contains only a single typical Boreal-type element, *Arctohungarites* (Zakharov, 1968; Zakharov and Rybalka, 1987). Outside of the Boreal realm representatives of *Arctohungarites* are also known in the Lower Anisian of Central Qinghai, China (He et al., 1986; Shevyrev, 1995). The genus *Arctohungarites* originated, apparently, at the beginning of the Anisian in the Tethys and migrated later (mainly in middle Early Anisian) to high latitudes.

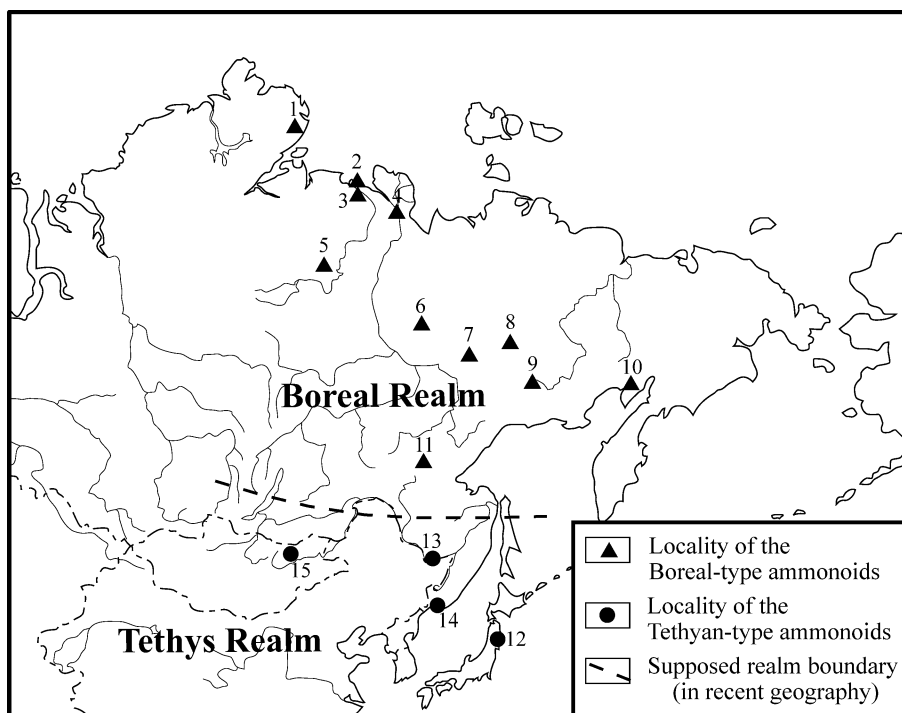


Figure 4. Main ammonoid localities and supposed position of the Tethys-Boreal realm boundary in northeast Asia during Early Triassic time. 1 - Taimir, 2 - Olenek Gulf, 3 - Olenek River (lower reaches), 4 - Buur River basin, 5 - Lena River (lower reaches), 6 - Western Verkhoyansk area, 7 - Eastern Verkhoyansk area, 8 - Indigirka River (upper reaches), 9 - Kolyma River basin (Kenjelichi), 10 - Okhotsk (Taigonos) area, 11 - Uda River basin, 12 - Japan (Kitakami), 13 - Bolshiye Churki Range, 14 - South Primorye, 15 - Khentey (Mongolia).

Paleogeographic significance of the fauna

The *Pseudoceltites* (*Saikhanites*) *khenteyensis* Bed in the Mt. Saikhan Undur Ovoo area, Khentey Province is intercalated in the thick terrigenous clastic sequence of unnamed Triassic formation, which is widely distributed in the area. The widely distributed marine Olenekian strata offer us a circumstantial evidence for the existence of the Mongolia-Okhotsk Ocean in the Mongolia-Okhotsk Belt of Khentey Province at least during the Early Triassic time.

The Olenekian strata of the Mt. Saikhan Undur Ovoo area and of the Bolshiye Churki Range, to the east of Khentey Province, are considered, probably, to be deposited on the northern continental shelf of the Mongolia-North China continent of Zonenshain *et al.* (1990), because these localities belonged to the northern peripheral zone of the Tethyan ammonoid faunal realm as discussed above. Since the southern part of Mongolia and Inner Mongolia already changed to the continental environment in Late Permian time (Wang and Liu, 1991), the warm water current from the low latitudinal part of Tethys or Panthalassa must have flowed into the Mt. Saikhan Undur Ovoo area through the South Primorye and Bolshiye Churki Range area. Accordingly the northern continental margin of the Mongolia-North China Continent is considered to had extended east to west or east-southeast to west-northwest, not northeast to southwest. This reconstruction of continental arrangement is the

same as those of Zorin *et al.* (1998) and Zorin (1999), mainly based on the paleomagnetic data (Zhao *et al.*, 1990; Pruner, 1992).

