The Walakpa Site, Alaska

ITS PLACE IN THE BIRNIRK AND THULE CULTURES

Dennis J. Stanford

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ABSTRACT

Stanford, Dennis J. The Walakpa Site, Alaska: Its Place in the Birnirk and Thule Cultures. *Smithsonian Contributions to Anthropology,* number 20, 226 pages, 29 figures, 119 plates, 10 tables, 1976.—An archeological survey directed by the author near Point Barrow, Alaska, during the summer of 1968 resulted in the discovery of Walakpa, a deeply stratified coastal Eskimo site. It contained over 20 occupation levels, showing the development of Eskimo culture from Birnirk to Thule, as well as earlier and later Eskimo occupation levels. On the basis of excavations at Walakpa during 1968 and 1969, previous estimates of Birnirk and Thule origins are reexamined and a new interpretation of the genesis of this Eskimo culture proposed.

Specifically, on the basis of the Point Barrow excavations, this monograph (1) examines the development of the Birnirk and Thule Eskimo cultures and (2) provides definitions for the horizon markers for each of the Eskimo stages represented at Walakpa. As a result of this detailed study, the author concludes that (1) Birnirk developed out of Old Bering Sea; (2) Birnirk can be divided into three phases: Early, A.D. 500-700, Middle, A.D. 700-800, and Late, A.D. 800-900; (3) Thule Eskimo culture developed directly out of Birnirk; and (4) the development from Birnirk to Thule took place because of over-utilization of seals as the primary food resource and a change to a warmer climatic regime that further depleated the already weak seal resource, resulting in an increased use of whales for food and an expansion of hunting territories to the east.

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Preface

During the summer of 1967, Professor John M. Campbell, at that time Chairman of the Department of Anthropology at the University of New Mexico, conducted field reconnaissance in the areas of Anaktuvuk Pass and Chandler Lake, Central Brooks Range, Alaska. Before returning to New Mexico he spent several days at Point Barrow. There he purchased a sizeable collection of Eskimo antifacts from the Birnirk and Utkiavik sites, most of which were obtained from Mr. Charles Brower of Barrow. Dr. Campbell was impressed by the possible antiquity of the large midden deposits at Utkiavik and both he and Dr. Max Brewer, Director of the Naval Arctic Research Laboratory, were disturbed over the rapid destruction of the site from relic collectors and wave erosion. It was their opinion that Utkiavik should be excavated at the earliest opportunity, lest the site and its archeological record be permanently lost. Upon Dr. Campbell's return to Albuquerque, he urged me to go to Point Barrow the following summer for the purpose of conducting salvage-archeological operations and with the scientific aim of possibly discovering new evidence relative to the controversial question of the origin of Eastern Thule culture.

It was agreed that I would lead a team to Point Barrow and work on these problems with Charles W. Amsden as a co-leader. Mary M. Rushton was to work on problems relating to temporal changes of tool kits and corresponding changes in the local ecology. Mary Rushton intended to work on seriation of harpoon-head types with the idea of comparing her conclusions with Ford's (1959) harpoon seriation.

With the Barrow Town Council approval, we began excavating Utkiavik in June 1968. The crew consisted of Peter Eidenbach, Marc Stevens, Mrs. Natalie Pattison, Simeon Kunaknana, and James Itta. The remaining Utkiavik middens were mapped with 2-meter grids and test trenches for profile controls were started. After one week our excavations were discontinued at the request of the town council. Apparently several prominent members of the community were concerned that our excavations would disrupt their relic trade. After many frustrating attempts to convince them of the urgency of our work and its scientific significance, we temporarily abandoned the project. Being in Alaska with a team ready to conduct field work, we were not willing, however, to abandon our major theoretical problems and so decided to examine the possibilities of excavating other sites in the Barrow area. With Robert Jack Smith, a civil engineer from Rawlins, Wyoming, who joined our expedition to help with the surveying, I tested the site of Nuwuk located at the tip of Point Barrow. After making several test trenches we decided that this site did not contain sufficient time depth to be useful in working on the problem of Thule origins. All artifacts collected were of historic Nuwuk age. Kenneth Toovak, maintenance supervisor of Naval Arctic Research Laboratory, thought that we should examine the house mounds at Walakpa Bay, which, according to local legend, are the most ancient in the area. Walakpa Bay, is sometimes known as "monument" as there is a monument on the North shore erected in honor of Will Rogers and Wiley Post, who crashed on that spot in 1935 (Plate 1*d*). After consulting Dr. Max Brewer, an expedition was launched to examine Walakpa, to explore the coast for other archeological sites, and to investigate additional house mounds reported earlier by Ford (1959:18).

Our first stop was at the former site of Nunavak, located two miles (3.3 km) southwest of Barrow village, where we learned that all traces of the former village had been destroyed by gravel operations of the Burgess Construction Company. All that remains of this former site are several burial mounds, which had been excavated by Fred Hopsen in

1929 (Ford, 1959:21). Due to an impending snow storm and my impatience to see Walakpa, we decided to take the inland trail and go directly to the bay rather than searching for sites between Nunavak and Walakpa.

When we arrived at Walakpa, the crew was divided for a more efficient approach to the various problems before us. Amsden, Eidenbach, and Stevens were to explore the area around the main mounds and judge the size and extent of the occupation, while Mary Rushton, Sherry Heizer, and I made a preliminary test trench into the large trash midden. Our work was rewarded by finding evidence that both Birnirk and Thule cultures were represented at Walakpa. We decided that the Walakpa midden was indeed a site with considerable antiquity and possibly contained evidence bearing on the origin of Eastern Thule culture. It was due to these several circumstances, therefore, that the excavations at Walakpa were undertaken in the summer of 1968 and continued during the summer of 1969. The work of those two summers was supported by grants-in-aid to Dr. Campbell, University of New Mexico, from the Arctic Institute of North America, and the Office of Naval Research, Department of Navy, as well as from the New York Explorers Club.

As anyone knows who has worked in the Arctic, and especially at Point Barrow, field conditions are less than desirable. One soon learns to expect a continual series of disasters, mostly propagated by adverse weather conditions. It is therefore important that special acknowledgments be made to the field crews who assisted me during both seasons. These people, who without pay, suffered snowstorms, subzero temperatures, frostbite, permafrost, mosquitos, and other deprivations, include (in 1968) Charles Amsden, Mary Rushton, Marc Stevens, Natalie Pattison, Peter Eidenbach, Walter Akpik, Nate Elavgak, James Itta, and Simeon Kunaknana; (in 1969) James Duguid, Peter Eidenbach, T. Weber Grieser, Natalie Pattison, Susan Kaplan, Edwin Samuelson, Steve Beckerman, and Walter Akpik. Without their generous and industrious support, it would not have been possible to conduct this field excavation.

Laboratory work, by sheer numbers of artifacts and faunal remains, seemed to be an insurmountable task. Over 60,000 bones and 7000 artifacts had to be cleaned, preserved, identified, and cataloged. Through the untiring work of Natalie Pattison, Susan Kaplan, Dan Witter, and Alison Witter, with a total cash budget of less than $500, this work was accomplished in less than two years.

Laboratory space was provided by the University of New Mexico. Unfortunately, during the course of the study, due to administrative problems, the laboratory had to be moved no less than four times. During these moves, a number of the artifacts were lost or misplaced. Fortunately most of the descriptive work was completed before these tragedies occurred. It is for this reason, that all of the artifacts described in the text are not illustrated. Those artifacts which survived are now housed at the Maxwell Museum of Anthropology at the University of New Mexico, Albuquerque, New Mexico.

I am indebted to a great many people for their advice, encouragement, and assistance throughout the production of this monograph. These people include John M. Campbell of the University of New Mexico, William Taylor of the National Museum of Canada, Robert McGhee of the National Museum of Canada, Douglas Anderson of Brown University, Wilbert Carter of Tufts University, and Kiyushi Yamaura, a predoctoral fellow at the Smithsonian Institution in 1973-1974 from the University of Tokyo, who were most generous with their time, collections, and ideas.

To Drs. Betty Meggers, Clifford Evans, Henry Collins, William Fitzhugh of the Smithsonian Institution, William Taylor of National Museum of Canada, and John M. Campbell of the University of New Mexico, all of whom suffered through various versions of this manuscript, I owe special thanks. I have incorporated most of their suggestions to make this a more readable, better organized and more accurate scientific monograph.

Special acknowledgment is also due to those people whose technical knowledge and efforts were required. These people include Mr. Robert Jack Smith of Rawlins, Wyoming, who surveyed and mapped the Point Barrow sites, Steve Beckerman who was the site photographer, Dick Dunatchik of the University of New Mexico and Victor Krantz of

the Smithsonian Institution who photographed the specimens. The scientific illustrations were done by Edward Schumacher, George Robert Lewis, and Marcia Bakry of the Department of Anthropology, Smithsonian Institution, who converted crudely done sketches, maps, and charts into magnificent scientific illustrations as well as Paula Cardwell for her efficient typing of a difficult manuscript.

Special appreciation is due to editor Joan Horn of the Smithsonian Institution Press for her ability to bring metamorphic change to a monograph so that it is now easily readable and consistent and whose editorial guidance on my first major publication should make her and my job simpler next time. To Al Ruffin, Series Managing Editor, and Vern Shaffer, Series Production Manager, of the Smithsonian Institution Press, I owe a word of thanks for their advice and assistance at various stages of production of this monograph.

A note of thanks to scientific collaborators from other fields includes Dr. James Duguid of Princeton University, who worked on the geology of the Walakpa Bay area; Dr. Loren Potter, who worked on the ecology of Walakpa Bay, Dan Witter of the University of New Mexico, who identified the faunal remains, and Dr. Clayton Ray of the Smithsonian Institution, whose work on the paleontology provided important information that led to the conclusions based on archeozoological interpretations. James Toler of Albuquerque Technical Vocational Institute, Don Ortner and Neal Roth of the Smithsonian Institution provided computer assistance for handling the bulk of the raw data.

Finally, to my wife Jeanne, who for two summers was an archeological widow and subsequently lived for three years with all of the artifacts and faunal remains from the Walakpa site scattered throughout her living room, dining room, and bedroom, I owe my deepest debt of gratitude.

THE WALAKPA SITE, ALASKA

Dennis J. Stanford

Introduction

ORIGINS OF THULE ESKIMO CULTURE

The antiquity of the Eskimo occupation of the Point Barrow area of Alaska was first noted by Lieutenant P. H. Ray (1885). During the International Polar Expedition to Point Barrow, Alaska (1881–1883), Ray observed many ancient villages along the coast and in the interior (Ray, 1885:37). The site of Perigniak (Birnirk) was observed, and its antiquity was apparent as "it stands in the midst of a marsh . . . and it is their custom to select the high, dry points of land . . . for their villages . . . and the fact of our finding a pair of wooden goggles twenty-six feet below the surface . . . points conclusively to the great lapse of time since these shores were first peopled" (Ray, 1885:37).

Early excavations conducted at Point Barrow (Stefansson, 1914; Mason, 1930) also pointed to an occupation of considerable antiquity in the area. Wissler (1916), in considering Stefansson's collection from Point Barrow pointed out the similarity between harpoon heads found at Birnirk and those reported by Bogoras from ancient sites in Siberia (in Wissler, 1916:439). Wissler also noted a greater similarity among the harpoon heads from old sites in Siberia, Alaska, and the Hudson Bay district than among those found in ethnographic collections from these areas (Wissler, 1916:440).

Five archeologists have contributed to our understanding of the significance of Wissler's observation and specifically to the origins and spread of Eskimo culture in Northern Alaska, Canada, and Greenland. These archeologists are Mathiassen (1927b; 1930a), Collins (1933, 1935, 1937b,c; 1940; 1951), Ford (1959), Taylor (1963), and McGhee (1970). Their research and conclusions are the most relevant works on the subject of Birnirk and Thule origins and must necessarily be reviewed before attempting further discussion of late Eskimo cultural developments.

The first systematic archeological studies in the Arctic were conducted between 1921 and 1924 by Therkel Mathiassen of the fifth Thule expedition, which was organized by Knud Rasmussen. On the basis of his excavations in the Central Canadian Arctic, he defined the Thule culture (Mathiassen, 1927b). The Thule Eskimos, according to Mathiassen, were those people who represented a cultural horizon older than that of the modern Central Eskimos (Mathiassen 1927b:182). Mathiassen described Thule culture as dependent upon marine resources, primarily whale, seal, and walrus. He further defined 152 elements as representative of Thule material culture; and contended that wherever all of these elements appear in archeological context, Thule culture is necessarily represented. By plotting the occurrence of these artifacts from the various Arctic collections that he was able to study, Mathiassen concluded that Thule, with its highly evolved tool kit, must have originated in an Arctic area where whales and other large marine mammals were abundant. Further, due to the presence of such items as the women's boat and conical-shaped tents, the place of origin must have been an area where wood was present. He believed this to have been in Alaska (Mathiassen, 1927b:182).

Mathiassen (1927b:183) pointed out that there are many traits of the Thule culture, the prototypes of which are known only from the Alaskan regions. Examples are ornamental harpoon side blades, the winged needle case, the Y-shaped ornamental design, barbed antler arrow points and round earthenware cooking pots. But, having made this formal bow to what was indeed compelling evidence, he never referred to it again. On the contrary, when he discussed

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the chronological relationships between Birnirk and Thule harpoon heads, he argued that the Thule harpoon heads were older, because they were simpler in form and had a wider geographical distribution in the Arctic (Mathiassen, 1930a,b). Birnirk harpoon heads, he thought, were a later, local type influenced by the Old Bering Sea culture.

The first papers written by Henry Collins on Eskimo archeology were, in considerable measure, directed to putting Thule culture into a chronological perspective. Reporting on his work of 1928, Collins (1930:149) indicated that early Alaskan finds from St. Lawrence Island exerted a strong influence to the east as evidenced in Mathiassen's Thule collections, and that the Thule culture was clearly derived from Alaska, from where it seems to have spread at a relatively late period.

In considering Mathiassen's claim for the antiquity of Thule, based on its simple form and geographical distribution, Collins (1929) showed that these axioms could not be applied in the Arctic. The complex prehistoric art and harpoon-head sequence, which Collins worked out for Alaska, pointed to the opposite conclusion—that the Birnirk harpoon heads were older than the Thule harpoon heads (Collins, 1929: 45).

According to Collins, the results of the excavations at Kurigitavik at Cape Prince of Wales, Alaska (Jenness 1928; Collins, 1937a, 1940) provided confirmation of the Birnirk-Thule sequence in Western Alaska. The presence of Birnirk, Western Thule, Punuk, and modern Western Eskimo traits at Kurigitavik, which are not found in the Canadian Thule culture, indicated to Collins that the eastward migration of Thule culture must have originated from some point farther east, such as Point Barrow (Collins, 1940:562).

Another interpretation of the development of Eskimo culture has been offered by James A. Ford (1959). After careful analysis of the artifacts from the Birnirk site, Ford (1959:232) seriated harpoon head types from throughout the Arctic. In his analysis he considered five significant types of harpoon heads: (1) those with side blades or barbs at right angles to the line hole; (2) those with side blades or barbs in the same plane as the line hole; (3) those with a slit for an end blade in the same plane as the line hole; (4) those with a slit for an end blade at right angles to the line hole; and (5) those that have closed sockets.

These harpoon types were seriated in terms of their individual traits, proposed temporal position, and their areal distributions. Ford also constructed trait-comparison lists of artifacts shared by Birnirk and other Eskimo cultures. He discussed these traits in terms of their earliest occurrences and their spread through time and space. The harpoon seriation along with the trait comparison led Ford to construct a complicated system of cultural relationships and development indicating that Birnirk culture was derived from Okvik and Old Bering Sea cultures, with influences from Ipiutak and early Punuk. Canadian Thule did not stem directly from Birnirk, but that it was derived from the "Nunagiak stage" (Ford, 1959:241). The Nunagiak stage, named for the Nunagiak site located near Wainwright, Alaska, was thought by Ford to correspond with the end of the Birnirk period, dating around A.D. 1200. This would imply that the Thule culture of Canada could not be any older than A.D. 1200.

William E. Taylor, Jr. (1963) has opposed Ford's views on the origin of Thule culture. Taylor's opinion was based on data that were unavailable to Ford at the time of his study. These data are primarily (1) collections of Canadian harpoon heads of the "Birnirk" types—Natchuk and Sicco from Devon Island, the Inman River, Booth Islands, and Lady Franklin Point, Victoria Island; and (2) radiocarbon dates of Thule occupations at Inugsuk, which give ages of A.D. 1010 ± 120 and A.D. 1240 ± 120. Therefore, Taylor maintained that the trait comparisons made by Ford between Birnirk, Nunagiak, and Thule are inadequate to support Ford's conclusions.

On the basis of this new evidence noted, Taylor (1963:461) concluded that

a) Birnirk culture extended as far east as Cape Parry prior to A.D. 900, and that this eastward spread of Birnirk constituted a first stage in the eastward Thule migration;
b) Canadian Thule developed not in Alaska, but from this eastern extension of Birnirk;
c) Thule culture generally developed from Birnirk along the arctic coast between Capes Prince of Wales and Parry;
d) an early Thule stage must separate Birnirk from Nunagiak;
e) Nunagiak, or something closely akin, existed as far east as Lady Franklin Point on Victoria Island;
f) finally, the existence on the Beaufort Sea Coast of a Proto-Thule stage, between Birnirk and Nunagiak, allows one to suggest a beginning for the latter, not around A.D. 900 but about A.D. 1100 or 1200.

In a recent paper, Robert McGhee (1970) has indicated that Thule probably developed out of Birnirk in Northern Alaska and spread eastward across the Canadian Arctic to Greenland. McGhee (1970:173) stated that the uniformity of early Thule culture and the close-clustering of C-14 dates suggest this expansion took the form of a single rapid migration. It was McGhee's opinion that the transition from Birnirk to Thule took place due to the effects of the climatic changes proposed by Bryson and Wendland (1967:280). These climatic changes

are (1) the Sub-Atlantic (550 B.C.–A.D. 400), (2) the Scandic (A.D. 400–900), (3) the Neo-Atlantic (A.D. 900–1200), (4) the Pacific (A.D. 1200–1550), (5) the Neo-Boreal (A.D. 1500–1850), and (6) the Recent (A.D. 1850–1960) episodes.

McGhee (1970:175) has outlined the major effects of these episodes in the Arctic. He saw the Scandic as a transition between the cooler Sub-Atlantic, and the warmer Neo-Atlantic. He stated that the Scandic was probably similar to the climatic conditions that are found today in the Arctic. He further thought that the Neo-Atlantic was apparently warmer and ice conditions would be significantly different from cooler periods. Drift ice would be reduced, the pack ice would retreat from the coast, open water would last longer, and new ice would form later and be thinner. The result would be an increase in whales, walruses, and bearded seals, with a reduction in ringed seals. This would necessitate cultural adjustments from spring ice lead hunting to summer whaling on open water.

McGhee (1970:178) believed that Thule culture developed during the Neo-Atlantic period and spread eastward into the Western Canadian Arctic. This spread was thought to have consisted of movements of small groups that were large enough, however, to hunt whales. They were not associated with large settlements and moved several times during the year to wherever subsistence was assured by either the successful killing of a whale or by other means.

GEOPHYSICAL CONDITIONS

Geology

The Quaternary geology of the Point Barrow area has been well defined (Black, 1957). The Gubik formation comprises the entire Quaternary unit throughout the Arctic coastal plain of Northern Alaska, and it mantles a Cretaceous unit that is composed of horizontal, bedded sandstone and shale. These sandstone and shale deposits are frequently exposed and are a potential source of raw materials for the manufacture of artifacts (Paige, Foran, and Gilluly, 1925). The Gubik is comprised of lenses and admixtures of silt and fine-grained sand, which are predominantly quartz and chert. The sediments are primarily marine, but are partially fluvial, lacustrine, and eolian in origin (Black, 1957:1701). The Gubik is made up of three lithologic units: (1) Skull Cliff; (2) Meade River; and (3) Barrow. The Skull Cliff unit is generally widespread throughout the Alaskan coastal plain. It is the oldest unit, dating to 38,000 B.P. (W-380) in the Barrow area (Coulter, Hussey, and O'Sullivan, 1960). Its maximum thickness is about 6 meters (20 ft), consisting of poorly sorted clays and gravels, which are both marine and glacial in origin.

The intermediate stage, the Meade River unit, has been frequently eroded and at Walakpa it does not exist, as the Barrow unit unconformably overlies the Skull Cliff unit. In other localities the Meade River unit reaches a maximum thickness of nearly 60 meters (200 ft) and consists of light-colored, well-sorted marine sand, grading upward into loess in the southern and southeastern areas of the coastal plain.

The Barrow unit, the youngest, dates possibly as late as 2000 B.P. or later and rarely exceeds 6 meters (20 ft) in thickness. It consists of poor to well-sorted mixtures of clay, silt, sand, and gravel. In many areas ice constitutes more than one-half of its structure. Organic matter is abundant in the upper part of the unit. The sediments are generally marine, but are locally fluvial and lacustrine in origin (Black, 1957: 1701).

At Walakpa, the Gubik formation comprises only two lithologic units—Skull Cliff and the Barrow unit. The Barrow unit is of prime importance to the Walakpa studies. Its upper portion consists of several feet of eolian sand. It is in this sand that the first occupation at Walakpa, Walakpa Phase Denbigh, is found. Above the Walakpa phase, the Barrow unit continues to be eolian in origin for 5–10 centimeters. Above this, it grades into an organic matter, mixed with gravels and sand (James O. Duguid, pers. comm.).

Physiography and Ecology

The coastal plain consists of numerous meandering streams, lakes, marshes, and varying types of patterned ground. It is nearly flat except for occasional low relief hills and ridges. The plain is treeless, with a ground cover of grasses, sedges, willows, and mosses.

The northern coast of Alaska, although harsh, possesses unique qualities, which have great potential for economic exploitation by nonmechanized, nonindustrial cultures. Four recognizable ecosystems exist. The low tundra ecosystem and the marine ecosystem are of the first order of importance in terms of

economic potential. The ponds and river ecosystems are of the second order of importance.

These ecosystems are so situated that they could all be successfully exploited from a central geographical area. Moreover, each could act as a buffer for the others, so that during certain seasons when the food supply of one ecosystem is at a low point, another system could be exploited. An important point is that these ecosystems have seasonal and long-term cycles of production so that hunters could, with a high degree of success, predict a successful pattern of exploitation.

Low Tundra Ecosystem

The low tundra ecosystem is part of the Arctic coastal plain physiographic province (Spencer, 1959:9). This ecosystem, and more specifically, the interrelationships of the use of the low tundra and the marine ecosystem, is of prime importance to this study. The Walakpa midden is located at the point of contact between the low tundra, Walakpa Bay, and the Chukchi Sea. The ecology of the low tundra ecosystem has been examined twice at Walakpa Bay (Wiggens and Thomas, 1962; Potter, 1972), but the ecological role of Walakpa Bay and the Chukchi Sea at Walakpa, has not to my knowledge been studied.

At Walakpa, the low tundra ecosystem consists of six principal physiographic forms: (1) ponds and low-centered polygon pans; (2) sedge-willow meadows; (3) depressions between high-centered polygons; (4) high-centered frost polygons; (5) polygons with frost boils; and (6) coastal beaches and bluffs. The following descriptions of the physiographic forms are based on Potter's work in the Walakpa area (Potter, 1972).

Ponds and Low-centered Polygon Pans.—The dominant relief of the tundra north and east of Walakpa is elongated, with oval-shaped basins, which have a longitudinal axis of approximately 9° west of north. These basins are in varying stages of being filled in and range from being well-drained to marshy with low-centered polygons.

The vegetation of these ponds and low-centered polygon pans includes *Arctophila fulva,* which is found in the mud, wet gravel, and shallow water around the margins of the ponds. A second grass found around the wet margins is *Dupontia fisheri.* Grass-like dominants include *Carex aquatilis* and *Eriophorum anqustifolium.* The most common aquatic herbs are *Hippuris vulgaris* and *Hippuris tetraphylla. Ranunculus pallasii* and *Ranunculus gmelini* are found in shallow pools and lake margins.

Sedge-Willow Meadows.—Sedge-willow meadows are found on the gentle slopes of the principal drainage channels. Because there is little relief, vegetational variations are not pronounced. Over 90 percent of the vegetation consists of *Carex* spp. and *Salix rotundifolia.* Other vegetational types include *Petasites frigidus, Dupontia fisheri, Poa* spp., *Luzula* spp., *Salix pulchra,* and *Saxifraga cernua.* Several other species make up less than 1 percent of the relative cover.

Depressions between High-centered Polygons.—Depressions or troughs surround raised-centered polygons. These two types of topography are the most common around the Walakpa site. It is also in these depressions that the principal habitats of the lemmings are found.

The troughs are covered with a dense growth of *Carex aquatilis, Dupontia fisheri,* and *Eriophorum* spp. *Petasites frigidus* is found in clumps on the upper edges of these depressions. Extensive mats of sphagnum are sometimes found in the lower part.

High-centered Frost Polygons.—High-centered frost polygons, when mature, can reach a height of 0.9 meter (3 ft). These polygons are well drained and have a dense mat of tufted vegetation. Phanerogam cover is quite high. *Salix pulchra* makes up 31 percent of the foliage cover. Patches of willows cover the surface with a mat of woody stems. *Carex* spp. make up 30 percent of the relative cover of the polygons. *Petasites frigidus, Luzula* spp., and *Salix arbutifolia* are found near the centers of the polygons. The grasses, *Poa* spp., *Arctagrostis latifolia, Festuca brachyphylla,* and *Dupontia fisheri* are found on locally drier sites. The transitional area between the sloping sides of the polygons and the more moist depressions have tufts of *Eriophorum* spp., *Carex* spp., and *Petasites frigidus.*

Polygons with Frost Boils.—When high-centered polygons become dissected by contraction cracks and frost boils, the plant types change. Minor changes result from lemmings, which use the cracks as runways and enrich the peat with nitrogenous wastes. Vegetation changes with improved drainage caused by the cracks. Major changes also result from mineral soil of silt and clay, which is thrust up from below by frost boils. *Luzula* spp., *Eriophorum* spp., and *Carex* spp. make up the dominant cover of these disturbed polygons. Other than crustose lichens, much of the disturbed surface has no vegetation for several years, except that found in the contraction cracks. *Salix pulchra* and *S. arbutifolia* grow over the surface from the edges, unless they are disturbed by additional frost activity. *Rubus chamaeorus,* cloudberry, *Vaccinium vitis-idaea,* and lingonberry are also found on disturbed polygons.

COASTAL BEACHES AND BLUFFS.—The shorelines of both the Chukchi Sea and the sand splits, which separate the open sea from Walakpa Bay, are repeatedly scoured by waves, ice, rolling sand, and gravel. For this reason they are nearly devoid of vegetation. In the protected bay areas the coastal species of *Mertensia maritima, Arenaria peploides, Elymus mollis,* and *Puccinellia phryganodes* are found. Patches of *Cochlearia officinalis, Cerastium beeringianum, Stellaria humifusa,* and *Saxifraga caespitosa* are also common.

The exposed areas of the bluff face, brink, and gully sides are colonized by tap-rooted plant species such as *Cochlearia officinalis, Taraxacum lyratum, Sagina intermedia,* and *Oxyria digyna.* The dandelion, *Cochlearia officinalis,* is found in these areas and could possibly be an important food plant. Other common species include *Cerastium beeringianum* and *Saxifraga rivularis.*

Wiggins and Thomas (1962) have identified 59 species of plants in the Walakpa area. Of these, 17 percent are known to be used by the Alaskan Eskimo for possible food sources (Heller and Scott, 1967). These are *Carex aquatilis, Eriophorum angustifolium, Salix pulchra, Oxyria digyna, Rumex arcticus, Honckenya peploides, Caltha palustris, Ranunculus pallasii, Cochlearia officinalis, Saxifraga punctata, Hippuris vulgaris, Vaccinium vitis-idaea, Pedicularis lanata,* and *Petasites frigidus.*

None of these plants was found in the archeological investigations at Walakpa, probably because of the seasonal occupation of most of the cultural levels. It is a reasonable assumption, therefore, that plants were of minor importance as a food resource for the people who lived at Walakpa. Ethnographically, I observed only one plant, *Petasites frigidus,* being eaten. This plant has a broad, green leaf, which is eaten raw. Other plants are utilized for nonfood purposes, such as willows (*Salix*), which are used for floor matting in both houses and tents, packing muluks, diapers, and fire tinder (Potter, 1972:130). Young flexible stems of *Salix pulchra* were found in the archeological assemblage, used for bindings on scrapers and knives.

The Caribou (*Rangifer arcticus*) is the principal tundra food resource for the Point Barrow Eskimo. Those caribou that are found in the Point Barrow area represent the northernmost occurrence of the Arctic caribou herd, which occupies a range of approximately 362,600 square kilometers (140,000 sq mi), and numbered more than 242,000 animals in the 1970 census (Hemming, 1971:5).

The primary winter range of this herd is south of the Brooks Range, where food resources can be found; however, some caribou stay on the Arctic slope until the snow gets too deep to find food, then they will move toward the coast, where food can be found in semi-open areas, which are relatively free of snow. The spring brings on the calving season and most animals move to the major calving areas located on the headwaters of the Colville, Ketik, Meade, and Utukok rivers. The important food during this season is the cottongrass (*Eriophorum vaginatum*) shoots. After calving, summer distributions are essentially random and caribou can be found anywhere west of the Savavanirktok River to the Arctic Ocean and the Chukchi Sea. Towards the fall the herd begins to drift slowly toward the tree line.

The diet of the caribou, as described by Skoog (1968:81) and Hemming (1971:7–9), consists of willow shrubs (*Salix* spp.), sedges (*Carex* spp.), cottongrass (*Eriophorum vaginatum*) and lichens (*Cladonia* spp. and *Certraria*), which are all found at Walakpa (Potter, 1972:125). Caribou are often found in the summer and fall in the immediate area of Walakpa Bay; thus during historic times the area has been known as a good caribou hunting location.

Other possible food animals found on the low tundra are musk ox (*Ovibos moschatus*) and moose (*Alces americana*). The bones of these animals are rare in most of the occupation levels at Walakpa and are not considered to have been important. Remains of the arctic fox (*Alopex lagopus*) and the wolf (*Canis lupus*) are found in the faunal collection. In historic times these animals were rarely eaten and were probably killed for their skins. It is possible that these animals were a prehistoric food resource, as in the Birnirk level there is a small species of dog that was apparently eaten.

MARINE ECOSYSTEM

For man, the main economic resources of the marine ecosystem consist of whales (*Balaena mysticetus, Delphinapterus leucas*), walrus (*Odobenus rosmarus*), bearded seals, (*Erignathus barbatas*), seals (*Phoca vitulina, Phoca hispida, Phoca fasciata*), and certain fishes.

Ice covers the surface of the ocean offshore from the Walakpa site for most of the year and exercises an important influence over hunting activities. There are several types of ice and ice conditions based on the age of the ice and its relationship to the coast. These types of ice and their movements, due to currents and winds, are of extreme importance in exploitation of the sea. Sea-ice conditions and their effect on hunting has been summarized by Nelson

(1969). His observations are the basis of the following description.

SUMMER ICE.—The ocean is usually ice-free for a very short period during the summer. If the summer is particularly cold, or if there are frequent, onshore winds, the ocean may be ice-bound all year around. Even during a relatively warm summer, ice floes and drifting ice are common along the shore. The ocean is usually ice-free, however, from late June through late September or early October.

The open water of the ocean is not utilized to any great extent, and economic activities are generally concentrated on land. Seals are hunted from boats, and walruses are found on the ice floes during late summer. Open-ocean whale hunting is not practiced at Barrow, as the most effective ice-lead hunting is conducted in the spring and fall. The small Beluga whales are shot from the shore during this period but are not pursued. The hunter usually shoots them near shore and waits for them to be washed ashore.

FALL ICE.—The new or young ice forms in the fall. Its occurrence and condition is erratic, as it is subject to movement by winds and currents (Nelson, 1969:11). New ice forms on the ocean and appears when onshore winds or currents wash it ashore. By the end of November the young ice is usually landfast and will thicken quickly. Ice hunting is possible after it thickens, which is usually in December.

An ice apron is the formation of new ice along the edges of open-ice leads in either young ice or winter ice. Ice aprons may develop rapidly or slowly, depending on the current direction. If the current parallels the lead edge, the apron will grow quickly and soon cover the entire lead. Most travel and hunting are done on the ice aprons. The aprons are thicker near the base and become thinner towards the edge. It is of extreme importance to be able to gauge the thickness and condition of apron ice and new ice. The color of the ice will indicate whether or not it is safe for travel.

WINTER ICE.—There are two types of winter ice: (1) winter ice (ice of the year) and (2) polar ice (old ice) (Nelson, 1969:28). The winter ice is not common except during midwinter. It is thick enough that a hunter need not worry about it breaking. It can reach a thickness of 3.5 meters (10 ft), but when it becomes piled it reaches up to 18.3 meters (60 ft) in height. This type of ice is quite mobile and is subject to cracking and opening of ice leads. This causes the surface to become piled and jumbled with pressure ridges.

Polar ice is not flat or piled as winter ice, rather it has developed a gently undulating surface. This is caused by weathering from the warmer summer temperatures. The Polar ice will form jagged, rough edges along its limits and cracks. Polar ice will develop large fissures up to 4.57 meters (15 ft) deep, which freeze over almost level with the surface (Nelson, 1969:31). Polar ice, unlike winter ice, is usually not completely covered with snow. This is because the snow will not blow free over the moist surface of salty, winter ice, while the Polar ice is free of salt.

Landfast ice is ice that has been driven up on shore or into the shallow water along the shore. It becomes solidly anchored to the ocean bottom or to the beach. When the offshore ice moves, due to currents or winds, the landfast ice will usually stay in place, and ice leads will open along its ocean edge. It may well be the most important type of ice for economic exploitation of the sea. Most of the hunting and traveling during the fall, winter, and spring are carried out on this type of ice.

The effects of winds and currents on the ice pack and ice floes are of prime importance to the Eskimo hunter. During the fall, winter, and spring, the wind direction and velocity is more important than the currents. In fact, currents are sometimes determined by the wind direction and velocity.

The most common winter wind is from the northeast. This is an offshore wind, which causes the ice to drift seaward and opens up ice leads between the pack ice and the landfast ice. This is a dangerous time to be hunting out beyond the landfast ice. It is, however, an extremely favorable time to hunt seals along the leads from the landfast ice. It is also necessary for successful whale hunting. An east wind will have the same effect as a northeast wind on ice movement, but east winds are relatively rare at this time of year.

When there is a southeast wind accompanied by a south or southwest current, the ice will remain fast against the coast. Onshore winds will also hold the ice landfast. During these periods, it is safe for a hunter to travel a good distance away from land in search of polar bears. A southeast gale is quite dangerous. It can open wide leads and remove landfast ice. This is because a wind of gale velocity accompanied by a high tide can lift the landfast ice from the ocean bottom and drift it out to sea.

When traveling or hunting on ice during the winter, the hunter is obliged to test both winds and currents before leaving shore. Currents often shift before an approaching wind change and allow a certain amount of predictability before ice travel.

During the summer the currents are more important than winds. Summer ice floes are carried northward along the coast by the strong and powerful south current. In the early summer a west wind will

pack the ice up along the shore, but by late summer even a strong, onshore wind will not stop the ice from drifting along the coast or out to sea. These ice floes and their movements are extremely important for hunting seals, bearded seals, and walruses. It is important for the hunter to make the most of the summer landfast ice and the drifting floes. If the weather is favorable, a large amount of meat can be obtained and stored at this time.

Pond and River Ecosystems

The pond and river ecosystems are not of extreme importance to this study. The lakes, ponds, and marshes have been analyzed above for vegetational composition as physiographic features of the low tundra ecosystem. As far as I could determine, none of the waters in the Walakpa area contain fish. Some lakes, such as Tusikvoak and others, are important for winter fishing, but they are long distances from Walakpa. During historic times the pond ecosystem has been secondarily utilized because waterfowl nest along the shores of these lakes.

The only running stream in the Walakpa area is the Walakpa River. This river is not economically important, as it has no fish. Walakpa Bay does not contain fish, but occasionally a seal will go into it. Waterfowl and caribou are also taken in the bay. To the east of Point Barrow, the Kulugrua, Ikpikpun, and Meade rivers are important in the summer. Many families will establish fishing camps there and net a great many fish. However, the only fish remains found at Walakpa were those of tomcod (*Boreogadus saida*), which are netted or jigged from the ocean.

Prehistoric Climates and Climatic Change

Little is known of the paleoclimatic conditions or changes that have occurred at Point Barrow. Only several minor indications are available. The first is that of the pollen analysis of radiocarbon-dated coastal peat by Colinvaux (1964:707). The results of Colinvaux' analysis indicate that the vegetation and climate of the Arctic coastal region have been rather stable over the last 4000 years. However, his studies were not aimed specifically at the later climatic conditions.

Analysis of the formation of beach ridges by Hume (1965), Rex (1964), Brown (1965), Brown and Sellman (1966), and Moore (1960) have indicated that there have been rises and falls in the level of the sea along the north coast of Alaska. These fluctuations of the sea level are summarized as (1) a period from approximately A.D. 500–1000, when the sea level dropped 2 meters below the present sea level; (2) a high period from A.D. 1100 to 1400/1500, when the sea level rose 3 meters; (3) a drop in the level of the sea between A.D. 1400 and 1500; and (4) high level between A.D. 1700 and 1850 (Figure 1, Column 1). These sea level fluctuations do not necessarily reflect climatic conditions or changes, but with additional data presented by Bryson and Wendland (1967), they tend to correlate with climatic fluctuations in other areas of the Arctic.

For additional climatic data we must turn to other areas where work has been done in the North. Whether or not these data are applicable to the Barrow area is problematical, but they are used as indicators of general climatic trends in the Arctic.

Koch (1945) studied ice and ice conditions in eastern Greenland and Iceland. He consulted the written works on Norse observations of ice conditions and their effects on life in both Greenland and Iceland. Ice conditions and climatic changes were expressed by the necessity of the Norsemen to change their transportation routes between Greenland, Iceland, and Northern Europe because of ice accumulations and ice floes. Koch also consulted accounts on grazing and agriculture in both Greenland and Iceland. From these data he constructed graphs of ice conditions showing the number of weeks in which ice was around Iceland for 20-year periods from A.D. 860 to 1939 (Figure 1, Column 3). Koch (1945:354) concludes that during this span there were five major periods of climatic change:

1) In the period A.D. 800–1200 there was hardly any ice in summer near Iceland and the southern half of Greenland.
2) In the period A.D. 1200–1400 there was somewhat more ice in the summer near Iceland and the southern half of Greenland.
3) In the period A.D. 1400–1600 the ice decreased in quantity in the summer near Iceland and the southern half of Greenland.
4) In the period A.D. 1600–1900 there were exceptionally large quantities of ice in the summer near Iceland and the southern half of Greenland.
5) In the period A.D. 1920–1939 there was hardly any ice.

Bryson and Wendland (1967) have proposed tentative climatic patterns for some of the late glacial and postglacial episodes in North America. This work was done on the basis of correlations between reconstructions of past airmass regimes and biotic regions and, specifically, shifts of the northern limits of the boreal forests, glacial advances and retreats, and palynological studies. They (Bryson and Wendland, 1967:294–296) have constructed six climatic episodes (Figure 1, Column 2), which are of direct importance to this study: (1) The Scandic episode, A.D. 400–900,

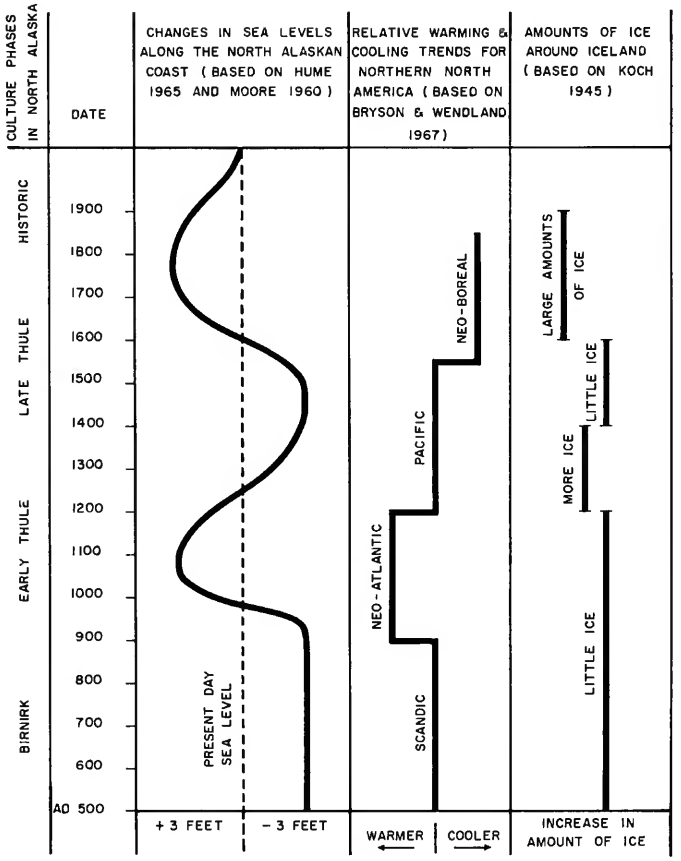

FIGURE 1.—Summary of climatic data for the Arctic.

a cold period, much like the Atlantic. (2) Neo-Atlantic, A.D. 900–1200. During this period, open water appeared in the Canadian Arctic Archipelago, the tree-line readvanced into the tundra, summer rains extended farther into the southwest. Glaciers disappeared from the U.S. Rockies. These evidences suggest weaker westerlies and more meridional circulation. Westerlies increased about A.D. 1200, terminating the Neo-Atlantic. The northern edge of the boreal forest once again retreated southward. (3) Pacific episode A.D. 1200–1500 is a period of increased westerlies, followed by an expansion of the circumpolar vortex and a return to patterns more like the sub-Atlantic (cooler). A far south jet stream in winter associated with blocking highs over northwestern Europe and a reduced summertime penetration of tropical air northward across the United States and into Canada is indicated by historical data. (4) Neo-Boreal episode, A.D. 1500–1850, had cooler summers and cold autumns. Glaciers once again formed as far south as New Mexico. The Neo-Boreal ended in the mid-nineteenth century with the well-documented climatic change which was associated with a return to strong westerlies in mid-latitudes.

Modern Climatic Conditions

The Alaskan Arctic coastal plain is virtually a desert from the standpoint of rainfall. Precipitation is slight and ranges from 25 to 228 mm (1 to 9 in) per year, with a yearly average of 100 mm (4 in). Most of this precipitation comes during the summer in the form of sleet and rain. The average annual snowfall at Point Barrow is about 6.5 cm (26 in). Summer, the period of greatest economic potential, lasts from June through August, during which the sun shines 24 hours a day. The summer temperatures range from −7°C (20°F) to as high as 18°C (64°F). After July the sun begins to set briefly in the early hours of the morning and by mid-November the sun will not be seen again for 72 days. Winter temperatures range from −42°C to 12°C (−45°F to 18°F) (U.S. Department of Commerce, 1963:27.)

Windstorms are frequent, and when the wind is blowing, the temperature must be calculated with a

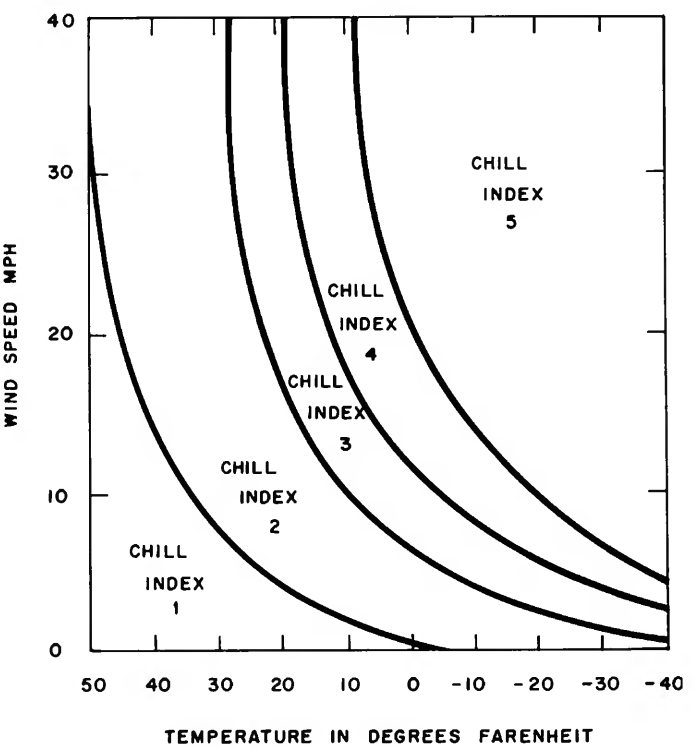

FIGURE 2.—Temperature-wind-chill index. (Chill Index 1 = Comfortable with normal precautions. Chill Index 2 = Very cold, travel becomes uncomfortable on overcast days. Chill Index 3 = Bitterly cold, travel becomes uncomfortable even on clear sunny days. Chill Index 4 = Freezing of human flesh begins, depending upon degree of activity, amount of solar radiation, and character of skin and circulation; travel and life in temporary shelter becomes disagreeable. Chill Index 5 = Survival efforts are required; exposed flesh will freeze in less than one minute. Chart is based on data from the Naval Arctic Research Laboratory.)

TABLE 1.—*Climatic data from Point Barrow, Alaska, based on observations made between 1921–1953 and averaged per month over this period* (based on Naval Arctic Research Laboratory, n.d.)

MONTH	TEMPERATURE (°F)						PRECIPITATION	WIND		CHILL FACTOR	
	Maximum	Minimum	Average High per month	Average Low per month	Absolute Maximum	Absolute Minimum	Average per month in inches	Average velocity, miles per hour	Average Direction	Minimum	Maximum
Jan	-9	-22	17	-40	33	-53	.2	11.0	ESE	4	5
Feb	-12	-25	11	-42	31	-56	.1	11.3	ENE	4	5
Mar	-8	-22	12	-39	30	-52	.1	10.9	NE	4	5
Apr	7	-8	25	-25	42	-42	.1	11.5	E	3	4
May	24	13	36	-5	45	-18	.1	11.8	NE	2	2
Jun	39	29	54	20	70	8	.3	11.4	E	1	2
Jul	46	33	63	28	78	22	.9	11.8	SW	1	2
Aug	44	33	63	27	73	20	.8	12.7	E	1	2
Sep	34	27	46	18	59	4	.5	13.7	ENE	2	2
Oct	22	12	34	-4	40	-19	.5	14.0	NE	2	3
Nov	7	-5	28	-20	39	-40	.3	12.5	NE	3	4
Dec	-4	-18	18	-33	34	-55	.2	10.9	ENE	4	5
Yearly Average	16	4	66	-45	78	-56	.1	12.0	NE	3	3

chill factor, which will lower the effective temperature (Figure 2). The wind plays an extremely important role in both the success and failure of economic activities; it affects the ability of Eskimos to hunt and travel and it also regulates the occurrence of game animals. Winds are usually from the northeast. The average wind velocity is about 19 km/hr (12 mi hr) (U.S. Department of Commerce, 1959:12).

Table 1 is a composite chart showing temperatures, precipitation, wind velocity, wind direction, and the corresponding maximum and minimum chill factors for the period of 1921–1953.

Site Description

The Walakpa site is located on a 6.1-m (20 ft) high bluff on the Chukchi Sea, 19.3 km (12 mi) south of Barrow Village (Figure 3). To the south of the site is a sandpit which separates Walakpa Bay from the sea. North and east of the site is the low tundra, which is composed of the physiographic features previously described (pp. 4–5).

The site contained 15 surface house structures of varying age, most of which were historic (Figure 4). These houses were oriented in two lines, one running north-south along the sea coast and the other east-west along the bay side of the bluff. The midden was situated at the point of the bluff between the two house rows. It is reported that there were once more houses between the midden and the ocean, but they have been washed away by the ocean eroding the bluff.

There is no evidence in the area for prehistoric ice cellars. A single ice cellar, which was constructed in 1946, is located between the A area of the mound and the B area. This ice cellar cuts through both Thule and Birnirk occupation levels.

Stratigraphy

The Walakpa stratigraphy has been defined on the basis of the 1968 test trenches and the 1969 excavations. The development of the natural stratigraphy of the site has been worked out in detail by Duguid (1971). At least one occupation level occurs in the upper portion of the Gubik formation; however, the rest of the mound has a different origin. Several of the processes to be described below are probably the same as those that contributed to the formation of the Barrow unit of the Gubik. Excepting the cultural debris, I consider the mound a continuation of the formation of the Barrow unit.

The first Walakpa stratigraphic process to be described is the eolian deposition. Much of the upper Barrow unit and the cultural stratigraphy are separated by windblown sands (Plate 2*b*). The origin of these sands is not completely understood; however, the Arctic coastal plain is particularly favorable for eolian erosion and deposition (Black, 1951:92). This is because of high winds, lack of topographic windbreaks, and an abundance of silt and sand. If it were not for permafrost impeding surface runoff, and thereby making it possible for vegetation to grow in spite of small amounts of precipitation, this area would become a desert with shifting sands (Black, 1951:93).

The stratigraphic units, which are of prime importance to this study (5, 6, and 7, pp. 13–14), can be differentiated by their color and sand composition.

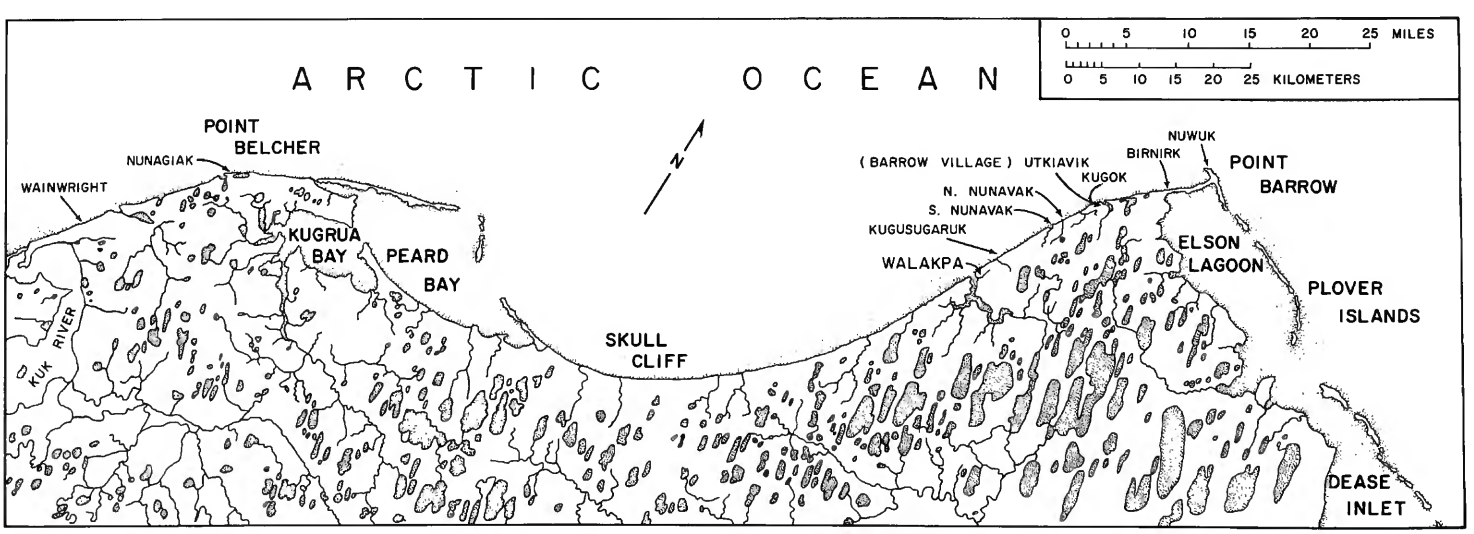

FIGURE 3.—Eskimo archeological sites in the vicinity of Point Barrow, north coast of Alaska.

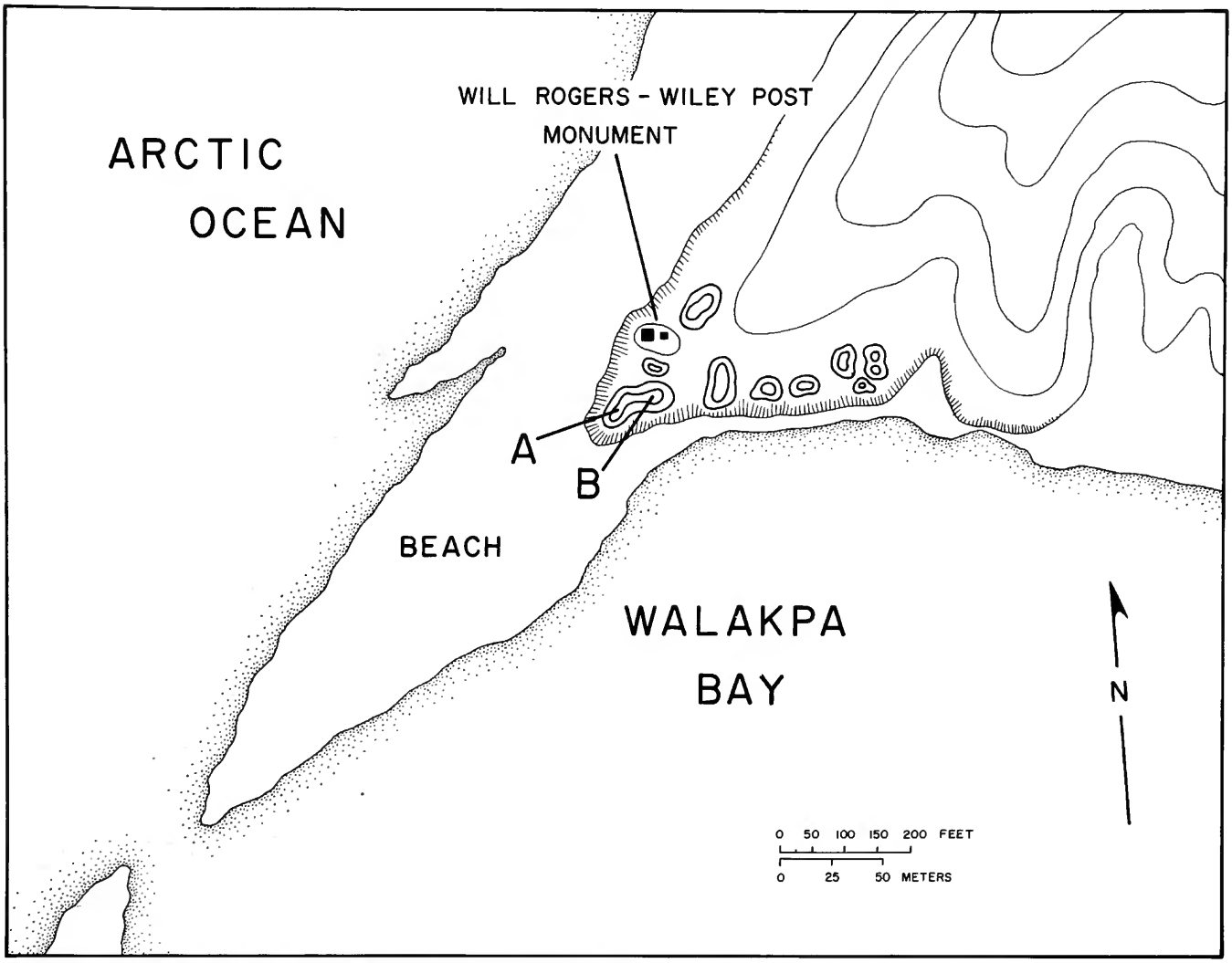

FIGURE 4.—Topographic map of Walakpa site, showing mounds A and B.

It was not possible to determine what caused these differences, but it is thought that they reflect sands of different origins, compositions or mixtures rather than soils as described by Britton (1967:35). The immediate sources for sand at Walakpa are (1) the ocean beach and large sandspit of Walakpa Bay, (2) the beach of Walakpa Bay, and (3) the tops of polygonal mounds stripped by winds. The parent formation of most of these eolian sands is probably the Gubick formation consisting of fine-grained, white to yellow and tan quartz, and chert sands.

The change in color of these deposits at Walakpa is perhaps indicative of climatic fluctuations and changes in the sea level (page 7), both perhaps reflected by changes in the mean annual wind direction and velocity, and severe storm frequencies. A drop of 2 meters in the sea level would cause Walakpa Bay to become an inward draining basin and the alluvial sediments, which would normally be disbursed along the beaches to the northeast by ocean currents and ice floes, would then accumulate at the bottom of the bay. These sediments would be similar to the gray lake sediments as described by Brown (1965:44). Furthermore, if there were a 2-meter drop in the sea level, areas now under water in Elson Lagoon and Dease Inlet would be exposed to wind action and would contribute to eolian deposition throughout the entire Point Barrow area.

When the bay was once again open, after a rise in the sea level, there would be an extremely high amount of sediment that would be cleaned out of the basin and be deposited in an alluvial fan at the mouth of the Walakpa River. This load of silt would subsequently be disbursed along the coast by ocean current and ice action. If this rising of the sea level were concurrent with a warming trend, there would also be an increase in the silt load of the Walakpa River, which would be highly variable in color and compo-

sition caused by the differential draining of inland lakes and bogs as the permafrost recedes.

Additional sources of sand would be produced by solifluction causing numerous rivulets of sludge to descend from the face of the cliffs along the beach, which would be composed of variable types and amounts of sand (Rex, 1964:388). It should also be noted that waves reach the cliffs only during severe storms and erosion is especially pronounced during southwest storms (Rex, 1964:388).

Also of importance for determining stratigraphic breaks is the occurrence of thin gravel layers. The cliffs in the Walakpa area are covered with a thin lens of gravel, which at first glance would be identified as the result of solifluction. Gravels of this nature covered the Walakpa midden; however, no artifacts were found among the gravels. It was also observed that these lenses were interspersed throughout the stratigraphic column of the site. These gravel layers were apparently formed on the tundra surface after a period of Eskimo occupation and then covered by subsequent occupations.

It is Duguid's (1971:4) contention that these gravel lenses were formed by a strong onshore wind pushing pack ice against a narrow margin of landfast ice, which is pushed up to the cliff forming a ramp. An offshore wind would subsequently push the pack ice back out to sea. During later storms, waves would push beach sand and gravel up over the ice ramp and onto the beach cliff. Over a period of years, erosion and precipitation would spread the gravel out in a thin layer across the surface of the cliff.

The stratigraphy of the two major excavation units, A and B of the Walakpa site, is summarized below (Plate 1*a,b,c,d*). Profiles were drawn of all trench walls. Changes in the geological deposition were identified and grouped into ten major stratigraphic units (Figure 5). The term "unit" designates discrete, natural accumulations of soil and does not relate to the cultural subunits which are described on pp. 15–16. The units are identified on the basis of their color, composition, and position.

A Area

FIGURE 6

Unit 1: This uppermost layer consists of recent sod, gravel, and sand. It varies from 5 to 3 cm (0.5–0.1 ft) in thickness and is light gray in color. Artifacts are all datable to historic and modern times.

Unit 2: A thin lens 6–3 cm (0.2–0.1 ft) thick of beach pebbles and sand. This unit is gray in color. It probably originated through the ice ramp process. There were no artifacts found in this unit.

Unit 3: This unit is from 39 to 18 cm (1.3–0.6 ft) thick—a gravel lens containing artifacts of Nuwuk and Thule ages. It is composed of gravel and sod, along with sand and is gray-brown in color. It is probably the result of the construction of a house that was built during the Nuwuk period in Unit 4 (Plate 3*a*).

Unit 4: A lens averaging about 60 cm (2 ft) thick of gravel, sand, and sod. It is coarse and gray-brown

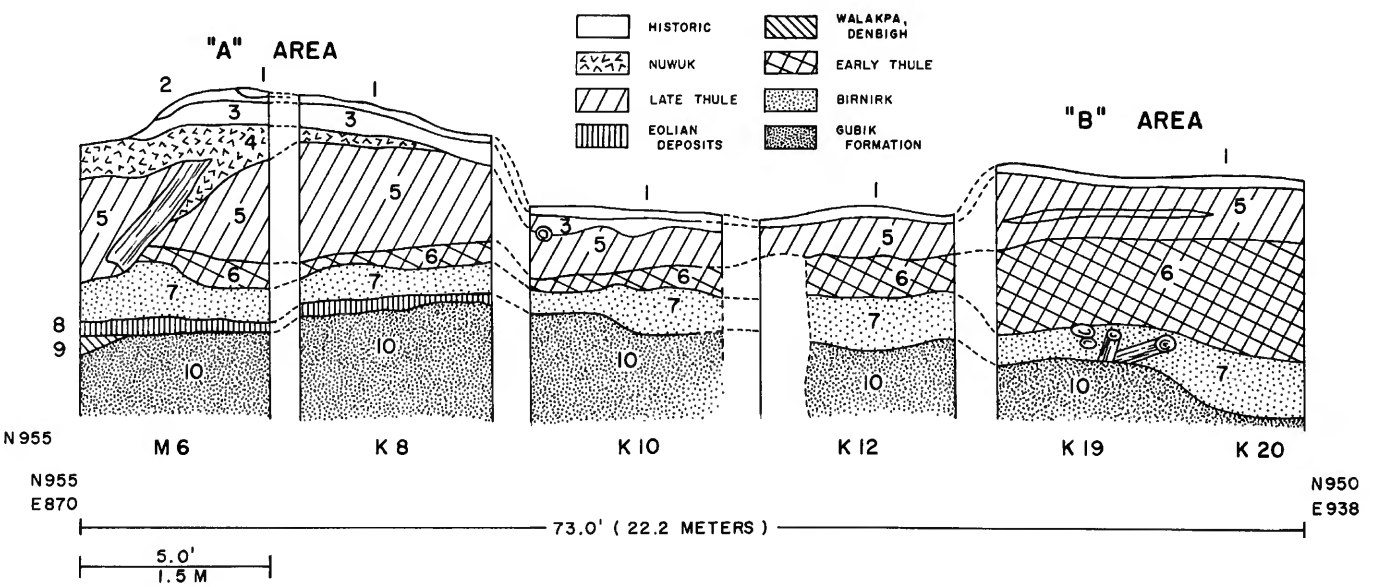

FIGURE 5.—Schematic profile showing correlation of the stratigraphy of the A and B areas of the Walapka site.

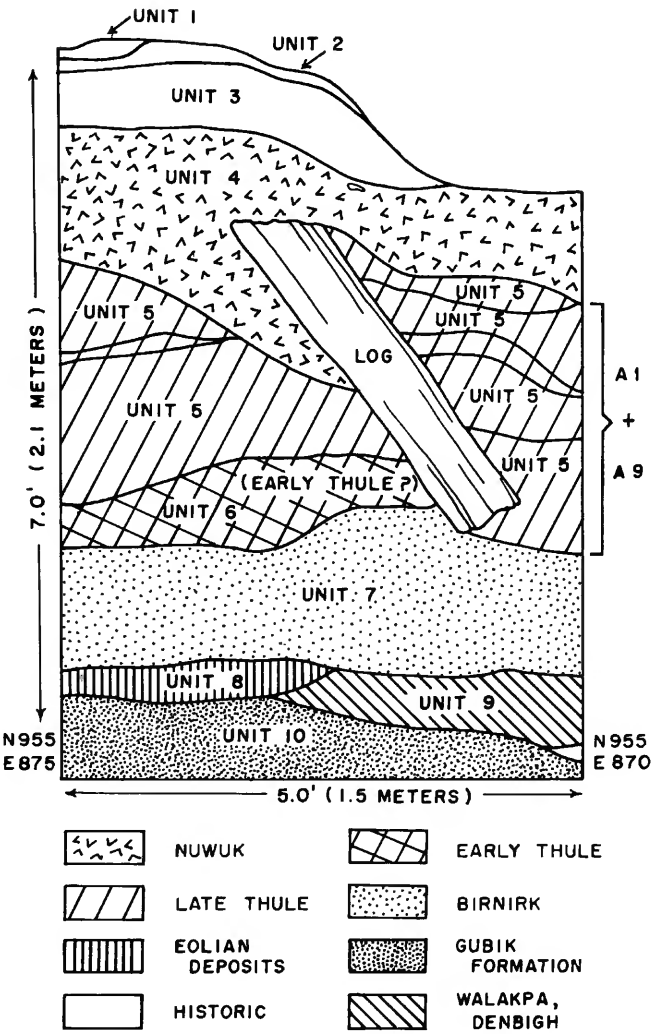

FIGURE 6.—A area stratigraphy at the Walakpa site.

in color. It is also made up of elements from Unit 5 that were disturbed by the construction of a Nuwuk age house.

Unit 5: A 92–61 cm (3–2 ft) deposit of sand, clay, sod, and gravel. It is reddish to yellow-tan in color. This is the unit that contains the Late Thule occupations. Unit 5 contains 20 independent levels of which 10 are occupation levels and 10 are sod and sand levels that separate each occupation. At the west end of the east-west profile test trench, these levels are all slumped together and have been completely soaked with oil from a sea mammal. This is probably the result of a historic Eskimo staking out a seal or walrus skin on the ground surface. This is the point where these levels emerge from the eroded midden. It appears that this area was disturbed by both erosion and later Eskimo activity. Consequently, artifacts and cultural debris from this area have been excluded from the analysis. The cultural levels can be readily recognized. They are 6–3 cm (0.2–0.1 ft) thick. Bones, artifacts, sod, cultural debris, and gravel were found in these units. The occupation levels are dark brown to gray in color. Each is separated by eolian sands, which are yellow to tan in color.

Unit 6: Unit 6 is black grading into yellow in color. It is 39–18 cm (1.3–0.6 ft) thick containing eolian sand interspersed with organic units. Artifacts, diagnostic of Early Thule, were found in one of the organic subunits; other subunits contained artifacts but none was diagnostic.

Unit 7: Unit 7 contains logs and bones. It has at least one occupation level containing artifacts that are Birnirk in age. It is yellowish to brown and black in color, measuring an average of 92 cm (3 ft) thick.

Unit 8: Thin lenses of fine gray and tan sands. These units are probably a continuation of the Gubik formation post-Walakpa Phase Denbigh occupation. No artifacts were found in this unit.

Unit 9: A lens of organic matter and sand. It is black in color. This unit contains a distinct occupation level with artifacts typical of the Arctic Small Tool Tradition. It has been identified as Walakpa Phase Denbigh.

Unit 10: This consists of yellow-tan, fine-grained sands with interspersed gray, loamy streaks. It also contains orange and yellow clays, which are probably limonite. Unit 10 represents the upper part of the Barrow unit of the Gubik formation.

B Area

FIGURE 7

The stratigraphy of the B area has five major units, all of which contain one or more occupation levels. These units are not as well-defined as those in the A area, but it is possible to identify and correlate them on the basis of color and cultural compositions. Therefore, the unit numbers given below also correspond to the units of area A. Many of the units found in the A area did not occur in the B area.

Unit 1: This is the current sod level, with the typical band of gray sand and clay. This unit contains artifacts of historic age.

Unit 5: This unit is a sandy loam which is yellow-tan in color. Its upper portion, as well as some areas of the first unit, have been disturbed. This unit contains a single, black organic level which is 3 centimeters (0.1 ft) thick in most areas. There is little in the way of bones and cultural objects in this level. Artifacts indicate that it is Late Thule in age (Plate 2*c*).

Unit 6: This unit is quite thick, measuring up to about 1 meter (3 ft) thick. It consists of a yellow-

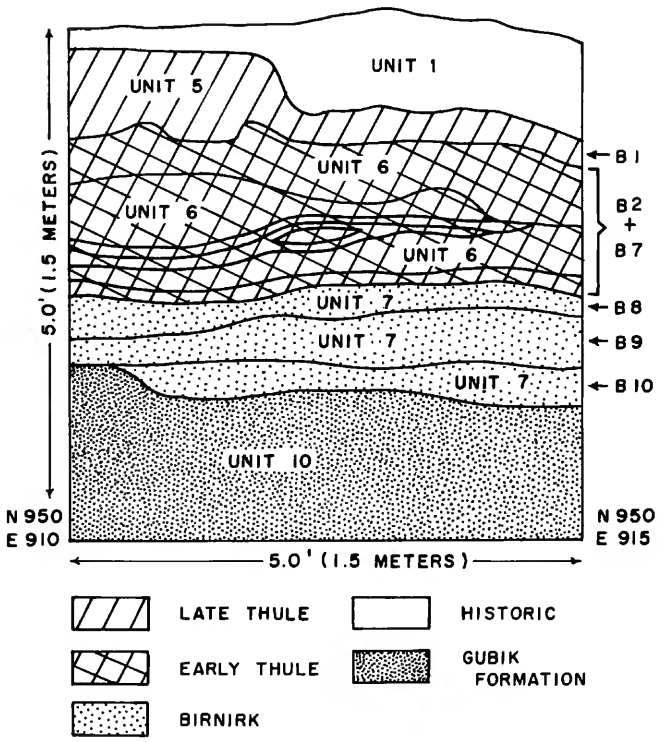

FIGURE 7.—B area stratigraphy at the Walakpa site.

gray sand, which is interspersed with six organic levels which are gray to black in color. These lenses are usually 6–3 cm (0.2–0.1 ft) thick and contain occupational debris of Early Thule age and cultural affiliation.

Unit 7: This unit is quite complex. It is made up of nearly solid occupational debris of Birnirk affiliation. It consists of wood chips, baleen, bone, and logs, all permeated with oil. The unit has been divided into three subunits on the basis of the midden structure. It is felt that these three levels are quite distinct and they do separate when traced out from the midden.

Units 8, 9, and 10: This is the upper part of the Gubik formation. It consists of yellow-tan, fine-grained sands with interspersed gray streaks. There are slight traces of an occupation level in the upper portion of the unit, but it was nearly removed when the Birnirk house was constructed. I believe that it was Denbigh in age.

The correlation of the stratigraphic units of the A and B areas can be accomplished with the aid of the test trench segment stratigraphy (Figure 5). Unit 1, the recent sod, is, of course, quite readily recognized throughout the site. Units 2, 3, and 4 of the A area are apparently unique to that portion of the site. This is probably because of the manner in which they were deposited and their proximity to the beach. Unit 5 of the A area can be traced through the site and becomes the second layer (Unit 5) in the B area. The number of Late Thule levels in the A area is reduced to only one in the B area. Unit 6 contains the Early Thule cultural levels. It is identified as the third layer (Unit 6) in the B area. Unit 7 (in the A area) contains Birnirk artifacts.

Archeological Excavations of the Walakpa Site

1968 Excavation

The archeological excavations at Walakpa utilized a grid system of 1.5 meter (5 ft) squares, which was superimposed on the site area. A north-south base line was established, using true north as its orientation. The base line was assigned the coordinate identification of E 1000. The southeast corner of the base of the Will Rogers-Wiley Post monument is a reference point for the base line (Plate 2*a*). The corner of the monument was identified on the grid as N 1096.4, E 1000. Three brass caps embedded in concrete were placed along the base line. These brass caps were located at N 1000, E 1000; N 1050, E 1000; and N 950, E 1000. The brass cap at N 1000, E 1000 was used as the main datum point, with all elevations and grids referenced to this point.

The grid point identification system was set up so that each 1.5 meter (5 ft) grid had four main reference points, one at each corner. The corners were referenced to a point that was identified as N 1000, E 000, W 000, and S 000, a point southwest of the site in the Chukchi Sea. This point was used so that all of the site would be in the northeast quarter of a 2-axis grid. This was found to be quite useful, as all grids were located only on north and east lines. This system eliminates the confusion of four directional locators. Moreover, with this system, all artifacts can be referenced to each other without having to transpose directions.

From this figure of a sample grid, one notes how to determine the exact location of the grids and how the positions of artifacts were plotted. The artifacts' location (N 943.9, E 804.2) were thus plotted horizontally on the site map without any other identification.

A second system was used for rapid grid identification. This system was devised primarily for the ease of handling paper work. This system utilized both letters and numbers. The letters were assigned to grids located in the north-south plane, with the letter "A" being completely off the site area. All grids

along the east-west axis of the site between N 895–900 were assigned the letter "A"; all grids along the east-west axis N 900–905 were designated by the letter "B" and so on.

The numbering system identified grids in their east-west position along the north-south axis. The numbers ran from 1 to 100, with number 1 being to the west of the site. For example, grid unit J-19 has the coordinate numbers N 940–945, E 935–940, while unit J-20 has the coordinate numbers N 940–945, E 940–945.

Elevations during the 1968 field season were determined by positions above or below the main datum point. The elevation of an artifact was calculated from its depth below the northeast corner of the excavation square. The elevation of the northeast corner of the square was calculated according to its position in relation to the main datum point.

The grids chosen for excavation in 1968 were those along a single east-west axis (N 940–945) and those along the two north-south axes (E 880–885 and E 920–925). These were chosen in order to provide a test trench that would transverse both axes of the major middens. Cross-sectional trenches were excavated into all other house structures to determine their age and relationship to the middens.

Every other grid along these axes was excavated. The other grids were left intact in order to work out detailed stratigraphy of all four faces of the excavated grids. By excavating in this manner and interpolating the stratigraphy between the excavated grids, a complete cross-section of the stratigraphy of the major middens was determined. The interpretation of the east-west test trench stratigraphy also provided evidence for the relationship of the stratigraphy of the two middens. The grids were excavated in arbitrary levels of 12 centimeters (1 ft). This depth was used to speed up excavation, but when occupational stratigraphy was determined, natural living surfaces were excavated. All levels were troweled, and when possible, the dirt was dried and screened. All structural features, artifacts, and other debris were mapped and recorded before they were removed.

1969 Excavation

In 1969, excavations were resumed a month earlier and even though our work was critically hampered by below seasonal temperatures and numerous snow storms, good results were forthcoming. Those areas labeled "A" and "B" (Figure 8) were chosen for excavation because the stratigraphic continuum defined by the 1968 test trenches indicated that they would be the most productive areas. Each area was excavated according to the grid system established in the 1968 excavations. Occupation floors, which were defined by the test trenches, were excavated as single units, exposing entire occupation surfaces. These surfaces were left intact until all features were mapped and photographed. By using this method, specific activity areas were exposed; moreover, the relationships between these task specific-activity areas and other features such as houses, drying racks, and trash middens were observed.

All cultural features including bone scraps and flaking debitage were collected, recorded, and analyzed.

Pollen and carbon samples were collected from each level. Several pollen profiles were made in each stratigraphic column, as well as a composite sample from each occupation surface. Surface pollen samples were collected from the site and the surrounding tundra.

The major difference between the archeological techniques used in 1969 and those used in 1968 was the utilization of local H.I. (height above main datum) stations for elevation control. Two major H.I. stations were erected. The H.I. stations consist of three concrete reinforcement bars, which were placed in the ground, forming a small triangle with each reinforcement bar being 0.3 meter (1 ft) from the other two. The stations were placed on the highest ground nearest the area of excavation. A string was tied around the rebars at 61 centimeters (2 ft) above zero elevation. All artifacts, structural features, debris, and the upper surface of each occupation level at grid intersection points were recorded as to their positions below the H.I. datum point. This allowed fast, accurate recording of data without the use of a line and line level. Further, with one consistent point of elevation for each unit, all artifacts in that unit could be directly compared with the elevation of every other artifact from all levels in the unit.

Excavations of area A, the largest excavation area, were terminated at a depth of 1.2 meters (4 ft) below the present ground surface. At this lowest depth, an Early Thule horizon was partially excavated. Overlying the Early Thule level were eight distinct levels of Late Thule occupation. Above the Late Thule levels were two levels of historic Eskimo occupation, but these levels were, for the most part, disturbed by looting (Plate 3*a*). In addition, the 1968 test trenches indicated that the Thule occupation may be underlain by Birnirk, Norton, Choris, and Arctic Small Tool levels. As yet, we have not systematically excavated these occupations.

In area B, an historic level, one level of Late Thule,

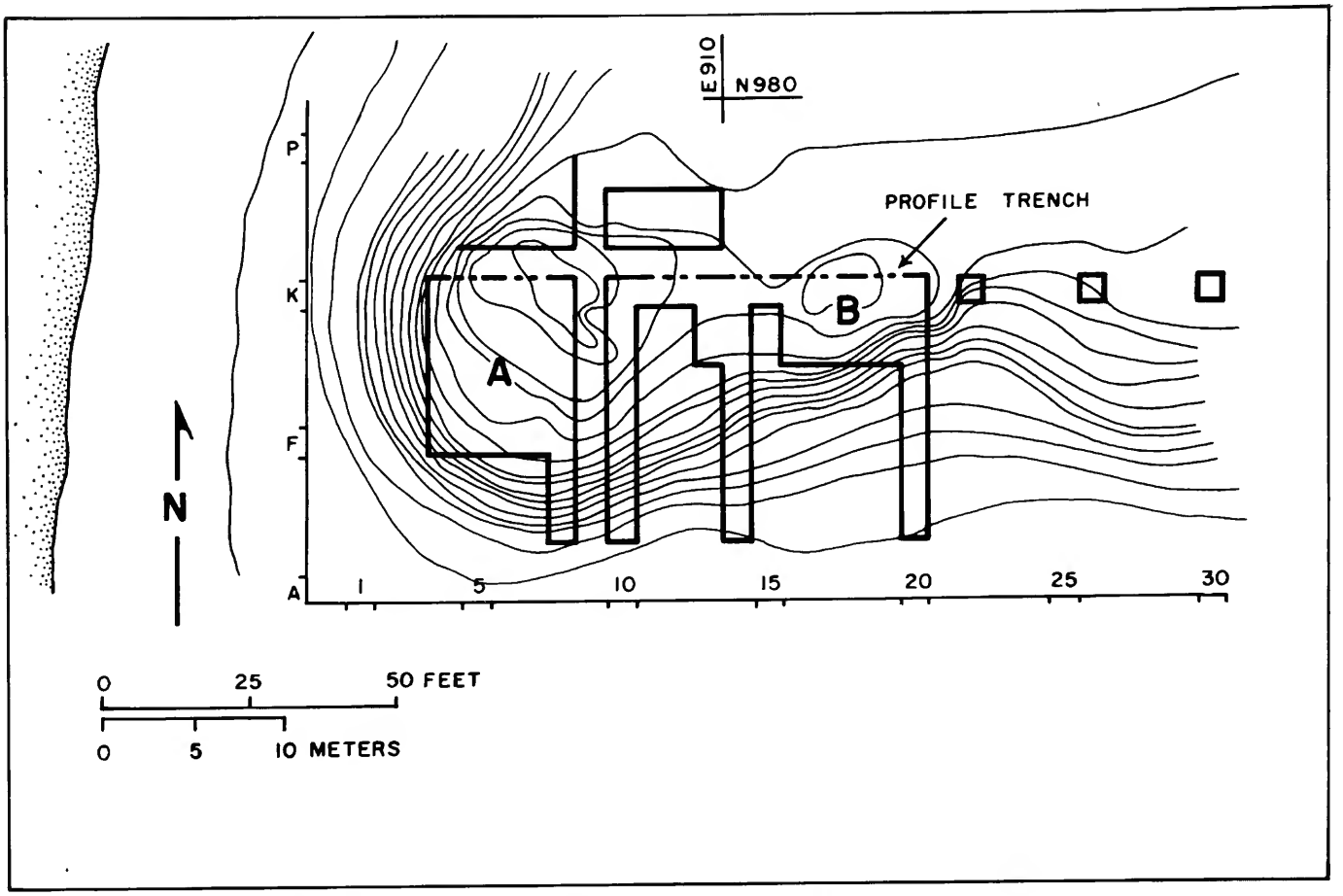

FIGURE 8.—Contour map of the A and B areas of the Walakpa site. Contour interval equals one foot (0.3 meter).

six levels of Early Thule, and three Birnirk levels were excavated. Below the Birnirk occupation, there is evidence that an Arctic Small Tool level may have once existed, but it has been nearly destroyed by the construction of the Birnirk house.

Additional Excavations in the Walakpa Bay Area

Test excavations were made in two new sites found in the Walakpa Bay area during the 1969 season. The Coffin site, located on a high bluff about a mile east of Walakpa on the north beach of the bay, yielded pottery and ground slate in unquestionable association with typical flint artifacts of the Arctic Small Tool Tradition. Since a level consisting of this same assemblage was found in the main Walakpa excavation, we now have considerable control over this horizon. This level has been dated by C-14 at 1450 B.C. ±520 (GAK-2299), and is designated as the Walakpa phase of the Arctic Small Tool Tradition. Apparently this assemblage represents a late Denbigh horizon, transitional into the Choris horizon.

Facing the Coffin site from across a large creek basin is another archeological locality known as the Kahraok site. From this small surface site were recovered projectile points similar to the lanceolate points of the Old Cordilleran tradition.

Other artifacts found were burins, burin spalls, and large blade tools, all distributed around a cache of 32 cores. These artifacts are similar to both the Akmak assemblage and to the Driftwood Creek complex (Anderson, 1970; Humphrey, 1970).

The surface reconnaissance of the Point Barrow area produced what appeared to be six additional Arctic Small Tool sites, several Norton sites and several uncharted Eskimo sites. Based on a composite interpretation of these several sites and both summers' excavations, a tentative scheme for cultural succession of the Walakpa site areas includes the following horizons, from latest to earliest: Modern Eskimo,

Historic Eskimo, Late Thule, Early Thule, Birnirk, Ipiutak, Norton, Choris, Walakpa Phase Denbigh, Denbigh, and Kahraok.

Although many of the above early levels are important to an understanding of American Arctic prehistory, they will not be considered in this monograph; more extensive excavations are required for the earlier material. Only the Birnirk, Early Thule, and Late Thule occupations that have direct bearing on the problem of the origins of Thule culture and Thule culture development in the Point Barrow area will be analyzed and interpreted here.

Analysis and Classification of Artifacts

HUNTING AND FISHING EQUIPMENT

Harpoon Gear

Harpoon Heads

Except where noted, the classification used in the following treatment of harpoon heads is that employed by Ford (1959) and Collins (1937c). Several new types of harpoon heads have been identified and given names that are compatible with the already existing classifications.

Birnirk Open Socket.—Fourteen specimens of the Birnirk open socket variety were found in the Walakpa excavation (Plates 7*a*, 15*d-h*, 37*a*, 49*a-d*). Unlike the Birnirk open socket harpoons found by Ford at the Birnirk site, which were all of antler, four of the Walakpa specimens are made of ivory and ten are made of antler (Ford, 1959:75).

All specimens have barbs placed on a lateral edge with an inset side blade facing the barb. On nine specimens, where the location of the socket could be determined, it was found that the spur occurred on the right edge of four and on the left edge of five. Three have the open socket flanked by two lashing slots, while six have only one lashing slot. The rest of the base is grooved for hafting. All line holes are round.

On four complete examples, the range of the lengths of these harpoon heads is from 14.4 to 8.8 cm, with an average of 11.9 cm. This compares to a range length of 13.5–7 cm and an average of 10.5 cm on Ford's Birnirk open socket harpoon heads (Ford, 1959:75). Measurements from the upper edge of the line hole to the tip of the harpoon point range from 8.75 to 6.8 cm, with an average of 7.7 cm. The ivory specimens are all shorter than the antler specimens, which have a range of 7.1–6.9 cm from line hole to tip of harpoon point.

Decoration is simply straight incised lines that diverge from the median ridge to approximately halfway between the line hole and the point of the harpoon. One of the antler specimens has two short converging lines placed over the line hole and on the socket surface; the area between these lines is also incised. A unique specimen has two scallops that are similar to nonfunctional side blade slots. These occur on the edge of the outside spur. On either side of the spur are incised crescent-shaped lines. None of the ivory specimens contain any decoration above the line hole.

It is also interesting to note that the location of the sockets on the antler specimens are not determined by the cancellous structure of the antler, for on five specimens the socket is carved into the hard surface. On four others it is carved into the cancellous structure.

The inset side blades are made on small, thin semi-rectangular flakes. Three of these flakes are made from a gray chert that comes from the Siksikpuk formation in the Brooks Range. One is made from a clear chalcedony.

Naulock Open Socket.—Six specimens of the Naulock open socket variety were found, all made from antler (Plates 6*b*, 7*b*, *c*, 15*a*). The range of lengths of these harpoon heads is 9.2–7.6 cm, with an average of 8.4 cm.

On three specimens, three gracefully carved points which make up the spurs are carved (Plates 7*c*, 15*a*). These are placed directly below the sockets on the left edge of the harpoon. One specimen has only two points, one much larger than the other (Plate 7*b*). The larger point has four lateral points. Unlike the specimens reported by Ford (1959:79), one has the open socket placed on the hard surface rather than on the cancellous side of the antler. Three of these harpoons have the open sockets flanked by two lashing slots. One has only one lashing slot. They have round line holes, which are beveled toward the base of the harpoon to accommodate the harpoon line. The blade slit is located in the same plane as the line hole.

The decoration on these specimens consists of two converging lines located on both sides of the harpoon point. The lines begin at the lashing slot and continue beyond the blade slit. The incised lines do not reach the edge of the harpoon and do not serve as ornamental barbs. Ornamental barbs appear on the

edges, but are simply the result of the depression carved into both lateral edges to form nonfunctional side blade slots.

TUQUOK OPEN SOCKET.—Two antler specimens were found which resemble Ford's (1959:79) Tuquok type (Plates 6*a*, 15*b*). Although in certain aspects they are quite different, I will not attempt to describe a new type with only two specimens, and consider these examples as a variety of the Tuquok type. These specimens are small compared to Ford's and measure 9.4–8.7 cm in length, while Ford's measure on the average of 10–16 cm in length (Ford, 1959:79).

The spur of this type is not bifurcated and rather than a vestigial third prong, one has four distinct prongs symmetrically placed below the open socket (Plate 15*b*). The other has only two prongs (a third prong is broken), which are also placed directly below the socket (Plate 6*a*). The open sockets are flanked by one lashing slot. One has a deeply cut groove running from the slot across the harpoon to the socket. The other has the groove cut completely around the harpoon. Both examples have side blades located on both edges of the blade. The side blades are made from chert. The line holes are round and beveled towards the base of the harpoon. Other than the four basal spurs, the decoration is simply two converging lines that start between the line hole and the edge and nearly three-fourths the length of the harpoon blade.

TASIK OPEN SOCKET.—Only one example of the Tasik type was recovered in the Walakpa excavations (Plate 7*d*). This specimen is 8.6 cm in length, which compares to the range of 13–7.5 cm reported by Ford (1959:82). This specimen, like Ford's, is made of antler.

The harpoon head has a single asymmetrically placed lateral spur. The inside of the spur is scalloped in the shape of a nonfunctional point placed on the upper margin of the spur. It is oval in cross-section. Both sides are slightly constricted by the presence of nonfunctional side blade slots. Ford does not mention the presence of these side blade slots on any of his specimens. Two lashing slots are present on either side of the socket. The line hole is rather small and placed in the same plane as the blade slot. It is slightly beveled towards the socket to accommodate the harpoon line. Ornamentation consists of incised lines that run from the line hole to the blade slot. Two incised lines are located along both edges below the nonfunctional side blade slots and extend almost to the base of the harpoon point. It also appears that the small, nonfunctional point on the spur is for ornamentation.

SICCO OPEN SOCKET.—Three examples of the Sicco Open Socket type were recovered at Walakpa (Plates 58*b*, 63*c*). Only one specimen was complete and its length is 8.9 cm; this is slightly smaller than those described by Ford (1959:83). Its spur has one point with five facets placed lateral to the socket. All of the examples have two lashing slots, which flank the open socket. Blade slits occur in the same plane as the line hole and socket. In cross-section these harpoon heads have six facets. They are slightly constricted at the line hole and have faceted triangular-shaped prongs on either side of the blade slit. Decoration, which occurs on only one specimen, consists of elongated triangles placed between the line hole and blade slot. The center areas of the triangles have been filled with incised lines. Neither specimen has vestigial side blade slots, such as those reported by Stefansson from Point Barrow (Ford, 1959:85).

NATCHUK OPEN SOCKET.—Ford believes that the Natchuk open socket evolved from the Birnirk open socket by the elimination of stone side blades and the reduction of the multipronged spur to one point (Ford, 1959:83). He further believes that it is a type that represents a step in the development of the Thule II harpoon head (Ford, 1959:83). Evidence from the Walakpa site would suggest that this type occurs very late in the Birnirk sequence and is contemporary with the Birnirk type harpoon head in the uppermost Birnirk level at Walakpa. The differences between the two types of harpoon heads are that the Natchuk type is usually more delicate, less elaborate and does not have inset side blades.

Three ivory specimens of the Natchuk open socket were recovered at the Walakpa site, two from levels that represent middle period Birnirk occupation (Plate 49*e, f*), and one from an Early Thule level (Plate 58*a*.) Of those from the Birnirk level, one is a finished specimen while the other is a nearly finished preform. The two Birnirk specimens may demonstrate an early period of Natchuk development, as they are more closely related to the Birnirk open socket variety in that they have multipointed spurs and the barb is placed at the center of the blade.

As Ford (1959:83) noted, Natchuk specimens are smaller than the Birnirk type. These two measured 8.9 and 8.8 cm in length, as compared to the average of 10.5 cm for the Birnirk type. The spurs have two points and are placed on the opposite side of the lateral barb. The line hole in the finished specimen is round while in the unfinished specimen it appears to have been intended to be triangular.

The unfinished specimen has three nonfunctional slots to replace the side blades, while the other contains two scallops, unlike the nonfunctional slots. One specimen has two lashing slots, while the other has

only one slot with a cut groove extending three-fourths of the way around the diameter of the harpoon point. The unfinished preform provides details on the manufacture of the open socket. Three cuts are made: two long cuts run parallel to the long axis of the harpoon and one short cut placed at a right angle across the top of the two parallel cuts. This leaves an uncut section, which is chipped out; then the rough surfaces are ground off. Decoration consists of converging incised lines starting at the lowest portion of the nonfunctional slot and/or scallops, which end and do not meet above the lateral barb. On the complete specimen an intricate scallop has been carved under the bark.

The Early Thule Natchuk specimen from the A area is extremely interesting, as it more closely resembles the Thule II type than the Birnirk open socket variety (Plate 58*a*). It has only a one-pronged spur, which is laterally placed. It retains the nonfunctional side blade slot. Unlike Ford's specimen, however, and more nearly like Thule II, the lateral barb has been placed near the tip of the harpoon rather than at the center of the blade. It has a small round line hole with beveling between it and the socket for the line. It has two lashing slots. The specimen is 9.15 cm in length. Its decoration is confined primarily to two converging lines above the line hole with two matched sets of inward pointing lines which do not meet.

THULE II OPEN SOCKET.—The Eastern Thule II is the most distinctive of the Thule types. Eleven specimens were recovered at Walakpa (Plates 49*g*, 58*c*, 59*a*, *b*, 63*e*, 75*b*, 118*a*). Three of these were complete and the rest were damaged. Seven of the harpoon heads were made of ivory, while the rest were of antler. The range of lengths is 8.9–8.5 cm. This compares to a range of 15–8 cm from Birnirk, with an average of 9.5 cm (Ford, 1959:86).

These harpoon heads can be characterized by having two symmetrically placed lateral barbs, open sockets and single-pointed spurs. Three slight variations appear in the lashing techniques. Six specimens have two lashing slots cut into either side of the socket and converge toward each other. A groove is cut between them on the opposite side of the open socket. One specimen has two drilled holes on either side of the socket. Two specimens have only a groove cut around the diameter of the harpoon head from one side of the socket to the other. Four specimens have triangular line holes, while the others are round. One specimen has two round line holes. This appears to be accidental, as the socket cuts into the lower line hole and the second hole was subsequently drilled.

Occasionally on the outside edges of the body of the harpoon head there appears a pronounced ridge. The ridge runs from slightly below the line hole to the tip of the spur. It appears that these were carved to give greater support for the lashing slot.

Decoration ranges from no modification to a straight line carved from the line hole extending up the center of the harpoon to the tip. An incised, upside down Y occurs over the line hole on one example, while another has a very simple triangle carved above the line hole. The final example has a triangular-line hole, the top of which terminates with a short incised line. Both the line hole and the incised lines are inside two converging lines that run from the lashing slots to about two-thirds the length of the harpoon head.

One, possibly two, specimens of Thule II harpoon heads occurred in the Walakpa-Birnirk occupation. The first is a broken ivory specimen (Plate 49*g*). In most respects it is similar to those described by Ford (1959) and Mathiassen (1927a), but it seems to have many decorational features that are more similar to Birnirk than to Eastern Thule and is identical to a specimen from Kurigitavik (Collins, 1940:562). The length of this specimen is 7.25 cm. On the specimens from Birnirk, Ford (1959:86) reports that they have single pointed spurs. On the Walakpa-Birnirk specimen there is a single pointed spur, which has been faceted into a pentagonal cross-section, with one small but very pronounced spur placed slightly above the main spur and to the opposite side of the socket. The open socket is flanked by two lashing slots with connecting lashing grooves. The line hole is triangular. Two barbs are placed symmetrically at the tip of the harpoon head but are broken.