Systematic Description

By Y.D. Zakharov and M. Ehiro

All specimens described here were collected from the Lower Olenekian *Pseudoceltites* (*Saikhanites*) *khenteyensis* Beds at the southern ridge of Mt. Saikhan Undur Ovoo, Umnudelger area, Khentey Province, Mongolia, and are stored in the Tohoku University Museum, Sendai, Japan.

Order Ceratitida Hyatt, 1884

Superfamily Dinaritoidea Mojsisovics, 1882

[nom. transl. Shevyrev, 1968 (ex Dinaritidae Mojsisovics, 1882)]

Family Kashmiritidae Spath, 1930

Genus *Pseudoceltites* Hyatt, 1900

Pseudoceltites: Hyatt, 1900, p. 558; Spath, 1934, p. 239; Arkell *et al.*, 1957, p. L142; Kiparisova and Popow, 1958, p. 31; Kummel, 1969, p. 437, Shevyrev, 1986, p. 88 (pars).

Type species.—*Celtites multiplicatus* Waagen, 1895; Upper Ceratite Limestone of the Salt Range.

Composition.—1. Subgenus *Pseudoceltites* Hyatt, 1900 ;
2. Subgenus *Saikhanites* Zakharov and Ehiro, subgen. nov.

Subgenus ***Saikhanites*** Zakharov and Ehiro, subgen. nov.

Type species.—*Pseudoceltites (Saikhanites) khenteyensis* sp. nov. ; Lower Olenekian of Mongolia.

Diagnosis.—Shell discoidal, evolute, sculptured like *Pseudoceltites*. Distinguished from subgenus *Pseudoceltites* by having goniatitic suture-line (or ceratitic one with very small denticulations).

Species assigned.—Two species: *Pseudoceltites (Saikhanites) khenteyensis* sp. nov. and *Pseudoceltites (Saikhanites)* sp. from Lower Olenekian of Mongolia.

Etymology.—Name from Mt. Saikhan Undur Ovoo (Mongolia).

Pseudoceltites (Saikhanites) khenteyensis Zakharov
and Ehiro, sp. nov.

Pl. I, Figs. 1-20

Materials.—IGPS coll. cat. no. 109651 (holotype) and paratypes : IGPS coll. cat. no. 109652-109670.

Description.—Shell discoidal, evolute, venter broadly rounded (Pl. I, Figs. 13c, 14c, 17c, 18c, 20c), flattened at inner whorls (Pl. I, Fig. 6b), with rounded ventral shoulders ; umbilicus very wide with rounded umbilical edge. Broad folds extending across the venter from the prominent parts of ribs located at the ventro-lateral area. The flattened lateral areas bear strong radial ribs that begin on umbilical shoulder and become significantly thicker at ventral shoulder.

Sutures shown in Figure 5. Three lateral saddles at the external part of the suture. The large first lateral saddle lies near the ventral shoulder, the smaller second lateral saddle lies near umbilical shoulder and smallest one on the umbilical wall. Suture goniatitic, no denticulations at the base of U-shaped lobe, the smaller next lobe locates on the umbilical shoulder.

Comparison.—The present species most resembles *Pseudoceltites (Pseudoceltites) cheneyi* Kummel (1969, p.

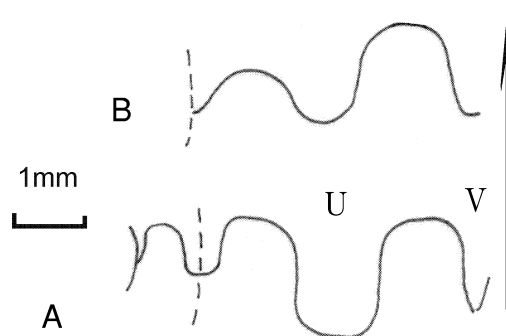


Figure 5. Suture lines of *Pseudoceltites (Saikhanites) khenteyensis* sp. nov. A, IGPS coll. cat. no. 109651 (holotype), at H=6.9 mm ; B, IGPS coll. cat. no. 109657, at H=5.8 mm ; *Pseudoceltites (Saikhanites) khenteyensis* Bed on the southern ridge of Mt. Saikhan Undur Ovoo, Umnudelger, Khentey Province.

438, pl. 44, figs. 4-11) from the Upper Olenekian Thaynes Formation, the *Columbites* Zone, of southeastern Idaho, but differing in its somewhat more evolute shell and simpler (goniatitic) suture-line.

Distribution.—Mongolia, Lower Olenekian.

Etymology.—The name from Khentey Province (Mongolia).

Pseudoceltites (Saikhanites) sp.

Pl. II, Figs. 1-9

Materials.—Nine poorly preserved specimens and some juvenile shells and shell fragments, IGPS coll. cat. no. 109671-109679.

Description.—Shell discoidal, from semi-evolute to evolute, laterally compressed ; venter rounded, with rounded ventral shoulders ; umbilicus wide with abruptly rounded umbilical edge. Very weak folds across the venter extending from the prominent parts of ribs located at the ventro-lateral area. Flanks covered with strong radial ribs that begin on umbilical shoulder and become significantly thicker at ventral shoulder.

Measurements (mm)

Specimen number (IGPS coll. cat. no.)	D	H	W	U	H/D	W/D	U/D
109651 (holotype)	34.8	11.0	—	16.1	0.31	—	0.46
109652	59.4?	12.2?	—	34.9	0.21?	—	0.59?
Same specimen	48.2	12.0?	—	23.6	0.25?	—	0.49
109653	51.7	13.7	—	24.5	0.26	—	0.47
109654	ca. 47	18.0	—	ca. 28	0.38	—	0.60±
109655	39.0	11.0	—	19.0	0.28	—	0.49
109656	33.3	9.6	—	14.5	0.29	—	0.44
109657	27.8	8.7?	—	14.7	0.31	—	0.53
109658	26.1	8.8	—	12.7	0.34	—	0.49
109659	—	6.2	5.6?	—	—	0.28?	—
109660	19.2	5.2?	—	8.8	0.27	—	0.46
109661	17.9	6.0	—	8.1	0.34	—	0.45
109662	17.4	4.3	3.2?	9.7	0.25	0.18?	0.56
109663	14.9	5.0	—	6.6	0.34	—	0.44

Measurements (mm)							
Specimen number (IGPS coll. cat. no.)	D	H	W	U	H/D	W/D	U/D
109671	42.5	14.9	–	18.4	0.35	–	0.43
109672	42.0	13.6	11.0?	17.2	0.32	0.26?	0.41
109673	26.7	8.0	–	11.1	0.30	–	0.42
109674	24.2	9.3	–	9.0	0.38	–	0.37
109675	24.1	9.4	–	10.3	0.39	–	0.43
109676	9.9	3.2	2.2?	3.7	0.32	0.22?	0.37

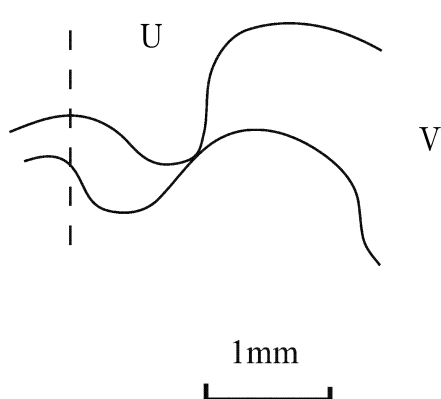


Figure 6. Suture lines of *Pseudoceltites (Saikhanites)* sp., IGPS coll. cat. no. 109676, at H=3.9 mm; *Pseudoceltites (Saikhanites) khenteyensis* Bed on the southern ridge of Mt. Saikhan Undur Ovoo, Umnudelger, Khentey Province.

Suture lines shown in Figure 6. Suture goniatic. Two lateral saddles at external part of the suture. Lower and broad first lateral saddle lies near the ventral shoulder and the smaller second lateral saddle on the umbilical shoulder. U-shaped lobe between them; the smaller next lobe locates, apparently, on the umbilical edge.