The decoration is quite elaborate. A set of two incised lines are placed above the line hole, with one starting below the hole and meeting above the line hole where they form a single line and continue up the blade of the harpoon. A triangular-shaped groove has been cut between the line hole and the incised lines, which act as a decorative extension of the triangular line hole. Incised lines are cut into the blade from the ends of the barb cuts. Below the barbs, and symmetrically placed to either side of the line hole, are two gracefully carved vestigial barbs. These barbs have incised lines cut into the blade from the termination of the barb cuts. The faceted spur is the final form of decoration.

This particular harpoon head, even though it is considered here as a Thule II, has features that are characteristic of both Thule and Birnirk cultures. It is a good example of a harpoon head belonging to the time when Thule types were beginning to emerge

from Birnirk types. Therefore, it is considered an early form of Thule II.

The second example, which may be a Thule II harpoon head found in the Birnirk occupation at Walakpa, is a broken tip (Plate 37*b*). Although there is no way of making a positive identification, whatever type it may have been would have had two symmetrically placed lateral barbs. The only type of harpoon head that occurs with this type of barb arrangement is the Thule II.

THULE III OPEN SOCKET.—Eastern Thule III is represented by only two antler specimens (Plates 63*b*, 80*a*). In regard to general characteristics, they have no side barbs but are slotted for end blades. The slots are cut so the blade is set parallel with the line hole. They have round, medium-sized line holes and both sides have lashing slots. They have open sockets with lateral spurs. Mathiassen's (1927a:25) specimens range in length from 10.4 to 7.4 cm, while those recovered at Walakpa are 11 and 6.7 cm in length. The smaller specimen is decorated by two incised lines, which run from the lashing slot along both edges for a distance of approximately two-thirds the length of the point. In the manufacture of the socket on the larger specimen, the line hole was accidentally damaged. A small ivory wedge was placed in a slot behind the line hole. This wedge kept the open socket separated from the line hole.

THULE IV CLOSED SOCKET.—Thule IV specimens, as described by Mathiassen (1927a:25), have closed sockets, with the blade slit cut at right angles to the direction of the line hole. Eastern Thule IV is not reported by Ford from the Point Barrow area. At the Walakpa site, four, or possibly five, specimens of this type were recovered. Three of these were in unquestionable association with the Birnirk occupation. There is no doubt about their occurrence in situ in the Birnirk occupation. The implication is that, like Eastern Thule II, Eastern Thule IV also has its immediate origin during the Birnirk period and is indeed fully developed before the end of the Birnirk period.

One of these closed socket specimens (Plate 15*c*) is made of ivory. Its total length is 8 cm. The prongs have a thick diamond-shaped cross-section, while the base has been faceted into ten sides. The line hole is round and in comparison with other specimens from this level is rather large. The hole is placed in a shallow concave surface on each side of the harpoon, with a shallow bevel extending towards its base. The end blade slot is placed at a right angle to the line hole. It has a single-pointed spur occurring below the socket. Other than the faceting at the base of the harpoon point, there is no decoration appearing on this specimen.

The second specimen of Thule IV (Plate 7*e*) comes from the test trench in a Birnirk level. This specimen, measuring 6.8 cm, is smaller than the example described above. The prongs have a diamond-shaped cross-section and the base has eight facets. The line hole is round and is proportionally smaller than the first specimen. It is placed in a shallow concavity with a bevel leading back to the base of the harpoon. Unlike other specimens from Walakpa, this one has a slight ridge at the front of the line hole. The end blade slit is placed at a right angle to the line hole. The faceted spur is placed below the socket. A portion of an ivory foreshaft still remains wedged into the closed socket.

A third specimen from the A area was also found in association with Birnirk type artifacts (Plate 6*c*). This specimen is not complete and no overall length could be determined. The blade slit is situated at a right angle to the line hole, with the prongs being diamond-shaped in cross-section. The line hole is relatively small, and it is placed in a concave surface, which occurs on each side of the harpoon. The socket is also relatively small. The spur is placed at a right angle to the socket. The spur is not faceted as in the first two specimens and there is no decoration.

The fourth specimen of Thule IV (Plate 63*d*) made of antler was found in the Early Thule unit of the B area. The prongs have been broken, but it is possible to determine that the blade slot was at a right angle to the line hole. The specimen is broken and no measurements could be made. The line hole is round but it is not placed in the concave portion of the harpoon. The cross-section of the harpoon is almost rectangular, which is quite different from the Barrow or Nuwuk types and fits the faceted cross-section of the other Eastern Thule types from Walakpa.

THULE IIa.—I have here designated four harpoon types as Thule IIa, b, c, d. These new designations are used to remain parallel with the Thule-II type harpoon head, of which these are simply variations. They do not imply any temporal ordering.

Only one broken specimen (Plate 97*a*) of this variety was recovered at Walakpa. Larsen and Rainey (1948) recovered one of this type in their Western Thule house at Point Hope.

In their general characteristics, they are open socket harpoons, which are very closely related to both Thule II and the Natchuk types. The singular difference is that they are similar to Thule II, but have only one lateral barb rather than two. The specimen from Walakpa is broken; however, it has a triangular line hole, no decoration, and is made of ivory.

THULE IIb.—This type is also a variety of Eastern Thule II (Plate 93*b*). The only difference is that these

specimens are cut for an end blade slot. In all other features they are identical to Thule II.

Only one specimen was recovered at Walakpa. It measures 7 cm in length and is made of ivory. It has an open socket, two lashing slots, and a single-pointed spur placed at a right angle to the socket. Two lateral barbs were present but one is broken. The specimen has a round line hole. Decoration is a simple incised line running from the line hole to the end blade slot.

THULE IIC.—This variety of harpoon head was found in the St. Lawrence Island Punuk assemblage and is called type IV(a) by Collins, (1937c:211) (Plates 81*b, c,* 87*a, e*). It is closely related to Thule II, but differs in that it has multiple sets of barbs. Most of these specimens come from the Late Thule levels at Walakpa.

In general description, they may be characterized as having open sockets and two or three sets of lateral barbs. End blades are not present. The line holes on four specimens are round. The spur is placed at right angles to the socket and has only one point. On three specimens there are lashing slots on both sides of the socket, while a fourth has two round holes drilled on both sides of the socket. The lashing holes are connected by cut grooves.

Only one specimen is complete (Plate 87*a*) and its length is 11.8 cm. Decoration consists of incised lines extending from the line hole past, or at least to, the end set of barbs. On one specimen the decoration is much more elaborate. A mark, which may indicate ownership, is placed above the line hole. On both edges of this specimen there are two incised lines, one on either side of the edge facet. These lines all have short incised lines, which turn away at approximately 90° and nearly meet the ends of the main incised lines. The back facets are bifurcated.

THULE IID.—This variety of Thule has not been described in the literature. Two ivory specimens were found at Walakpa (Plate 81*a, d*). These harpoon heads have, as their most characteristic feature, blades that have neither barbs nor end blades. They have a long slender pointed blade. In its essential structural features, this type is similar to Ford's (1959:82) Tipiruk-type. Ford sees this as a more slender and ancestral version of Mathiassen's (1927a: 24) Thule I. Collins (1937c:211, pl. 71:12, 13) also describes a variety similar to these from St. Lawrence Island. The complete Walakpa example, however, is simply a Thule II type, which has a long barbless blade. It may well indeed be the end point of the change from a Tipiruk to Thule I type.

The smaller specimen is incomplete (Plate 81*d*). We can determine, however, that it has an open socket and a round line hole. The most interesting feature of this harpoon head is the decoration that is incised on the blade.

The larger specimen measures 16.9 cm in length (Plate 81*a*). It has an open socket with the spur placed at a right angle. The spur has a single point with gracefully scalloped edges. Lashing slots flank the socket. The line hole is triangular in shape. On the blade a fluting effect has been achieved by the removal of the core pulp from the walrus tusk. Decoration consists of an ownership mark placed above the line hole. The mark is an inverted Y, which has two slashes across the base. This same ownership mark occurs on several antler arrowheads in the Late Thule levels. The edge facets have been incised with a single line located on all four facets of the spur. These lines are bifurcated near the base and have two pairs of falling lines, which meet at the base.

UTKIAVIK CLOSED SOCKET.—This variety is closely related to Thule IID (Plate 101*a*). It has multiple barbs, a round line hole and a closed socket. The spur has a single point and is placed below the socket. Three of these were recovered at Walakpa. Two antler specimens were incomplete. One made of ivory was complete; its length is 11.6 cm. Decoration consists of a simple incised line beginning at the line hole and running approximately two-thirds of the length of the blade. One specimen has an inverted Y design over the line hole.

NUWUK CLOSED SOCKET.—Nuwuk Closed Socket harpoon head, in addition to having a closed socket, has spurs containing single points, which are placed below the socket. Line holes are round and the end blade slot is placed in the same plane as the line hole. The prongs are triangular to elliptical in cross-section. The main body and the spur are faceted to round in cross-section. Line holes are beveled towards the socket.

Three examples of Nuwuk closed socket harpoons were found in the Late Thule levels (Plates 84*b,* 93*a,* 108*a*) and one from an Early Thule level at Walakpa (Plate 75*a*). One (Plate 108*a*) is made of ivory and three are made of antler. They range in length from 8.4 to 7.5 cm. These specimens are decorated with incised lines. The major design motifs are converging lines forming series of triangles. The upper ends of the triangles have been etched solid. The inverted Y motif occurs on two harpoon heads over the line hole (Plates 75*a,* 108*a*).

PUNUK II (f)(x).—This harpoon head type is represented by one specimen in the Early Thule level (Plate 63*a*). It has an open socket flanked by two lashing slots and a bifurcated symmetrically placed spur. The line hole is round and is slightly beveled

towards the spur. Two nonfunctional side blade slots occur at right angles to the line hole. The blade is diamond-shaped in cross-section and the blade slot is located on the same plane as the line hole. In cross-section the main body of the harpoon is almost rectangular in shape. The lateral edge expands directly below the side blade slots, then falls at a slight angle, where two additional triangular slots have been carved. This specimen measures 9.6 cm in length.

Decoration is quite elaborate and consists of two incised lines beginning at the bifurcation of the spur and extending up the blade on both sides. At a point directly across from the upper edge of the lashing slot, the outside line turns back to the upper edge of the spur. At the exact place where the outside line turns, a hole inset with fossil ivory, has been drilled. From the edge of the spur the outside line turns back up the blade and rejoins the inside line near the line hole. One line extends up both sides to a point just below the end blade slot. On both lateral surfaces the single inside line has been carved. This line starts slightly above the line hole and proceeds to a point opposite the end blade slot. The line then turns back on itself; after a short distance, it terminates with a set of drilled holes, which have been inset with fossil ivory.

Whaling Harpoon Head.—The only specimen of strictly whaling equipment is a whaling harpoon head from the Late Thule occupation (Plate 84*a*). This harpoon measures 25.6 cm in length. It is made of bone. It has a closed socket and the end blade slot is located at a right angle to the line hole. The line hole is located near the ventral edge. It is extremely large, measuring 2.7 by 1.7 cm. The line hole is not particularly beveled, but it is placed in deep concave surfaces carved on both sides of the harpoon point. An ownership mark occurs on the dorsal surface near the socket. It consists of a single line slanting slightly to the right. Another short line extends at a 90° angle to the right of the main line. The spur is faceted into five sides.

Harpoon Head Preforms.—Eleven examples of harpoon-head preforms were recovered. As these were in various stages of manufacture, they indicated the steps in the manufacture of harpoon heads.

The first step in the manufacture of open socket harpoons is the cutting of a rectangular antler strip. The second step is that of cutting one end at an angle (Plate 6*h*), which will eventually become the spur of the harpoon. The edges are then faceted and the point is roughly cut. Next, the blade is ground to a sharp edge, as is the point. At the upper edge of the angular-end cut there is a deep notch (Plate 37*c, d*). This gives additional definition to the spur and creates a flat surface from which the socket can be carved. Next, the line hole is drilled (Plate 6*i*). (On one example the hole is drilled completely through the preform; in another case, holes are drilled from both sides and meet near the center of the preform.) The spur is then shaped and ground into its final shape. The next step includes the cutting of the barbs, side blade slots, and lashing slots, and the final step is the manufacture of the socket (Plate 6*j*). The socket is made by cutting two parallel grooves up to a point near the line hole. Another groove is cut that transects the ends of the parallel lines. This leaves a central portion, which is chiseled out, and then the rough surface is ground off.

Very few specimens of the closed socket preforms were recovered. The step after quartering the antler blank is that of cutting an angular surface across one end (Plate 85*a*). The other end is bluntly pointed by a series of facets and the diameter of the harpoon head body is also faceted. These are then ground smooth (Plate 85*a*). The end blade slot and the sockets are then manufactured. As no specimens were found representing these final steps, I cannot say which is manufactured first.

Harpoon End Blades

Several types of harpoon end blades were found in the Walakpa middens. In general they conform to the type described by Ford (1959:96–97).

Type One.—The first type has fluted or hollow ground faces (Plate 85*b*). This type occurs only in the Late Thule levels. Six specimens, all of gray slate, represent this type. They range in length from 5.3 to 4.2 cm. Their maximum widths range from 2.2 to 1.4 cm. The maximum widths of the flutes range from 1.4 to 1.2 cm.

The style of the base ranges from concave to straight. The edges are ground all the way to the margin of the flute. Below the flute the edges meet to form a diamond-shaped cross-section. The flutes are horizontally scarred; probably the results of manufacturing or from the wedging of these end blades into the prongs of the harpoon.

These end blades appear to be very strong, as the only breakage, which occurred on five of the specimens, was that on the upper quarter of the blades. This appears to have resulted from stress in harpoon removal.

Type Two.—Type two is closely related to the first type, but rather than being hollow ground, they are ground flat (Plate 87*f*). The cutting edges are not as steep as those of type one. At the termination of the hafting surface there is a steep rise to meet the edges. The edges are ground into four facets.

The type-two examples were recovered in the Late Thule occupation. The complete specimen is made of red slate, and the other of gray slate. On the only complete specimen, the base is ground flat; the length is 5.1 cm, the maximum width is 2.3 cm, and the maximum width of the hafting surface is 1.8 cm.

TYPE THREE.—Type three is the most numerous type of end blade found at Walakpa. These are both Early and Late Thule in age (Plates 59*d*, 73*a*, 77*b*, 87*d*, 93*d*, *e*, 101*b*). There are fourteen examples: eleven of gray slate and three of red slate. These harpoon end blades are extremely thin and well made. The major portion of the end blade consists of the hafting surface. The edges are steep, narrow, and come together at the tip. The bases are ground flat. This type of harpoon end blade appears to be the least structurally sound of the types. All but one of these specimens is highly fragmentary. They appear to break near the tip, at the center, and at the base of the blade. The measurements range from 3.7 to 2.3 cm in length. The maximum width is 2 cm, and the maximum width of the hafting surface is 1.6 cm.

The final class of harpoon end blades includes a large variety, presumably for whale or walrus harpoons. Three tip fragments of gray slate make up the first type. These correspond to type three of the smaller variety (Plate 59*c*). No measurements are meaningful, but they are extremely wide. The hafting plane extends nearer to the tip than do those of type three of the small variety. All of these specimens are Early Thule in age.

Specimens which do not fit into Ford's classes are lenticular in cross-section, with no distinct bevel on the edge (Plates 81*h*, 84*c*, *d*). The only near-complete specimen is greater than 7.3 cm in length, and it is approximately 4.6 cm in width. The base is ground flat. It is Late Thule in age.

Nine harpoon end blade preforms were found (Plate 59*e*). These are roughly triangular-shaped pieces of chipped and ground slate. They range in length from 5.8 cm to slightly greater than 2.3 cm. The method of manufacture appears to be flaking the preform to the approximate shape with final shaping by grinding. The grinding of the edge is the last step.

HARPOON FORESHAFTS

On the upper end of the harpoon shaft is affixed the harpoon foreshaft. The foreshaft is used to connect the main shaft with the harpoon head. These artifacts occur in two varieties, large and small, but structurally and morphologically they are the same. The size difference is probably related to function, with the larger type being used for walrus, bearded seal, and possibly whale, while the smaller are used for small seals.

Eight ivory specimens were recovered in the Birnirk levels, but only one is complete. Seven larger specimens make up the first class (Plates 15*j-m*, 37*e*, 49*h*, *i*). One (Plate 15*m*), nearly complete, can be used for descriptive purposes. The foreshafts are slender, oval to rectangular in cross-section, and made of ivory. Both ends are tapered and round. On those specimens, which are complete enough for analysis, all have one small line hole near the butt end for attaching a line to the harpoon shaft or socket piece. The upper end is carved to fit the socket of the harpoon head. No total lengths are available, but for two specimens the length from the line hole to the haft end is 5.1 and 6.7 cm, respectively. On one, the length from the line hole to the tip is 16.4 cm. These foreshafts tend to break in two places—at the tip near the harpoon head and at the line hole or immediately behind it. These would be the two places of maximum stress during impact.

The smaller variety is represented by one complete specimen and a broken end from the Birnirk levels (Plate 15*i*). They are structurally identical to the larger type except that one end is scarred for hafting purposes. This indicates that the larger type is made to separate from the harpoon shaft, while the smaller remains attached. The length of the complete specimen is 10.5 cm, with the distance from the line hole to the shorter end being 2.1 cm, and 8.1 cm to the longer end.

Only three foreshafts were found in the Early Thule occupation. Two are broken fragments of the larger variety (Plates 63*g*, 68*a*). They are oval in cross-section, measuring 1.5 by 1.4 cm at their widest point and tapering to a narrow blunt point. The complete example (Plate 80*b*) is of the smaller variety. It is pointed at both ends. One end is closer to the widest portion of the shaft than is the other. The rectangular slot is in the widest portion. Lashing grooves are cut on one side of the slot. The specimen has four sides, three of which are slightly fluted. The fourth side is convex. The foreshaft measures 9.1 cm in length and 1 cm at its maximum width. The line hole is 1.2 cm long and is situated 6.6 cm from one end and 1.4 cm from the other. One complete foreshaft and three fragments were found in the Late Thule levels (Plate 119*a*). The three broken specimens appear to have been from broken, larger foreshafts.

An extremely large, bone harpoon socket piece was found in the lowest Birnirk level (Plate 16*e*). This tool is 32 cm long and 2.4 cm wide. The distal end

contains a socket hole for engaging the butt of the foreshaft. The hole is 1.6 cm deep and 1.25 cm wide. At the other end it is flat on two surfaces with a hole drilled completely through the shaft. The hole is located 6.4 cm from the end. This end of the artifact is beveled to a round point.

Harpoon Shafts

Harpoon shafts are not common because wood was extremely valuable and a broken shaft could be reused for another artifact. Five small fragments and one large fragment were recovered (Plates 68*l*, 101*h*). The measurements of the diameters of these fragments range from 3 to 2.5 cm.

The longest section (not illustrated) is 89.5 cm in length. It is from a Birnirk level. Fortunately, one end of this example was that which was attached to the harpoon socket. This harpoon shaft is beveled on one edge to fit the socket. The hafting surface was manufactured by cutting away one-half of the shaft at a slight angle. The length of this surface is 6.6 cm. From the lower end of the outside surface of the haft surface it is slightly beveled toward the end, where it culminates with a raised lip. There is wood discoloration, which outlines the binding of the socket to the shaft. The hafting surface has not been drilled.

Another Birnirk specimen is a fragment of the butt end of the shaft. The end of this shaft has a drilled socket to receive the tang end of the ice pick. This hole is 2 cm in diameter and 5.4 cm in depth. This correlates with tang measurements on certain Birnirk ice picks. As in the hafting technique of the socket, this end is also slightly tapered toward the butt with a lip at the end. The wood is discolored from the binding of the ice pick.

The last artifact was probably never utilized for a harpoon shaft, as it bends markedly to one side. It is probably a discard from the manufacture of a shaft. This section of shaft measures 40.5 cm in length. Its largest diameter is 3 cm and tapers to 2.3 cm. Although the surface has undergone the final smoothing stage of manufacture, it has not been polished. It had been cut from a larger shaft by incising the circumference to a depth of 0.3 cm; then it was snapped off. This specimen is from the lowest Birnirk level.

Harpoon Ice Picks

The ice pick is attached to the butt end of the harpoon and is used to break ice from seal breathing holes. According to Ford (1959:102), they appear to change through time and are possibly diagnostic of cultural change. The ivory ice picks recovered by Ford from the Birnirk period fall within one of his five major classes of harpoon ice picks, that is, class A. He found that this was the only type that occurred in the Birnirk level (Ford, 1959:102):

> Type A. Only one type occurs in the Birnirk finds. It is made from the distal end of the slender tusks of young female walrus. Towards the points, flat facets have been ground to sharpen the picks. . . . At the proximal end there are a sloping shoulder and tapering tang made to fit into a socket in the wooden harpoon shaft.

Two complete examples of type A were found in the Birnirk levels at Walakpa (Plate 49*j*, *k*). Both of these are ivory. The measurements are 17.7 and 18.8 cm in length and 2.3 and 2.1 cm in maximum diameter, respectively. The length of the hafting tangs are both 6.5 cm with their maximum diameter being 1.8 and 17 cm. Fourteen broken examples were recovered (Plates 68*b*, 87*i*, 97*e*, 119*b*, *c*). Their distribution seems to be fairly general throughout the various occupation levels of the site. This does not conform to the pattern discovered by Ford, where this type was strictly a Birnirk manifestation.

Another complete specimen was recovered from the lowest Birnirk level at Walakpa (Plate 16*d*). This example may make up a subtype of Ford's A group, but in many respects it is different. Although it is made from the distal end of a walrus tusk, it does not have the shoulders nor is it cut into a cylindrical shaft. Rather, it is simply a quartered section of tusk with three pronounced sides. It is pointed at both ends, with adz cuts on one end for hafting. Its total length is 28.5 cm, which is 4.5 cm longer than any reported by Ford.

Two other examples of possible ice picks, which have not been described in the literature, were found in the Birnirk levels (Plates 16*b*, 49*l*). Only one of these antler examples is complete. It is a long, 17.5 cm, slender, knife-shaped piece of carved antler. The blade is diamond in cross-section, having four beveled edges. At 10.1 cm from the tip of the blade there are slightly rounded shoulders, with the rest of the artifact being oval in cross-section. At the hafted end, adz cuts occur. On the face of the complete specimen is a small hole cut into the blade. The hole does not go completely through the blade.

A single example of Ford's type B was found in a Late Thule level (Plate 115*a*). It is made from antler with a round shaft and the tip is semicircular in cross-section. The distal end is beveled to a point, while the proximal end is socketed to fit the harpoon shaft. There is a shoulder 5 cm above the proximal end. The area between the socket and the shoulder is roughened for lashing. This ice pick measures 19.5 cm in length and 2.4 cm in diameter.

The second variety of Late Thule ice pick, recovered at Walakpa, is represented by four broken examples (Plate 101*g*). These specimens are made of antler. In cross-section the blade is triangular. The longest specimen measures in excess of 29.5 cm in length. The other two examples are small blade sections. The tang on the longest specimen is wedge-shaped, with a single bevel along one edge. The beveled surface has been roughened for hafting by adz cuts.

The final examples of ice picks from Walakpa are probably closely related to Ford's type E (Ford, 1959: 102–104). The major difference is that this variety does not have the cut scarf of the type E, and the blade tends to be oval in cross-section. The blade is carved round in a very crude fashion. The tang is wedge-shaped, having been beveled on one edge. All surfaces of the tang are scarred for hafting. There is no shoulder to offset the tang from the blade. This specimen dates Late Thule in age. It measures 19.4 cm in length. The tang is 8.6 cm in length, with a width of 2.2 cm.

Another extremely interesting ice pick was found in the upper Late Thule level (Plate 93*i*). It is made from a split caribou antler. The blade is curved gracefully to a sharp point. The tang is wedge-shaped, the wedge being produced by cutting the split antler at a slight angle until it intersects the os-compacta of the antler. The inside cancellous structure has been scarred for hafting. At the upper end of the tang a hole is drilled. Slightly above the hole two notches are carved in both lateral edges. The interior of these notches is roughened. Near the tip of the tang, on the outside surface, is a shallow notch. These are probably hafting devices. The total length of this ice pick is 33.8 cm. The tang measures 12.1 cm in length, with its maximum width being 3.3 cm.

Seal Poke Gear

Float Bars

Ford describes three major varieties of float bars: (1) small bars with raised ends late in time, (2) large round bars with rounded ends, Birnirk in age, and (3) curved bars, Birnirk in age (Ford, 1959:104). The float bars from Walakpa generally follow Ford's model.

Ford's Type 1: No examples of type 1 were found in the Late Thule levels, but they did occur in the historic houses.

Ford's Type 2: Five examples of the second type were found in the Birnirk and Early Thule levels (Plate 70*a, b*). It is hard to determine whether these are float bars or baleen basket handles. It is most probable that they are float bars, as the ends have not been perforated for basket suspension. They are round in cross-section with the widest portion in the center and slightly tapered to either end. This type does not have the raised lip on the ends as does the smaller type 1 mentioned above. The range of lengths for these bars is 22.9–15.1 cm. The average length is 18.6 cm. The range of maximum measurements of the center diameter is 2.7–1.7 cm, with an average of 2.1 cm.

Ford's Type 3: One example of the curved type was found in the Birnirk level. This specimen is crescent-shaped (Plate 17*a*). Its length is 18.3 cm. The center is concave. The length of the concavity is 4 cm. Below the concavity the ends taper to a point and turn downward.

Seal Float Mouthpieces

As the name implies, the seal float mouthpiece was used for the inflation of seal floats. Two examples of these artifacts were found at Walakpa. One is of Birnirk age and one is Early Thule age.

The Birnirk specimen, like those of Ford's (1959: 105) was crudely manufactured in comparison to the later forms (Plate 47*c*). It is a short, cylindrically shaped tool with a wide groove encircling the entire shaft. The groove is used in the attachment of the mouthpiece to the float. It has an extremely small hole cut through the length of the cylinder. It is 3.6 cm in diameter and its length is 4 cm. The width of the attachment groove is 0.8 cm.

A single example of an Early Thule seal float mouthpiece was found (Plate 69*c*). This is an ivory specimen that measures 3.4 cm in diameter and 2 cm thick. It is concave on the inside and convex on the outside. A small hole was drilled through the center. It probably has an attachment groove; however, the mouthpiece is still attached to a portion of the seal skin and the groove is not visible.

Seal Float Mouthpiece Stoppers

Four examples of mouthpiece stoppers were found. Three are of Birnirk age and one is Late Thule in age. The ivory specimen measures 4.8 cm in length (Plate 51*c*). It has at the outside end a short, tabular handle, which would fit the fingers. The remaining portion of the tool is slender and tapers to a blunt point. Around the shaft, spiraling scars are visible, which resulted from the stopper being forced into the mouthpiece.

A wooden specimen of Birnirk age is identical in form to the one described above (Plate 51*d*). It has a

short, tabular handle placed above a long, tapering plug. It measures 5.8 cm in length. Another Birnirk specimen was also made of wood. It consists of a round piece of wood, larger in diameter at one end and tapering to the small end. At the small end the wood is peeled back a distance of 1 cm. This has resulted from its insertion into the mouthpiece. It measures 3.3 cm in length, 1.1 cm in maximum diameter, and 0.4 cm in minimum diameter.

The last specimen is Late Thule in age (Plate 81*i*). It, too, is a cylindrical-tapering piece of wood. It measures 3.7 cm in length, with the diameter tapering from 1.2 cm to 0.6 cm.

Seal Float Plugs

These plugs are used to close holes in the floats. A wooden Birnirk specimen is quite well made and is possibly a float mouthpiece without the hole having been drilled (Plate 7*i*). It is polished and appears to be a finished specimen. It is 2 cm in length and 3.4 cm in diameter. It has an attachment groove carved around the outside surface, which measures 0.8 cm in width.

The second specimen, also Birnirk in age, is crudely made, possibly an unfinished tool. It measures 4.6 cm in length and its diameter is 3.4 cm. The attachment groove is slightly offset towards the inside face. The groove is 0.8 cm in width.

Detachable Lance Points

Ford describes an artifact known as the detachable lance point (Ford, 1959:105). This is a wooden shaft, measuring 37 to 41 cm in length. The tip has a crude stone blade. The proximal end has a conical point, which fits into the harpoon socket piece. A shallow notch near the butt serves to retain a line that holds the lance point in place.

A possible example of this artifact was found in the Late Thule occupation. The blade end is broken, but it appears to have once had a blade slot. The length is greater than 36.5 cm and its diameter is 2 cm. The butt end has a conical point. The major difference, which may mean that it is not a lance point, is that it does not have the retaining notch.

Ice Hunting Gear

Wound Plugs

The wound plug is used to plug the wounds of animals to conserve the blood in the carcass. These have also been described as plugs to hold air blown under the skin of a seal to make it float (E. Nelson, 1899:147, Ford, 1959:106). Ford (1959:106) feels that there has been little change in the morphology of this artifact through time. I would have to agree, as in our finds this artifact does not change through time.

Four wound plugs are from the Birnirk occupation (Plates 7*l, m,* 17*b, c*). They can be described as blunt, pointed, tapering pieces of wood. They range from 9.5 to 8.5 cm in length. Ford (1959:106) indicates that his specimens have grooves encircling the larger end of the artifact. These specimens from the Walakpa site were attached at the opposite end. One has an encircling groove at the narrow end, while two others have perforated holes at the same end. One of these holes is square while the other is round.

A preform was also recovered from a Birnirk level. It is nearly complete except that there has been no arrangement made for attachment to the bundle.

Another specimen (Plate 51*h*), which I will describe separately because it is unique, was found in an upper Birnirk level. The most distinguishing feature of this example is that at its wide end it has two flanges on both edges. It has a round hole drilled at the pointed end and measures 9.2 cm in length. Two additional specimens come from the Late Thule occupations. Here, again, the holes have been drilled in the pointed end.

Wound Pins

Wound pins from Walakpa can be separated into two varieties. One is exclusively Birnirk, while the other is Thule.

Four ivory wound pins were found in the Birnirk levels (Plates 7*j, k,* 17*d,* 51*g*). They tend to be round in cross-section, but near the tip, four facets make a diamond-shaped cross-section. The upper end is flared and gives the artifact a nail-shape in appearance. These do not have the sharp edges reported by Ford (1959:106). The range of lengths is 11–7.8 cm. The diameters range from 0.7 to 0.5 cm.

A bone specimen from a Late Thule level (Plate 87*j*) more closely resembles Ford's specimens (1959, fig. 41). In cross-section it is flat to lenticular. The base is expanded and has a short handle-like central section, which results in the pin looking like a miniature dagger. Directly below this handle there are shoulders, which expand to the blade. The edges are ground sharp. The length measures 9 cm. Its width is 0.8 cm and its thickness is 0.4 cm.

Ice Scoops

The ice scoop, as described by Murdoch (1892:308–309), was a baleen netting lashed inside an oval-shaped

antler strip. It has a long handle attached at one end. These were used for removing ice chips when cutting holes in the ice or gathering chips of fresh water to melt.

Two small sections and one large section of an ice scoop rim were found in the Birnirk levels (Plate 17*e-g*). They measured 2–2.7 cm in width. The diameter of the scoop on a nearly complete specimen is roughly 18 cm. This is identical to the diameter of those from the Birnirk site (Ford, 1959:107).

Along the bottom edges of these rims are lashing slots through which the baleen netting was attached. These slots, on the most complete specimen, average 3 cm apart, while on the broken rims they average 1.9 cm. These slots are connected on all but two specimens by grooves used for additional lashing support. One specimen had two holes drilled at both ends to lash the ends together. On another specimen, an additional hole was drilled on the upper edge. Ford (1959:107) recovered at least one rim with this type of attachment mechanism.

The last Birnirk specimen is made from antler. Rather than binding holes, this example has a narrow tang with lateral spurs. The tang is either inserted into a slot or it overlaps the other end.

A single broken Late Thule specimen was also recovered (Plate 114*g*). It is made of antler and is too fragmentary to yield measurements.

Two-Piece Ice Scoops

The two-piece ice scoop was used to skim ice from fishing holes and to remove snow and hoar frost from clothing (Murdoch, 1892:309). It is made from two semicircular pieces of antler, baleen, or horn lashed together to form a scoop. The two halves are attached to a handle. Ford (1959:108) speculates that this was not a popular tool in early periods but came into more general use later. Our meager evidence tends to support this thesis. Only four halves were found, all of Late Thule age (Plates 82*h, i,* 111*h*). None of these were found in the Early Thule or Birnirk levels.

Two halves (Plate 82*h, i*) were found that were undoubtedly part of the same artifacts. These are made from antler measuring 12.8 by 9.1 cm. The edges are smooth and blunt. On the inside edges there are four matching holes drilled in each half, which are for lashing the halves together. Two lower lashing holes are square. The upper two holes are round and were probably used for the handle attachment.

A third antler specimen (Plate 111*h*) is different and may not be part of a two-piece ice scoop. It has the general shape and outline, but the holes for the attachment of the second half are peculiar in placement and there is no provision for handle attachment. It measures 13.7 cm in length and its maximum width is 5.2 cm. It has two holes placed close together and near the juncture of the inside edge and the distal end. The distal end and the outside edges are ground sharp. The inside edge is ground flat to fit to the other half.

The fourth example of a two-piece ice scoop is made of baleen. The handle end is incomplete, but the overall shape must have been semicircular. The outside edges are rounded while the inside edge is flat. Along the inside edge four holes were drilled for the attachment of the other half and the handle.

Seal Drag Handles

As the name implies, a seal drag is used to drag home seals. It consists of a thong about 46 cm (18 in) long attached to a handle. The thong is attached to the seal's lower jaw. The handle can be used for attachment to a longer line or to a dog harness (Murdoch, 1892:256).

One specimen of a seal drag handle was found at Walakpa. It is Late Thule in age (Plate 101*e*). The handle is carved from dense bone, such as a walrus mandible, and resembles a seal's head. A hole is drilled from a tang at the base of the head to a point just below the mouth. A second hole goes through the tang at a 90° angle to the original hole. These holes serve to attach the thong to the handle. The eyes and nostrils are drilled holes. A mouth is represented by an incised line. The handle measures 4.5 cm long and 1.5 cm wide.

Seal Scratchers

The seal scratcher is used to make a scratching noise on the ice, which was thought to attract seals to the hunter (Murdoch, 1892:253). Two very fine complete specimens were found in the Birnirk occupation at Walakpa. Ford (1959:102) did not recover any from the Birnirk site.

The first specimen fits Murdoch's (1892, fig. 253) drawings of those being used in historic times at Point Barrow (Plate 50*d*). It is 21 cm long and 5 cm at its widest point, which is just below the claws. It is manufactured from a single piece of wood, which resembles a seal's flipper. The wood is carved to allow seal claws to slip over five spurs at the distal end. The claws are attached by baleen cords. Two holes, cut side by side, are placed 8 cm back from the distal end. The holes are cut at an angle so that they intersect

each other and allow the baleen to pass through. The holes do not penetrate the ventral side of the tool. There are four baleen cords that are tied around the claws, passing through the holes and then back up to be attached to another claw on the other side. No provision has been made for attaching a thong to the proximal end of the scratcher.

The second specimen is made from a carved piece of wood (Plate 50*b*). When the handle portion is held in the hand, the claws bend downward. This specimen has only three claws. The claws are apparently made to be covered by seal claws, as in the specimen reported above. There are two holes drilled at the ventral side of the scratcher, which must have been used in claw attachment. The tool is carved to leave a thicker cross-section immediately behind the claws. The holes are drilled in this thicker section. The proximal end of the handle has a hole drilled through the side. In cross-section the handle is rectangular and flattens to a wide triangular cross-section near the claws. The length of this specimen is 18.1 cm.

Seal Rattles

The cottonwood block and ivory bangle seal rattle reported by Ford (1959:109) was not found at Walakpa; however, a possible rattle was found in the lowest Birnirk level (Plate 18). It is made from two split caribou scapuli attached to a short wooden handle. The handle is 20.5 cm in length. A notch is cut at one end and a hole drilled 7.2 cm back from the end. A baleen loop passes through the hole and around the notch. The distal end of each scapula is drilled and another loop of baleen attaches both pieces. The two loops are joined together, allowing the scapuli fragments to hang loose. When the handle is jerked, they bang together producing a clicking sound.

Nets and Net Weights

Nets were used for capturing seals and fish. One fragmentary example of a net was recovered at Walakpa. It is made of thin baleen strings tied together producing diamond-shaped openings. It is Late Thule in age.

An example of a net weight made of dense bone was found in a Birnirk level (Plate 47*d*). It is circular in shape and on one end it has two sets of holes, which are used to attach the weight to the net. It is 5.2 cm in diameter.

Two stone weights of Late Thule age were found (Plate 116*a, b*), which are heavy quartz beach pebbles. They are not modified but are bound with baleen lashing. The lashing has a major knot on the upper surface with four bands encompassing the stones. Rawhide lashing is attached around the central knot. This lashing is used to attach the stone weights to the net. These weights are 10.3 and 9.2 cm in diameter.

Atlatl Equipment

Atlatl Dart Boards

The atlatl dart boards were used for casting both seal darts and bird darts (Murdoch, 1892:218). A possible dart board handle was recovered in an Early Thule level (Plate 63*l*). It was purposefully cut in half just above the forefinger platform. The groove for the atlatl shaft runs the full length of the handle. Three finger holes are located on the left margin, with a notch to rest the middle finger below the forefinger platform. The opposite side is carved round to fit into the palm of the hand.

An example of a distal end of a throwing board was found in the same Early Thule level (Plate 63*n*). The end is carved blunt. The dart shaft groove terminates at 4.1 cm from the end. Above the end of the groove a hole is drilled to receive the hook that engages the dart butt piece. On the reverse side there is a shallow hole of undetermined function.

Atlatl Hooks

A possible atlatl hook made of ivory was found in a Late Thule level (Plate 85*n*). Its total length is 2 cm. It has a relatively long hafting tang and a short, pointed barb for engaging the dart butt piece.

Dart Shafts and Butt Pieces

Dart shafts are hard to identify unless a diagnostic feature can be found. There is only one candidate for a dart shaft in the Walakpa collections and its identification is highly tenuous. It is of Early Thule age. If it is a dart shaft it is the butt end. The end of the shaft has been carved to receive another artifact such as a butt piece. The shaft is narrow at the butt, 1.2 cm in width, and expands to a maximum diameter of 1.9 cm. The shaft is diamond-shaped in cross-section. The total length of this fragment is 24.7 cm. The shaft is highly polished.

A dart butt piece was recovered from the Birnirk occupation. It is 2.7 cm in length. The socket is circular with a concave base. Four tiny holes of unknown function are drilled into the rim of the base.

The diameter of the socket is 0.1 cm. The hafting tang is 2.2 cm in length. It is wedge-shaped and none of the surfaces have been scarred for hafting (Plate 37*i*).

Harpoon Socket Pieces

The type of harpoon socket piece found at Walakpa is similar to those found in Eastern Thule collections (Mathiassen, 1927a:28). Three specimens were recovered in the Early Thule levels and one from a Late Thule level. In general form they are very similar. The first two specimens are of the same style. These measure 6.1 and 4.6 cm in length, respectively. They are cylindrical in form with the inside portion of the bone carved out, leaving a thin cylinder. The socket opening on the only complete specimen (Early Thule) is 1.8 cm in diameter. Around both the upper and lower lips there is a groove.

The second variety is Early Thule in age. It is essentially the same as those described above, with the exception that it does not have the grooved rings around the lips. The surface is highly polished and the socket end is slightly flared. Its length is 5.4 cm and the diameter of the socket is 1.7 cm. These sockets function by sliding down over the distal end of the dart shaft. Since the holes are large and round rather than rectangular, they must have been used for larger lance points or bladder darts.

One possible preform for a socket piece is from a Late Thule level. This is a cylindrical-shaped piece of bone, which measures 5.4 cm in length. At both ends of the cylinder, holes have been started but were not completed.

Inflation Nozzles

One example of an inflation nozzle was found in an Early Thule level (Plate 59*f*). It is made of ivory and measures 2.7 cm in length. It is cylindrical with a hole drilled through the center. A raised portion at one end forms a thin lip. The center section is indented with attachment scars cut three-fourths of the way around the diameter. The lip at the distal end is larger and has a transverse tapering base. In diameter this artifact measures 1.3 cm.

Bird Dart Points and Side Prongs

Murdoch (1892:210–214) reports that atlatl cast bird darts were used at Point Barrow. These darts consisted of a single end point or occasionally two points with additional prongs attached near the midcenter point of the shaft. At Walakpa four specimens of bird dart side prongs were recovered. No end points were found. All of these specimens fit into either Ford's (1959:117) class A or B. Three of these specimens from the Walakpa site were found in the Birnirk levels while the last was from an Early Thule level. Ford's (1959:117) class A side prongs are flattened ovals or lens-shaped in cross-section and have barbs on both edges. Two of this type were found in the same Birnirk occupation level. One is complete while the other is a small fragment. The complete specimen (Plate 51*a*) was manufactured from antler. It measures 14 cm in length. There are four side barbs on the inside edge and three barbs on the outside edge. The barbs are made by cutting into the blade at an angle greater than 90°. The point of the lower barb tapers back to the cut made for the barb above. A lashing slot is cut near the base of the prong. At the edge directly above the lashing slot there is a small notch. This is undoubtedly used for lashing. Both faces of the base of the prong are also scarred for lashing.

The fragment of a side prong is made of ivory (Plate 51*b*). It has a lashing slot and edge notch. The edge notch is placed above the lower end of the slot. The faces of the base have been slightly roughened for hafting.

Specimens of Ford's (1959:117) class B are similar to those of his class A except that they are triangular in cross-section with barbs placed on all three edges. A Birnirk specimen is made of ivory. Its total length is 10.9 cm. There is only one side barb on two edges and none on the third. The edges with the side barbs are gracefully carved with an incised line running the full length of the prong on each side. There are three slightly raised borders and at the center of each there is a lashing notch. A lashing slot is carved slightly off center and closer to the barbed edges. On the barbless edge and slightly above the upper end of the lashing slot there is a relatively large notch. It has a tapering tang, which has not been scarred for lashing.

An Early Thule specimen is made of ivory (Plate 77*e*). Its length is 10.9 cm. All three edges have small side barbs. One edge has at least two while the other edges have at least one. An incised line is carved on both sides of each edge. The lashing slot is placed near the base. It is impossible to determine if there were any lashing notches.

Another type of side prong for a bird spear occurred in the Late Thule occupation. It was not described for Point Barrow by Ford but is similar to a specimen described by Giddings (1964:31, 34) for Nukleet. This ivory artifact measures 11.5 cm in

length. It is flat to oval in cross-section with side barbs on both edges. The outside edge has only one barb and there are two areas for lashing, one carved at the base and the other a short distance above the first. The inside edge has two barbs. The base of the inside edge is beveled and the surface is scarred.

Harpoon Dart Heads

Giddings (1952:54–55) found that on the Kobuk River there were two sizes of harpoon dart heads. The smaller type has been termed "harpoon arrow point."

Two examples of the smaller variety were found at Walakpa. Both were made of antler. A broken specimen of this type was found in the Birnirk level. The blade is diamond in cross-section and has only one side barb on each edge. A line hole is drilled into the shank, but does not appear to be beveled. The length from the line hole to the tip of the blade is 3.6 cm. A complete example, measuring 7 cm, was recovered in the Late Thule level. Both edges have one side barb. Toward the tip on one edge it looks as though there may have been an additional barb. The edges curve outward and resemble a Christmas tree. A line hole is drilled in the shank of the dart head. On the os-compacta surface of the antler the line hole is beveled for the line. The opposite side has not been beveled. The length from the line hole to the tip of the blade is 5.2 cm. The base is carved to a wedge-shape. The butt is flat with an edge that measures 0.7 cm along its long axis.

Another extremely interesting example came from a Late Thule level. This long antler harpoon dart head is 30.7 cm in length (Plate 89*l*). Three deeply cut side barbs occur on one edge. At the termination of each cut for the barbs, there is a long incised line, which runs almost to the beginning of the next incised line. The incised line of the last barb runs completely to the end of the dart head. The tip is socketed to receive a stone end blade. Two line holes are drilled at the base, one directly below the other. On one side of the blade the line holes are connected with a short groove. The tang is beveled on all sides and terminates with a sharp point, which is scarred for hafting.

Bow and Arrow Equipment

Bows

Two specimens of bows were recovered at Walakpa, one complete and the other a fragment. Both are of the "Arctic Type" (Murdoch, 1884:316) or a single-piece self bow. These are the type II bow in Hamilton's (1970:46) classification.

The complete bow is Birnirk in age (Plate 13). Although small, 76 cm long, it is probably a functional hunting bow rather than a toy. It is a short spruce bow, nearly elliptical in cross-section, being flatter on the back than on the ventral surface. The handle is narrow, but thick in cross-section. It has recurved wings. The nock ends were carved by splitting the wood on both sides and breaking the edges off. Although no traces of the sinew backing are present, marks on the ventral surface indicate that it was once present; there are six bleach marks on one end and four on the other.

The broken specimen comes from the Early Thule occupation (Plate 68*k*). It consists of a recurved end. It would have been a larger specimen than the one described above. At its maximum width it measures 4 cm and it is 1.3 cm thick. The wide wing tapers to a carefully manufactured nock. Two wedge-shaped notches were cut on both sides of the end leaving a small wooden central peg for the attachment of the bowstring. At 25.7 cm from the nock the wing is curved. It is at this point that the bow was broken. Just above the break the edges have been roughened for the attachment of the sinew backing. There were at least five lashes, each having six strands for holding the sinew backing in place. The bow is elliptical to rectangular in cross-section.

Marlin Spikes

Marlin spikes were used to raise parts of the sinew cord when putting the backing on a bow (Murdoch, 1892:292). Although no tools such as Murdoch illustrates were found at Walakpa, several were found which are similar to those illustrated by Giddings (1952:72) from the Kobuk River.

The three examples from Walakpa were found in the Late and Early Thule levels and fit the same basic type (Plates 77*h*, 83*g*, 89*j*). They are long and slender, slightly curved, and with pointed rib sections. All have holes drilled near a blunt end. The most nearly complete specimen has an ownership mark below the hole (Plate 83*g*). The ownership mark consists of a bifurcated line placed over the suspension hole. An incised line extends 1.8 cm down the spike from the point of bifurcation. This marlin spike measures in excess of 18 cm. In maximum width they are 1.5 cm, 1.3 cm, and 1.1 cm, respectively.

Sinew Twisters

A single bone sinew twister was recovered from a Birnirk level (Plate 8*e*). It is rectangular in cross-section, measuring 11.5 cm long and 1.1 cm wide. At

either end and on opposite sides flanges are carved producing notches to keep the sinew in place.

Arrowshafts

In order for a wooden shaft to be classified as an arrowshaft, it must be either complete or have one or the other distinguishing end described below. Two types of arrowshafts were found in the Walakpa levels. The first type was for hafting deer arrowheads (Murdoch, 1892:201). The haft end of this type of arrowshaft does not change in appearance from Birnirk to modern times. Eighty-one examples were found in the Walakpa mound. Two are Birnirk in age, six are Early Thule (Plate 73*h*), and 73 are Late Thule (Plates 85*g*, 89*b*, 94*h-j*, 102*i*, 108*l*). The ends of these shafts are cut at right angles to the shaft. A conical hole is drilled into the flat end of the shaft. This conical hole received the tang of the antler arrowhead. The deer arrowhead is wedged into the conical holes up to and beyond the shoulder of the arrowhead tang. The stele and pile are wrapped with baleen lashing. The pile is wrapped to a point above the shoulder of the tang and the lashing extends about 3.8 cm up the stele. The stele occasionally split when used, which allowed the pile to slip in its haft. Consequently, we see examples of these haft ends being purposefully cut above the splits and being discarded. Four specimens were recovered in which the broken arrowhead tangs are still in place. The diameter of the stele at this end ranges from 1.1 to 0.6 cm.

The second type of haft end was used on Bear arrows (Murdoch, 1892:202; Plates 102*g*, 115*i*). There are six examples of this type of stele in the Walakpa collection, all of which are of Late Thule age. These artifacts do not have the concave ends, but are expanded and flattened out with the surfaces tapering to a blunt end. The ends have been split laterally, and a stone point is inserted into the split. The hafting is reinforced by sinew bindings, which extend up the stele for at least 2.5 cm. One of these specimens has an ownership mark carved above the lashing scar. The ends of these hafts range from 1.81 to 1.1 cm in width and average 1.3 cm.

An Early Thule arrowshaft is unique (Plate 89*a*). It has four projections carved in the haft end of the shaft. Directly below the projections, a notch has been carved around the diameter of the shaft. Below the notch the shaft is square in cross-section with four hollowed-out sections on each side. This gives the impression of a worn-out drill bit. The shaft is broken but would have measured in excess of 30 cm. It measures 1.1 cm in diameter with the diameter of the point being 1.1 cm.

The nock end of arrowshafts from the Walakpa site sort into three distinct types. These types seem to be unique to certain culture types. The earliest variety found in the Birnirk levels can be characterized as having a triangular-cut nock (Plate 48*c*). The stele is slightly widened just below the nock and is round in cross-section. Of five specimens of this type only one had any direct evidence of fletching. This consists of two shallow cuts or scratches across the stele just below the nock. The range of diameters on this variety is 0.8–0.6 cm, with an average of 0.7 cm.

The second variety appears to be characteristic of the Early Thule levels (Plates 68*g*, *h*, 77*k*). It is similar to the one described above, the major difference being that these tend to be flat in cross-section rather than round. The nock end is more expanded and the upper part of the stele tends to be flat and expanded. The nock has a large V-shaped cut on both outside edges. Thirteen examples of this variety of arrowshaft were recovered. Seven of these have evidence for fletching. Two types of fletching were utilized. In the first, the feather is bound to the stele without any modification. Binding marks occur directly below the nock end and at an average of 0.5 cm below the nock. The widths of the upper binding scars range from 1.4 to 2.2 cm. The width of the lower binding ranges from 2.2 to 1.2 cm. The outside length of the fletching ranges from 14.1 to 11.3 cm. One of these examples has a small notch placed on one edge near the center of the fletching, which may be for stabilizing the fletching.

The second technique for fletching is cutting notches below the nocks, around which a binding holds the feathers to the stele. Two specimens have one notch, while another has a series of four notches. The diameters of the stele on this type ranges from 1.1 to 0.7 cm.

The third type of arrowshaft is found only in the Late Thule levels (Pates 85*f*, 102*h*, 108*i-k*, 118*e*). This type was utilized up to historic times. The majority of this type do not have an expanded notch. The general form for these arrowshafts is a round stele, which gradually flattens out to an oval cross-section near the nock. The butt of the nock is flat with a U-shaped notch in the center. The diameters of these arrowshafts range from 1 to 0.8 cm. The fletching is attached by cutting a slight groove directly below the nock. No lower grooves have been cut. Binding marks occur on the upper end of one specimen, which measures 2.5 cm in length. One shaft has traces of red paint on the stele but no design was discernible.

Feather-Cutting Boards

Three wooden feather-cutting boards were found at Walakpa. All three are Late Thule in age. These boards are thought to be used for either cutting feathers for fletching or for cutting sinew thread (Ford, 1959:138, Giddings, 1952:81).

The first specimen is a long, thin, bipointed piece of wood (Plate 89*k*). It is rectangular in cross-section. There are 34, 30, 15, and 11 irregularly placed notches on the four respective edges. The surfaces are slightly concave with both vertical and horizontal cutting scars. The board is highly polished on all edges and surfaces. It measures 17.8 cm in length, 3.3 cm in width, and 1.2 cm in thickness. It is possible that because of the notches, the artifact may be a game counter; but due to the cutting scars on the surfaces, I feel that it is probably a cutting board and the notches may serve as gauges.

The second specimen is an elongated oval that is rounded at both ends (Plate 85*j*). It has a semilenticular cross-section. The flat surface has numerous vertical cutting scars with fewer horizontal scars. It is 9.7 cm long, 3 cm wide, and 0.8 cm thick.

The last specimen is also an elongated oval in outline. Its cross-section is semilenticular. The flat surface is also scarred with vertical and horizontal scars. One end is thinned to a tang. It measures 10.4 cm long and 3.3 cm wide. In thickness it measures from 0.7 to 1.6 cm. This specimen has a dubious identification, and the surface scars may be the result of manufacturing rather than cutting.

Antler Arrowheads

Antler arrowheads have caused an extremely interesting and equally confusing problem in Eskimo prehistory. It is thought that the arrowheads are almost as useful as harpoon heads for establishing cultural chronologies for the north coast of Alaska (Ford, 1959:124). The most distinguishing feature is apparently the tang. Collins (1937c:324) first described the important types of tangs, which he termed the "tapering tang," the "knobbed tang" and the "spurred tang." Ford (1959:124) used this same general taxonomic system for his Point Barrow specimens, although he included placement of barbs as another important type determiner.

It was observed in the Walakpa specimens that several different types occurred within the same level and that in levels where ownership marks occurred the same ownership marks were found on specimens of purportedly different types. This raises the question as to whether the variability of types is temporal, functional, or fortuitous. As the antler arrowpoint is reported to be used only for caribou hunting (Murdoch, 1892:201–207), it would be extremely difficult to determine functional differences. The possible difference that could occur would be the manner in which the caribou were hunted, e.g., single kills, herd challenges, drives, surrounds. The principle for killing the animal with bow and arrow, however, would be essentially the same. The variability in antler arrowpoints is probably not functional, but probably has more to do with the individual manufacturer's whim at the time of manufacture. However, these variable were all compared and include the following categories: (1) shoulder type: curved, square; (2) knobs: curved knobs (strong, weak, strong upper portion), circular, lateral (offset, symmetrical), no knobs; (3) barbs: single barb, unilateral multibarb, multiple-bilateral barb (symmetrical, asymmetrical), no barb; (4) spur: short, long; (5) cross-section: round, lenticular, triangular, diamond-shape, combinations; (6) ownership mark: present, absent.

Using these twenty-three variables on a sample of over 400 antler arrowpoints from Walakpa, Birnirk, Utkiavik, and Cape Prince of Wales, it was found that only four specimens conformed to a single type, while each of the others then represented a unique type of its own. A comparison of the arrowheads was made using only the first three categories: (1) shoulders, (2) knobs, and (3) barbs. This comparison indicated that the form of the barbs did not constitute type indicators. The shoulder and knob form appeared to be the only traits that seemed to change through time, or to indicate types. All five barb forms were found on the various shoulder and knob classes. It therefore appears that Collins (1937:324) was correct when he discussed types based on only shoulder and knob forms. On the basis of these comparisons we found that there were eight types of antler arrowheads, which indicated general trends through time. These eight types and their varieties, based on barb placement (used only in a descriptive sense), are discussed below with the earliest forms first and younger forms last.

Type 1, Tapering Tang.—This type is thought to be one of the earliest, and at Walakpa it appeared only in the Birnirk levels. This type is called the "tapering tang" by Ford (1959:128). In his classification, however, he includes types with both a strong central knob and those without knobs, which may be temporarily significant. For these reasons I have split these types into two distinct groups. Type 1 has a rounded shoulder, long, tapering tangs and no knobs. Five of these were found, all of Birnirk age. There

are three varieties of side barbs: (1) no side barb, (2) multiple, bilateral barbs, and (3) multiple-bilateral barbs with end blade slots.

Three barbless examples were found. Two larger examples (Plates 8*a*, 51*q*) measure 16.1 and 15.1 cm in length. The tangs are 3.3 and 2.8 cm in length, respectively. The blades are slightly expanded near the tip. No ownership marks are present. The third barbless example (Plate 8*b*) is extremely short (9 cm), but otherwise it is identical to those discussed above. The tang measures 3.3 cm long.

There is only one example of the multiple-bilateral barb variety (Plate 51*p*), which is 16.3 cm long, with the tang 2.8 cm long. It has a side barb placed on both sides of the blade. These barbs are part of the blade structure. One barb is slightly higher on the blade than the other. These barbs are both long, narrow, and extremely sharp.

The last specimen of this type is unique for this collection (Plate 19*a*). It has a bifurcated tip for the insertion of an end blade. The barbs are short and are part of the blade structure. One barb is placed above the other and on the opposite side of the blade. The length of the arrowhead is 16.4 cm; the tang is 2.6 cm long. There is no ownership mark on the arrowhead. This arrowhead was found in sterile clay a few centimeters below the lowest Birnirk level. It is unknown if it is Birnirk in age or older. It is the author's opinion that it probably belongs to the Birnirk level and was forced into the wet clay from pressure by the occupants of the site.

TYPE II, KNOBBED TAPERING TANG.—This type is similar to type I and is the type that Ford (1959:128–132) included in the tapering tang category. Twenty-eight examples were recovered at Walakpa. These were found most commonly in Birnirk and Early Thule levels, but four were found in Late Thule levels. Most of these were originally long arrowheads but appear to have been broken and resharpened. The range of lengths is 20.7–6.8 cm, with an average length of 11.3 cm.

The majority of these arrowheads have a single lateral barb. These barbs group into three types: (1) those with the main blade terminating in a barb at a distance of over one-half the length of the point (one of these is Birnirk in age, Plate 51*n*, and three are Early Thule, Plate 63*h*, *j*); (2) those with the barb being placed almost directly at the end of the blade (one example of this type is Birnirk in age, Plate 8*c*); (3) those with a single barb carved in the side and are not a part of the main structure of the blade (two are Early Thule, Plate 68*e*, two are Late Thule). The varieties of barb manufacture occur together in several levels and are not to be taken as functional variables.

Four small specimens have no lateral barbs of any kind and appear to be resharpened examples of the larger varieties. Three are Early Thule in age (Plate 59*h-j*) and one is Late Thule (Plate 97*k*).

Two examples have multiple-unilateral barbs. A Birnirk specimen is rather unique (Plate 51*o*). The end of the blade has been widened before it tapers to the point. The first barb is part of the blade structure and, like those described above, it is placed about halfway down the length of the blade. The second barb is quite small and is placed directly below the first barb. In the case of a Late Thule example, the barbs are evenly spaced on the blade but do not make up part of the blade structure (Plate 118*c*). The tang on this specimen has been roughened by lateral cuts for hafting purposes. No ownership marks are found on any of these specimens.

TYPE III, CONICAL KNOB.—The conical tang variety was first described by Larsen and Rainey (1948:169). This type was associated with the Western Thule levels at the Ipiutak site. Ford (1959:129–136) found this type at both Birnirk and Nunagiak. Ten specimens of these arrowpoints were found at Walakpa: two from the uppermost Birnirk levels, five from the Early Thule levels, and three from the Late Thule levels. I would therefore conclude that these are probably Late Birnirk types and are transitional forms between Birnirk and Early Thule, and persist into Late Thule times.

The most characteristic feature of these antler arrowheads is the conical tang. The upper edges of shoulders of the cones are rather sharp and intersect the taper of the rounded shoulder. The cone is short in comparison to the tapering tang varieties. At least two types of barbs are present, single barbs and multiple-unilateral barbs. These measure from 16.3 to 13.1 cm in length. The length of the tangs from the shoulder to the conical tip range from 3.5 to 2.7 cm. The average of the tang lengths is 3 cm. The length of the conical portion of the tang ranges from 2.1 to 1.1 cm, with an average of 1.6 cm. The longer tangs are from the Birnirk levels.

The most common form of barb is that of the single barb. All of the single barb types have the barbs carved independently of the blade structure. One, of Early Thule age, is a short barb that extends out from the blade at a steep angle (Plate 68*d*). Two other Early Thule examples have relatively long barbs that are slightly parallel to the blade (Plate 63*i*). The cuts that separate the barb from the blades on these specimens are long and cut quite deeply into the blade.

The only example of multiple-unilateral barbs is Late Thule in age. It has five small barbs along the central portion of one side of the blade. These barbs are manufactured like the barbs of a leister prong.

Six broken examples, four Early Thule (Plates 58*d*, 59*k*, 73*f*, 80*c*), and two Late Thule cannot be analyzed for blade types. The Birnirk specimens are both small tang sections that were broken just above the shoulder of the cone. One of the Birnirk tangs was found still hafted to a broken arrowshaft.

TYPE IV, OFF-SET KNOBS.—A single level from the Walakpa site had this interesting type of knob (Plate 75*c*, *d*). There are two knobs on either side of the tang, one placed slightly above the other. The shoulders are not square but do not slope as much as those in the previous classes. This type of tang has not as yet been reported for North Alaska, but it is found in the Eastern Thule collections from Canada (Mathiassen, 1927a:35–36, pl. 9:4). Only two specimens were recovered and they are incomplete. Therefore, the only measurements to be discussed are the tangs. The total lengths are 2.4 and 3 cm. The lengths of the tangs below the upper knob are 1.7 and 1.6 cm, respectively. No ownership marks occur on these two arrowheads.

TYPE V, TAPERING TANG, WITH A SLIGHT KNOB.—This unique type came from the uppermost levels of the Early Thule period. These can be characterized by a slight shoulder and a very slight knob. Two types of barbs occur. The Early Thule example is a multiple-unilateral barb (Plate 80*d*). It has one barb present, carved away from the blade structure. Another barb (Plate 84*e*) which has been broken, is placed a short distance above the lower barb. Incised lines run from each of these barbs up the blade for a short distance. The length of this arrowhead is 13.3 cm, the tang length is 2.5 cm, with the distance below the knob being 0.7 cm. There are no ownership marks on this specimen.

One of the Late Thule arrowheads of this type has two bilateral barbs. One, which is broken, was placed near the tip while the other is a short distance below the tip. The incised line occurs on the lower barb. This arrowhead measures greater than 9.8 cm. The tang is broken slightly below the knob. This specimen has the first ownership mark in the stratigraphic sequence. The ownership mark is a straight incised line. At the lower end of the line there are two short symmetrical lines slanting downwards. A second Late Thule example has a single barb. It measures 7.9 cm long. It does not have an ownership mark.

TYPE VI, SQUARE SHOULDER SYMMETRICAL KNOBS.—This type and type VII are closely related. Both types occur in the same levels and both types have the same ownership marks. These arrowpoints have square shoulders and two knobs symmetrically placed on each side of the tang. There are at least four types of barb techniques: (1) single barb, (2) single bilateral barbs, (3) multiple-unilateral barbs, and (4) no barbs. The most common has a single barb. Four examples of this type occurred (Plate 102*a*). The range of lengths varies from 21.1 to 8.6 cm. The tangs range from 3.6 to 2.2 cm. The distances below the knobs measure from 2.7 to 1.5 cm in length. The barbs are all part of the blade structure. They ocur about halfway between the tip and the tang.

The second type of barbs are those which have single bilateral barbs, symmetrically placed at the tip (Plate 94*b*). Neither of this type is complete. Tang measurements are 2.8 and 2.11 cm. The lengths of the tangs below the knobs are 2.1 and 1.4 cm, respectively.

The third type of barb has several barbs on a single side (Plate 88*d*). A large specimen measures 14 cm in length. The tang measurements are 1.8 cm for total length and 1.2 cm below the knobs. Two barbs occur on part of the blade structure and the second is placed just below. Decoration consists of two incised lines at each barb. A smaller specimen measures 8.5 cm long (Plate 102*e*). The tang measures 1.9 cm in length and the distance below the knobs is 1 cm. The barbs have been placed close together directly under each other. There are four in number. The last barb is part of the blade structure. A broken example may have been of type VI (Plate 88*m*).

One example of a barbless arrowhead was found (Plate 88*h*). It probably resulted from the resharpening of a broken specimen. It has a broken tang, thus measurements are of little use. The length of the point is in excess of 8.4 cm. Most of the specimens of this type have ownership marks.

A unique specimen in this class has neither barbs nor a tip. The tip of the point is socketed to receive a flint point. This specimen does not have an ownership mark. Its length is 7.7 cm. The tang measures 1.7 cm in length and the lower portion is 1.1 cm. Another broken specimen has a hole drilled near the tip (plate 88*l*). A groove has been carved on both faces running towards the tip from the drilled hole.

TYPE VII, SQUARE SHOULDERS, CIRCULAR KNOBS.—This type is closely related to Type VI. Twenty-two Late Thule antler arrowheads fit into this class. Four types of barbs are found on arrowheads of this type: (1) multiple-bilateral barbs, (2) single barb, (3) notches on the blades, and (4) no barbs. Four examples are broken so that no barb analysis was possible on them (Plates 97*g*, *h*, 102*d*).

The first and most numerous type of barb placement is that of multiple-bilateral barbs. There are several techniques of manufacture of these barbs. Three examples have two very short barbs that are part of the blade structure (Plate 102*b, c*). These are located approximately halfway between the tip and the tang. Below the barbs there are nonfunctional barbs consisting of a slight raise in the antler. These specimens are decorated by long, incised lines on both sides, running from the nonfunctional barb to the tip of the point. The range of lengths is from 18.3 to 15.1 cm. The tangs range from 3.3 to 2.2 cm, with the portion below the knobs ranging from 2.4 to 1.7 cm.

The second type of multiple-bilateral barbs are those that are placed near the tip of the projectile point (Plate 88*e*). These are set slightly asymmetrically and are sharply pointed. One complete specimen measured 14.6 cm in length; the tangs on this and an incomplete specimen measured 2.3 and 1.8 cm, while the lower portions of the tangs measured 1.8 and 1.2 cm, respectively.

The last example of this subclass is a broken tip that has been rebased. The barbs are simply a sharp symmetrical shoulder at the end of the blade (Plate 97*l*). This specimen measures 9.3 cm, with tang measurements of 1.7 and 1.2 cm. The remnant of the ownership mark and the decorative incised lines of the former barb are still visible.

The next type of barb found in type VII are those antler arrowheads that have only one barb (Plate 88*b, c*). These barbs are placed about midway between the tip and the tang. They are part of the blade structure. Only two complete specimens were found. These are 13.9–12.8 cm long. Their tang lengths are 2.3 and 1.9 cm, respectively. Only one specimen has decoration, which consists of an unusually placed ownership mark. The mark is an incised line running from the barb to near the tip of the point. It is crossed by two short lines.

The third subtype consists of those specimens with unilateral notches cut into the blade edge (Plate 108*c*). These notches serve as barbs. One has a real barb placed below a notch. The only complete specimen measures 12 cm long and tang measurements of 2.4 cm in length, with the knob measuring 1.6 cm.

The specimens of the fourth subtype have no barbs (Plate 88*g*). They, as in the cases described above, are probably resharpened, broken arrowheads. Two of these were recovered, one complete and the other with a broken tang. The complete specimen measures 9.6 cm in length. The tang is 3.5 cm in length, and the knob is 2.8 cm long.

TYPE VIII, SQUARE SHOULDER, KNOBBED TANG.—This type is only found in Late Thule levels. It has a square shoulder and a slightly knobbed tang. Two varieties were found: multiple barb and no barb.

The multiple barb variety is represented by two specimens, of which one is complete. The incomplete specimen has one barb, but it has the beginning groove for a second (Plate 119*d*). These barbs are not part of the blade structure. Decoration is the typical incised line at the barb. It does have an ownership mark. The tang measurements on this specimen are 2.8 cm in length, with the knob measurement being 2.6 cm.

The second specimen of this type has two small barbs at the tip of the point (Plate 119*e*). The first is part of the blade structure while the second is a small rise carved away from the blade. It measures 9.5 cm in length. The tang is 1.8 cm long with the length of the knob being 0.8 cm. This specimen has no ownership mark.

The barbless example has the end ground round (Plate 94*g*). It may be a bird arrowpoint, but it fits these types of arrowheads better. It measures 7.6 cm. in length.

TYPE IX, SQUARE SHOULDER, CONICAL KNOB.—Two examples of square shoulder, conical knob, antler arrowheads occurred in the Late Thule levels. Ford (1959:133) also illustrates two of these from his Utkiavik collections. One of these specimens has a single barb that is part of the blade structure. The barb is placed near the tang. The length of this point is 10.8 cm. The tang measures 1.6 cm, and the knob measures 1 cm.

The second specimen is identical to the first, with the exception of a narrow notch cut into the blade to form another barb. This specimen measures 15.6 cm with a tang length of 2.6 cm. The conical knob measures 2 cm in length. Both of these specimens were from the same level and contained the same ownership marks, the mark being placed on the incised line of the notch decoration.

TYPE X, BLUNT-BIRD ARROWPOINTS.—The last variety of arrowpoints to be described in this section is that of blunt-bird arrowpoints. One from an Early Thule level is made of antler (Plate 80*e*). It is expanded at the point. The point is divided into four wings, all coming together at a raised point in the center of the tip. This gives an impression of a worn-out drill bit. It has a bifurcated tang with a small portion of the arrow stele still wedged in place. It appears that there was once a binding around the tang and the arrowshaft. This specimen measures 7 cm in length. The maximum diameter of the arrowhead is 2.3 cm.

Antler Arrowhead Preforms

The manufacture of antler arrowheads has never been described in detail. Examples of arrowhead preforms were found in most stages of manufacture, which permits the following description.

Three types of antler were observed in the occupation levels at Walakpa and primarily in the Birnirk levels: (1) old, shed antler, probably found by the Eskimos, and brought into the site; (2) antlers which were in velvet; and (3) antlers in advanced stages of ossification. These are distinguished by the fact that shed antler has natural separation scars on the articular surfaces, while unshed antler, when disarticulated, still has major skull portions attached. Antler in the velvet stage is soft and spongy in texture and does not preserve as well as the hardened, mature antler.

The skull bone of a specimen of advanced ossification was separated from the antler in two stages: first, by cutting in a saw-like fashion, which yielded an irregular-cut surface around the base of the antler and on the skull; and secondly, after several edges were cut in this manner, by chopping strokes, which were used for final separation. Once the antler was removed from the skull, the forward tine and the immediate upper portion were removed leaving a short section of antler with the skull attached. The tines were removed by sawing, probably with a baleen saw, through the os-compacta surface to the cancellous structure. Then it was a simple matter of breaking the antler by force.

Two types of scars are found in tine separation. One is from the baleen saw, which leaves long, flat scars in a vertical plane to the antler stem. The other type of scar results from adz cuts, which are short, irregular chops at an angle to the antler stem. Occasionally these are found in combination with the sawing used to weaken the antler and the adz-chopping for final separation.

Long beams are split with a graver-like tool. One short section of antler, 18.11 cm, is probably a preform core. It has five cuts parallel to its long axis. In this case it was discarded before any sectional pieces were split away. In split sections the groove is repeatedly cut with a graver or burin-like tool until the cancellous structure is struck. Then a wedge is inserted and probably twisted to break the antler into the desired pieces. Four sections, each 24 cm long, were found. They were probably intended for antler arrowheads. An interesting cache of these quartered sections was found under a toboggan of unknown age. Twenty-one cut antler sections were found in this cache. The width range is from 2.1 to 1.1 cm.

The next step in arrowhead manufacture is the sharpening of both ends of the antler strip (Plate 88*o*). Three examples from this cache have one end carved to a point. After the points have been carved, the tangs are roughly blanked out (Plates 88*p*, 115*e*, 119*i*). The blade is then faceted and ground to a sharp point, and the rest of the blade is ground into shape. Barbs are then cut into the sides of the blade. Tang-manufacture appears to be the last step in the manufacture of antler arrowpoints.

Chipped Flint Arrowheads

On the basis of Murdoch's classification of flint points from Point Barrow, Ford (1959:135) devised five classes of chipped flint points:

Class 1: Long, narrow points, diamond in cross-section. They have square shoulders and short stems, with parallel sides and square bases.

Class 2: Shorter points with rather sloping shoulders.

Class 3: Relatively long, narrow, unstemmed points with a squared, thinned base.

Class 4: Thin, wide, well-chipped points with slight shoulders, curving, blade edges. The stems, which form almost one-half of the length of the points have either straight or curved bases.

Class 5: Willow-leaf-shaped points without stems. The bases are either round or almost straight, approaching a triangular form.

These classes are apparently partially compatible to Giddings' (1952:50–51) sequence, which is as follows: "1250 A.D.: thin, stemless, wedge-shaped points; 1400 A.D.: thin, wide-stemmed, Ekseavik type A points; 1550 A.D.: transitional to following; 1750 AD.: long, parallel points with rhomboid cross-sections and small, rectangular stems."

The flint points from Walakpa do not particularly fit these sequences. Ford's class 1 is the most common type found. Classes 4 and 5 are not arrowheads but are either lance, spearheads, knife or end blades.

Classes 1 and 2 create problems. If these are indeed independent, functional classes, they should be tested for that function. Murdoch (1892:202) does not imply any function for any class of flint arrowheads other than for killing bears. It appears, however, that many differences may be due to proficiency of workmanship. These types could also be the result of reutilization of broken projectile points for drills and other types of artifacts. When projectile points of both classes 1 and 2 are seriated, one finds that there is an even, imperceptible transition from one class to the other. Therefore, I would say that there is only one class of flint arrowhead at Walakpa and that minor variations in length and shoulders are due to individual proficiency in manufacture.

Thirty-four specimens of chipped flint arrowheads were found at Walakpa and, of these, only twelve are complete. All but two are made from chert from the Sik-sik-puk formation in the Brooks Range. The color of this flint ranges from black to red with the most common color being gray. Two specimens were made from a clear chert.

The length of these projectile points ranges from < 7 cm to 4 cm. The average length is 5.2 cm. All but two of these specimens are of Late Thule age (Plates 89*d-g*, 94*k, l*, 102*j, k*, 108*g, h*, 115*h*, 119*g*). The remaining three are of Early Thule age (Plates 59*n*, 77*i, j*). None were found in the Birnirk levels.

Bola Weights

Bola weights, used for hunting birds, were numerous at Walakpa. Murdoch (1892:244) describes the bola as six or seven small, ivory balls, each attached to a string about thirty inches (75 cm) long. The ends of the string are fastened to a tuft of feathers, which serves as a handle and perhaps directs the flight of the bola. Ford (1959:139–141) classified 13 varieties of bola weights, classes A-M. Four of these varieties, A-D, were found only in later periods while three types, E, F, and G were found in both early and late occupations. Six varieties, H-M, were found only at Birnirk. At Walakpa, only 11 classes were found. Ford's classes C and I did not occur in the collection. Further, it was found that classes A, B, and D, which Ford found only in later sites, occurred in the Walakpa Birnirk levels. Of Ford's types H, J, and L were found only at Birnirk. At Walakpa types H and J occurred in both Birnirk and Early Thule levels, while type L was found in Late Thule levels. It appears that there is possibly no temporal distinction between bola weights.

CLASS A.—These are irregular fragments of ivory or bone. They are parts of broken tools or leftover raw materials that have been drilled for a bola weight. Ford (1959:140) did not recover any bolas of this class from the Birnirk site, while the majority of bola weights from the Walakpa Birnirk levels were of this type (Plates 9*f, k*, 37*k*). One Birnirk specimen (Plate 19*c*) is an ice pick tang which is drilled for a bola weight. Another specimen is a small section of a harpoon foreshaft (Plate 37*k*). A root section of a walrus tusk was utilized for a bola weight. A split section of ivory is cut to a point and drilled (Plate 19*d*). The last Birnirk specimen (Plate 37*m*) is an irregular portion of a walrus jaw that is drilled for suspension. This specimen has part of the baleen thong attached.

Three additional examples of broken tools utilized for bola weights were found in the Early Thule levels (Plate 64*b*). Two are broken sections of harpoon foreshafts and the third is a broken ivory ice pick. Part of the hafting tang and shaft remain. A hole has been drilled in the tang; both broken ends are rounded and polished.

Six irregular pieces of bone from the Late Thule levels were also drilled for bola weights (Plate 109*a*).

CLASS B.—Bolas in Ford's class B are those that are made from perforated seal astragali. A modification of this type, a class that Ford found only at Utkiavik, is made from a perforated Caribou astragali rather than seal. There were four of these found in the Birnirk levels (Plate 9*g-j*). Two additional examples of caribou astragali bola weights were found in the Early Thule occupations. One (Plate 73*i*) is split in half while the other is split in half and ground.

CLASS D.—These are cut segments of walrus ribs and ivory. These weights differ from class C in that the suspension holes are drilled from the sides rather than from the ends. These holes are also slanted so that they meet to allow the thong to be inserted. Four of these were found in the Birnirk levels (Plates 19*e*, 37*m,n*). Three examples of this type were found in the Late Thule occupations. One (Plate 75*j*) has a short section of rawhide lashing still attached.

CLASS E.—These weights were cut from walrus tusks or ribs. The cut faces of these sections are flat. Three examples of class E were recovered in the Late Thule levels (Plate 82*a*). These were all ivory and no examples of rib sections were found.

CLASS F.—This class consists of teeth that are drilled for bola weights. Ten examples of drilled teeth were found at Walakpa. Two were Birnirk in age, one is Early Thule (Plate 64*a*), while seven were Late Thule (Plate 109*b*). All of the teeth used at Walakpa are walrus molars.

CLASS G.—These bola weights are teardrop in shape and are made from bone or ivory. One ivory Birnirk example was found (Plate 37*l*). Three Early Thule examples were found at Walakpa. Two were drilled at the small end, while one was drilled at the large end.

CLASS H.—These are crudely finished weights cut from sections of whale ribs They are oblong in shape. The suspension hole is drilled in the long end. Two of them are Birnirk in age (Plate 9*l*), and two are Early Thule (Plate 69*a*).

CLASS J.—These are segments cut from ribs with the suspension holes drilled through the sides rather than the ends. These weights resemble class D but are made of bone and are much larger and heavier.

The suspension holes are drilled straight through rather than being formed by two perforations. One specimen is Birnirk in age (Plate 19*f*). Three specimens of this class were found in the Early Thule levels, as well as an undrilled preform (Plate 64*d-f*). The preform has the perforation started but not completed.

CLASS K.—These weights are egg-shaped in outline and are carved thin with flat faces on opposite sides. Many appear to have been made from the hard bone of the jawbone of a whale. The perforation is located in the smaller end. One of these was found in the Birnirk levels at Walakpa (Plate 37*q*).

CLASS L.—These are bone cylinders with a perforation in one end. Three Late Thule examples of this type were found at Walakpa.

CLASS M.—This class is made up of bolas that are made from femur heads. Only one example of this type of bola was found (Plate 37*p*). It is Birnirk in age.

Miscellaneous Hunting Gear

SNOW-PROBE FERRULES

Snow-probe ferrules are cylindrical objects that come to a pointed end and are used to tip the snow probe. Two of these ferrules were recovered in the Birnirk levels (Plates 37*h*, 50*e*). Both specimens have sockets to receive wooden poles. In both cases a portion of the pole remains inserted into the socket. These examples show no evidence of having been secured by a bone pin as were the specimens reported by Ford (1959:142). These specimens measure 4.6 and 3.3 cm long, respectively. They are 1.3 and 1.6 cm in their maximum diameters.

Ford did not recover any ferrules in his Birnirk collections. Since they are common in Eastern Thule sites (Mathiassen, 1927a:67–68) and have a very restricted distribution in Alaska, where they appeared late, Ford (1959:142–145) argues that they have an Eastern origin. As both of these specimens are Birnirk in age, it appears that Ford's assumptions are wrong and that the Eastern Thule varieties have their origin in the Alaskan Birnirk period.

ICE STAFF RINGS

Ice staffs were used as an aid for walking on thin-ice tundra (E. Nelson, 1899:214–215). They have an attached ring, which makes the tool appear to be a ski pole. One example of an ice staff ring was found in the Birnirk occupation (Plate 50*c*). This was a baleen strip, which had been tied to form a circle of 9.1 cm in diameter. The strip is completely wrapped with another layer of baleen. A small inner circle manufactured in the same manner is attached to the outer circle by four baleen cords. A short section of the ice staff still remains inserted through the inner circle. This staff measures 0.8 cm in diameter. A specimen reported by Ford (1959:145) also had a similarly small hole. Because of the small hole, Ford suggested that an iron staff was used.

SNOW SHOVELS

Snow shovels made of wood with ivory or bone blades were used to remove snow from houses, pitfalls, etc. (Murdoch, 1892:306). No wooden or bone shovels were found at Walakpa. However, six bone blades of Late Thule age were recovered (Plates 91*c*, 103*j*, 109*f*). Three are complete enough for measurements ranging from 32.3 to 22.2 cm in length. In width they measure from 3.8 to 2.2 cm. The blades are crescent-shaped and have one sharp edge for cutting into the snow. A groove on the upper edge or surface is carved for a socket, in which the shovel is inserted. Usually there are a series of lashing holes for attachment to the shovel.

SNOW KNIVES

Snow knives were used for cutting blocks of snow while building snow huts (Murdoch, 1892:304–305). Only one specimen of Late Thule age was recovered at Walakpa (Plate 82*j*). This is a long, thin, saber-like antler implement. It measures 42.9 cm in length with a maximum width of 3.4 cm. Along one edge of the blade, 13 drilled holes are placed very close to each other. Near the point on the opposite edge, two small holes are drilled. These holes are drilled for baleen wrapping to provide a grip.

WOODEN HUNTING HATS

A most unique archeological discovery comes from the lowest Birnirk level (Plate 20). This artifact is apparently a wooden hunting hat. The wooden hunting hat is known ethnologically among Eskimos south of Norton Sound and was used for hunting sea animals, for dances, and by shamans (Ivanov, 1930:483, E. Nelson, 1899:394). They are generally ornately decorated with zoomorphic objects and hunting scenes. The present specimen is of the open-top variety. It is a single piece of wood that has been wrapped into a truncated cone. The front extends

forward and projects over the face as a visor. The back has two narrow overlapping tangs that have been wrapped together with willow strips. On both sides there are two slots for straps, which are tied under the chin to hold the hat on the head. This specimen has no ornamentation, although it may once have been painted. The distance from the top of the cone to the forward edge of the bill is 21.1 cm. The diameter of the top of the cone is 18.9 cm.

Snow Goggles

Snow goggles are an extremely important item for traveling across either snow or ice during daylight hours. On bright days these are essential in protecting the eyes from snow blindness.

Three complete snow goggles were recovered in the Birnirk occupations. They are of the single-piece variety. One is made of wood and the others of baleen. The wooden specimen has been carved from a single piece of wood in a semilunar shape to fit the contour of the face (Plate 50*a*). The inside or dorsal surface had been carved at the center to conform to the nose. To either side of the nasal cavity are two deeply cut sockets, in which the eye slits are set near the center. The eye slits are long, thin, semilunar cuts. The left border of the goggle has two small holes, while the right border has four holes. Apparently two of these holes on the right side were split, making it necessary to carve the additional holes. The dorsal surface has been finished by sanding the cut marks and polishing. No further decoration was attempted. The upper border is faceted with a slight concavity for the bridge of the nose.

The ventral surface is not polished. The primary cutting is done with short, narrow whittle cuts; there is no evidence of adz cuts. The deeper portion of the sockets were cut with a thin, narrow, graver-like tool. The nasal cavity has been done with long, carving strokes and then ground for good fit.

The first baleen specimen is also of the single-piece variety (Plate 7*h*). The eye slots are narrow and slightly elliptical in shape. One hole is carved at both ends for holding straps. The overall shape of the artifact is bi-elliptical with a slightly deeper groove cut at the center on the bottom edge to fit over the nasal bridge. Two decorative grooves are carved between the eye slits and the nasal notch. These probably represent an illustration of the nose. Both the nasal notch and the eye slits are deeply inset to fit the nose and protect the eye. This specimen measures 13.3 cm in length, 3 cm in height, and 1 cm in maximum thickness.

The last Birnirk specimen is incomplete (Plate 37*g*). The eye slits are flattened ovals in outline. A slot has been carved for the lashing. There is no cut made for the nose except for slight notches on both the upper and lower edges. On the inside the eye sockets are extremely deep. There is no decoration on this specimen. It measures over 12.9 cm in length, 3.2 cm in maximum height, and 0.6 cm in thickness.

Two incomplete examples of Early Thule snow goggles were found. Both are made of ivory and split at the nasal groove. The first specimen is an elaborately decorated artifact (Plate 75*l*). The eye slit is narrow and rectangular in shape. There is a slight rise for the nasal bridge. The border of the upper edge has an incised line running its full length. At a point near the inside edge of the eye slit, two parallel lines fall from the rim line to a point just above the eye slit. Over the center of the eye slit, a diamond-shaped figure is carved. A deep groove runs from the eye slit to a lashing slot. The inside surface has deep concave grooves for both the nose and the eye. It is 3.1 cm in height and 1.2 cm in maximum thickness.

The second specimen has oval-shaped eye slits (Plate 63*k*). The nasal notch is incomplete, but it appears to have been fairly deep. For lashing, a slot, rather than a drilled hole, is cut at the edge. The inside portion of the eye slit is extremely deep and almost the entire wing is concave in cross-section. There is no decoration on this example. In height it measures 3.5 cm while in thickness it is 1 cm.

A complete baleen and a broken wooden example are part of the Late Thule collections. The complete specimen is a narrow, rectangular-shaped goggle (Plate 101*c*). The eye slits are rectangular and parallel to the plane of the edges. A notch has been carved for the nose. Lashing holes are drilled near the ends with slight notches carved at the ends for guiding the lashing. Three holes are drilled, one above and one below the left eye slit; another is drilled above the nasal notch. The function of these holes is unknown. The remains of two additional holes drilled at both ends of the eye slit can still be seen. These are probably cutting guides for the manufacture of the eye slit. Both the nasal and eye grooves are concave. This goggle measures 14.8 cm in length. It is extremely narrow and measures 2.5 cm in maximum height and 0.6 cm in thickness.

A small fragment of a wooden snow goggle was recovered from a Late Thule level (Plate 93*g*). The eye slit is extremely narrow and parallel to the edges of the goggle. Two holes are drilled at the end for lashing. The eye socket is extremely deep and there is no decoration. It is 2.7 cm in height and 0.6 cm thick.

Fish Arrow Prongs

Nine examples of fish arrow prongs were recovered at Walakpa. These fall into two types: a small variety found in Birnirk levels and a larger type found in the Thule levels. It is difficult to determine if the larger variety is a fish arrow prong or a bird dart prong.

Two small, ivory fish arrow prongs were found in the Birnirk levels (Plate 51*e,f*). These are slender, delicate prongs with lateral barbs. Both of these prongs are incomplete and no measurements were made.

An additional small, center arrow prong was recovered in the Birnirk level (Plate 37*j*). It is made of ivory and measures 7.6 cm in length. One small barb has been placed near the end and the tang is beveled on all sides.

The first example of the large variety is from an Early Thule level (Plate 80*f*). This antler specimen is 15.6 cm in length. It has three barbs on the outside edge. In cross-section it is round. The tang is tapered to a sharp point with a beveled surface for hafting. The lower end of the main shaft of the prong is carved to a slightly smaller diameter than the tang. This aids the prong by giving it a wider angle of separation from the shaft. The tang has not been roughened for hafting.

An antler center prong was found in the Early Thule occupation (Plate 68*f*). This specimen is 6.8 cm in length. The blade is only 2.3 cm long while the tang is 4.5 cm in length. The blade has no barbs and is carved to a short, slightly blunted point. The tang is beveled on both edges, which converge towards each other. Both sides of the tang have been scarred for hafting.

A broken, wooden fish arrow prong is also of Early Thule age (Plate 63*m*). This is a long, thin prong, which is rectangular in cross-section. It has three barbs placed near the tip on one side and a single barb on the other side. It measures over 13.8 cm in length.

Three examples of the large fish arrow prong were recovered from the Late Thule levels. All of these specimens are made of antler. Two examples of outside prongs are 16.8 and 16.7 cm in length (Plate 115*c,d*). The larger specimens have long, beveled tangs, which are horizontally scarred for hafting purposes. Three outside lateral barbs are made by cutting notches into the edge of the arrow prong. A smaller example has its prongs on the inside edge (Plate 87*k*). It measures 11.5 cm in length. It has a short, beveled tang. This tang has not been scarred for hafting, although two hafting notches are found on the opposite side. This specimen has three lateral barbs; unlike those described above, they have been cut at right angles into the blade. At the bottom of the cut it tapers back to the next barb. The lowest barb tapers to the hafting tang.

Fishing Poles

A possible fishing pole was found, which is Late Thule in age (Plate 86*b*). It is similar to the poles used for jigging tomcod and flatfish by the modern Eskimo. It consists of a long, slender piece of wood, round in cross-section. It measures over 40 cm in length and 1.3 cm in diameter. At one end a notch has been carved, which runs three-fourths of the way around the diameter of the pole. A two-strand baleen line is looped and tied around the notch. Several inches of the line extend below the pole. Table 2 is a summary of all the hunting and fishing equipment found in each occupation level.

TRANSPORTATION EQUIPMENT

Boat Parts

Boat Paddles

A single fragment of a Birnirk paddle was found. It is too fragmented to tell if it is a two-bladed kayak paddle or a single-blade umiak paddle. It is part of the paddle blade and a fragment of the handle.

Paddle Tips

Two examples of paddle tips were found in the Birnirk levels. A complete antler specimen is nearly triangular in shape with a rounded point (Plate 22*a*). It is lenticular in cross-section. The tip is 3.7 cm long, 3.7 cm in maximum width, and 1.5 cm thick. The inside is hollowed out to form a socket, which fits over the paddle. The socket is 2.9 cm long and 1.2 cm wide.

A second specimen is made of ivory (Plate 9*d*). It is broken in half. In shape it is identical to the first specimen and is 3.1 cm long. The socket was made by drilling three holes, two at both ends and one in the middle. The remaining area was then ground out. The socket is 2 cm deep.

TABLE 2.—*Hunting and fishing equipment by occupation level of each culture phase, Walakpa site*

Culture Phase	Mound Occupation Level	Harpoon Gear					Seal Poke Gear				Ice Hunting Gear								Atlatl Equipment						Bow and Arrow Equipment								Miscellaneous Hunting Gear									Totals by Occupation Level
		Harpoon Heads	Harpoon End Blades	Harpoon Foreshafts	Socket Pieces	Ice Picks	Float Bars	Seal Float Mouthpieces	Seal Float Stoppers	Seal Float Plugs	Wound Plugs	Wound Pins	Ice Scoops	Two Piece Ice Scoops	Seal Drag Handles	Seal Scratchers	Seal Rattles	Nets & Net Weights	Atlatl Dart Boards	Atlatl Hooks	Dart Shafts & Butt Pieces	Inflation Nozzles	Bird Dart Points & Slide Prongs	Harpoon Dart Heads	Bows	Marlin Spikes	Sinew Twisters	Arrowshafts	Feather Cutting Boards	Antler Arrowheads	Antler Arrowhead Preforms	Chipped Flint Arrowheads	Snow Probe Ferrules	Ice Shaft Rings	Snow Shovels	Snow Knives	Wooden Hunting Hats	Snow Goggles	Fish Arrow Prongs	Fishing Poles	Bola Weights	
Late Thule	A-1	-	1			-	-	-			-	-		-		-			-	1		-	-		-		-		1	-	-	1				-		1	-	1	1	6
	A-2	2	2	-	-	1	-				-	1		-		-					-	-		1			-	-	1	15	2	3	-	-	-	-	-	-	1	-	2	31
	A-3	2	4	-	-	2	-		-		-	-		-		-		1			-	-		-		-		-		4	-	1	-	-	-	-	-	1		-	-	15
	A-4	1	-		-			-	-		-	-	-						-	-	-	-	-	-	-	1		-	-	5	-	2		-	-	-			-		9
	A-5	1	1		1				-	-	-		1		1			-	-	-	-	-	-	-		2	-	2	1	6	1	2	-	-	1	-	-	1		-	2	23
	A-6	1		-	1	-			-	-	-		-					1	-	-			-	-	1	-		2		4	-	2	-	-	1	-	-			-	2	15
	A-7	-		-	-	1		-		-	-		-		-			1	-	-			-	-		-	-	1		2	-		-	-		-	-	1	-	1	1	7
	B-1	1	1		-	-		-		-	-		-		-			-	-				-	-		-	-		-	1	-	-	-	-		-	-	-	-	-	1	4
Early Thule	B-2	-	-					-	-	-					-		-						-			-			4	-	-	-	-		-		1		-		5
	B-3	2	1	-			-	-	-	-						-					-		1			-			1	-	-	-	-		-	-			-		5
	B-4	1		-			-	-	-	-				-	-			-					-	-	-		-		-	2	-	-	-	-		-	-	1	-		1	5
	B-5	1			-	-	-	-	-				-		-	-		-	-	-	-		-					-	-	2	-	-	-	-	-	-	-	-			1	4
	B-6		-		-	1	1	1	-					-	-			-	-	-	-			1	-		-	-	2	-	-	-	-	-	-	-	1			1	8
	B-7	4	-	1		-	-	-				-		-	-		-	-	2	-	1	-				-	-	3	-	3		-	-		-	-	1	1	-	5	21
Birnirk	B-8	5				3	1	-	1	-	1	1	-	-	-	2		-	-		-	-	2		1	-	-	2	-	4		-	-	1	-	-	1	2	-	1	28
	B-9	2		1	-	-	1	1	-				-	-	-	-		1			1	-				-	-	2	-	2		-	1	-	-	-	1	1	-	8	22
	B-10	11	-	2	1	2	1	-	-	-	2	1	3	-	-		1		-		-	-			-	-	-	-	1	5	-	-	-	-	1	-	-	-		3	34
Late Thule Test Trench		5	2	2		1		1	-	-	-	-	-	2	-	-		-				-	1	-		-	-	5	-	3		1		-	-	-	1		-	-	3	27
Early Thule Test Trench		1	3	1			-	1		-	-				-			-	-		1	-	-	-	1	1	-	1	-	5	-	1		-	-	-	-	-	-	-	4	20
Birnirk Test Trench		12	-	-	-	1	-		-	1		1			-			-	1	-			1	-	1	-	1	-		1	-		1	-	-	-	-	1	-	-	4	26
Totals		52	15	7	3	12	4	4	1	1	3	4	4	2	1	2	1	4	3	1	2	1	5	1	5	4	1	18	3	67	8	13	2	1	2	1	1	7	8	1	40	315

Umiak Parts

A Birnirk artifact is probably an umiak part (Plate 21*a*). It is a large, massive piece of wood measuring 82 cm in length, 25.3 cm at its maximum width, 14.4 cm at its minimum width, and 5.5 cm thick. Although there are no diagrams of umiaks that illustrate a part of this nature, I feel that it is most likely a seat which, because of its small size and shape, would have been located near the bow or the stern of a boat. It is fashioned so that an individual could sit facing either direction. It is too large to be a kayak part or sled but it could be part of a house or other large, wooden structure.

The artifact resembles an airplane propeller with two large wings or blades. The center is narrowed and curves outward to the maximum widths of the wings on all four edges. The edges are rounded on both sides giving it a lenticular cross-section. At both ends there are large rectangular slots measuring 6 cm deep and 3 cm wide. These were probably set into a frame of some type. Two holes are drilled on both sides and at the end of the slots, and are used to lash this piece to the frame.

Kayak Ribs

The last possible boat part is an antler artifact. Ford (1959:159–160) found similar artifacts and stated that he was unable to identify them but feels they were possibly ribs for kayaks.

> Possibly these are ribs for kayaks. The flattened sides of the staves (concave side) are carefully smoothed, possibly to prevent the fraying of the skin covering. They could hardly have been intended for the bottom ribs of the western type of kayak, for they do not have enough arch and lashing holes are provided for only two longitudinal stakes, not the six or eight usually found. Possibly these are top ribs used aft and foreward of the manhole.

Mathiassen is also uncertain of their use. He thought they were either drying racks or drum frames (Mathiassen, 1927a:78). They are obviously not frames for drums as they do not have essential drum features (pp. 61–62). The possibility of drying racks is intriguing, but no data are available to confirm this.

Seven of these ribs were found at Walakpa, three complete and one broken specimen in the Birnirk occupation, and three broken specimens in an Early Thule level.

The Birnirk specimens measure from 34 to 31 cm in length (Plates 34*e*, 38*d*, 54*d,e*). The antler is split and the central cancellous structure is removed. The edges of the concave sides are ground smooth and both ends notched on the edges. On one specimen, one end has two sets of notches with the posterior set being 2.8 cm behind the forward notch. Four holes are drilled into the central section of the artifacts. Two are placed on each edge with the holes on one edge being spaced farther apart than those on the other edge. The distance between these sets average 11 cm on one edge and 6.1 cm along the other. On one specimen along the edge with the shortest spacing between holes, there is a groove; it runs the full length of the artifact and joins both holes. As seen in other artifacts, such as ice scoop rims, these grooves are usually for insetting the lashing to provide strength and to get the lashes out of the way. This groove does not occur on all specimens and may give some clue to their function.

Three broken rib ends were found, all in one level of the Early Thule period (Plate 74*i-k*). These are all broken in the same place, which is at the point where the first edge hole is drilled. These specimens all measure 12.8 cm from the hole to the end. Two are notched on the upper and lower edges near the end of the rib, while the third has a slight notch on the ventral side near the end.

Kayak Cockpit Frames

Two sections of wood from a Birnirk level are possibly frames for a kayak cockpit (Plate 38*a,b*). These pieces are both from the same artifact. They are curved, rectangular strips measuring 2.6 cm wide and 1.6 cm thick. The edges are ground round, giving it a slightly elliptical cross-section. One section has the end beveled so that it would abut to another strip. A lashing hole is drilled at this end. Three additional lashing holes are located at various points along the center axis of the frame.

Sled Parts

Antler Arches

Ford (1959:152) identifies bow pieces or antler arches for built-up sleds. These were used for supporting the structure of the railed sled and for attachment of the runner. The railed sleds were large and were pulled in historic times by dog teams (Murdoch, 1892:355).

Two of these arches were found, one of Birnirk age and one of Early Thule age. The Birnirk specimen is semicircular in outline and oval in cross-section (Plate 38*c*). Both ends are roughened for hafting. Two holes, 11.2 cm apart, are drilled in the middle of the arch. The total length of the arch is 48.1 cm and is 1.6 cm thick.

The Early Thule specimen is of the same general shape (Plate 62*a*). Both ends have two lashing holes and notches for attachment to the sled frame. Two holes, 7.4 cm apart, are drilled at the center portion of the arch. Below the center holes are two notches, which fitted into the sled frame. The arch measures 33 cm in length and 2.5 cm thick.

Sled Shoes

Only one sled shoe was found (Plate 106*d*). It is Late Thule in age. It is made from the dense bone of a whale jaw. It is rectangular in cross-section. The bottom surface is highly polished while the upper surface is rough. It has four irregularly placed holes drilled along the center axis in a horizontal line. Bone treenails are still inserted in all the holes. One end is flat while the other is beveled at a 33° angle back from the bottom surface. The shoe is 33.3 cm long, 3.9 cm wide, and 1.7 cm thick.

Harness Swivels

The last sled piece is a harness swivel from the Birnirk period (Plate 37*z*). This is a broken ivory artifact that resembles a nail in shape. It has a round, flat head, which measures 1.8 cm in diameter and 0.9 cm in thickness. Below the head there is a cylindrical schaft, which has been broken. A hole for a line attachment was drilled through this portion of the artifact. The cylinder measures 1.1 cm in diameter.

Miscellaneous Boat or Sled Parts

A large, carved fragment of wood from an Early Thule level is possibly a boat or a sled part (Plate 67*b*). The wood is markedly curved at one end while the other end tapers flat with a hole drilled through the center. One face is carved for lashing to another artifact. The specimen measures 3.8 cm in width and 1.5 cm in thickness.

Table 3 is a summary of all the transportation equipment that was recovered at each level at Walakpa.

TABLE 3.—*Transportation equipment by occupation level of each culture phase, Walakpa site*

Culture Phase	Mound Occupation Level	Boat Parts					Sled Parts			Boat or Sled	Totals by Occupation Level
		Boat Paddles	Paddle Tips	Umiak Parts	Kayak Ribs	Kayak Cockpit Frames	Antler Arches	Sled Shoes	Harness Swivels	Miscellaneous Parts	
Late Thule	A-1								-	-	
	A-2		-	-						-	
	A-3			-				-	-	-	-
	A-4			-				-	-		
	A-5			-				1	-		1
	A-6			-				-	-		
	A-7			-			-	-	-		
	B-1			-			-	-	-		
Early Thule	B-2	-				-	-	-	-		
	B-3					-		-	-		
	B-4	-				-		-	-		
	B-5	-			1	-		-	-		1
	B-6	-				-		-	-		
	B-7	-							-	1	1
Birnirk	B-8	-	-	-	1				-		1
	B-9	-		-	1	2	1		-	-	4
	B-10		1	-	1				-	-	2
Late Thule Test Trench			-		-	-			-	-	-
Early Thule Test Trench					-	-	1			-	1
Birnirk Test Trench			1	-		-	-	-		-	1
TOTALS		0	2	0	4	2	2	1	0	1	12

MANUFACTURE, MAINTENANCE, AND PROCESSING OF EQUIPMENT

Men's Knives

Crooked Knives

These knives are used for whittling or carving on wood (Murdoch, 1892:157). These knives have a long, slender tapering handle, which is usually slightly bent or curved. The handle has a blade socket on the ventral edge near one end. According to Murdoch (1892:157) there are two types of crooked knives, a large variety for cutting wood and a small one for cutting bone and ivory. Ford (1959:160), taking Murdoch's suggestion, arbitrarily divided these knives into the two categories at the length of 17 cm. How-

ever, the large-knife category, illustrated by Murdoch, ranges from 30 to 22 cm. I feel that the distinction made by Ford may not be valid.

Two complete handles were found at Walakpa. All of the Walakpa specimens are made of bone and antler. These, as are Ford's specimen, are Early Thule in age (Plate 70*i,k*). None were recovered in the Birnirk levels. The length of the handles ranges from 29 to 14.2 cm and averages 16.4 cm. Blade slots measure from 1.1 to 3.7 cm in length. One Early Thule handle has a hole drilled in the larger end for a suspension loop (Plate 70*k*). This specimen is decorated with two incised lines, which run at right angles to both edges and nearly meet in the middle of the handle.

Knives with End Blade Slots

Ford (1959:171) indicates that there are two varieties of knife handles with end blade slots, one that he considers to be of Birnirk age and the other later in age. The distinctions between these types is not clear, but it is based primarily on handle shape. Two varieties of end blade slots were found at Walakpa.

The distinguishing feature of these is not so much the handle shape but rather the method in which the end slot is made. The two types of ends are (1) a socket type of slot and (2) a split slot that extends part way up the handle. These types do not reflect any temporal change. Both types were found in Birnirk, Early Thule, and Late Thule levels. It would appear that these types of blade slots are functional. The socket type is used for chipped flint blades, while the slotted variety are for ground slate blades.

The handles from the Birnirk occupations are made of either antler or wood. The antler specimen is similar to Ford's (1959:166–167) Birnirk type (Plate 19*j*). It is made from a round section of antler with no surface modification. It has a socketed end that is ground flat, with a rectangular cut, which measures 1.1 cm in length and 0.3 cm wide. The cross-section of the handle is 1.5 cm wide by 2.2 cm long. The end has been broken but it would have measured at least 19.2 cm in length. There is no evidence for a suspension hole.

The wooden handles from the Birnirk assemblage are of the split slot variety and oval to flat in cross-section (Plates 10*h*, 52*c*). The two specimens measure 18.9 and 16.8 cm in length. The longer specimen is 2.3 cm wide and 1.2 cm thick. It tapers to a blunt point with a round suspension hole drilled near the end. The socket is 4.2 cm in depth. A slight notch has been cut for lashing. Ford (1959:166) does not believe that the lashing was for stabilization of the blade, but rather for holding the handles together. The smaller specimen is nearly identical, except that the lashing notch is expanded to a wide groove, which covers the full length of the socket. The socket depth is 3.8 cm. The cross-section measures 2.6 cm by 1.8 cm.

Both varieties of knife handle also occur in the Early Thule levels. The socketed type is represented by two specimens. One, an extremely well made handle, measures 14.8 cm in length with the oval cross-section measuring 2.4 by 1.1 cm (Plate 75*g*). The socket is rectangular in shape, measuring 2 by 0.6 cm. A suspension hole is drilled near the end with an additional notch carved into the base. The handle is decorated with two short incised lines starting from the base and running up both sides of the knife to a point above the suspension hole. Another decorational motif is highly reminiscent of an ownership mark. It is located above the suspension hole. This mark consists of a long, straight line that culminates with two lines crossing over the end of the original line.

The second specimen appears to be a composite tool. Blade sockets are located in both ends. It appears that the original socket was broken and then the other end was used. The length of the handle is 9.3 cm. It is oval in cross-section with measurements of 1.8 by 1.4 cm. The depth on one socket is 2.8 cm. One end of the knife is cross cut, giving it the appearance of having once been part of a composite handle.

Four examples of the slotted socket type were found in the Early Thule levels. One was made of antler and the others of wood. The antler specimen is similar to Ford's Birnirk type (Plate 75*h*). The surface of the antler has not been modified. It measures approximately 13.8 cm in length. The oval cross-section measures 2.2 cm. The slot is greater than 2.5 cm in depth. A hole is drilled completely through the handle to hold the end blade in place. The base has a round suspension hole. The handle is wrapped for a grip.

The wooden specimens are both rectangular and pointed in shape. The pointed specimen is 14.4 cm in length (Plate 75*i*). The oval cross-section is 2.8 by 1.2 cm in width. The blade slot is 5.2 cm deep. A slight notch has been carved for binding. A round suspension hole is drilled in the tapered end.

The rectangular specimen is 16.8 cm in length (Plate 78*b*). Its cross-section measures 1.8 by 3.1 cm. The blade slot is 3.3 cm. The hafting surfaces are carved slightly smaller in cross-section and slightly tapering. A small round hole is drilled at the butt for suspension.

The fourth Early Thule specimen to be described is oval in shape. It measures 13.2 cm in length and is 2.8 cm wide. The slot is 5.5 cm deep. It has a lashing notch cut into one surface. A rectangular lashing hole is drilled into the base.

There are two examples of the socket type of knife handle found in the Late Thule levels. Both of these are antler and fit Ford's description. Their length ranges from 16.8 to 13.8 cm. The cross-sections measure 3.2 by 1.4 cm, and 0.2 by 1.2 cm, respectively. The rectangular sockets are 3 by 0.6 cm and 1.3 by 0.5 cm. One specimen has no suspension hole (Plate 103*i*), and the other has a rectangular hole (Plate 117*j*).

Eight examples of the slot-socket type of handle were recovered in the Late Thule levels. Seven are made of wood and one is made of bone. The bone specimen is 12 cm long (Plate 95*g*). It is rectangular in cross-section measuring 2 by 1 cm wide. The hafted end has been cut on an angle, which brings one edge to a slight point. The maximum depth of the slot is 3.1 cm. Around the hafting prongs there are a series of scars. The base is square with a hole drilled from one edge to the other. Another hole has been drilled from one surface, which intersects with the first hole.

The seven wooden specimens are discussed according to the method of the suspension arrangement. The first are those with no suspension holes. Three of these occur and possibly a fourth, but the base has been broken on the last example. These tend to have a tapering handle although one is truncated. The largest measures 14 cm in length (Plate 117*i*). It is oval in cross-section and measures 3 by 2 cm in width. The length of the slot is unknown as it is split well behind the original termination. A fragment of the tang of a slate blade still remains wedged in the socket. A lashing notch is carved near the tip. The smaller specimen measures 11.4 cm, with a slot depth of 4.2 cm (Plate 95*e*). No cross-section is available as it is split in half. The other small specimen is also split in half (Plate 95*c*). It measures 12.7 cm in length. The slot is 2.6 cm in depth. Both of these have a lashing notch, but differ in that the base of one comes to a blunt point.

The broken specimen is very crudely made (Plate 100*d*). The length of the handle is in excess of 21 cm. It is oval in cross-section, measuring 2.3 by 1.4 cm. The slot is at least 2.5 cm deep. The slot end is wrapped by a baleen lashing.

Only one Late Thule specimen has a drilled suspension hole (Plate 110*d*). It is 16.8 cm long. It has an oval cross-section, which measures 2.6 by 1.5 cm at its maximum width. At the slotted end there is a collar, which is 3.2 cm long. Lashing scars extend below the collar for 1.8 cm. The slot is 3.4 cm long and 2.6 cm wide. The slot was made by drilling a hole through the handle at 3.4 cm back from the end. The rest of the slot was then cut out, probably by using a string saw.

The final two examples are similar to those described above, except that instead of suspension holes they have a deep groove carved around the base. The first handle has a woven cord of baleen that wraps the handle, acting as a grip (Plate 98*a*). It measures 15.4 cm in length. The oval cross-section is 2.8 by 1.4 cm in width. The slot measures 3 cm in depth. It has a lashing notch near the end. The scars of a separate set of bindings, which are not part of the handle grip, were present in the slot.

The final handle to be discussed is part of the most spectacular knife in the collection (Plate 98*b*). A complete slate blade is still hafted into position. The blade will be discussed below (p. 48). The handle has a suspension groove rather than a hole. The length of the handle is 13.8 cm. In cross-section it measures 2.4 by 1 cm. The slot is 3 cm deep. The blade is set completely to the base of the socket. The prongs of the handle extend up the entire length of the blade tang and terminate at the blade shoulder. Lashing begins at a notch cut below the haft termination and extends 4.7 cm down the shank of the handle. It is wrapped with a braided baleen lashing.

Composite Knives

The composite or splitting knife is a specialized form of knife used for splitting bone, ivory, and antler (Ford, 1959:161–165, Murdoch, 1892:172–173). The knife has a thin chisel-like blade, used like a graver.

Four ivory specimens of composite knives, one of which is a complete handle, were found in the Birnirk levels (Plates 19*i*, 37*r–t*). These handles are short split pieces of ivory. When they are put together they form a handle that is round in cross-section. The chuck end has a raised flange, in back of which the binding is attached. They are further secured by both round and rectangular splines drilled into both inside surfaces. In one specimen the spline passes completely through the handle. The blade sockets are extremely short and narrow. The handles measure 9.2–7.6 cm in length. The diameters are 1.5–1.2 cm in maximum width.

Knife Blades

Five major types of knife blades occur in the Walakpa artifact assemblages. These are (1) stemmed

ground slate blades, with a single cutting edge, (2) stemmed ground slate blades with double cutting edges, (3) bifacially flaked stemmed chert blades, (4) bifacially flaked ovate blades, and (5) knife blades made on flakes.

A considerable amount of confusion exists over the flaked chert knife blades. As mentioned above these could be knife blades, lance points, or arrowpoints. The criteria used here is that of relative size and apparent usage. Flaked points that are too small for lance points and too large for arrowpoints are considered knife blades. Many of these examples have definite knife wear on the edges. The presence of knife wear, however, does not necessarily exclude the possibility that they may have also been used for either arrowheads or lance points. Many of these artifacts could have been used for both purposes. It is my belief, however, that because of their size they are best considered knife blades.

From Birnirk levels ten knife blades were found that can fit into the four latter classes, 2–5.

CLASS 2.—The ground slate variety have both edges ground sharp and have a stemmed tang (Plates 10*c*, 19*h*). The only complete specimen measures 7.4 cm in length and 1.9 cm wide. The tang is 2.1 cm long and 1.9 cm wide. The widest portion of the blade is 3.2 cm. An extremely short tanged end blade is incomplete but the blade is 3.7 cm in length. These slate blades are diamond- to rectangular-shaped in cross-section.

CLASS 3.—Three examples of flaked chert blades are present. These have a relatively square-based tang, as do the slate specimens (Plates 6*p*, 52*d*). They measure 5.6 by 2.3 cm, 2.4 by 2.3 cm, and 2.1 by 1.3 cm in length and width. Two of these specimens are bifacially flaked, while one is unifacial, being made from a primary cortex flake.

CLASS 4.—Two ovate bifacial knife blades occurred in the Birnirk levels (Plate 10*e,f*). These are thin (0.4 cm and 0.45 cm), bifacially flaked blades. They have a wide rounded base, which tapers to a point. These blades measure 4.5 by 1.8 cm and 4.3 by 1.7 cm. The blades are not made from the commonly used Sik-sik-puk flint but rather from a clear chalcedony and a translucent brown flint.

CLASS 5.—Twelve examples of retouched flakes, which have been used for knives, were found in the Birnirk levels. Four of these are made on primary flakes with a portion of the cortex still visible. Eight are secondary flakes. All are made from the Sik-sik-puk chert.

All five classes of knife blades were found in the Early Thule levels.

CLASS 1.—Two examples of this variety occurred (Plate 78*a*). They are 7.4 and 5 cm long. The tangs are 2 and 1.3 cm in length, and the maximum widths at the shoulder are 2.1 and 1.7 cm, respectively. The upper (back) edges have the remains of the preform flaking still unground. The blades have a single facet starting at the back edge and taper to the sharp edges.

CLASS 2.—Only one example of the double edge blade occurred (Plate 64*h*). This specimen is 6.5 cm long; the length of the tang is 1.3 cm, and the width of the shoulder is 2.4 cm. It is made of gray slate and has two holes to facilitate binding and hafting. One is drilled in the tang and the other is drilled just below the shoulder.

CLASS 3.—One complete example (Plate 70*j*) and several broken specimens were recovered. The complete blade is symmetrical and appears to be like a lance blade. The edges have not been resharpened, but close examination shows knife usage. It measures 6.4 cm in length.

A subclass of class 3 occurred in the Early Thule levels; these are semilunar stemmed chert blades. These are probably the same as the symmetrical types, but it appears that when the blade has been resharpened several times, it becomes semilunar in shape. Semilunar stemmed blades occur in both large and small varieties. A large example measured 6.1 cm in length (Plate 70*h*). The stem is 2.6 cm long and the maximum width of the stem is 2.9 cm. This is a bifacially flaked blade made from Sik-sik-puk chert. One edge is resharpened and the tip is repointed. There is no evidence for basal grinding. A stem section of a semilunar blade (Plate 70*f*) was recovered; it is 2.5 cm long and at the shoulder it measures 2.8 cm.

Two small examples, one made of gray sik-sik-puk chert and the other of a clear to black banded chalcedony (Plate 61*h*) were also found. Both have semilunar blades with retouch on their cutting edges and tips. The stems are not ground. The only complete blade measures 3.9 cm in length with the tang measuring 1.4 cm and the width at the shoulder being 2 cm.

CLASS 4.—Two examples of ovate bifacial chert blades were made of Sik-sik-puk chert (Plate 73*k,o*). They measure 4.7 and 3.4 cm in length, with maximum widths of 2.8 and 2.3 cm, respectively. There is no grinding present to indicate hafting. The blades are not resharpened, but they do have hard knife wear on both edges.

CLASS 5.—Nine examples of flake knives were found in the Early Thule levels. Two were made on primary flakes; the rest on secondary flakes (Plate 76*e*). All but one were of Sik-sik-puk chert. The remaining flake is a gray quartz.

One example found in an activity area gives us an idea of how these flake knives were used (Plate 65*h*). This is a simple secondary flake, which (when found) was hafted between two flat sticks of wood. It was bound in place by baleen lashings, one set in front of the flake and the other in back. The lashings held the two sticks together and the flake in place. The stick handle of this knife measures 9.5 cm in length, 2 cm in height, and 1.4 cm thick. The flake is oriented so that its long axis, 5.1 cm long, is on the same plane as the handle. About 1.6 cm of the flake extends below the handle. This edge of the flake is circular in outline. Along the edge there are small chips that resulted from usage along one side. If this flake had been resharpened it would have been identified as a side scraper.

The function of this tool is to shave spalls of wood when preparing arrowshafts. Many arrowshafts that were broken in manufacture were scattered around the artifact, along with long wood spalls (Plate 71*i*) and discarded arrowshaft preform ends.

Only four of the five classes of knife blades were found in the Late Thule levels. (Type 4 did not occur in the Late Thule collection.)

CLASS 1.—Three examples of single-edged slate blades occurred in this sample. Two are made from gray slate (Plate 98*b*, 117*d*), while one is of red slate (Plate 95*f*). All of these are complete, and measure in length at 10.4, 6.8, and 6 cm. The stems measured 2.7, 2, and 2.4 cm. The widths of the shoulders are 2.6, 2.3, and 1.5 cm, respectively.

CLASS 2.—Five examples of double-edged slate blades were found (Plate 110*c*). Four are made of gray slate and one of red slate. The lengths range from 7.8 to 5.1 cm, with an average of 6.3 cm. The length of the tangs range from 2.5 to 1.7 cm, with an average of 2 cm. The width of the shoulders varies from 3 to 1.7 cm, with an average of 2.5 cm.

CLASS 3.—Seven examples of the stemmed symmetrical flint blades were found (Plates 95*b,d*, 99*d*, 110*e*). Two are complete, both measuring 6.8 cm long. Their stems are 2.8 and 1.7 cm in length. The shoulders are 3.2 and 2.3 cm wide, respectively. All of these specimens are made from Sik-sik-puk chert.

CLASS 5.—Fourteen flake knives were found in the Late Thule levels. Six are made on primary flakes and eight on secondary flakes. Twelve are made from Sik-sik-puk chert (Plate 86*c,d,f*) and two of a clear chalcedony.

Whetstones

Three types of whetstones were observed in the Walakpa collections. The most common type occurred in most of the cultural units (Plates 23*a–e*, 29*d*, 39*d–h*, 53*d,e,g*, 66*i,j*, 84*g*, 90*h*). These are unshaped, fine-grained pieces of sandstone. They range in size from 18 by 11.7 cm to 6.8 by 5.1 cm, respectively. A broken example has a suspension hole drilled in one end (Plate 99*b*).

The second type are elongated sandstone bars, which are square in cross-section. Two examples of this type ocurred, both in Late Thule levels (Plates 90*i*, 95*h*). Both of these examples are fragmentary.

The third variety of whetstone seems to be unique to the Walakpa collection. These are extremely large, unshaped sandstone slabs. The largest specimen (Plate 24*a*) measures 35 by 26 cm, and two other examples are 25 by 24 cm (Plate 24*b*) and 20 by 22 cm (Plate 24*c*) in size. Only one surface on each stone has been utilized. These whetstones are all Birnirk in age.

The wear pattern on most of these whetstone surfaces seems to indicate two grinding phases. The first phase is that resulting from hard usage or wear. This produces deep longitudinal scars. The second wear pattern produces a highly polished surface. The motion that produces this surface is from the opposite axis of the deep scars. There is no evidence for a circular motion. This last type of wear probably results from fine finishing of slate artifacts, with the deeper scars resulting from roughing out preforms.

Flint Flakers and Hammerstones

The composite tools used for working flint, which were common at Nuwuk, Birnirk, and Utkiavik, were not found at Walakpa. No handles or handle fragments were found, and only three possible flaker points were identified. This can be correlated with the scarcity of flint flakes at Walakpa.

FLAKER POINTS

Two flaker points came from the Birnirk levels. The first is unique. It is undoubtedly a complete tool (Plate 8*f*). It is made from the proximal end of a walrus rib with the rib shank making up the handle. The shank is beveled laterally with the end cut blunted on both edges from use. The flaker measures 21.8 cm in length. The width of the flaking edge is 1.4 cm.

The second Birnirk specimen is possibly a flaker point (Plate 28*j*). It is a short section of walrus rib measuring 9.8 cm in length. Both ends are blunted from usage. One end is beveled from both sides. The widths of the flaking edges are both 1.7 cm.

The third specimen is Early Thule in age (Plate 72*a*). It is made from a short curved section of walrus rib. The length of the point is 18.2 cm and the width of the flaking edge is 1.3 cm. The flaking edge is beveled on both sides. The other end is slightly pointed.

Hammerstones

One example of a hammerstone was found which may have been used for a flaking instrument (Plate 114*e*). It is simply a round quartz beach cobble which is scarred on one surface from pounding hard objects. It measures 7.4 by 5.7 cm in diameter. The hammerstone was found in a Late Thule level.

Bone Hammerheads

Two bone hammerheads were found, one Birnirk and the other Late Thule in age. These hammerheads are smaller than those described by Murdoch (1892:93), which were used as bone crushers, but the ends are crushed from usage. It is thought that these may have been used for a soft hammer when flaking flint.

The Birnirk specimen is a rectangular section of dense bone (Plate 34*d*). It is rectangular in cross-section with slightly rounded ends. There is a notch in the middle of the one edge, for attaching a handle. The opposite edge is flat. A lashing hole is drilled through the center. It measures 8.1 cm long, 5.5 cm wide, and 3.3 cm thick.

The Late Thule specimen is badly damaged but appears to be the same type of artifact (Plate 96*j*). It is rectangular in shape with rounded ends. A notch was once cut into one edge and the opposite edge is flat and scarred for hafting. A lashing hole was drilled through the center. It measures 6.4 cm in length, 4.8 cm in width, and 2.7 cm in thickness.

Engraving Tools

These are tools for incising lines on bone and ivory. They were, according to Ford (1959:171), not used in later times. Our evidence does not support this assertion. These tools occurred in the Birnirk, Early Thule, and Late Thule periods.

Two of the Birnirk specimens are made of ivory. These are long slender rods, with the widest portion at the center tapering to both ends. The wide portion is used as the handle or the point of applied force. One tapering end is for the blade shaft, the other rests against the hand between the thumb and forefinger. A specimen from the earliest Birnirk level is 7.59 cm long (Plate 37*w*). The stylus end has a small groove to receive the engraver point. Lashing notches are found on the reverse face of the tip. The widest portion has four sides on which the thumb and forefinger rest. The edges between the sides have three cut scallops for either decoration or to act as a finger grip.

An ivory specimen from a later Birnirk level is similar, except that the thumb and forefinger rest is made of two raised knobs, with a short distance between (Plate 51*s*). The stylus end has a flat facet for hafting the engraver point. The back of the facet has a single notch for lashing the engraving point to the handle. This engraving tool measures 8.7 cm in length.

The rest of the specimens are made of wood. Two are of Birnirk age (Plate 11*d,e*), one is Early Thule (Plate 61*e*), and two are Late Thule (Plates 83*c*, 117*g*). These are very simple and have a single knob finger rest. The stylus ends are all socketed for the engraver point. One has a lashing notch but the others have no mechanism for attaching the point. An Early Thule specimen has a short section of iron for the engraving point (Plate 61*e*). These specimens measure from 7.4 to 6.8 cm in length.

Bow Drills

Drills that are used to drill holes in ivory, bone, and antler are a common Eskimo artifact. The drills are composite tools, which consist of a bow, a mouthpiece or handpiece, drill spindles, and drill points.

In the Walakpa midden, several small bows were found which could have functioned for bow drill bows. However, none of these specimens are similar to any described by other investigators, and they are most likely toy bows.

No examples of mouthpiece or drill bits were recovered. The only part of this composite tool that was found at Walakpa was a small wooden drill spindle from a Late Thule level (Plate 84*j*). This specimen is short and measures only 13.1 cm in length. At its maximum diameter it measures 1.4 cm. The spindle tapers from the small bearing end to a larger chuck end. The bearing end is rounded with a slight shoulder, probably resulting from use. The bearing portion measures 1.2 cm in length. The chuck is slotted or split to receive a drill bit which is slightly rectangular. Hafting scars are present and extend 1.7 cm up the spindle. There is a slight lip at the chuck, which prevented the haft wrapping from slipping during use.

Firemaking Equipment

Aboriginal Eskimo firemaking equipment was of two kinds, the strike-a-light method and the platform-drilling technique (Murdoch, 1892:291). No pyrites were found at Walakpa; however, many rounded shafts, which are burned on one end, were found in all levels.

Drill Bearings

Two drill bearings were also found, both from the Birnirk occupation. These are wooden blocks that are pointed at both ends and carved to fit the palm of the hand. At first glance these would appear to be kayak models. The flat surfaces have holes drilled near their centers. These holes are burned from repeated use. The larger specimen, which measures 20 cm in length and 4.2 cm in width, has two holes, both placed nearer one end than the other (Plate 25*i*). The other end is slightly inset to provide a tanglike handle. Over the holes on the back side a slight notch is carved to fit a finger to provide better leverage. The smaller example measures 11.4 cm in length and 3.5 cm at maximum width (Plate 25*h*). This example is nearly symmetrical in shape with a single center hole.

Fire Drill Platforms

Fire drill platforms are thin pieces of wood that have been used to start the tinder for a fire. Thin shavings of wood or dried moss were placed over the platform. A drill spindle was placed in a slight notch in the fire platform and was rotated until the tinder ignited. Several examples of fire platforms were found in Late Thule levels (Plates 83*h*, 96*b*). They consist of a piece of split spruce with several drilled holes, which are scorched on the edges. Several bunches of collected wood shavings were also recovered (Plate 103*c*). It is thought that these may have been tinder caches.

Fire Drill Spindles

Numerous examples of short, arrowshaft-like spindles with burned ends were found in all levels. A single Late Thule specimen is unique (Plate 103*d*). It is larger than the majority of drill spindles measuring 11.5 cm long and 2.2 cm at its maximum diameter. One end has been roughly carved to fit a drill bearing. The other end is worn round from use, with a short nipple-like projection, which apparently fitted into a hole in the fire drill platform. Both ends of the spindle are burned.

Adzes

The compound adz has been described by Murdoch (1892:165) as being a tool that women used for wood cutting. The adz consists of a short curved handle, which is attached to either an adz blade or an antler sleeve, which holds a blade.

Adz Handles

Four adz handles were found at Walakpa, two are Early Thule (Plates 70*c*, 80*h*) and two are Late Thule in age (Plates 100*e*, 110*f*). Three are made of antler, the fourth is a large piece of dense bone (Plate 100*e*). The range of handle lengths is 27.2–18 cm. The distal end of these handles are widened and have from one to four lashing holes. The proximal end on one is notched, another is drilled for suspension. The central edges on two handles are notched near the distal end, presumably for additional lashing support. The butt, or distal end, is also notched on two specimens for additional hafting stability.

Adz Blades

Seven adz blades were found. Five were of Birnirk age (Plates 9*b*, 39*a,b*, 52*a*) and two from an Early Thule level (Plate 64*i,j*). Five were made from jade (Plates 39*a,b*, 52*a*, 64*j*) and two of slate (Plates 9*b*, 64*i*). These blades are quadrilateral to triangular in outline with the blade edge being wider than the tang edge. Usually these are made from rough pebbles with grinding appearing only on the lower faces and the faceted edge. The size of these blades ranges from 7.8 to 4.9 cm.

Ford (1959:178) classified two varieties of adz blades: "One group has ground facets which meet at an angle of about 30°. These were presumably used to cut fairly soft materials such as wood. The second group has facets which meet at an angle of about 90°. These blades were probably intended for working hard materials such as bone, ivory or antler."

In the Walakpa collection there are several edges with angle measurements averaging between 30° and 90°. Those which measure closer to 90° do not indicate any more or less wear than the others. The possibility should be considered that resharpening of the blade while it was hafted in a sleeve or to the handle may account for angle variation.

Sleeves

One sleeve was found in a Birnirk level (Plate 52*a*). This is simply a cut section of antler measuring 8.8 cm in length. The lower portion of the sleeve is hollowed out to receive the blade. Both faces are scarred and roughened to facilitate hafting to the handle.

Whale Rib Tools

Whale rib mattocks were extremely important tools for construction of semisubterranean houses, ice cellars, etc. They were used to cut sod for houses and for clearing the houses of ice that collected during the summer (Murdoch, 1892:302). The mattock consists of a whale rib blade attached to a short wooden handle.

Mattock Blades

Eight specimens of rib blades were found in the Walakpa collections, six in the Birnirk levels, and two in the Late Thule levels. There appear to be five varieties of mattock blades, based on the method of attachment of the blade to the handle. The differences are in the number of notches cut into the edges. They number from four to two notches, with the two-notch variety being later in time than the others. The other difference is the presence or absence of connecting grooves carved between the lateral notches. This latter characteristic does not seem to have any chronological significance.

In the Birnirk specimens there are three examples with three notches and no connecting grooves (Plates 40*a*, 41*c*). These measure 30.5, 33, and 60 cm in length. Three specimens have three notches with connecting grooves (Plates 26*b*, 40*b*). They measure 38.9 and 28.3 cm in length. The final Birnirk specimen has four lateral notches with no connecting grooves (Plate 26c). It measures 32.1 cm in length.

The two Late Thule specimens have two sets of lateral notches connected by grooves. The upper notch is near the termination of the tool and forms a small knob. They measure 33.3 and 32.4 cm in length. The latter specimen has an additional hole drilled into the ventral surface, presumably for the insertion of an additional brace between the blade and the handle.

In all cases the ventral surface has been roughened to create a surface for hafting the handle to the blade. One specimen from the Birnirk level has a shallow socket to receive the handle. Cutting edges are badly worn and chipped, indicating hard wear, which would occur when chipping ice or frozen ground.

Mattock heads from the Birnirk type site are apparently quite short, averaging about 25 cm (Ford, 1959:181). The difference in size between the Birnirk and Walakpa specimens is probably the result of use and resharpening and not of function. Ford (1959: 181) does not report any specimen from Birnirk with four pairs of hafting notches.

Whale Rib Ice Picks

In addition to whale and walrus rib mattocks, Murdoch (1892:302) describes rib ice picks. These are picks made from small narrow ribs that come to a sharp point, rather than the wide blade of the mattocks. The pick points have been dulled from use; however, they have not been as badly crushed and chipped as the mattock blades. These were also used for digging ice cellars, house excavation, and for chipping ice (Murdoch, 1892:302). Seven specimens were found at Walakpa: two were Birnirk, two Early Thule, and three are Late Thule in age. As with the mattock head, the pick head can be divided into groups depending on the number of lashing notches, and once again, those with two notches are later in age.

One Birnirk example is extremely small and measures only 19.1 cm in length (Plate 26*d*). It has three lashing notches connected by lashing grooves. The articulatory surface is cut and roughened to receive the pick handle. The pick end is crushed to a flat surface but the angular cut for the point is still visible. The other Birnirk specimen measures 42.2 cm in length, made from a whale rib split in half (Plate 41*b*).

Two Early Thule specimens are different from each other. One has three notches with connecting grooves. The uppermost groove is a deep notch that extends to the end of the tool (Plate 62*d*). The articulatory surface consists of a deep socket, which is inset between the upper and lower hafting notch. Its total length is 33.3 cm. The second specimen closely resembles a mattock head but has been cut to a narrow, thin blade (Plate 62*c*). It has only two lashing notches with connecting grooves. It measures 37.8 cm in length. The hafting surface has been scored for hafting to the handle.

Five Late Thule specimens have two notches with connecting grooves (Plates 91*b*, 100*f*, 104*c–e*). They vary only in the way the handle is attached. One has a deeply inset socket (Plate 100*f*), while the others have only a roughened surface between the notches. Two specimens have the tip broken and the others range from 35.3 to 31.2 cm in length.

Whale Rib Mattocks or Pick Handles

Only one handle was recovered (Plate 40*c*). It is Birnirk in age. Its total length is 37.4 cm. It is 9.9 cm in width at the articulatory end, while at the end of the handle it is 4.4 cm wide. It is made from driftwood, which is cut narrow at one end and wider at the hafted end. A large hole is cut at the haft end for the lashing. The articulatory surface is slightly concave and roughened to facilitate hafting.

Wedges

Bone wedges were used for splitting wood (Ford, 1959:184). These wedges can be divided into two categories based on size. Some are quite large, while others are significantly smaller. The difference in size may reflect differences in function. The larger ones were for splitting large logs, while the smaller examples were used for working on smaller wooden items. It is also possible that the smaller ones may have been used for splitting bone, antler, or ivory. Large wedges are quite wide at the bit and shank compared to the smaller variety.

The large wedges are all made of whale or walrus rib. The working edges are sharpened while the opposite ends are crushed from hammer blows. Two Birnirk (Plates 12*a*, 41*a*) and two Late Thule (Plates 104*a,b*) examples were found. The range of length is 23.3–18.1 cm, with an average of 20.7 cm. One of the Birnirk specimens is made from a broken mattock blade and has a whole drilled into the side.

The smaller wedges are made from bone ivory and one from antler. Five are from Birnirk levels (Plates 12*b–d*, 47*a,b*), one from Early Thule (Plate 64*g*), and two are Late Thule in age (Plates 92*a*, 118*g*). The range of length is 15.8–7.9 cm, with an average of 11.2 cm.

A very small wedge was found in an Early Thule level arrowshaft manufacturing activity area (Plate 64*g*). It was wedged into a split in a long, thin piece of driftwood. The wedge is short, measuring 3 cm in length. It is 1 cm wide and 0.2 cm thick. It is trapezodial in cross-section with one flat surface and the other having sharp beveled edges. It does not have any crushed surfaces and was probably used by hand.

Ulus

One of the most distinctive Eskimo artifacts is the woman's knife or the ulu. These knives seem to have served as an all-purpose tool being used to cut anything from food to thread (Murdoch, 1892:161). The knife consists of a handle made from wood, bone, antler, or ivory. The handle was placed over a roughly triangular- to lunate-shaped slate blade.

Ulu Handles

Ulu handles are short blocks of antler, wood, bone, or ivory carved to fit the hand. A slot is cut on the ventral edge for the insertion of the ulu blade tang. Seven examples were found at Walakpa. Five wooden specimens are from the Birnirk levels, while two ivory specimens are Late Thule in age.

Two of the Birnirk specimens are roughly cut pieces of wood. One appears to be part of a discarded burned shaft. One end is tapered and burned while the other is cut square. The other handle is simply a roughly cut block of wood (Plate 27*b*). The handles measure 7.5 and 11.2 cm in length. The widths of both are 1.5 cm.

The other three Birnirk specimens are more nicely finished. Two are elongated, hemispherically shaped objects (Plate 42*a,b*). They measure 14.5 and 13.3 cm in length, with the widths measuring 2.4 and 2 cm, respectively. The lengths of the lashing slots are 13.8 and 10.5 cm. The larger specimen has two concave notches cut near the center of the ventral edge (Plate 42*a*). A groove is carved around the handle between the two notches. An ivory peg is inserted from the dorsal edge through the handle. A short section of a rawhide thong is still attached to the peg. A wooden handle is split and patched with baleen lashing. A hole is drilled through the handle for a suspension lashing.

The third handle is basically different from those described above (Plate 27*a*). It more nearly fits the handle type described by Ford (1959:186) for the late period handles. It is a short, thin, hemispherical piece of wood, which measures 6.2 cm in length and 1.1 cm in width. The lashing slot is 4.3 cm in length.

The Late Thule ivory specimens are both small. They measure 8.8 and 4.5 cm in length, with a width of 1.7 and 0.8 cm, respectively. The hafting slot on the larger specimen is cut through both ends (Plate 84*l*). A hole has been drilled through the sides to attach the slate blade. The small ulu is a unique specimen (Plate 90*a*). The blade is still attached and the handle has been incised with a long line extending along both sides almost to the top. A series of short lines in the typical Thule style extend a short distance down the handle from the longer lines. A rectangular hole has been cut in the top of the handle.

Ulu Blades

There appear to have been three basic forms of blades used at the Walakpa site. These blade forms are based on the way the hafting was manufactured. The most common is that of a nonspecific tang shape with a convex edge. Twenty-five specimens of this variety were found: 19 are Birnirk in age (Plates 27*g*, 42*i–k*, 53*a,b*) and seven date from Early Thule times (Plate 70*d*). These blades have little or no preparation for the handle but are most generally convex to pointed in shape. The cutting edges vary from straight to slightly curved. The sizes range from 11.1 to 4 cm in their maximum length and their average length is 7.1 cm. These blades range from 7.3 to 2.2 cm long, with an average of 4.7 cm.

The second type of blade is an elongate, narrow blade with roughly parallel sides. The cutting edge is crescentic, coming to a point at either end of the blade back. The backs are either ground flat or chipped straight. Only seven of this type were found, four are Birnirk (Plates 10*a,b*, 27*h*) and three are Early Thule in age (Plates 73*j*, 76*g*). They range in maximum length from 9.7 to 7.5 cm, with an average of 7.9 cm. The blade heights range from 3.8 to 2.4 cm, with an average of 3 cm.

The last variety of ulu blade is that containing a tang, which is inserted into the handle. A total of eleven examples of this variety were found, eight are Birnirk (Plates 27*a*, *c–f*, 42*c–f*), one Early Thule (Plate 61*i*), and two Late Thule (Plates 86*g*, 110*a*). This type is quite distinctive. The backs of the blades are dressed to fit the handle by flaking a square tang near the center of the dorsal edge. After the desired shape is attained the edges are ground. In most cases there are two shoulders; however, in some only one shoulder exists. One of the Late Thule specimens has a hole drilled into the tang, probably for pegging the blade to the handle. The shape of the blades are semilunar to horizontal. The range of lengths is 8.6–6 cm, with an average of 7.5 cm. The blade heights range from 6 to 3.4 cm, and the average is 4.7 cm.

Six slate ulu blade preforms were recovered. The slate preforms are flaked to the desired shape. The first grinding was done on the flat face surfaces, gradually tapering to the cutting edge. The final step is the fine grinding on the facets for the edge sharpening.

Scrapers

There are essentially four types of chert scrapers found in the Walakpa assemblage. These I have divided into the major groups of end and side scrapers. Under the end scraper category there are two types. First the common planoconvex end scraper, and secondly a type of end scraper that is simply a split pebble, or a primary flake, both of which still have cortex on the dorsal surface of the artifact.

The side scrapers fall into the same two types, those made on secondary flakes and those made on primary flakes with cortex still present on the dorsal surface. The main difference between the side and end scrapers is that the side scrapers have one or both edges of the longitudinal axis of the flake resharpened while the end scrapers have retouch and use on the distal end of the flake.

Planoconvex End Scrapers

A common artifact in most late period Eskimo sites is the planoconvex scraper. These scrapers are used, according to Murdoch (1892:294–295) to remove bits of flesh and fat from a green skin and for breaking the grain and removing the subcutaneous tissue from a dried skin. The skin is laid upon the thigh and thoroughly scraped with the tool, which is pushed away from the worker. It is also used to soften dried skins.

Planoconvex end scrapers occurred in the Birnirk (Plate 52*h*), Early Thule (Plate 58*h*), Late Thule (Plate 111*a*) levels. Four specimens made from Siksik-puk flint make up the entire sample. All but the Birnirk example are bifacially flaked. In overall shape they are triangular, being widest at the scraping plane and tapering to a point. Steep retouch on the distal end constitutes the scraper edge. On two specimens the edge has a high gloss polish, most likely the result of the breaking down of hide fiber. The overall lengths of two specimens are 3.8 and 3.5 cm. The third specimen is still hafted to its handle and was not removed for measurement (Plate 103*b*). The width of the scraping edges on these specimens is 2.2, 2.2, and 1.8 cm.

The handle on the hafted specimen is a straight piece of wood, oval in cross-section (Plate 103*b*). It is split at the end, with the stone bit wedged into place. A slight shoulder is carved at the end for lashing. The handle is 10.3 cm long and 2.4 cm in maximum diameter. The lashing consists of split willow wrapped around the handle for a distance of 2.4 cm. The willow is cross-threaded in a fashion that interlocks the wraps and holds the scraper blade secure.

Pebble End Scrapers

Ford (1959:194) found only three end scrapers in his Birnirk assemblage, and noted their rarity in

comparison to the many two-handed metapodial beamers. He also noted that the two-handed beamer was no longer in use during historic times. From this evidence he postulated that these two tool types served the same function in different periods of Point Barrow cultural development. Ford would likely have attributed the rarity of planoconvex scrapers to the exclusive use of the beaming tool. This does not seem to me to be the case, as from specific activity areas we found that the most common occurrence of the two-handed beamer was in areas where there was a great deal of caribou hair and some were matted with the hair. Thus, two-handed beamer may have been used for hair removal, while scrapers were used for other tasks in hide preparation. The scarcity of planoconvex scrapers in early period sites might be attributed to the use of pebble scrapers rather than the well-flaked end scrapers.

The pebble end scraper, not to be confused with the split pebble scrapers, is a flake tool which would probably be discarded with the flake debutage by the unwary investigator. Strictly speaking, the pebble end scraper is indeed a planoconvex scraper. It does not, however, have the fine dorsal and ventral retouching of the common Eskimo scraper. It is manufactured from either a cobble stone or a primary reduction flake with cortex still visible. Fourteen examples are Birnirk in age (Plates 28*a,d–g;* 43*f–h, k*) four, Early Thule (Plates 65*b,d*; 72*e*), and two are Late Thule (Plates 86*e*; 111*e*). Two are unmodified and 12 are resharpened. All of these specimens have cortex material on their dorsal surface. At the distal end we find pressure retouch for resharpening purposes. Twelve of these scrapers are made of chert from the Sik-sik-puk formation, while two are made of fine grain quartz.

These scrapers measure, from the distal to the proximal end, 6.4 to 2.1 cm with an average of 3.80 cm. In width the scrapers range from 5.4 to 2 cm. The average width is 3 cm.

Side Scrapers

Most side scrapers found at Walakpa were of the pebble side scraper variety. However, numerous side scrapers or cutting tools were found which were made from secondary flakes. There are flakes which do not have any cortex left on their dorsal surfaces from the original core. They also have edge retouch on one or more edges. In general shape they are usually rectangular in outline, but are occasionally triangular or irregular in shape. None of these occurred in the Birnirk collection, but they became more common in the later occupation levels. The occurrence of more pebble end and side scrapers in the Birnirk levels, as opposed to their increasing scarcity in later levels, does not imply an evolutionary scheme, but reflects the fact that the Birnirk culture in the Point Barrow areas confined most of its activity to the coast. As the natural chert sources on the coast consists only of relatively small pebbles, there was not an overproduction of large chert bifaces or secondary flakes. This is seen in the relative scarcity of flakes, or chert, tools in the Birnirk levels, as well as the fact that most scrapers and flake knives were made from small primary cortex flakes. As the population increased during later Thule times, we note two significant changes: expansion into the interior, and an increase in the amount of chert artifacts made from larger cores, which are quarried in the interior.

The Early Thule side scrapers are all basically the same (Plates 65*i*, 73*q*). They are triangular in outline, unifacially flaked and retouched along all three edges. The edge measurements of three examples are 4.5 by 2.9 by 3.6 cm, and 3.3 by 2.6 by 3.2 cm.

An additional chert artifact that would fit into the side scraper classification is a large secondary Sik-sik-puk flake spall, which is rectangular in outline (Plate 65*g*). All four edges have been retouched. It measures 4.2 by 2.6 cm.

A total of eleven side scrapers occurred in the Late Thule levels. Ten were made from Sik-sik-puk chert and one of a dark brown translucent chert. One triangular-shaped scraper has three edges; its edges measure 4.4, 4.2, and 3 cm.

The rest of the side scrapers found in the Late Thule tool kit do not appear in either Early Thule or Birnirk levels at Walakpa. These are long thin, blade flakes which are sharpened along the lateral edges (Plate 111*c,d*). None of these scrapers are complete so no measurements were made. The proximal end on one is resharpened in a concave manner to produce a spoke shave (Plate 99*h*).

The pebble side scraper is the most common side scraper found in the Birnirk levels. Eight were found, all made of Sik-sik-puk chert (Plates 28*b,c,h,i;* 43*e;* 52*f,g*). These scrapers range in size from 4.5 to 2.1 cm, measuring from the scraping plane to the back edge of the artifact. Two are multiple use tools. At the end of the scraping plane on one specimen there is a sharp point, which was probably used as a graver (Plate 52*g*). The second specimen has retouch along both edges and at the distal end. The distal end is concave and may have functioned as a spoke shave.

Three pebble side scrapers were found in the Early Thule levels. They ranged from 5 to 3.1 cm in length, with the scraper edges averaging 3.05 cm long (Plate 65*c,e,f*).

Three Late Thule pebble side scrapers were also found. One of these scrapers is secondarily flaked on two edges that terminate at rounded points (Plate 118*f*). The lengths of these scraper planes are 6.3 and 5.4 cm. The second specimen has only one scraping edge, which measures 4.6 cm (Plate 111*b*). The third Late Thule specimen is incomplete (Plate 111*f*).

Scraper Handles

Two scraper handles were found in the Birnirk levels. Both are made from wood. The larger specimen is 22.1 cm in length (Plate 52*b*). Its lenticular cross-section measures 4.6 by 1.3 cm at its maximum width. A small hole is drilled through the proximal end. The distal end is rounded and has a raised collar. Lashing scars run from the collar ridge 4.8 cm onto the handle. The side in which the scraper blade fits is carved out. This socket is 7.5 cm long. The back of the socket is rounded to fit the back end of the scraper. This handle would fit a large scraper such as the one depicted in Plate 65*b*.

The smaller handle is of the same type but considerably shorter. It is 8.8 cm long and 5.6 cm wide. The proximal end is wider than the distal end. Here again there is a raised collar with lashing scars extending back 3.5 cm. The scraper socket is 3.2 cm long and has a rounded end.

Split Pebble Scrapers

Four very interesting Tci Tho-like scrapers were recovered from the Birnirk levels (Plates 29*c*, 45*e-g*). These are quartz pebbles that have been split in half and flaked along the edges of the broken surface. Grinding occurs on the broken face and on the cortex of the pebble. This grinding could either be from wear or purposefully done. The surfaces of the ground edges have a high gloss, satin polish. I believe that these artifacts were used like the Tci Tho scraper for breaking down the fibrous structure of animal hides.

The flat faces of these scrapers range in measurement from 9.3 by 7.8 cm to 6.8 by 4.6 cm. In height, with the flat surface as a base, they range from 7.5 to 2.5 cm.

One example of these artifacts is either a multiple-use tool or is made from a broken hammerstone (Plate 45*g*). The top and one side of the artifact is scarred from being used as a hammer for crushing hard substances.

Two-handed Scrapers

The two-handed scraper is an interesting artifact. Murdoch's (1892:299) supposition, which has not been questioned by subsequent investigators, is that bone beamers made from caribou metapodials were used for cleaning subcutaneous tissue from skins. Murdoch thought that they were an obsolete tool, as he never observed any in use during his stay in Point Barrow. His opinion has been discussed by Ford (1959:194), Larsen and Rainey (1948:22–25), and Giddings (1952:77–78).

Ford has evidence that it occurs quite commonly during the Birnirk period and is rare in later times. This would support Murdoch's opinion. At Walakpa it was again found quite commonly in the Birnirk levels, but was rare in later periods. I question Murdoch's assertion that their function was for cleaning subcutaneous tissue from skins. We found that when two-handed scrapers were examined in the activity specific context, they generally occurred with large mats of caribou hair. I therefore propose that these tools were for the removal of hair from hides, rather than for cleaning tissues.

The two-handed scraper is manufactured by cutting a horizontal groove down the ventral surface of the metapodial; then the lateral edges are cut and ground to fine edges. The condylar ends were normally left intact to serve as handles. Twelve Birnirk specimens were recovered (Plates 31*a-f*, 54*c*). The range of lengths of the Walakpa specimens are 19.6–24 cm, while the lengths of the working edges measure from 12.7 to 18 cm.

An extremely small Early Thule scraper was made from a loon or goose humerus. It is manufactured just as those described above. It measures 17.4 cm in length and 2 cm in width.

Scapula Scrapers

The caribou scapula scraper is by far the most consistent bone scraper. Eleven examples were found at Walakpa. Three were Birnirk (Plates 30*d*, 54*b*), two were Early Thule (Plate 79*h*) and six were Late Thule in age (Plates 111*j*, *k*, 119*k*). These scrapers are scapulae with the epiphyses broken away. One or both edges are sharpened and used for scraping planes. The edges are either resharpened or worn down from use until only the center keel remains.

Miscellaneous Metapodial Scrapers

The second most common bone scrapers are made from broken caribou metapodials or worn out two-handed scrapers. They occur in several forms with different portions being used for the scraper plan.

Six were found in the Birnirk occupations. Three

are metapodials that are split down the middle and one or the other end broken away (Plate 30*b, e*). The broken ends are sharpened for use. The other two have distal ends broken and are sharpened to a point at the break (Plates 30*a*, 46*d*). The last specimen is a distal end with a short section of the shank remaining (Plate 46*f*). The shank has been cut transversely, coming to a rounded point. The rounded point is polished from use.

Two examples from Early Thule occupations are of a variety that have been split down the center of the shank. One comes to a round point while the other has a rounded edge with a larger scraping plane (Plate 71*a, b*).

Humerus Scraper

A caribou humerus was found in the Birnirk occupation that had its proximal end removed (Plate 54*a*). The proximal end of the shank was broken to produce a scalloped edge, and the surfaces of the edge are worn and polished from use. This could have been a tool similar to the gun barrel scrapers used by the historic Eskimos in the Point Barrow area. These tools are used to clean tissue from skins and to break down hide fiber.

Miscellaneous Bone Scrapers

Bone scrapers, fish scalers, and bark peelers are the catch-all classification for unidentified worked bones. These artifacts are generally broken, long bone shanks, used as a tool (Plates 30*c*, 46*a, g, j*, 66*b*, 86*h*, 105*e, g*, 111*g, i*, 113*i*). Murdoch and others have observed these bone artifacts used in a certain way; hence these functions are the basis of the identification. It appears that such classifications as fish scalers and bark peelers should be dropped, and the simple classification of bone scraper used instead. Over 50 miscellaneous bone fragments were recovered at Walakpa, which have various edges or points that show usage. It is conjectured that these bones were used whenever the circumstance required. The functions could be fish scaling (although little evidence for fishing was found at Walakpa), bark peeling, fleshing, or dehairing hides.

Hide Pegs

Hide pegs, or short thin wooden pointed stakes, were quite numerous in all levels (Plates 76*j*, 80*j, k*). The hide peg is still in use by Eskimos in the Point Barrow area. While excavations were in the process, an Eskimo hunter came to the excavation area to retrieve a bundle of 36 stakes that were cached in a small hole. Later in the summer these same pegs were used for stretching hides over a grassy hillside.

These pegs vary in length from 23 to 12.5 cm, and average about 16 cm in width. A unique Early Thule bundle consists of eight small slender pegs (Plate 78*d-k*). The lengths range from 17.6 to 12.5 cm. In width they average 0.7 cm.

Ladles and Spoons

Only four spoons were found in the Walakpa excavation, all Birnirk in age. Two of these are wooden and two are made from bird sternums.

One wooden spoon is very badly eroded and does not lend itself to extensive analysis. It is broken in half and the handle is also broken. It appears to have been long in comparison to the other example and the fragment measures in excess of 18 cm. It is markedly curved and concave in outline, with a deep bowl. The other wooden example is rectangular in shape and flares at one end (Plate 34*a*). It has a shallow bowl. Two rectangular holes are drilled in the tang for hafting the handle to the spoon. The edges of the bowl are ground to a rounded edge. In total length the spoon measures 10.4 cm, and 6.5 cm in maximum width. The bowl is 1.5 cm deep.

Two bird sternum spoons were also found (Plate 34*b*). One is made from an eider duck and the other from a Canadian goose. These artifacts are manufactured by grinding the pectoral keel from the sternum. The rear portions of the sternum are broken, leaving only the central tang. There is no evidence that these were hafted.

Another fragment, which could possibly be part of a spoon or a wooden bowl, was found in a Late Thule level. However, there is not enough of the artifact left for analysis.

A wooden spoon-like artifact also occurred in the Birnirk collection (Plate 34*c*). Although this is not a spoon and does not have a bowl, it may have been used as a stirring instrument. The handle is broken but the tool measures over 19.7 cm in length. The diameter of the handle is 1.2 cm. The blade is flat with rounded edges. The distal end is slightly elongated and comes to a blunt point. The blade is 7.9 cm long, 4.5 cm wide, and 1.8 cm thick.

Marrow Extractors

Marrow extractors have been reported by Birket-Smith (1945:198) and Stefansson (1914:102) from

the Eastern Arctic. Ford did not recover any of these from the Point Barrow area.

Nine possible marrow extractors were found in the Late Thule levels. Seven are made of caribou ribs, while the remaining two are made from ivory.

One example of a marrow extractor is a short ivory artifact measuring 5.8 cm in length (Plate 85*k*). The handle portion has three gracefully carved scallops on both edges. The base is concave with a suspension hole drilled just below the concavity. The tip is flat with a semicircular edge.

The second ivory specimen (Plate 105*e*) may not be a marrow extractor, but the semicircular edge is worn almost identically to the specimen described above. The tool is carved round while the blade is flattened and terminates with the blunt semicircular edge. It measures 12.5 cm in length.

Seven caribou ribs are possible marrow extractors (Plates 83*f*, 91*d*, *e*, 106*a*, *b*), but they could possibly be meat forks or scrapers of some type (Ford 1959: 207). However, the rib is broken and the tip is cut to a flat semicircular blunt edge. This is in contrast to the sharp pointed ends described by Ford. The tips of these ribs, as well as a short portion of the rib sides, have a high gloss polish. Three specimens have the proximal end broken from the ribs. These ribs range from 32.8 to 16 cm in length.

Wooden Trays

Wooden trays used for serving food were apparently common during the Late Thule period (Murdoch, 1892:89). Ford (1959:198) did not recover any specimens of this type from his earlier sites. Only one example of a wooden tray was found at Walakpa (Plate 32). This specimen was from the Birnirk period. This artifact is an oblong tray with low edges. One end is slightly pointed and tang-shaped. The other is wider and round. The tang end is slightly elevated from the bowl of the tray. The length of the tray is 40.1 cm and its width is in excess of 20 cm. The bowl is 1.3 cm deep. One end is cracked and repaired by split willow lashing. The tray was apparently roughed out by an adz and then carved into its final shape.

Pottery Lamps and Cooking Vessels

Unlike other artifacts found at Walakpa, pottery was not well preserved. Only 227 potsherds were found and 211 of these were of Late Thule age. No vessel bottoms were recovered in any level and very few rim sherds were found. In general it appears that two types of vessel were found, the nearly vertical-sided pot and lamp fragments. Most sherds were covered with thick layers of soot and grease. All vessels have been tempered with coarse gravel and organic matter such as hair, feathers, and grass. Only two styles of surface treatment were observed, Barrow curvilinear and Barrow plain. Both surface types occurred in all levels, and it does not seem that the Barrow curvilinear type is indicative of culture age at the Walakpa site.

Nine Birnirk sherds have an average thickness of 1.5 cm and a range of 2.6–1.2 cm. The Early Thule examples average 1.5 cm in thickness with a range of 2–1 cm (Plate 76*d*). The Late Thule sherds averaged 1.4 cm in thickness with a range of 2.7–0.8 cm (Plates 92*c*, *j*, 99*i*).

Twenty-seven rim sherds were analyzed for rim shape. Many rim sherds could not be analyzed, as surfaces had either crumbled away or were completely obscured by dried and burned oil. Three types of rims were observed. The most common were those with completely convexed rims and no lip. All the pottery lamp discs have this same type of rim.

Two rim sherds of Late Thule age have convex rims with interior lips. Other Late Thule sherds and one of Early Thule age have rounded to flat rims with exterior lips.

The last rim type observed has a flat rim with a sharp exterior lip directly below, which the vessel body begins to expand. This sherd is one of the thinnest, measuring 0.8 cm and appeared to be more well made than the other specimen.

Baleen Buckets

Buckets with wooden bottoms and baleen sides are found in many Eskimo sites. Murdoch recovered several buckets that had both wooden bottoms and sides. He felt that the wooden sides replaced baleen, after baleen acquired commercial value (Murdoch, 1892:86–88).

Wooden Bucket Bottoms

Wooden bucket bottoms were relatively rare in the Walakpa collections. Fifteen wooden bottoms were found; twelve were Birnirk, one Early Thule, and two Late Thule in age.

The Birnirk bucket bottoms were carved from split shakes of spruce driftwood (Plates 33*a-e*, 47*g*). They are typically oval in outline and flat in cross-section. The grain of the wood runs parallel to the long axis of the bottom. Many specimens have a deposit of

organic matter on one face. The organic matter often has circular and parallel scratches, which are apparently evidence of attempts to clean the vessels.

Two unique Birnirk specimens were found. One which approaches a rectangular outline measures 16.2 by 11.5 cm, with a thickness of 1.2 cm. This specimen is split along its long axis in several places. It is mended by placing two small wooden braces across the breaks. The braces are attached to the bottom by baleen lacing, passing through holes drilled on both sides of each end of the brace.

The second bottom measures 25 by 23 cm, with a width of 1 cm. On one side two pairs of holes are partially drilled into the disk. The two holes are 11.3 cm apart. The holes measure 8.6 and 3.9 cm from their nearest respective ends. On the observe side there are two other partially drilled holes arranged in a parallel axis to the bottom. These holes are 6 cm apart and measure 9.7 cm from their closest ends. It is thought that the two pairs of holes may be sockets for legs, but no function is offered for the two single holes.

As a group these bucket bottoms range in size from 12 by 15.5 cm to 20 by 28 cm, and 1.7–1.5 cm in thickness.

The single Early Thule specimen is quite small and circular (Plate 72*c*). It measures 8 cm in diameter, with a thickness of 0.7 cm. The bottom has no unusual features and is, in outline and shape, the same as the Birnirk examples.

Only two bucket bottoms were found in the Late Thule occupations (Plate 114*b*). One specimen is an ordinary bottom, which measures 16.7 by 11.4 cm and has a thickness of 0.5 cm. The other specimen is split down the middle but measures 10.8 cm long and 0.4 cm thick. This bottom has a series of holes drilled along the outside circumference. These were probably used to lash the bucket side to the bottom.

Complete Baleen Buckets

Three complete buckets were found, all Birnirk in age. The largest bucket has a bottom which measures 25 by 15 cm (Plate 55). The walls are made of three baleen strips which have a total height of 19.5 cm. The inside surface of the bottom strip appears to be grooved for the attachment of the bottom. The strips are fastened together by two sets of lacing on opposite sides of the bucket. The baleen strips overlap each other and the ends of each strip are overlapped too. Holes for handle attachments are drilled at the top of the bucket on two sides.

Two smaller buckets have bottoms that average 12.7 by 9 cm in diameter (Plate 47*h*). The baleen sides consist of a single baleen strip averaging 4 cm in height. Another thin strip is sewn at the bottom of the wall strip. The smaller strip provides the seat upon which the wooden bottom rests. Both strips overlap at the ends and have two laces on the sides of the walls. No suspension holes were drilled in these specimens.

Bone Crushers

A bone crusher is a stone or bone maul attached to a short handle. These tools were used to break large bones, both to obtain the marrow and to facilitate the drying out of fat for making pemmican (Murdoch, 1892:93). It is also possible that they were used to crush bone when making bone grease.

Only one specimen of a stone bone crusher was found at Walakpa. This specimen occurred in a Late Thule level (Plate 96*i*). It is roughly round to oblong in shape. Both ends are chipped and battered to give rough, flattened surfaces. Near the center on both edges a slight groove has been pecked, one for the handle and the other for lashing. It measures 12.3 cm long and 7.8 cm wide.

Two other possible bone crushers are not of the handled variety. The first is Early Thule in age (Plate 67*d*). This is a long, oval slate nodule. It is 18.9 cm long and 5.7 by 3.7 cm in diameter. The rough edges of the ends are ground flat. The use scars are located on the flat surfaces of the diameter at both ends.

A second bone crusher is of Late Thule age (Plate 114*i*). It is the distal end of whale rib. The end is carved round, and use-scars are evident on this end. It measures 30.4 cm in length and 5.4 cm at its maximum diameter.

Awls and Bodkins

Bone awls and bodkins were used to make holes in soft material such as wood or skins. These were used both in a twisting and pushing fashion. Usually they consist of a bone bit, which is usually a slender pointed bone fragment attached to a handle. Some specimens consist of a single large pointed bone making up both the handle and the sharpened point. As the bone awls are found over the entire Eskimo area and are made from many kinds of bone splinters, Ford (1959:211) felt that they have little diagnostic value. Several types of awls are found in the various levels at Walakpa. The most obvious difference is in the presence or absence of a handle.

In the Birnirk levels, eight awls were found. Two were sharpened bone splinters with handles, and six

were probably used without handles. Neither Murdoch nor Ford illustrates or describes any similar ones.

The first specimen consists of the awl point, a wooden handle, and baleen lashing (Plate 37*u*). The awl point was made from a section of bone 1 cm long and 0.1 cm wide. The distal end had been sharpened and then rounded smooth from usage. The total length of the tool is 12.2 cm. The baleen wrapping is made from a single strand, which is 0.04 cm wide. The binding runs from directly below the end of the handle to 2 cm from the end of the shank.

The other specimen found in the same activity area is manufactured differently (Plate 37*v*). This long slender tool has a total length of 11 cm and is 3.3 cm wide. The bone bit extends below the shank for a distance of 1.6 cm. It is made from an unidentifiable bone fragment and is ground to a sharp point. The cutting edge of the bit has a flat surface cut back away from the bone at a 33⅓° angle. This tool was used for piercing by direct force rather than by a rotation action, which would indicate that it is a bodkin rather than an awl.

The bone bit was hafted by placing it between two small sections of wood. No measurements are available as they are completely wrapped. The wrapping is made from split willow fibers and can be divided into two functionally different sections. The first is the binding section. Here the function is to bind the two wooden sections and the bone bit into one complete unit. This is accomplished by numerous wrappings around the end of the tool. Then a few wider spaced wraps appear to be placed further up the handle. Over this wrapping the second functional wrapping occurs. This is a mat of split fibers all held together around the wooden shank. Then the bone bit is wrapped again to hold it into place.

Twenty-one single-piece awls were recovered. They measure from 14.1 to 8.4 cm in length. Eleven are Birnirk (Plates 6*l, n,* 11*a-c,* 25*b-g,* 37*x*). Six Early Thule (Plates 66*a, c, d,* 72*b,* 74*a, b*) and five Late Thule (Plates 83*d,* 92*e,* 113*a, c, d*) in age. They are made from split or broken fragments of seal, caribou, and bird long-bone shank fragments, which occasionally have a proximal or distal end attached for a handle. The tips of the awls are sharpened points of the shanks. The tips of several Birnirk specimens are beveled on two sides, producing a short, flat edge.

A unique Birnirk awl-like tool is a V-shaped piece of ivory (Plate 37*bb*). It is scalloped along all three edges. Between the points of the scallops, the edges are fluted. These scallops and flutes may have provided excellent finger holds, especially if the user wore mittens. This tool may be the one Geist and Rainey (1936:103) thought was used for cleaning ice and snow from clogged implements. The tip is relatively sharp and is offset to one side. It measures 19.5 cm long by 0.9 cm thick.

Gauged Drills

This artifact is termed the gauged drill because the sharpened end is presumably made to a gauged thickness to allow a hole to be manufactured at a predetermined size (Giddings, 1964:145). As mentioned above, Geist and Rainey (1936:103) thought they were used for cleaning clogged implements. Robert McGhee (pers. comm.) feels that in the Canadian Arctic, these tools may have functioned as foreshafts.

Twenty-two gauged drills were found, five are Birnirk (Plates 6*m,* 46*h, i*), eight Early Thule (Plates 71*d-g,* 74*c-f,* 79*d*), and nine Late Thule in age (Plates 83*a, b,* 99*a,* 113*b, e, f,* 117*a-c*). These artifacts range in measurement from 11.5 to 4.6 cm in length. They are round in cross-section with little modification of the bone, except for sharpening of the point. A few have been sharpened in such a way as to produce a slight shoulder between the bone shank and the tip. In most cases the tips are badly broken. In those cases where they are not, wear is present all around the diameter of the point. Whether this resulted from use or manufacture could not be determined. One Birnirk example has been resharpened and comes to a short point, which is offset to one side of the tool. Several have the same type of beveled edge as described above. Where measurements were available, the tips range from 1.2 to 0.4 cm in length. I believe that these tools are drills and the gauged length is incidental to both wear and resharpening.

Stone Drill Bits

Six stone drill bits were found at Walakpa. These were bits that were hafted to wooden handles and used to drill hard materials such as ivory, bone, antler, or wood. One was Birnirk, three Early Thule and two Late Thule in age.

The single Birnirk specimen is broken (Plate 37*y*). It appears to have been made from a broken knife blade or projectile point. It is shouldered with a square tang. The tang measures 1.8 cm long and 2.2 cm wide. Below the tang the blade is widened. This section of the tool measures 2 cm long and 2.7 cm wide. The broken tip measures 1.8 cm wide. The surfaces of the tip are slightly worn from use.

The three Early Thule examples have drill bases,

which were hafted to a handle (Plate 61*g*). In width the bases of the three examples range from 2.3 to 1.2 cm. The two complete examples measure 4.8 and 3.2 cm in length; their tips are 1 and 0.7 cm wide, respectively; and they are 2.2 and 1.4 cm in length.

The Late Thule specimens are different from the earlier examples (Plate 113*g, h*). These do not have the expanded bases. They are simply long, narrow points. They measure 4 and 3.5 cm in length. At their widest portion they are 1 and 0.9 cm wide, respectively.

Awl Handles

Other than the two-hafted awl handles described above (p. 59), two wooden handles were found.

The first, of Birnirk age, is round in cross-section (Plate 25*a*). It measures 16.9 cm in length and 1.8 cm in diameter. The hafted end is carved smaller than the rest of the handle. It has a slight shoulder. A wide groove is carved out on one side of this end. The groove is 4.1 cm long, 1.2 cm wide, and 0.8 cm deep. The shape and size of this groove would fit perfectly to the shank of a gauged drill. There are lashing scars around the outside surface of this end of the tool.

The second awl handle is of Late Thule age (Plate 100*b*). It measures 12.2 cm in length and 1.8 cm in maximum diameter. At the distal end the handle is cut to a tapering point. The end has a raised collar. On one side a rectangular notch is cut for a bit. The central portion of the artifact is wider than either end. On one side of the widest point, there is a small round hole. On the opposite side of the hole, there is a long, wide, concave groove, which is probably a finger rest. At the proximal end three sides are cut flat and taper to a rounded point. On the side where the finger rest is carved there is a slight indented shoulder. The proximal point is offset from the shoulder, which produces a tang that would rest between the thumb and the forefinger. This gives additional leverage while using the awl.

Bone Needles

Two bone needles were found in the Birnirk occupations. Both specimens are broken. One has a small drilled hole at the proximal end for threading. It is round in cross-section, measuring 0.7 cm in diameter. The second specimen is a distal end. It has a long, curved shank with a sharp point. It is 0.6 cm in diameter.

Table 4 is a summary of all of the manufacturing, maintenance, and processing equipment found in the various levels at Walakpa.

COMMUNITY ACTIVITY ARTIFACTS AND EQUIPMENT

Perforated Teeth

Canine teeth of bear, wolf, dog, and seal, along with walrus molars, were perforated or grooved at the proximal end for suspension. It is thought that these teeth were used for decoration. Fourteen examples of these teeth were found.

No examples of perforated bear teeth were found in the Birnirk levels. However, one drilled walrus molar was found (Plate 9*e*). This tooth was drilled near the distal end. Four examples of pinniped incisors were also recovered. The teeth have all been grooved around the proximal end.

Three large bear teeth were found in the Early Thule levels. Two (Plates 64*k*, 75*k*) have been drilled, while one (Plate 78*c*) is grooved around the lower portion of the proximal end. One grooved pinniped tooth has also been grooved for suspension (Plate 73*l*).

In the Late Thule level, two perforated bear teeth were found (Plate 112*e*). Two dog or wolf canine teeth were also found in the Late Thule occupation (Plate 117*e, f*).

Beads

Three beads were recovered. One from each cultural horizon. The Birnirk bead fits more in the category of a ball pendant as reported by Giddings (1964:77) from Nukleet. This is an ivory ball, which measures 1.2 cm in diameter. The top of the bead has a perforation in an elevated loop. There is a diamond shape incised on the front of the bead (Plate 37*aa*).

The Early Thule bead is tubular in form with a triangular cross-section (Plate 73*m*). It measures 2.6 cm in length. The width is 1.1 cm. This ivory specimen has three sides with both ends cut flat.

An amber bead is from the Late Thule period (Plate 92*b*). The amber is lenticular in shape, but seems to be unformed. A hole is drilled in the small

TABLE 4.—*Manufacture, maintenance, and processing equipment by occupation level of each culture phase, Walakpa site*

Mound Occupation Level	Knives & Knife Blades						Firemaking Equipment			Adzes			Whale Rib Mattocks			Wedges		Ulu		Scrapers									Hide Pegs	Ladles & Spoons	Marrow Extractors	Wooden Trays	Pottery Lamps & Cooking Vessels	Baleen Buckets	Bone Crushers	Drills & Awls				Whetstones	Totals by Occupation Level
	Crooked Knives	Composite Knives	Knife Blades	Knife Handles	Flaker Points	Gravers	Bow Drills & Sockets	Fire Platforms	Fire Drill Spindles	Adz Handles	Adz Blades	Sleeve	Whale Rib Ice Picks	Whale Rib Mattock Heads	Whale Rib Mattock or Pick Handle	Large Wedges	Small Wedges	Ulu Handles	Ulu Blades	Pebble End Scrapers	Planoconvex End Scrapers	Side Scrapers	Split Pebble Scrapers	Scraper Handles	Two-Handed Scrapers	Bone Scrapers								Gauged Drills	Stone Drills	Bone Drills or Awls	Awl Handles		
A-1	-				-												1	1		1							-		1								1	3
A-2	-		2				-										1	1			2				2		-		1					1		1	1	12
A-3	-		2	1			-														1						-				1					-	1	7
A-4	-		-	3						1											1						-		1				-				1	7
A-5	-			3					1				1								1		1				4		1				-			-		13
A-6	-	-		1															2	1	1	3				2	-				1	1	1		2	1	-		16
A-7	-		2	2				-		1												1				3					1							10
B-1	-	-			-		1											1																				2
B-2	-																									2					2							2
B-3	-		1	1																														1				3
B-4	-	-		3															1																			4
B-5	-	-	4																1			1												1		2			9
B-6	2		2		1					1							-					1										1				-	-		8
B-7	-		3							1	2						1			4		3				3							1				1	-		19
B-8			2	1		1					1	1							1	2		2		2	1							1	-	1				1	17
B-9		3	-			1					2			1	1	2	2	2	4	4		2	3			5						2			1	4	2	2	43
B-10		1		1	1		2						1	2				3	4	5	1	4	1		6	4		4		1	3	1				6	1	3	55
e Thule Trench					-	1		1			-			-			1		-			1												2		2		1	9
y Thule Trench	-		3			1				-											1	2													2	1			10
nirk Trench			4	1	1	2					1						2		1	3					5	2										3			25
als	2	4	25	17	3	6	3	1	1	4	6	1	2	3	1	2	7	7	14	20	4	25	5	2	12	21	4	4	4	1	8	6	3	5	6	22	3	10	274

end. It measures 4.1 cm in length. The closest source of amber is found at Wainwright.

Labrets

Only one labret was found in the Walakpa excavations. This is an ivory specimen from an Early Thule level (Plate 59g). This labret is of the disk-shaped variety. It has a thin, flat platform, which measures 1.1 cm in diameter and 0.7 cm in width. A round shaft, 1.2 cm long, extends from the platform.

Drums

Only one fragment of a tambourine drum was recovered at Walakpa (Plate 35). This fragment is part of a drum rim from a Birnirk level. It is too short

a specimen to give any indication of the drum diameter. There is no indication of handle attachment. The rim measures 3.5 cm wide and is 0.8 cm thick. A deep groove for binding the drum head occurs on the outside of the rim. The groove is 0.7 cm wide and 0.3 cm deep.

Toys

Toys are an interesting archeological manifestation in Eskimo sites. Most toys described in the literature are miniatures of adult equipment, animal carvings, dolls, etc. Murdoch (1892:378–379) describes tops, bull-roarers, whirligigs, buzz toys, and pebble snappers

Cup and Pin Game

Few examples of artifacts that can unquestionably be attributed to the toy category were found at Walakpa. Among these are three seal humeri, which may be representative of the Ajagag game (Ford, 1959:227).

Two of these humeri are of Birnirk age (Plates 11*i*, 36*g*). One is from an ugruk, the others from small seals. Both have been tied near the center of the bone shank by baleen. The small specimen has a short baleen string with a loop near the end for the attachment of the pin.

A third specimen of the cup and pin game is from an Early Thule level (Plate 69*d*). This humerus is from a small seal. It, too, has baleen tied near the center of the bone shank.

Inserted Seal Vertebrae

An example of a seal vertebrae, which has three seal ribs inserted through the foramen, was recovered in a Late Thule level (Plate 82*f*). Another example was observed in a Birnirk level; however, the artifact was destroyed and I can only attest to its presence in the Birnirk period.

It is thought that these vertebrae make up a game such as pulling the wishbone (Ford, 1959:229). However, an Eskimo informant interviewed at Barrow indicated that this game may have been similar to pick-up sticks. He was not aware of whether or not the direction or pattern in which the ribs fell would be indicative of a good hunting direction such as in scapulamancy. Murdoch does not make any reference to this type of artifact.

Dolls

Three dolls or human figures were found. In the Birnirk phase a grass and baleen doll was recovered (Plate 36*e*). The doll is 17.1 cm in height. It consists of hair, grass, and baleen, wrapped with baleen to the approximate human shape. The arms are outstretched and the legs are spread out in a V-shape. The head is damaged and no facial features are present. The doll is completely soaked with oil.

A possible doll from an Early Thule level was recovered (Plate 61*a*). It is not possible to tell if this artifact was a doll or an effigy of some kind. A human head is carved at the end of a long slender tapering rod. Although the rod is broken, it would have measured in excess of 26 cm, with a maximum diameter of 1.5 cm and a minimum diameter of 0.8 cm. Below the head a notch is cut into the rod, possibly for the attachment of arms. The head is 2.4 cm high and 1.3 cm wide. The eyes and mouth are carved out leaving the nose in relief. There was no provision made for ears.

This doll resembles one illustrated by Murdoch (1892:409), which has a soapstone head attached to a shaft, with a cross-member, resembling a crucifix. Murdoch was convinced that this was an invention of a local Eskimo, possibly based on a crucifix that he may have seen at one time or another. He further stated that other Eskimos, on viewing this doll, would only laugh. Thus, he felt that it was not part of the native artifact assemblage. With its occurrence in a prehistoric level at Walakpa, this does not seem to be the case. I would suggest that these artifacts are more properly assigned to the category of religious paraphernalia, possibly a shaman's rod.

The last human figure to be described is that of a crudely carved wooden doll from a Late Thule level. This small doll stands 5.8 cm high. The outstretched arms are short and stubby, as are the legs. There are no apparent sexual features.

Toy Kayaks

One example of a wooden kayak model was recovered from the Early Thule occupation (Plate 69*e*). It is thought that this is a kayak model rather than a drill bearing, as the opening on the deck is rectangular rather than a drilled hole. At one time, this slot probably contained a figure of a human being. The hull has a definite keel and gunnel ridges. The total length of the boat is 12.2 cm. Its maximum width is 2.8 cm and its depth is 1.4 cm. Both the bow and the stern are pointed, but the bow is slightly raised above the deck level.

Gaming Pieces

Cut bone and antler squares were found in all periods at the Walakpa site (Plates 12*g–j*, 105*h*). Larsen and Rainey (1948:57) contended that these were used as swivel pins. Gidings (1964:78) and others (e.g., Hall, 1971:44) have thought that they were gaming pieces. I suggest that they are probably button blanks, because an example from an historic level at Walakpa has two rectangular slots cut into the center. However, if this is true, it is perplexing that more finished specimens do not occur in other levels.

At Walakpa there are two varieties, those that are square or rectangular and those that are concave on all four sides. The square variety range from 3.8 by 3.7 cm to 2.9 by 2.9 cm in width, while the concave variety range from 3 by 3 cm to 3 by 2.8 cm across the diagonals.

Toy Bows

Six specimens of toy bows were recovered in the Birnirk levels. All these bows are of the "Arctic type" or the self-bow (Murdoch, 1884:316; Hamilton, 1970:43). These bows are all too small to function as adult bows or drill bows. For this reason they are considered to be toys.

The first specimen has an elliptical cross-section but is flatter on the back than on the underside (Plate 48*d*). It is narrow but thick at the handle, with the end being recurved. It measures 46 cm long and 1.4 cm wide. There is no evidence of a sinew backing. There is still baleen wrapping attached on one end below the nock.

Another specimen is much smaller (Plate 36*d*). It measures 17 by 1.1 cm. It is manufactured from a single piece of wood. The handle portion is carved small with wide wings. There is no evidence to indicate whether or not it was a reflex bow.

A crude wooden self-bow was also recovered. This bow measures 29 cm in length. No special feature has been carved for a handle. The nock ends are both manufactured differently. One end has notches cut in either side, just below the bow tip. On the other end, cuts are made into either side, and the upper portions are cut away leaving a short tang for bowstring attachment.

A broken example of a self-bow was also found (Plate 48*a*). This fragment consists of a carved handle and two small sections of the wings. This would have been an extremely small example. The handle measures 6.6 cm in length, with a maximum width of 0.8 cm.

A small baleen bow, also of Birnirk age, would fit the self-bow category (Plate 57*b*). It is 32 cm long. No handle has been carved. The nocks are made by notching both ends.

Five fragments of small bows came from the Thule levels. Three are Early Thule (Plates 58*i*, 59*o*, 68*i*) and two (Plates 105*k*, 112*c*) are Late Thule in age. Three are made from wood and two from baleen. The small bows are broken in the same manner as those described above. The nocks are also manufactured in the same manner. The range in widths is from 1.5 to 1.2 cm (Plates 58*i*, 59*o*, 68*i*, 105*k*, 112*c*).

An Early Thule baleen specimen is identical to the bows described above. It measures 1.7 cm at its maximum width. The other baleen bow is part of a composite bow. This is the nock end; it measures 4.5 cm in length. The nock was manufactured by cutting notches into the side and rounding the nock. The wing portion has a large wedge cut to articulate with the next piece of the bow.

Charms and Amulets

Most Eskimo archeological sites have yielded a number of carvings of animals. These carvings functioned as toys, decorational motifs, or religious items.

The finest effigy that was recovered at Walakpa was that of an ivory polar bear (Plate 60*a–f*). This carving was found in an Early Thule level. As the legs of the bear are carved so that the front feet meet and the back legs are grooved, it is thought that the carving is part of a composite tool.

The bear measures 5.1 cm in length, with a maximum width of 1.4 cm. The carving stands 2.9 cm high. The bear has three incised lines running from the head around the sides and back to the tail. They appear to be similar to a harness. The lines are connected by short 0.2 cm lines, two pairs near the back and front quarter of the animal body. At the center of the body, holes are drilled between the lines. These holes are inset with fossil ivory. On each side of the holes there are two more short lines connecting the main lines. Below the main lines and the inset holes are two short lines, which are bifurcated at the ends.

The eyes and anus are also inset with fossil ivory. Another hole is drilled near the center of the back. These holes have also been filled with fossil ivory. The ears are carved in relief as is the snout. The ivory chosen for the carving has a dark spot, which was positioned at the snout tip to give it a realistic color.

TABLE 5.—*Community activity artifacts and equipment by occupation level of each culture phase, Walakpa site*

Culture Phase	Mound Occupation Level	Perforated & Notched Teeth	Beads	Labrets	Toys: Cup & Pin Games	Toys: Inserted Seal Vertebrae	Toys: Dolls	Toys: Toy Kayaks	Toys: Gaming Pieces	Toys: Toy Bows	Charms & Amulets	Bear Jaw	Totals by Occupation Level
Late Thule	A-1	1			-	-	-	-	-	-			1
	A-2		1		-	-	-	-	-	-			1
	A-3			1	-	-	-	-	-	-			1
	A-4				-	-	-	-	-	-			0
	A-5				-	-	-	-	-	-	5		5
	A-6	1			-	-	-	-	-	-	1		2
	A-7	2			-	-	-	-	-	-			2
	B-1				-	-	-	-	-	-			0
Early Thule	B-2				-	-	-	-	-	-			0
	B-3	1			-	-	-	-	-	-			1
	B-4	1			-	-	-	-	-	-			1
	B-5	1	1		-	-	-	-	-	-			2
	B-6				-	-	-	1	-	1			2
	B-7	1			-	-	-	-	-	-			1
Birnirk	B-8				-	-	-	-	-	-		1	1
	B-9				-	-	-	-	-	2	1		3
	B-10				1	-	1	-	-	1			3
Late Thule Test Trench					-	1	1	-	-	-			2
Early Thule Test Trench				1	-	-	1	-	-	-	1		3
Birnirk Test Trench		5			1	-	-	-	4	-			10
Totals		13	2	2	2	1	3	1	4	4	8	1	41

Two effigies, one from the Early and one from Late Thule occupation, are carved whales (Plates 69*g*, 82*g*). The carvings are simply outlines and no features are apparent other than the flukes. The whales measure 21.2 and 4.5 cm in length, and 2.3 and 1.7 cm in maximum width, respectively.

The last effigy found at Walakpa is a grass caribou from a Late Thule level (Plate 107*a*). The body is made of grass wrapped by baleen strands. The legs are small twigs inserted into the body. The caribou does not have antlers. The length of the effigy is 6.3 cm and stands 4.4 cm high. The body is 1.1 cm in maximum width. Found with the caribou effigy were three small broken arrows (Plate 107*b–d*). Although comparatively larger, it is believed that they are associated with the caribou and possibly represent some form of sympathetic magic. The arrow shafts are all broken but measure in excess of 8.5 cm in length. In diameter they measure 0.4 cm. Fletching still remains on one specimen. The fletching consists of a small feather wrapped at both ends by a baleen string. The feather, which is split at the center but not at the end, is still attached to the arrowshaft.

Bear Jaws

An interesting small polar bear jaw is pictured in Plate 56. It is a lower mandible found in a Birnirk level. The jaw is unmodified. A baleen cord is tied around both of the ascending rami. The cord was probably used to hang the jaw on a wall or a post. Modern Eskimo use parts of skulls of various animals for charms and amulets (Murdoch, 1892:434, Spencer, 1959:282). This jaw may, in fact, be a Birnirk version of one of these charms and reflect a variation of the bear cult.

Table 5 is a summary of all of the community activity artifacts that were recovered in each level at Walakpa.

MISCELLANEOUS AND UNIDENTIFIED ARTIFACTS

Belt Toggles

At Walakpa three examples of belt toggles were found, all of Birnirk age. These are square, flat to pyramidal-shaped artifacts. The flat specimen is made of bone (Plate 11*h*). It measures 3.8 by 3.9 cm in width and 1.2 cm in thickness. One side is polished with the center being slightly elevated. Near the center on the opposite side, two rectangular holes have been cut at an oblique angle so that they intersect.

The other specimen, which is made from antler, measures 3.8 by 3.7 cm (Plate 11*g*). Its thickness is 1.7 cm. The front face has a high center with a

drilled hole, which is inset with an ivory plug. On the reverse side two oblique holes are drilled near the center.

The third Birnirk belt toggle looks like a quarter of a sphere with two flat sides. The rounded outer surface has a ridge at the center. One side is polished while the other side has the two obliquely cut, rectangular holes. This ivory specimen measures 3.6 cm in length, with a width of 1.1 cm.

Only one example of an Early Thule toggle was recovered. It is an incomplete bone specimen. In overall shape it is rectangular, with one end curved, on which there is a small slot, while at the other end a large hole. The toggle measures 2.6 cm in length, 1.2 cm in width, and 1.2 cm thick.

Ivory Chains

An extremely well-carved chain with three oblong interlocking links was found in the lowest Birnirk level (Plate 36*a*). Its maximum length is 8.7 cm, with the links being 4, 3.6, and 3.2 cm, respectively. It appears to be identical with those reported by Larsen and Rainey (1948, pl. 70:1–3) from the Ipiutak site. A single ivory link or circle was found. It is also Birnirk in age. This ivory artifact is nearly circular and measures 2.1 cm on its outside diameter (Plate 51*m*).

Unidentified Ivory Artifacts

Many ivory objects, which are probably parts of other artifacts or ornaments, were recovered at Walakpa. One of the most interesting is a thin piece of ivory with a small hole bored into its center (Plate 36*b*). At either end, and pointing in opposite directions, are two small projections, which are reminiscent of half of a whale's fluke. On both edges two sets of bifurcated appendages are carved. Its length is 4.15 cm and its maximum width is 0.98 cm, with the thickness being 0.52 cm. It appears to be a zoomorphic figure, such as two seals or whales, facing opposite directions.

Another interesting artifact is a thin strip of ivory which has been curved like a bracelet (Plate 36*c*). It has a series of wrapped baleen strands tied to either end. Near the apex of the curve, a slight nipple has been left on one edge with a shallow cut in its center. It is impossible to specify the function of this tool, but I feel that it is probably a saw similar to a hack saw. The baleen strings, acting along with a fine grit sand, would constitute the blade, and tension could be regulated by pressure applied to the ivory strip. To support this identification, a similar baleen string saw was found at the Utkiavik site. On the Utkiavik specimen the blade was broken in the process of cutting ivory, and it was left in its original position when it was discarded.

An interesting Late Thule artifact is a thin ivory cylinder measuring 4.4 cm in length (Plate 112*d*). Its maximum diameter is 0.8 cm. One end is ground to a point with two flat sides and a hole has been drilled, which goes through both sides. The opposite end is truncated with a slightly raised lip going completely around the circumference. The lip is slightly larger and pointed at one end. A socket has been drilled in the truncated surface. This could possibly be a toy harpoon socket piece.

An unidentified Late Thule artifact may be a thimble holder. It is a highly decorated piece of ivory. The edges have three scallops which terminate in a blunt point. A square hole is cut near the point. At the other end, a slot is cut up the center of the tool shank. Prongs to either side of the slot are broken. Incised lines run along all of the edges. Two short lines run from the tips of the scallops toward the center of the artifact. Five short lines are found around one side of the rectangular cut. Two designs, which suggest ownership, are located above the end slot. The tool is oval in outline and would have measured in excess of 7.8 cm. It is 1.4 cm at its widest point and 0.7 cm thick.