Comparison.—This species is very similar to *Pseudoceltites (Saikhanites) khenteyensis* sp. nov. described above, but differs by having more involute shell and broader lateral saddles of the suture.

Distribution.—Mongolia, Lower Olenekian.

Family Melagathiceratidae Tozer, 1971

Genus **Juvenites** Smith, 1927

Type species.—*Juvenites krafftii* Smith, 1927

Juvenites sp.

Pl. II, Fig. 21

Measurements (mm)							
Specimen number (IGPS coll. cat. no.)	D	H	W	U	H/D	W/D	U/D
109680	19.1?	8.8	–	–	0.46?	–	–

Measurements (mm)							
Specimen number (IGPS coll. cat. no.)	D	H	W	U	H/D	W/D	U/D
109681	5.8?	2.5?	5.1	2.0	0.43?	0.88	0.34?

Material.—One poorly preserved specimen, IGPS coll. cat. no. 109680.

Description.—Small semi-evolute shell with arched venter and flattened flanks. Ventral shoulders rounded; umbilicus rather narrow with abruptly rounded umbilical edge. Venter and flanks ornamented with numerous radial constrictions and ribs.

Suture-line unknown.

Comparison.—The most closely comparable species is *Juvenites needhami* Tozer (1994, p. 54, pl. 22, figs. 5, 6) from the Lower Olenekian (Smithian). The main difference is that the Mongolian specimen has more involute shell. But further comparison is impossible because of lacking data of suture-line of the described species.

Distribution.—Mongolia, Lower Olenekian.

Melagathiceratidae gen. and sp. indet.

Pl. II, Figs. 22a, b

Material.—One poorly preserved specimen, IGPS coll. cat. no. 109681.

Description.—Small semi-evolute shell with broadly arched venter; venter joining with short flanks without ventral shoulders; umbilicus rather narrow with abruptly rounded umbilical edge. Venter and flanks ornamented with numerous radial constrictions and ribs, having small tubercles on the umbilical edge.

Suture-line unknown.

Comparison.—Similar fossils were recently collected by Y.D. Zakharov in Lower Olenekian sequences of the *Hedenstroemia bosphorensis* and *Anasibirites nevolini* Zones of the Abrek and Artyom sections of South Primorye. They seem to belong to a new genus and new species of the family Melagathiceratidae, which have not been described yet.

Distribution.—Mongolia, Lower Olenekian.

Superfamily Meekoceratoidea Waagen, 1895

[nom. transl. Spath, 1934 (ex Meekoceratidae Waagen, 1895)]

Family Prionitidae Hyatt, 1900

Prionitidae gen. and sp. indet.

Pl. II, Figs. 10–13

Materials.—Six poorly preserved specimens, IGPS coll. cat. no. 109682–109685.

Description.—Shell discoidal, from semi-involute, laterally compressed; venter apparently tabulate with abruptly rounded ventral shoulders; umbilicus rather narrow with rounded umbilical edge. Umbilical and central parts of the flanks covered with strong radial ribs, slightly curved in the middle parts of the flank.

Sutures shown in Figure 7. First lateral saddle somewhat lower than the second one; U-lobe with seven denticles at its base and in the lower part of a wall; middle and umbilical parts of the suture-line not preserved.

Comparison.—This species resembles some Olenekian representatives of the family Prionitidae (*Gurleyites* and *Arctoprionites*). From *Gurleyites armatus* (Welter) from the Lower Olenekian *Owenites egrediens* Beds (Block "P") in Timor (Welter, 1922, p. 135, pl. 166) and *Anasibirites nevolini*

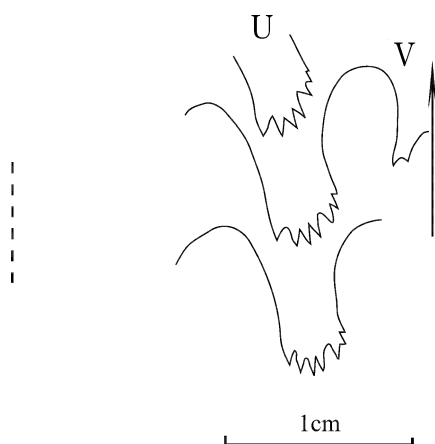


Figure 7. Suture lines of Prionitidae gen. and sp. indet., IGPS coll. cat. no. 109682, at H=28.6 mm; *Pseudoceltites* (*Saikhanites*) *khenteyensis* Bed on the southern ridge of Mt. Saikhan Undur Ovoo, Umnudelger, Khentey Province.