Another Late Thule ivory object could be a cup-shaped, fat scraper or a chin rest for a bow drill (Plate 103*a*). It is a thin, 0.3 cm, concavely carved artifact. It is 7.1 cm long and 4.7 cm wide. All edges are rounded and polished. A cut, which is keyhole in shape, is placed near the center of the artifact.

Miscellaneous Coal

A single Late Thule disk is made of fine-grained bituminous coal (Plate 85*o*). It may be a labret. It is quite thin, measuring 0.6 cm. The diameter is 3.2 cm. It is ground flat with holes drilled into the center from both sides, but not meeting.

Unidentified Bone Artifacts

Two unidentified Birnirk bone tools were found. One is a long, thin, highly polished tool (Plate 51*r*). It is 13.4 cm long, 1.3 cm wide, and 0.7 cm thick. The edges of the proximal end have two scallops. The distal end comes to a sharp, flat end.

Another bone artifact is a long, 18.3 cm, pointed peg (Plate 8*d*). It is 1.3 cm wide, 1.8 cm thick, and is

oval in cross-section. The proximal end is crushed and appears to have been beaten with a hammer. The distal end is pointed. A baleen string is tied around the center of the peg.

Unidentified Wooden Artifacts

Seventeen unidentified artifacts were found in the Birnirk levels. A short, wooden handle-like object was recovered (Plate 57*d*). It has a square end with a hole drilled through the center. Behind the square end the handle is round and comes to a blunt end. The tool measures 18.5 cm in length.

An object shaped like a propeller measures 11 cm in length and 1.1 cm at its maximum width (Plate 11*f*). It is lenticular in cross-section. It is carved from a piece of wood that contained a knot hole. The knot is at the center of the artifact and has been removed. To either side of the hole there are short, tapering, flat wings, which terminate in rounded ends.

A long, thin stick measuring more than 20.5 cm in length and 1.7 cm in diameter was recovered (Plate 57*e*). Two notches are carved on one edge, and one on each side of the pointed end.

Several unmodified wooden sticks and pieces of wood were found in the Birnirk levels (Plates 14*a,e,* 36*f*). These pieces of wood were tied together and undoubtedly made up part of a more complex tool.

Four unidentified Early Thule artifacts were made out of wood. The first is a split tool, which measures in excess of 12.7 cm in length, 4.5 cm in width, and 3.3 cm in thickness (Plate 79*b*). On one surface a large hole measuring 2.8 cm in diameter was drilled near the center. Two small holes are drilled to either side of the large hole. On one edge, two holes are drilled even with, and at a 90° angle to, the small holes on the artifact.

Another broken piece of wood is rectangular in cross-section (Plate 80*l*). It measures 2.1 cm in width and 0.8 cm thick. The end that is not broken is cut to a tip with a slight shoulder and has a hole drilled in it.

A large piece of wood has a truncated, oval shape. One end is beveled with a notch for adjoining to another artifact. Discoloration at this end of the artifact indicates that it has been lashed around the beveled portion. It measures 2.2 cm in width and 2 cm in thickness.

An interesting type of artifact of unknown use was found in both the Early and Late Thule levels (Plates 66*f*, 74*n*, 76*h*, 80*g*, 92*h*, 112*h*). These are small shafts that resemble arrowshafts. They have a nock end with V-shaped cuts. The opposite ends are expanded at the tip. It may be that they are small toy arrows. However, one has a cord tied around the center and the tip has been burned (Plate 66*f*). They may be small, bow-drill spindles, but if this is the case I cannot account for the nock ends. Also the string around the specimen depicted in Plate 66*f* is not set up for a bow-drill string. It is looped on one side and the unattached ends are both on the same side. These range in length from 18 to 11 cm and 0.6 to 0.3 cm at their maximum diameters.

Two wooden artifacts of Late Thule age may be small cases for holding needles, end blades or other objects. The larger specimen is broken (Plate 83*e*). This case looks as though it was made from a broken wound plug. It is 9.8 cm long. Its maximum width is unknown. The center part of the case is carved hollow. There is a notch around the wide end, which possibly held a lid over the top. The other end is cut out and would not serve as a containing end. The second case is extremely small (Plate 85*p*). It is 2.8 cm long, 1 cm wide, and 0.5 cm thick. The ends are rounded with lashing grooves cut around the outside surface. The inside is hollowed out.

A chain of five wooden balls are of Late Thule age (Plate 84*i*). The chain is 6.2 cm long and 1.7 cm in diameter. It is highly reminiscent of the chain pendant pictured by Mathiassen (1927a, pl. 30:18). However, it does not have any suspension mechanism.

Two short sections of wood that are the same kind of artifact was found in a Late Thule level (Plates 84*k*, 105*n*). The complete specimen is 16.2 cm in length. They are both 2.2 cm wide, and 2 cm and 1.7 cm thick, respectively. They are ovoid in cross-section. At opposite sides on both ends the wood is cut in a curved fashion to attach an elliptical object. Behind the cuts on both edges a hole is drilled. At the center, another hole is partially drilled for a brace.

A thin stick is cut on both ends and resembles a crude toy bow (Plate 118*h*). It is 12.5 cm long and 0.8 cm wide.

A long, thin spatulate-shaped artifact measures 44.5 cm in length. At its maximum width it measures 2.8 cm; its thickness is 0.8 cm. The distal end of the artifact is blade-like, with its widest portion near the blunt tip. At the proximal end there is a shoulder with a tang made from a cut on both edges. The width of the shoulder is 2 cm, the width of the tang is 1.4 cm, and its length is 1.8 cm. A hole has been drilled through the tang.

A broken artifact with an elliptical cross-section measures 2.5 cm wide and 1.5 cm thick (Plate 105*m*). The only unbroken end has a rounded, blunt end. Four notches are carved on both faces of the artifact below the end.

A broken piece of wood that measures in excess of 38 cm has four large square holes cut into one face (Plate 83*i*). These squares are 1.8 cm by 2.6 cm.

A portion of what appears to be a round wooden ball was also recovered. In diameter it would have measured 9.1 cm. The rounded surface is roughly cut and not finished.

A split piece of wood gives the appearance of a spoon. It measures 9.3 cm in length. At its maximum width it is 1.7 cm, and its minimum width is 0.6 cm. In thickness it is 0.3 cm. I do not believe it is a spoon as the surface is broken and it appears that it may have been originally round in cross-section.

An example of what the above-described artifact may have been was also recovered. It is a round shaft but at one end it widens out considerably then tapers back to a blunt point. The end is broken so its length is unknown, but it is more than 11 cm. The diameter at the greatest point of expansion is 1.8 cm, while the diameter of the narrow end of the shaft is 1.2 cm.

Another paddle or spatulate-shaped object was found. It is carved flat on one face, while the rest of the artifact is rounded. A long, round handle is broken. The other end is oval in outline. It would have measured in excess of 14.3 cm in length. The widest point of the blade measures 1.5 cm. The handle is 1.1 cm in width and 0.7 cm in thickness.

Unidentified Baleen Artifacts

One of the most unique unidentified baleen specimens comes from the Birnirk occupation (Plate 14*c*). It is a circle made of a baleen strip with baleen wrapped around it. In diameter it measures 10.2 cm. Another piece of baleen is a long parallel-sided strip of baleen, which is bent into a square crook-shape. The bottom of the crook is drilled with a baleen swivel passing through the hole and attached to the circle. The end of the crook is notched and tied back to the main strip with a baleen cord. The end of the strip is also notched. In length the strip measures 28.9 cm. It is 2.4 cm wide.

Another piece of baleen measuring 24.7 cm long by 5.1 cm wide has both ends rounded (Plate 36*h*). It appears similar to a bull roarer such as Ford (1959: 226, fig. 112b) describes, but it has not been drilled for suspension.

In the Early Thule levels three silhouettes of unknown objects have been cut out of baleen. One, measuring 22.8 cm long and 1.4 cm at its widest point, looks like a long knife blade and handle (Plate 69*h*). The blade is lunate in shape and terminates with a point. The handle is rectangular and is set off from the blade by notches cut on both edges.

The second specimen is 17.3 cm long and 2.3 cm at its widest portion (Plate 70*e*). The blade is also lunate in shape with a sharp point. The handle is narrower than the blade, but expands at its base.

The third specimen also has a lunate blade and a rectangular handle (Plate 66*e*). However, the handle is wider than the blade. This artifact measures 13 cm in length. Its maximum width is 1.2 cm.

Another silhouette is probably part of a more complex tool (Plate 69*f*). It has an elongated diamond shape measuring 16.5 cm long. At its widest portion it measures 2.5 cm. Six holes have been drilled in a straight line, evenly spaced from one point to the other. It is bent at the center, causing the points to turn upward.

Another baleen strip has been tied in a small circle. It measures 6.2 by 4.1 cm in diameter (Plate 69*b*). Inside the circle is a webbing of baleen string with a small sliver of wood woven into the web.

Very little baleen of any kind was found in the Late Thule levels. Among those pieces that were found were two elongated, diamond-shaped silhouettes like the one described from the Early Thule period (Plates 92*i*, 112*a*). The major difference being that these two do not have the drilled holes. They measure 12.2 and 10.2 cm in length. Their maximum widths are 1.7 and 1.6 cm, respectively.

A silhouette shaped like a knife also occurred in the Late Thule period (Plate 100*c*). It has a lunate blade and a short, narrow handle. It measures 18.7 cm in length. The widest portion of the blade measures 3.6 cm.

Coils of baleen lashing were found from each occupational period (Plates 14*d*, 66*h*, 77*l–n*, 85*q,r*, 112*b*). Several skin lashing cords were also found. The cord depicted in Plate 57*a* has a small loop on one end. The one in Plate 14*b* has a loop on one end. The one in Plate 85*q*, has a loop on one end and a small twig at the other end.

Miscellaneous Stone Artifacts

Thin, bifacially flaked, flint preforms were found in both Birnirk and Early Thule levels. Fifteen are Birnirk (Plates 43*b,c,i*, 52*i*), two are Early Thule (Plate 65*a*), and one is Late Thule (Plate 90*j*) in age. These are relatively thin pieces of stone, which appear to be exhausted cores. Many show use on the edges. They have not been assigned to any formal artifact class as the use patterns may have resulted from being used as scrapers, knives, or adzes. They range in size from 14.1 by 13.7 cm to 3.8 by 3.7 cm. All are made from fine-grained quartzite, which can be found along the beach at Walakpa.

Two exhausted conical cores were found in Late Thule levels. Both are made from Sik-sik-puk chert and do not show any indication of secondary use. The complete specimen measures 6 cm long, 5.5 cm wide, and 2 cm thick.

Two large stone artifacts were found in the Birnirk levels (Plates 23*d*, 44*a*). These are both made of slate. They have been flaked into the desired shape and then the flat surfaces were partially ground. Neither has sharp edges although one has a slightly beveled edge. They resemble gigantic ulu blades, but do not seem to have functioned in that capacity.

Among the stone artifacts which have not been identified are a series of slate nodules (Plates 29*f*, 45*d*, 53*f*, 76*a*,*b*, 114*a*). These nodules occurred in all three occupation units. They are all of the same general shape. They are round to oval in cross-section, with a central portion having a larger diameter than the ends. The ends are flat to rounded. Some ends were naturally flat but others were ground to this shape. Any irregularity on the stone is ground away to leave the circular cross-section. They range in size from 20 to 4 cm in length, with an average of 7.6 cm. In maximum diameter they range in size from 6.2 to 1.2 cm, with an average of 2.7 cm.

Several small hematite nodules were found. Three were Birnirk (Plates 29*e*, 53*c*) and three were Late Thule in age. These have been ground, producing faceted surfaces. The grinding was presumably done to get the fine, red powder for making red paint.

A notched quartzite pebble was found in a Birnirk level (Plate 29*b*). It measures 3.7 by 2.8 cm. The notch runs around the entire center of the long axis. It is flat on one surface. The pebble may have been used for a sinker, a bola weight, or possibly an atlatl weight.

Two small, flat, sandstone pebbles, one Birnirk (Plate 45*c*), and one Early Thule (Plate 61*j*) in age, have a hole drilled through one edge. They may have been used for sinkers. The larger specimen measures 5.7 cm and the smaller specimen is 2.8 cm in diameter.

The debitage produced in flaking chert or flint artifacts from Walakpa was very sparse. A total of 816 flakes were found in all the levels combined.

Faunal Analysis

Introduction

The excavations at Walakpa produced over 30,000 animal bones. In addition, a few fish scales, gastropods, egg shells, and quantities of oil-soaked fur and feathers were recovered from the prehistoric levels, all of which have not been identified as to species. Only 18,523 bones were used for the faunal sample, as the others were from disturbed areas of the site and historic levels that are not a part of this study. Ninety-two percent of the 18,523 bones under study, or 17,066 bones of the faunal sample, were identified as to species and bone elements. Over one-third of the 1457 unidentified specimens were bird bones.

Procedure

Identification of faunal elements was established by comparing each bone or bone fragment to specimens in the Department of Biology reference collection of the University of New Mexico. The comparative osteological collections available included complete skeletons of common seal, fur seal, bearded seal, arctic fox, and musk ox. A coyote skeleton was used to determine the dog bones; black and grizzly bear skeletons were used for the polar bear; and a mule deer skeleton substituted for caribou. These were supplemented by miscellaneous caribou, walrus, and polar bear elements collected at Point Barrow.

All cervid remains of deer size, and too small to be moose, were assumed to be caribou *Rangifer arcticus*. Similarly, all small seal bones were considered to be *Phoca* spp., while those of medium large size were considered to be bearded seal, and those too large for bearded seal were referred to as walrus.

There was no reference skeletal material available for whales at the time of the study. This material was dealt with by measuring the forelimb bones and extrapolating size by comparisons with illustrations of whale skeletons. In the case of small whales, the ratio of the length of the humerus to the total length of the animal is about 1 to 25 (Romer, 1966). All humeri material from Walakpa seems to belong to this small whale. No evidence was found for larger whales.

The available bird reference collection included: (1) loon, (2) black brant, (3) Canadian goose, (4) snow goose, (5) pin-tailed duck, (6) old squaw, (7) bufflehead, (8) merganser, (9) grouse, and (10) gull. Marine material was absent and references made to such species is by inference only. Identifications in the case of birds was attempted only for selected elements that are the most distinctive in the different species. The elements used were the skull, corocoid, furculum, humerus, tibia, tarsal-metatarsal, synsacrum, and sternum.

Bones that had been modified into tools or that showed use-marks were considered as artifacts and were not included in the faunal identifications or count. Both butchering marks and dog-tooth marks were observed on many of the bones but no attempt was made to record them formally.

The faunal remains were recorded by the provenance units of level and square. Where the bone concentrations were dense, each provenance unit was recorded on a separate data form. In many cases so few bones and fragments were present that they were merely listed.

Bones were sorted into species, then into specific bone elements, after which the number of each element for each species was recorded together with other information outlined below.

Eleven species of mammals were found at Walakpa: (1) ground squirrel, *Citellus* spp.; (2) polar bear, *Thalarctos maritimus;* (3) fox, *Alopex* spp., (4) wolf, *Canis lupis;* (5) dog, *Canis familarus;* (6) common seal, *Phoca* spp.; (7) bearded seal, *Erignathus barbatus;* (8) walrus, *Odobenus rosmarus;* (9) whale; (10) caribou, *Rangifer arcticus;* (11) musk ox, *Ovibos moschatus* (Table 6).

Twelve species and four families of birds found were classified and include: (1) loon, *Gavia* spp.; (2) brant, *Branta* spp.;(3) Canada goose, *Branta canadensis;* (4) snow goose, *Chen hyperborea;* (5) pintail duck, *Ana acuta;* (6) shoveler, *Spatula clypeata;* (7) scaup, *Aythya marila;* (8) old squaw, *Clangula hyemalis;* (9) bufflehead, *Bucephala albeola;* (10) king eider, *Somateria spectabilis;* (11) common eider, *Somateria mollissima;* (12) ducks, Anseridae; (13) ptarmigan, *Lagopus* spp.; (14) shore birds, Charadriidae; (15) gulls, Laridae; (16) thick biller murre, *Uria lomvia;* (17) owls, Strigidae (Table 7).

TABLE 6.—*Distribution of bones of various species of animals by number and percentage from the various occupation levels of each culture phase, Walakpa site*

Culture Phase, Mound, and Occupation Level		Ground Squirrel		Bear		Fox		Dog		Seal		Bearded Seal		Walrus	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Late Thule	A-1	6	.6			2	.2	13	1.4	385	41	13	1.4	5	.5
	A-2		-	3	.1		-	4	.2	508	29.2	10	.6	2	.1
	A-3		-	-		1	.2	4	1.1	255	68.8	6	1.6	1	.2
	A-4		-	1	.2	4	.7	3	.5	242	43.8	3	.5	-	-
	A-5		-	5	.3	4	.2	8	.5	424	26.8	6	.3	3	.2
	A-6		-	3	.1	8	.7	12	1.1	446	46.5	4	.3	5	.4
	A-7		-	1	.2	4	1.1	14	3.9	106	29.8	3	.8	1	.2
	B-1		-	-	-	3	.6	3	.6	230	47.6	4	.8	2	.4
Early Thule	B-2		-	1	.4	-		1	.4	121	54.5	1	.4		
	B-3			2	.7	-		4	1.4	159	56.5	1	.3	1	.3
	B-4	-			-	1	.3	3	1.1	172	60.5	2	.7	2	.7
	B-5	-		-		-	-	2	.7	198	70.5		-	2	.7
	B-6	-		1	.2	1	.2		-	274	71	2	.5	1	.2
	B-7	1	.1	2	.3	2	.3	6	.9	340	55.1	6	.9	8	1.3
Birnirk	B-8	-		4	.6	4	.6	13	1.9	404	59.3	13	1.9	10	1.4
	B-9		-	9	.2	26	.7	63	1.7	2,020	55	70	1.9	52	1.4
	B-10		-	2	.1	112	2.2	143	2.8	3,193	62.6	57	1.1	4	.1
Totals		7	-	34		172		296	-	9,477	-	201		99	
% of Totals			.3	-	.2	-	.9		1.6	-	51.2		1.1	-	.5

CRANIAL ELEMENTS.—Maxillae and mandibles for each species were recorded as right or left. Fragments were also sorted into right and left when possible. When the tooth row was at least partially present, jaws were recorded as to their probable age. The classification used (juvenile, mature, or old) was based on a subjective examination of the degree of tooth wear. Initially, an unsuccessful attempt was made to determine ages of caribou from the faunal remains based on tooth eruption, wear, and shedding. Our tentative classification was based on those of Bochoud (1966), Skoog (1968), and Lucifer (n.d.). During the summer of 1971, Dr. Lewis R. Binford of the University of New Mexico made a collection of caribou mandibles at Anaktuvuk Pass, Alaska. These were animals killed during a known year and season and were of known ages. This collection was provided for our use and proved invaluable for age determination of the caribou of comparable time periods. However, caribou killed during the Birnirk time period did not have the same type of eruption and wear as did the latter examples. This difference in wear may be attributed to a different climatic episode, a shift in the caribou migration schedule or changes in territory, which allowed the animals to graze on softer feeds in early spring and late fall. These possible changes may have caused the teeth to be less highly worn than on those animals that did not graze on softer vegetation so long into the year.

LONG BONES.—Long bones were recorded as right

Whale		Caribou		Musk Ox		Birds		Unidentified		Total Per Level	% of Total Count
No.	%	No.	%	No.	%	No.	%	No.	%		
3	.3	473	50.5		-	8	.8	29	3.1	937	5.1
5	.2	955	55	-		23	1.3	230	13.2	1,740	9.4
-	-	97	26.2	1	.2	6	1.6			371	2
	-	244	44.2			29	5.2	27	4.9	553	3
3	.2	974	61.5		-	22	1.4	135	8.5	1,584	8.5
7	.6	380	38.7		-	17	1.6	101	10.2	983	5.3
3	.8	212	59.3		-			13	3.6	357	1.9
1	.2	151	31.3		-	5	1	84	17.4	483	2.6
2	.9	65	29.2		-	2	.9	29	13.1	222	1.2
		74	26.3		-	14	4.9	27	9.6	282	1.5
		67	23.5		-	5	1.7	33	11.6	285	1.5
		50	17.8	-	-	7	2.1	22	7.9	281	1.5
1	.2	44	11.4	1	.2	38	9.9	23	5.9	386	2.1
2	.3	194	31.4		-	32	5.2	24	3.9	617	3.3
4	.6	127	18.6		-	44	6.5	58	8.5	681	3.7
7	.2	960	26.2	-	-	120	3.3	335	9.2	3,662	9.7
3	.1	1,009	19.1	1	.1	288	5.6	287	5.6	5,099	7.7
41	-	6,076		3	-	660	-	1457		18,523	-
	.2		32.8	-	.01	-	3.5		7.9		100

and left. On the humerus and femur the degree of epiphyseal fusion was recorded. The fusion was recorded in three categories: unfused, partially, and completely fused.

When possible, proximal and distal fragments were treated as if they were complete bones, but if they were badly broken they were recorded as long-bone fragments. Shank fragments were identified as to element whenever possible. When this was not possible, they were recorded in the general category of long-bone fragments. Due to the lack of size overlap in the populations present, fragments could usually be assigned to a species if not to the particular bone element.

Caribou metapodials were recorded with the long bones as right or left metatarsals or metacarpals. Fragments were sorted into front and rear legs when possible; otherwise they were recorded as metapodial fragments. Seal metapodials were considered as miscellaneous flipper elements instead of long bones, because they are not long bones in a morphological sense.

Body Elements.—Pelvic elements were recorded as complete pelvis, ilium, ischium-pubis, acetabulum, or pelvic fragments. These were also identified as to right or left side when possible.

Vertebrae were recorded in the categories of cervical, thoracic, lumbar, sacral, and caudal. Fragments were also recorded in these categories whenever pos-

TABLE 7.—*Distribution of bones of the various species of birds from the various occupation levels of each culture phase, Walakpa site*

Culture Phase, Mound, and Occupation Level		Loon		Brant		Goose		Snow Goose		Pintail Duck		Shoveler		Scaup		Old Squaw		Bufflehead	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Late Thule	A-1	-			-				-	1	12.5	-	-	1	12.5		-		
	A-2				-			1	4.3					-	-		-	-	-
	A-3				-			-	-				-			-	-	-	-
	A-4	2	6.9	-	-	1	3.3	-	-		-	2	6.9	3	10.4	-	-	-	-
	A-5	1	4.5	-		-	-	-		2	9.1	-		2	9.1	3	13.6		
	A-6	-	-	-		-	5.9	-		-	-	-		-	-				-
	A-7	-	-	-		-	-			-			-		-	-	-	-	-
	B-1	-	-	-		-	-			1	20.		-	1	20.	-	-	-	
Early Thule	B-2		-	-	-		-	-	-		-	-		-	-	-	-	-	-
	B-3	1	7.1		-	1	7.1	-	-	-		-			-	1	7.1		
	B-4				-	-		-		-			-	-	-	2	40.	-	-
	B-5	1	14.3			1	14.3	-		-			-	-	-	1	14.3	-	
	B-6	-	-	-		4	10.6				-	-		-		-	-	-	-
	B-7	-	-	-		2	6.2		-			-	-			-	-		
Birnirk	B-8				-	2	4.5			-	-	-	-	-	-	5	11.3		
	B-9	-				5	4.2	2	1.6		-	-				3	2.5	-	
	B-10	5	1.7	5	1.7	3	1.				-	-		6	2.1	3	1.	1	.3
Totals		10	-	5	-	20		3	-	4		2	-	13	-	18	-	1	
% of Totals		-	1.5	-	.7	-	3.1	-	.4	-	.6	-	.3		1.9	-	2.7	-	.1

sible; otherwise they were called miscellaneous vertebrae fragments.

Ribs were recorded in three categories: complete, proximal, and fragmented.

FOOT BONES.—Tarsal and carpals were not separated but were recorded as foot bones. The cubonavicular was recorded separately. The metapodials were not subdivided except in the case of the caribou as noted above. First and second phalanges, both front and rear, were recorded as one category. The third phalange, or ungle, was recorded separately. Proximal and distal fragments of the metapodials and phalanges were also recorded.

Measurements

In addition to classification, a set of measurements was taken on selected elements and recorded on the same data forms. Dog skulls were measured to see if there were any differences in sizes. Seal femurs, humeri, and tibias were measured for maximum length and maximum width at the distal ends.

SEAL LONG-BONE MEASUREMENTS.—It has been pointed out by McLaren (1962:177) that the size of seals is directly proportional to the length of the seal pup suckling period. The suckling period is terminated when the ice breaks up in the spring. There-

King Eider		Common Eider		Ducks		Ptarmigan		Shore Birds		Gulls		Thick Billed Murre		Owls		Total Per Level	% of Total Count
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
		5	62.5	1	12.5		-	-			-	-		-	-	8	1.2
		21	91.5		-			-		-	-	-		1	4.3	23	3.5
		6	100.		-	-	-	-		-	-	-				6	.9
-		21	72.4		-	-	-			-	-	-	-			29	4.4
		13	59.3	1	4.5	-	-	-		-		-	-			22	3.3
		13	76.5	3	17.6	-	-			-	-	-	-			17	2.6
-	-	-	-	-	-	-	-			-		-	-	-	-	-	-
-	-	2	40.	1	20.		-							-	-	5	.7
-	-	-		-	-	-	-	2	100.					-	-	2	.3
		9	64.	-	-		-	2	14.2					-	-	14	2.1
		3	60.	-	-									-	-	5	.7
		4	57.1	-					-					-	-	7	1.
-		34	89.4	-					-	-	-					38	5.8
		15	46.9		-	1	3.1		-	-	-	14	43.8			32	4.9
-	-	20	45.5		-				-	-	-	17	38.6			44	6.7
-	-	103	86.	-	-				-	5	4.2	2	1.6	-	-	120	18.3
23	8.	227	78.9	2	.7	-		1	.3	12	4.2	-	-	-	-	288	43.6
23		496		8	-	1		5	-	17		33		1		660	
																	100.
-	3.5		75.5	-	1.2	-	.1		.7		2.6	-	5.		.1		

fore, if the ice breaks up earlier in the year the pups will be smaller, and if the ice breaks up later in the year the pups will be larger (McLaren, 1962:177). If the rise and fall of the sea level at Point Barrow indicates climatic changes, these changes would affect the seal suckling period, which would be reflected by variations in the sizes of seal bones found in the different occupation levels at Walakpa. Measurements were then taken on seal long bones in order to see if in fact there was a correlation between seal size and the proposed sea levels or climatic episodes.

As it has been demonstrated by Usher and Church (1969:126) that there is a relationship between seal length and girth that can be used to predict seal weight, a biometric analysis of seal long bones was made on seal specimens coming from various archeological levels. If there were any significant changes in seal sizes, it was hoped that they would correlate with proposed climatic shifts. Biometric measurements were taken on seal humeri, femurs, and tibias.

Measurements taken on the humerus were articular length and distal condylar width (Figure 9), on the femur were the notch length and the distal condylar width (Figure 10), and on the tibia, for diaphyseal length (Figure 11). The major problem of this experiment was that the sample size was too small.

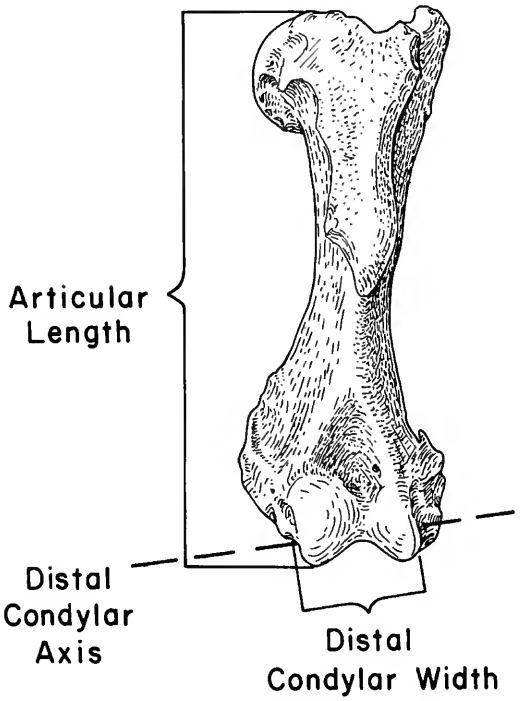

FIGURE 9.—Seal humerus showing the distal condylar width and articular length.

As juvenile variability would skew the result, only the bones of adult animals were used. Also the bones had to be complete. Both of these features reduced the sample size to the following: humerus—Birnirk (40), Early Thule (14), Late Thule (12); femur—Birnirk (66), Early Thule (22), Late Thule (0); tibia—Birnirk (32), Early Thule (5), and Late Thule (14).

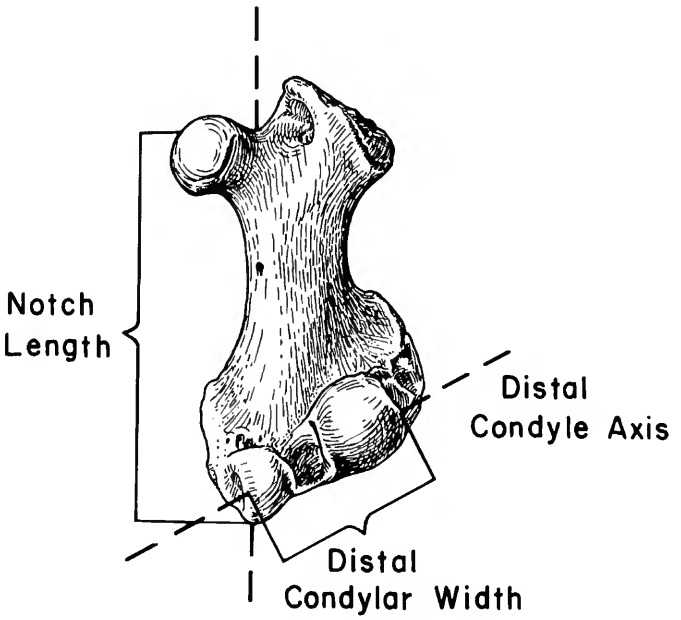

FIGURE 10.—Seal femur showing distal condylar width and notch length.

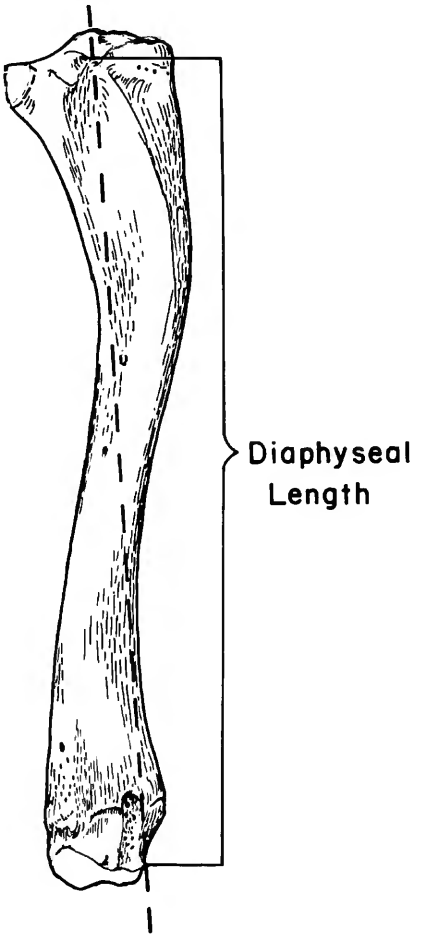

FIGURE 11.—Seal tibia showing diaphyseal length.

The means of the measurements of the humeri widths are 2.39 cm (Birnirk), 2.39 cm (Early Thule), and 2.38 cm (Late Thule). The lengths are 9.42 cm (Birnirk), 9.26 cm (Early Thule), and 9.47 cm (Late Thule). This indicates that the humerus width did not vary in the three phases examined. However, there is a high correlation between the lengths of the Birnirk and Late Thule lengths, while the Early Thule lengths are significantly different from the other two. This may indicate that suckling periods for seals during the Birnirk and Late Thule ages may have produced seals that were longer than those of the Early Thule period.

The mean femur width for Birnirk is 3.6 cm, while for Early Thule is 3.7 cm. The length mean was 7.63 cm for Birnirk and 7.7 cm for Early Thule, respectively.

The tibia diaphyseal lengths for Birnirk had a mean of 15.4 cm, while for Early Thule the mean was 14.44 cm. Late Thule was again longer with a mean of 15.7 cm. Here, as in the measurements for the

humerus, we see that the Birnirk and Late Thule seals appear to be longer than those from the Early Thule levels. It should be pointed out that the slight tendency of correlation of longer seal humeri in the Birnirk and Late Thule levels does correlate with cooler climatic periods and the lowering of the sea level. However, this may be insignificant, as the sample is small. The other problem that must be considered is that no work has been done on the osteological remains of modern seals from various localities to see if in fact the bones reflect the body size as reported by McLaren (1962), and Usher and Church (1969).

Dog Skull Measurements.—The measurements of dog skulls from the Birnirk levels at Walakpa indicate that there is a possible bimodality in the dog population. The most common size of dog is quite small as compared to modern Greenland sledge dogs. On ten selected adult animals the condylo-basal length ranges from 15.8 to 17.7 cm. The zygomatic breadth ranges from 10.7 to 9 cm. The palatal lengths range from 9.1 to 7.9 cm, and the upper carnassials range from 1.9 to 1.6 cm. They are probably the same type of dog as those at Ipiutak, but are slightly smaller. They fall into the range of Siberian dogs and Samoyeds. However, a single Birnirk-age specimen, which may be a wolf, has a condylo-basal length of 23 cm. This dog compares more favorably to the size of Greenland sledge dogs and those from Labrador as measured by Olaus Murie (in Larsen and Rainey, 1948:255–259).

Number of Animals Present.—In order to determine the minimum number of individual animals of each species from each occupation level, the maximum number of animals represented by the absolute number of each skeletal element was calculated. Special attention was paid to the number of right and left sides and distal and proximal ends of bones with maximum possible pairs being calculated. The element with the largest number per level was taken to represent the minimum number of accountable individual animals present in each occupation level.

I believe this estimate of minimum numbers of individuals per species is fairly accurate; however, it may be that the number of individuals was higher. Whole bodies or body parts may have been removed to other campsites, or there may have been errors in recovery. The important point, however, is that the basic calculation is on the low conservative side.

Analysis by Archeological Level and Cultural Units

The analysis of the horizontal distribution of the bones in the various levels was not particularly useful. Most bones were found in association with trash middens, which were irregularly structured with elements introduced from discarded portions of meat when the animal was butchered and from choice meat packets when they were either consumed or processed for the drying racks. There was little evidence that the middens were disturbed by dogs or wolves. Few bones showed extensive scars from being chewed by these animals. The evidence suggests that dogs were present at the site and were staked out in an area that was not excavated.

As seal and caribou make up the primary animals utilized by the Walakpa inhabitants, the elements of these animals have been grouped into "meat packets." The meat packets are differentiated by the amount of available meat occurring on unit cuts. The unit cuts are large meat packets (upper fore and hind limbs), small meat packets (lower fore and hind limbs, trunk and certain head portions), and waste packets (hooves, feet and certain head portions). The presence or absence of these parts in each occupation level was tabulated as a basis for establishing the minimum number of individual animals represented. When the minimum number of animals is known, the maximum number of possible elements can be determined. The percentage of the number of bones recovered, calculated with respect to the expected number of bones found in a single animal, and multiplied by the estimated number of animals, should indicate what portions of the animals are present or absent.

It is important to consider several variables when discussing the meaning of the occurrence or nonoccurrence of bones representing meat packets, because they reflect to a great extent the time of year during which the animal was killed; therefore they are potentially significant. The variables are (1) the type of camp, i.e., a base camp or hunting camp; (2) the distance from the camp to the kill or kills; (3) the number of animals in the kill or kills; (4) the number of people available to process the meat; (5) the mode of transportation available to carry the meat back to camp, i.e., sled, boat, pack dog or by hand/foot; (6) weather conditions, e.g., windy, icy, snowy; (7) ice and snow conditions; (8) whether or not the meat was frozen when butchered; (9) what the ultimate destination might be, i.e., immediate or near-future consumption by man and/or dogs, storage for later consumption, drying or ice-cellar freezing; (10) season of animal year (if antler or hide is not suitable for artifact manufacture due to seasonal changes, it will be discarded).

Several assumptions based on these variables and on observations of Eskimo butchering practices have been made about the significance of meat packets.

One assumption is that if the animals were killed at or near the site, most, if not all of the elements, will be represented at some time at the site. Whereas, if the animals were killed far from the site, many waste portions such as the feet and certain head elements will not be taken back to the camp. If antlers, tongues, brains, and noses were desired, they would be extracted in the field. This would eliminate the necessity of carrying many extra pounds back to the camp. This is particularly likely when there is no transportation available, or when the number of animals killed exceeds the capacity of a sled or boat. In this case, even large meat packets will be discarded. In some cases, meat will be cut from the bones in the field leaving heavy elements such as humeri or femurs at the kill site.

When a level represents a base camp, most of the elements from the large meat packets should be present. Irregularities in the numbers of elements found in a base camp probably represent meat consumed, dried, or fleshed out at the hunting camps, or stored in ice cellars to be consumed later. Waste cuts found in the base camp probably represent an occasional animal killed near the base camp and/or portions introduced for dog food.

The evidence also indicates that when dealing with a hunting camp, particularly a seasonal task-specific hunting camp, the bones found in extraordinary numbers represent that specific activity, while bones from other species found in small quantities were introduced into the hunting camp from the base camp. That is, provisions were brought from the base camps to sustain the hunter for the duration of the encampment or until he obtained fresh meat. Certain elements may also have been introduced to provide raw materials for the manufacture of tools.

Base camps should be central collection points with meat being imported from various task-specific hunting camps. Although these camps are considered as primarily winter sites, bones should represent animals that are killed during all seasons of the year.

Seals

From examining the occurrence of seal elements from Walakpa, we find two general trends (Figures 12–16). The first is found in levels A–1 through B–8. Here we see a low percentage of skulls, relatively low percentage of the trunk bones and high percentages of leg and flipper bones. In levels B–9 and B–10 we see nearly the reverse of this trend, with skulls, lumbar vertebrae, and ribs being high. The larger leg meat packets are also high in relationship to the smaller meat packets, and the flippers are extremely low. It is also observed that the number of individual seals in levels A–1 through B–8 is very low, while in B–9 and B–10 it is extremely high. This has been interpreted to mean that the upper levels are hunting camp sites of brief duration, while the lower levels represent base camps.

The scarcity of skulls from the levels that represent hunting camps could be explained by the fact that the skull is prized for both the brain and eyes (Spencer, 1959:373). These are apparently taken back to the base camp. Thirty-three to 58 percent of the skulls from the minimum number of seals killed were found in the base camp levels. This is extremely high and supports the hypothesis expressed above. This is also affirmed by Murdoch (1892:434), who indicates that skulls are usually brought home and regarded as sacred.

The trunk, as represented by the lumbar vertebrae and ribs, does not figure significantly in the hunting camp levels, but a relatively high percentage of these were found in the base camp levels. Spencer (1959: 373) indicates that the choicest portions of seals are the heart, liver, and shortribs. This would account for absence of lumbar vertebrae and ribs from the hunting camps and their presence in the base camp levels.

No mention is made by either Spencer or Murdoch of the leg and flipper cuts. It appears from our data that the back leg bones are introduced into the base camp more frequently than the front leg bones. Apparently the back leg and flippers are either consumed or left at the hunting camp.

In former days dogs were fed blubber and seal entrails (Spencer, 1959:374). Rarely was a dog given seal meat; but the blubber was an important source of dog food, as it took little of it as compared to either seal meat or caribou meat to sustain a dog.

The archeological significance of the change in size of seal elements between the lower B levels and the upper B levels can only be assessed by examination of the population dynamics of modern seals. McLaren's (1962) work on seals in the eastern Canadian Arctic has profound implications for the seal analysis at Walakpa. Even though there is a possible bimodality of seal sizes at Walakpa, I believe that these animals are all the *Phoca hispida* or ringed seal. The ringed seal is the most common seal found in these northern latitudes, and is the only species of small seal that currently resides the full year in these waters (Burns, 1970:447). The size variation is not only influenced by sex and age, but also by ice conditions. The size of adult seals from high arctic localities averages 15 percent longer than that of adults from southeast Baffin Island, while those from

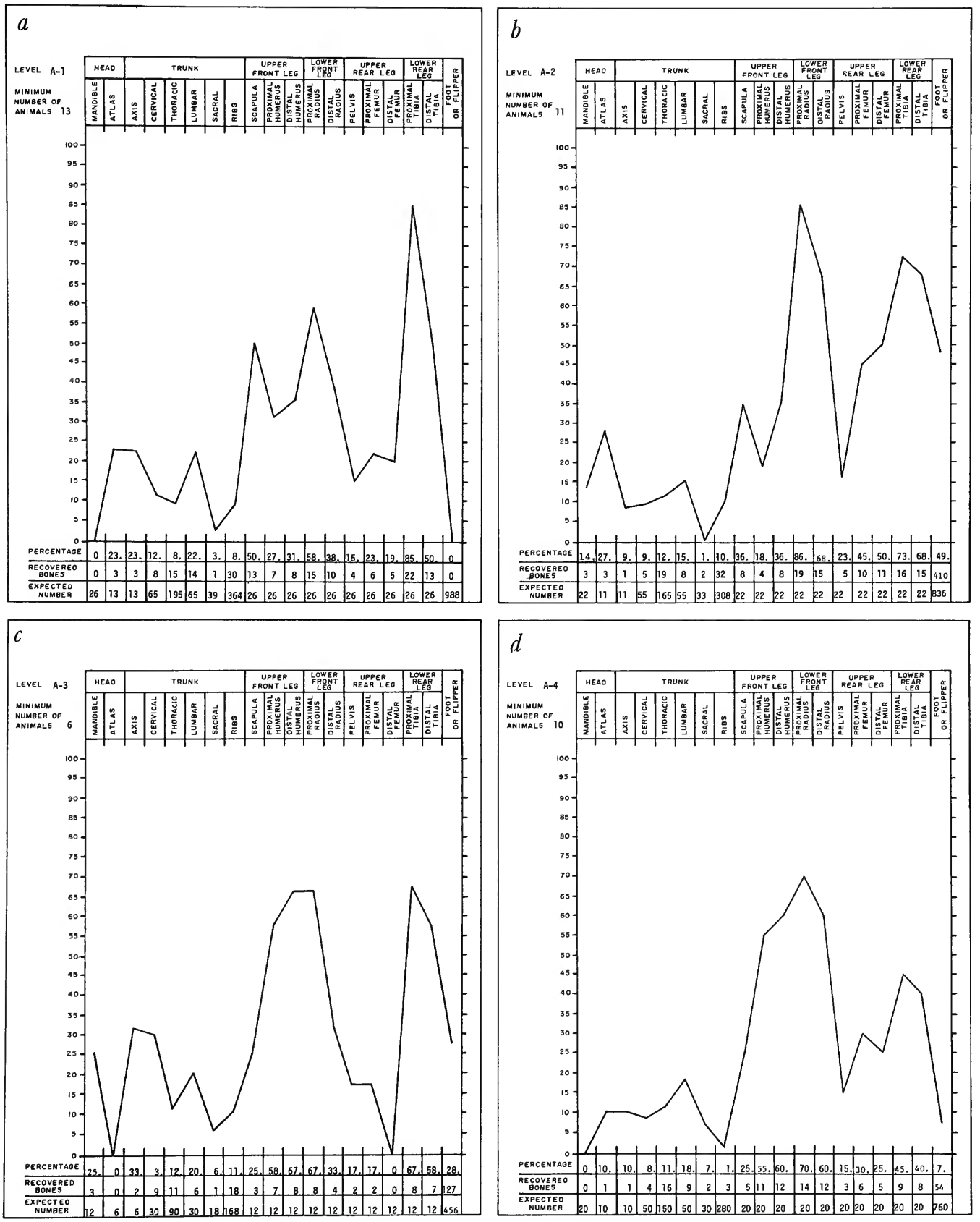

FIGURE 12.—The attained percentage of the expected number of bones for the minimal number of recovered seal bones from the Walakpa site: *a*, level A–1; *b*, level A–2; *c*, level A–3; *d*, level A–4.

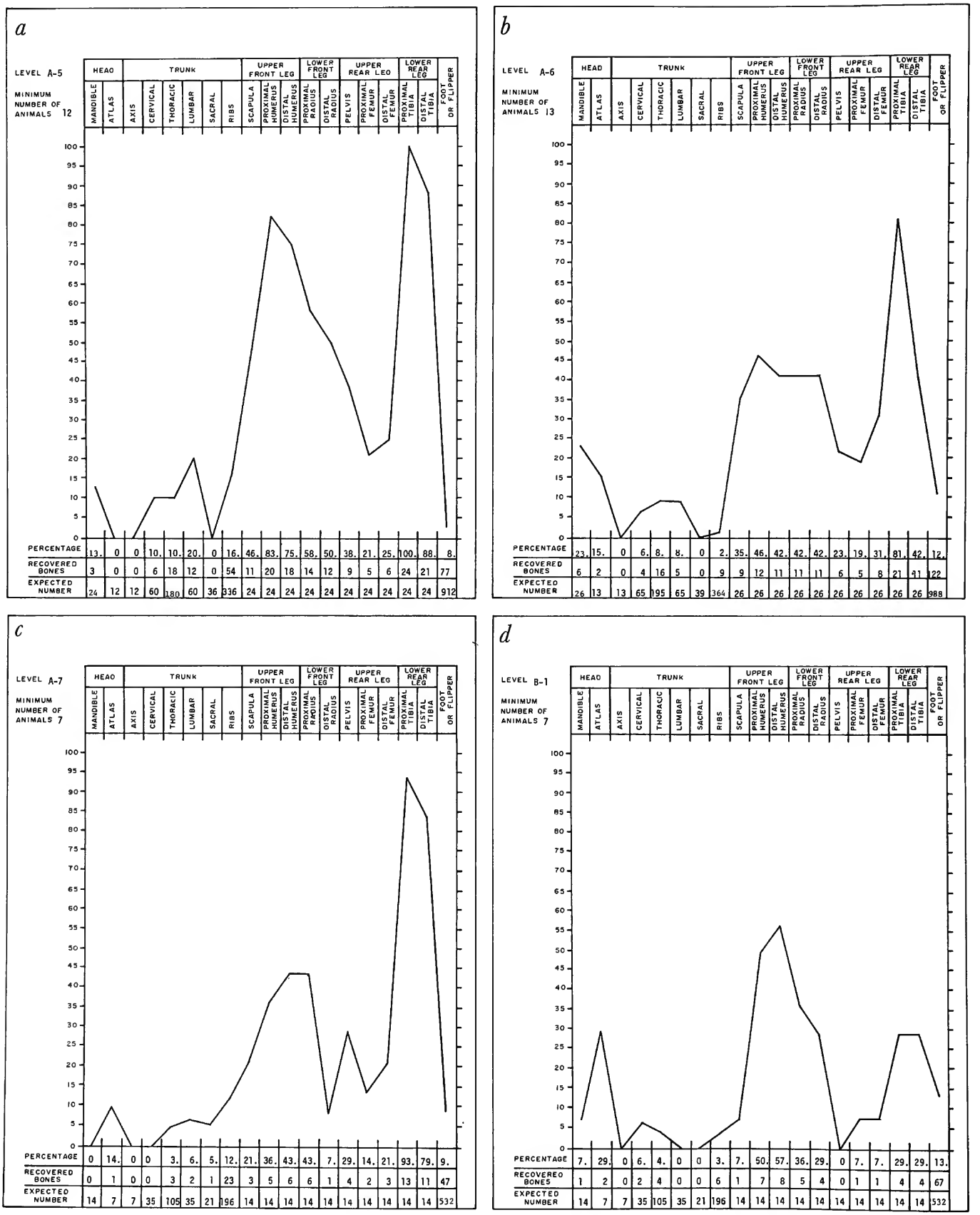

FIGURE 13.—The attained percentage of the expected number of bones for the minimal number of recovered seal bones from the Walakpa site: *a*, level A–5; *b*, level A–6; *c*, level A–7; *d*, level B–1.

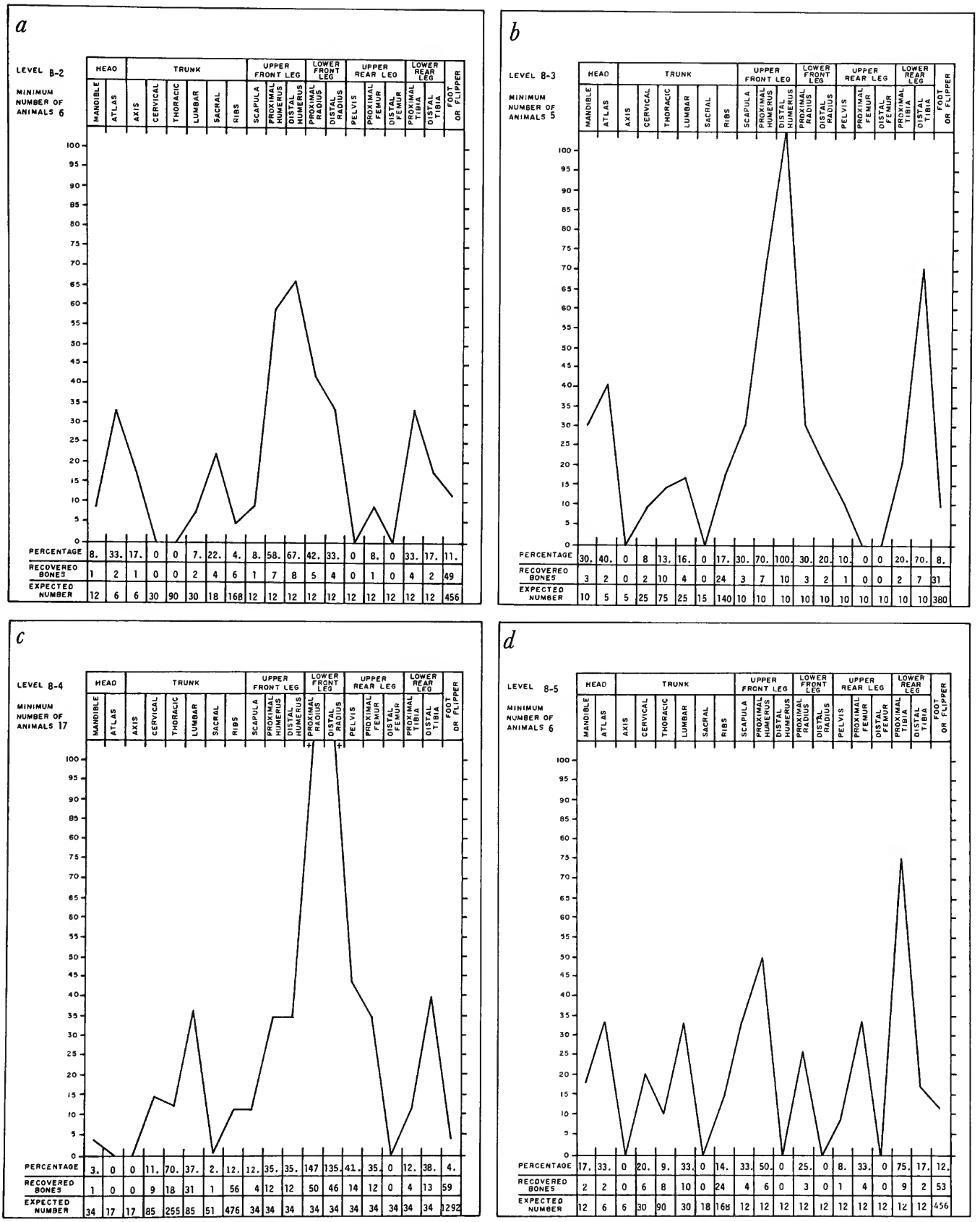

FIGURE 14.—The attained percentage of the expected number of bones for the minimal number of recovered seal bones from the Walakpa site: *a*, level B–2; *b*, level B–3; *c*, level B–4; *d*, level

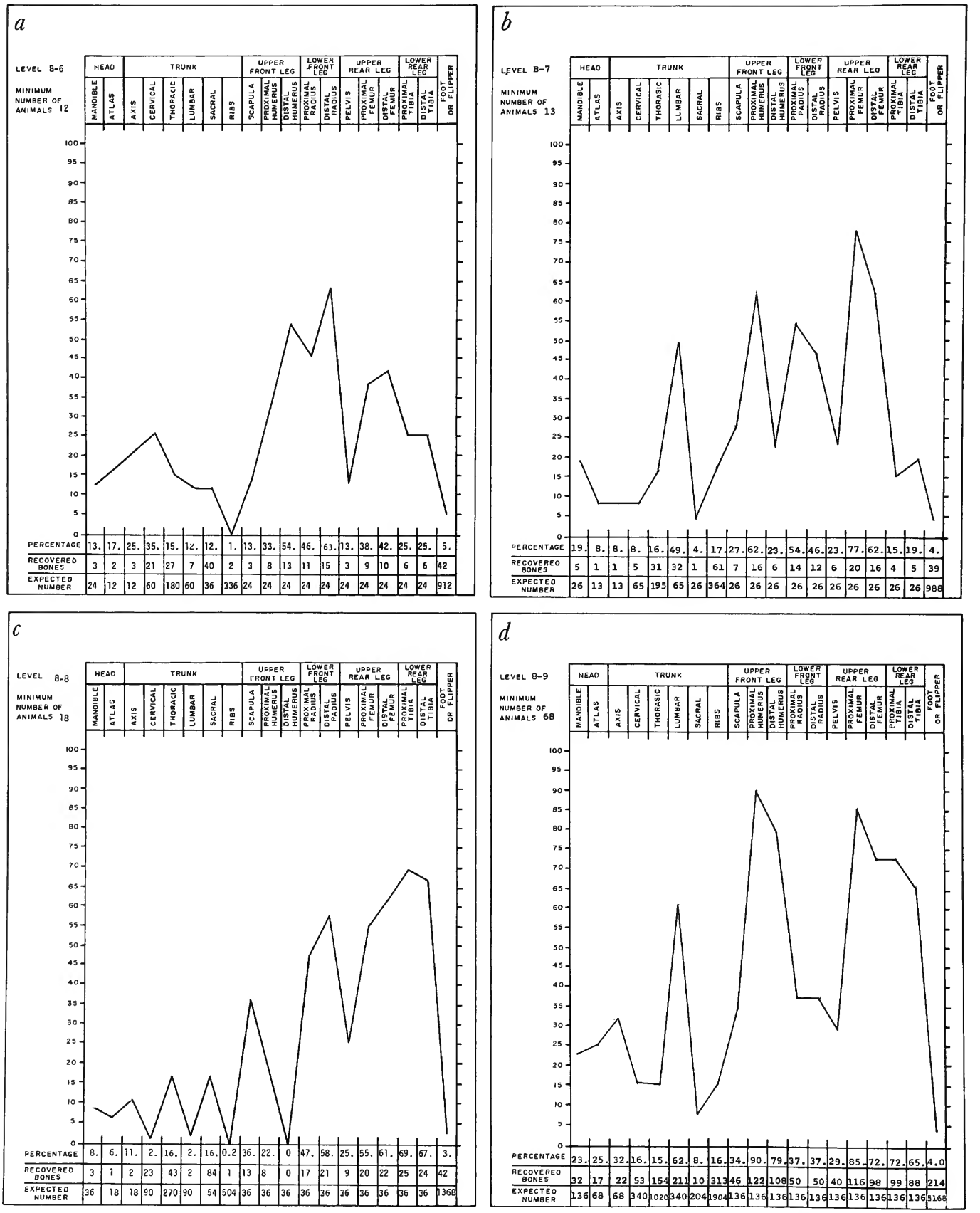

FIGURE 15.—The attained percentage of the expected number of bones for the minimal number of recovered seal bones from the Walakpa site: *a*, level B–6; *b*, level B–7; *c*, level B–8; *d*, level B–9.

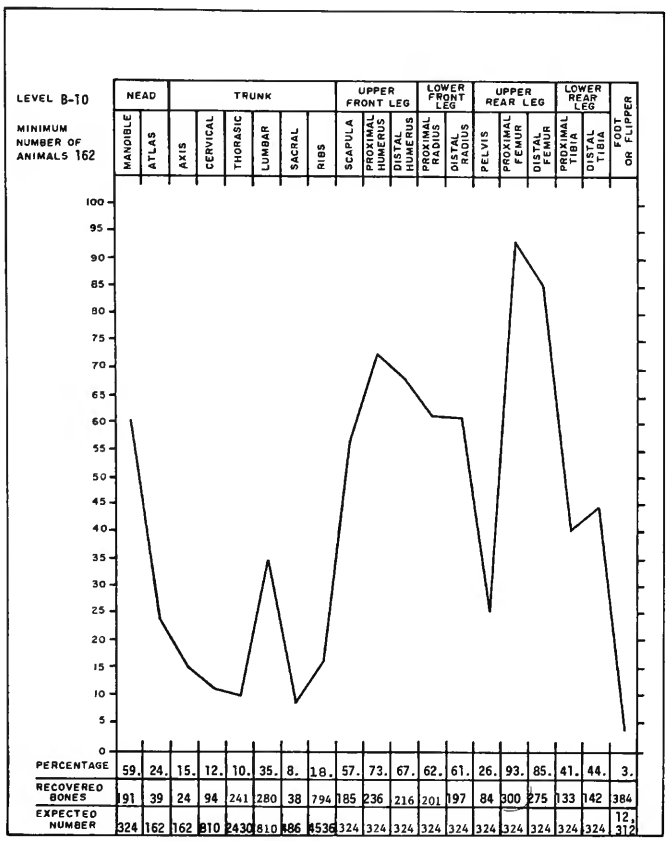

FIGURE 16.—The attained percentage of the expected number of bones for the minimal number of recovered seal bones from the Walakpa site, level B–10.

southern Hudson Bay may be 8 to 10 percent shorter (McLaren, 1962:171). The reason for this size difference is that a longer suckling period is permitted in the more northerly localities, which results in larger, more vigorous pups. If the climatic conditions during the Early Thule occupations were significantly warmer with longer summer weather conditions, the ice would tend to break up sooner in the spring and seriously shorten the suckling period of the ringed-seal pups. This would in turn cause the seals to be smaller and would account for the size distribution noted above (p. 74).

The maintenance of a balanced population size of the ringed seals is of great importance for the successful exploitation of these animals. Land-fast ice is the most important variable limiting the number of reproducing females. Within the area of land-fast ice, there are limited numbers of sites which are suitable for birth lairs and reproduction is unsuccessful elsewhere (McLaren, 1962:172). Each seal requires a territory of fixed size so that there is an upper limit to the number of animals inhabiting a given area of ice. McLaren has calculated population densities of seals based on ice types: (1) Within one mile of shore and surrounded by further ice, there will be approximately 35 seals per square mile of ice. (2) Within one mile of land but exposed to open water on its seaward edge, there will be about 10 seals per square mile. (3) More than one mile from land, there will be about 5 seals per square mile of ice.

If the Eskimos of a region are successfully to exploit an area for a long period of time, then the mortality rate imposed by hunting and natural causes must not exceed the recruitment into the seal population. In order to achieve this balance of population, the annual kill should not exceed 10 percent of the total population at the beginning of the seal year (McLaren, 1962:175).

When calculating the minimum number of seals represented by Birnirk level B–10, I find that at least 162 seals were killed. By using optimum modern hunting conditions, with a seal density of 35 individuals per square mile, it is found that 162 seals totally depletes four square miles of ice area. In order to maintain a balance in the seal population, the Eskimos would have had to exploit a minimum of 3.5 seals per mile. If the 162 seals from level B–10 represent this type of minimal exploitation, the Eskimos would have had to hunt 46 miles of coastline. Based on element distribution, if our remarks about proximity of kills to the camp site are valid, then a great percentage of the seals were killed locally. We can then assume that the local seal population would have been seriously depleted for several generations and would not support a continued Eskimo habitation.

The above remarks are based on modern climatic conditions and with the proposed warming trend in the climatic situation correlated with a decrease of suitable pupping areas, the ringed-seal population may actually have been significantly smaller. Given this situation and the fact that I did not calculate any loss of seals due to ice conditions, I feel that a minimum exploitative area of 46 coastal miles is not out of line and should possibly be increased several fold. This is possibly the reason that Birnirk camp sites were of brief duration and moved often. It is also because of this type of maximizing exploitative strategy that we see a rapid spread of Birnirk camp sites.

CARIBOU

The same pattern was found in the distribution of caribou elements (Figures 17–21) as occurred with the seals. The elements again point to the same type of campsites as indicated by the seal bones. In levels A–1 through B–8 there is a higher incidence of skulls.

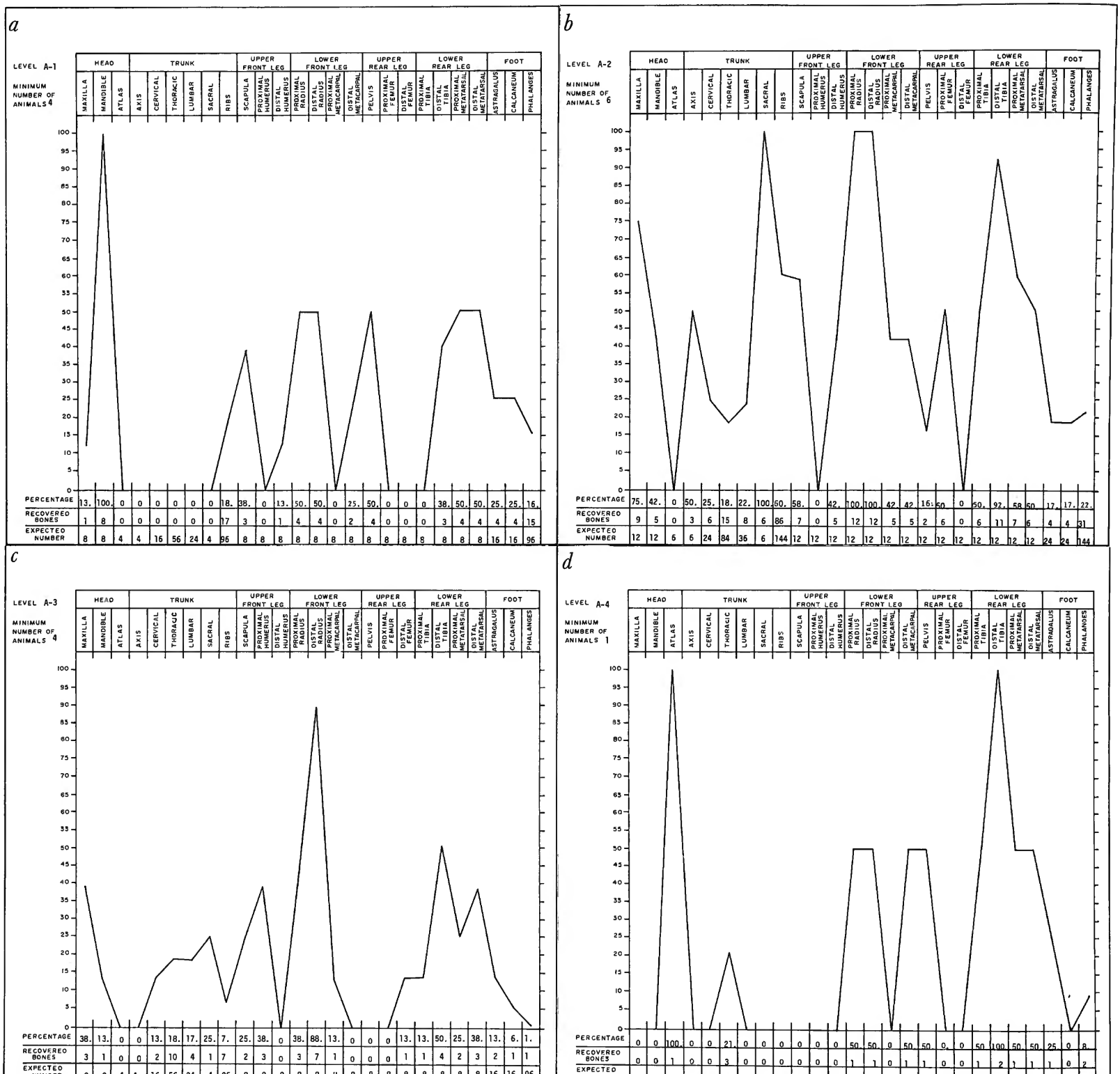

FIGURE 17.—The attained percentage of the expected number of bones for the minimal number of recovered caribou bones from the Walakpa site: *a*, level A–1; *b*, level A–2; *c*, level A–3; *d*, level A–4.

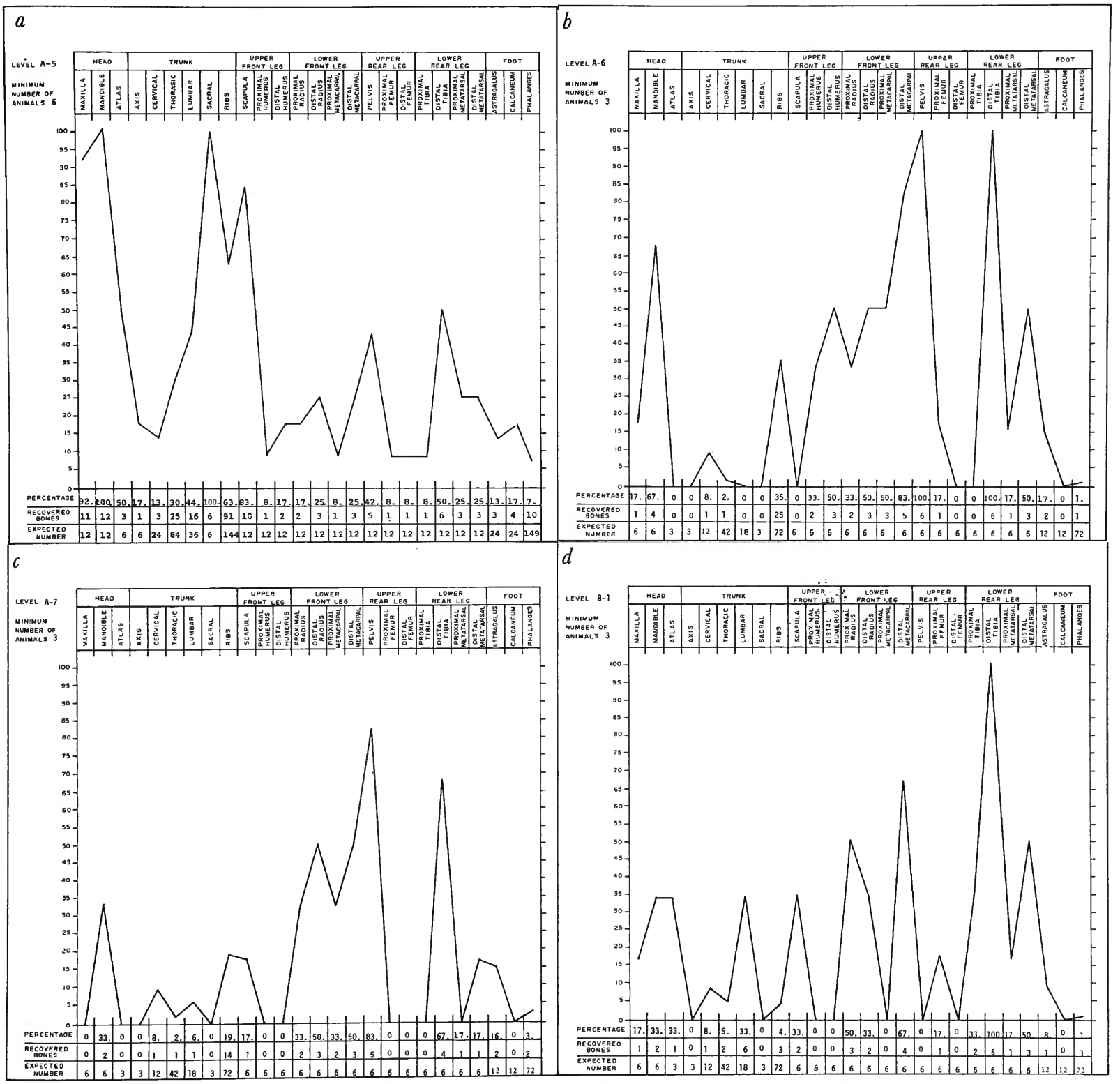

FIGURE 18.—The attained percentage of the expected number of bones for the minimal number of recovered caribou bones from the Walakpa site: *a*, level A–5; *b*, level A–6; *c*, level A–7; *d*, level B–1.

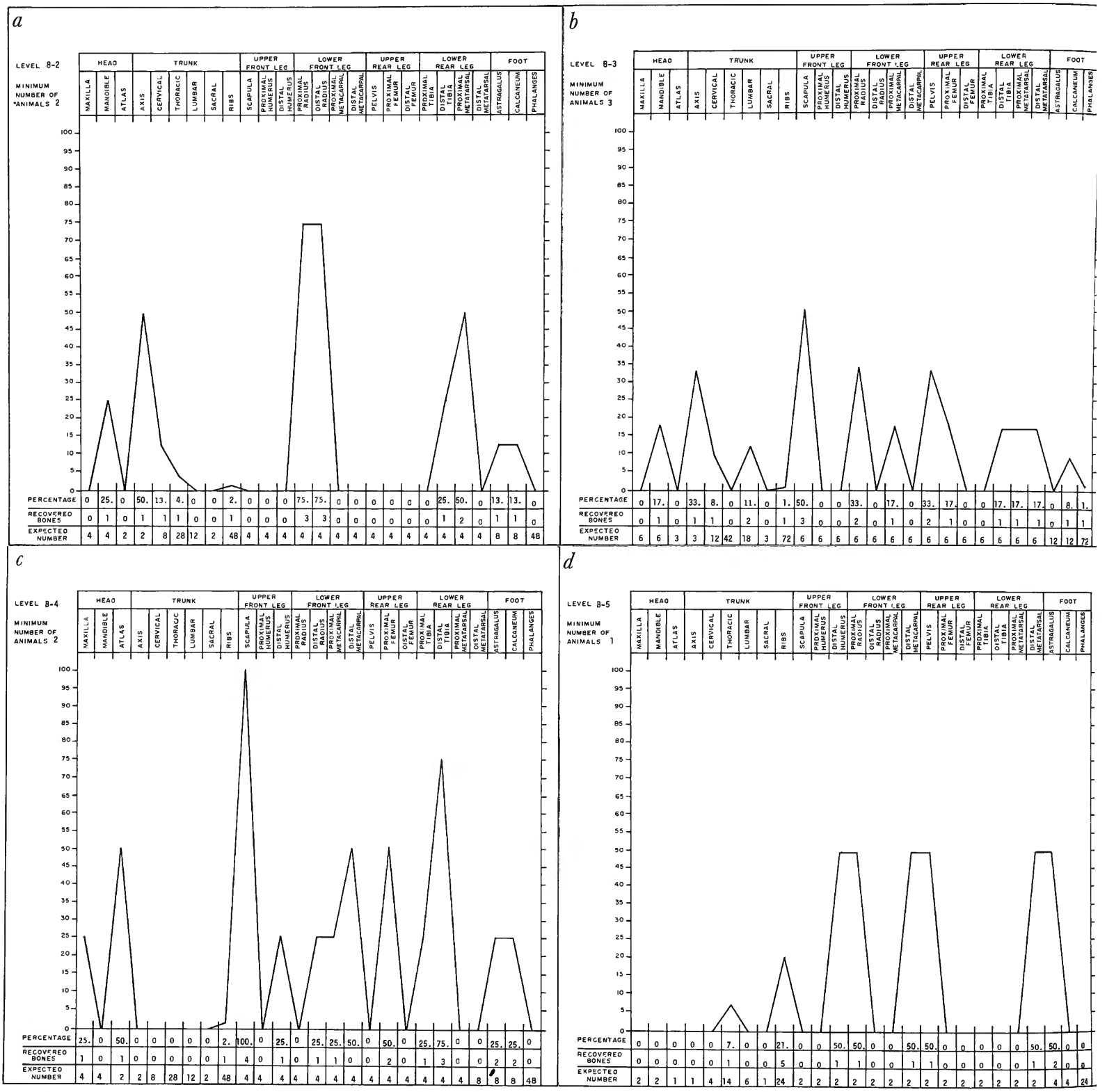

FIGURE 19.—The attained percentage of the expected number of bones for the minimal number of recovered caribou bones from the Walakpa site: *a*, level B–2; *b*, level B–3; *c*, level B–4; *d*, level B–5.

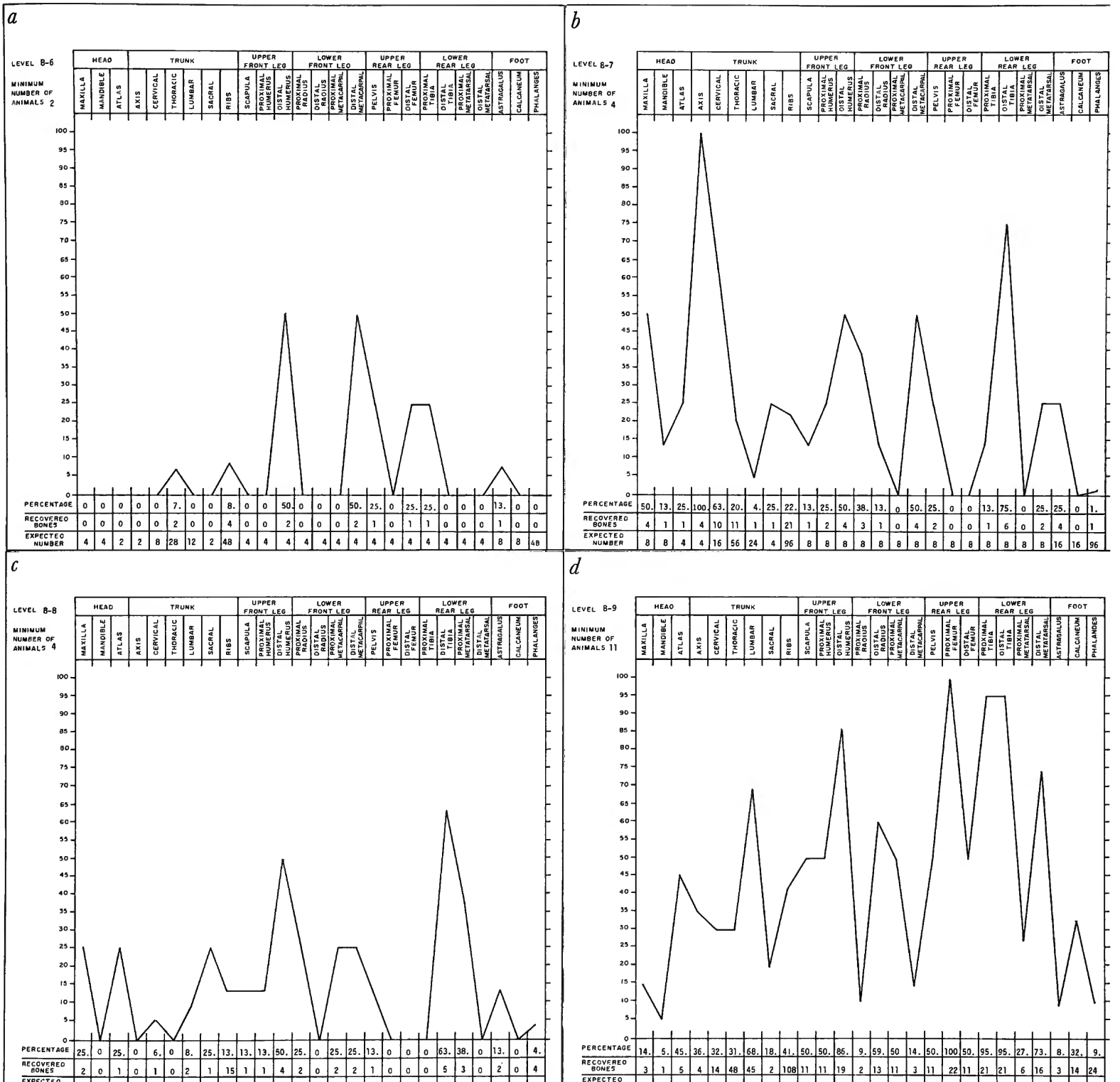

FIGURE 20.—The attained percentage of the expected number of bones for the minimal number of recovered caribou bones from the Walakpa site: *a*, level B–6; *b*, level B–7; *c*, level B–8; *d*, level B–9.

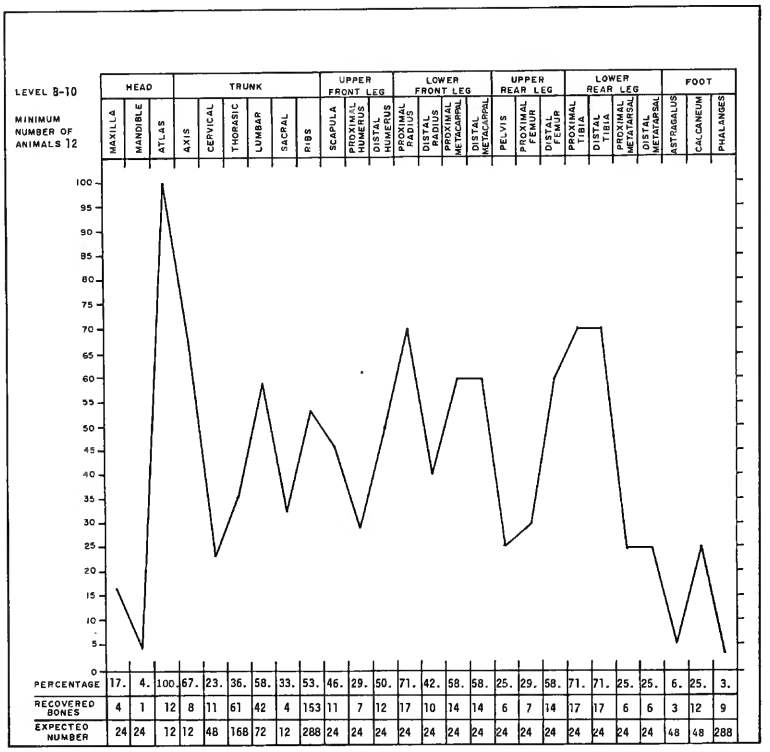

FIGURE 21.—The attained percentage of the expected number of bones for the minimal number of recovered caribou bones from the Walakpa site in level B-10.

ribs, scapulae, pelves, and lower leg bones. Foot bones remain proportionately high or low to head bones which, as mentioned above, may indicate the distance the animal was killed from camp. However these, as well as missing lower leg bones, may indicate dog feeding. In the levels B–9 and B–10 these bones are relatively scarce, indicating that most of the caribou meat utilized in these two levels came from places other than Walakpa. The occurrence of a few of these bones may indicate the occasional local kills. The upper limb bones and trunk bones are relatively low to completely absent in the hunting camp levels, while in the base camp levels they are represented by 50 to 100 percent of the expected bones. It can be observed that the occurrence of the scapulae and pelves is quite erratic. It is felt that their presence or absence has to do with whether or not the meat was frozen when butchered.

WHALE

The rare occurrence of whale bones in the Birnirk levels at Walakpa is significant. Although the sample is extremely small, I believe that it represents a true picture of the whales hunted by the Birnirk inhabitants. Considering the combined length of occupation of both the B–10 and B–9 levels (page 92 for details) and the probability that the time spans cover two fall seasons, one or two spring seasons, and one summer season, it would seem reasonable to assume that during this time the larger baleen whales would have migrated past the site at least three or four times, unless, of course, the migratory habits of these mammals were different than those we observe today. If these whales were present in these waters during the Birnirk occupation, their presence does not appear in the Walakpa faunal sample. This may indicate that the Birnirk Eskimos were not getting these animals regularly, that the bones were left at the kill sites, or possibly they were not even hunting the large whales.

However, by late Birnirk times, which does not occur at Walakpa, whale-hunting equipment is found and is probably imported from western Alaska (Ford, 1959:103). The evidence seems to indicate that during the early Birnirk phase, large whales were not hunted regularly, but their importance increased during middle Birnirk and may have been an important element in the late Birnirk economy.

POLAR BEARS

The distribution of polar bear bones is unique (Table 8). Bear meat was considered an excellent food by the historic Eskimos (Spencer, 1959:374). Most of the bear meat, other than the liver, which is extremely toxic, is eaten. In the hunting camp levels where bear elements did occur, they were exclusively head or feet elements. It is presumed that the choice cuts of meat were taken back to the base camp with the claws and teeth being extracted at the hunting camp. However, in the base camp levels there were again fewer choice meat elements and more head and feet bones. It is possible also that the claws and skulls were brought back still attached to the hides, resulting in this bone distribution.

DOG, FOX, AND WOLF

By the breaks in the dog skulls, it appears that a small variety of dog was eaten. Coastal Eskimos are not now inclined to eat dog, but have no feelings against it (Spencer, 1959:374). The inland Eskimos raise dogs for food, and wolves and foxes are also boiled and eaten. Dog and fox may have made up a small portion of the diet of the people living on levels B–9 and B–10, but are infrequently found in the later levels.

TABLE 8.—*Distribution of selected bone elements for polar bear, bearded seal, and walrus from the various occupation levels of each culture phase, Walakpa site*

Culture Phase	Mound Occupation Level	Polar Bear					Bearded Seal					Walrus				
		Head	Trunk	Front leg	Back leg	Foot	Head	Trunk	Front leg	Back leg	Foot	Head	Trunk	Front leg	Back leg	Foot
Late Thule	A-1	2			-	1	1	3	2	2	8		1	1		
	A-2	-			-	1	-	1	1	-	5	1	1			
	A-3	-			-	-	1	1	2	-	-					
	A-4	-				-	-	2	-	1	2				1	-
	A-5	2			-	3	1	1	-		4		2	1	-	
	A-6	-			-	3	-	2	-		2	-	3	-		2
	A-7	1			-			1	1		1	-		1	-	
	B-1	-			-			1	1	1	1	-	2		-	
Early Thule	B-2	-			-	1	1					-			1	
	B-3	2			-					1		-		1		
	B-4	-		-	-			1		-	1			1		-
	B-5	-		-	-					-	5				-	2
	B-6	-		-	-	1		1		-	1		1			
	B-7	-		-	-	2	1	4		1	-	2	2	1	1	2
Birnirk	B-8	-		1	-	3	-	5	3		1		4		2	3
	B-9	6		4	1	18	3	24	16	5	6	3	1	2	22	10
	B-10	7	18	2	2	30	5	29	5	2	20	3	2	1	20	6

OTHER MAMMALS AND BIRDS

Except in levels B–9 and B–10, the bones of animals other than seal and caribou make up an extremely insignificant number. Those bones, as mentioned above, are thought to have been introduced from outside the site in the form of supplemental foods. This is particularly apparent in the case of birds where the majority of bones found were those on which larger portions of meat occurred. There were few heads and no feet, with the humeri, sterna and furcula making up over 90 percent of the bone count.

This is also apparent with bearded seal and walrus bones. The bones found in the hunting camps represent, for the most part, leg bones, foot bones, and occasionally trunk bones (Table 8). From these animals the choice portions of meat are the heart, liver, and ribs (Spencer, 1959:374). The rest of the meat is less highly regarded for human consumption and is fed to the dogs. The flesh of the flippers and legs are sewn into skins and allowed to ferment. When the flipper is boiled it is regarded as an excellent food (Spencer, 1959:374). Skull bones of these animals are very dense and may have also been carried to hunting sites or collected on the beach for materials to manufacture artifacts.

In summary, the faunal analysis has pointed out several important aspects from which to interpret archeological evidence of the Walakpa site. The first and most important inference that can be made is that there has been a change in the seal populations between the Birnirk and Early Thule periods and the possibility of larger sizes of ring seals in the Birnirk and Late Thule periods as compared to variations in size of the seals from the Early Thule period. This is thought to have occurred because of the nutritional defects of a shorter pupping season, caused by the earlier ice break-up in the spring during the possibly warmer, Early Thule cultural phase.

The second important inference which can be made from the faunal analysis is that there are two basic patterns of site utilization. The first is that of brief hunting camps represented by small numbers of seal and caribou kills. The elements that were left behind in these camps are butchered and discarded bones and a relative absence of choice meat-packet bones. It is thought that the better cuts or portions of meat were taken back to a base camp while the rest was left at the hunting site.

The second pattern of site utilization is that of a base camp site. Here we found that the reverse distribution of bones occurred. The choice or large meat packet bones made up the majority of the bone count, while the less desirable cuts made up significantly fewer bones. This would indicate meat input from the hunting camps.

Another important consideration is that during Birnirk times few whale bones were being introduced into the faunal inventory. The possibility that the Birnirk Eskimos were not systematically hunting large whales is quite significant for the origin of Thule culture and is discussed in greater detail on pages 97 and 113.

Archeological Analysis of the Walakpa Cultural Units

In order to clarify the cultural processes represented by the archeological assemblages unearthed at Walakpa Bay, it may be fruitful to examine the seasonal round of the historic Point Barrow Eskimos (Murdoch, 1892; Spencer, 1959), which can be viewed as a complex scheduling of various seasonal economic activities, which correlate with the maximum potentials of the various ecosystems. The seasonal round is manifested in a series of economic options so that when one ecosystem is at a low point, another ecosystem may be exploited. The seasonal options are ranked in order of their economic potentials, so that the primary option has the greatest energy yield, while the secondary and tertiary options are respectively less. If the primary option activity is successful, the secondary and tertiary options are less important and are used only to provide a variation in diet or activity. However, if the primary option should fail, the secondary and tertiary options become extremely important for replacing the major food resource. The scheduling of options will depend seasonally on the success of the primary option. These options are summarized in the discussion of the seasonal round and in Figure 1.

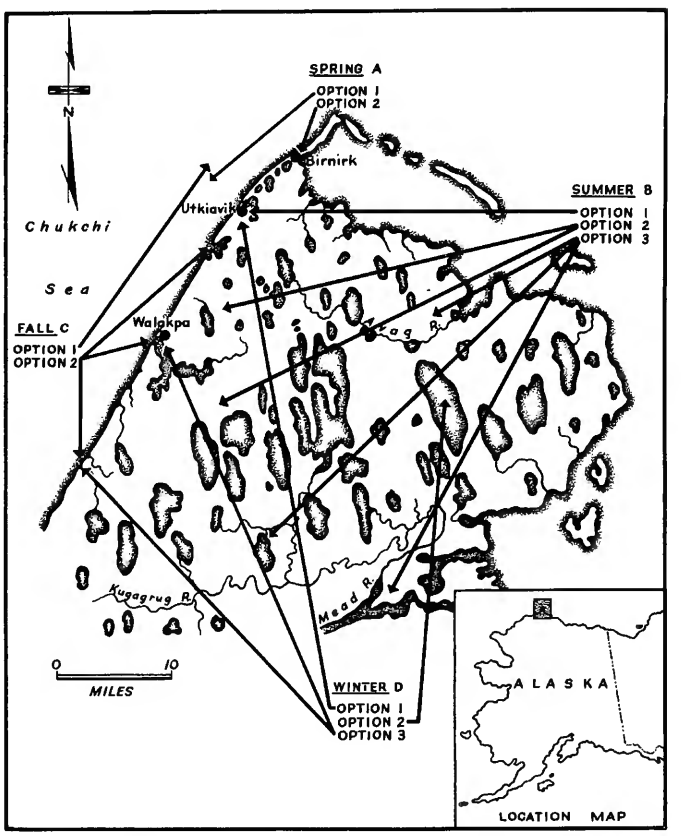

FIGURE 22.—Seasonal options and their general geographic location.

Historic Point Barrow Eskimo

The seasonal round of the historic Point Barrow Eskimo begins in the spring (Figure 22). During mid-April most people are gathered in the main village (Utkiavik). If the weather is favorable the whaling season will soon commence. The major activities revolve around preparations for whaling (spring, option 1). New gear is made and old gear is repaired and cleaned. A small amount of duck and caribou hunting (spring, option 2) can be done at this time. The whaling season continues through May and tapers off during the first week of June.

The whaling camps are situated on the ocean ice near ice leads. Camps are located near each other, and there is frequent intercrew cooperation. The remains of these camps will not, in most instances, survive the summer, and broken and discarded tools usually end up in the ocean leaving no evidence for the archeologist.

During June the offshore ice usually breaks up and drifts out to sea. Cooperative hunting may continue, concentrating on the bearded seal.

After the whaling season, several subsistence options exist. A hunter may remain in the village and participate in cooperative hunting (summer, option 1), or if he desires he may take his family to individual hunting camps (summer, option 2). These camps are

oriented toward hunting of seals, caribou, water birds, and fishing.

In July, the main caribou herds arrive, and they are hunted by cooperative hunting parties composed of the same people who make up the whaling crew. Some men will return to the village from the small summer camps to participate in the hunt, others prefer to stay in the summer camps and hunt caribou on their own. If a man returns, his family generally stays at a summer camp to concentrate on the fish resources (option 3). Although the caribou remain on the coast for a short time, they can be obtained in large numbers when hunted on a cooperative basis.

By mid-August, the walrus herds are moving along the coast with the drifting pack ice. Walrus hunting is another cooperative activity. The walrus is essential for the manufacture of many items needed to sustain life. The walrus herds have mostly left the area by the end of August at which time more effort is expended on fishing and duck hunting. The summer camps then become the primary center of activity.

In the fall a secondary whaling season might occur in the Barrow area (fall, option 1). At this time families start returning to the main village; but many individuals elect to continue hunting caribou and seal (fall, option 2). Most hunters are generally back in the main village by November (winter, option 1). Sometimes during the winter, a few families will leave the community to ice fish on the inland lakes and hunt caribou (winter, option 2) or venture down the coast to hunt seals and caribou (winter, option 3). However, the attractions of the village are great during the winter months of December through March, when one can visit with friends and participate in group activities, such as dances, games, and religious activities. This is also a period for repairing and manufacturing tools.

This brief sketch of the seasonal round of the historic Point Barrow Eskimo indicates that there are certain limitations placed on the Eskimo by the cyclical nature of the major food sources. In order to insure enough food for the long winter, it is important that a hunter participate, in cooperative economic associations. It is also clear that several options are available for a variation in the pattern of existence if a primary energy source should fail.

Archeological Considerations

In order for the archeologist to reconstruct the economic round of the prehistoric Eskimo culture, the investigator must define basic sets of interrelated variables associated with specific seasonal economic activities. The variables that should define economic pursuits are (1) settlement types and locations, (2) tool kit types, and (3) faunal analysis.

Settlement Types and Locations.—The settlement types to be used in this treatment are the type I, II, and III settlements as defined by Campbell (1968) for the Tuluaqmiut Eskimo.

Type I: The central base camp. This is the largest local group forming a political unit and a village. At Point Barrow, it is the village of Utkiavik.

Type II: Smaller, less permanent camps occupied for several months during the year. These camps are not necessarily occupied every year. The summer hunting or fishing camps belong here. Many of these camps exist along the coast, inland lakes, and rivers in the Point Barrow area, but none have been excavated.

Type III: Camps set up for short durations for various hunting and fishing activities. These are located in the geographical areas of exploitation.

Tool Kit Types.—Tool kit types have been defined on the basis of implied activities all of which are confirmed by research on the historical Eskimo. The tool kits utilized by an Eskimo group would include those for hunting whales, seals, caribou, birds, and fish; and also those used for processing, maintenance, and manufacturing; transportation; culinary; environmental protection; and community activities. Of this inventory of tool kits, it is presumed that only hunting tool kits, environmental protection tool kits (dwelling type and associated artifacts) and community activity tool kits (drums, games, etc., used during the winter), and possibly transportation tool kits (boats, sleds, and related gear) would be good indicators of seasonality. The other tool kits are less specific in their functions and can be expected to occur on almost every type of camp site at all times of the year.

Faunal Analysis.—Faunal and floral analysis are essential in understanding the seasonal round. In many cases, this type of data is not available to the archeologist. In the Arctic, animal and plant remains are usually well preserved; however, because of the remoteness of most sites and the tremendous cost of transportation, few investigators bring this material back to the laboratory and do not capitalize on this type of analysis. This is unfortunate because the age of animals at the time of death can be determined from tooth eruption and wear, growth ring patterns, and examination of the stages of epiphyseal closure. It also appears that butchering and meat-handling processes among the Eskimo may fluctuate during the year, depending on the type of camp site, the weather,

and if the meat is intended for immediate consumption or storage. This type of data is an extremely important tool for determining the seasonal aspect of an archeological site.

The Chronology of the Walakpa Site

The chronological sequence of the occupation levels at Walakpa represent one of the most complete series showing cultural development in northern Alaska. The superimposed nature of the occupation levels have yielded new data that will help clarify these cultural developments.

The chronology presented here is based primarily on the occurrence in the stratigraphic sequence of certain cultural features that seem to be significant. Only two wood-charcoal C-14 samples were recovered, and the dates fit the sequence reasonably well: 970±90 B.P. (Gak 2298)=A.D. 980 for the upper Birnirk level in the A area test trench, and 840±90 B.P. (Gak 2297)=A.D. 1110 for Early Thule in the A area test trench. Additional dates were analyzed using seal bones; the results are, as usual, unsatisfactory. These dates are: (1) level B-10, 1240±95 B.P. (SI-2158)=A.D. 710; (2) level B-8, 1695±95 B.P. (SI-2159)=A.D. 255; (3) level B-7, 1765±90 B.P. (SI-2160)=A.D. 185; (4) level B-6, 1070±90 B.P. (SI-2161)=A.D. 880; (5) level A-5, 1555±95 B.P. (SI-2162)=A.D. 395. Of these dates, only one falls close to the expected age, that is, sample 1 (SI-2158), A.D. 710 for Early Birnirk.

Birnirk is divided into three phases: Early, Middle and Late. It is suggested that these phases date as follows: Early Birnirk, A.D. 500–700; Middle Birnirk, A.D. 700–800; and Late Birnirk, A.D. 800–900.

These dates are arrived at by (1) the approximate date of A.D. 500 for the Kugusugaruk site, which is here considered to be the earliest Birnirk date, and (2) the terminal date of A.D. 900 for Birnirk, because the Early Thule occupation of Nunagiak must have occurred between A.D. 900–1000, as indicated by the rise in the sea level elevation. The break for Middle Birnirk is purely arbitrary, and further dating is being awaited.

Early Birnirk is characterized by having harpoon heads with medially placed trifurcated spurs. This type of spur is found exclusively in the lowest level at Walakpa and from two burials at Point Hope. The spur is also thought to have developed from Old Bering Sea, where many harpoon heads have trifurcated spurs. The major differences between Birnirk and the earlier Eskimo cultures seem to be (1) that the Birnirk open-socket harpoon head only occurs in Birnirk, and (2) there is a decreased emphasis on decorative motifs in Birnirk.

Middle Birnirk is a relatively subjective phase. It is typified as having harpoon heads with bifurcated spurs. This type of spur is found exclusively in two levels (B9 and B8) at Walakpa, as well as at other sites. There are variations and overlaps in spur styles; the sequence is not as clear-cut as it should be. However, it seems that the vast majority of harpoon heads from this phase have the bifurcated spurs. Many others have ornamental third spurs, but it can usually be demonstrated that these are strictly ornamental with the basic spur being bifurcated. These ornamental spurs may represent a transitional phase between the trifurcated and bifurcated spurs.

Late Birnirk did not appear at Walakpa but was found at mound A in the Birnirk site. The harpoon heads from this phase have single-pointed spurs with decorative medial lines recalling the bifurcated spur. Sometimes these medial lines separate tiny points, which also give the impression of an ornamental bifurcated spur. A decorative single point placed laterally at the top of the spur also recalls the bifurcated spur. This last feature occurs in the Early Thule phase.

The Thule sequence is divided into two phases, Early and Late. Early Thule dates from A.D. 900 to A.D. 1400, and Late Thule lasts up to historic contact.

The major difference between Late Birnirk and Early Thule is the dropping of the decorative medial line on the harpoon head spur and the disuse of many of the classic Birnirk harpoon heads, particularly the Birnirk open socket variety. The major differences between Early and Late Thule are that Early Thule has the classic Thule harpoon types and antler arrowheads with rounded shoulders. The Late Thule harpoon heads are obviously related to the Early Thule types, with many modifications and proliferations of the Early Thule types. The major difference is the change from round-shouldered antler arrowheads to the square-shouldered types and the use of ownership marks in the Late Thule phase. The date of A.D. 1400 is used for the transition because of the cooling of the climatic conditions and the lowering of the sea level, which occurred at this time. These two events probably triggered the beginning of communal whale hunting and the development of large villages—both of which are characteristic of Late Thule in northern Alaska.

Cultural Analysis

Birnirk

The Birnirk phase at Walakpa was found in both middens and underlays Early Thule cultural levels.

In the A area of excavation, a Birnirk level was encountered in the 1968 test trenches. Only the upper Thule levels of A area were examined in 1969, but the evidence indicates that it may contain several distinct levels of Birnirk occupation. The lower portion of the unit contained the earlier Naulock and Birnirk types. No structural features were excavated in the A area.

The B area contained three Birnirk-occupation levels. These consisted of a permanent house, a possible tent structure and three levels of trash middens. Estimation of population size is impossible without further excavations in the A area. However, the size of the A midden would indicate that it contains no more than one additional house, and it is doubtful that more than two households could have camped here at any one time.

The lowest Birnirk level was B–10. The harpoon heads from this level are all early types and may date this level as being one of the earliest Birnirk occupations in the Point Barrow area. This unit consisted of a trash midden and several upright posts. To the southwest of the trash midden there was an activity area defined by a large area of matted caribou hair. Associated with the caribou hair were several two-handed scrapers and a log. The insides of the two-handed scrapers were matted with caribou hair as was one end of the log. Caribou skins were placed over the log, and the scrapers were used to pull the hair away from the hide. The concave portion of the scrapers matched the upper diameter of the log.

From the faunal analysis of this level it appears that level B–10 represents a continuous habitation of several months duration. The dentaries on the juvenile caribou mandibles and the epiphyseal closure of other bones indicate that the animals were killed during the winter. The exceptionally high number of seals points to a long period of habitation. The remains of 162 seals were recovered from this level which represents a minimal number. This would average out to represent about a seal a day during the winter. This can be compared to the 18 seals recovered from level B–8, which apparently represents a short-duration Birnirk hunting camp. Many of the seals and caribou may have been killed locally. However, from the occurrence and absence of the animal elements it appears that as high as 37 percent of the seals and 42 percent of the caribou may have been killed at other places and their meat transported to this camp site. The number of walrus and bearded seal bones is significantly lower than would be expected.

Level B–9 appears to represent a spring-through-fall habitation. This is indicated by the eruption and wear on caribou dentaries along with an extremely high proportion of immature animal bones. Moreover, the wear pattern on the seal teeth found in this level is significantly different from those of the presumed winter levels. A high number of walrus, bearded seal, and polar bear bones may also indicate that this level was occupied from spring through fall.

A possible tent structure was discovered in this level (Figure 23). Three logs were found placed in a roughly U-shaped rectangle. Perhaps they had been placed over the lower edges of a tent-covering to hold them down. Eight horizontal planks make up an entrance platform near the center of the open end. Upright legs were placed at the corners where the logs come together. Between the entrance platform and the sides, there were several upright logs along the front edge. These uprights were probably used for the tent framework. Two upright logs in front of the structure and slightly to the west possibly served as drying racks. These logs were placed about 1.2 meters apart. All of the upright logs were cut off in the upper levels, and these portions of the logs were used for other purposes or by later inhabitants. Several other miscellaneous upright logs were found, but it is

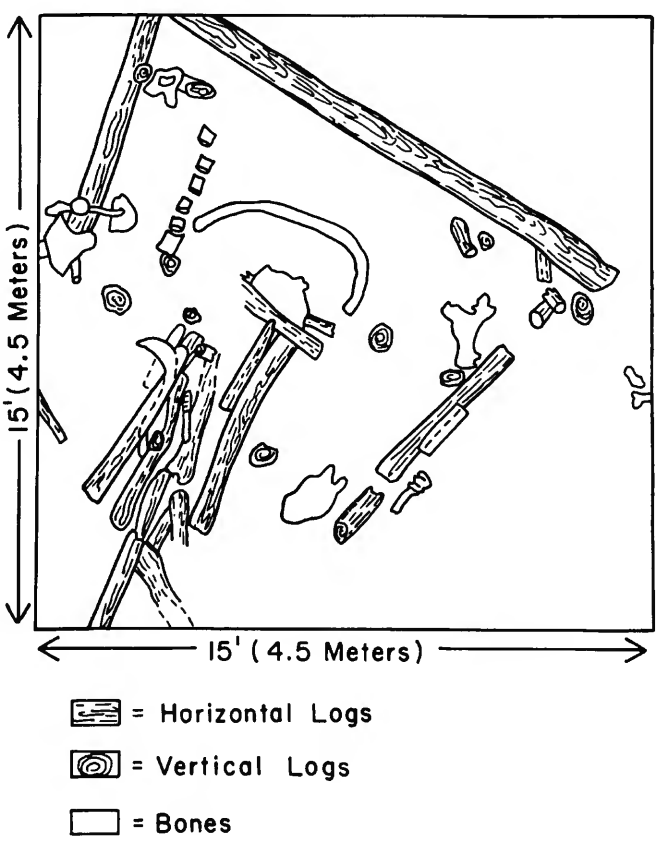

FIGURE 23.—B–9 occupation floor showing logs possibly used to hold down the tent walls, and logs used for entrance way.

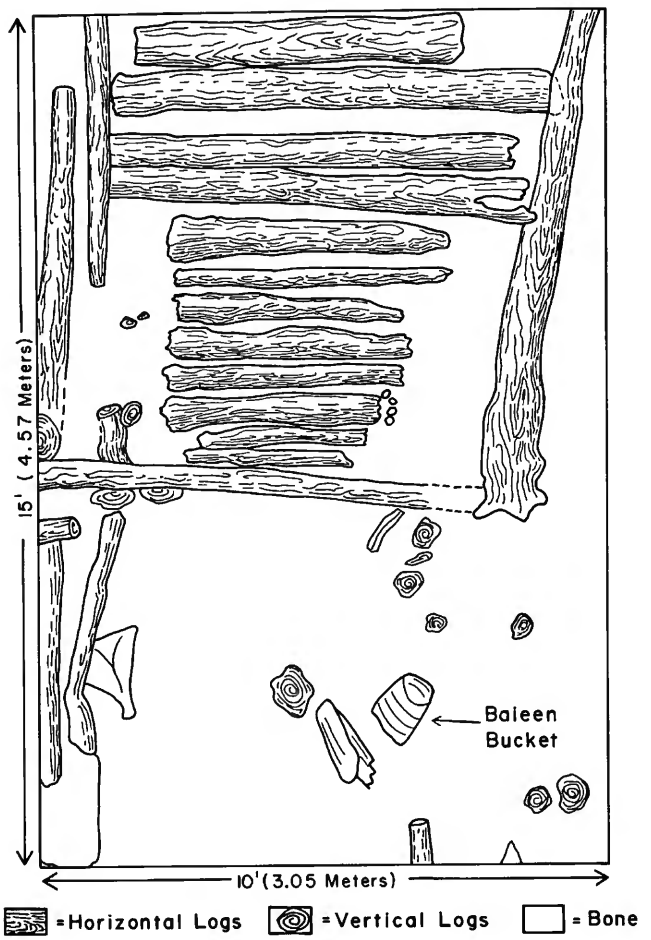

FIGURE 24.—Plan of house floor from B–8 occupation level.

impossible to say what their use may have been. They were probably associated with level B–10, as caribou hairs from level B–10 were found matted around them. Nothing indicates that the logs were intrusive.

The B–9 level is unique for the Walakpa site. It is the only level that apparently represents a spring-through-fall occupation of the site. There is no actual stratigraphic break between the B–10 and B–9 levels. However, it was observed that the logs at level B–9 overlayed the bones of level B–10. Secondly, there seemed to be a difference in the structure of the refuse deposition. This was further substantiated by the faunal analysis. It is for these two reasons that the levels were excavated and artifacts cataloged separately.

The B–8 level represents a brief hunting camp. Seals and caribou were the animals primarily killed or introduced into this occupation level. These animal remains are similar to those found in the later hunting camp levels, and the caribou dentaries point to this as being a winter site. This level is different from the hunting camps of the Thule periods in that a sod house was the dwelling used (Figure 24, Plate 5*a–d*).

The house remains consisted of a single room with a square wooden floor measuring 2.14×2.14 m (9×9 ft). There were several upright posts at the southwest corner and along the west side of the structure. These were probably wall supports. Cut sod was placed along the outside timbers with the grass mat facing downwards. There were no remains of the entrance tunnel and no roof timbers were found. It is possible that these planks may have been used by later occupants of the site and thus removed from this level. Whale bone apparently was not used in construction of this house.

Early Thule

Early Thule levels were found in both the A and B areas of the site. As the 1969 excavations did not reach the depth of the Early Thule level in the A area, little is known about it. The Early Thule level found in the test trench contained Natchuk and Sicco varieties of harpoon heads. Our information on the Early Thule occupation of Walakpa site comes from the B area. Six occupation levels were found in the B area, all of which contained harpoon heads and arrowpoints, which are similar to those of the Thule culture as defined by Mathiassen (1927b).

The six levels represent essentially the same type of occupation (Plate 4*a–c*). No permanent houses were found, and it is thought that tents were used for shelters. The only evidence for a tent occurred in the B–6 level, which consists of a few scattered large logs, and it is possible that it may represent another type of structure (Figure 25).

The patterns of occurrence of the faunal elements in these levels are nearly the same throughout the entire Early Thule continuum. They are thought to represent the results of brief winter-hunting encampments with the choice cuts of meat being taken to these base camps and leaving mostly discarded butchered elements at the kill sites. The area of occupation, including the A area, indicates that there were probably less than two or three tent sites in any one level, and the scarcity of bones and artifacts indicates that these probably represent single-family or single hunting-party occupations.

The lowest Early Thule level, B–7, had the largest concentration of artifacts (Plate 4*d*). These included the typical Thule harpoon heads and a Punuk harpoon head.

An activity area, where arrowshafts were manufactured, was found in the B–7 level. The debris

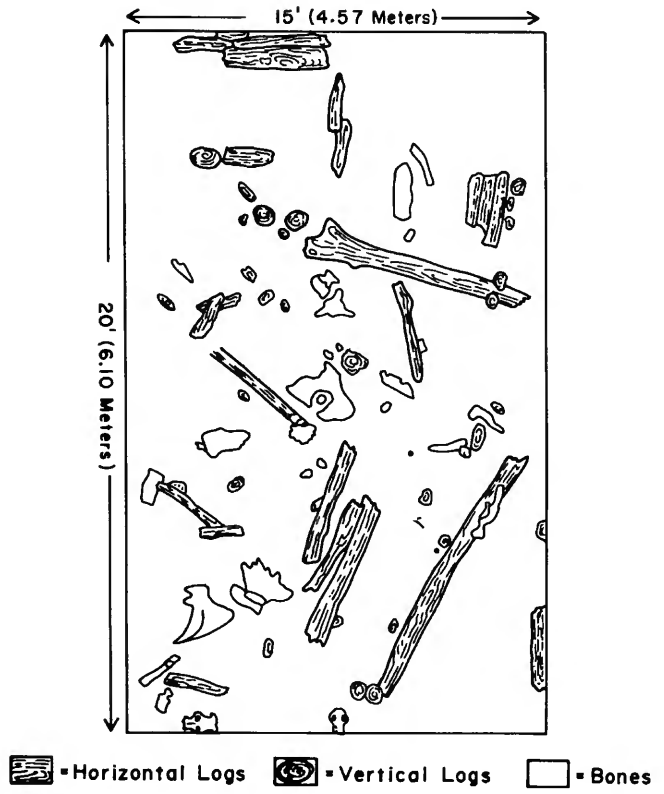

FIGURE 25.—B–6 occupation floor, showing logs possibly used to hold down the tent walls.

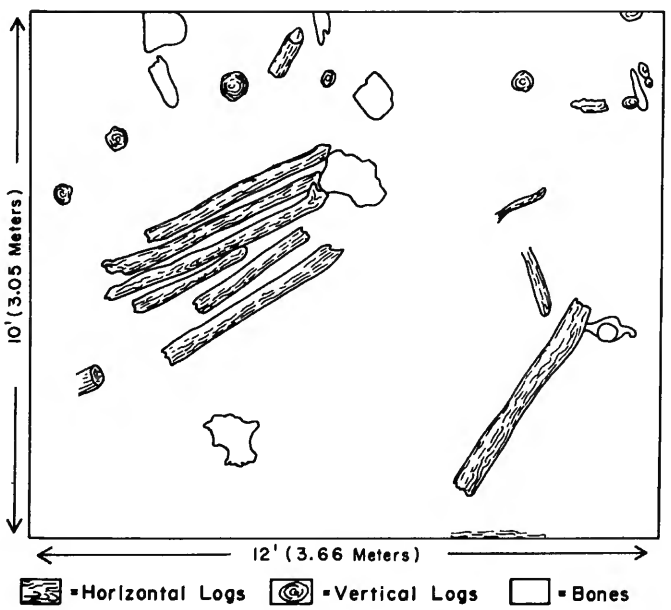

FIGURE 26.—A–5 occupation floor showing possible tent structure.

recovered from this area includes (1) small sections of driftwood in various stages of being split and carved into round shafts, (2) shafts that were apparently too curved to be straightened or that were otherwise found to be unsuitable, (3) several bundles of wood shaves collected into piles, which had apparently been saved for padding or kindling, (4) a hafted knife, (5) a worn-out flake-knife blade, (6) a small wedge, and (7) numerous pressure-resharpening flakes.

LATE THULE

There were at least nine Late Thule levels in the A area. However, the lower two, A–8 and A–9 were only tested and not excavated. Like the Early Thule levels, these are all considered brief winter hunting camps. No permanent structures were found. However, there were the remains of several tents (Figure 26, Plate 3*b*). There is no evidence to indicate that

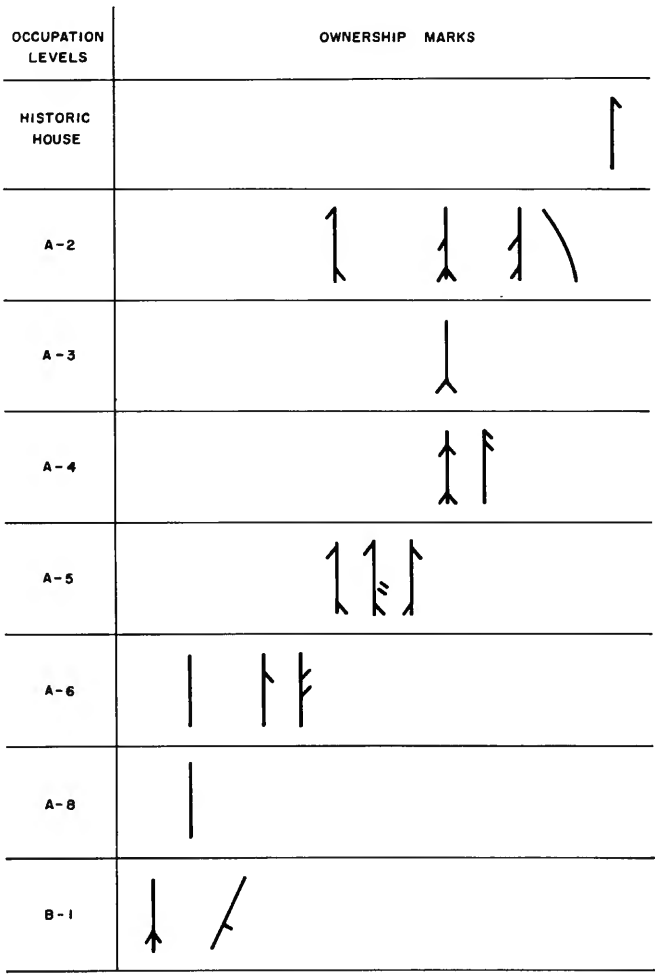

FIGURE 27.—The occurrence of antler arrowhead ownership marks in the Late Thule levels at Walakpa site.

TABLE 9.—*Summary of artifacts and faunal remains from the various occupation levels of each culture phase, Walakpa site*

Culture Phase	Mound Occupation Level	Faunal Remains Recovered	Minimum Number of Individual Animals	% of Total Possible High Energy Yield Meat Packets	% of Total Possible Low Energy Yield Meat Packets	% of Total Possible Waste Packets	Number of Faunal Associated Hunting Tools	Transportation: Sled	Transportation: Boat	Community Activity Artifact	Shelter Type	Season, as Determined by Faunal Analysis	Seasonal Option
Late Thule	A-1	Seal	13	27.	67.	09.	2	0	0	0	T	Late Fall	2-Fall
		Caribou	4	16.	32.	21.	5	-	-	-	-		-
	A-2	Seal	11	35.	74.	21.	7	0	0	0	T	Late Fall	2-Fall
		Caribou	6	28.	67.	36.	29				-		-
	A-3	Seal	6	21.	57.	15.	8	1	0	0	T	Late Fall	2-Fall
		Caribou	4	13.	33.	10.	16						
	A-4	Seal	10	35.	54.	05.	5	0	0	0	T	Early Winter	2-Fall
		Caribou	1	8.	51.	11.	8						
	A-5	Seal	12	26.	41.	05.	11	1	0	0	T	Late Fall	2-Fall
		Caribou	6	26.	23.	44.	47						
	A-6	Seal	13	33.	52.	08.	4	0	0	0	T	-	
		Caribou	3	34.	48.	16.	32	-	-	-	-	-	
	A-7	Seal	7	27	56.	05.	2	0	0	0	T		
		Caribou	3	15	34.	09.	11					-	
	B-1	Seal	7	22.	31.	06.	6	0	0	0	T	Spring	
		Caribou	3	08.	44.	16.	2	-					
		Whale	0		-	-	2						
Early Thule	B-2	Seal	6	24.	32.	12.	0	0	0	0	T	Winter	3-Winter
		Caribou	2	00.	29.	12.	1						-
	B-3	Seal	5	35.	35.	18.	2	0	0	0	T	—-	
		Caribou	3	16.	16.	08.	6						
	B-4	Seal	17	18.	57.	06.	4	0	0	0	T		
		Caribou	2	25.	25.	12.	2			-			
	B-5	Seal	6	21.	30.	11.	3	0	3	0	T	Winter	3-Winter
		Caribou	1	16.	19.	26.	5			-			
	B-6	Seal	12	32.	40.	09.	5	0	0	0	T		
		Caribou	2	16.	09.	25.	7					-	
	B-7	Seal	13	46.	34.	15.	15	0	0	0	T	-	
		Caribou	4	19.	27.	23.	13					-	
Birnirk	B-8	Seal	18	33.	61.	09.	21		-	-	-	-	-
		Caribou	4	15.	22.	14.	4	3	0	2	S	Winter	3-Winter
		Ugruk	2	-	-		-	-					-
		Walrus	1								-		
		Polar Bear	1				-						
		Whale	1				0	-			-		
		Bird	+				5					-	
		Fish	+				2	-		-			
	B-9	Seal	68	65.	53.	20.	5	3	0	2	T	Spring-Fall	1-Summer
		Caribou	11	64.	53.	24.	1						-
		Ugruk	3	-									
		Walrus	3	-			-						
		Polar Bear	3				-						
		Whale	1				0						-
		Bird	+				7						-
		Fish	+				2						-
	B-10	Seal	162	67.	52.	15.	27	3	5	5	S?	Fall-Winter	1-Winter
		Caribou	12	40.	53.	44.	2				-		
		Ugruk	7		-		0						
		Walrus	3		-		0	-		-			
		Polar Bear	3				0	-		-			
		Whale	1				0	-		-			
		Muskox	1				0						
		Bird	+				5						
		Fish	+		-	-	1			-		-	

+ Present in undetermined quantities, Missing data, T Tent, S Sod.

there were over two tents here at any one time. The tent remains were similar to that described for the B–9 level. They consisted of several logs placed horizontally in subrectangular patterns with horizontal planks making up entrance porches. The interiors around the logs were remarkably devoid of cultural debris. Only the central portions of the tents contained debris accumulations. In each tent, the clear area between the logs and the debris is believed to have been storage or sleeping areas, with either containers or skins having been placed on the floor. Most of these floors were covered with scattered cut sod.

The Late Thule phase at Walakpa is defined on the basis of ownership marks on the antler arrowheads. Ownership marks are identification signs that are carved on the body of the arrowheads. These marks occasionally occur on other objects but are found primarily on antler arrowheads and whaling harpoon heads—both communal activity tools with the marks serving to identify the killer or owner of specific animals.

Ownership marks, according to Spencer (1959:150) are not inherited, but a man designs his own mark when he feels he has sufficient equipment and prestige to merit having a mark. His mark is related to his father's in that it is similar in the use of the same motifs but with slight variations. Brothers have closely related marks.

When examining the marks from Walakpa (Figure 27), we see that there is a close relationship between the marks from the earliest level until the historic period. These marks are variations of slanted lines around a single straight line. Although it is not conclusive, I would suggest that these marks may indicate that the same family used Walakpa for their fall-hunting camp over the generations from perhaps before A.D. 1400 until the historic period. The same historic ownership mark occurs at Nuwuk, and it may not be too far out of line to suggest that the family who camped at Walakpa were Nuwukmuit.

Table 9 is a summary of the artifact and faunal remains from each of the levels at the Walakpa site.

Comparison of Walakpa and Other Birnirk and Thule Sites

Most archeological reports on Eskimo cultures contain detailed comparisons of trait lists. These lists are designed to show similarities and differences between various phases of Eskimo prehistory. As more sites are found and reported, various phases become less distinctive and often they may now be grouped together into larger cultural complexes. To illustrate this point, one can examine Ford's (1959:241) trait comparisons of Birnirk and Canadian Thule. He described 46 traits that tie Birnirk to Thule. However, from Walakpa and other excavations in Alaska and Canada, his trait list could now be expanded to include Thule II, Thule III, Thule IV, Sicco, and Tasik harpoon heads, tapering tang antler arrowheads, and seal scratchers as occurring in both Birnirk and Thule.

In another list, Ford (1959:241) described eight traits that first appeared at Nunagiak and were shared by Canadian Thule. These traits are (1) Thule II harpoon heads, (2) Tasik harpoon heads, (3) arrowheads with knobbed tangs, (4) harpoon socket pieces with wedge-shaped tangs, (5) bird dart side prongs, (6) bladder dart socket pieces with tubular and split tangs, (7) double-crescent thimble holders, and (8) gull hooks. Of this list, which was designed to prove that Nunagiak is the cultural link between Birnirk and Thule, the first four traits are found in collections from the Birnirk sites. As Taylor (1963:460) points out, these finds seriously weaken Ford's argument that Nunagiak was the transitional phase and thus brings Birnirk and Canadian Thule closer together.

Ford (1959:241–242) in another comparative list, notes 34 traits that first appeared in Canadian Thule and are found in later Point Barrow phases. But six of these traits are now found in either Birnirk or Northern Alaskan Early Thule levels at Walakpa. These are (1) single-edged, slate knife blades, (2) snow probes, (3) men's knife handles, flattened, oval in cross-section, (4) picks and mattocks with lashing notches, (5) crooked knives, and (6) cylindrical ulu handles.

Traits that are now found in Thule but not in Birnirk are (1) loose lance heads with open sockets, (2) fixed lance heads with wedge-shaped tangs and side blades, (3) weapon points of baleen, (4) square-shouldered antler arrowheads with spurred tangs, (5) Late Thule harpoon heads, (6) Thule bird darts, (7) barbs for salmon spears, (8) broad snow knives, (9) whale bone shaves, (10) winged needle cases, (11) lamps, and (12) soap-stone cooking pots. The present writer believes that many of the items in the above list will be dropped as exclusive to one or the other cultural complexes when more Birnirk sites are excavated and described.

To show that there was continuing influence from the Bering Straits region to the Point Barrow area, Ford (1959:242) pointed out traits shared between Punuk and later Point Barrow cultures. In this list he included the seal scratcher and bladder-dart mouthpieces. Both of these items were found in earlier cultural units at Walakpa. The seal scratcher, as mentioned above, was found in the Birnirk unit, while an excellent example of a bladder-dart mouthpiece was found in an Early Thule level.

Four traits supposedly link Okvik of the Bering Sea area and Nuwuk-Utkiavik (Ford, 1959:242). Among these are blunt, bird arrowpoints and three-piece adzes with handles lashed to the socket at right angles. The three-piece adz occurs in both Birnirk and Early Thule and the blunt, bird arrowpoint is found in Early Thule occupation at Walakpa.

The use of trait lists was of value in early days of Eskimo archeology. At the time the exact relationships between far distant cultures was not known. These lists, during the 1920s and 1930s, helped to show the relationships of these cultures from Greenland to Siberia. Now, however, we should turn to more sensitive diagnostic comparisons. It is felt here that the most diagnostic traits that can be used to indicate Eskimo cultural development and relationships are harpoon heads and, possibly, antler arrowheads. While their known distribution and chronological positions are still somewhat confusing, these artifacts, nevertheless, show general style changes through time.

Few sites have been found in which the stratigraphy

indicates temporal positions of various Birnirk and Thule harpoon heads and arrowpoints. In fact, in most sites, these artifacts have been discovered in separate middens and it is unfortunately impossible to tell which midden accumulated first, as C-14 dating is not that sensitive. Therefore, the stratigraphic continuum of the 17 levels of the Walakpa midden is important in that it precisely indicates the relative temporal positions of these artifact types. Therefore, the harpoon heads and antler arrowheads found in these levels will be compared with other sites of Birnirk and Thule age.

A second type of comparison will be made between Birnirk and Thule cultures on the basis of settlement size for the purpose of indicating possible group size and showing any significant change through time. This latter comparison is tenuous and is based largely on circumstantial evidence because many investigators generally fail to seriate habitations accurately into horizontally comtemporaneous units.

Northern Alaska

Most Birnirk sites occur in Northern and Western Alaska, and none have been found east of Point Barrow. Few of these sites have been excavated, and others, for various reasons to be explained, are not believed to be Birnirk by the present author.

BIRNIRK (Figure 28:9).—The Birnirk type-site, located midway between Utkiavik and Point Barrow, consists of 16 mounds. Seven of these mounds were excavated in part by Ford (1959). Three were excavated by Wilbert Carter of Tufts University between 1951 and 1953. Other excavations were conducted at Birnirk by Eskimos who were employed by Stefansson (1914:393), but the exact location of where they worked is uncertain. The mounds represent a long period of occupation, which may be as early as Old Bering Sea in age (Carter, pers. comm.), with occupations during all the Birnirk phases and including a Thule occupation.

The Birnirk occupation of the site can be grouped into three periods based on harpoon head types (Table 10). The earliest Birnirk occupations are found in mounds H, Q, and K. This phase, as at Walakpa, is marked by harpoon heads with medially placed, trifurcated spurs. They include the types of Birnirk, Naulock, Oopik, and Tuquok. Middle Birnirk artifacts, similar to those in levels B–9 and B–8 at Walakpa, are also found in mounds H and Q. These harpoon heads have bifurcate, laterally placed spurs. These were also found in mound B and C of Ford's excavations. The types represented here are Naulock, Birnirk, Natchuk, and Tuquok. Late Birnirk is well represented in the various structures of mound A, but also occurs in mounds J, R, H, and Q. This phase has the simple lateral spur, with a decorative, medial line. These spurs are found on Naulock, Tasik, Birnirk, Tuquok, Oopik, Katoktok, Tipiruk, Thule II, Natchuk, Sicco, and Alilu. Late Birnirk was not found at Walakpa.

The harpoon heads that were found at Birnirk, but were not found at Walakpa, are (1) Oopik, an open socket type with either lashing slots or grooves, barbless blades placed at right angles to the line hole, inset-side blades placed in the same plane as the line hole, and spurs with either single or multiple points placed either directly below or at right angles to the open socket (Ford, 1959:77, fig. 27b–4); (2) Katoktok, which is very similar to Oopik, except that it does not have the inset-side blades (Ford, 1959:80, fig. 28g), and (3) Tipiruk, which has an open socket, lashing slots and blades without either barbs or end blades (Ford, 1959:80, fig. 28h–1).

The Thule occupation of the Birnirk site is found primarily in mound H. It appears to be late in the Thule sequence and has only Thule II harpoon heads. Carter (pers. comm.) feels that the elevation of mound H is high enough to have remained dry during periods of high sea levels. However, it can be pointed out that this Thule occupation could have coincided with the drop in sea level of A.D. 1400/1500.

The antler arrowheads that I have been able to examine from Birnirk tend to follow the same sequence as is seen at Walakpa, with the rounded shoulder, straight tang varieties being common in the early phase structures, while the rounded shoulder, conical tang variety is typical of the late structures in mound A.

Two whaling harpoon heads should be noted as having been found at Birnirk. Ford (1959:103) reported one from mound A, which has a round Thule type of line hole, but the angular shape is suggestive of Punuk-whaling harpoon heads. Carter (pers. comm.) found a whaling harpoon head, along with other whaling gear in mound Q. The harpoon head from mound Q is much more Punuk looking than is the example from mound A. It is made of ivory, with an elongated, oval line hole, which is placed near the lower margin of the head. Of the two harpoon heads, I would say that Carter's specimen is much earlier than is Ford's, which was found with Late Birnirk harpoon head types. The only piece of Birnirk whaling gear found at Walakpa, was a large harpoon socket piece (Plate 16*e*). Little evidence is found at Walakpa of whale hunting, and Carter and I feel that the Birnirk hunters did not regularly hunt whales.

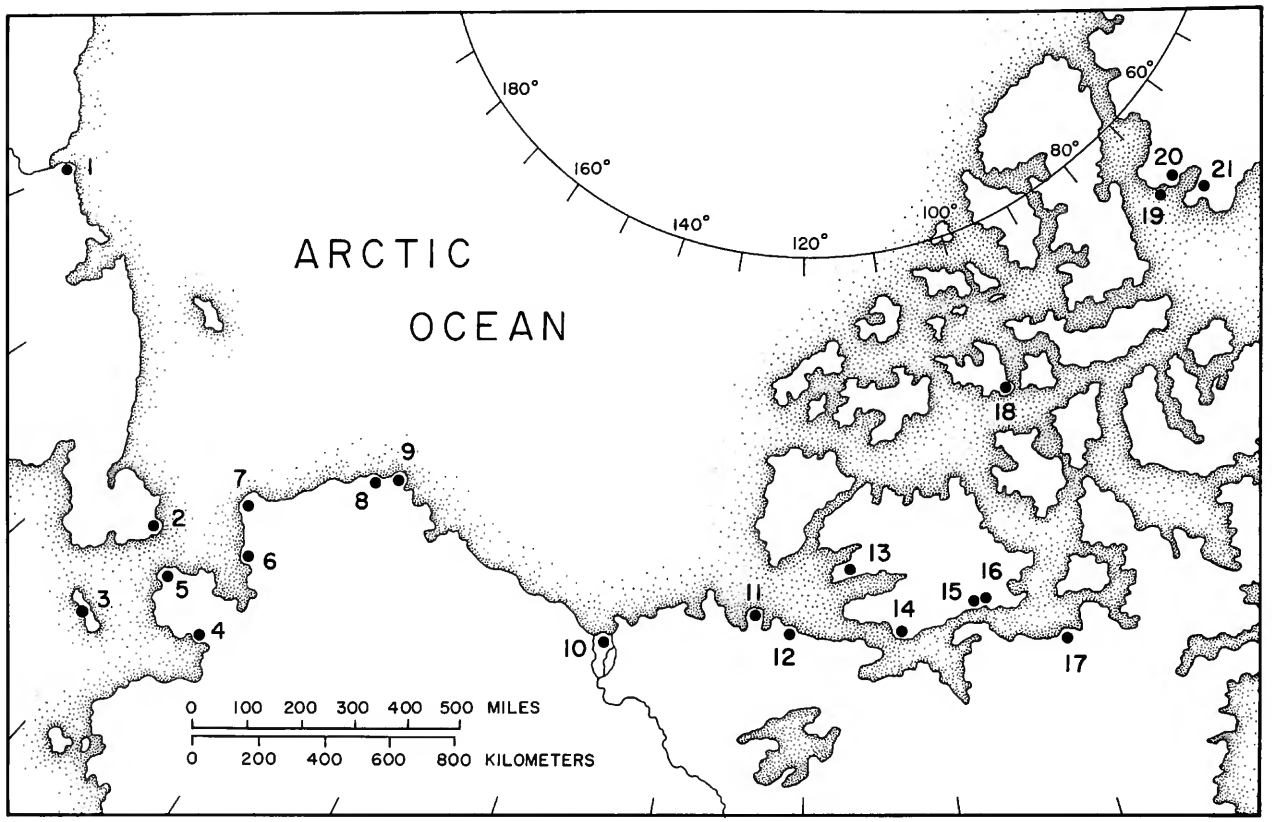

FIGURE 28.—Polar projection of the locations of Birnirk, and Early and Late Thule sites. Although the sites are on the coast, for emphasis they are shown as large dots and are designated by numbers with their names and cultural affiliation as follows: 1, Cape Baranov (Late Birnirk); 2, East Cape (Early and Middle Birnirk, Late Thule); 3, St. Lawrence Island (Early Birnirk); 4, Cape Denbigh (Early and Late Thule); 5, Cape Prince of Wales (Birnirk, Early and Late Thule-Punuk); 6, Cape Krusenstern (Birnirk, Early and Late Thule); 7, Point Hope (Early Birnirk, Early and Late Thule); 8, Nunagiak (Early and Late Thule); 9, Point Barrow sites: Birnirk site (Early, Middle, and Late Birnirk, Late Thule); Utkiavik (Late Thule); Koguk (Early and Middle Birnirk); Nunavak (Early, Middle, and Late Birnirk); Walakpa (Early and Middle Birnirk, Early and Late Thule); 10, Hershel Island (Early Thule); 11, Vaughn (Early Thule); 12, Jackson (Early Thule); 13, Memorana (Early Thule); 14, Lady Franklin Point (Early Thule); 15, Pembroke (Early Thule); 16, Clare (Early Thule); 17, Bell (Early Thule); 18, M1 (Early Thule); 19, Ruin Island (Early Thule); 20, Umanag (Early Thule); 21, Nûgdlît (Early Thule).

Carter (pers. comm.) estimates that the occupation of the Birnirk site during any one phase was rather small, consisting of possibly two to three houses. This fits the estimates of the size of the occupation at Walakpa.

NUVUWARUK (Figure 28:9).—Nuvuwaruk, located at Browerville, near Barrow Village, consists of three house mounds (Ford, 1959:55–56). Ford made several minor tests at the site finding only one Thule II harpoon head and no antler arrowheads. The placement of Nuvuwaruk into the Thule sequence is impossible on the bases of the evidence at hand, and it seems unlikely that any further work will be done at this site, as Browerville is now built up.

UTKIAVIK (Figure 28:9).—The Kugok burial mounds excavated by Ford are located at Utkiavik (1959:25–32). These mounds contained Birnirk harpoon heads of the trifurcate spur, Birnirk open socket, and the Naulock bifurcated spur types, as well as artifacts that have Old Bering Sea styles of decoration. Ford (1959:31) thought that these burials may be slightly earlier than most of the material from the Birnirk site. This was because of the Old Bering Sea decoration. Now, with the stratigraphic placement at Walakpa of the trifurcate-spurred harpoon heads as being early Birnirk, it seems that Ford's assumption was correct.

Most of the house mounds at Utkiavik represent Late Thule occupations. As the present village of Barrow is built over the site it is nearly impossible to

TABLE 10.—*Summary of occurrence of various Birnirk and Early Thule harpoon types in the Point Barrow area*

Birnirk and Early Thule Sites				Medially Placed Trifurcated Spurs						Laterally Placed Bifurcated Spurs							Laterally Placed Single Spur with Decorative Medial Line											
	Mound	Structure	Level	Naulock	Birnirk	Tuquok	Oopik	Katoktok	Tipiruk	Naulock	Birnirk	Tuquok	Oopik	Katoktok	Tipiruk	Natchuk	Naulock	Tasik	Birnirk	Tuquok	Oopik	Katoktok	Tipiruk	Thule II	Natchuk	Sicco	Thule III	Closed Socket
Walakpa	A		Early Thule Test Trench		–		–		–		–	–	–	–	–		–				–			1	1	1		–
	B		Early Thule Test Trench		–													–				–		1				–
	B		B-7		–	–												–				–	–	1	–	1	1	1
	B		B-8	–	–	–	–				4					2		–		–		–	–	1	–	–		–
	B		B-9	–	–	–	–	–			1							–		–		–	–	1		–		
	B		B-10	1	5	1						–		–				–		–			–	–		–		1
Birnirk	A	A		1	–	–			–	–				–				1	–	2	–		1	–	1	1		
		B		–	–	–				–	–		–	–	–			2	1	–	–		–	–	1			1
		C			–	–			–	–	–	–	–		–			1	2	2	–		–	–	1			
		E			–	–			–	–			–				2	3	–		–		–	–	7			
		F		–	–	–			–	–			–					1			–			–				
		H			–			–	–	–	–									1	2		1	–	2			
	B				–					–	1	–	–		–					–				–				–
	C				–					1	1	–	–		–		–			–				–	–	–		–
	D				–					–		–	–	–	–	–	1							–	–	–	–	–
	J			1	–					–				–	–		–		1	–					1	1	–	
	R									–							–	–	1		–			–			–	
	H				3	2				2	1					2	3	4	5	1		2	1	3	4		–	4
	Q			1	4	4	1	–		3	2	2					2	2	1	–				–	1		–	
Kugok					1	–		–		1	–					–		–	–	–	–	–				–	–
Nunagiak	C							–									–	–		–	–	1	–	2	1	1		–
			Punuk House		–	–	–	–	–	–				–		–			–			–		2	1	1		–
Kugusugaruk		1			4	–	–	–	–		5											–				–		
		2	–			–	–	–			1	1				–						–	–		–		–	
		3	–			–	–					1				–						–	–		–			
		4					–			–	1					–		1	–				–		–		–	
		5		–		–	–					1	–			–			1		2		–		–		–	
Nunavak		1	–	3	–			–		2			–	–	–	–		1		–	–		–		1	–	–	–
		3	–		–		–				1	1	–	–		–		–			–	–	–	–			–	–

tell how many houses were once there. In 1968 we mapped over 17 houses. Reports from villagers indicate that many of the modern houses were built over older houses with the older houses being destroyed. It is also reported that many houses have been washed into the sea. However, it appears that this village must have been quite large in former times. During 1968, we were able to test several areas of the site as Ford (1959:67–74) had earlier. The harpoon head types that were found here are Utkiavik, Nunagiak, Cape Smyth, Nuwuk, Brower, Kilimatavik, Kuk, Thule II, and Thule II with an extra barb.

To summarize the harpoon heads mentioned above, which have not been previously described: Cape Smyth is a closed socket variety, which resembles the Nuwuk type, but has blunt, end blade prongs, which are grooved for binding a thick end blade (Ford, 1959:89, fig. 32a–d); Brower is a closed socket harpoon head, which is extremely similar to Nunagiak, but is slotted for an end blade (Ford, 1959:90, fig. 32e–g); Kilimatavik has closed sockets, multiple barbs placed in the same plane as the line holes. One side is flat with the other side being round with the spur placed on the round side of the harpoon (Ford, 1959:89, fig. 31k–p). Barrow is the same as Nuwuk but significantly larger (Ford, 1959:92, fig. 32k–n). The antler arrowheads have square shoulders and spurred tangs.

The harpoon heads found at this site are similar to those from the Late Thule levels at Walakpa. Many of the types listed above were not found at Walakpa except in the historic levels. These are Kuk, Cape Smyth, Brower, and Kilimatavik. These types were also found at the historic village of Nuwuk, which is located at the tip of Point Barrow. It is thought here that these types are either protohistoric or historic in this area. The Barrow and Nunagiak types were not found in any of the Walakpa levels. Of the harpoon heads found at Walakpa only one type was not found at Utkiavik. This is the Thule IId as defined in this paper (p. 22). The antler arrowheads from Utkiavik are nearly identical with those from the Late Thule levels at Walakpa.

NUNAVAK (Figure 28:9).—The Nunavak site is located about 6.5 kilometers southwest of Barrow Village. This site consisted of two localities, one on the ridge north of Nunavak Lagoon and the other on the south side of South Nunavak Lagoon. W. B. Van Valin, a school teacher from Point Barrow, acting under a contract from the University of Pennsylvania Museum, collected several mounds, but I was unable to determine at which locality he excavated. House mound one contained Early Birnirk-Naulock harpoon heads with trifurcated spurs, as well as the Late Birnirk types of Tasik and Natchuk. It is felt here that there were two occupations of this mound, one in Early Birnirk and one which was near the end of the Late Birnirk phase. House mound three contained the Naulock and Birnirk open socket harpoon heads with bifurcated spurs.

Alfred Hopson, a resident of Barrow village, continued Van Valin's work at Nunavak for the University of Pennsylvania during the 1920s. He excavated a series of burials, but few artifacts were found as the preservation was poor. It is not possible to tie these burials in with the various mounds.

KUGUSUGARUK (Figure 28:9).—Dated between A.D. 318 and 804 (Rainey and Ralph, 1959:367), this site consists of 6 mounds about 16 km southwest of Barrow. It was excavated by Van Valin between 1917 and 1919. The results of his work are published in Mason (1930). There is some confusion as to the location of the site, as Mason describes a place that could only be Utkiavik, and the artifacts are described and cataloged at the University of Pennsylvania Museum as having come from Utkiavik (Barrow Village). However, when Ford (1959:19) was in Point Barrow in 1931–1932, Hopsen and others showed him where Van Valin had excavated, which was indeed at the Kugusugaruk site rather than at Utkiavik.

The site consists of several house mounds, as well as several charnel houses. Here, as at other Birnirk sites, all the phases of Birnirk culture are represented by the harpoon heads found in the various structures. Structure one seems to be the oldest, with harpoon heads that have trifurcate and bifurcate spurs of the Naulock and Birnirk types.

Houses two, three, four, and five contained harpoon heads with bifurcated Birnirk and Tuquok types of the later single-spurred varieties, house four had one Tasik and house 5 had one Birnirk, and two Oopik.

The antler arrowheads, which were found with the various harpoon heads, conform to the Birnirk sequence at Walakpa. The rounded shoulder, slightly bulbed, straight tang varieties occurred with the earlier harpoon heads. Conical tang, round shoulder examples occurred with the later varieties.

Between Kugusugaruk and Nunagiak, with the exception of Walakpa, no Birnirk sites have been reported. There are at least four areas in which house mounds have been reported (Ford, 1959:18). Although these are reported as recent, some of these may be Birnirk or Thule in age. One of these, Atanik (Figure 28:8), is indeed a historic village. There are numerous house mounds at Atanik and the situation of the site on Peard Bay is similar to the situation

of the Birnirk site on Elson Lagoon. I would suspect that several of these house mounds may be of an earlier age. The rest of the sites listed by Ford were not occupied or at least have not been referred to as sites occupied during the historic period. As Ford did not excavate these sites and as historic artifacts are found on the surface of most areas where there is good hunting, it may be possible that some of these sites are Birnirk in age.

NUNAGIAK (Figure 28:8).—The Nunagiak site, located 18 miles northwest of Wainwright, Alaska, consists of thirteen mounds (Ford, 1959:56). Ford tested seven of the mounds, but concentrated his work in three of the structures.

None of the mounds tested by Ford had any classic Birnirk occupations. In mound A, the only harpoon heads found were the closed socket Nuwuk variety. Mound B had at least two occupations, one was Early Thule in age with Sicco and Thule II harpoon heads. Above the Thule occupation in mound B was a later occupation with five Nunagiak-type harpoon heads. Nunagiak harpoon heads, named by Ford, are similar to Thule II, with two symmetrically placed barbs, but differ in that they have closed sockets. Ford (1959:89) contends that these developed from Thule II, but occurred later than the spread of Thule into Canada. At Walakpa, this type was found only in the historic levels, and it appears that Ford was right in that they developed too late to be part of the Early Thule tool kit.

Mound C is of considerable interest in that three Punuk heads were found in association with Early Thule harpoon heads. These included the Punuk types of III (a) x and vx as described by Collins (1937c: 118–120). The Early Thule types which were found were Natchuk, Sicco, Katoktok, and Thule II. It is not clear from Ford's monograph as to what he thought the differences between Punuk III(a)x and Sicco are, as he feels Sicco is a direct copy of III(a)x (Ford, 1959:86). Sicco may better be considered a Punuk-Late Birnirk cross-tie, as are the whaling harpoons from the Birnirk site.

The Birnirk types of Natchuk, Katoktok, and Thule II are considered here to be Early Thule, as their spurs in all cases but one are laterally placed and do not have the decorative medial line. I feel that these may represent a very early stage of Early Thule, as the Katoktok specimen does have a medial line and all of the Natchuk examples have ornamental side-blade slots. Furthermore, a Thule II harpoon head, purchased by Ford from an Eskimo who dug at mound C, had a decorative spur similar to the Thule II from level B–8 at Walakpa. However, the Nunagiak specimen did not have the elaborate decoration of the Birnirk example from Walakpa.

The antler arrowheads that were found in these mounds were of the rounded shoulder, conical tang variety. A spurred-tang arrowpoint was found near the entrance of the house in mound C, but it may be intrusive as this area was disturbed by relic collectors.

Mound C, which is apparently the earliest house at Nunagiak, was built below the present water level of the lagoon (Ford, 1959:58). Ford's conclusion was that the area has subsided since the house was constructed. However, if the house were built during the period when the sea level was lower than it is now, the subsequent rise in sea level might account for the flooding rather than the subsidence of land. Further, if the dates of A.D. 1000/1100 (Hume, 1965:1166) are correct for the rise in the sea level, one must infer that mound C at Nunagiak was built before that time. As pointed out above, the harpoon heads found at this mound appear to be extremely Early Thule in age. This would date the beginning or transition of Birnirk to Thule at some time prior to A.D. 1000/1100.

POINT HOPE (Figure 28:7).—There is evidence of an Early Birnirk occupation at Point Hope. Three Birnirk burials were excavated by Larsen and Rainey (1948, pl. 87:1–4), which contained the Early Birnirk, trifurcated spur harpoon heads of the Tuquok and Naulock types. The Tuquok harpoon head from burial TB 171 is of an extraordinary size and may have been an early whaling harpoon head.

The antler arrowheads from the Birnirk burials are the straight tang variety and the knobbed tang variety. Both of these types were found in the Walakpa-Birnirk levels and are considered early. No house mounds were excavated that contained Birnirk artifacts at Point Hope.

TIGARA (Figure 28:7).—The Western Thule finds from the Tigara locality at Point Hope, burials 253 and 186, are probably very early Early Thule in age. Two examples of the Birnirk-Natchuk type (Larsen and Rainey, 1948, pl. 88:4–5) and one Thule II with a lateral spur, similar to the spur on the Walakpa specimen from Level B–9 (Larsen and Rainey, 1948, pl. 88:3), were found. The antler arrowheads from these burials were of the rounded shoulder, knobbed tang variety, which is common in the Walakpa-Birnirk and Early Thule levels.

JABBERTOWN (Figure 28:7).—The Western Thule house found at Jabbertown is also Early Thule in age. The Thule II harpoon head (Larsen and Rainey, 1948, pl. 95:1) is closely related to the Birnirk-Thule II from Walakpa with a vestigial spur, but this specimen has an end-blade slot. Plate 95:2 (Larsen and

Rainey, 1948:175) is an Early Thule Natchuk type harpoon head. The antler arrowheads from this house have conical tangs similar to the Early Thule arrowheads from Walakpa.

OLD TIGARA (Figure 28:7).—The village of Old Tigara at Point Hope is probably a Late Thule historic village (Larsen and Rainey, 1948). In 1924 there were 122 house mounds, but by 1940 only 70 had not been washed into the ocean (Larsen and Rainey, 1948:20). The artifacts collected by Larsen and Rainey included the harpoon types of Kilimatavik and Nunagiak. These were found along with square-shouldered antler arrowheads with spurred tangs. Rassmussen, as reported in Mathiassen (1930a: 154), made a collection from Old Tigara. His collection included two Thule IIb, as defined in this paper, a variant of Thule II with an extra side barb, a typical Thule II, Nuwuk, Kilimatavik and a variant of Thule IV (Mathiassen, 1930a, pl. 12:1–7).

It can be seen that this village has a long period of occupation; in fact, the village of New Tigara is simply an extension of this older site. The artifacts collected by Rasmussen are more like those from the Late Thule occupation at Walakpa than those collected by Larsen and Rainey. As it appears that this village is growing by accretion, and as the older houses are being washed away, it would also seem that some of Rasmussen's artifacts may date earlier than others, particularly those collected by Larsen and Rainey. Rasmussen's Thule IIb is identical to those from the Late Thule levels at Walakpa. His Thule II variant is very similar to one we collected from a Late Thule house at Utkiavik. The Thule III and Thule IV may fit either into Birnirk or Early Thule. The rest of the harpoon heads found by Rasmussen, and Larsen and Rainey are considered to be either protohistoric or historic in age.

Western Alaska

CAPE KRUSENSTERN (Figure 28:6).—Giddings (1965) reported both Birnirk- and Thule-age sites from Cape Krusenstern. These sites now have been analyzed, and a manuscript is being written by Douglas Anderson of Brown University. The Birnirk remains from the beach ridges at Cape Krusenstern consisted mostly of stone artifacts, as the wood and bone preservation was poor. Only one harpoon head was recovered, and it was not typical of Birnirk from Point Barrow. This harpoon head had a closed socket and an end blade slit that was situated in the same place as the line hole. Morphologically, it is similar to the Nuwuk variety at Point Barrow, but it is much longer from the line hole to the end blade than are the Nuwuk types.

The chipped stone is much finer in technique than are the Birnirk examples from Walakpa. There also seems to be a greater proportion of stone artifacts at Cape Krusenstern, as fewer than two dozen flaked stone artifacts were found at Walakpa.

The Early Thule houses at Cape Krusenstern had better preservation than the Birnirk houses. They produced harpoon heads of Natchuk, Thule II, Thule III, Thule IV, and Sicco-Punuk IIIa(x) types. These appear to be quite early in the Thule sequence as several examples have bifurcated spurs.

The antler arrowheads also appear to be very early with round shoulders and straight, bulbous, or conical tangs.

Several other houses appear to be later in the Thule sequence having only Thule II harpoon heads, and one has a Nunagiak-type harpoon head.

KOTZEBUE (Figure 28:6).—The archeology of the Kotzebue area has been defined by Giddings (1952) and VanStone (1955). From various sites on Kotzebue Sound and the Kobuk River, a fairly good chronology for Late Thule occupation has been worked out. The sequence includes: Ekseavik, A.D. 1400; Old Kotzebue, A.D. 1400; Intermediate Kotzebue, A.D. 1550; and Ambler Island, A.D. 1730–1760. These sites have a slightly different aspect from those of the Point Hope area and the west. In this area there was continued strong contact with the Punuk culture of the Bering Straits, with emphasis on inland fishing. However, all phases contain harpoon heads in the cultural inventory, which can be compared to the Late Thule cultures of the northern coast.

The harpoon heads that occur in the Ekseavik collection are Thule II, Thule III, and a local variety of Nuwuk. The Nuwuk harpoon heads differ from the northern varieties in that they are constricted both above and below the line holes. They also have a local decorational motif that does not occur at Walakpa. The antler arrowheads have square shoulders and spurred tangs. Other than the local embellishment of the Nuwuk harpoon heads, this culture phase is represented by the harpoon heads and antler arrowpoints, which are very similar to those from the Walakpa Late Thule.

Old Kotzebue harpoon heads are identical to the Nuwuk type found in the Early and Late Thule levels at Walakpa. The type of decoration found on the Nuwuk harpoon heads here is quite similar to the decoration on those from the Point Barrow area. The antler arrowheads found here are also square shouldered with spurred tangs.

The Intermediate Kotzebue is probably very closely related to the protohistoric periods of the northern coast. The harpoon heads found here are Kilima-

tavik, Nuwuk, and a possible variant of Nunagiak. The antler arrowheads have square shoulders and spurred tangs. This culture phase compares very favorably to the historic and protohistoric levels at Walakpa, Nunagiak, and Nuwuk.

AHTEUT (Figure 28:6).—Ahteut, originally excavated by Giddings (1952), is an Early Thule occupation in the Kotzebue area. It has harpoon heads, which include the types of Thule II and Thule III, Punuk IIIa(x), which have design elements typical of Punuk. The antler arrowheads have rounded shoulders and knobbed tangs. With its date of A.D. 1250, this phase fits in the Early Thule levels at Walakpa.

CAPE PRINCE OF WALES (Figure 28:5).—Two Birnirk sites are reported at Cape Prince of Wales (Collins, 1940:558). One of these sites is Kurigitavik and the other, located 3.2 kilometers north of Wales, is known as the Beach Midden. Neither site has been described in detail.

One Birnirk open socket harpoon head was found at the Beach Midden site. However, the head was poorly preserved, and the spur is no longer present. A carbon-14 date was taken from a nearby cut at the same level as the Birnirk harpoon head, and yielded a date of 1480±240 B.P. (P–63) (Rainey and Ralph, 1959:368).

KURIGITAVIK (Figure 28:5).—Kurigitavik is thought to be a single midden containing several occupations (Collins, 1940:562). An Ipiutak type 1 harpoon head was found in the lowest level. This type of harpoon point is very close to the Oopik open socket harpoon head of the Early Birnirk. It has a medially placed, trifurcated spur. A side blade slot, which is in the same plane as the round line hole, is cut completely through the harpoon head. A carbon-14 date, taken from nine small pieces of wooden shafts, is dated 1320±230 B.P. (P–65) (Rainey and Ralph, 1959:368). This date of A.D. 637, indicates that Ipiutak lasted longer in Western Alaska than it did in Northern Alaska.

Above the Ipiutak level at Kurigitavik, there occurred artifacts that Collins (1940, pl. 16:8, 9) described as containing Birnirk-like harpoon heads that were transitional into Thule. These Birnirk-like harpoon heads were Natchuk and Thule II with an ornamental bifurcated spur. These Thule II harpoon heads have more of a Thule appearance than Birnirk, and I would place them as being similar to the Early Thule from Point Hope and Nunagiak.

The upper levels of Kurigitavik produced harpoon heads that were of the later Thule II types, as well as Punuk harpoon heads.

The antler arrowheads from the Early Thule levels at Kurigitavik are, in general, similar to those from Walakpa, in that they have rounded shoulders and conical tangs. The later examples have square shoulders and spurred tangs.

NUKLEET (Figure 28:6).—At Cape Denbigh, Giddings (1964) described the Nukleet culture. This culture is divided into three phases: Early, Middle, and Late. The earliest phase, according to Giddings (1964:116), dates prior to A.D. 1250 and is related to Punuk with Birnirk cross-ties. The harpoon heads found in this level are Sicco or Thule III and a spurred variety of Thule II. The antler arrowheads from this level are of the Birnirk and Early Thule varieties and not Punuk. These arrowheads are round to oval in cross-section, while, as mentioned above, Punuk arrowheads are triangular in cross-section (Collins, 1937c:222). They have rounded shoulders and both conical and knobbed tangs. I believe that this unit can be equated with the Early Thule occupations described above. The Punuk harpoon head type is either Sicco or Thule III, a type found in both Late Birnirk and Early Thule, and other traits such as the antler arrowheads also appear in Early Thule and Late Birnirk.

St. Lawrence Island

Birnirk-related harpoon heads were found at various sites in the St. Lawrence Island area (Figure 28:3). These harpoon heads occurred at Seklowaghyaget, Ievoghiyok, Miyowagh, Hillside, Cape Kialegak, Kukulik, and the S'keliyuk sites. All of these sites are of Old Bering Sea or Early Punuk ages. The occurrences of the earliest Birnirk-like types were at Miyowagh and S'keliyuk. The harpoon head that has been named Type IIIx by Collins (1937c:104) is very similar to Naulock, but it is decorated with Old Bering Sea art styles. The Type II(a)y harpoon head found at Miyowagh is similar to the Tuquok variety of harpoon head, which has a trifurcated, medially placed spur and was found at Point Hope in the lowest level at Walakpa. Type II(a)y found at Miyowagh, S'keliyuk, and one on Cape Kialegak of St. Lawrence Island, is apparently Early Punuk in this area of the Arctic. Another Birnirk harpoon head found here, Type IIx of Collins' (1937c:102) classification, is similar to Oopik. This type of harpoon head is Old Bering Sea and Early Punuk in age.

Type III(a)x in Collins' (1937c:118) classification, as pointed out above, is identical to the Tasik type. It is Early Punuk in age and lasts in various forms through the Punuk cultural phase. It occurred at the Seklowaghyaget, Ievoghiyok, Miyowagh, and Hillside sites.

Antler arrowheads from these sites have been classified into at least seven types (Collins 1937c:135). The Old Bering Sea types range from little or no shoulders to rather square shoulders with tapering tangs. Some have end-blade slots and barbs, while others are just barbed. A Walakpa specimen (Plate 19*a*) from the lowest Birnirk level is similar to the Old Bering Sea types with end blade slits, but differs in that its shoulder is not as rounded and it has two small asymmetrical barbs.

The later Old Bering Sea-Early Punuk types are extremely important, as they show the relationship of antler arrowheads from Old Bering Sea to Birnirk. These are types 5 and 6 in Collins' classification. These have rounded shoulders with slight knobs (Collins, 1937c, pl. 34). They range from single barbs to no barbs. In general these types are identical to those found at Walakpa and the Birnirk site. A Birnirk specimen from Walakpa (Plate 51*p*) has the deeply cut barbs and is nearly identical to the one pictured by Collins (1937c, pl. 34:6).

The antler arrowpoints from S'keliyuk are in general of the same types as described above (Ackerman, 1962). However, Ackerman (1962, fig. 3) describes an example of the conical tang variety. The conical tang was found in the Birnirk levels at Walakpa. The Walakpa and the S'keliyuk finds indicate an early date for the appearance of this arrowhead-tang type.

The later Punuk type of arrowheads are different from either those of the Old Bering Sea age or of Birnirk. They have as their most characteristic feature triangular cross-sections and most are made of ivory (Collins, 1937c:222). None of these types of arrowheads have been reported from any Birnirk site.

Siberia

EAST CAPE (Figure 28:2).—At the Uelen and Ekven cemeteries on East Cape Siberia, there were burials that contained Birnirk or Birnirk-related harpoon heads (Arutiunov, Levin, and Sergeev, 1964; Arutiunov and Sergeev, 1968; Levin 1964a, 1964b; Okladnikov and Beregovaia, 1971). The burials, based on Walakpa artifacts, would fall into the Early and Middle Birnirk periods.

Burial 17 would be the earliest, with harpoon heads of the trifurcated-spur variety of a Birnirk and Tuquok-Naulock cross. This harpoon head has the inset side blades of the Tuquok, and the end-blade slit of the Naulock types. A closed socket harpoon head was found that fits Collins' (1937c:109) type IIIX, with an end-blade slit, which is in the same plane as the line hole. It has a trifurcated spur, with the center point being longer than the two lateral points. A Naulock harpoon head from burial 17 has a single lateral spur with a secondary, decorative point.

The harpoon heads from burial 6 are a Birnirk open socket harpoon head that has a bifurcated, lateral spur and a closed socket harpoon head. The spur of the Birnirk type has several decorative points on the outside margin of the spur, which is similar to those from Walakpa level B–8. The closed socket harpoon head is broken, and it is impossible to tell from the illustration if the end-blade slit is at right angles to the line hole or in the same plane.

Harpoon-head examples of simple bifurcated, spurred Birnirk, Naulock, and Natchuk types were found in burial 5. An Oopik harpoon head was found that had a trifurcated spur without the decorative line on the middle point. A closed socket Thule IV harpoon head was also found. This burial appears to be the youngest of the three burials from Uelen.

Mathiassen (1930a, pl. 18) pictures several later Thule types from East Cape. These are the harpoon type of Thule I, Thule III, and a variant of Thule II. Also included in this collection is one square shouldered, spurred tang antler arrowpoint. This collection was acquired by Knud Rassmussen from local natives, and it is impossible to tell their exact proveniences (Mathiassen, 1930a:72).

CAPE BARANOV (Figure 28:1).—At Cape Baranov near the Kolyma River, several examples of Birnirk harpoon heads have been found (Beregovaia, 1953, Okladnikov and Beregovaia, 1971).

Three houses have been excavated at Cape Baranov that are Late Birnirk in age (Okladnikov and Beregovaia, 1971). All of the harpoon heads from these houses have laterally placed, single spurs with decorative medial lines. Only two types were reported, Tuquok and Birnirk. House one contained eight Birnirk open socket harpoon heads and five Tuquok examples. House five produced three Birnirk open socket harpoon heads and three Tuquoks. A house in another nearby site yielded one Tuquok with the same type of spur.

These types of harpoon heads did not occur at Walakpa but were found in mound A of the Birnirk site and should be considered Late Birnirk in age.

Canadian Arctic

HERSHEL ISLAND (Figure 28:10).—The first site east of Point Barrow that has an early cultural component is the Hershel Island site (MacNeish, 1959).

The size of this site is not reported. The harpoon

types found here are Thule I, Thule II, and Nuwuk. The antler arrowpoints have rounded shoulders with the knobbed tangs. This site also contained Barrow curvilinear pot sherds. The artifact types from this site are mostly comparable to the Early Thule levels at Walakpa. The major difference is that the Thule I harpoon head was not found at Walakpa. This is probably a matter of luck rather than its absence at Walakpa. As it has been pointed out above, the harpoon-head sample size from these levels is very small. It is felt that when further investigations are conducted in the A area of Walakpa, the Early Thule harpoon-head types, which did not occur in the B area, will be found.

Barrow curvilinear pottery has been found in Canada and is used to point to Birnirk origins. However, it has been found in all three cultural units at Walakpa and should not be used as a temporal indicator.

VAUGHN (Figure 28:11).—The Vaughn site, located at Cape Parry, has two house middens (Taylor, 1972:8). The harpoon head types are Tasik, Thule II, and Nuwuk. These harpoon heads have lateral spurs that do not have a decorative medial line. The antler arrowpoints have rounded, nearly square shoulders and knobbed tangs. Many traits that have been listed by Taylor give this site a nearly western flavor. These traits are the absence of soapstone, quartzite scrapers (which are common in Birnirk and Early Thule levels at Walakpa), the form of the adz handle, and the incised barb on antler arrowheads.

The only feature that is found here and is not found at Walakpa is the tendency of the antler arrowheads to have square shoulders. This type of shoulder occurs at an early age from this point eastward and is considered by Collins (1951:563) to have developed in the Canadian Arctic during the Thule cultural period. This is substantiated since the square shoulder does not occur at Walakpa until later in the Thule phase.

Taylor (1972:12) felt that this site is well-developed Canadian Thule and dates the same as Naujan and the M1 site. I see no reason to date it as Late Thule, as most of the taits listed by Taylor are found in Birnirk and Early Thule levels at Walakpa. It seems logical to place this site chronologically, as being related to the Early Thule levels at Walakpa; but because of the squarish shoulders of the antler arrowheads, it appears to be slightly later than the occupation at Hershel Island.

JACKSON (Figure 28:12).—This is a small site adjacent to the Vaughn site on Cape Parry (Taylor, 1972:14). It consists of at least three house mounds. The harpoon head types found here are Thule I, Thule II, Thule III (which has side grooves), possibly Alilu, Nuwuk, and two late Dorset culture harpoon heads. The arrowpoints have square shoulders with knobbed or spurred tangs. Here again Barrow curvilinear pottery and pebble scrapers were found. Of interest is the occurrence of the Eastern Thule-type mattock handle (Taylor, 1972, pl. 3c) and the spurred tang antler arrowhead (Taylor 1972, pl. 3e, f).

Taylor (1972:25) felt that this site represents an established stage of Thule, not proto-Thule, but is a contemporary of Nunagiak. Carbon-14 dates of this site are A.D. 744±100 (M–1509) and A.D. 774±100 (M–1508), but Taylor estimated its age as approximately A.D. 1200. The occurrence of the Thule III with ornamental side-blade grooves and an Alilu harpoon head, along with the pebble scrapers, argues for an earlier age. However, the mattock handle and spurred-tang antler arrowheads suggest that it is probably younger than the Hershel Island and the Vaughn sites.

MEMORANA (Figure 28:13).—On Victoria Island there are several sites that probably date the same as the Jackson site. The first discussed is the Memorana site (McGhee, 1971:166). This site consists of four oval-shaped houses. The harpoon types are Thule II and Thule III.

Several of the Thule II harpoon heads have a single barb (McGhee, 1971:185, pl. 6b) and may be of the Late Birnirk-Early Thule-Natchuk type. The antler arrowheads have square shoulders and spurred tangs.

McGhee felt that this site is fairly old and is contemporaneous to Nunagiak, because the harpoon heads have lashing slots rather than drilled holes (McGhee, 1971:167). Thule II harpoon heads from Early Thule levels at Walakpa have both lashing slots and drilled holes. For this reason and because of the antler arrowheads, I would place this site closer to the Jackson site in age.

LADY FRANKLIN POINT (Figure 28:14).—Sicco and Alilu types of harpoon heads were reported from a collection from Lady Franklin Point (Taylor, 1963: 458). Taylor (1972:35) in search of a possible site with these harpoon head types, excavated a site at Lady Franklin Point. This site had 21 house mounds. It produced harpoon heads of the Thule II, the end-blade, slotted variant of Thule II, and the Nuwuk closed socket type (Taylor, 1972:39). These were associated with antler arrowheads with rounded shoulders and knobbed tangs, tapering tangs and square shoulders with spurred tangs.

Taylor (1972:39) felt that the artifacts from this site would suggest an occupation no older, and perhaps younger, than Nunagiak. I would concur with his evaluation, but would suggest it may be older than

the Memorana or Jackson sites, as the rounded shoulder, knobbed tang variety of antler arrowheads and the lack of soapstone point to a close relationship with both Hershel Island and the Vaughn site. It would be interesting to know the exact provenience of the arrowheads and see more of the house mounds excavated, as there is a possibility that not all of the house mounds represent the same stage of cultural development. This site may have earlier components than is indicated by the brief testing.

PEMBROKE (Figure 28:15).—The Pembroke site, located at Cambridge Bay on Victoria Island, has twelve structures (Taylor, 1972:44). Among the artifacts found here are a single-barbed harpoon head and a square-shouldered antler arrowhead. Taylor felt that the harpoon head is of the Natchuk type and hints an early age. Close examination of this harpoon head indicates that it is probably a broken Thule type II which has had the edges refaceted, giving it a Natchuk appearance. This would indicate that this site dates more closely in time to the Jackson and Memorana sites.

CLARE (Figure 28:16).—The Clare site, located near the Pembroke site, is apparently a caribou hunting station. It consists of as many as 11 tent rings (Taylor, 1972:46). The predominant artifacts are the same type of antler arrowheads as were found at the Pembroke site. No harpoon heads were reported from here, save a preform which could be either Nuwuk or Thule IV. It is felt that the Clare site dates about the same age as the Pembroke site.

BELL (Figure 28:17).—The Bell site on the Ekalluk River on Wellington Bay of Victoria Island has 16 houses (Taylor, 1972:54). Harpoon heads found here include both Thule II and Thule III. An antler arrowhead has a square shoulder and offset spurs. This site probably dates the same as the Pembroke and Clare sites.

M1 (Figure 28:18).—At Resolute Bay, Collins (1955:50, 51) found three small sites, the Lake site with nine houses, the M1 site with twelve houses, the M2 site with nine houses, and the M3 site with five houses. The M1 site has Sicco and Natchuk harpoon heads in association with Thule II and III. The Natchuk harpoon head has an ornamental side-blade slot. The other sites are contemporaneous to M1 and have Thule type IV harpoon heads. The antler arrowheads that are found here have rounded to nearly square shoulders with conical knobs and symmetrically placed spurs.

With the presence of the Sicco and Natchuk harpoon heads with the ornamental side-blade slots, the occupation at Resolute Bay appears to be one of the earliest Thule sites in Canada. However, the spurs of the harpoon are not decorated with the medial line, which would place the occupation as similar to level B–7 at Walakpa.

Greenland

RUIN ISLAND (Figure 28:19).—This small island, located in Marshall Bay of the Thule district in northwest Greenland, has seven house ruins on it (Holtved, 1944:70). The artifacts from these houses include several Thule II harpoon heads with the lateral spur, as noted on the Thule II harpoon heads from the Birnirk level at Walakpa (Holtved, 1944, pl. 3:5). Plate 3:8 also illustrated the ornamentation above the lashing slot that occurred on the Birnirk specimen from Walakpa. No antler arrowheads were illustrated from this site. It is felt here that the strong resemblances between the Thule II harpoon heads found at Ruin Island and those from the Western Arctic would date this site as very early Early Thule.

UMANAG (Figure 28:20).—This site and Comer's midden are also located on Marshall Bay (Holtved, 1944:112). The site includes 27 houses and 2 midden areas, one known as Comer's midden. From Holtved's charts it is very apparent that all of the houses do not represent contemporaneous occupations. Holtved (1944:146–149) indicates that there are probably four levels of occupations. The harpoon heads found here include Thule I, Thule II, Thule II with end-blade slots, Thule III, Thule IV, Nuwuk, and Sicco. The antler arrowheads range from rounded shoulders with knobbed tangs to rather square shoulders with offset spurs. The presence of the Sicco-type harpoon head and the round shouldered antler arrowheads would indicate that the lower components of this site may be of the same age as Ruin Island.

NÛGDLÎT (Figure 28:21).—The site of Nûgdlît is located in the Thule district of northwest Greenland (Holtved, 1954). This site has 62 ruins; they are divided into three groups with two being older than, and one dating from, the 16th century. However, once again it is impossible to determine within these groups if the houses were contemporaneously occupied. The harpoon heads found here include Thule II with end-blade slots, Thule II, Thule IV, Nuwuk, and Sicco. The antler arrowheads have rather square shoulders and spurred tangs. The site has been radiocarbon-dated to the first half of the tenth century A.D. (McGhee, 1970:187). I would concur with this early date for this site because of the presence of the Sicco and Nuwuk-type harpoon heads.

Other Thule sites in Canada and Greenland (Mathiassen, 1927a, 1930b, 1931, 1933, 1934, 1936;

Mathiassen and Holtved, 1936; Collins 1951b, 1955; Holtved, 1944, 1954; Larsen, 1934; Manning, 1950; McGhee, 1971; Taylor, 1964, 1967) are considered as well-established Canadian Thule and do not contain the harpoon heads of Natchuk and Sicco, which mark the Early Thule development in Northern Alaska. As these sites are rather numerous and represent a fairly uniform cultural phase, I will not attempt to describe each of them, but I will point out the types of harpoon heads and arrowpoints that are representative of the Late Thule culture in the Eastern Arctic.

The harpoon heads found in these Late Thule sites are Thule types I, II, IV, VI, VII, and a closed socket variety with a bifurcated spur. The bifurcated spur is placed directly below the socket. This last variety appears to be a local invention and does not occur in the Western Arctic. The antler arrowheads have rather square shoulders and spurred tangs. Occasionally an antler arrowhead is reported with rounded shoulders and knobbed tangs. The size of these sites range from one house mound to more than twenty.

The above comparison of the harpoon heads and antler arrowheads from various related culture phases in the Arctic to those from the levels at Walakpa, point to several major trends in the development of Birnirk and Thule cultures. These trends are reviewed below and summarized in Figure 29.

Summary

Early Birnirk

It is increasingly obvious that Birnirk had its roots in the Old Bering Sea-related cultures of St. Lawrence Island. This is reflected in the Birnirk harpoon heads of the Naulock, Tuquok, and Oopik types, which have analogous forms with shared features of medially placed trifurcated spurs with the type II harpoon heads from the Old Bering Sea and Early Punuk phases. The closed socket harpoon heads found in Early Birnirk have as their prototypes the IIIx and IIIy harpoon heads from St. Lawrence Island.

These Old Bering Sea-Birnirk-related harpoon heads turn up along the coasts of both Siberia and Northern Alaska. This is evidenced by the finds at the Uelen and Ekven cemeteries in Siberia and the Early Birnirk finds at Point Hope, the lowest level at Walakpa, and the Birnirk site.

The Early Birnirk harpoon heads have as their most characteristic feature, the medially placed trifurcated spurs. Usually, the center prong of the spur has a decorative medial line, but this is not always the case. The outside lateral edges of the spur and the body of the harpoon heads are sometimes decorated with thin, raised, scalloped lines which have notches cut at their apex. Sometimes the margins of the spurs are serrated with a series of small barbs.

Early Birnirk is found at the Birnirk type site mounds H and Q, Kugok, Nunavak structure 1, Kugusugaruk, level B–10 at Walakpa, the Point Hope-Birnirk burials and burial 17 at Uelen, Siberia.

Middle Birnirk

There is a gradual transition from the trifurcated spurred harpoon heads to harpoon heads with bifurcated spurs. The transition occurs with various combinations, but most commonly there are bifurcated spurs with small decorative third barbs. During this phase of Birnirk the decorative features continue, with ornamental side-blade slots becoming common. However, there is a general decreasing of decorative features. This phase, which should be properly called "Middle Birnirk," is found at the Birnirk site mounds R, H, and Q, Kugok, Nunavak structure 2, Kugusugaruk, and Walakpa levels B–9 and B–8. In Siberia, burial 6 at Uelen is Middle Birnirk in age.

During this phase in Northern Alaska, the Natchuk and Thule II harpoon heads appear. These early forms of Natchuk at Walakpa tend to be heavier harpoon heads with broad, shorter blades than those of the Early Thule-Natchuk varieties. The Birnirk-Thule II harpoon head from Walakpa has Birnirk decorative features typical of this phase, but has a single-pointed spur. The spur is decorated with a pronounced ornamental barb, which is found on harpoon heads as late as Early Thule, at which time it is finally discontinued.

Late Birnirk

This final phase of Birnirk is marked by decreasing ornamentation of the spur and a higher incidence of ornamental side-blade slots and spur prongs. The spurs are totally lateral by this time and are decorated with medial grooves, but usually have only one point. The late phase of Birnirk was not found at Walakpa, but the harpoon types from mound A at the Birnirk site were almost exclusively Late Birnirk. Late Birnirk also occurred in mounds H and Q at the Birnirk site, mound C at Nunagiak and houses four and five at Kugusugaruk. The only other reported occurrence of Late Birnirk is at Cape Baranov in Siberia where harpoon heads of this description were found in three

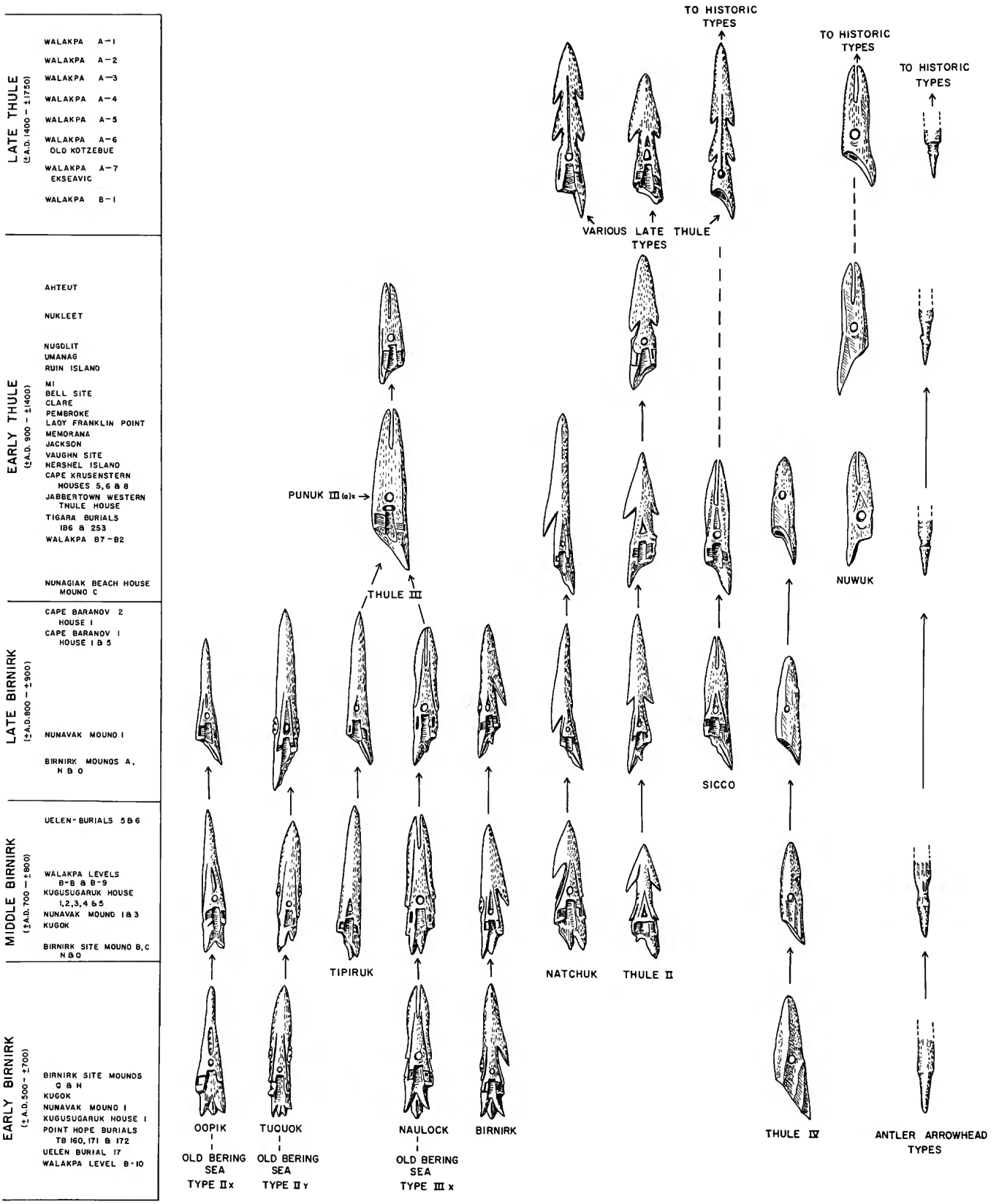

FIGURE 29.—Development of harpoon heads and antler arrowhead types arranged by period and sites.

mounds. The unique difference between the Late Birnirk from the northern coast of Alaska and the Cape Baranov-Late Birnirk is that there is a proliferation of harpoon head types in Alaska, while at Cape Baranov, there are only two types, Birnirk and Tuquok.

During Late Birnirk, there appears to be a certain amount of Punuk influence. This is seen in the Punuk harpoon heads IIIy and Sicco, which become common in Northern Alaska during this later phase. The harpoon type Naulock is replaced by Tasik, which is simply an undecorated version of Naulock.

It is also during this time when Punuk whaling harpoon heads and presumably whaling gear may have been introduced. This may be seen at the Birnirk site where a Punuk-related whaling harpoon head was found in mound A associated with Late Birnirk-type harpoon heads (Ford, 1959:103). Another Punuk-type whaling harpoon head was found by Carter (pers. comm.) at the Birnirk site. Morphologically it could be an earlier variety, but its age is not known at this time.

Early Thule

The transition from Birnirk to Thule is a gradual change marked only by minor differences in the harpoon heads. The most significant being the elimination of the classic Birnirk harpoon head types of Birnirk, Tuquok, and Oopik from the tool kit. Naulock, in the form of Tasik and Punuk type IIIy, become or are replaced by Thule III. There is a continuance of the Birnirk harpoon head types of Natchuk, Sicco, and Thule II, all of which have single-pointed spurs without the decorative medial line of the Late Birnirk. Initially, during the Early Thule phase, there is a decorative barb on the spur, but this is relatively rare (occurring primarily on the Thule II varieties).

These harpoon head types, which are considered Early Thule, are found at Walakpa: Early Thule Test Trench (mound A), Nunagiak, Point Hope (burials 253 and 186), the Western Thule house at Jabbertown, Cape Krusenstern, and at Kurigitavik.

It is during the Early Thule cultural phase in Northern Alaska that Thule began to spread into the Eastern Arctic. East of Point Barrow, the number and kinds of Birnirk harpoon heads diminish. The types that occur are restricted to the types of Natchuk and Sicco, having the undecorated single-pointed spurs, which are found in the Early Thule phase in Alaska. In the east, they are associated with various froms of Thule II, Thule III, and possibly Alilu and Nuwuk. These types are here considered to be Canadian Early Thule types and are restricted in their occurrence to the northern Canadian archipelago, including the southern part of Victoria, the southern coast of Cornwallis Island, the southern coast of Devon Island and the northwest coast of Greenland (Taylor, 1963:461). They do not occur in the southern Canadian Arctic at Naujan, Crystal II, or the Cape Smyth area (McGhee, 1971:179).

During the latter phases of the North Alaskan Early Thule period, the harpoon head types of Natchuk and Sicco tend to drop out of the cultural inventory, with Thule II, Thule III, and Nuwuk being the major types found. Sicco, or its Punuk equivalent, lasts longer in Western Alaska than it does in the Point Barrow area.

Late Thule

By the Late Thule period, most of the Birnirk and Early Thule types of harpoon heads, except Thule II, no longer exist. In most areas of the northern Arctic, the harpoon heads include the types of Thule I, Thule II, Thule III, Thule IV, and Nuwuk. At this time local developments of harpoon heads have been firmly entrenched in the artifact inventory. These are such harpoon heads as the Nuwuk variety found at Kotzebue, Nunagiak, Kilimatavik, Brower, Kuk; Cape Smyth harpoon head types found in the western Arctic, and the bifurcated spur variety mentioned above in the eastern Arctic.

In the Point Barrow area, Late Thule is identified by square shouldered antler arrowheads and the occurrence of ownership marks on arrowheads and other artifacts. These, along with the proliferation of harpoon head types mentioned above, are the major distinguishing characteristics for Late Thule.

The antler arrowhead sequence, as defined in this paper, is straight forward and seems to hold true for most sites. At Walakpa the earliest Birnirk arrowheads have rounded shoulders with straight to slightly knobbed tangs. These can be seen as a direct development from the Old Bering Sea arrowheads, which have rounded shoulders and straight tangs. The knobs appear to have developed later in the Old Bering Sea-Punuk, sequence, at about the same time that Birnirk was emerging as a distinct culture phase. Both the straight and knobbed tangs appear in the earliest Birnirk sites on the northern coast of Alaska. The straight tang is eventually replaced by the knobbed tang in the middle Birnirk phase sites.

During the Late Birnirk phase, the knobs on the tangs become more pronounced, and by the end of the Birnirk phase the conical tang with the rounded

shoulders is found. This can be seen on the antler arrowheads from mound A at Birnirk.

Both the conical tang and the knobbed tang varieties of arrowheads are found during the Early Thule phase with the conical tang being more common during the Early Thule phase in Northern Alaska.

The Early Thule arrowheads in Canada have rounded shoulders and bulbed tangs. The conical tang has not been found east of Point Barrow. This could mean that Early Thule began to spread eastward before the conical tang was fully developed in the cultural inventory at the beginning of the Early Thule phase.

The square shouldered antler arrowheads appear first in the east and then spread to the western Arctic. The square shouldered varieties are found with typically Early Thule assemblages in Canada, but do not show up until later in the Alaskan sequence. The knobbed tang variety of Birnirk lasts much longer in western sites than it does at Point Barrow, with the square shouldered arrowheads showing up quite late in the western sites.

Settlement size, although very important, is difficult to discuss, in that few sites of Birnirk and Early Thule age have been completely excavated in Northern Alaska, or because much of our knowledge of Birnirk comes from burial excavations rather than from village sites. The evidence that is now at hand indicates that settlements were small during the entire Birnirk sequence and did not increase in size during the Early Thule sequence. Perhaps the Birnirk occupation at Cape Krusenstern was a single large village; but, because of the poor preservation of perishable artifacts, it is impossible to determine how the various houses might fit into the Birnirk sequence. The estimated size for the Birnirk occupation at Walakpa is at maximum only two houses being occupied at any one time. Carter (pers. comm.) also estimates that at the Birnirk site there were possibly less than three houses being occupied simultaneously. The evidence from Siberia suggests that there were only one or two houses at maximum being occupied at the same time at Uelen.

During the Early Thule period, possibly one or two family groups made up an entire village. This is seen at Nunagiak, where only one house mound was found that represented an Early Thule occupation. I would also estimate that only one house unit made up any single occupation at Walakpa. Once again it is possible that larger Early Thule villages may have occurred at Cape Krusenstern.

By Late Thule times in Northern Alaska, there are numerous large villages. These are located at Nuwuk, Utkiavik, Nunagiak, Old Tigara, and possibly at other sites yet unexcavated. Walakpa does not represent a large Late Thule occupation, but appears to be an area of seasonal activity where perhaps only one extended family may have camped from time to time.

To summarize the settlement pattern for Northern Alaska, McGhee's (1970) model for Canadian Early Thule seems to fit the evidence for both Birnirk and Early Thule in Northern Alaska and Siberia. In his model he sees small groups of hunters frequently moving their base camps in order to insure sufficient amounts of food by exploiting new hunting areas or a windfall kill, such as a whale. At Walakpa, there were no mixed seasonal or annual accumulations of faunal remains in proposed Birnirk-based camps. Several of the Birnirk occupations have a large accumulation of bones in the trash middens, but none appears to have been carried over from other seasonal activities. Thus it appears as though they lived at Walakpa without bringing in faunal elements from previous camp sites.

The settlement pattern appears to change during the Late Thule phase, and at this time I feel that the exploitive strategies center around large group activities, such as organized whale hunting and communal caribou hunting. I think that the occurrence of ownership marks on antler arrowheads and other artifacts indicates this shift from family hunting to large group hunting, with the ownership marks representing the basis for the division of meat. This would not have been necessary with family group hunting associations, but would be with large communal associations.

Figure 29 indicates the development of harpoon heads and antler arrowheads during the various cultural phases as defined in the preceding discussion.

Development of Birnirk and Thule Cultures in Northern Alaska

The Eskimo culture phases of Birnirk and Thule have been known to Arctic archeologists for at least forty years. What has not been known in any substantial detail were their relationships with one another. The excavations of 17 superimposed levels of Eskimo occupations at the Walakpa site and the comparison of artifact types, especially harpoon heads and antler arrowheads found in these levels, to those from other sites has added much to our knowledge of the nature of Eskimo cultural development in North America. Moreover, the Walakpa archeological assemblages, including the faunal remains, have yielded new evidence concerning the economic exploitative strategies employed by these people and how these strategies might relate to the spread and development of Late Eskimo culture throughout the northern Arctic.

The excavated stratigraphic sequence at Walakpa consists of 17 occupation levels, which I have grouped into the cultural phases of Early Birnirk, Middle Birnirk, Late Birnirk, Early Thule, and Late Thule. The distinctions between the phases are made on the basis of harpoon head and antler arrowhead differences. These divisions are essentially arbitrary, because, quantitatively, the difference between the last level of one cultural phase and the beginning of the next are minor. The development of Late Eskimo culture, as seen from Walakpa, is a smooth, gradual transition from Early Birnirk into Late Thule.

As a whole, the Birnirk material culture assemblage from Walakpa is nearly identical to that of the Late Thule assemblage from Walakpa. Harpoon heads and antler arrowheads are the main artifacts that indicate the transition between these cultural phases. In the above chapters, I have described these indicative artifact types in detail, noted their stratigraphic placement in the Walakpa mounds, and discussed their relationships with other sites.

To summarize, there is a gradual change from the early harpoon head types of Birnirk, Naulock, Oopik, and Tuquok, which have trifurcated spurs, to the Middle Birnirk harpoon heads of the same types, which have bifurcated spurs, and the addition of the new harpoon-head types of Natchuk, Tasik, Sicco, Thule II, and Thule IV. The Late Birnirk types have single-pointed spurs with decorative medial lines. These types persist into the Early Thule period and slowly alter in form, dropping the Early Birnirk types of Birnirk, Naulock, Oopik, and Tuquok, until they represent the classic Thule harpoon head assemblage of Thule I, II, III, and IV. The Early Thule types continue into Late Thule with local developments in harpoon types, especially proliferations of Thule II variants.

It is significant that the Early Birnirk harpoon heads have their immediate origins in the Old Bering Sea phase. However, it is not clear at this time if Birnirk developed in the Point Barrow area from a local North Alaskan Old Bering Sea phase population, as seen from Old Bering Sea finds at Point Barrow (Ford, 1959; Mathiassen, 1930a; Carter, pers. comm.), or developed from a general cultural level that existed from along the coast of Northern Alaska to Point Barrow. The Old Bering Sea-Early Birnirk harpoon heads from Ekven and St. Lawrence Island might indicate that Birnirk may have been well developed before moving into the Point Barrow area.

It is also possible that the Ipiutak culture of Point Hope may have contributed to the development of the Birnirk culture. This is especially true if the date of A.D. 500 at Kurigitavik indicates a late stage of Ipiutak in Western Alaska. Consequently, this means that Ipiutak lasted as late as Early Birnirk in Western Alaska. Further indications for a late date for Ipiutak in Western Alaska were found at Cape Krusenstern (Anderson, pers. comm.).