Measurements (mm)

Specimen number (IGPS coll. cat. no.)	D	H	W	U	H/D	W/D	U/D
109682	80?	37?	10?	18.8?	0.46?	0.13?	0.24?
109683	77?	39.2?	–	12.8?	0.51?	–	0.17?
109684	58.3	28.8?	–	12.9	0.49?	–	0.22
109685	48.5	22.1	–	14.0	0.46	–	0.29

Measurements (mm)

Specimen number (IGPS coll. cat. no.)	D	H	W	U	H/D	W/D	U/D
109686	13.2	4.8	2.5?	6.2	0.36	0.19?	0.47

Zone of South Primorye (Zakharov, 1968, p. 127, pl. 23, fig. 9) it differs in having somewhat more evolute shell and more denticulated U-lobe; from *Arctoprionites williamsi* Tozer from the Lower Olenekian (Smithian) *Anawasatchites tardus* Zone of British Columbia (Tozer, 1994, p. 83, pl. 34, Fig. 1–4) it is distinguishable by lacking the bullae near the umbilical margin; from *Arctoprionites prontchischevi* Zakharov from the Upper Olenekian *Olenikites spiniplicatus* Zone of Arctic Siberia (Zakharov, 1978, p. 183, pl. 11, Fig. 3, 4) differs by different proportions of the lateral saddles: the first lateral saddle of Mongolian species is somewhat lower than its second lateral saddle.

Distribution.—Mongolia, Lower Olenekian.

Superfamily Ussuritoidea Hyatt, 1900

[nom. transl. Zakharov, 1979 (ex Ussuritidae Hyatt, 1900)]

Family Flemingitidae Hyatt, 1900

Genus *Flemingites* Waagen, 1892

Type species.—*Ceratites flemingianus* de Konick, 1863

Flemingites ? sp. indet.

Pl. II, Figs. 14, 15

Materials.—Two poorly preserved specimens, IGPS coll. cat. no. 109686, 109687.

Description.—Shell discoidal, evolute, with rounded ventral shoulders; flanks laterally compressed; umbilicus wide, with rounded umbilical edge; surface ornamented with regular spiral ridges and radial ribs, folds and rare constrictions. Suture-line unknown.

Comparison.—This species resembles some flemingitid ammonoids from the Lower Olenekian *Hedenstroemia bosphorensis* Zone of South Primorye described as *Flemingites radiatus* Waagen (Zakharov, 1968, p. 86, pl. 15, Fig. 2), but differs in having more evolute shell.

Distribution.—Mongolia, Lower Olenekian.

Genus *Euflemingites* Spath, 1934

Type species.—*Flemingites guyerdetiformis* Welter, 1922

Euflemingites ? sp. indet.

Pl. II, Figs. 16–19

Materials.—Four fragmental shells, IGPS coll. cat. no. 109688–109691.

Description.—Shell discoidal, with diameter less than 40

Measurements (mm)							
Specimen number (IGPS coll. cat. no.)	D	H	W	U	H/D	W/D	U/D
109688	30.5?	12.6	–	10.4	0.41	–	0.34

mm, semi-evolute, with rounded venter and ventral shoulders; flanks laterally compressed; umbilical edge rounded; surface with strong, regular spiral ridges, but no radial ornamentation.

Suture-line unknown.

Comparison.—In view of its shell form and sculpture ornamentation this species resembles *Euflemingites prynadai* (Kiparisova) from the Lower Olenekian *Hedenstroemia bos-phorensis* Zone of South Primorye (Kiparisova, 1961, p. 76, pl. 15, Fig. 1) and *Euflemingites romundari* Tozer from the Lower Olenekian (Smithian) Blind Fiord Formation of Arctic Canada (Tozer, 1994, p. 72, pl. 25, Fig. 4 and 5). From *Euflemingites* cf. *tsotengensis* Chao from the *Flemingites–Euflemingites* Zone of the Yinkeng Formation (Tong *et al.*, 2004, p. 200, pl. 2, figs. 13–15) it differs by more involute shell and stronger spiral ridges.

Distribution.—Mongolia, Lower Olenekian.

Family Palaeophyllitidae Popow, 1958

Genus *Anaxenaspis* Kiparisova, 1956

Type species.—*Xenaspis orientalis* Diener, 1895

Anaxenaspis ? sp.