Early Birnirk was firmly established in Northern Alaska sometime after A.D. 500 and is found at an early date at Point Hope, Walakpa, Kugusugaruk, Nunavak, and Birnirk. By the Middle Birnirk phase, several changes occurred in the harpoon heads, including a possible Punuk-Birnirk tie (Sicco and the development of local Birnirk variants), Natchuk, and Thule II. During Late Birnirk, Naulock, along with most of the other Birnirk harpoon heads have lost

much of the decorative frills, with Naulock becoming the plain undecorated Tasik. Both types give way to the Punuk type IIIx or Thule III.

The same sequence is true of antler arrowheads. The Birnirk antler arrowheads defined on the basis of rounded shoulders and knobbed tangs are nearly identical to those found in Old Bering Sea assemblages. During the Late Birnirk phase at Walakpa, antler arrowheads having rounded shoulders and conical tangs developed. Both the conical tang and the knobbed tang arrowheads lasted well into the Thule phase, during which they were eventually replaced by antler arrowheads with squared shoulders and spurred tangs. This last change took place during the Early Thule phase of the eastern Arctic and did not occur in the western Arctic until relatively late in the Thule sequence.

To summarize the evidence concerning the origin of Thule culture, I will first recapitulate the theories of Thule origins which were discussed in the introduction. Secondly, these theories will be analyzed in the light of the evidence recovered at the Walakpa site, and from this evidence a functional explanation will be made for the development of Thule culture.

The position of Mathiassen (1927b) was quite general; he felt that Thule developed west of Canada and Greenland and in regions where whales and wood were abundant. Presumably, this would have been in Alaska. However, the Birnirk types with which he was familiar were not considered to be proto-Thule, but a development out of Thule. This is not supported at Walakpa in that Birnirk occurs below Thule in the stratigraphic continuum.

Collins (1940) placed the development of Thule to the east of Cape Prince of Wales along the northern coast of Alaska. The excavations of the Birnirk site by James A. Ford and Collins' work at Kurigitavik indicated to Collins (1940:563) that Birnirk was temporarily older than Thule and a logical parent of the Canadian Thule.

The ideas originally expressed by Collins now have been supported by the stratigraphic evidence from Walakpa. There is little doubt now that Thule did develop directly out of the Birnirk phase on the north Alaskan coast.

Ford's (1959) idea of the transitional step of the Nunagiak stage between the Birnirk and Thule cultural phases can in part be supported by the Walakpa data. Ford's argument was based on the presence of Thule traits found at the Nunagiak site, which were not found at the Birnirk site. From the excavations of 1968 and 1969 at Walakpa, these traits have now, with minor exceptions, been found in the Birnirk assemblages at the Walakpa site. One of the house mounds at the Nunagiak site represents an Early Thule occupation with Punuk affinities. It may be noted that Ford considered the inhabitants of the Nunagiak site to be contemporary with those of the Early Canadian Thule sites. From the occurrence of Early Thule types of harpoon heads at the Nunagiak site in the Early Thule house mounds, this appears to be true, but his estimated date of A.D. 1200 for the Nunagiak cultural stage is apparently too young. The dates of Early Thule sites in the central Arctic, clustering around A.D. 1000, imply that the Nunagiak-Early Thule occupation is of about that same time period or earlier.

Moreover, the dated beach ridge chronologies indicate that mound C or the Early Thule house at Nunagiak had to have been built before A.D. 1000, to have been sufficiently above sea level for habitation.

Birnirk did not, however, as Taylor (1963:456) suggests, extend as far east as Cape Parry prior to A.D. 900. Attempts to locate Birnirk or proto-Thule sites in the Canadian Arctic by both Taylor (pers. comm.) and Robert McGhee (pers. comm.) have failed. Instead, the harpoon heads from Canadian sites thought by Taylor to be Birnirk, according to my criteria, would be considered Early Thule. Taylor is correct in suggesting that Nunagiak, or something closely related to it, existed as far east as Lady Franklin Point on Victoria Island (Figure 28:14). Many sites to the east of Walakpa have been found to contain Early Thule harpoon heads. These sites are Hershel Island, Vaughn, Jackson, Memorana, Lady Franklin Point, M1, Ruin Island, Nûgdlît (Figure 28). Taylor's hypothesis that an Early Thule stage separated Birnirk from the Nunagiak-Early Thule period has not been supported by the evidence from the North Alaskan sites. It can be seen at Walakpa, Birnirk mound A, and at Nunagiak that the transition from Late Birnirk to Early Thule at Nunagiak is quite smooth and does not require an additional cultural phase.

McGhee (1970) felt that Thule culture developed out of Birnirk in Northern Alaska. The development of Thule, according to him, took place because of a climatic shift and a corresponding shift in hunting strategy from Birnirk to Thule. He proposed that during the Scandic episode, the climate was similar to that which is found in the Arctic today. McGhee postulates that the main hunting strategy, which would have been practiced during the Birnirk phase, would have been one of ice-lead whale hunting. This would require large permanent villages located along the coast in various strategic places, where ocean currents and wind direction would cause ice leads to form during the periods of whale migrations. The large villages would support several teams of whalers

who could trap whales in the ice leads. The whales would then be the primary food resource for the Birnirk hunters.

According to McGhee's idea, the change to warmer weather during the Neo-Atlantic would cause an increase in whales, walruses, and bearded seals, and a reduction in ringed seals. The ice would also break up sooner in the spring and ice-lead hunting would then become impossible. The hunting strategy would then have to change to accommodate these new conditions. The new hunting strategy would be one of open-water whale pursuit. Because the probability of successful whale hunting in open water is quite low, sufficient food resources would not be available to support large villages. Consequently, the villages would break up and the Eskimo population would be dispersed. McGhee (1970:179) sees the transition from Birnirk to Thule as a rapid migration of small groups of whale hunters into Canada and Greenland at this time.

Although the faunal evidence from Walakpa tends to support McGhee's interpretation of the effects of climatic changes on the economic potential of ice hunting, it does not support his interpretation of Birnirk whale-hunting strategies and settlement patterns. It appears that even though ice-lead whale hunting was possible, Birnirk hunters did not capitalize on whale hunting. The evidence from three Birnirk occupations at Walakpa indicates that seals were the primary food source and not whales. It also appears, from the estimated village sizes of various Birnirk sites, that large villages with cooperative whale-hunting groups were not formed.

In my opinion, widespread occurrence of Birnirk and Early Thule harpoon heads may be attributed to the manner in which the Eskimos exploited their environment. If, as suggested by the faunal analysis of the Birnirk levels at Walakpa, these people were nearly eliminating the ringed seal populations for 80.5 kilometers or more of coastline during a single season, they would have been forced to move their camps considerable distances from year to year. In fact, it is conceivable that if they were killing as many seals every year, as were represented in the B–10 and B–9 levels, the average Eskimo family, during the course of a human generation, would have moved and lived along the entire coast of Northern Alaska. This type of economic strategy would act as a population check to keep the number of Eskimo inhabitants of this area at a low level, as well as produce a very homogeneous distribution of culture.

The broader implication of this exploitative strategy is that it would not take too many generations of Eskimos to reduce the ringed-seal population to such a low point that it could not serve as the primary food source. This prime energy source would then have to be augmented or replaced by other sources. It appears that from Birnirk to Thule the seals are replaced by whales as the primary food resource. This would not have required a particularly drastic change in the hunting technology. As has been pointed out (page 97), during Birnirk times the Eskimos were occasionally killing small whales and possibly killing or collecting dead baleen whales.

In order to kill larger whales, a somewhat elaborate technological assemblage is necessary. The development of large whaling equipment is seen in the Bering Straits area during the Punuk period (Collins, 1937c), possibly several hundred years prior to the development of Thule. It can also be pointed out that during Late Birnirk and Early Thule periods, there was considerable influence from the Bering Straits area. This is witnessed by the Punuk artifacts that occurred in the Nunagiak assemblage and the lowest Early Thule level at Walakpa, the Punuk-like whaling harpoon heads in the Late Birnirk levels at the Birnirk site, and the Thule III or Punuk type III(a) harpoon heads found at various sites in northern Canada.

The introduction of Punuk whaling equipment might possibly be correlated at Walakpa with a gradual shift to a warmer climatic episode and the depletion of seal resources, and the increase of the availability of large sea mammals. With the advent of slightly warmer winters, the ice would break up sooner in the spring. These climatic events would, as McGhee (1970) points out, cause a further reduction in the ringed-seal populations. Therefore, the shift to a different economic resource would become even more imperative, and new hunting areas would have to be sought out. This would explain the rapid expansion into the eastern Arctic by the Early Thule hunters. Further, if the ice did break up sooner in the spring, the whale migrations may have also adjusted to this new ecological condition and commenced sooner in the year, allowing ice-lead hunting during Early Thule times as well as during Birnirk and Late Thule periods.

In summary, the stratigraphic sequence at Walakpa indicates a development of Birnirk culture through at least three major phases: Early Birnirk, Middle Birnirk, and Late Birnirk. It also indicates that

Thule developed directly out of Birnirk with some of the Thule features, such as the Thule II harpoon head, appearing as early as the Middle Birnirk phase.

The faunal evidence from Walakpa suggests that seals were the primary food resource of the Birnirk Eskimos, and through the depletion of the seal population by overexploitation and warming climatic conditions, seals could no longer support the Birnirk hunters. The alternatives were to expand into new territories in search of new sealing localities and to replace the seals with a new primary food resource, whales.

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PLATE 1.—Walakpa site: *a*, looking west toward the ocean, the full length of the site; *b*, looking east from the top of mound A (mound B is just beyond the whale bone); *c*, mound A looking west; *d*, looking north from mound A toward the Will Rogers–Wiley Post monument with modern Eskimo camp in the foreground.

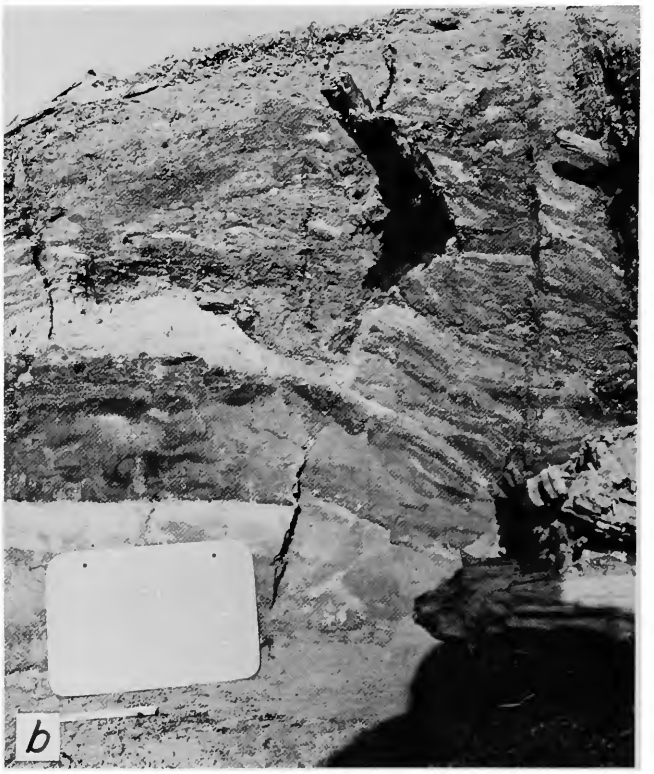

PLATE 2.—Walakpa site: *a*, Will Rogers–Wiley Post monument; *b*, section of east-west stratigraphy, mound A; *c*, level B–1, an unusual feature in a Late Thule level.

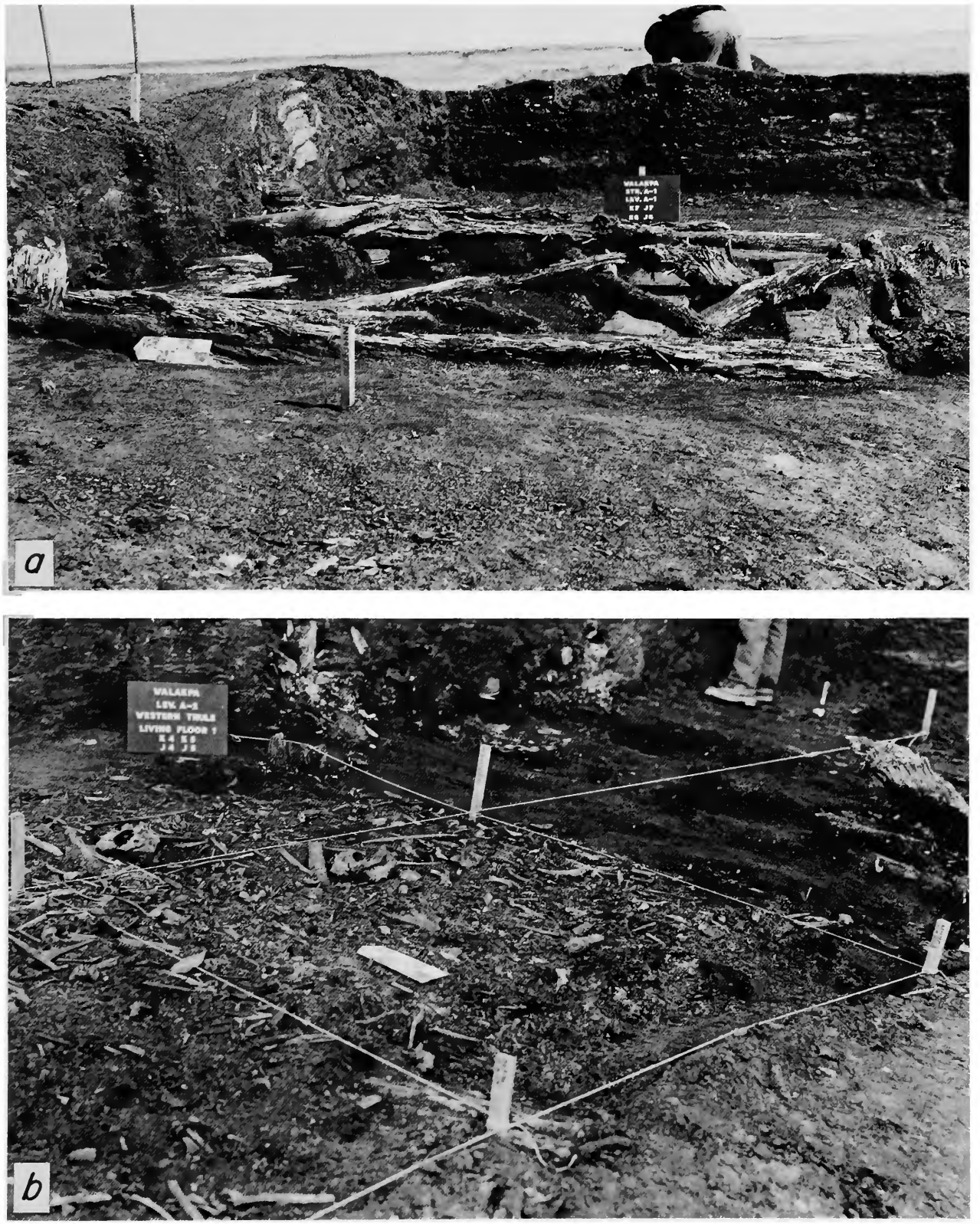

PLATE 3.—Walakpa site A area: *a,* Nuwuk (historic age) house, which cut through several Late Thule levels; *b,* Late Thule level A–2, showing truncation of the occupation floor by the Nuwuk house.

PLATE 4.—Early Thule levels in B area: *a*, Early Thule level B–4 (sign board indicates this as an Eastern Thule level; stratigraphic units are visible in the wall behind the sign board); *b*, Early Thule level B–6; *c*, another view of the B–6 occupation level; *d*, close-up of square J 20, level B–7 Early Thule. (*b*, *c*, *d*, incorrectly labeled "Birnirk"; note concentration of artifacts).

PLATE 5.—Birnirk occupation level B–8: *a*, house structure (the stratigraphy is visible in the wall); *b*, detail of square J 17, Birnirk house floor; *c*, detail of square K 17, Birnirk house floor; *d*, another view of square K 17, Birnirk house floor.

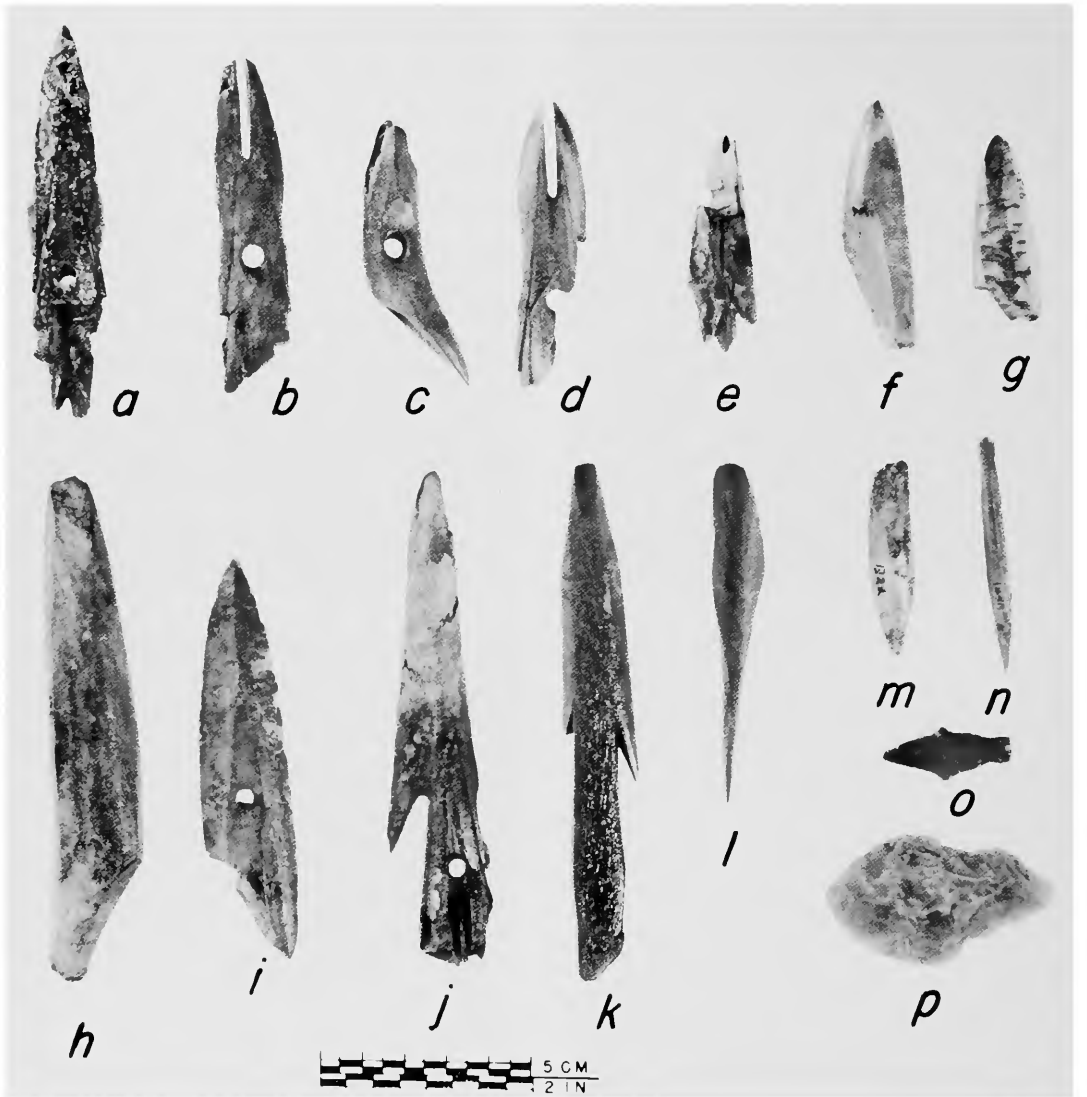

PLATE 6.—Birnirk artifacts from the mound A test trench: *a*, Tuquok open socket harpoon head; *b*, *d*, Naulock open socket harpoon heads; *c*, Thule IV closed socket harpoon head; *e*, fragment of open socket harpoon head; *f*, *g*, fragments of harpoon foreshafts; *h–j*, harpoon head preforms; *k*, antler arrowhead; *l*, *n*, bone awls; *m*, gauged drill; *o*, unidentified chert effigy; *p*. chert knife blade.

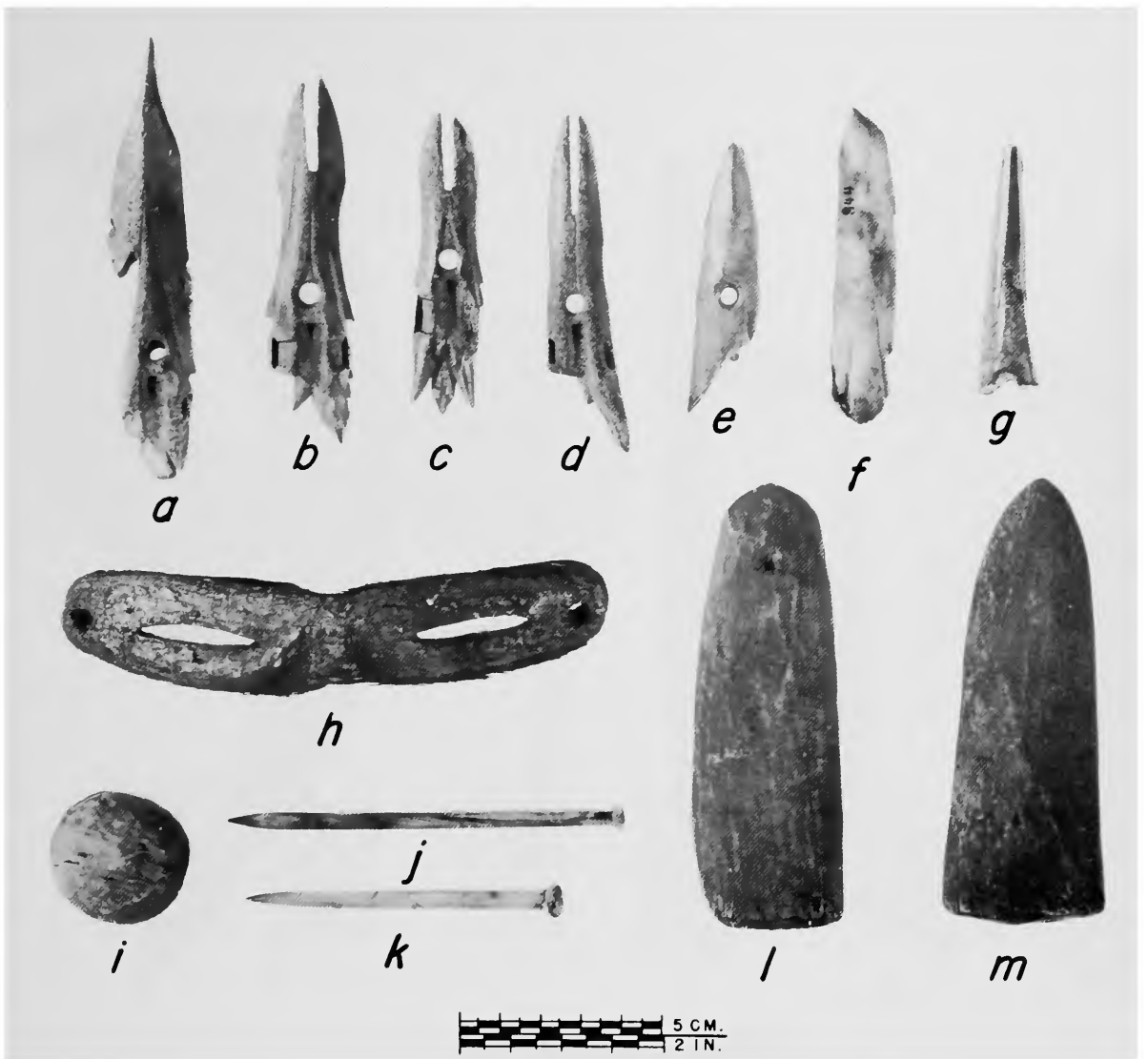

PLATE 7.—Birnirk artifacts from the mound B test trench: *a*, Birnirk open socket harpoon head; *b*, *c*, Naulock open socket harpoon heads; *d*, Tasik open socket harpoon head; *e*, Thule IV closed socket harpoon head; *f*, *g*, harpoon head fragments; *h*, baleen snow goggles; *i*, seal float plug; *j*, *k*, ivory wound pins; *l*, *m*, wood wound plugs.

PLATE 8.—Birnirk artifacts from the mound B test trench: *a–c* antler arrowheads; *d*, unidentified bone artifact; *e*, sinew twister; *f*, flaking tool.

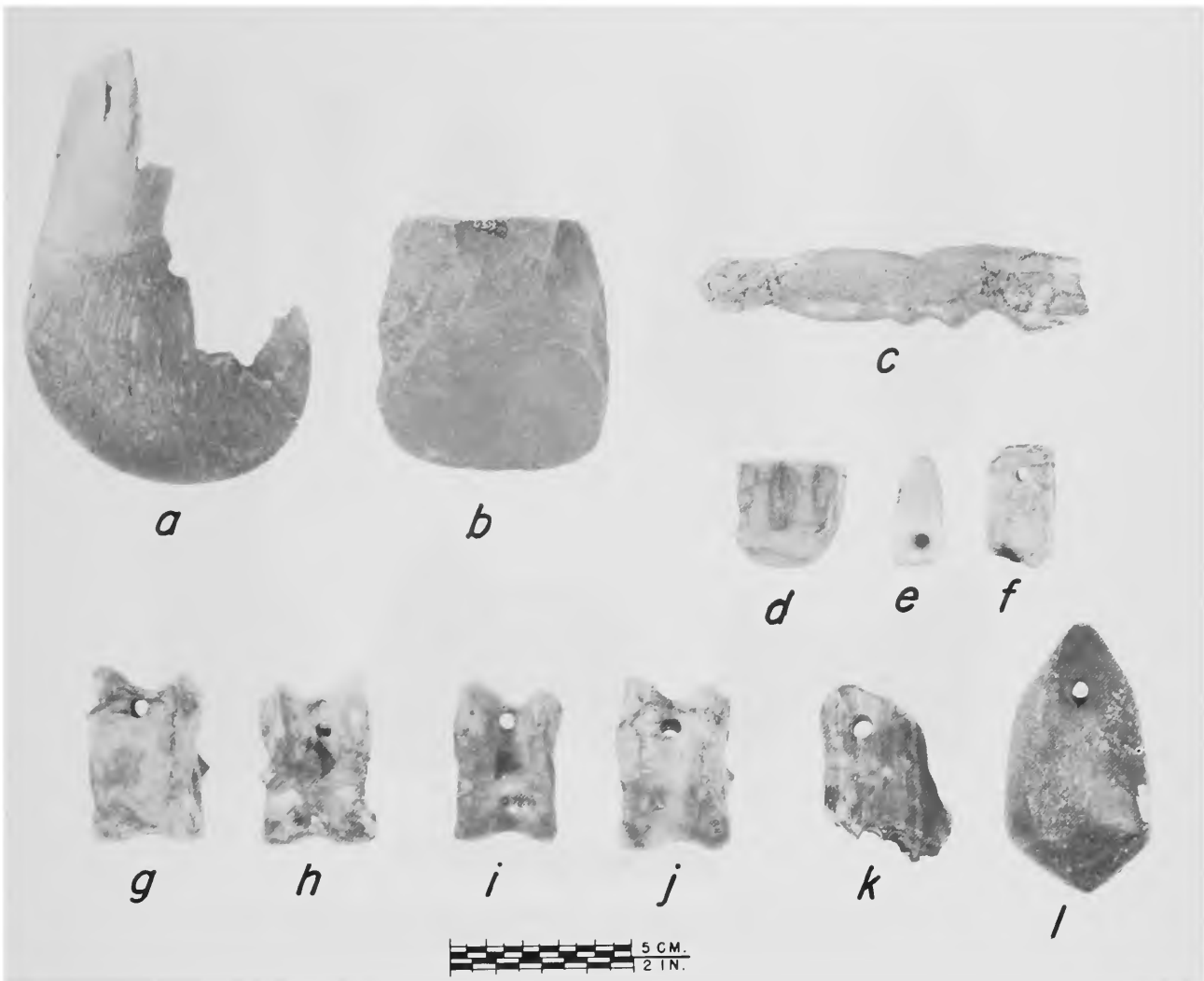

PLATE 9.—Birnirk artifacts from the mound B test trench: *a*, wooden spoon; *b*, adz blade; *c*, unidentified bone tool; *d*, paddle tip; *e*, drilled bear tooth; *f–l*, bola weights.

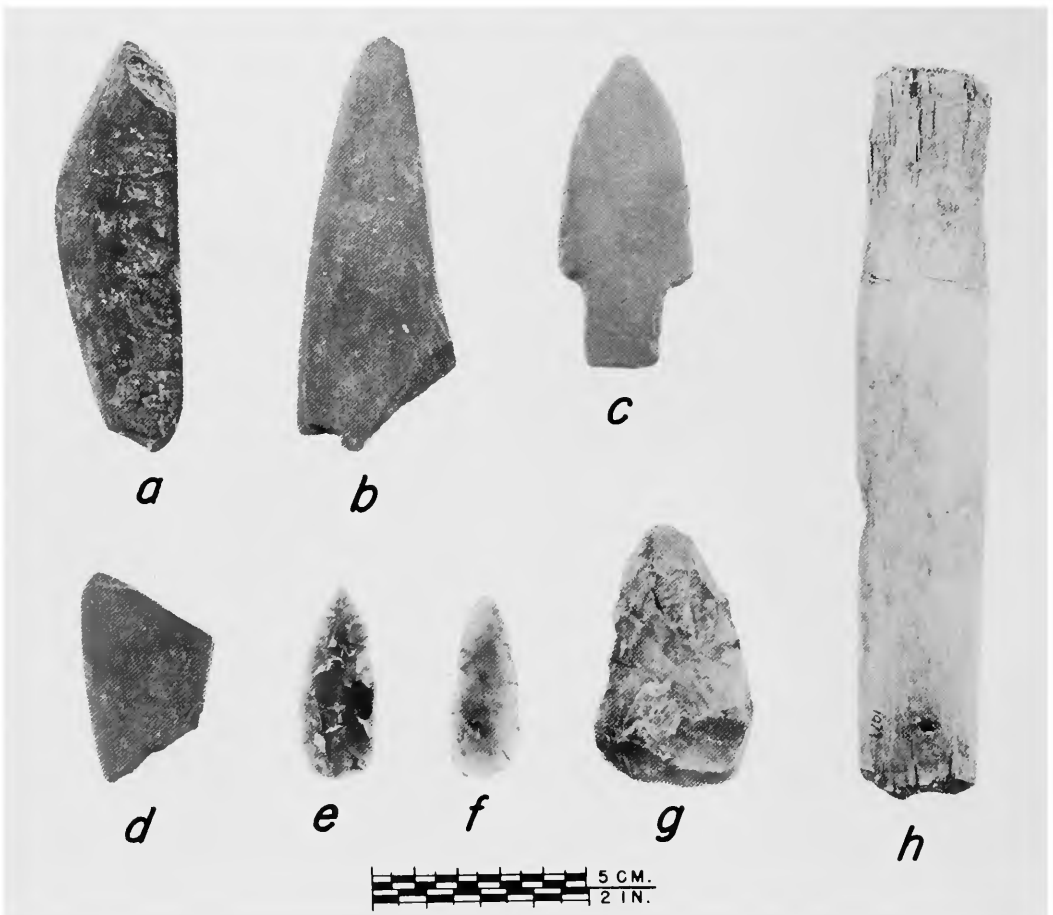

PLATE 10.—Birnirk artifacts from the mound B test trench: *a, b, d,* ulu blades; *c,* men's knife blade; *e–g,* chert knife blade; *h,* knife handle.

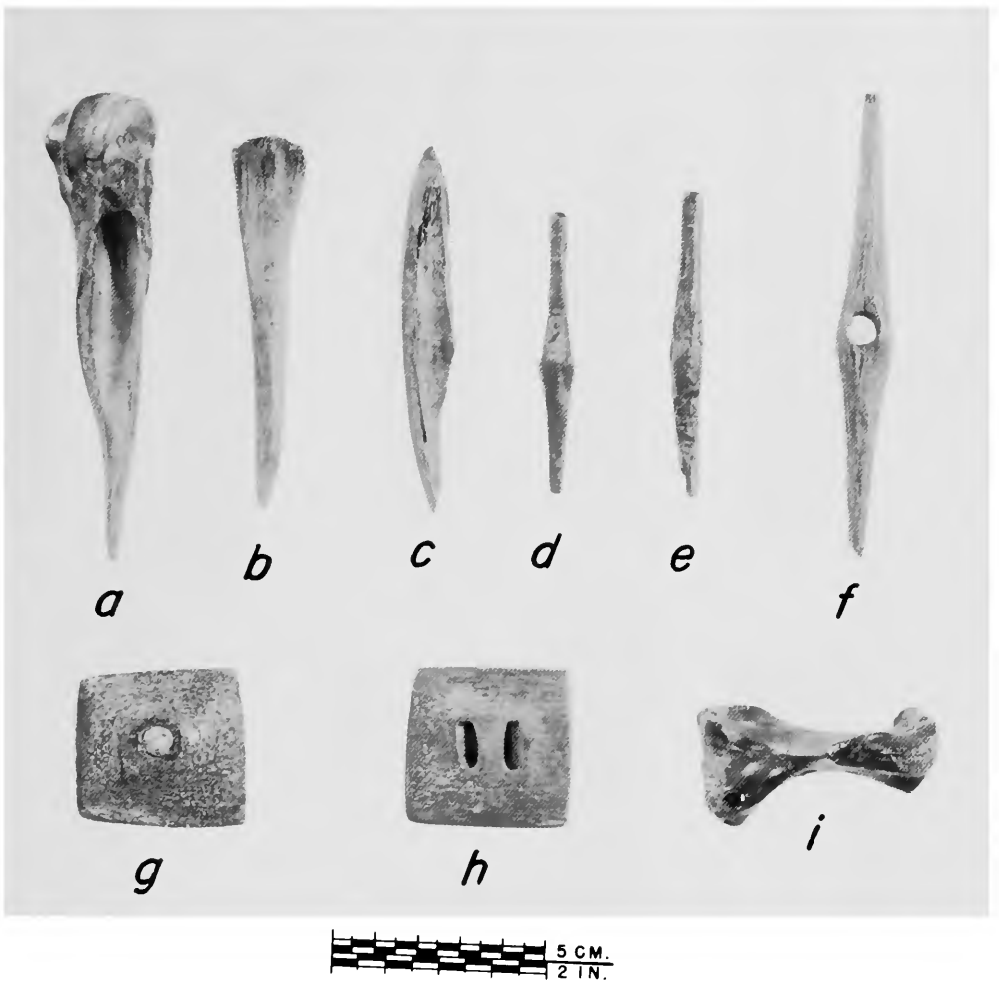

PLATE 11.—Birnirk artifacts from the mound B test trench: *a–c,* bone awls; *d, e,* engraving tools; *f,* unidentified wooden object; *g, h,* belt toggles; *i,* cup and pin game.

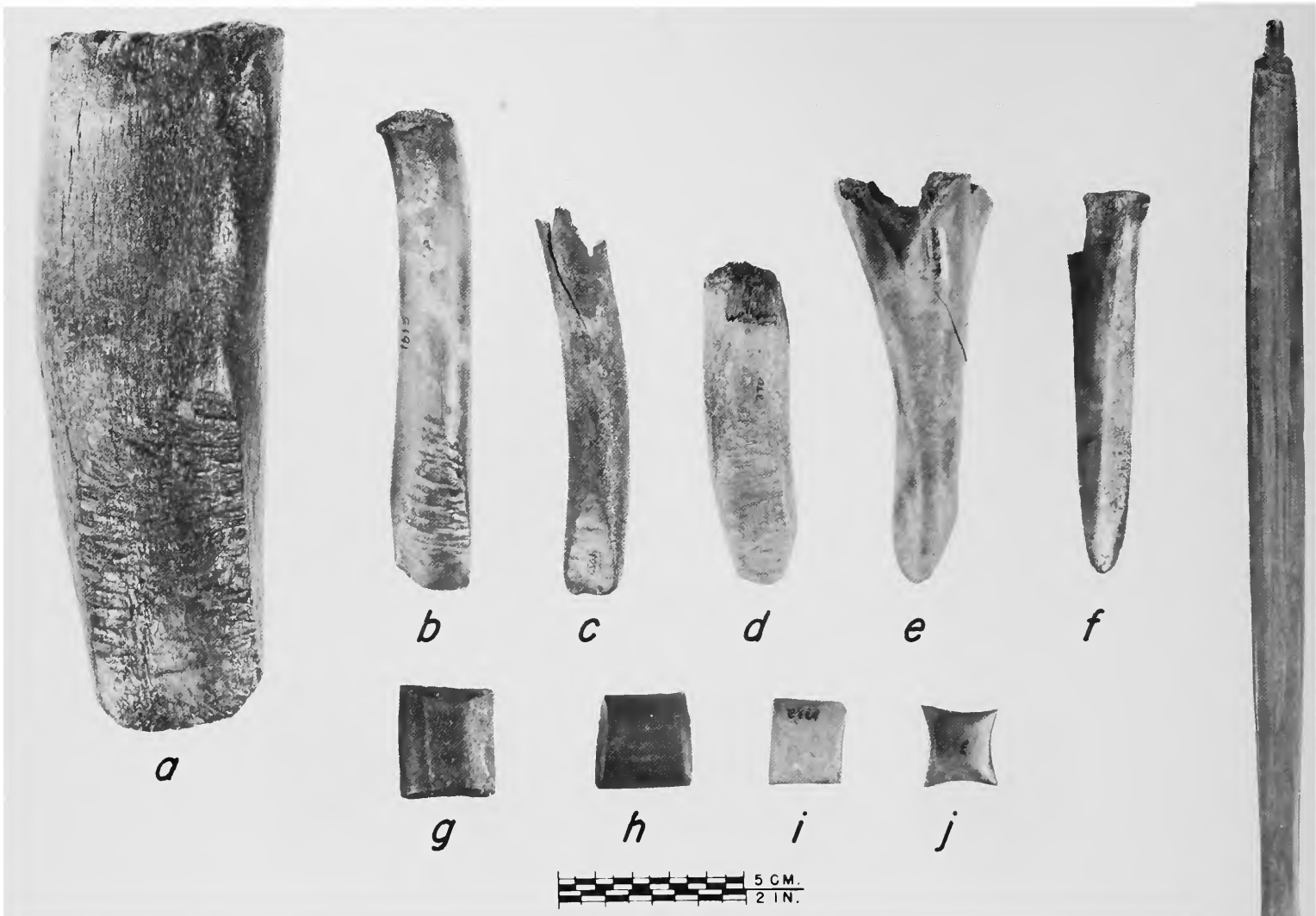

PLATE 12.—Birnirk artifacts from the mound B test trench: *a–d*, wedges; *e*, *f*, bone scrapers; *g–j*, gaming pieces.

PLATE 13.—Small bow from the mound B Birnirk level test trench.

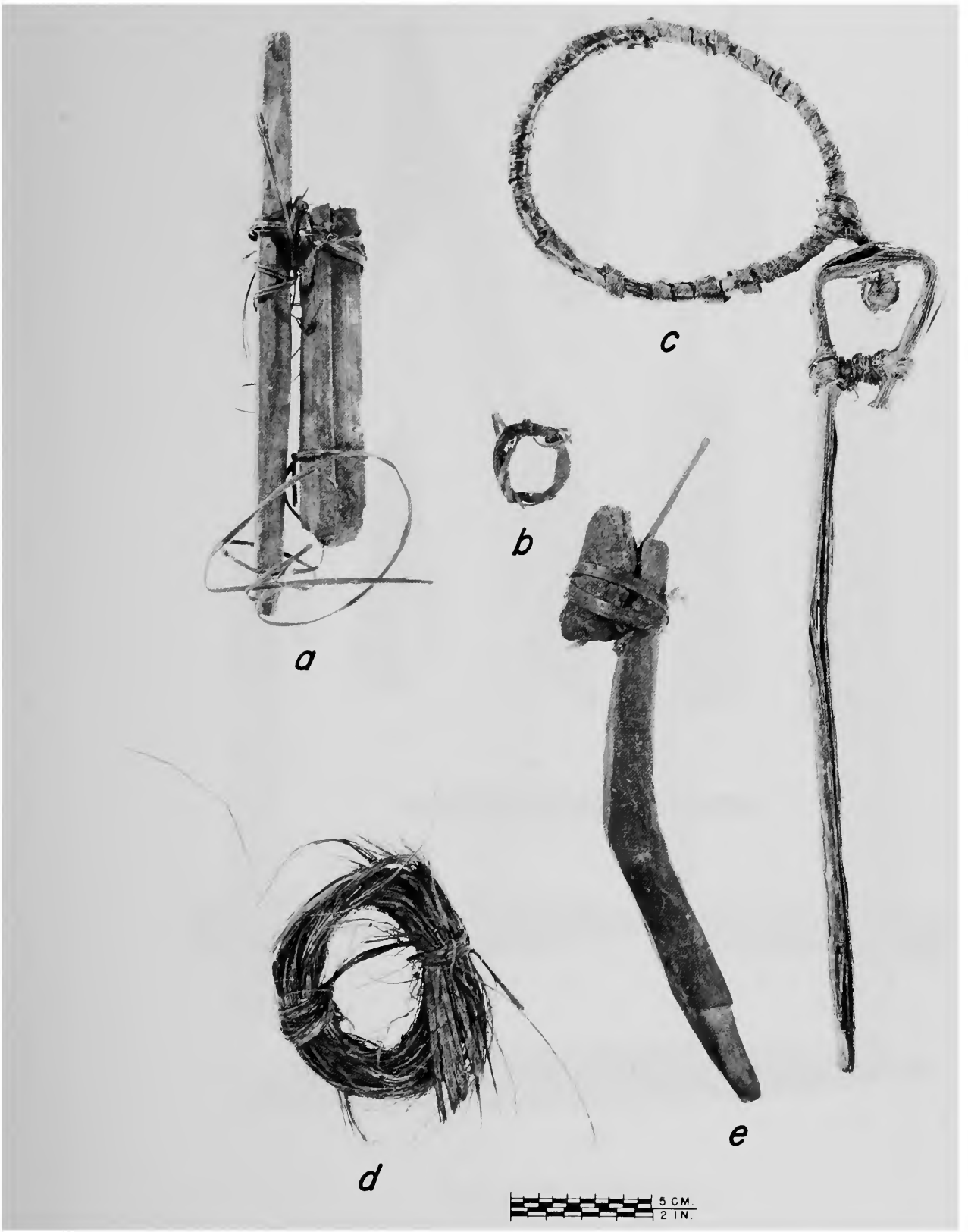

PLATE 14.—Birnirk artifacts from the mound B test trench:
a–e, unidentified wood and baleen objects.

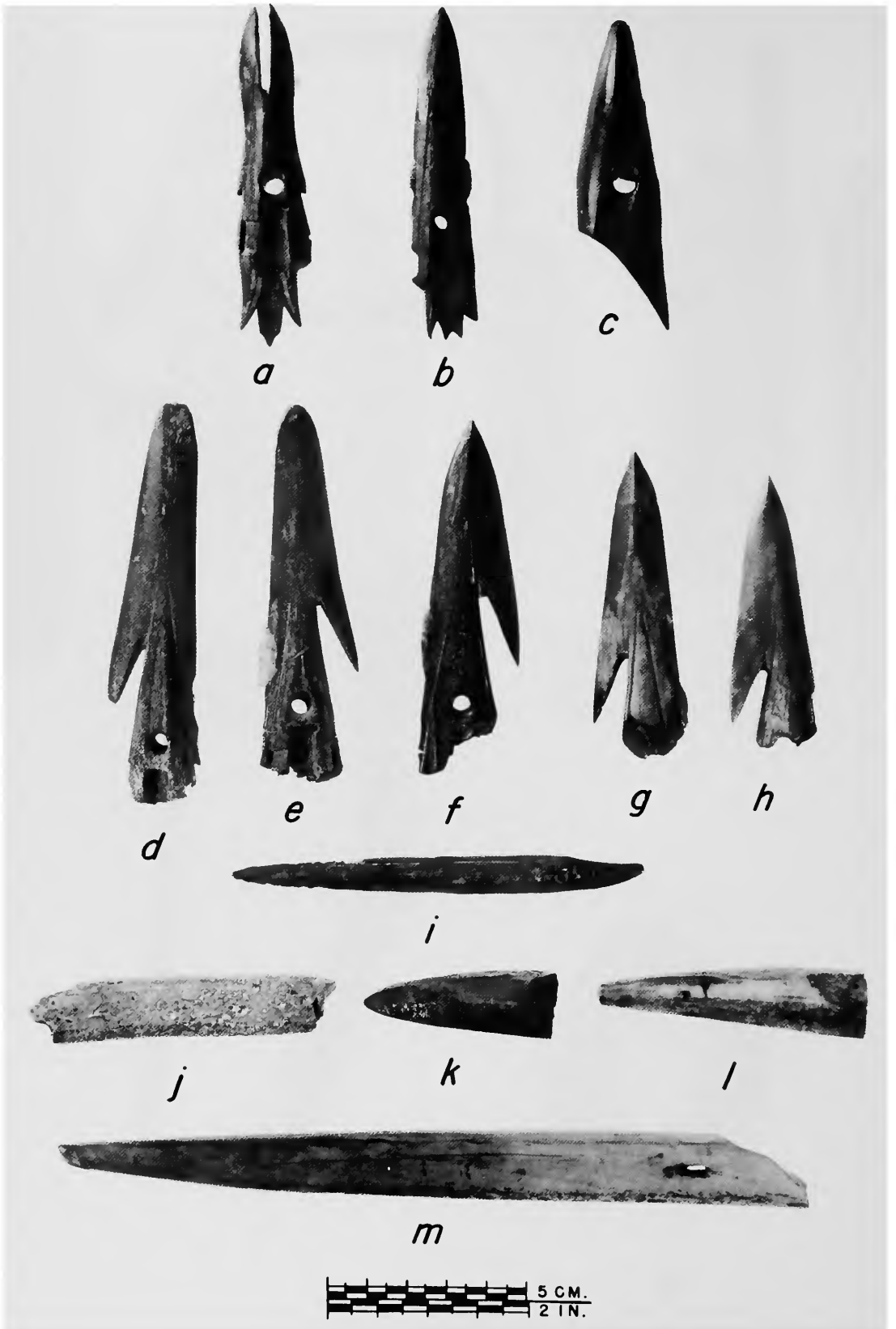

PLATE 15.—Birnirk artifacts, level B–10: *a*, Naulock open socket harpoon head; *b*, Tuquok open socket harpoon head; *c*, Thule IV closed socket harpoon head; *d–h*, Birnirk open socket harpoon heads; *i*, small harpoon foreshaft; *j–n*, large harpoon foreshafts.

PLATE 16.—Birnirk artifacts, level B–10: *a*, harpoon shaft ice pick fragment; *b–d*, harpoon shaft ice picks; *e*, harpoon socket piece.

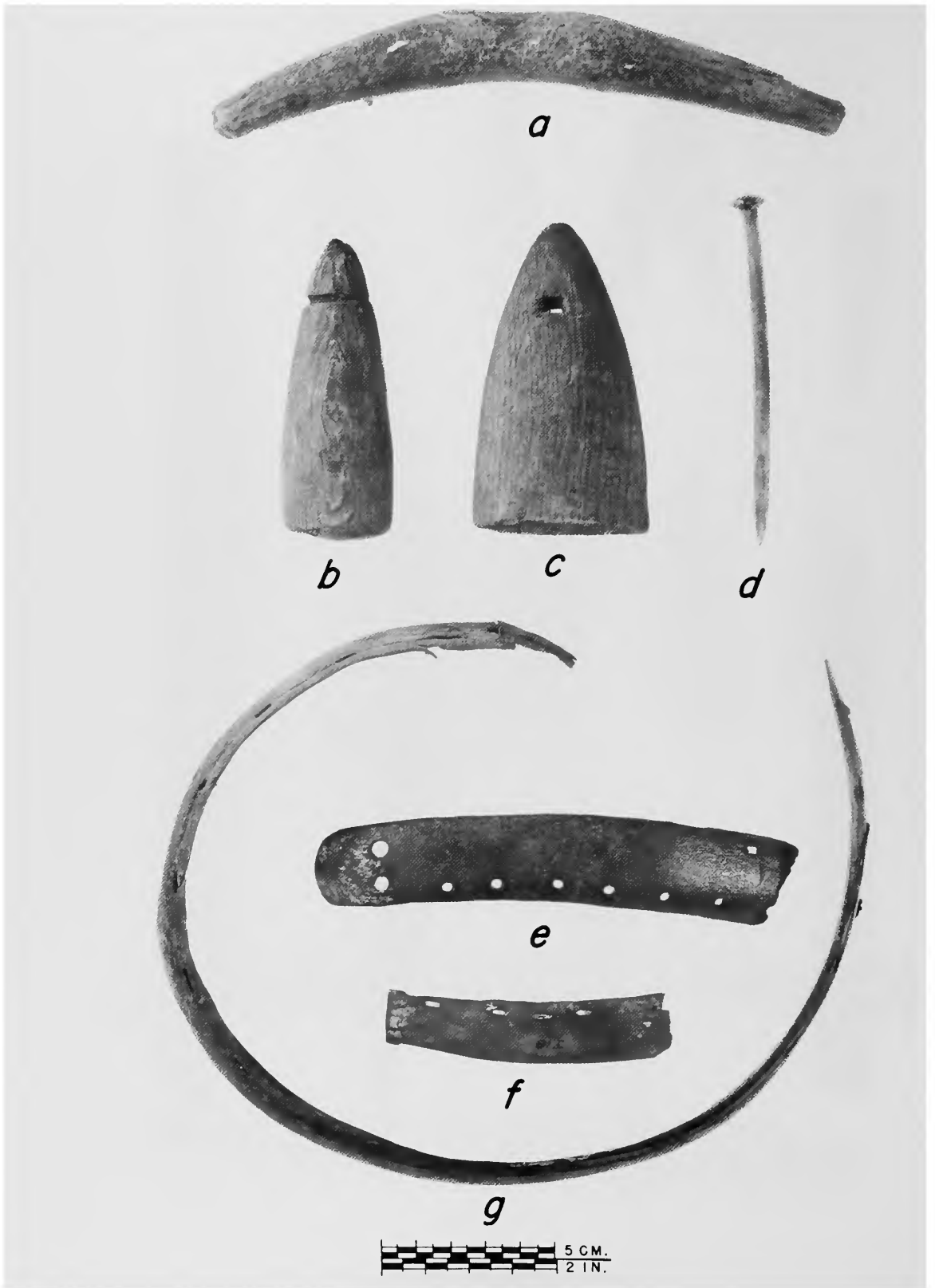

PLATE 17.—Birnirk artifacts, level B–10: *a*, float bar; *b*, *c*, wound plugs; *d*, wound pin; *e–g*, ice scoop rims.

PLATE 18.—Birnirk seal rattle, level B–10.

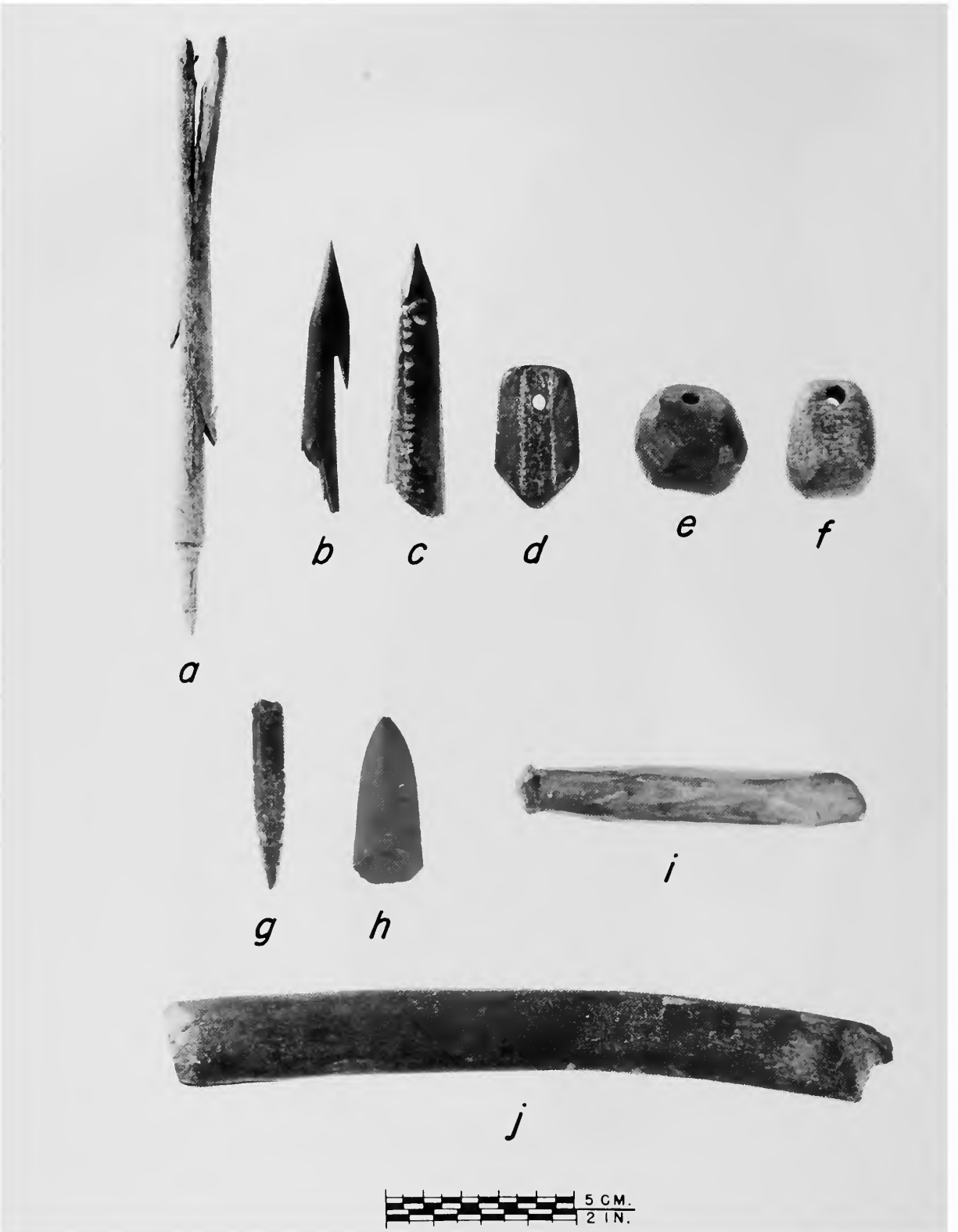

PLATE 19.—Birnirk artifacts, level B–10: *a*, antler arrowhead; *b*, antler arrowhead fragment; *c–f*, bola weights; *g*, foreshaft fragment; *h*, slate knife blade; *i*, composite knife handle; *j*, knife handle.

PLATE 20.—Wooden hunting hat, level B–10.

PLATE 21.—Birnirk artifacts, level B–10: *a*, boat seat; *b*, harpoon shaft.

PLATE 22.—Birnirk artifacts, level B–10: *a*, paddle tip; *b*, wooden shaft; *c*, *d*, paddle blades.

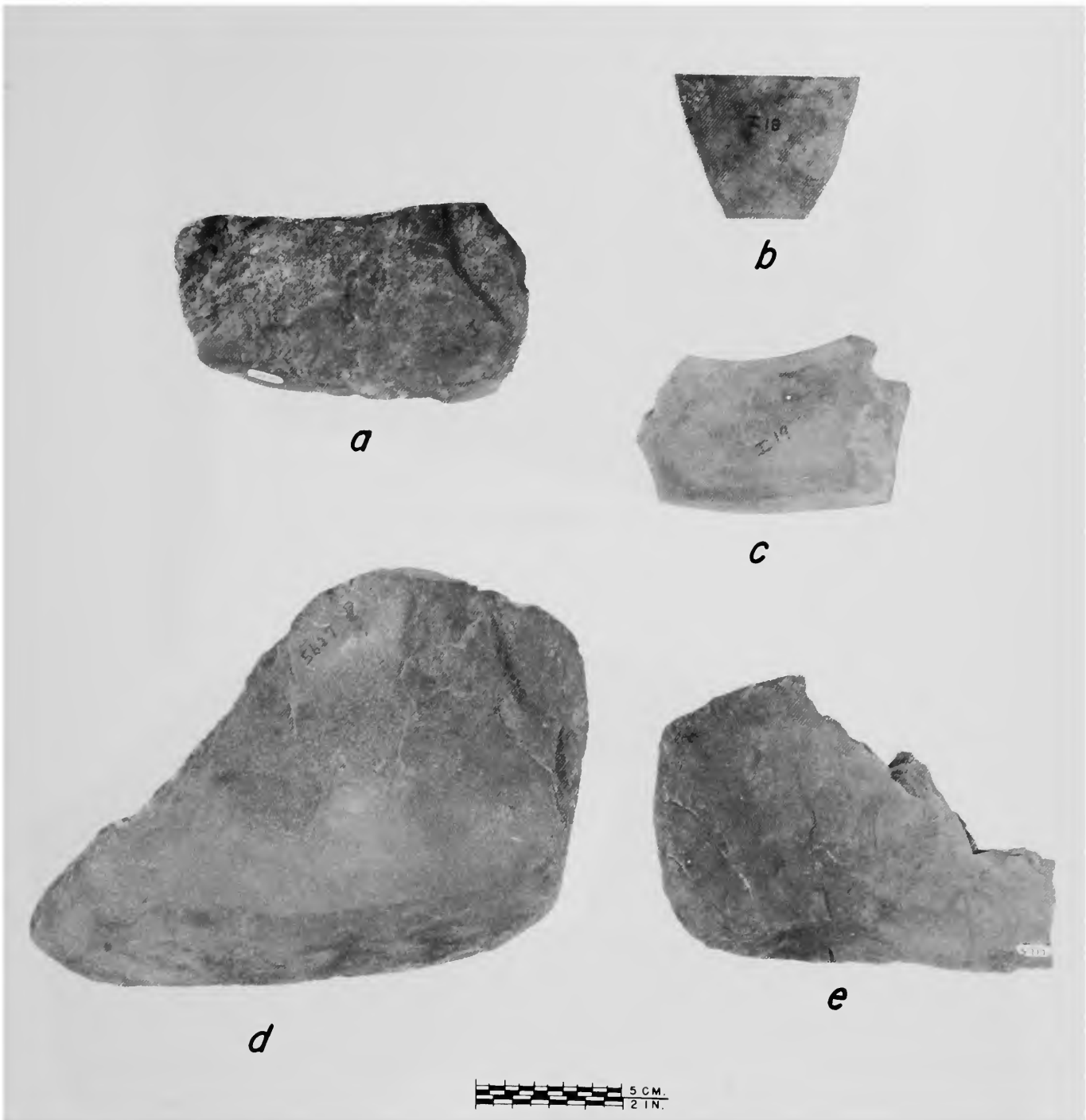

PLATE 23.—Birnirk artifacts, level B–10: *a–e*, whetstones.

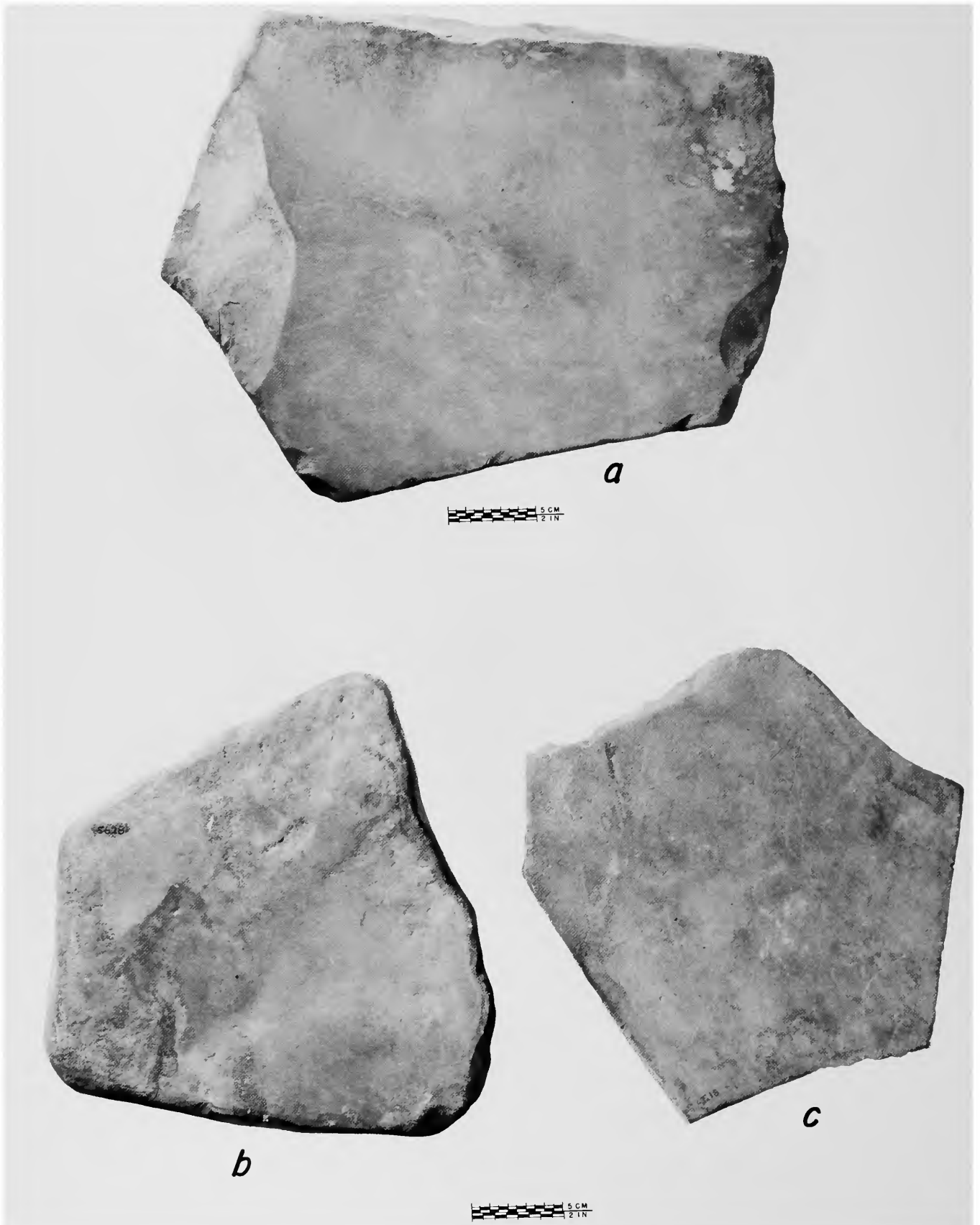

PLATE 24.—Birnirk artifacts, level B–10: *a–c*, whetstones.

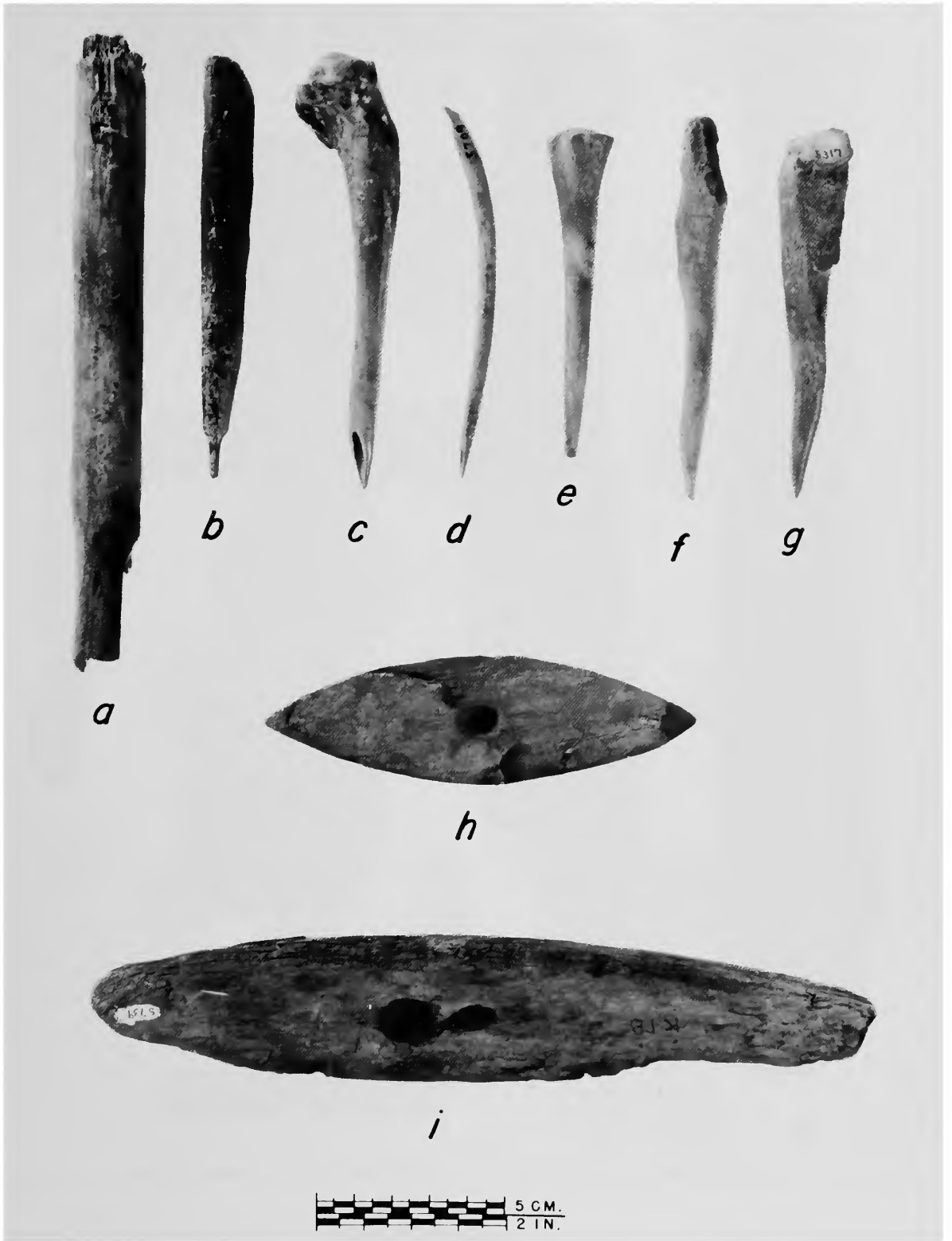

PLATE 25.—Birnirk artifacts, level B–10: *a*, awl handle; *b–g*, awls; *h*, *i*, bow drill bearings.

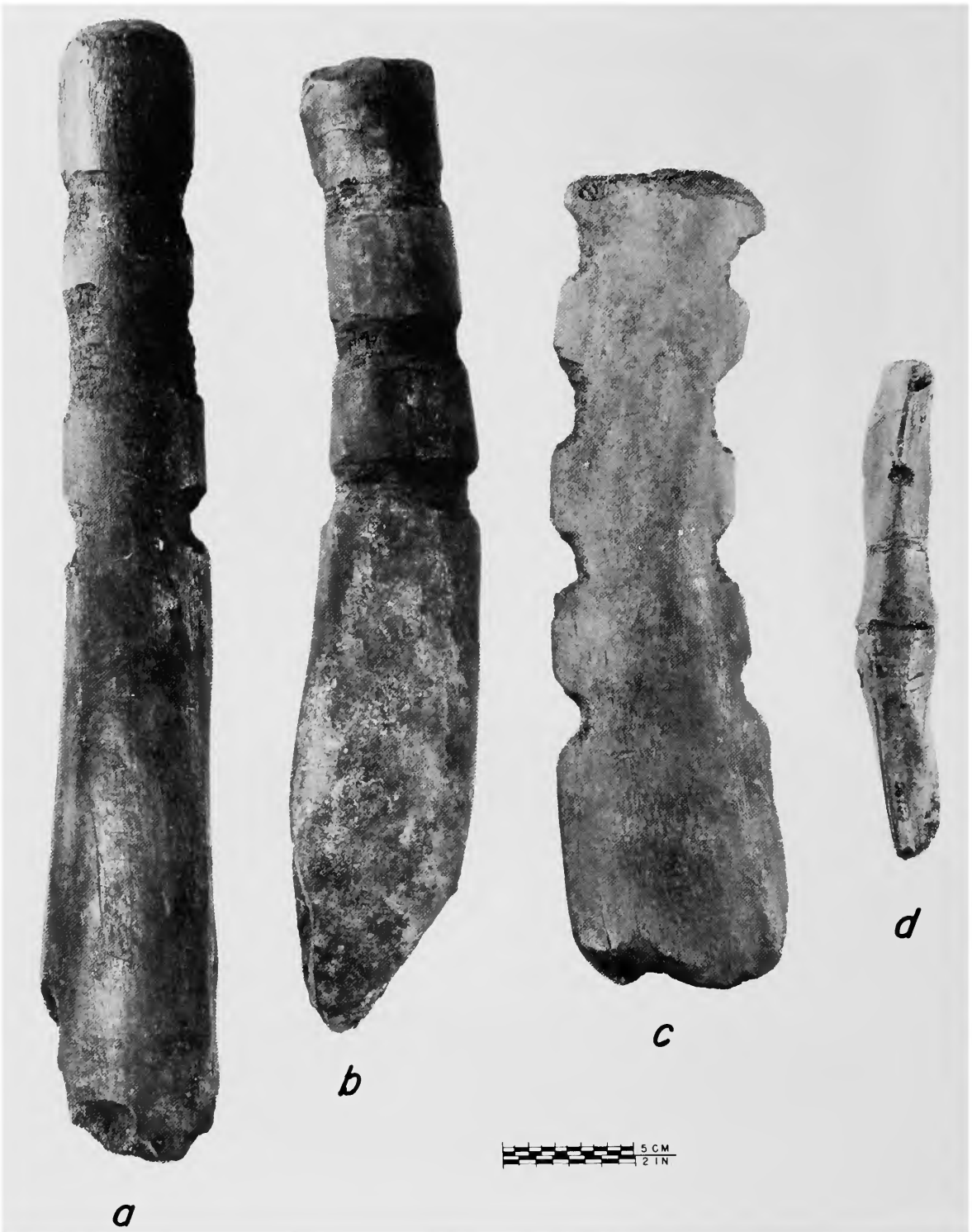

PLATE 26.—Birnirk artifacts, level B–10: *a–c*, whale rib mattock heads; *d*, whale rib pick.

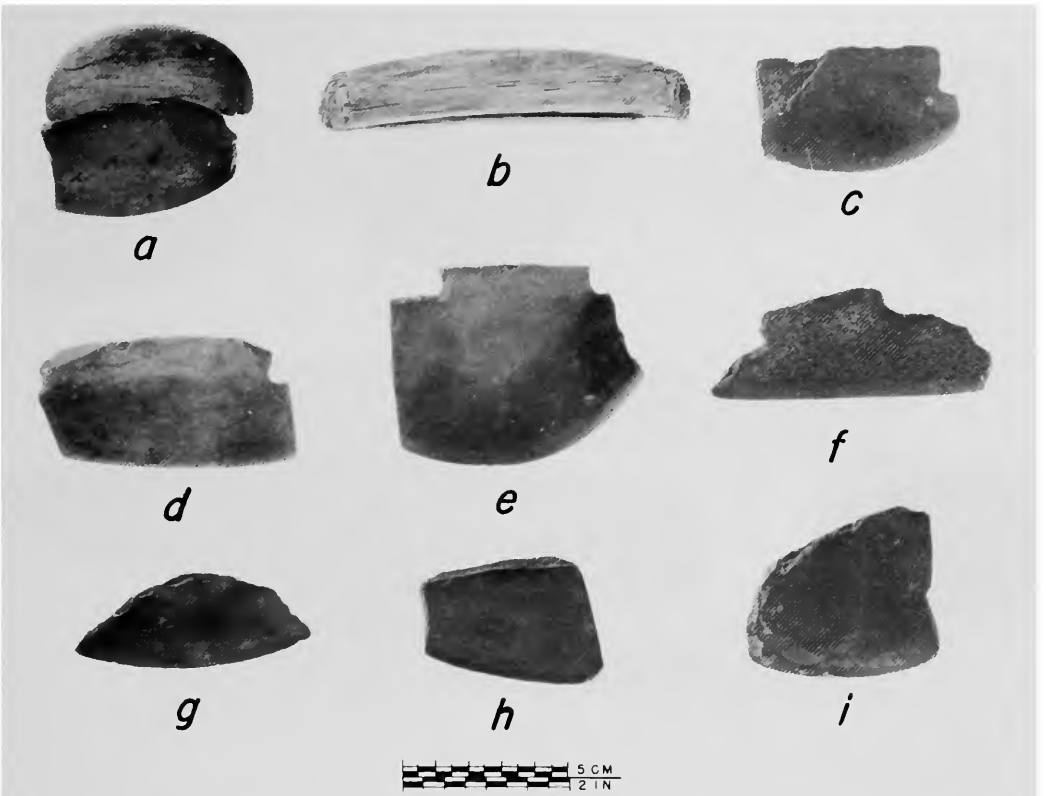

PLATE 27.—Birnirk artifacts, level B–10: *a*, ulu; *b*, ulu handle; *c–i*, ulu blades.

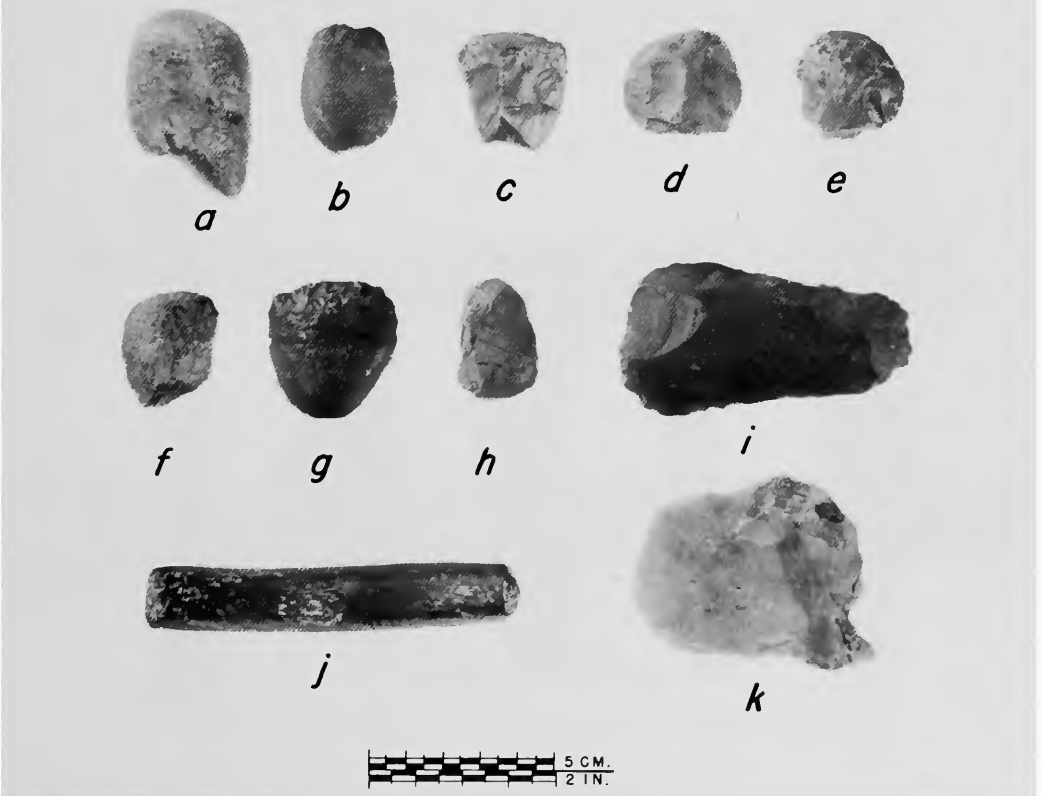

PLATE 28.—Birnirk artifacts, level B–10: *a*, *b*, *d–g*, *k*, pebble end scrapers; *c*, *f*, *h*, *i*, side scrapers; *j*, flint flaker point.

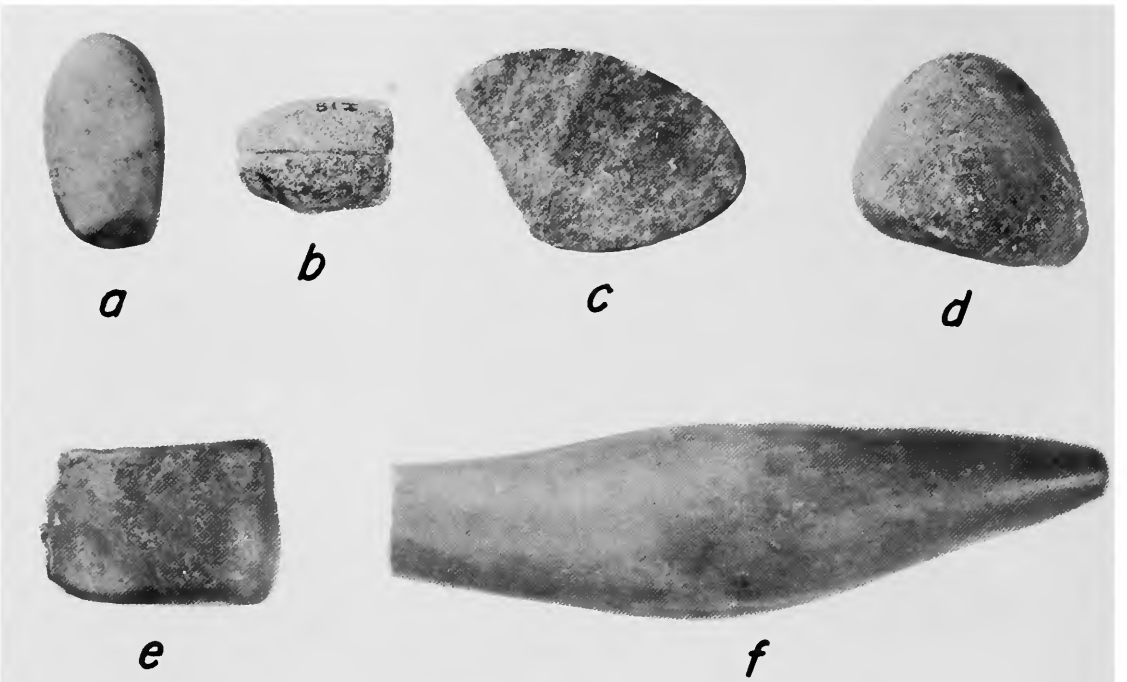

PLATE 29.—Birnirk artifacts, level B–10: *a*, flaked pebble; *b*, notched quartz pebble; *c*, Birnirk split pebbles scraper; *d*, whetstone; *e*, ground hematite nodule; *f*, ground slate nodule.

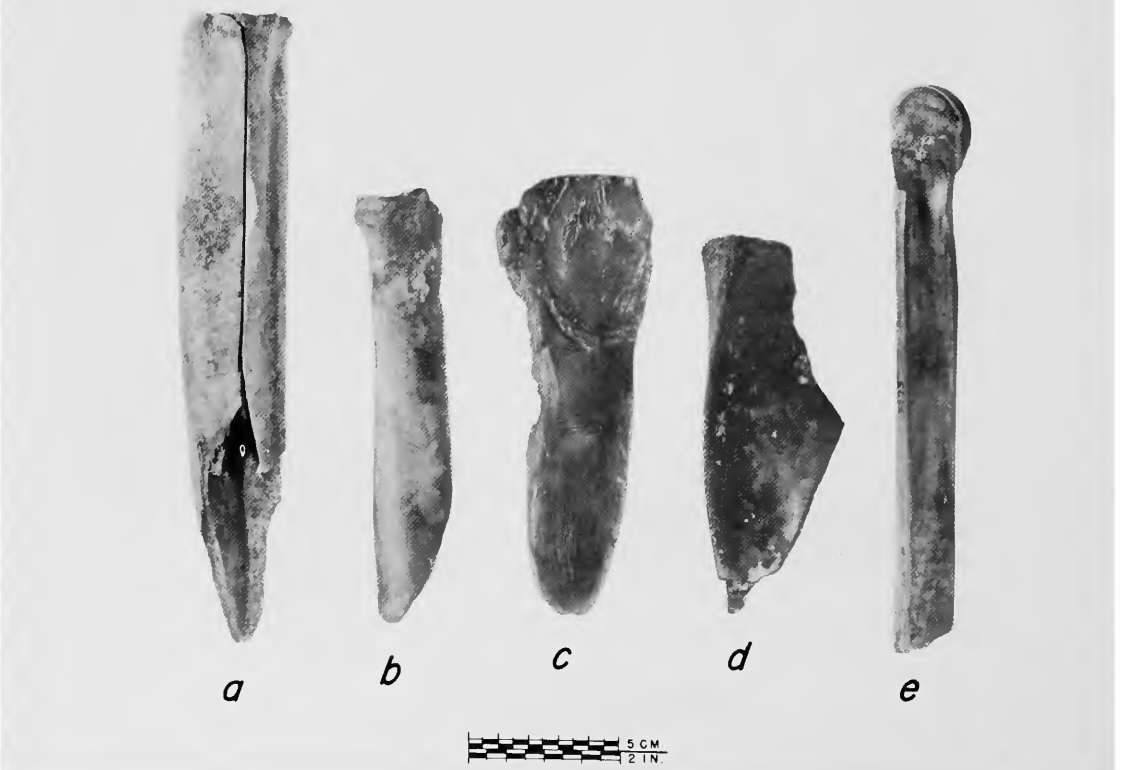

PLATE 30.—Birnirk artifacts, level B–10: *a–e*, bone scrapers.

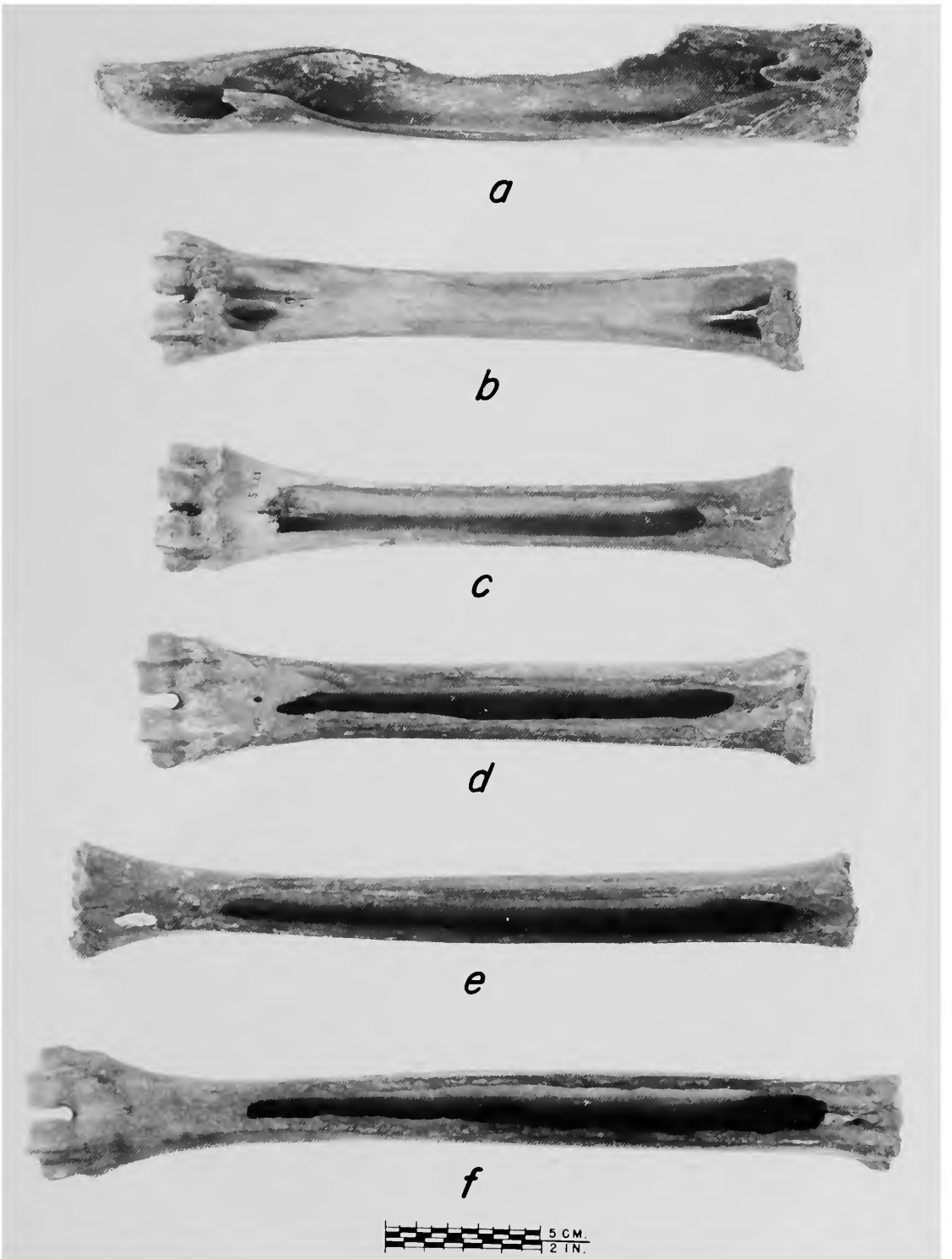

PLATE 31.—Birnirk artifacts, level B–10: *a–f*, two-handed metapodial scrapers.

PLATE 32.—Wooden meat tray, level B–10.

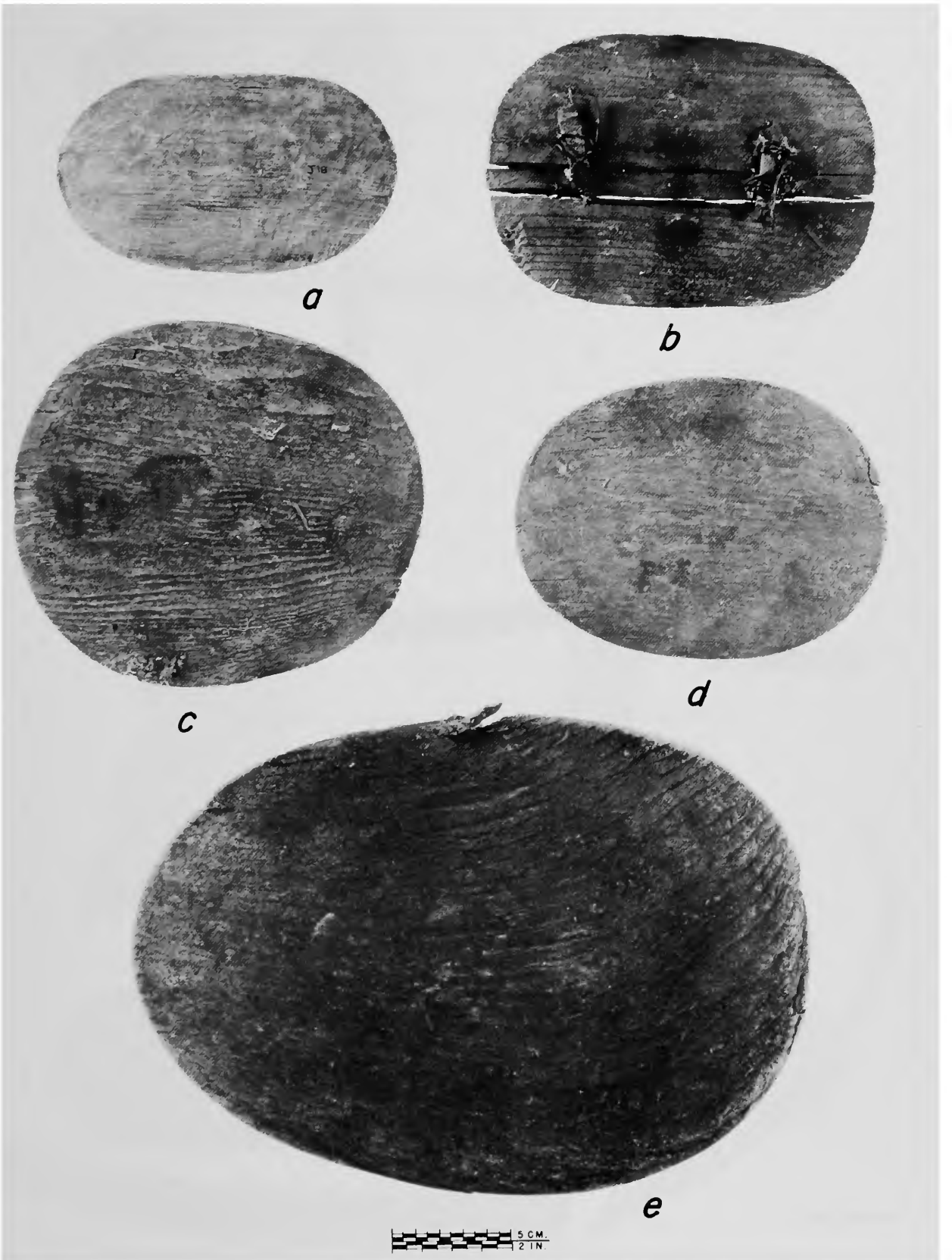

PLATE 33.—Birnirk artifacts, level B–10: *a–e*, wooden bucket bottoms.

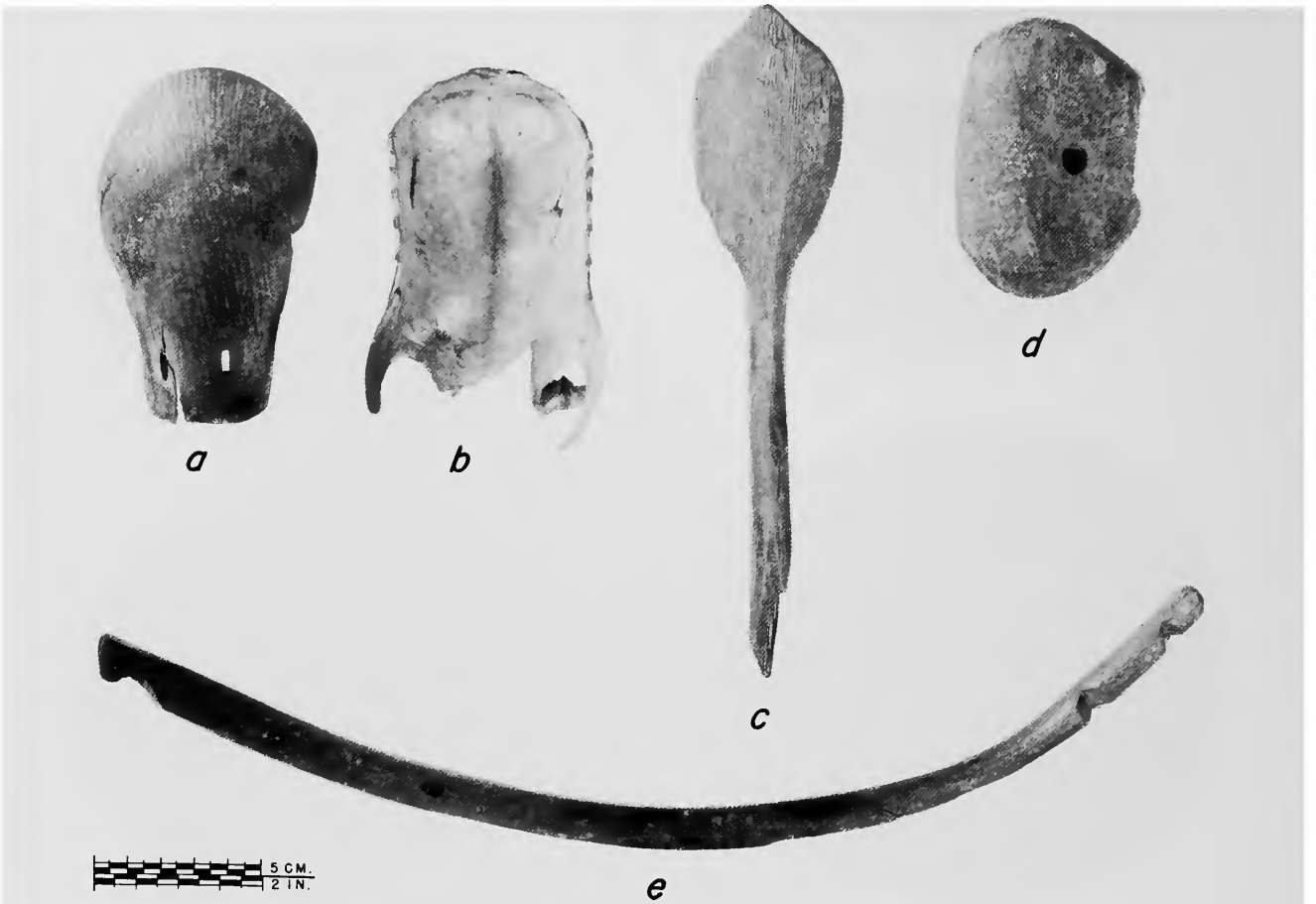

PLATE 34.—Birnirk artifacts, level B–10: *a*, *b*, spoons; *c*, spoon-like artifact; *d*, flaker hammerhead; *e*, kayak rib.

PLATE 35.—Drum rim, level B–10.

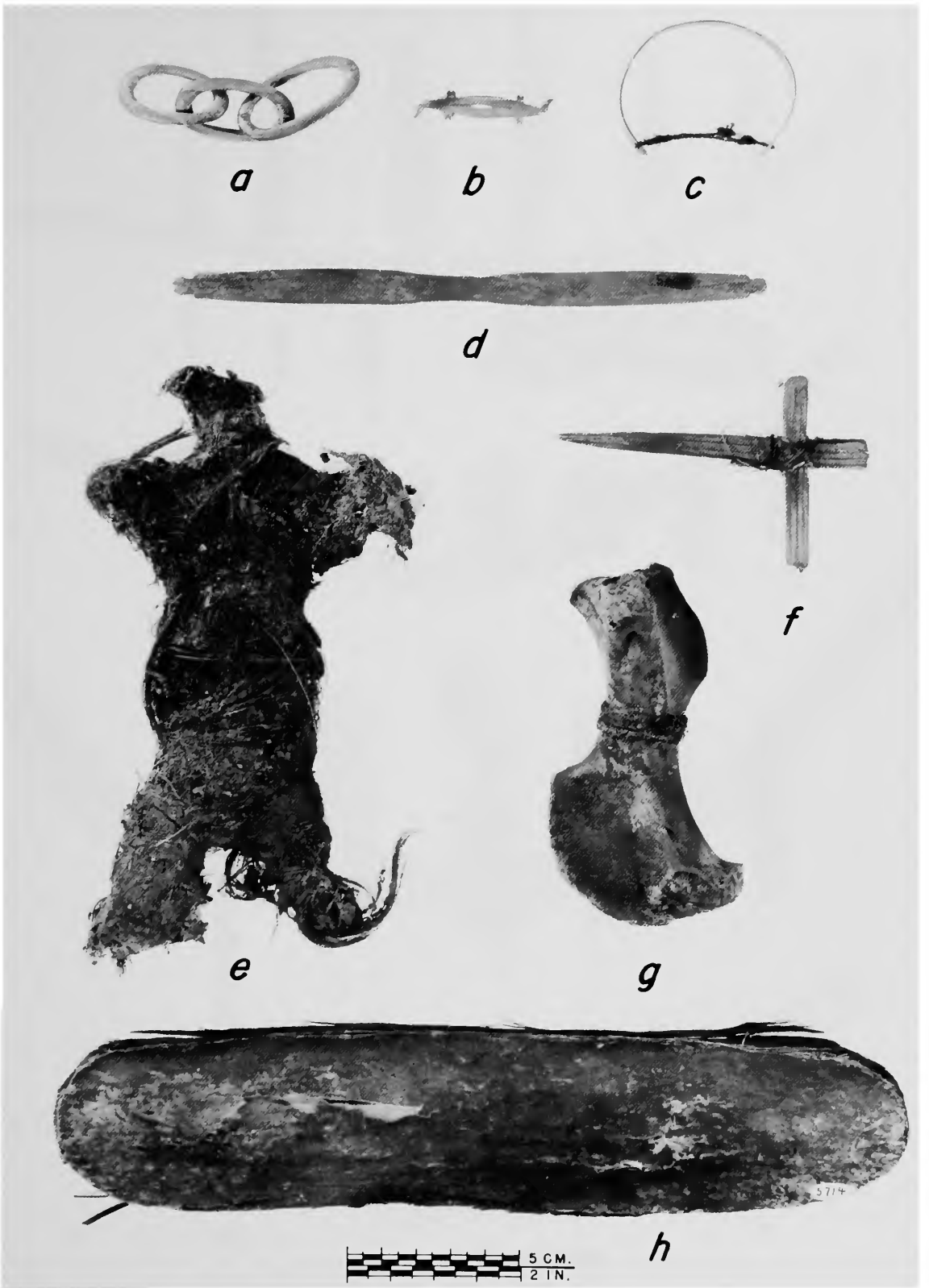

PLATE 36.—Birnirk artifacts, level B–10: *a*, ivory chain; *b*, ivory object; *c*, baleen saw(?); *d*, toy bow; *e*, organic doll; *f*, wooden object; *g*, cup and pin game; *h*, baleen object.

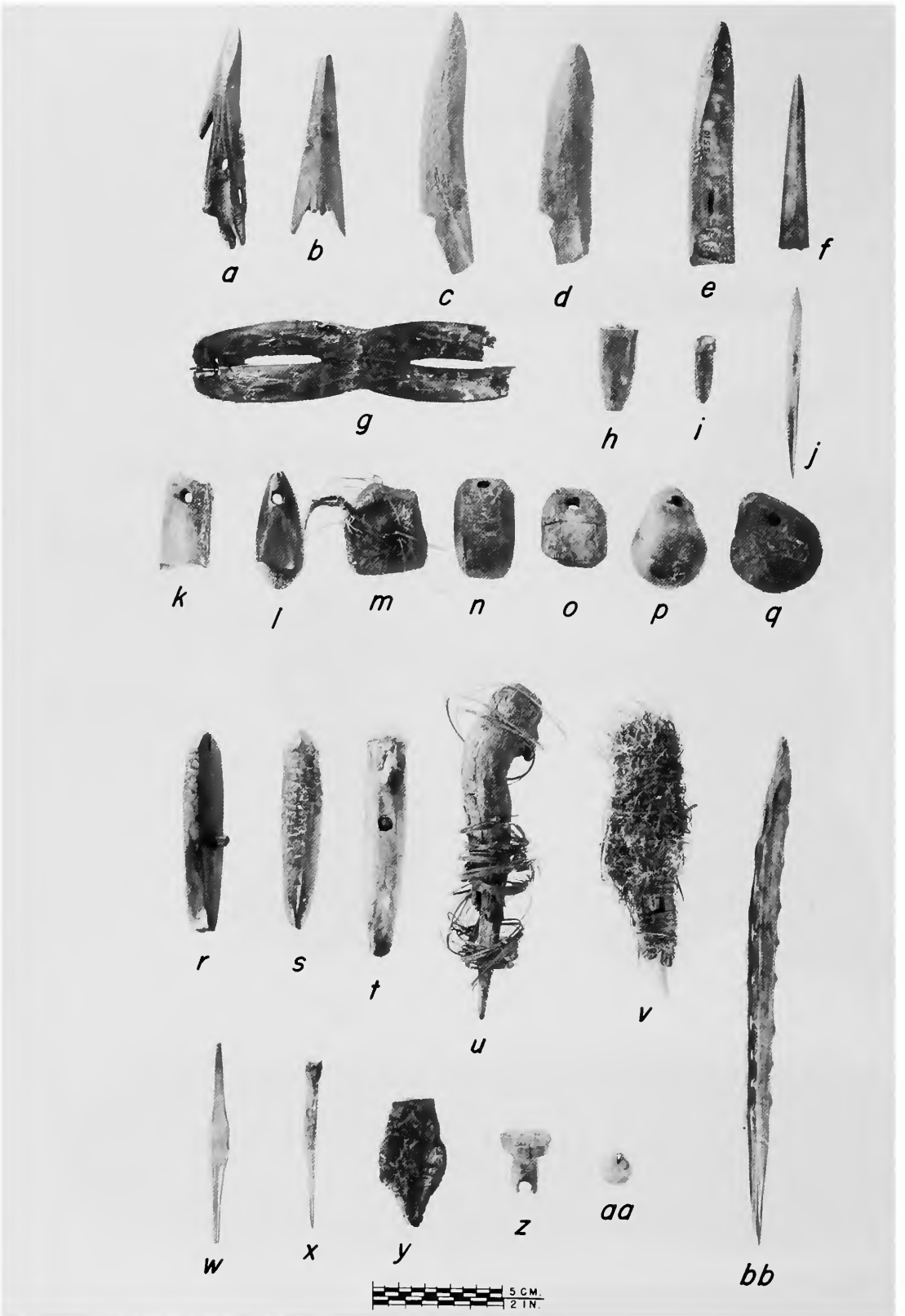

PLATE 37.—Birnirk artifacts, level B–10: *a*, Birnirk open socket harpoon head; *b*, harpoon head fragment; *c*, *d*, harpoon head preforms; *e*, harpoon foreshaft; *f*, antler arrowhead fragment; *g*, baleen snow goggles; *h*, snow probe ferrule; *i*, dart butt piece; *j*, fish arrow prong; *k–q*, bola weights; *r–t*, composite knife handles; *u*, *v*, composite awls; *w*, engraving tool; *x*, awl; *y*, chert drill bit; *z*, toggle fragment; *aa*, ivory pendant; *bb*, ivory awl.

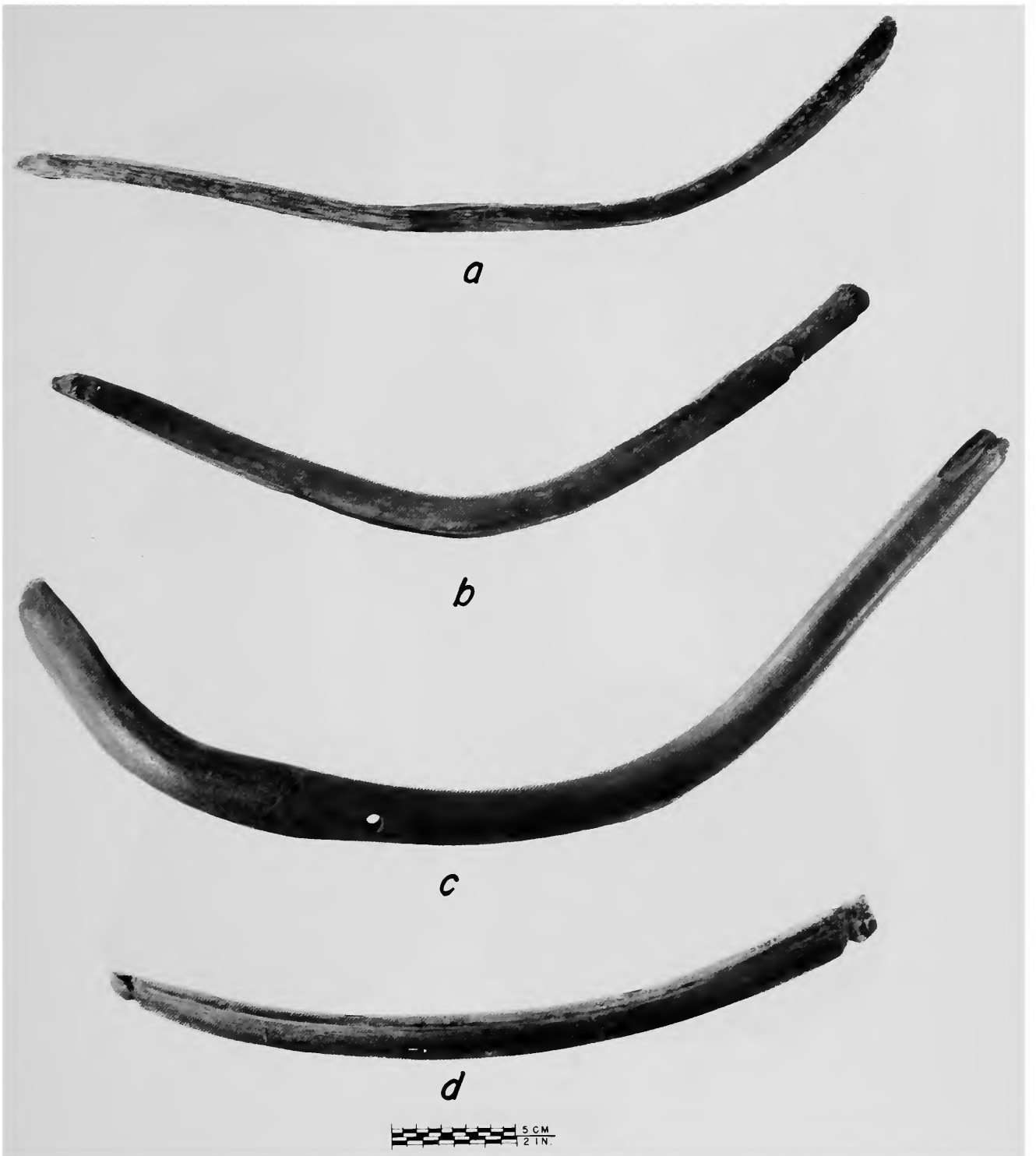

PLATE 38.—Birnirk artifacts, level B–9: *a–c*, sled arches; *d*, kayak rib.

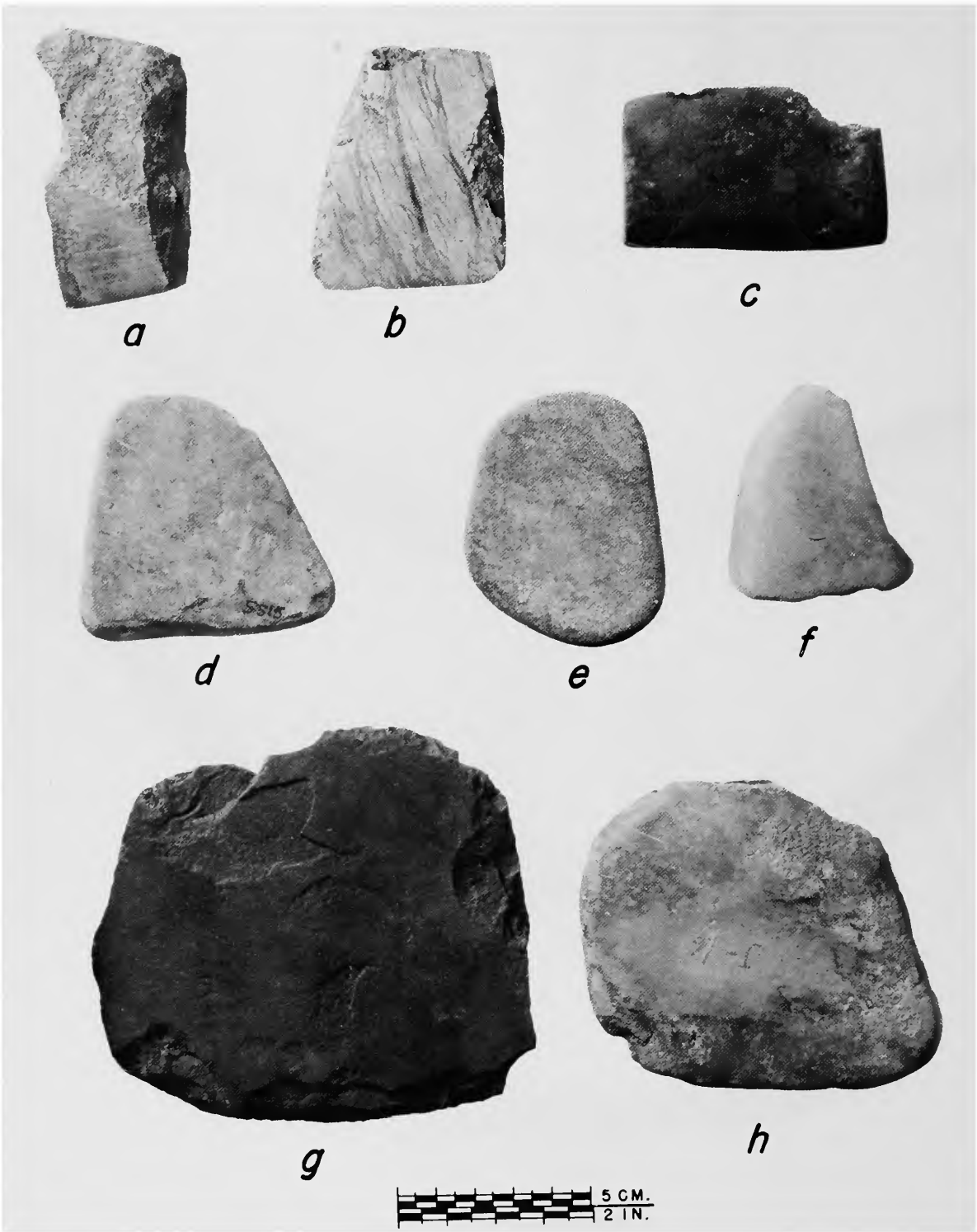

PLATE 39.—Birnirk artifacts, level B–9: *a*, *b*, adz blades; *c*, ground hematite; *d–h*, whetstones.

PLATE 40.—Birnirk artifacts, level B–9: *a*, *b*, whale rib mattock heads; *c*, mattock handle.

PLATE 41.—Birnirk artifacts, level B–9: *a*, wedge; *b*, whale rib ice pick; *c*, whale rib mattock blade.

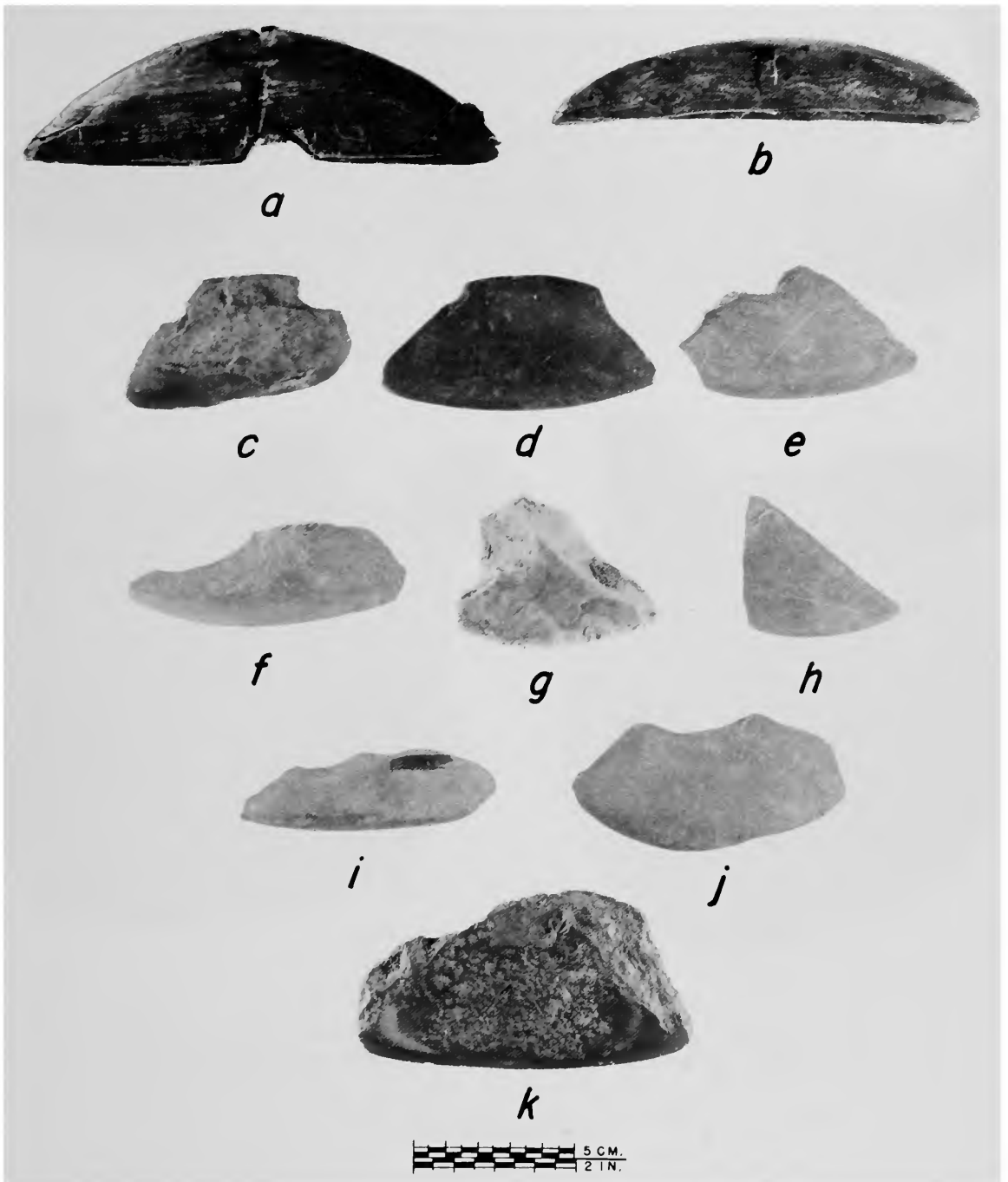

PLATE 42.—Birnirk artifacts, level B–9: *a*, *b*, ulu handles; *c–k*, ulu blades.

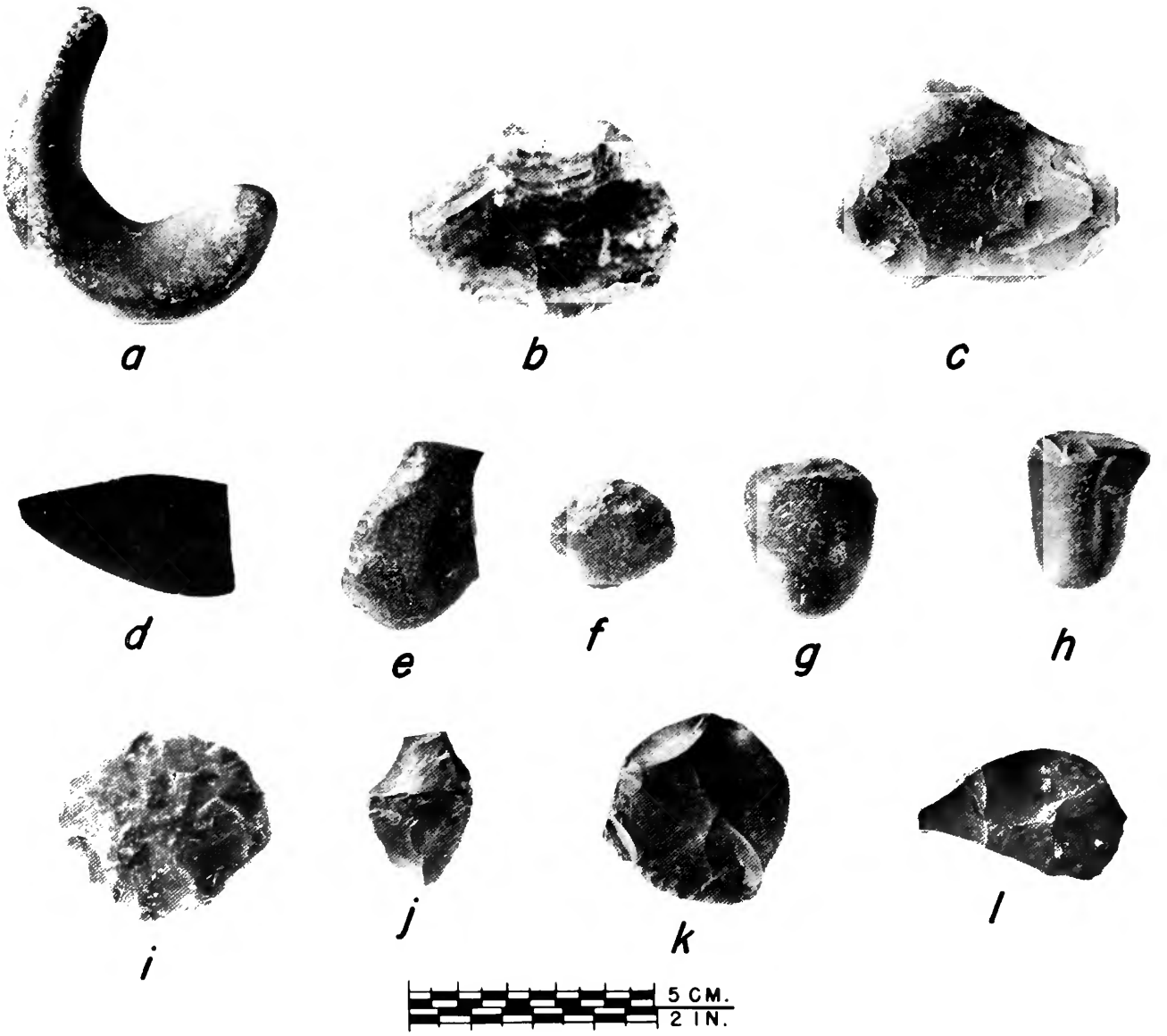

PLATE 43.—Birnirk artifacts, level B–9: *a*, stone object; *b*, *c*, *i*, chert bifaces; *d*, slate knife blade; *e*, pebble side scrapers; *f–h*, pebble end scrapers; *k*, *l*, retouched flakes.

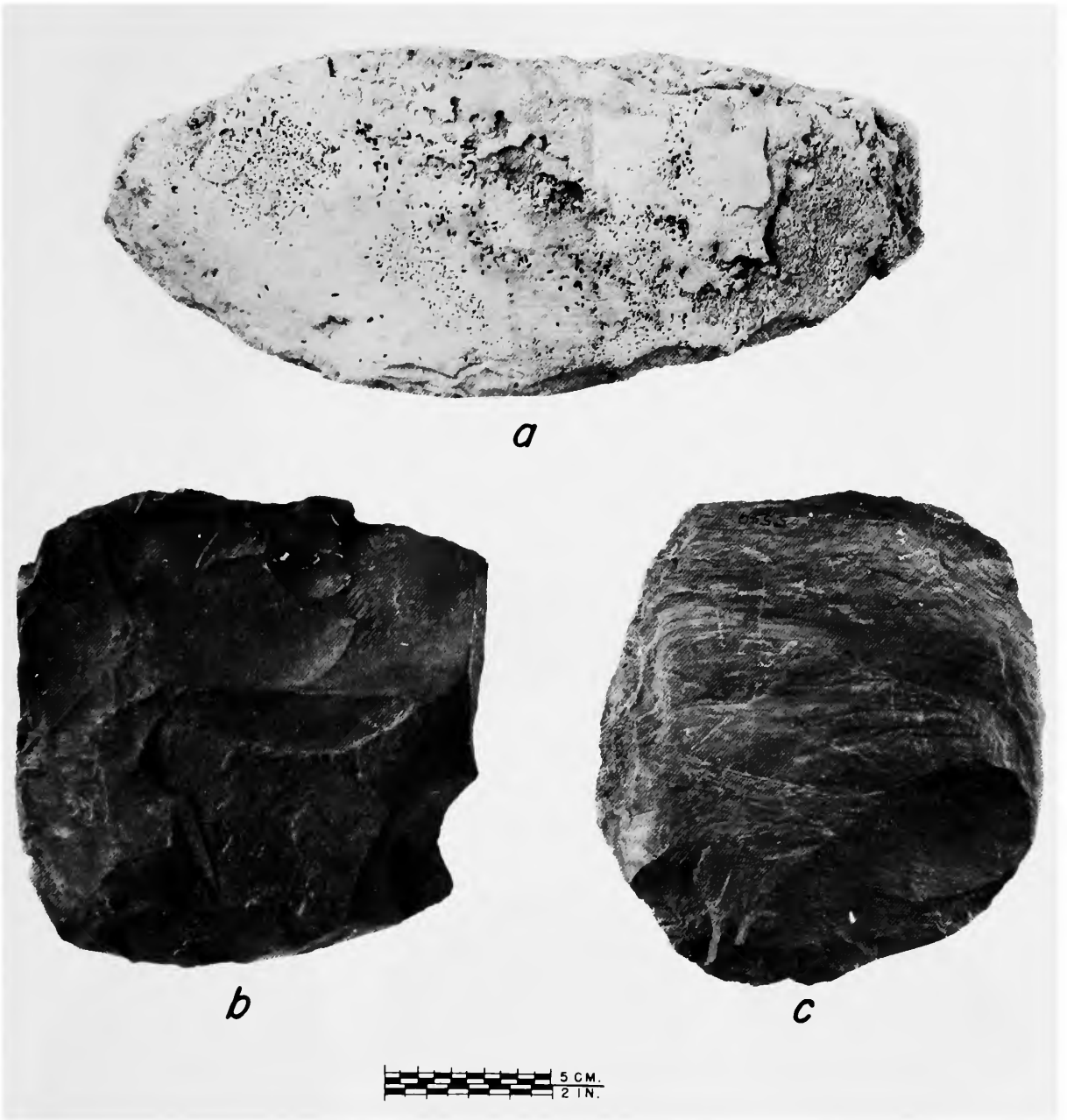

PLATE 44.—Birnirk artifacts, level B–9: *a*, flaked and ground slate object; *b*, *c*, large, bifacially flaked objects.

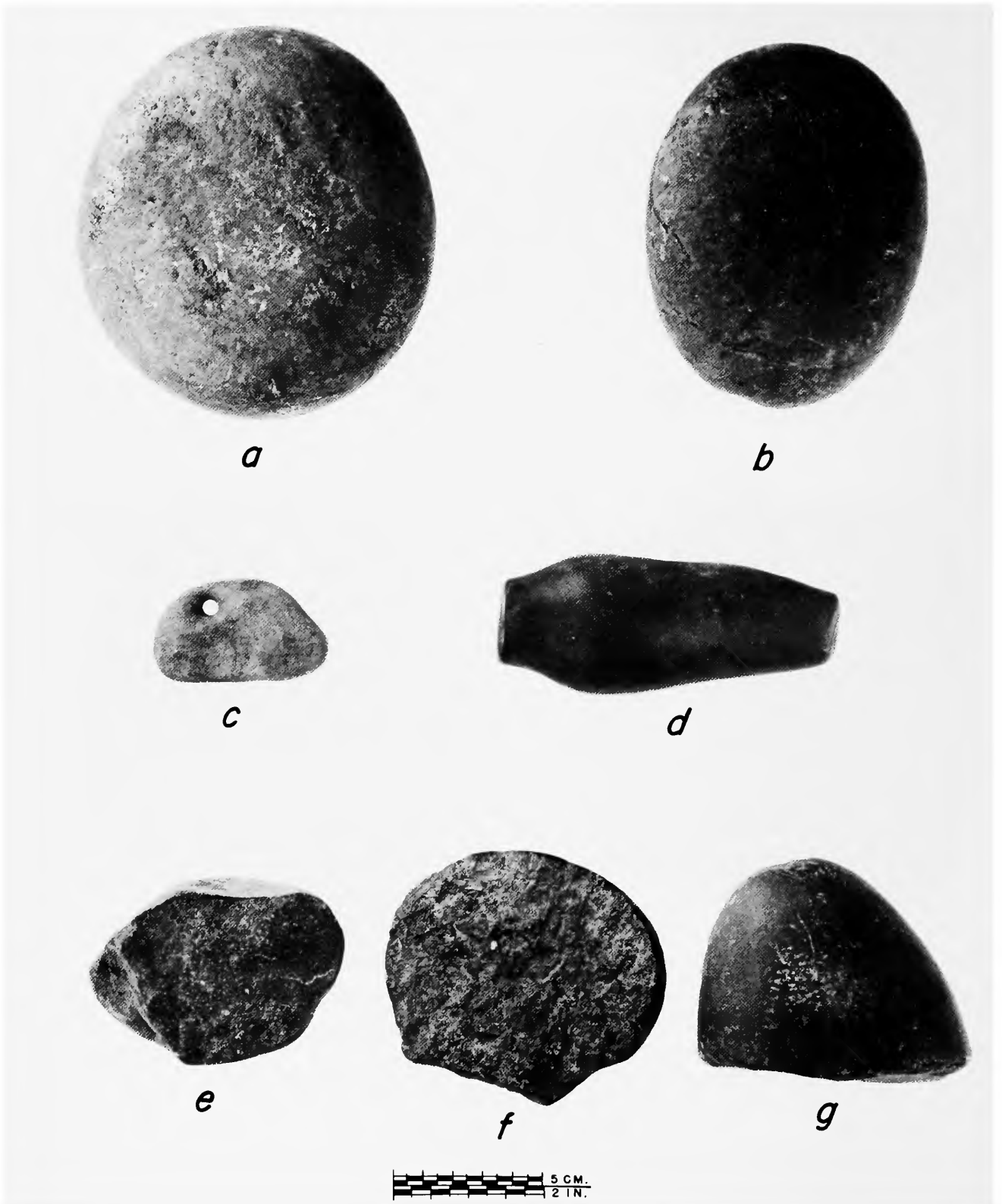

PLATE 45.—Birnirk artifacts, level B–9: *a*, *b*, hammerstones; *c*, drilled stone object; *d*, ground slate nodule; *e*–*g*, Birnirk split pebble scrapers.

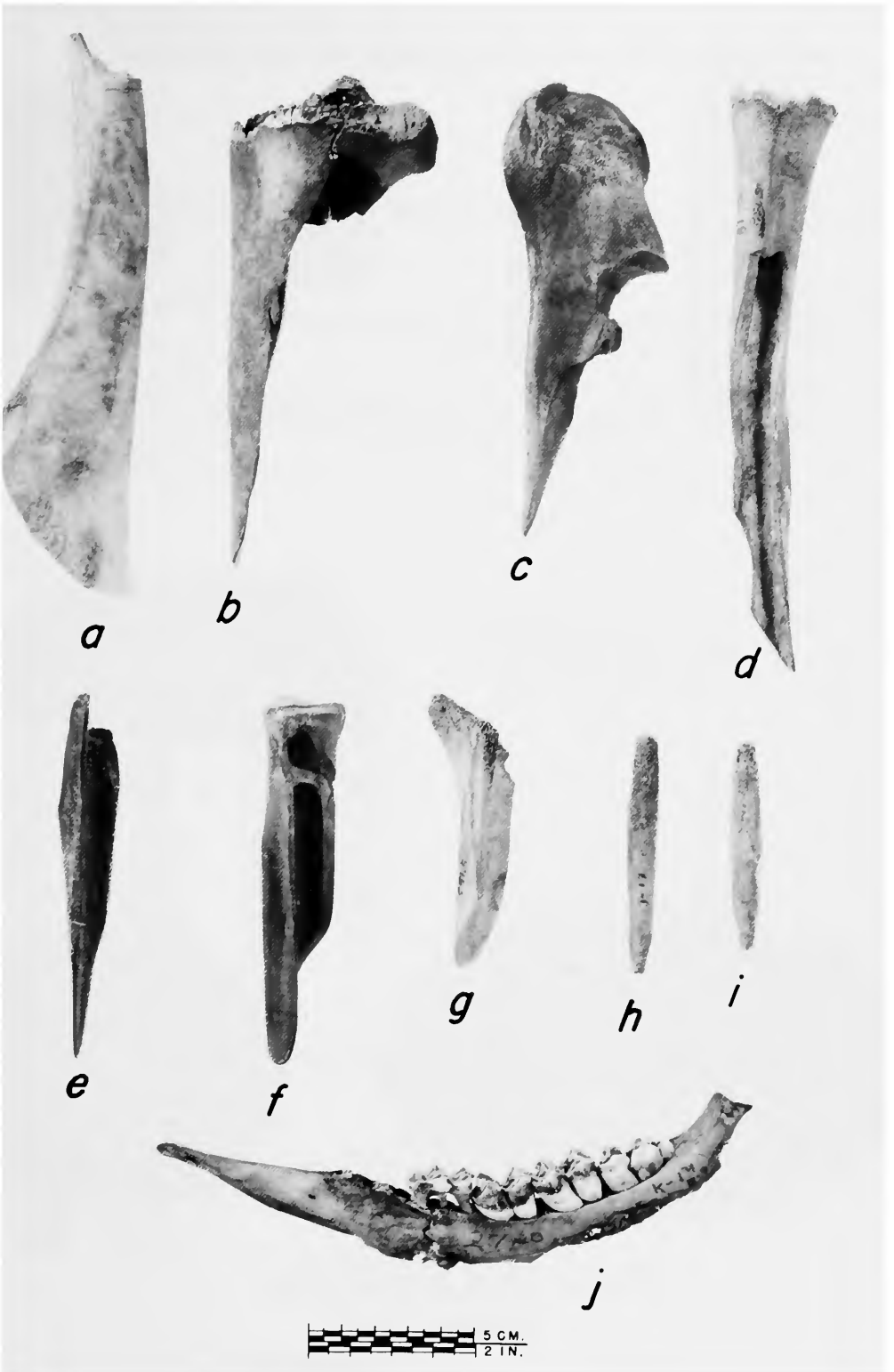

PLATE 46.—Birnirk artifacts, level B–9: *a, d, f, g, j,* bone scrapers; *b, c, e,* bone awls; *h, i,* gauged drills.

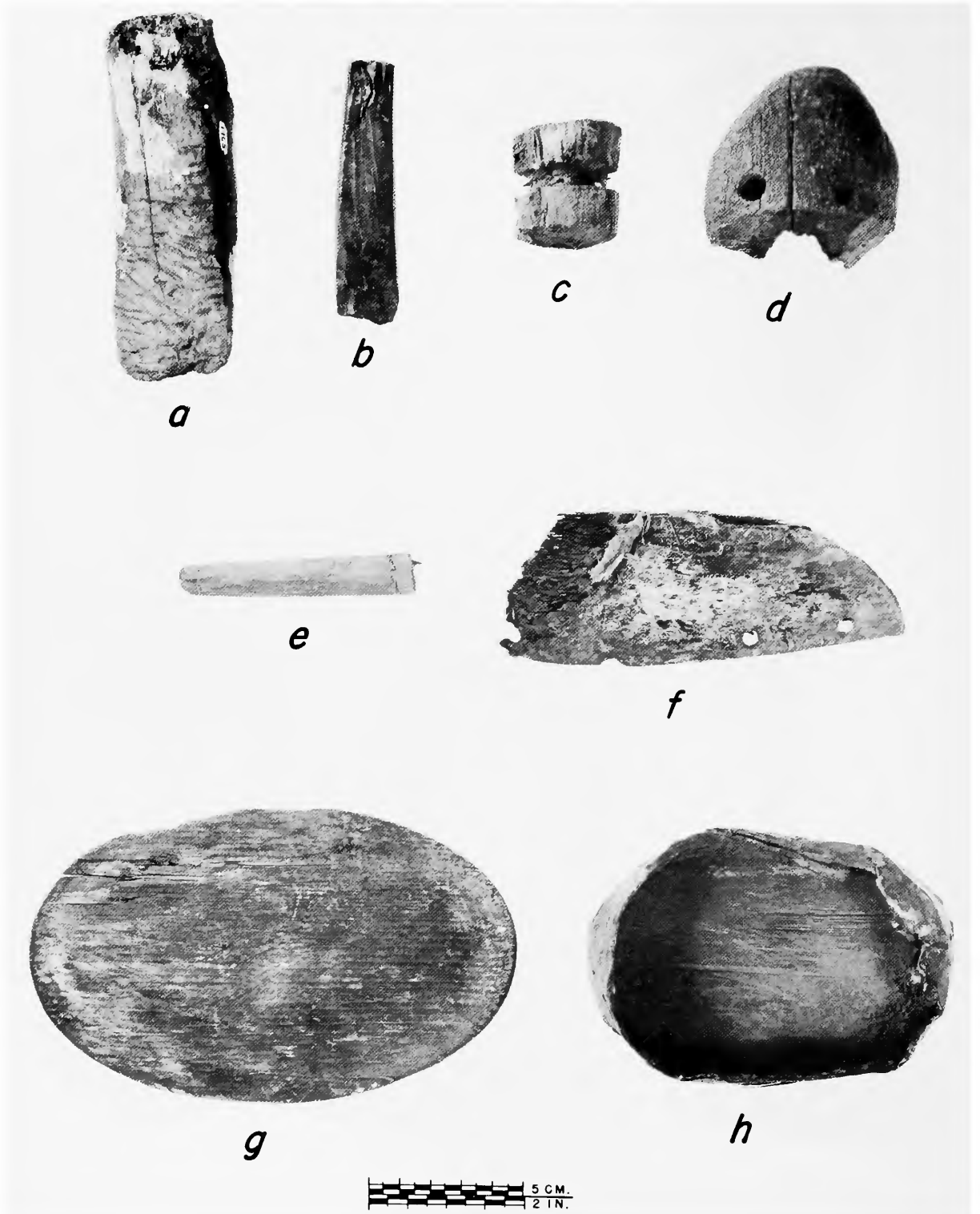

PLATE 47.—Birnirk artifacts, level B–9: *a*, *b*, small wedges; *c*, seal float mouthpiece; *d*, net weight; *e*, wooden shaft; *f*, baleen object; *g*, wooden bucket bottom; *h*, baleen bucket.

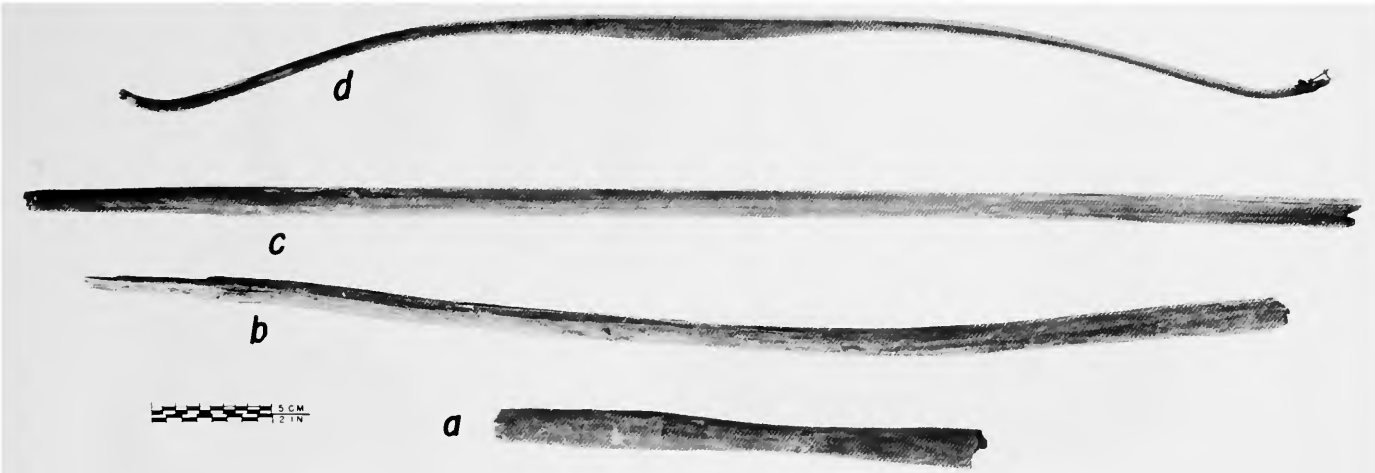

PLATE 48.—Birnirk artifacts, level B–9: *a, b,* toy bow fragments; *c,* arrowshaft; *d,* toy bow.

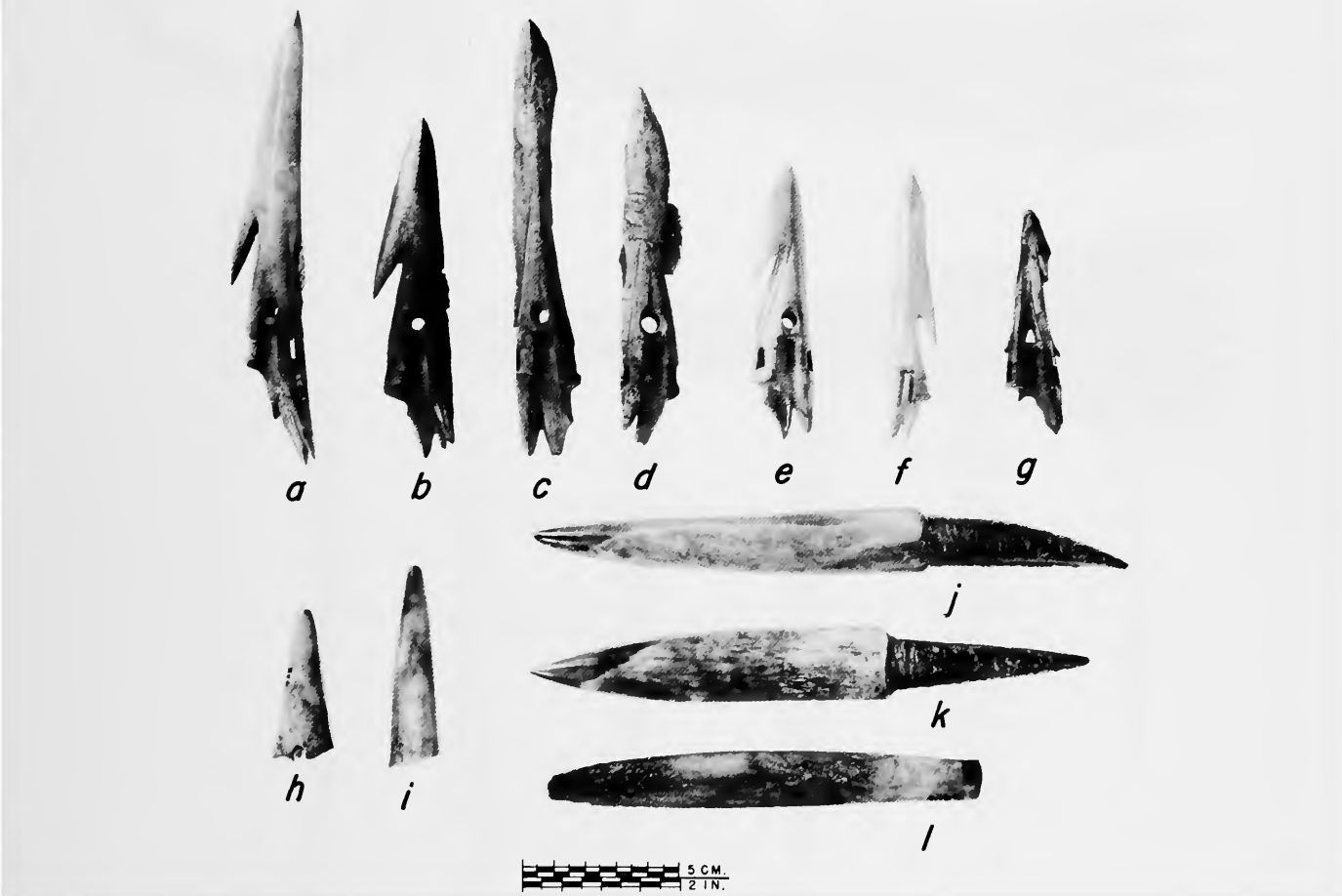

PLATE 49.—Birnirk artifacts, level B–8: *a–d,* Birnirk open socket harpoon heads; *e, f,* Natchuk open socket harpoon heads; *g,* Thule II open socket harpoon head; *h, i,* harpoon foreshaft fragments; *j–l,* harpoon shaft ice picks.

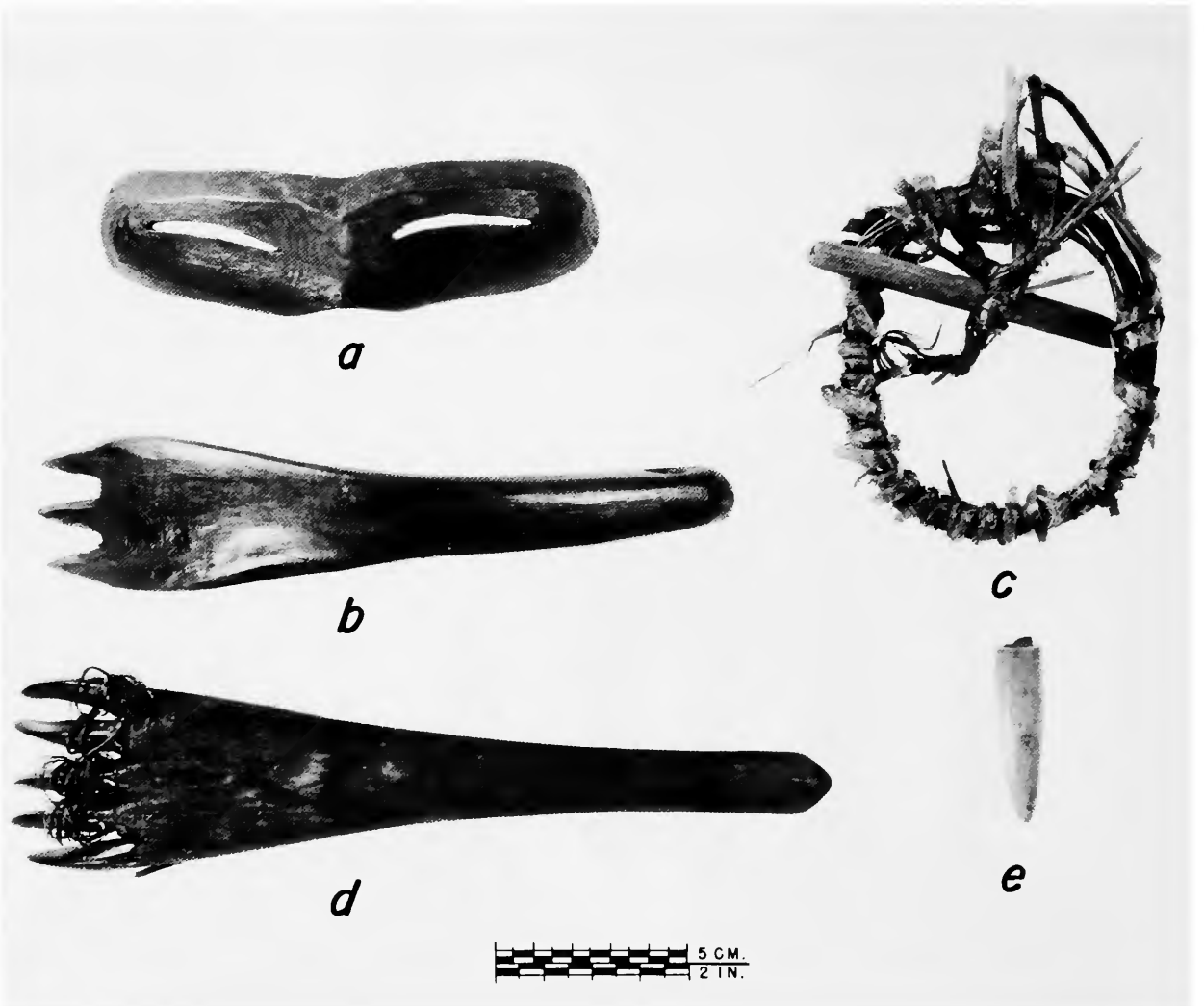

PLATE 50.—Birnirk artifacts, level B–8: *a*, wooden snow goggles; *b*, *d*, seal scratchers; *c*, ice staff ring; *e*, snow probe ferrule.

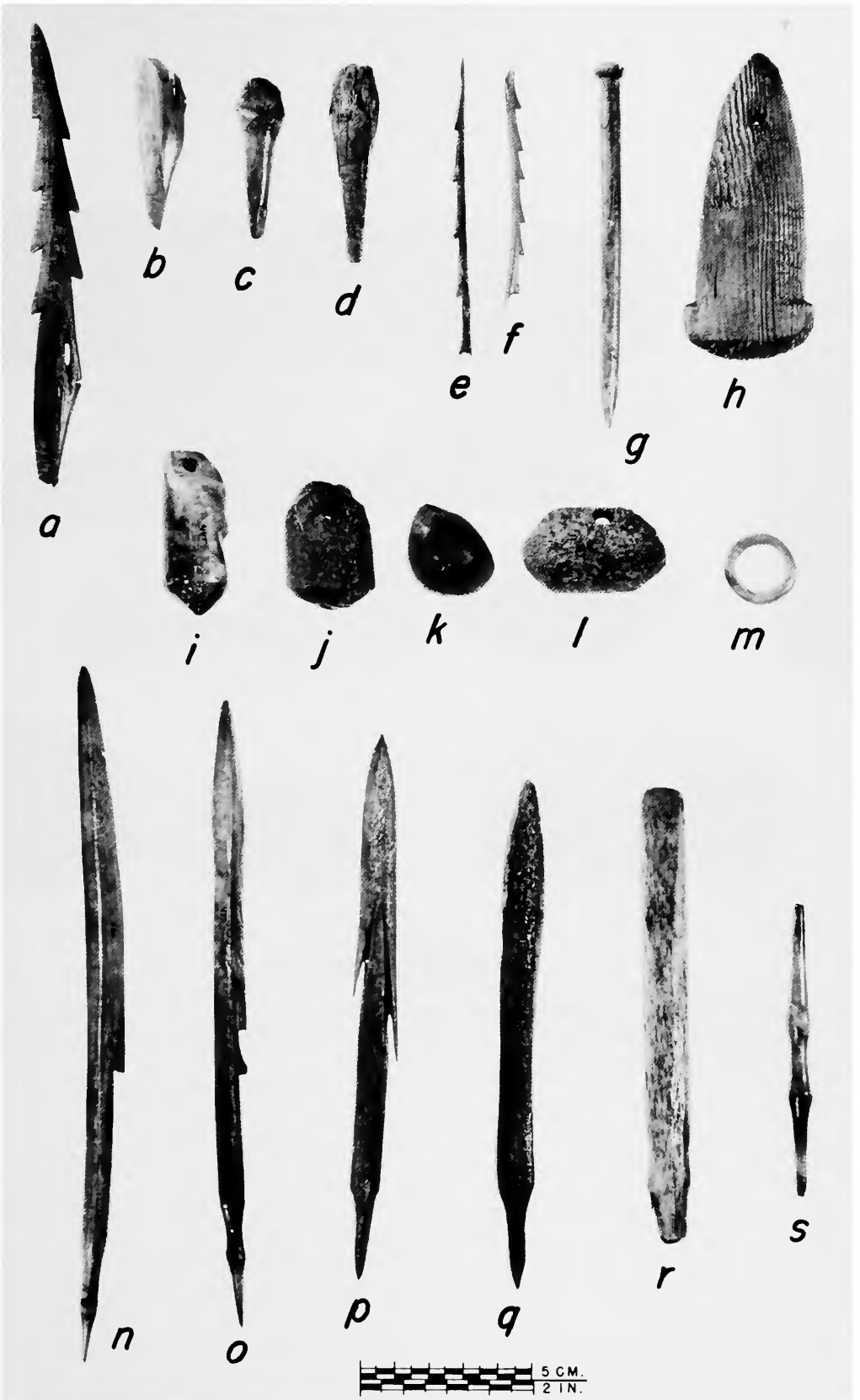

PLATE 51.—Birnirk artifacts, level B–8: *a, b,* bird-dart side prong; *c, d,* seal float mouthpiece stoppers; *e, f,* fish arrow prongs; *g,* wound pin; *h,* wound plug; *i–l,* bola weights; *m,* ivory ring; *n–q,* antler arrowheads; *r,* knapping tool; *s,* engraving tool.

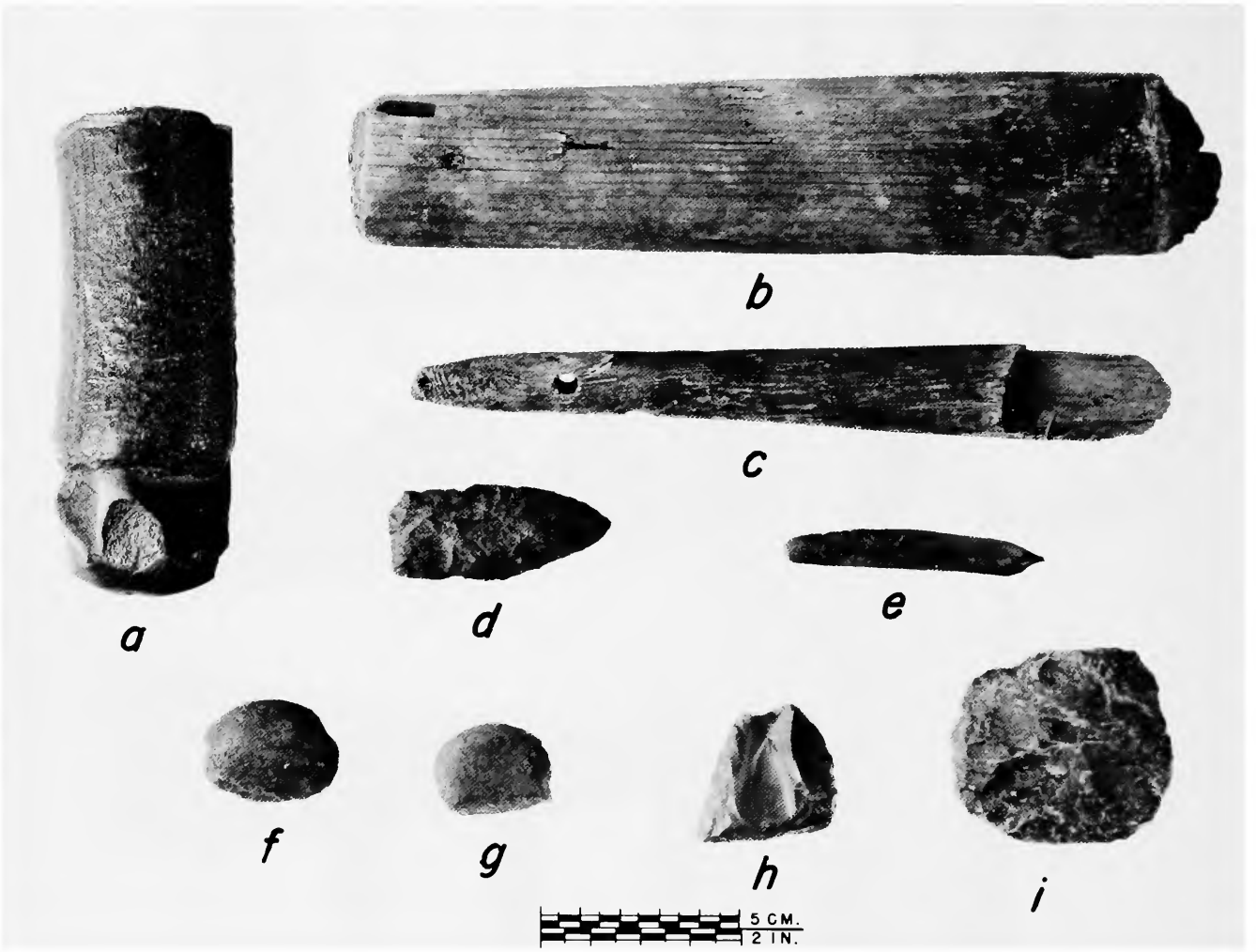

PLATE 52.—Birnirk artifacts, level B–8: *a*, adz blade and antler sleeve; *b*, scraper handle; *c*, knife handle; *d*, chert knife blade; *e*, gauge drill; *f*, *g*, pebble side scrapers; *h*, planoconvex end scraper; *i*, bifacial tool.

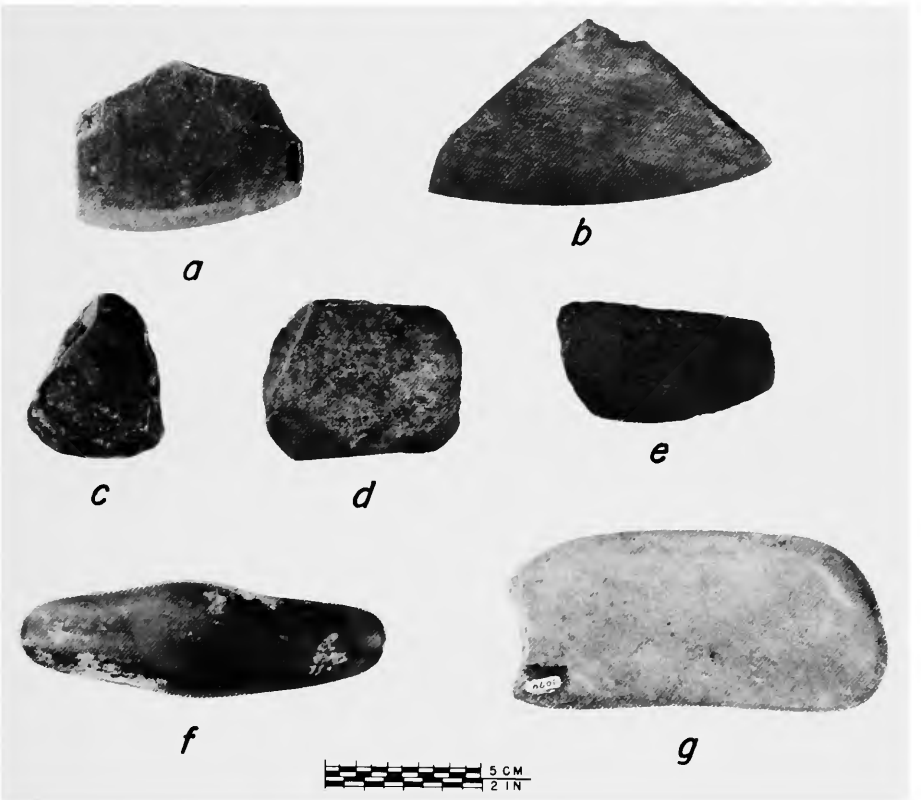

PLATE 53.—Birnirk artifacts, level B–8: *a, b,* ulu blades; *c,* ground hematite nodule; *d, e, g,* whetstones; *f,* ground slate nodule.

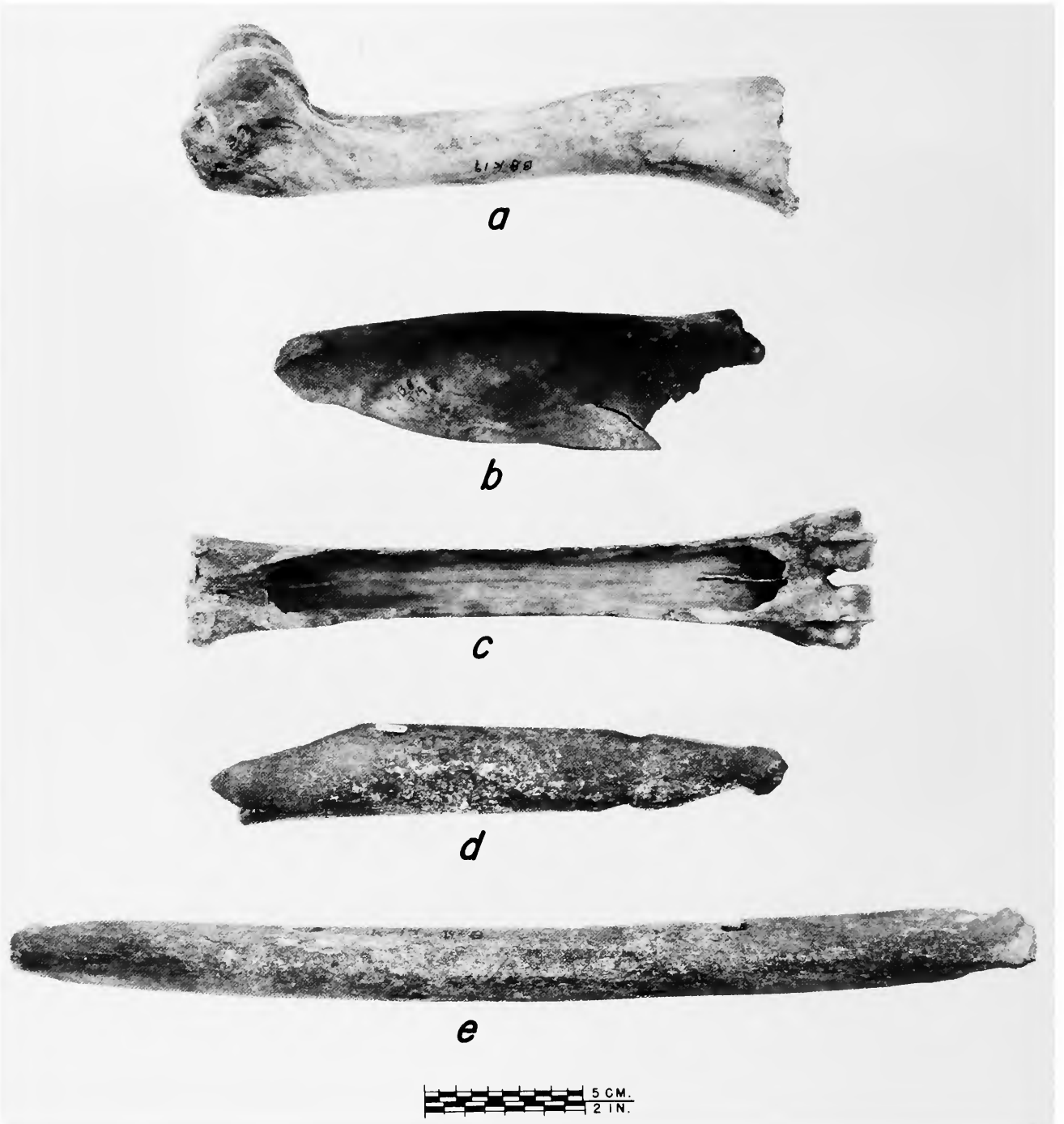

PLATE 54.—Birnirk artifacts, level B–8: *a*, humerus scraper; *b*, scapula scraper; *c*, two-handed bone scraper; *d*, *e*, kayak ribs.

PLATE 55.—Baleen bucket, level B–8.

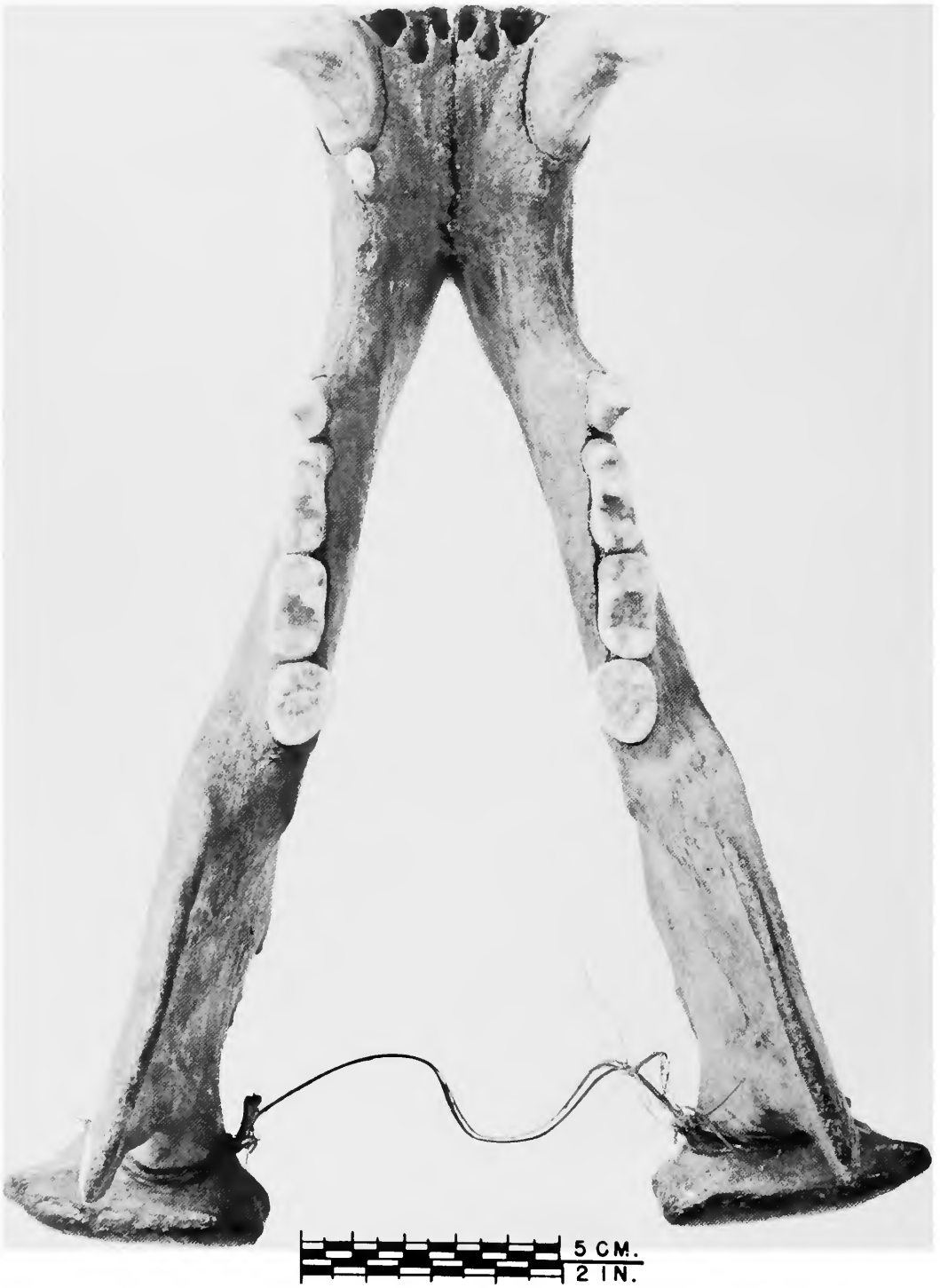

PLATE 56.—Polar bear mandible tied with baleen cord, level B–8.

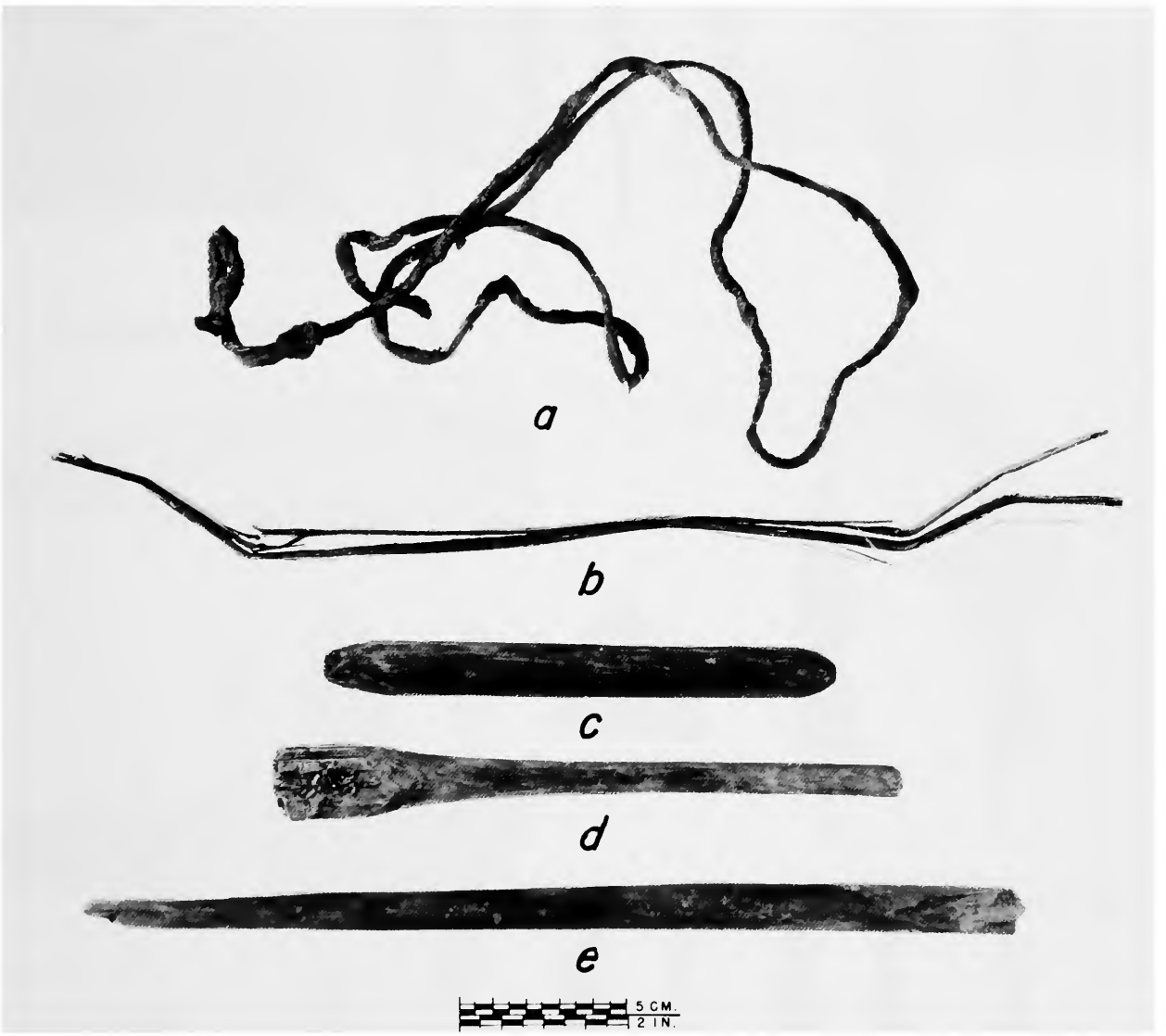

PLATE 57.—Birnirk artifacts, level B–8: *a*, rawhide cord; *b*, toy bow; *c–e*, unidentified wooden artifacts.

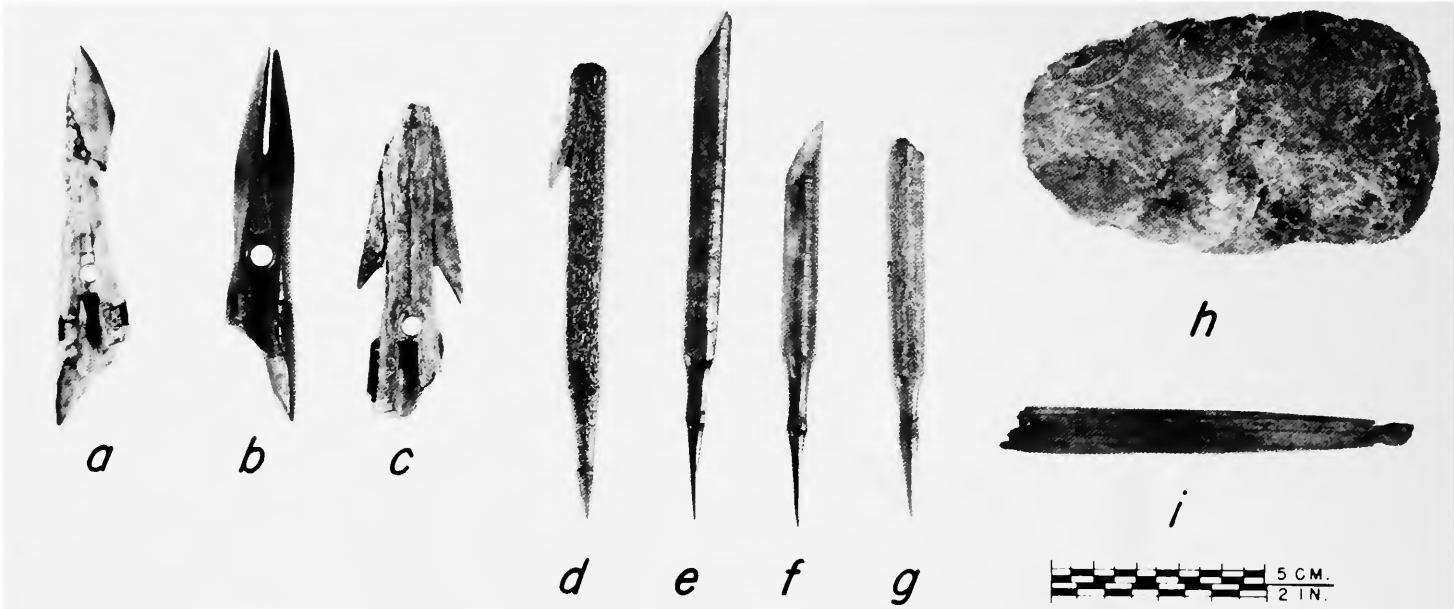

PLATE 58.—Early Thule artifacts from the mound A test trench: *a*, Natchuk open socket harpoon head; *b*, Sicco open socket harpoon head; *c*, Thule II open socket harpoon head; *d–g*, antler arrowheads; *h*, planoconvex end scraper; *i*, toy bow fragment.

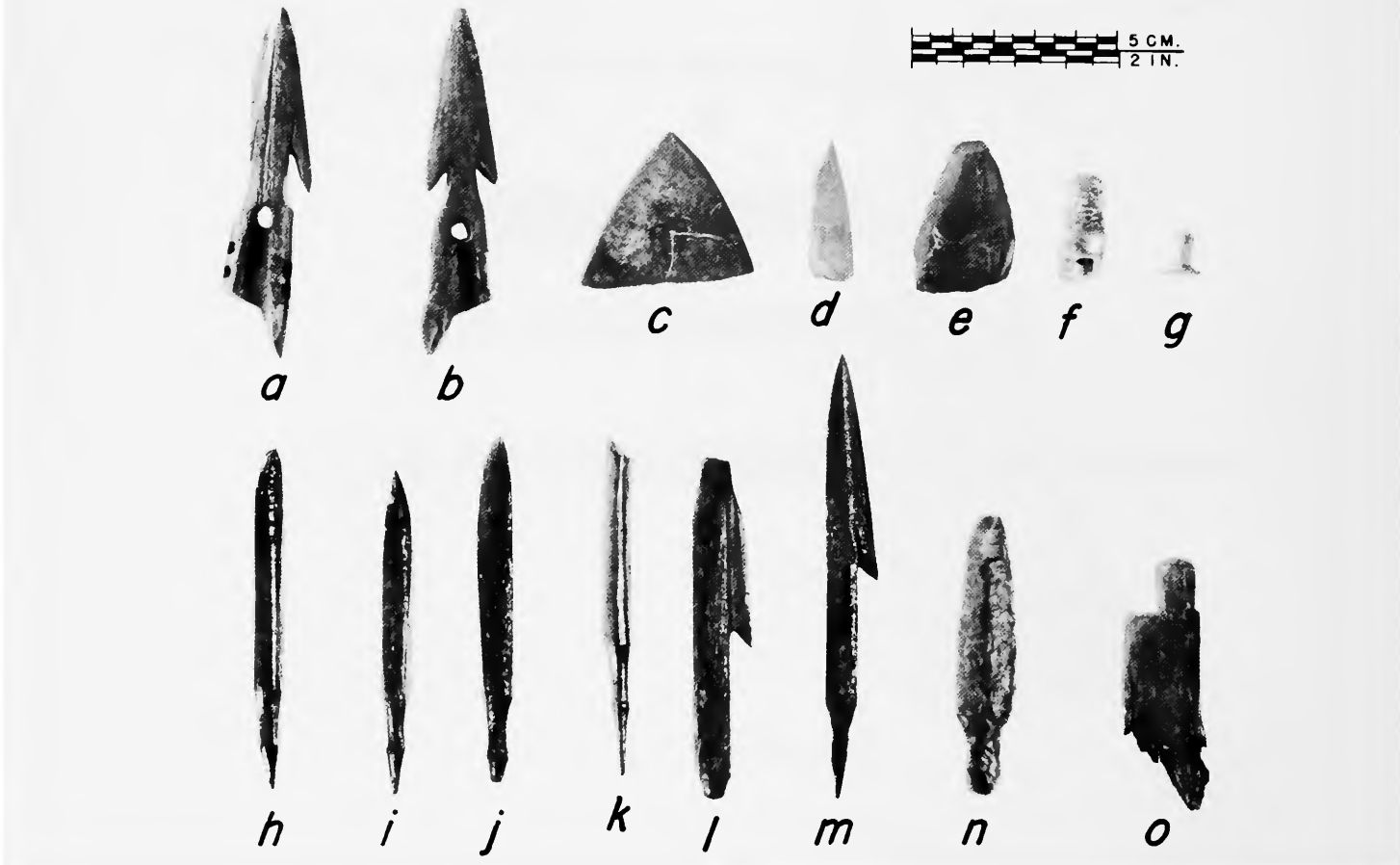

PLATE 59.—Early Thule artifacts from the mound B test trench: *a*, *b*, Thule II open socket harpoon heads; *c*, *d*, slate end blades; *e*, harpoon end blade preforms; *f*, inflation nozzle; *g*, ivory labret; *h–m*, antler arrowheads; *n*, chert arrowhead; *o*, bow fragment.

PLATE 60.—Early Thule polar bear carving from the mound B test trench.

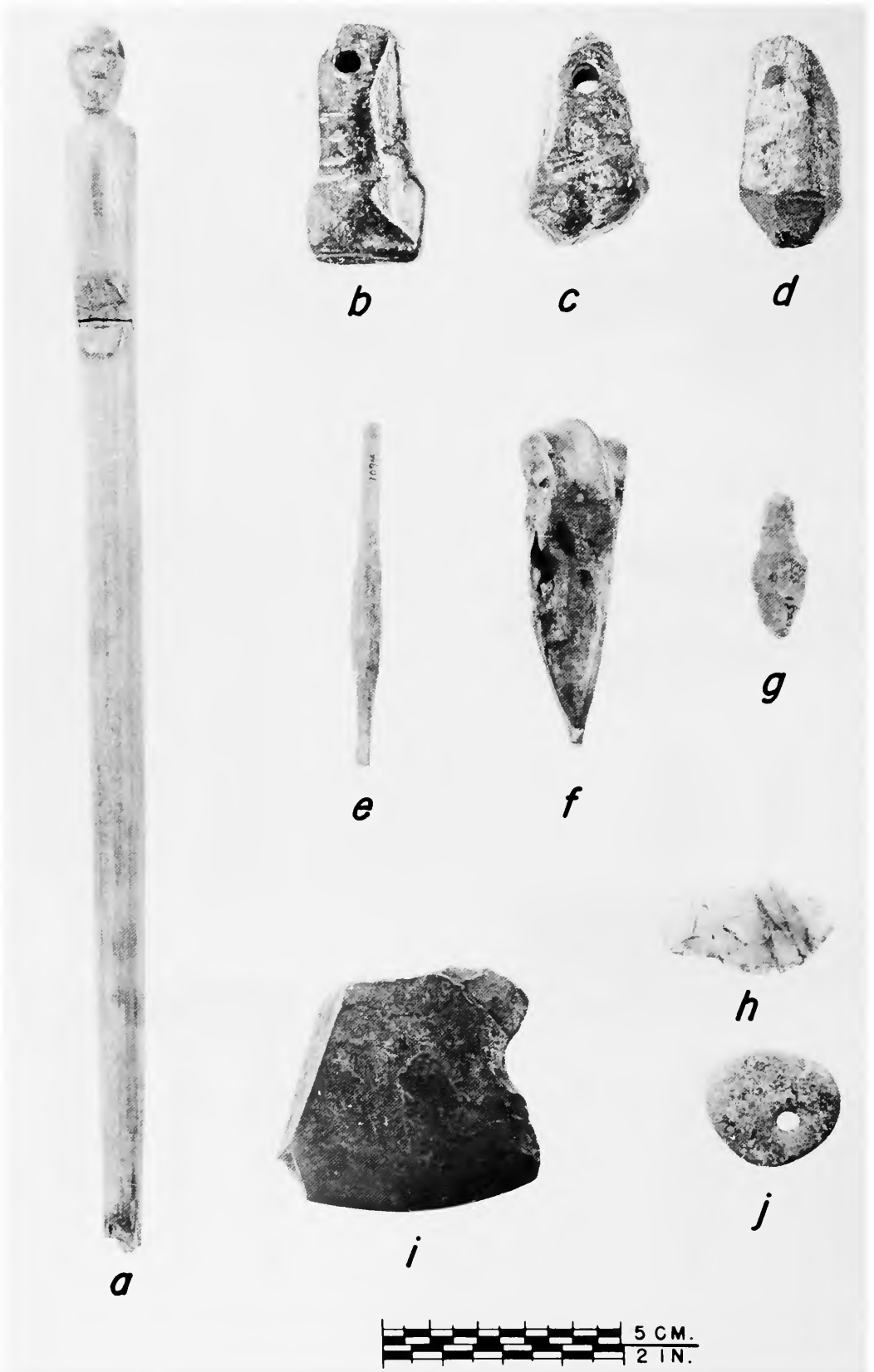

PLATE 61.—Early Thule artifacts from the mound B test trench: *a*, wooden staff with human face; *b*, *c*, *d*, bola weights; *e*, engraving tool; *f*, bone awl; *g*, chert drill bit; *h*, chert knife blade; *i*, ulu blade; *j*, drilled stone.

PLATE 62.—Early Thule artifacts from the mound B test trench: *a*, antler sled arch; *b*, cut drift wood; *c*, *d*, whale rib mattocks.

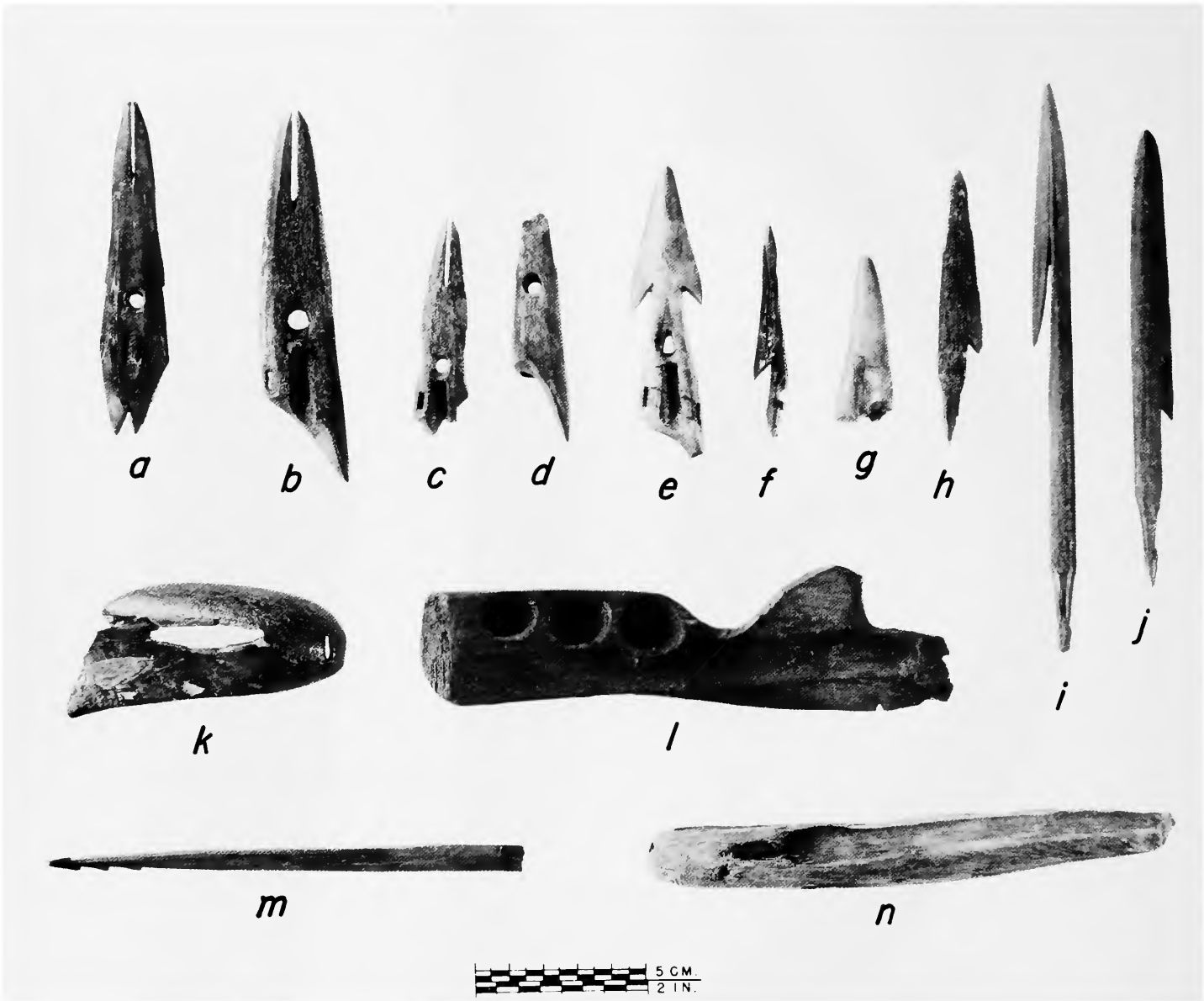

PLATE 63.—Early Thule artifacts, level B–7: *a*, Punuk II (f)(x) harpoon head; *b*, Thule III open socket harpoon head; *c*, Sicco open socket harpoon head; *d*, Thule IV closed socket harpoon head; *e*, Thule II open socket harpoon head; *f*, harpoon head fragment; *g*, harpoon foreshaft; *h*, antler arrowhead; *i*, *j*, antler arrowheads; *k*, snow goggle fragment; *l*, *n*, atlatl fragments; *m*, fish arrow prong.

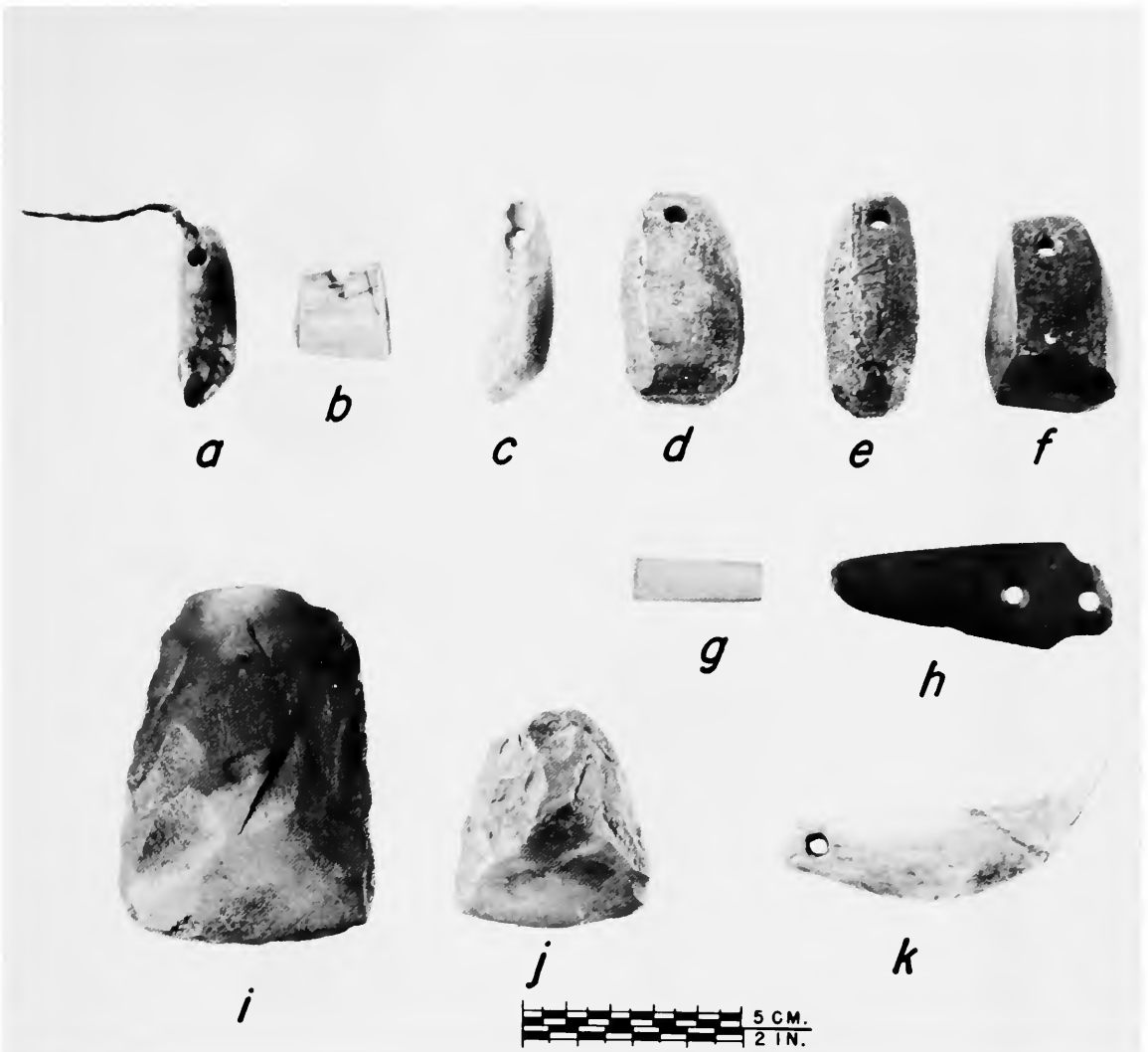

PLATE 64.—Early Thule artifacts, level B–7: *a–f*, bola weights; *g*, small ivory wedge; *h*, men's knife blade; *i*, *j*, adz blades; *k*, drilled bear tooth.