Pl. II, Fig. 20

Material.—One poorly preserved specimen, IGPS coll. cat. no. 109692.

Description.—Shell discoidal, semi-evolute; flanks gently convex; umbilicus moderately wide with rounded umbilical edge; flanks covered with numerous strong radial ribs.

Suture-line unknown.

Measurements (mm)							
Specimen number (IGPS coll. cat. no.)	D	H	W	U	H/D	W/D	U/D
109692	ca. 31	9.5	–	9.2	0.31 ±	–	0.30 ±

Comparison.—This species is similar to *Anaxenaspis krafftii* Tozer (1994, p. 74, pl. 23, Fig. 2, 3) from the Lower Olenekian (Smithian) *Euflemingites romundari* Zone of Ellesmere Island, Arctic Canada in forms of strong and very frequent radial ribs. A comparison is impossible because of lacking information of suture-line of the Mongolian species. From *Anaxenaspis orientalis* Kiparisova (Diener, 1895, p. 41, 44, pl. 3, Fig. 3; Kiparisova, 1961, p. 53, Fig. 10, Fig. 1; Zakharov, 1968, p. 51, pl. 2, figs. 1–3, pl. 3, figs. 1, 2) it differs by its involute shell and stronger ribs.

Distribution.—Mongolia, Lower Olenekian.

Acknowledgments

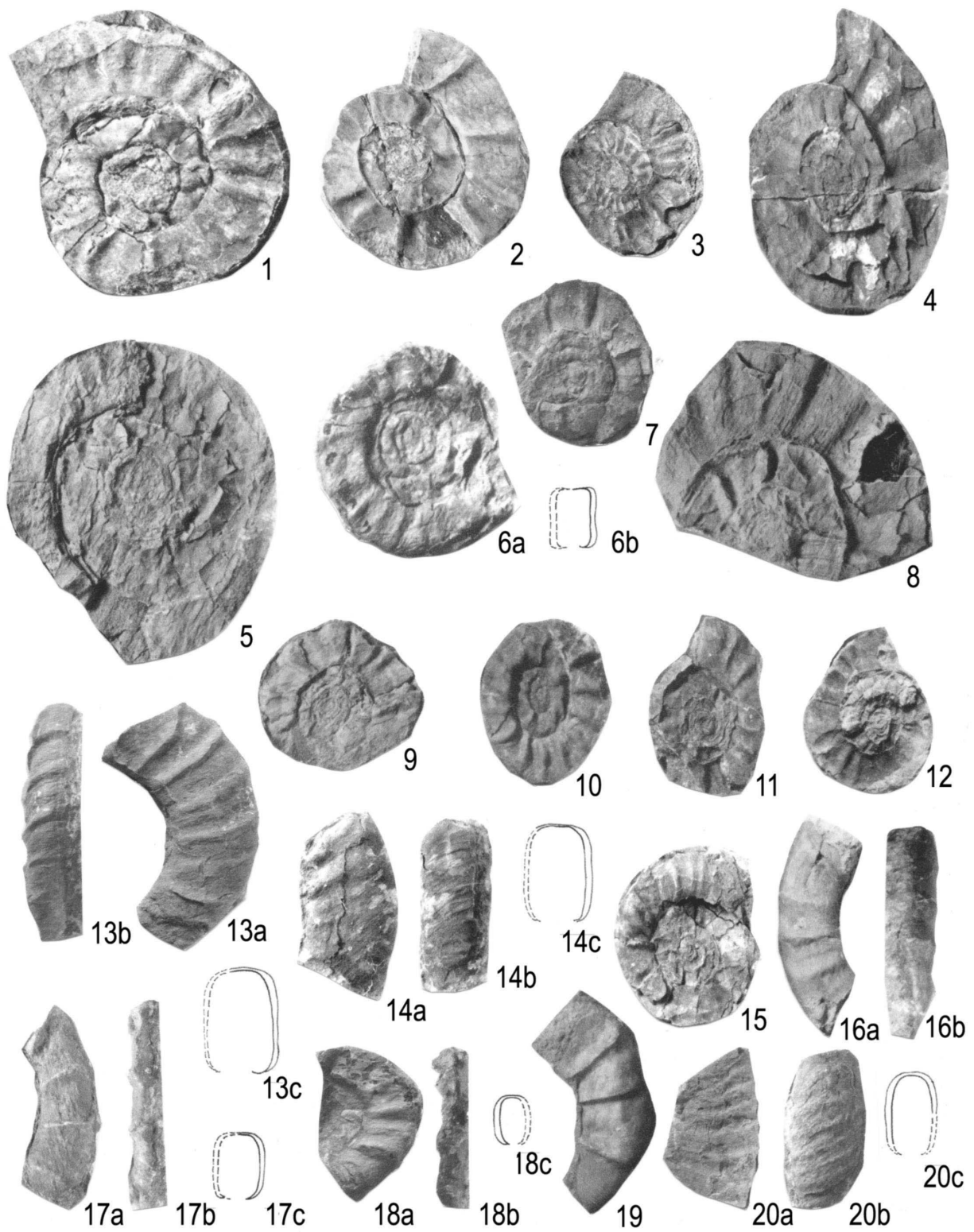
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PLATE I

Figure 1–20. *Pseudoceltites* (*Saikhanites*) *khenteyensis* sp. nov. collected from the *Pseudoceltites* (*Saikhanites*) *khenteyensis* Bed at the southern ridge of Mt. Saikhan Undur Ovoo, Umnudelger, Khentey Province, Mongolia. All figures are lateral views and approximately natural size unless otherwise stated.

1. IGPS coll. cat. no. 109651 (holotype), $\times 1.5$; 2. IGPS coll. cat. no. 109655; 3. IGPS coll. cat. no. 109661, $\times 1.5$; 4. IGPS coll. cat. no. 109653; 5. IGPS coll. cat. no. 109652; 6a–b. IGPS coll. cat. no. 109662, lateral view (a) and cross section (b), $\times 2.0$; 7. IGPS coll. cat. no. 109657; 8. IGPS coll. cat. no. 109654; 9. IGPS coll. cat. no. 109658; 10. IGPS coll. cat. no. 109663, $\times 1.5$; 11. IGPS coll. cat. no. 109665; 12. IGPS coll. cat. no. 109660, $\times 1.5$; 13a–c. IGPS coll. cat. no. 109668, lateral (a) and ventral (part) (b) views, and cross section (c); 14a–c. IGPS coll. cat. no. 109664, lateral (a) and ventral (b) views, and cross section (c), $\times 2.0$; 15. IGPS coll. cat. no. 109656; 16. IGPS coll. cat. no. 109659, lateral (a) and ventral (part) (b) views; 17a–c. IGPS coll. cat. no. 109667, lateral (a) and ventral (part) (b) views, and cross section (c); 18a–c. IGPS coll. cat. no. 109670, lateral view (a) and ventral (part) (b) views, and cross section (c), $\times 1.5$; 19. IGPS coll. cat. no. 109666; 20a–c. IGPS coll. cat. no. 109669, lateral (a) and ventral (b) views, and cross section (c), $\times 1.5$.

Thin lines of cross sections are across the rib and broken lines denote estimated part.



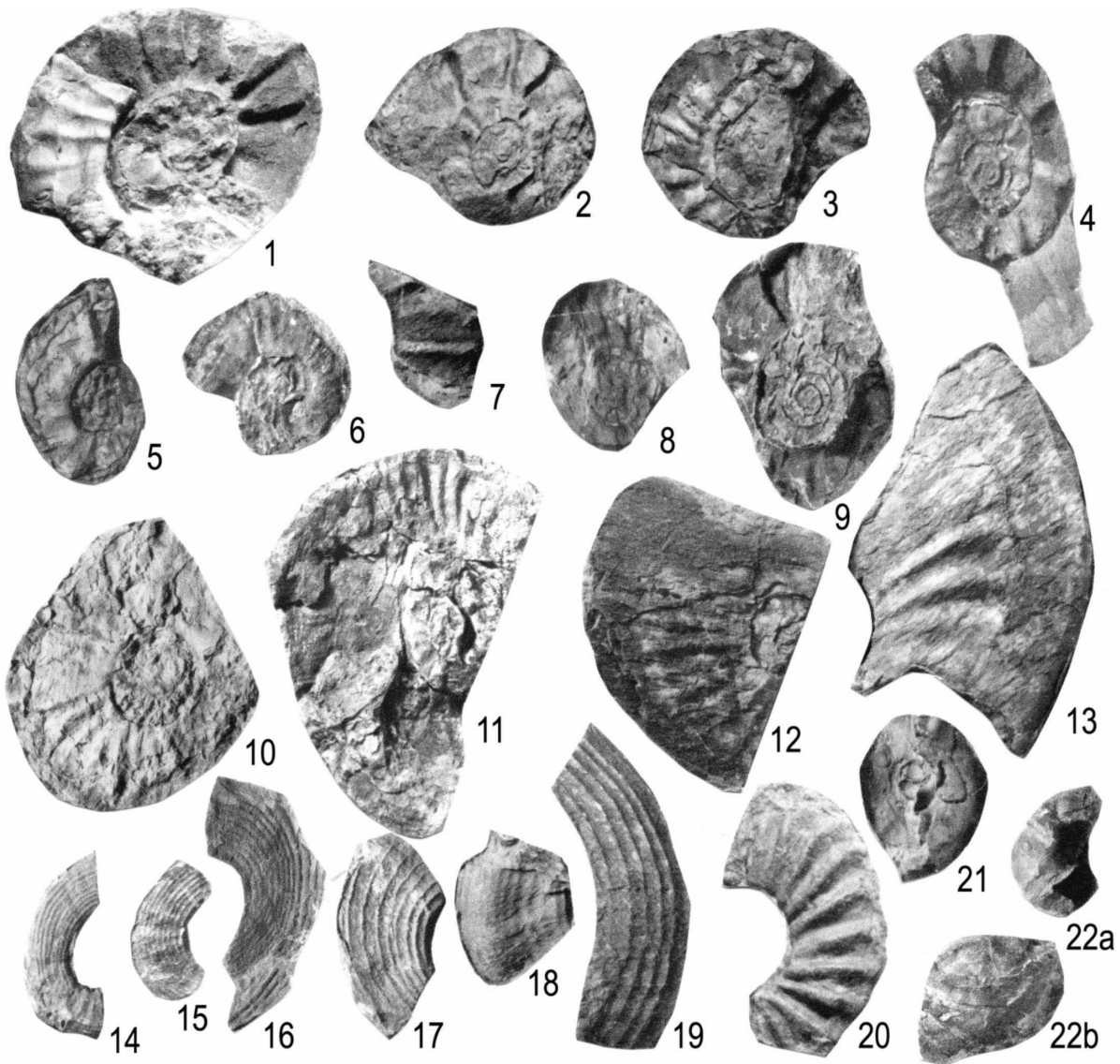


PLATE II

Ammonoids collected from the *Pseudoceltites (Saikhanites) khenteyensis* Bed at the southern ridge of Mt. Saikhan Undur Ovoo, Umnudelger, Khentey Province, Mongolia. All figures are lateral views and approximately natural size unless otherwise stated.

Figure 1-9. *Pseudoceltites (Saikhanites)* sp.: 1. IGPS coll. cat. no.109672; 2. IGPS coll. cat. no.109677; 3. IGPS coll. cat. no.109678; 4. IGPS coll. cat. no.109671; 5. IGPS coll. cat. no.109674; 6. IGPS coll. cat. no.109676, $\times 1.5$; 7. IGPS coll. cat. no.109679; 8. IGPS coll. cat. no.109675; 9. IGPS coll. cat. no.109673, $\times 1.5$.

Figure 10-13. Prionitidae gen. and sp. indet.: 10. IGPS coll. cat. no.109685; 11. IGPS coll. cat. no.109682; 12. IGPS coll. cat. no.109684; 13. IGPS coll. cat. no.109683.

Figure 14-15. *Flemingites*? sp.: 14. IGPS coll. cat. no.109686, $\times 2.0$; 15. IGPS coll. cat. no.109687, $\times 2.0$.

Figure 16-19. *Euflemingites*? sp.: 16. IGPS coll. cat. no.109688; 17. IGPS coll. cat. no.109689; 18. IGPS coll. cat. no.109690; 19. IGPS coll. cat. no.109691;

Figure 20. *Anaxenaspis*? sp.: IGPS coll. cat. no.109692.

Figure 21. *Juvenites* sp.: IGPS coll. cat. no.109680, $\times 1.5$.

Figure 22a-b. Megalaticeratidae gen. and sp. indet.: IGPS coll. cat. no.109681, lateral (a) and ventral (b) views, $\times 3.0$.

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