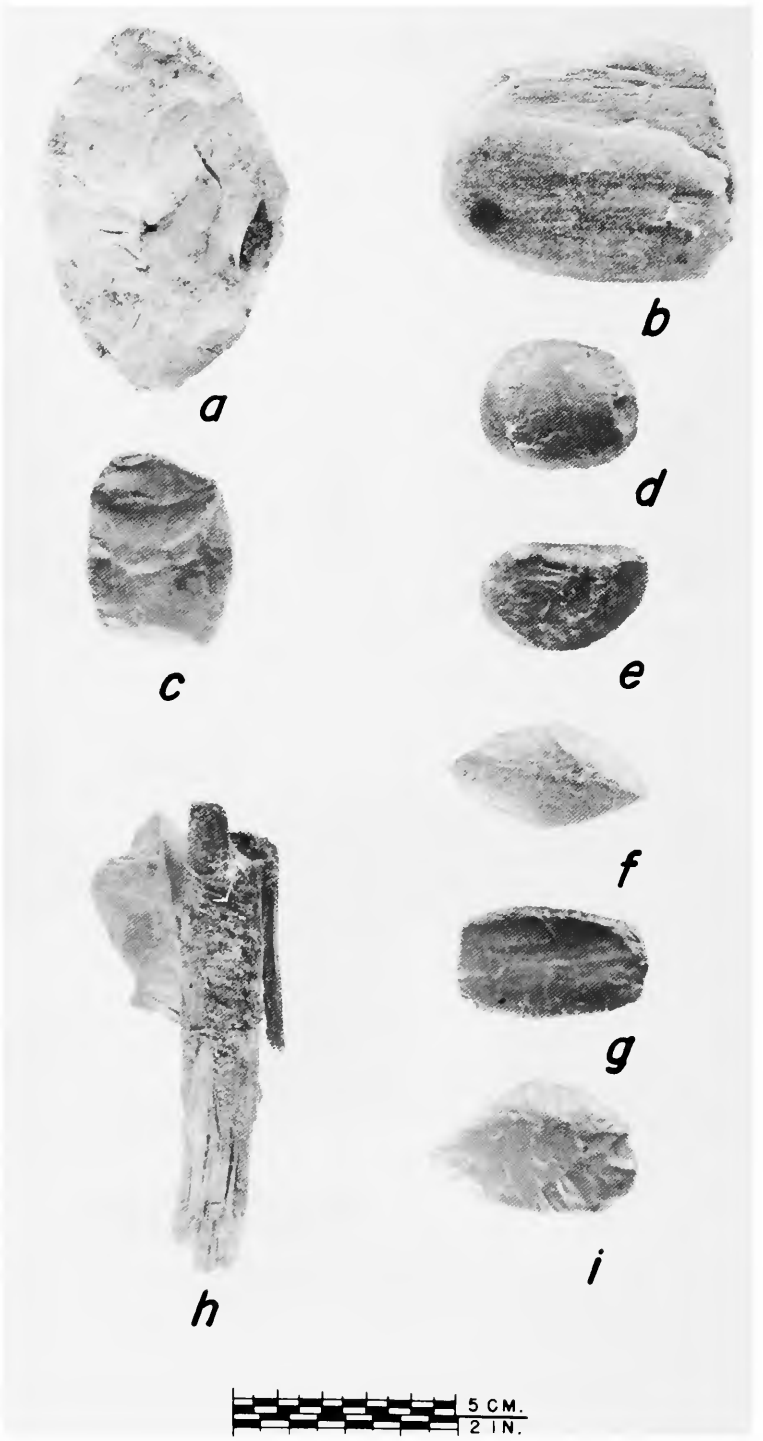

PLATE 65.—Early Thule artifacts, level B–7: *a*, bifacial preform; *b–d*, pebble end scrapers; *e–g*, *i*, pebble side scrapers; *h*, hafted flake knife.

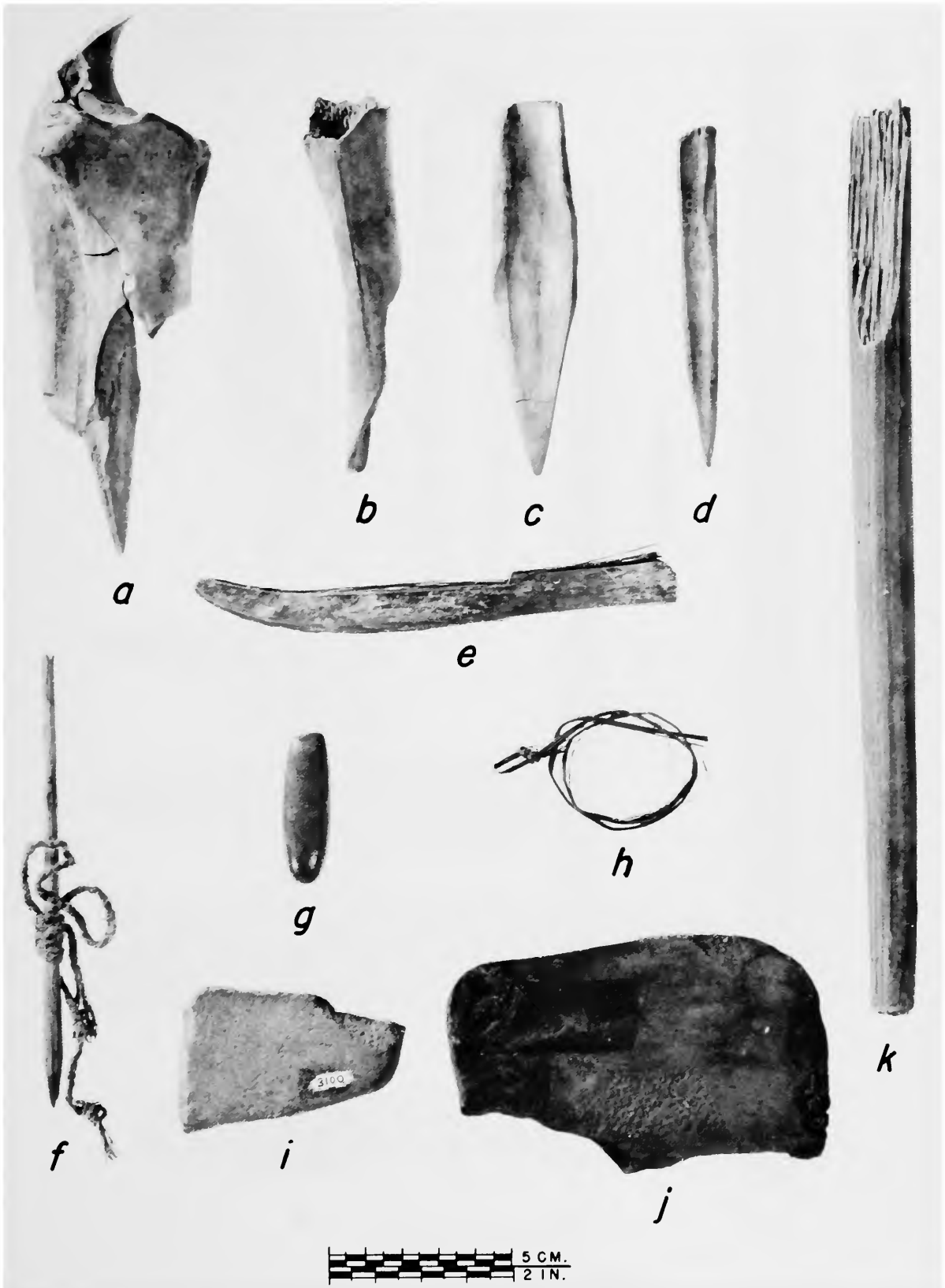

PLATE 66.—Early Thule artifacts, level B–7: *a, c, d,* bone awls; *b,* bone scraper; *e,* baleen object; *f,* pointed shaft with cord; *g,* polished stone; *h,* baleen knot; *i–j,* whetstones; *k,* wooden shaft.

PLATE 67.—Early Thule artifacts, level B–7: *a–c*, boat or sled fragments; *d*, ground slate hammerstone.

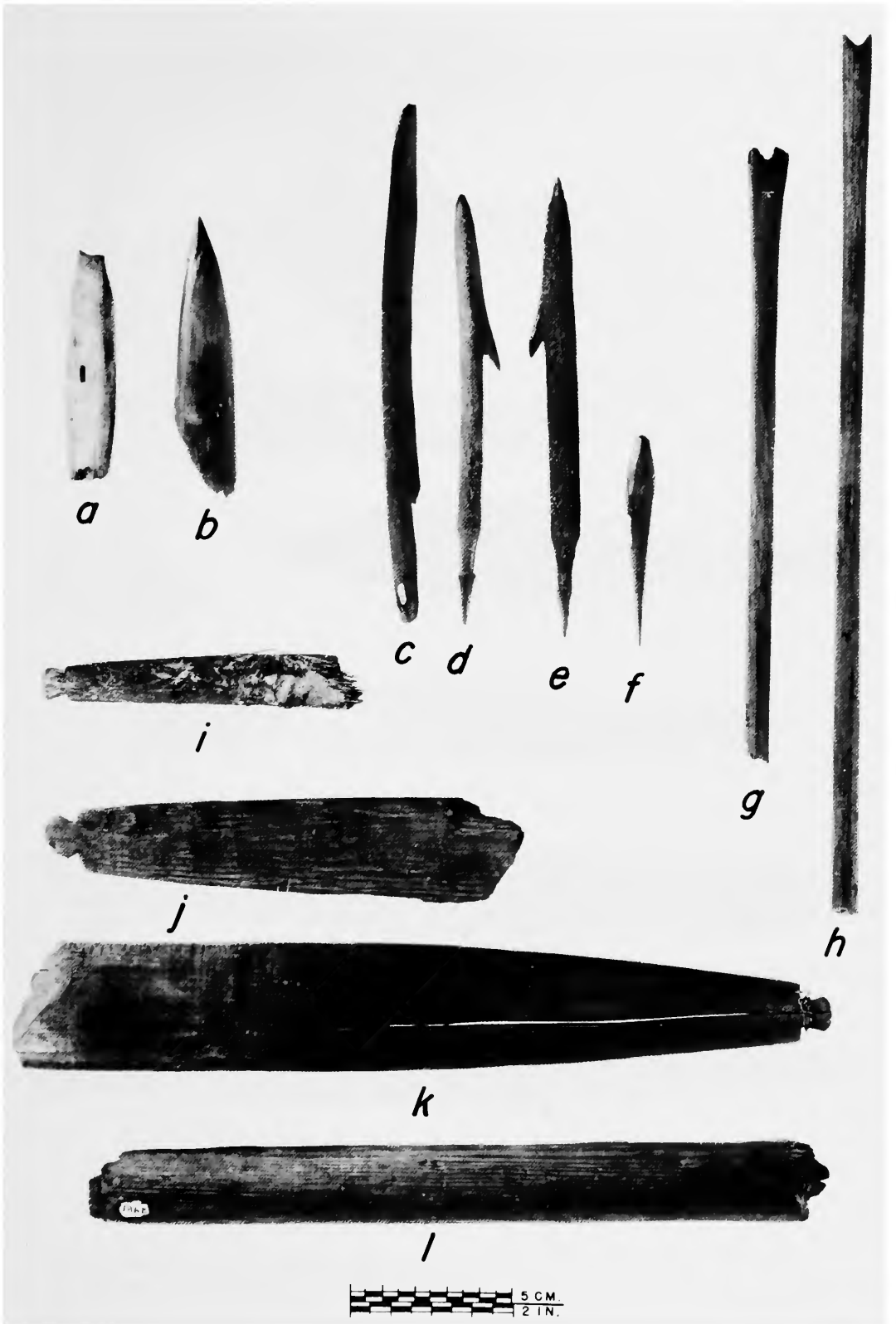

PLATE 68.—Early Thule artifacts, level B–6: *a*, harpoon foreshaft fragment; *b*, harpoon ice pick fragment; *c–e*, antler arrowheads; *f*, fish arrow prong; *g*, *h*, arrowshafts; *i–k*, bow fragments; *l*, harpoon shaft fragment.

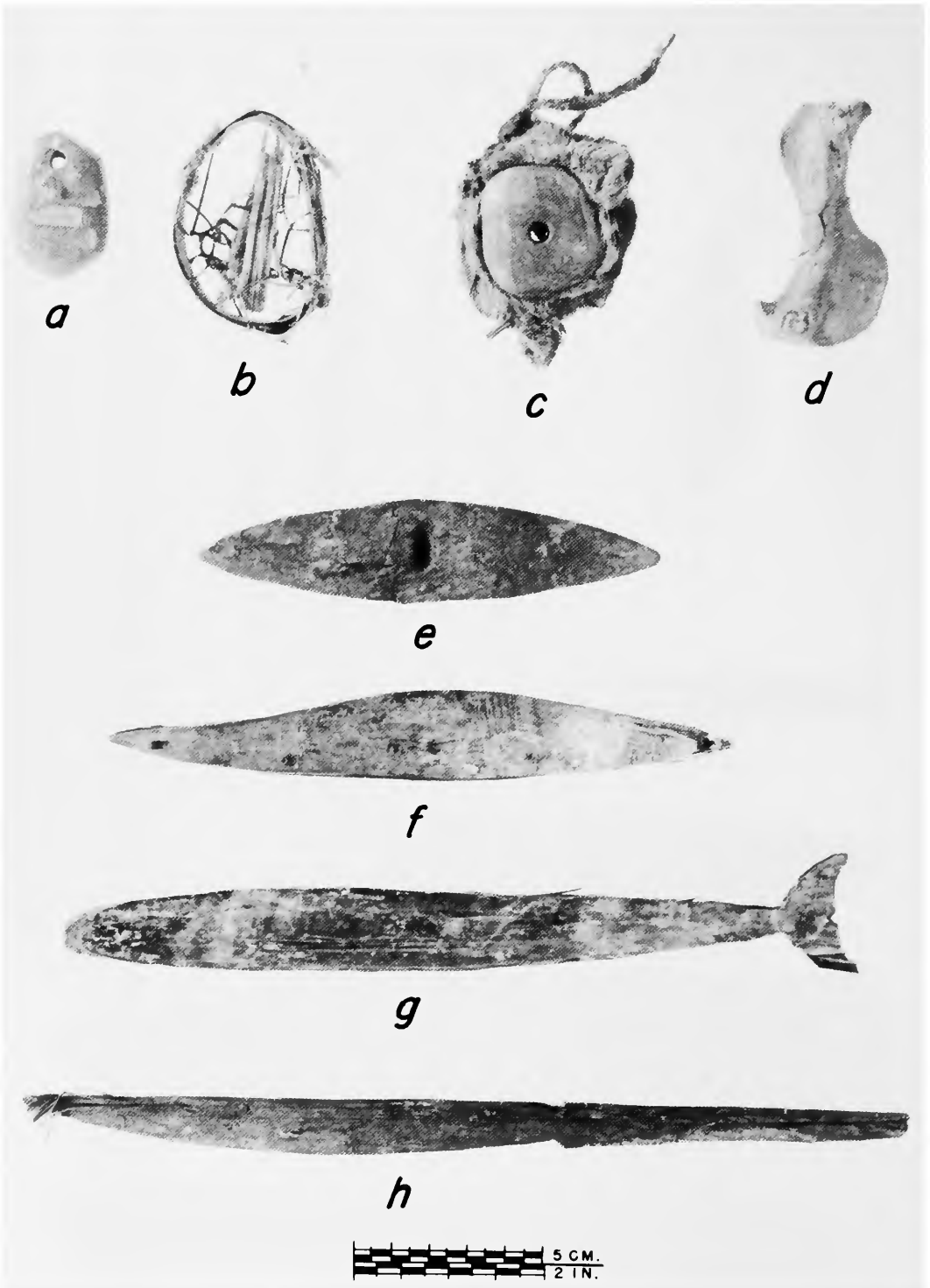

PLATE 69.—Early Thule artifacts, level B–6: *a*, bola weight; *b*, baleen and wood object; *c*, seal float mouthpiece; *d*, cup and pin game; *e*, kayak model; *f*, *h*, unidentified baleen objects; *g*, baleen whale effigy.

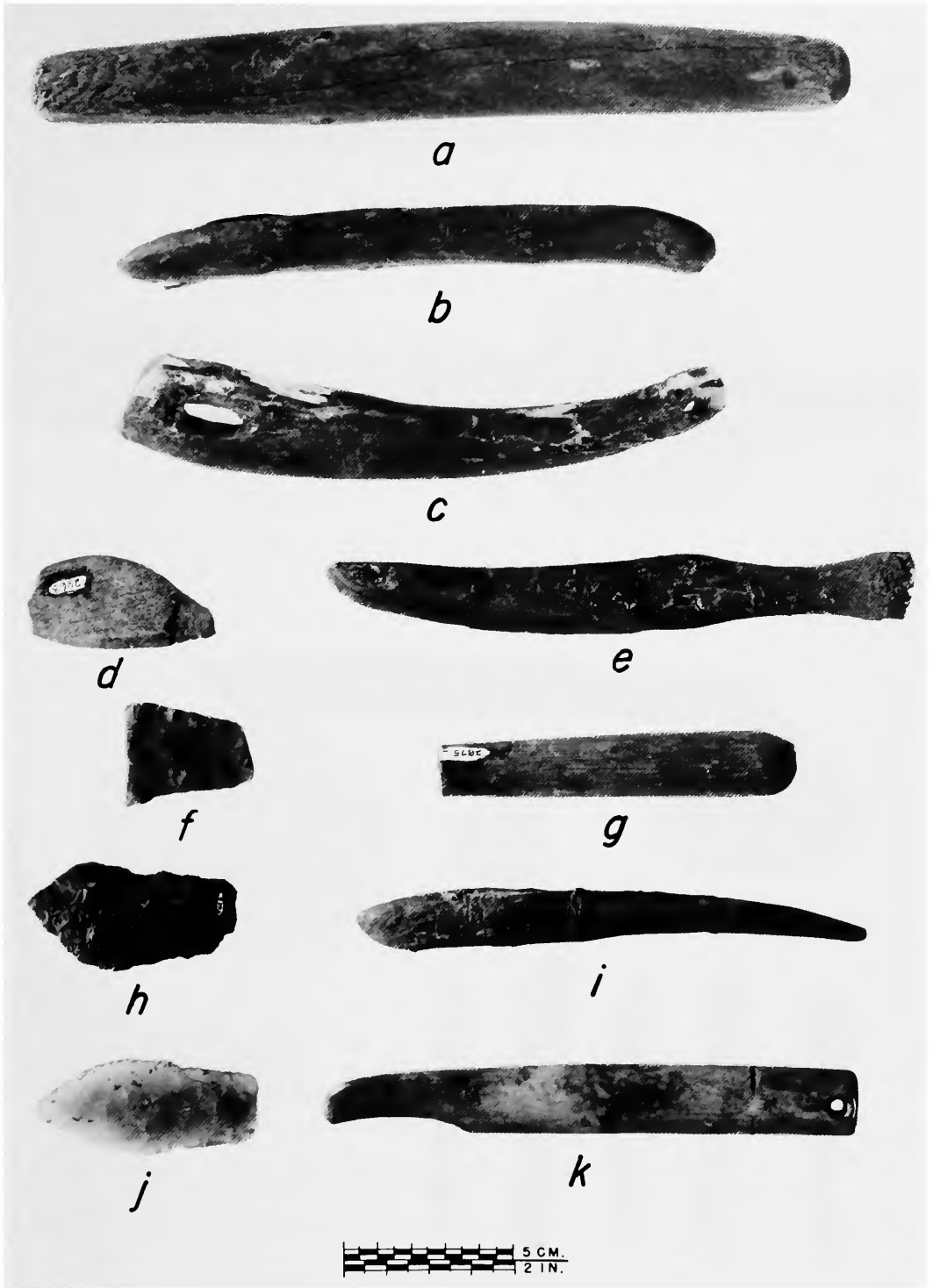

PLATE 70.—Early Thule artifacts, level B–6: *a*, *b*, seal float bars (?); *c*, adz handle; *d*, ulu blade; *e*, baleen object; *f*, *h*, *j*, chert knife blades; *g*, awl handle; *i*, *k*, knife handles.

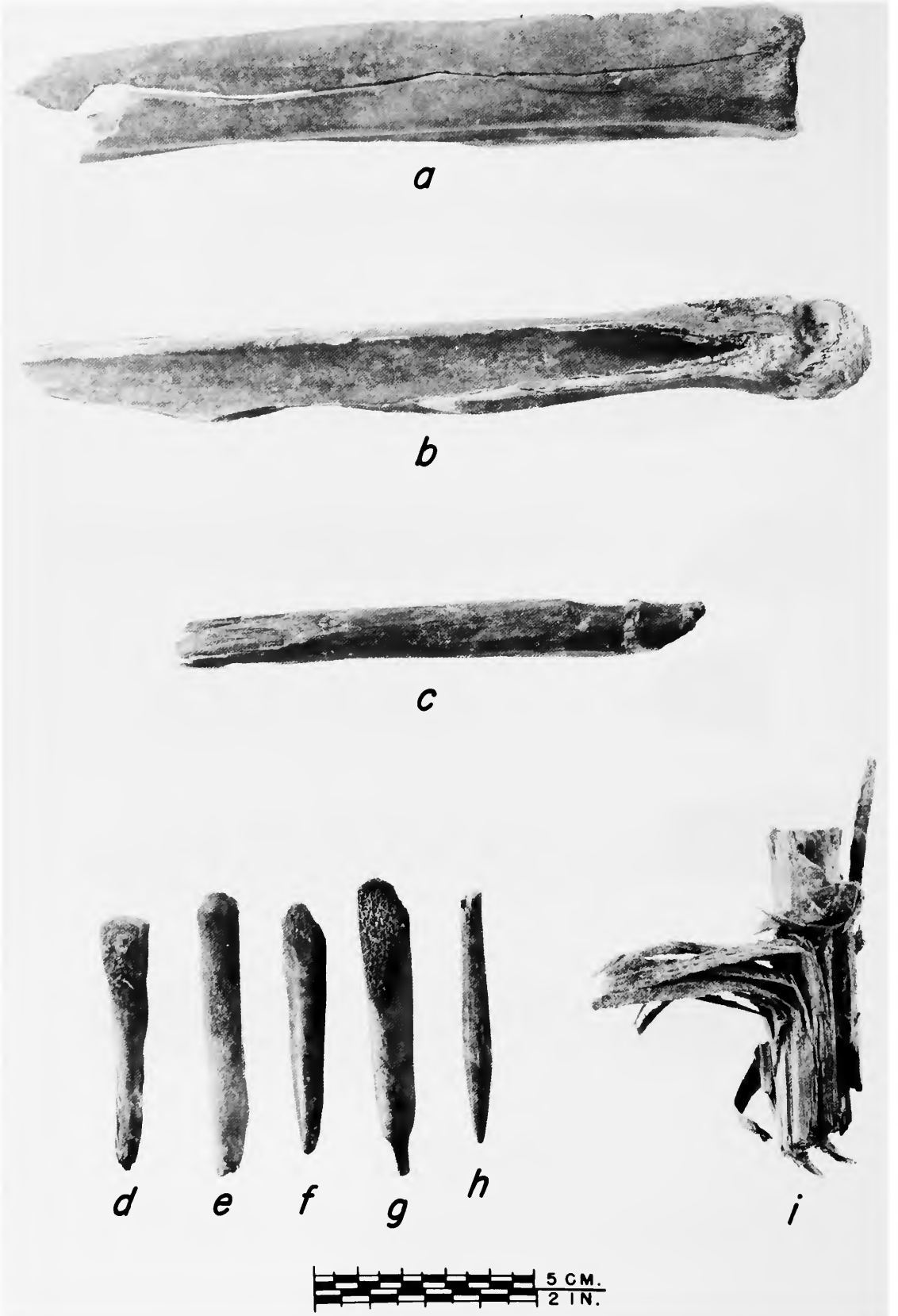

PLATE 71.—Early Thule artifacts, level B–6: *a*, *b*, two-handed bone scrapers; *c*, unidentified wooden object; *d–g*, gauged drills; *h*, small pointed shaft; *i*, cut wood with shave spalls.

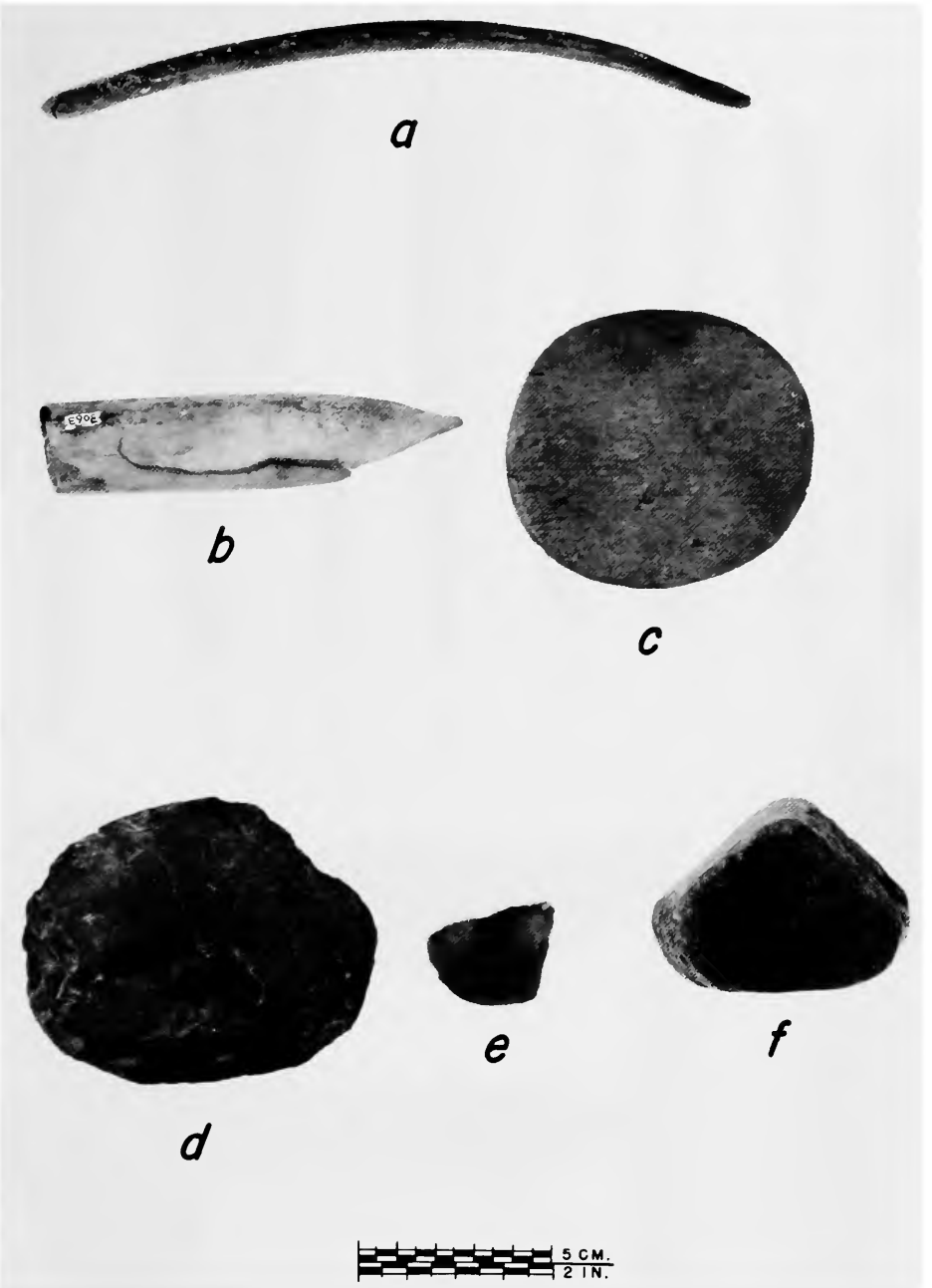

PLATE 72.—Early Thule artifacts, level B–6: *a*, flint flaker point; *b*, bone awl; *c*, small bucket bottom; *d*, ground and flaked discoid; *e*, pebble end scraper; *f*, ground stone.

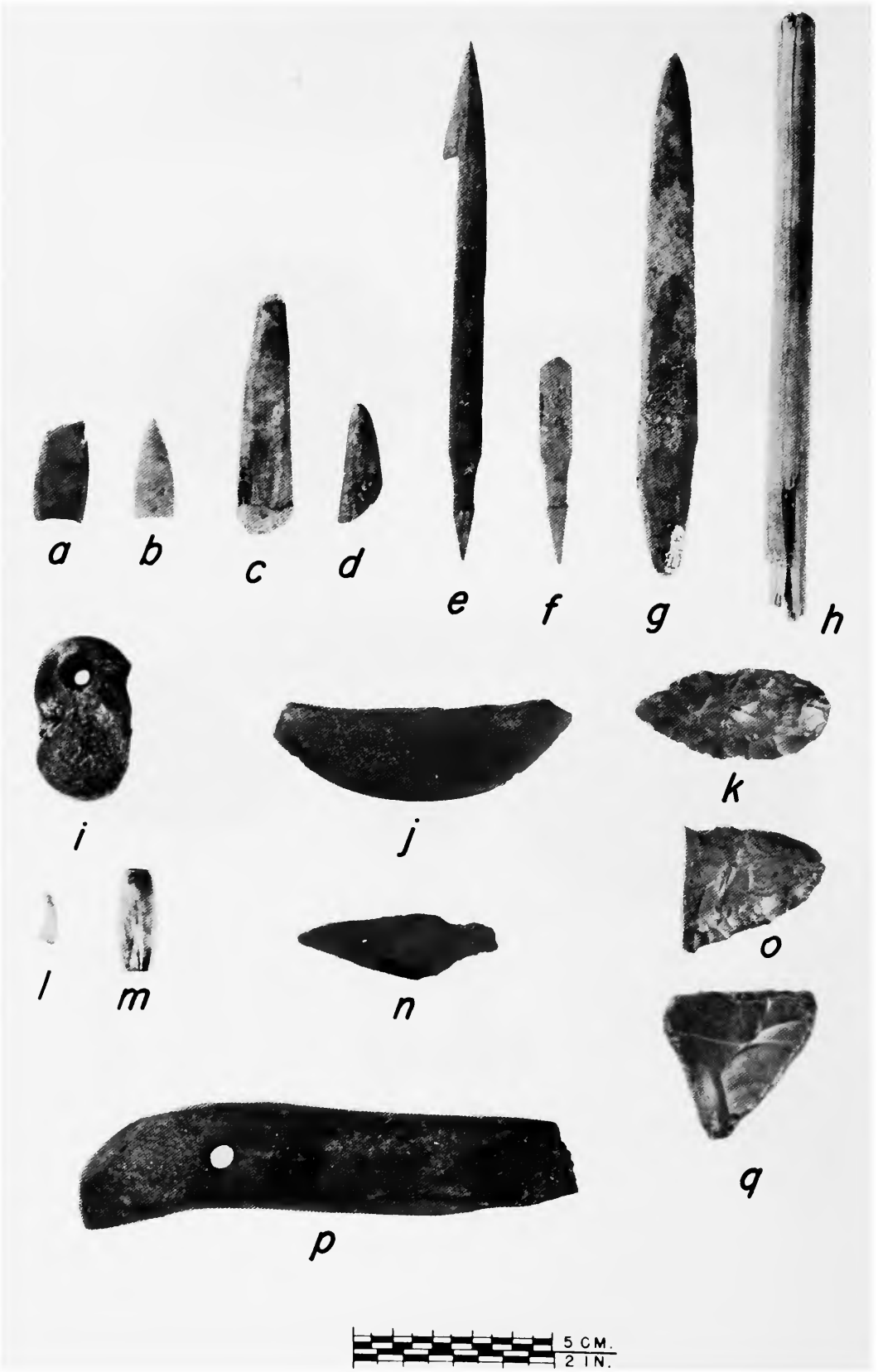

PLATE 73.—Early Thule artifacts, level B–6: *a*, slate end blade; *b*, chert end blade; *c*, *d*, harpoon foreshaft fragments; *e*, *f*, antler arrowheads; *g*, antler arrowhead preform; *h*, arrowshaft; *i*, bola weight; *j*, ulu blade; *k*, *o*, chert knife blades; *l*, grooved seal tooth; *m*, bead; *n*, slate knife blade; *p*, drilled antler; *q*, side scraper.

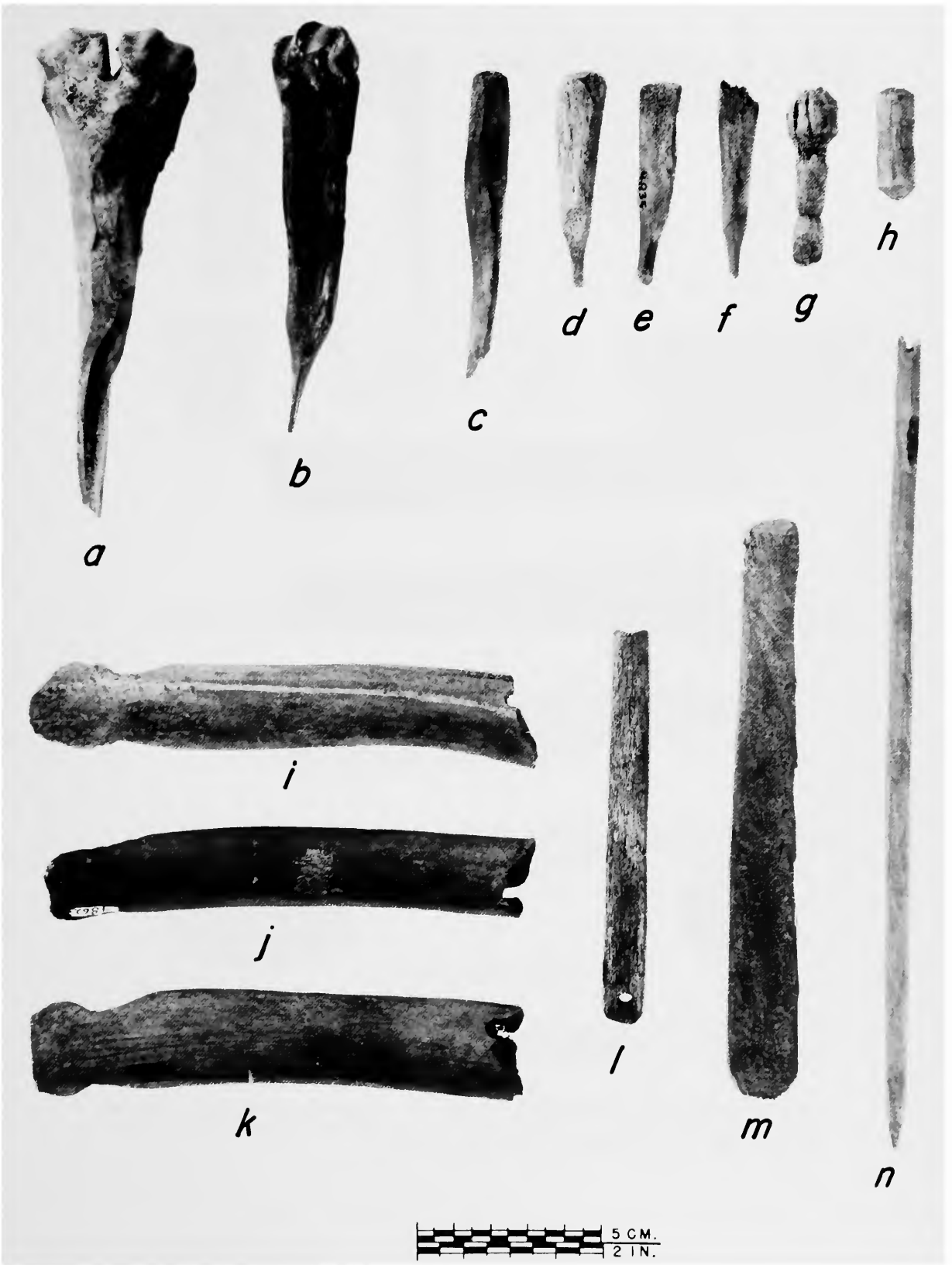

PLATE 74.—Early Thule artifacts, level B–5: *a*, *b*, bone awls; *c–f*, gauged drills; *g*, *h*, unidentified wooden objects; *i–k*, kayak ribs; *l*, *m*, unidentified antler tools; *n*, small arrow or drill shaft.

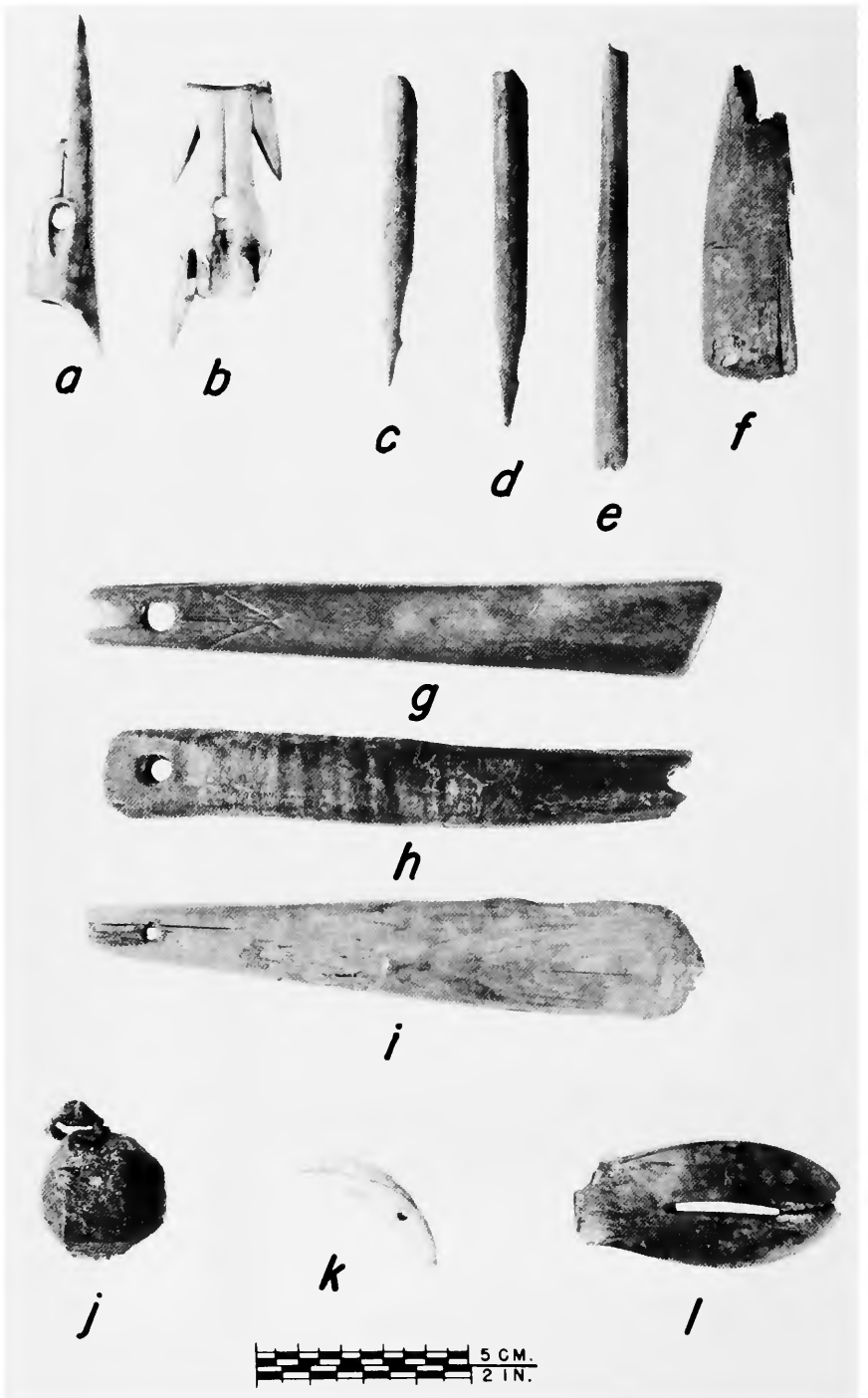

PLATE 75.—Early Thule artifacts, level B–4: *a*, Nuwuk closed socket harpoon head; *b*, Thule II open socket harpoon head; *c*, *d*, antler arrowheads; *e*, arrowshaft; *f*, wound plug; *g–i*, knife handles; *j*, bola weight; *k*, drilled tooth; *l*, snow goggle fragment.

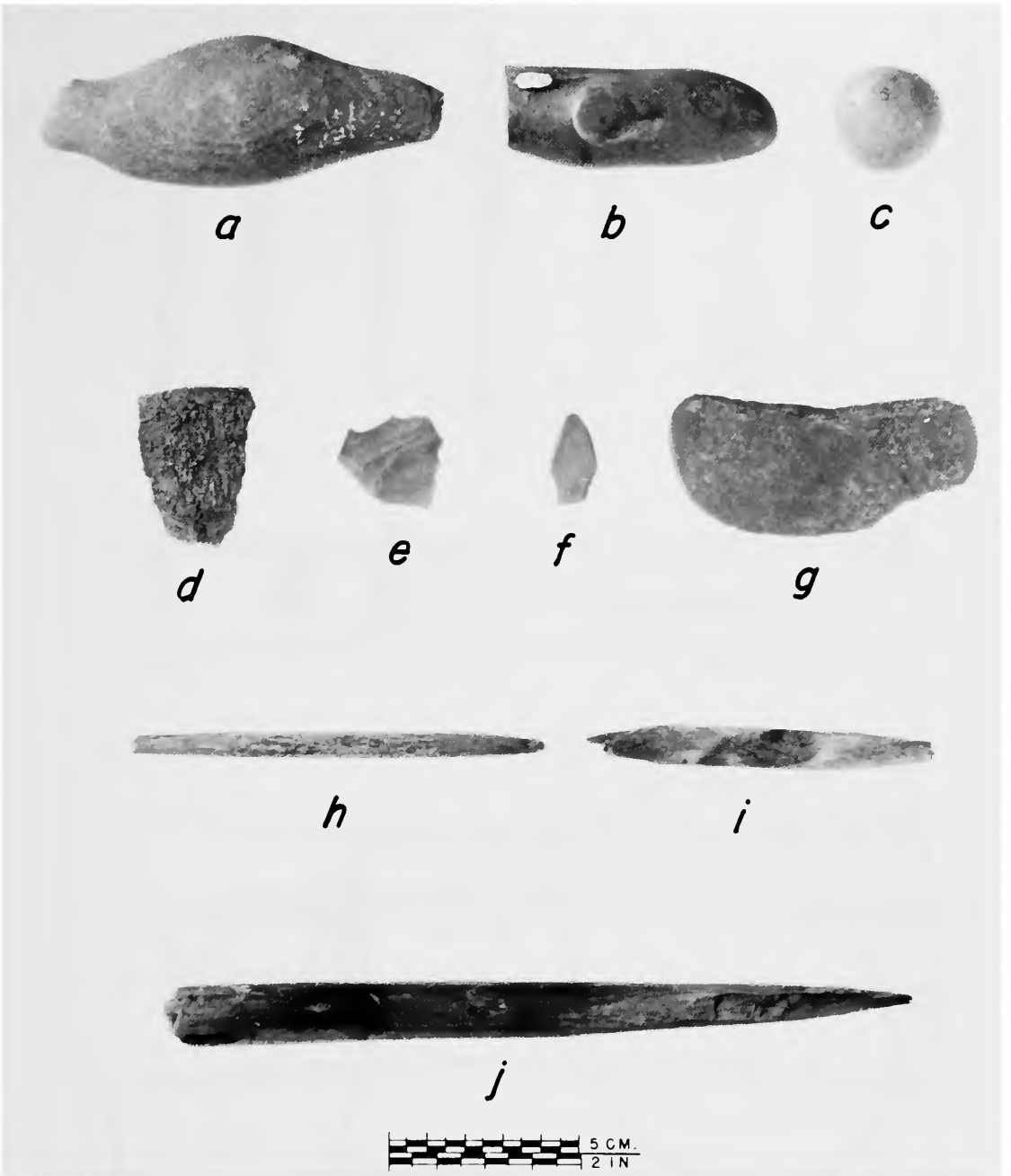

PLATE 76.—Early Thule artifacts, level B–4: *a*, *b*, ground slate nodules; *c*, ground stone; *d*, potsherd; *e*, retouched flake; *f*, small knife blade; *g*, ulu blade; *h*, unidentified pointed stick; *i*, gauge drill; *j*, hide peg.

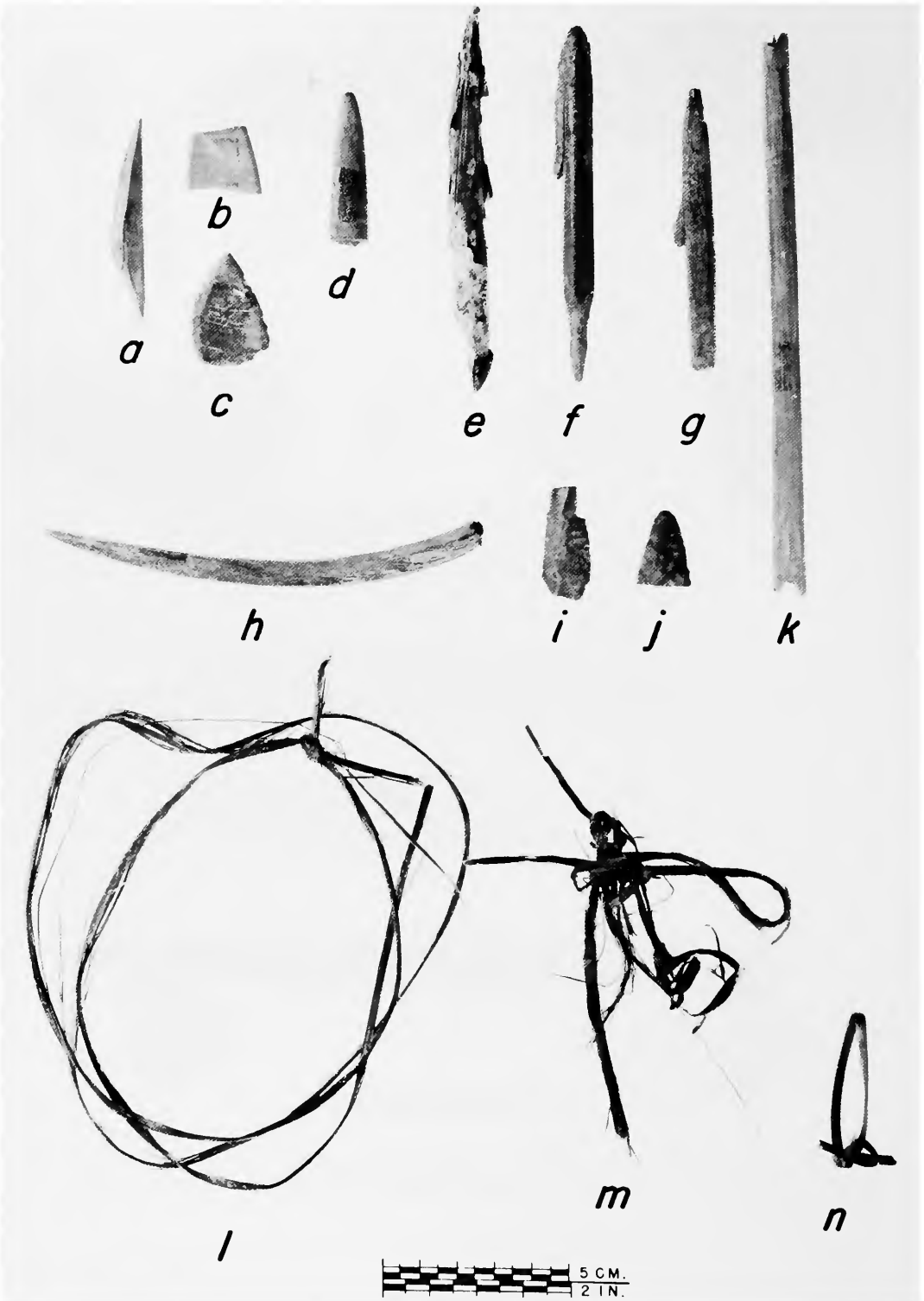

PLATE 77.—Early Thule artifacts, level B–3: *a*, harpoon head fragment; *b*, *c*, slate end blades; *d*, small foreshaft fragment; *e*, bird dart point; *f*, *g*, antler arrowheads; *h*, marlin spike; *i*, *j*, chert arrowheads; *k*, arrowshaft; *l–n*, baleen knots.

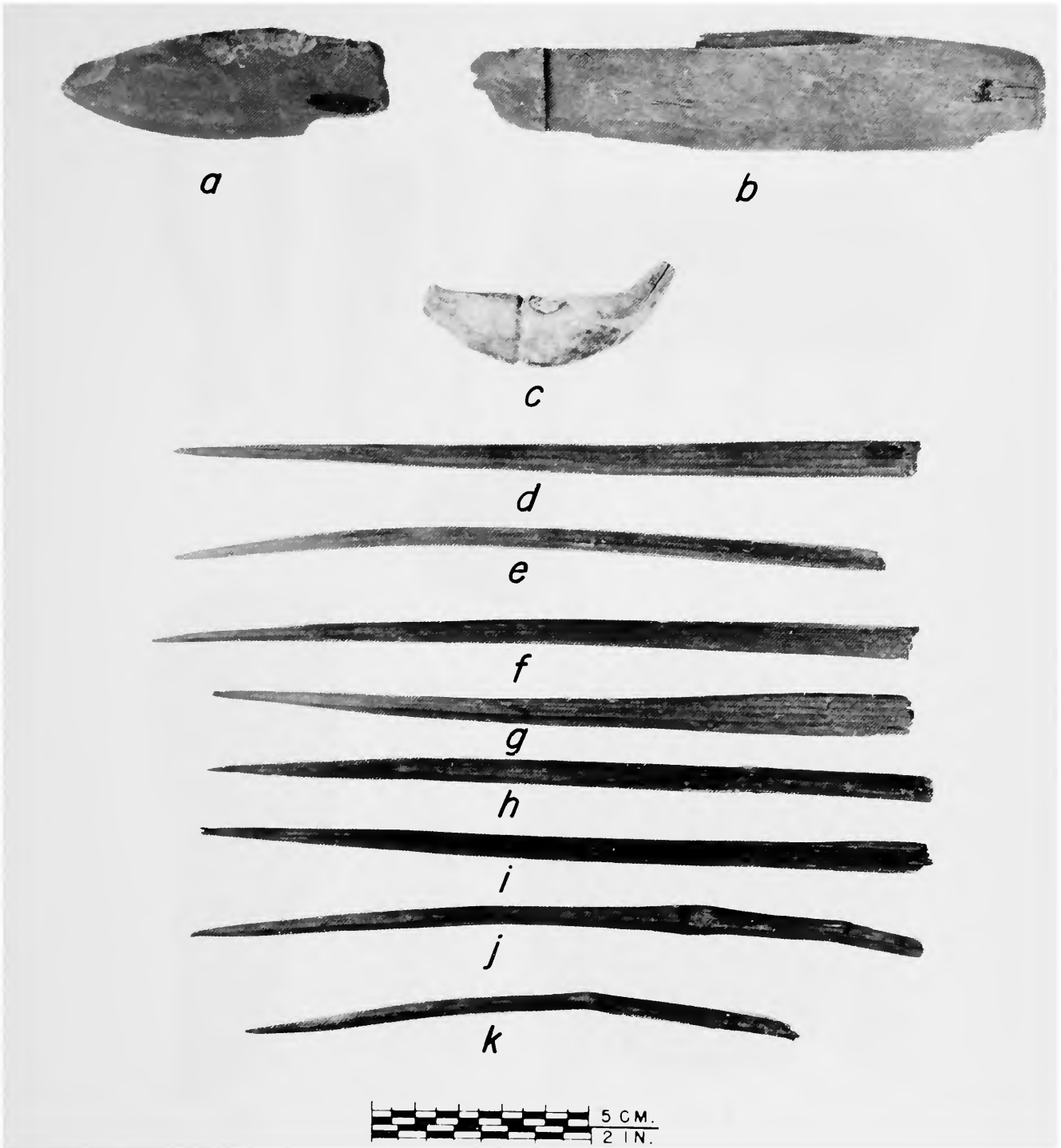

PLATE 78.—Early Thule artifacts, level B–3: *a*, slate knife blade; *b*, knife handle; *c*, notched bear tooth; *d–k*, small pointed wooden pegs.

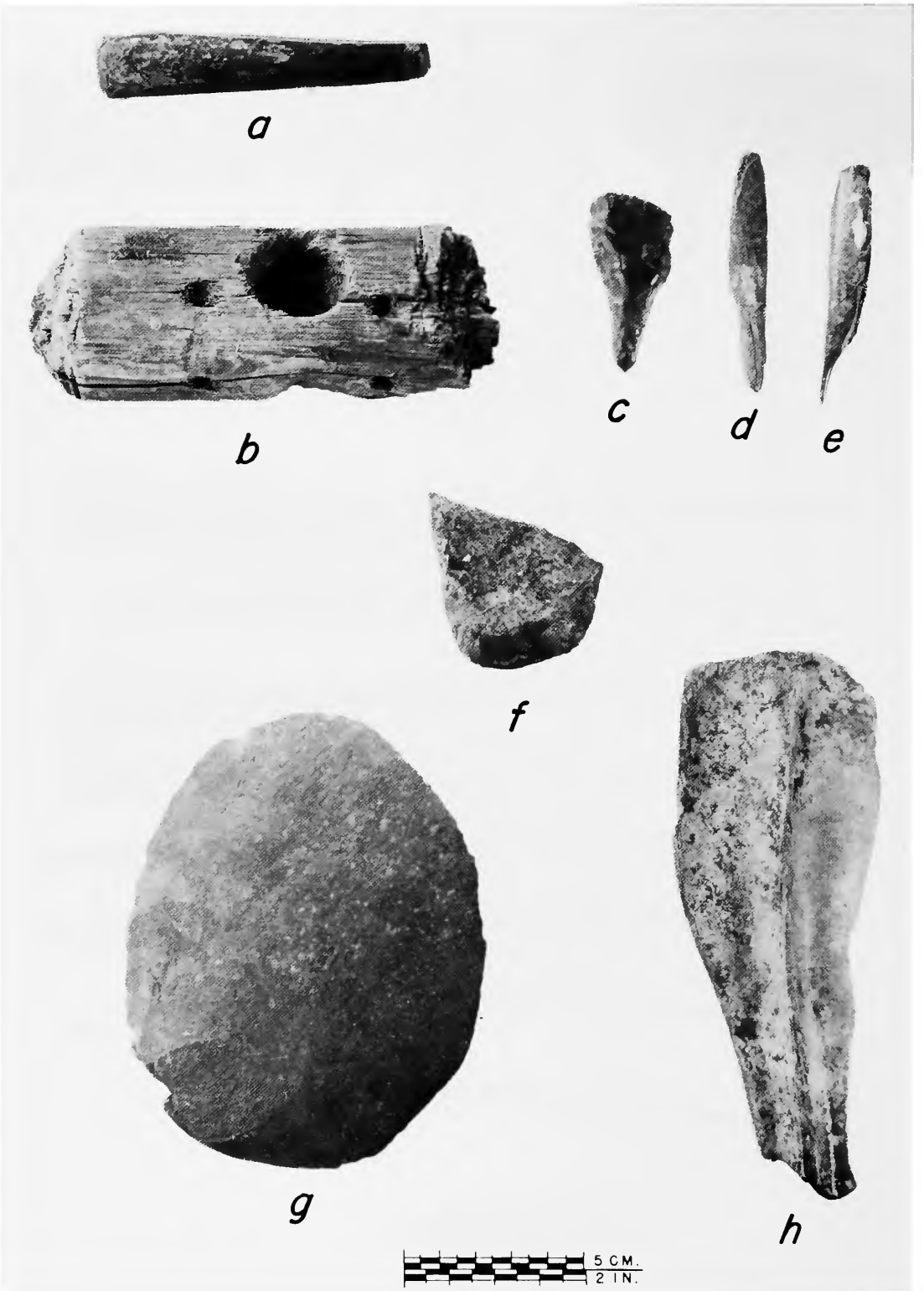

PLATE 79.—Early Thule artifacts, level B–3: *a*, composite knife handle; *b*, drilled wooden object; *c*, stone drill bit; *d*, gauged drill; *e*, bone awl; *f*, adz blade; *g*, large quartzite retouched flake; *h*, scapula scraper.

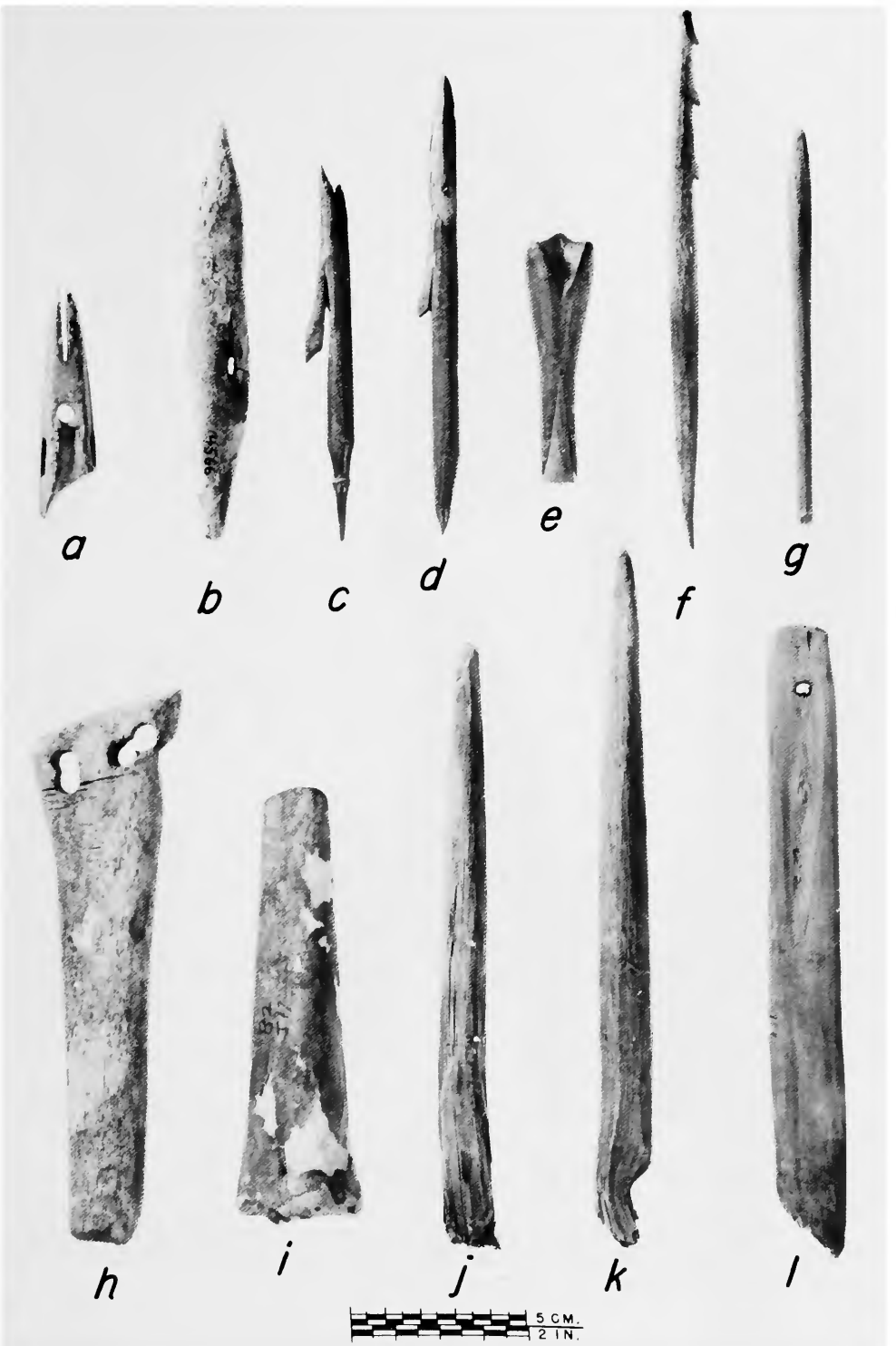

PLATE 80.—Early Thule artifacts, level B–2: *a*, Thule III open socket harpoon head; *b*, harpoon foreshaft; *c*, *d*, antler arrowheads; *e*, bird arrowhead; *f*, fish arrow prong; *g*, pointed shaft; *h*, adz handle; *i*, bone scraper; *j*, *k*, hide pegs; *l*, drilled wooden object.

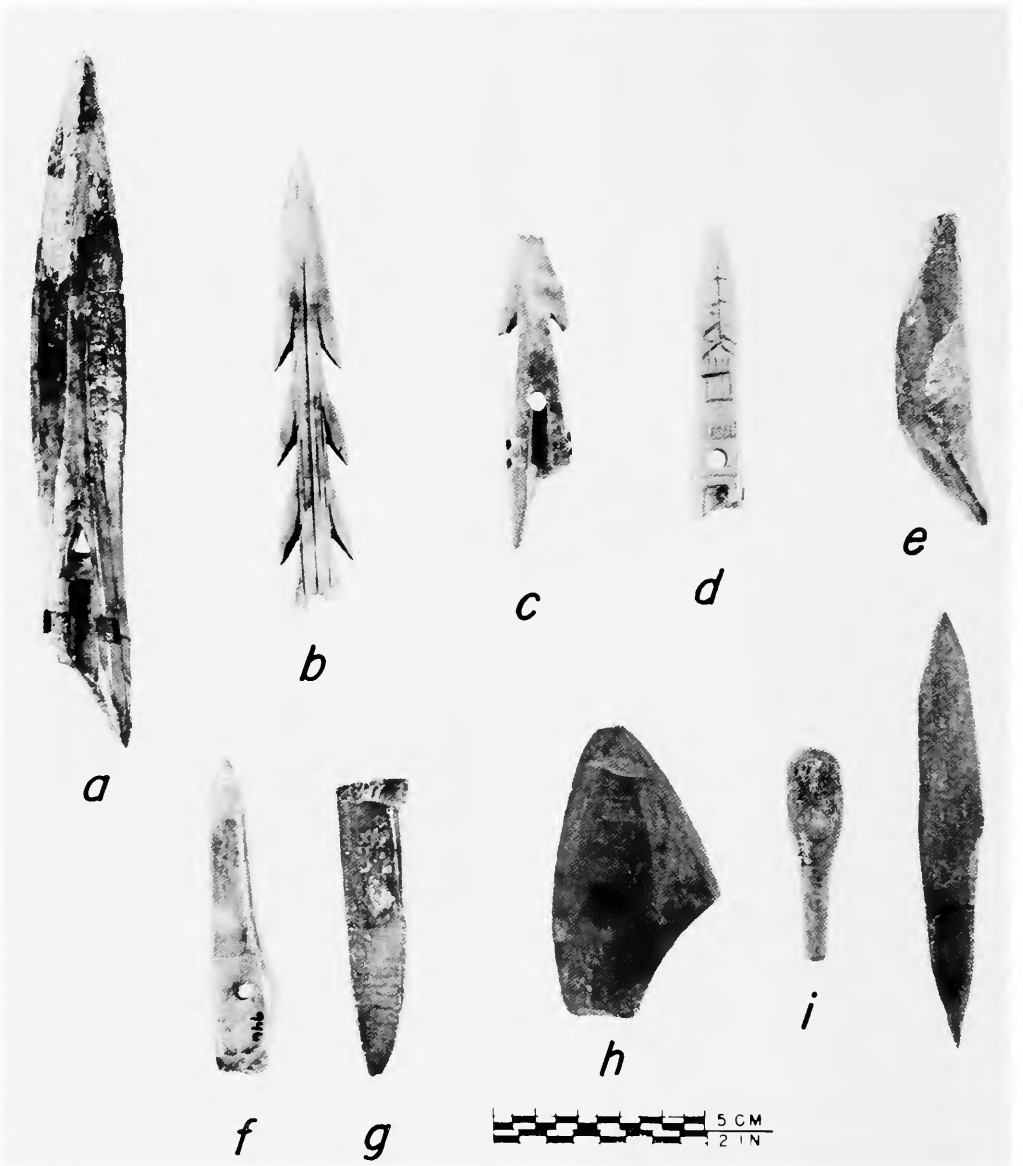

PLATE 81.—Late Thule artifacts from the area A test trench: *a*, *d*, Thule IId harpoon heads; *b*, *c*, Thule IIc harpoon heads; *e*, harpoon head preform; *f*, *g*, harpoon foreshafts; *h*, slate end blade; *i*, seal float mouthpiece stopper; *j*, antler arrowhead preform.

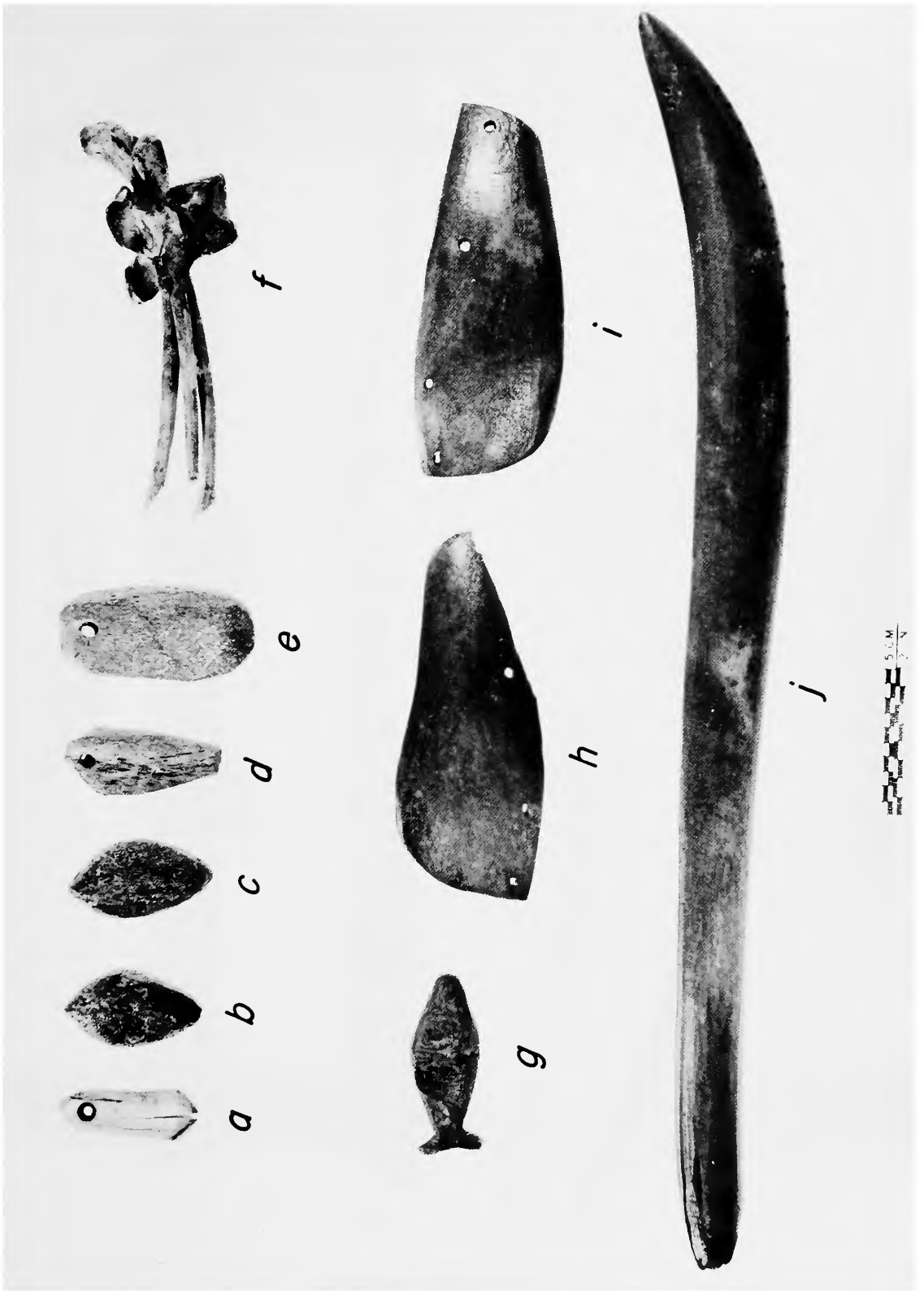

PLATE 82.—Late Thule artifacts from the area A test trench: *a–e*, bola weights; *f*, inserted seal vertebrae; *g*, whale effigy; *h*, *i*, two-piece ice scoops; *j*, snow knife.

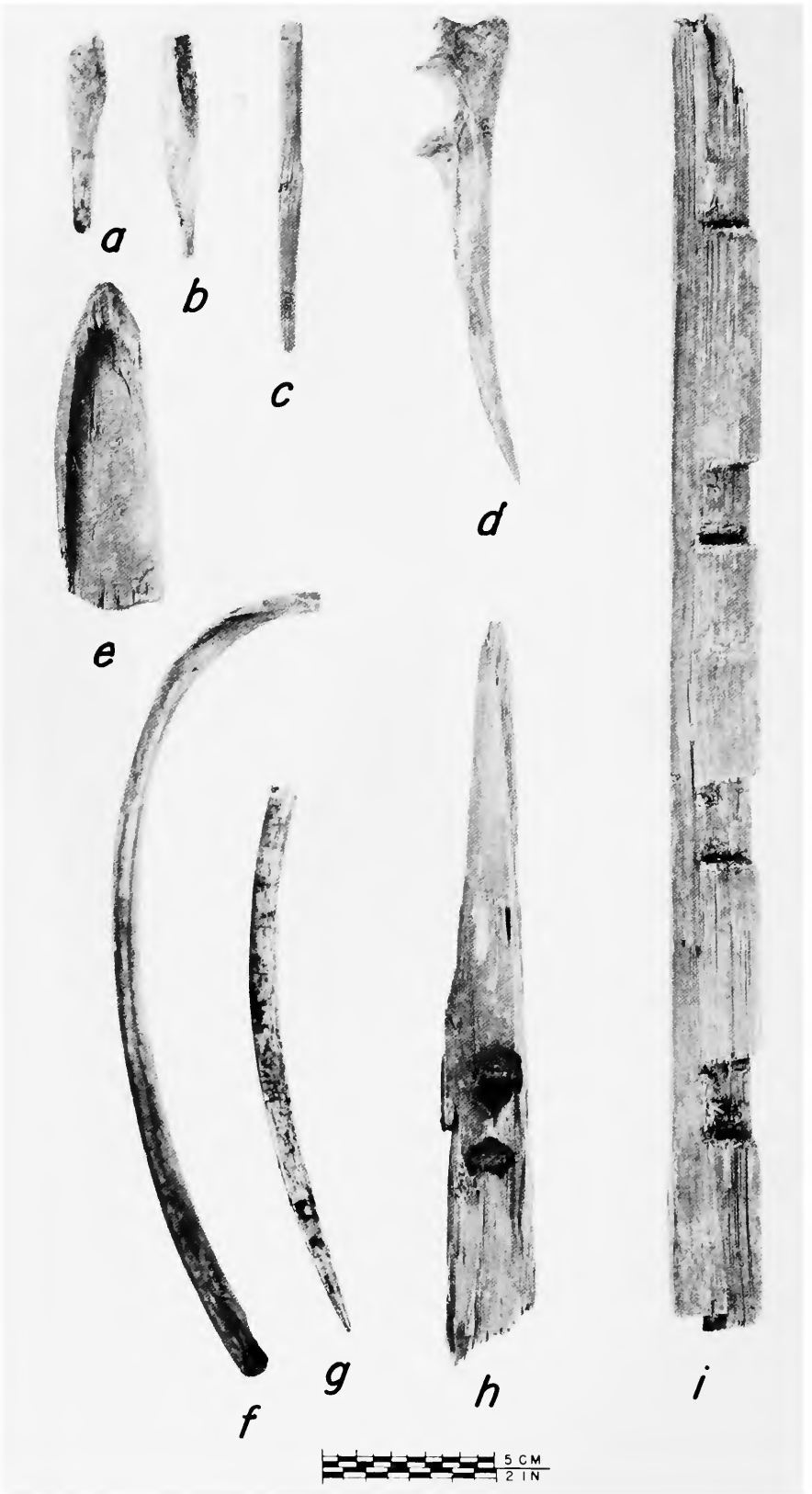

PLATE 83.—Late Thule artifacts from the area A test trench: *a*, *b*, gauged drills; *c*, engraving tool; *d*, bone awl; *e*, needle case(?); *f*, marrow extractor or rib scraper(?); *g*, marlin spike(?); *h*, fire drill platform; *i*, unidentified wooden object.

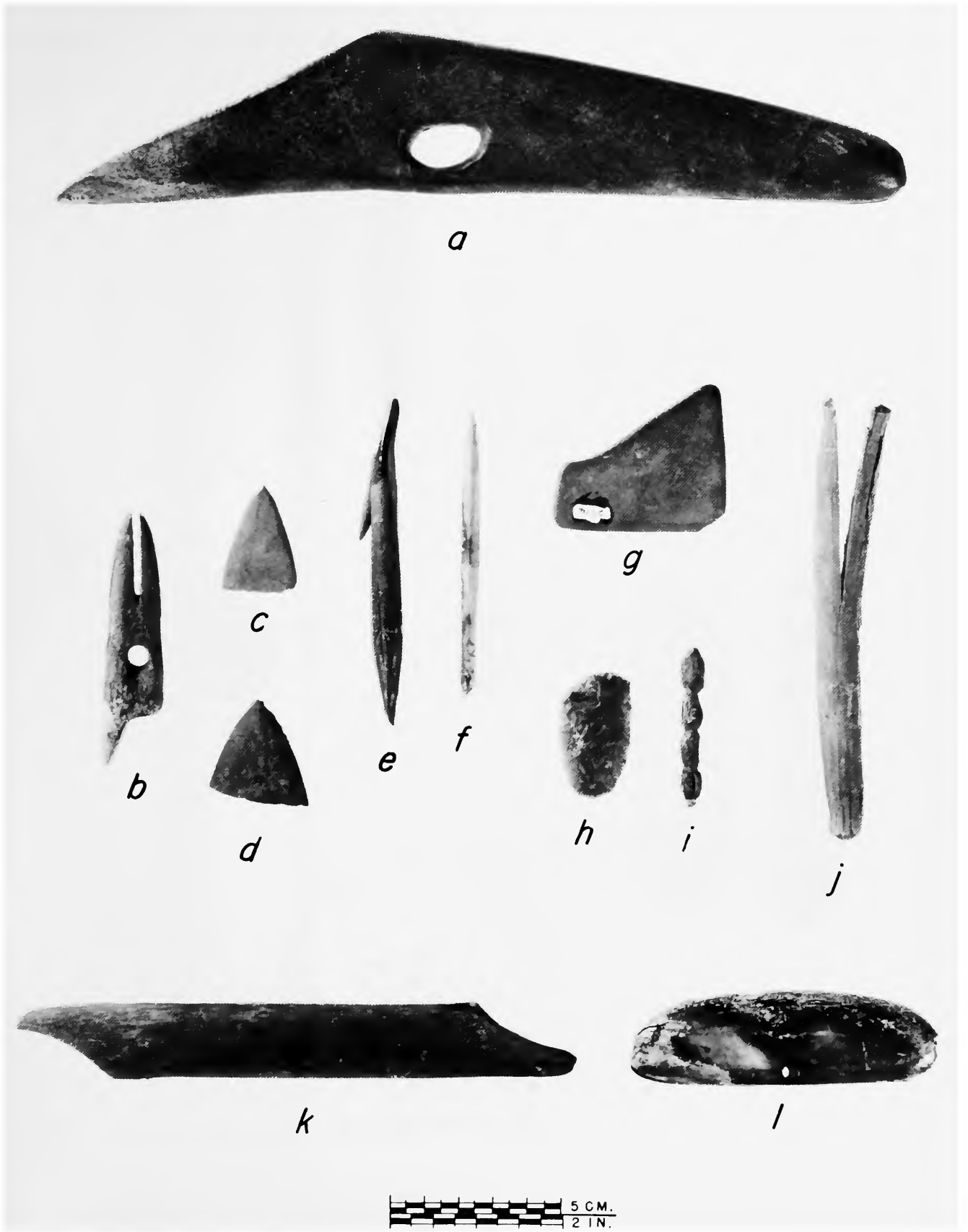

PLATE 84.—Late Thule artifacts, level B–1: *a*, whaling harpoon head; *b*, Nuwuk closed socket harpoon head; *c*, *d*, slate end blades; *e*, antler arrowhead; *f*, wound pin; *g*, whetstone; *h*, end scraper; *i*, carved wooden object; *j*, drill spindle; *k*, unidentified wooden object; *l*, ulu handle.

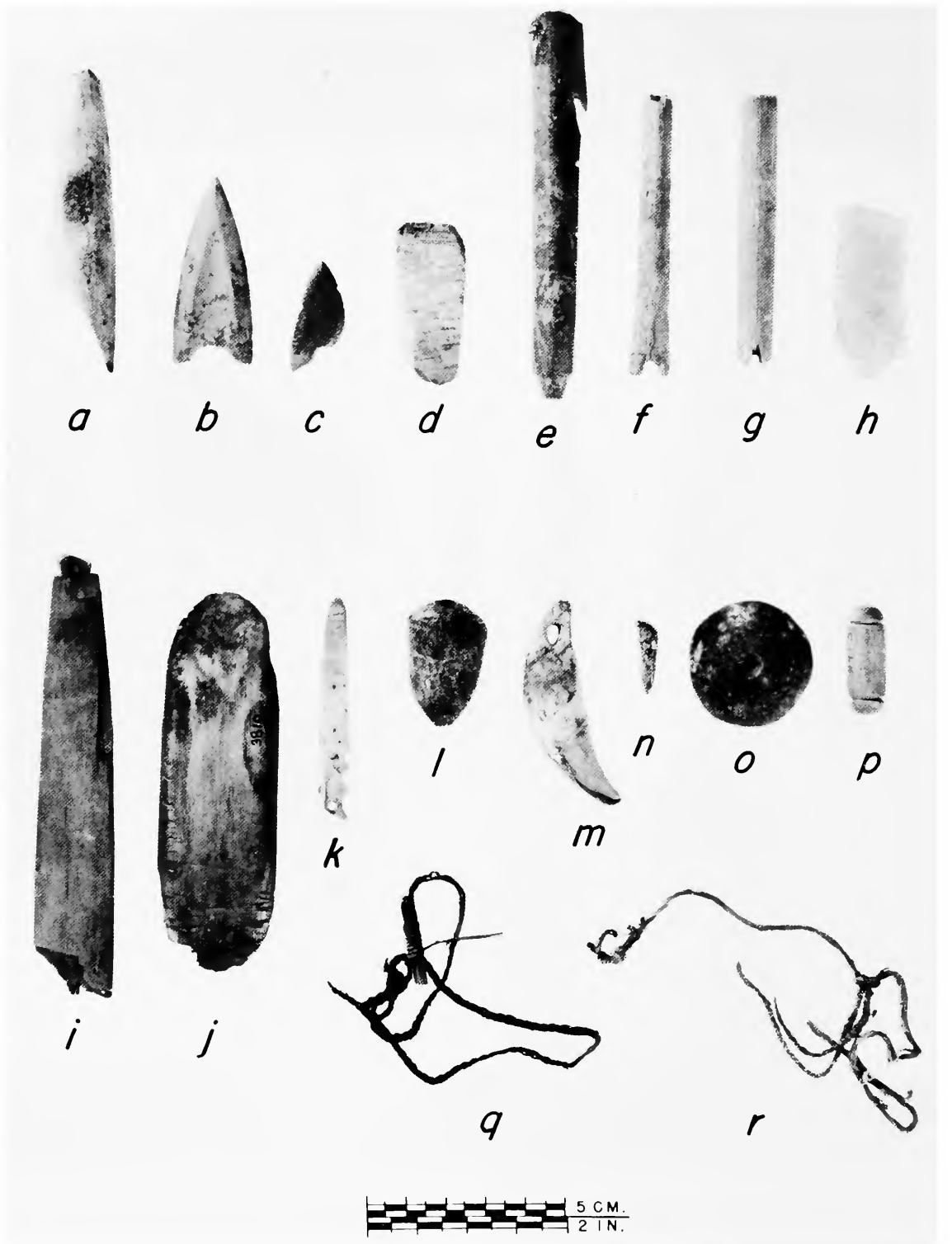

PLATE 85.—Late Thule artifacts, level A–1: *a*, harpoon head preform; *b*, *c*, slate harpoon end blades; *d*, harpoon ice pick fragment; *e*, antler arrowhead; *f*, *g*, antler arrowshafts; *h*, chert arrowhead; *i*, bow fragment; *j*, feather-cutting board; *k*, marrow extractor; *l*, bola weight; *m*, drilled tooth; *n*, atlatl hook; *o*, labret(?); *p*, small needle case; *q*, *r*, baleen cords.

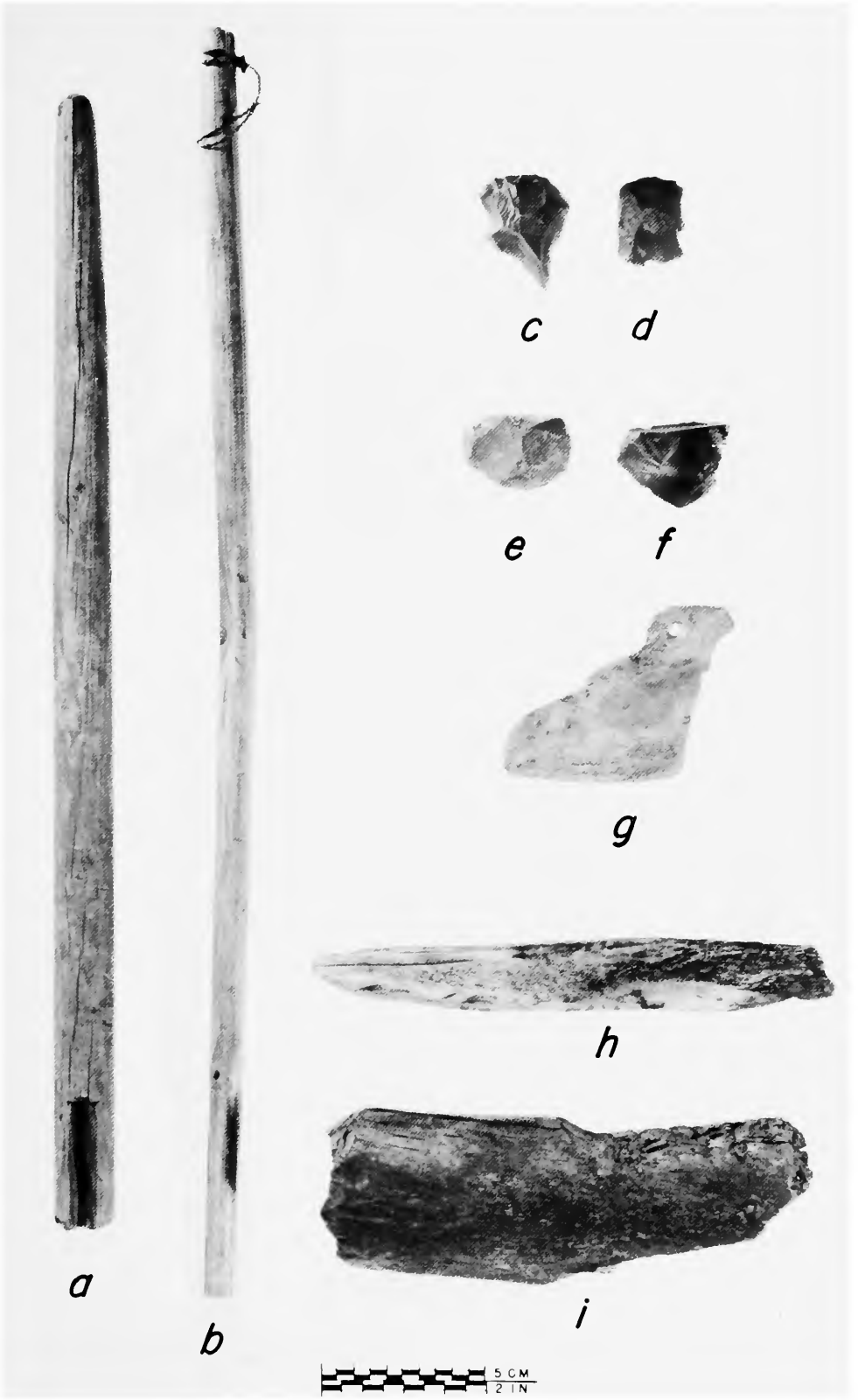

PLATE 86.—Late Thule artifacts, level A–1: *a*, drill shaft; *b*, fishing pole; *c*, *d*, *f*, retouched flakes; *e*, pebble end scraper; *g*, ulu blade; *h*, bone scraper; *i*, whale rib mattock fragment.

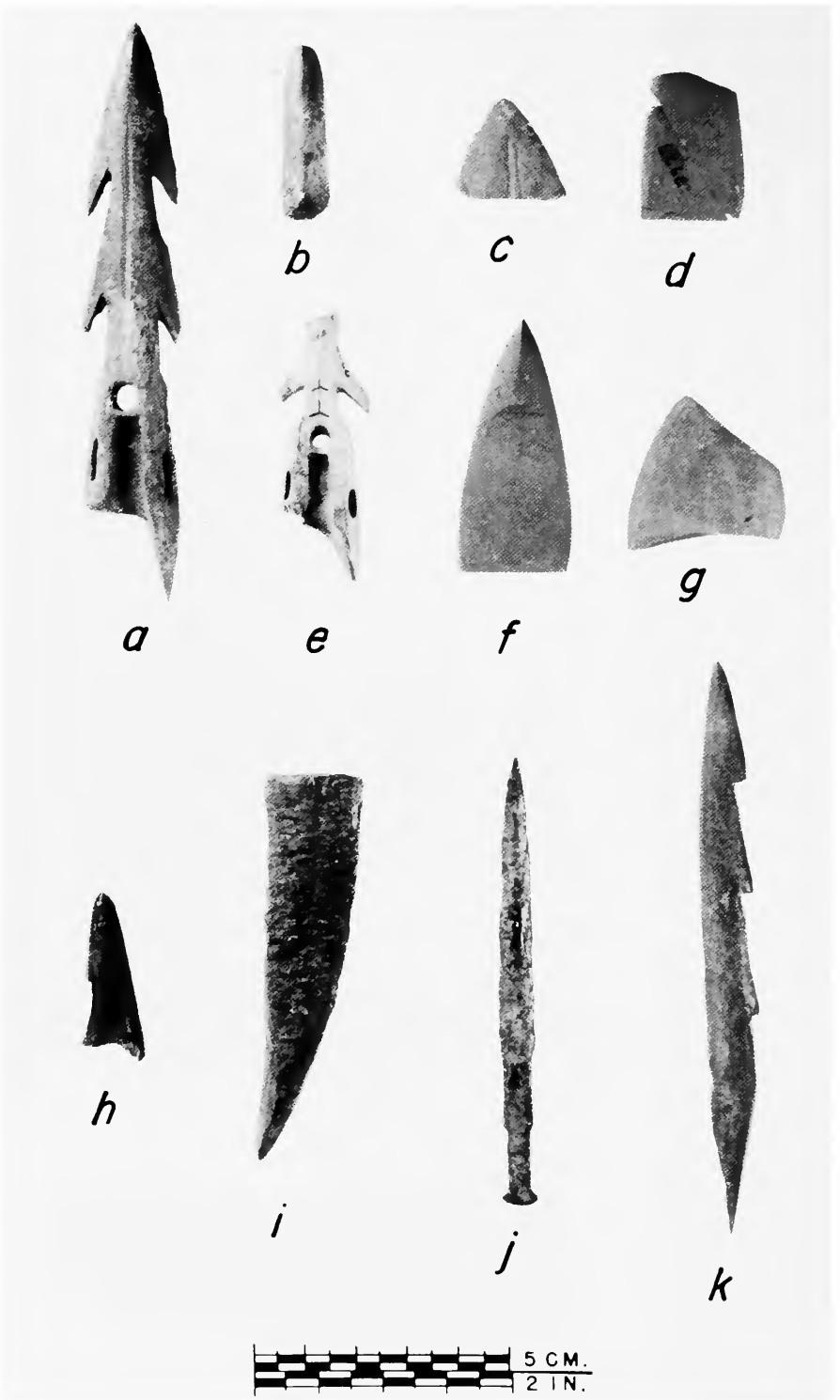

PLATE 87.—Late Thule artifacts, level A–2: *a*, *e*, Thule IIc open socket harpoon heads; *b*, harpoon head fragment; *c*, *d*, *f*, *g*, slate end blades; *h*, harpoon foreshaft fragment; *i*, harpoon ice pick fragment; *j*, wound pin; *k*, fish arrow prong.

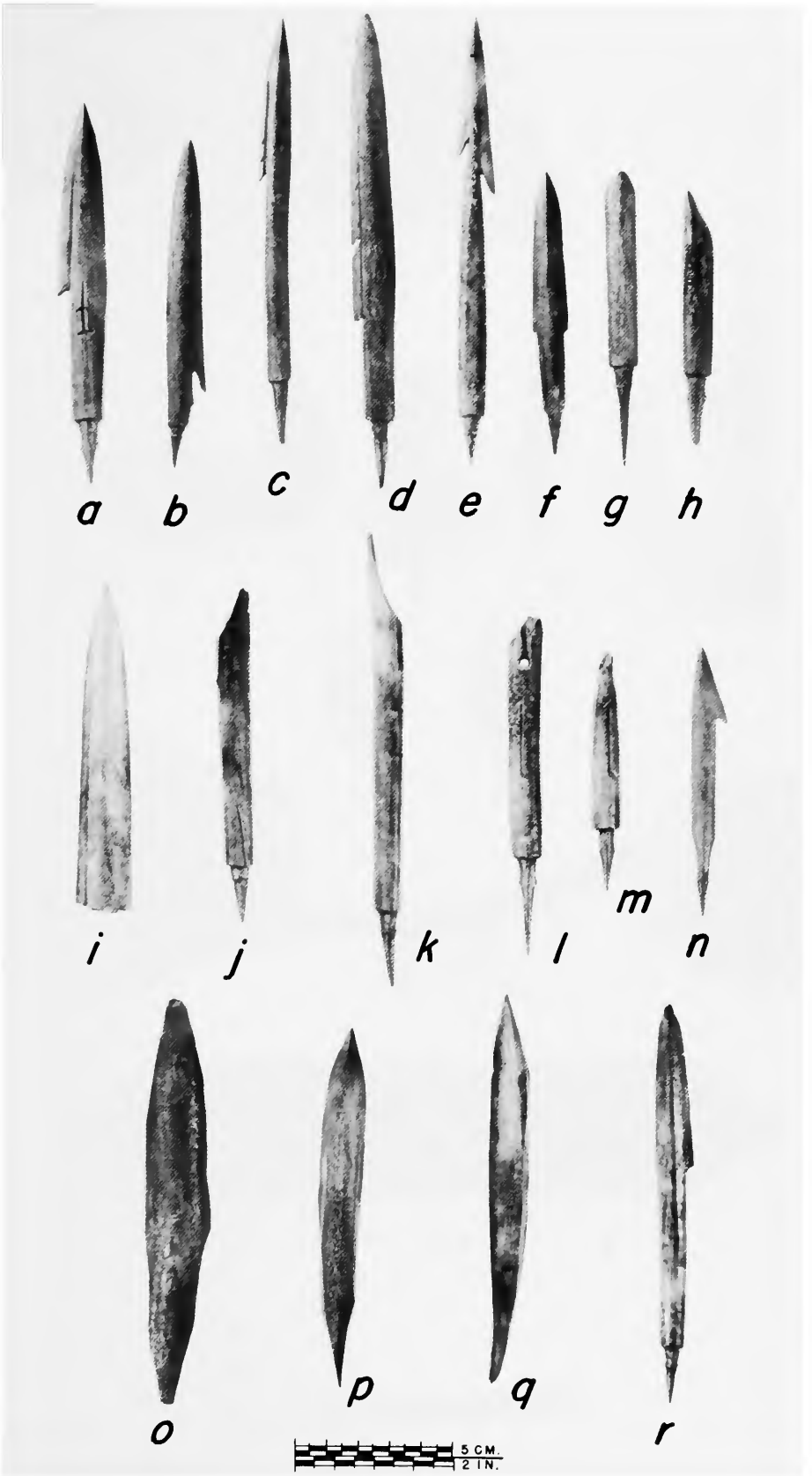

PLATE 88.—Late Thule artifacts, level A–2: *a–n*, antler arrowheads; *o–r*, antler arrowhead preforms.

PLATE 89.—Late Thule artifacts, level A–2: *a*, wooden bird arrow; *b*, *c*, arrowshaft fragments; *d–g*, chert arrowheads; *h*, *i*, bola weights; *j*, marlin spike; *k*, feather-cutting board; *l*, harpoon dart head.

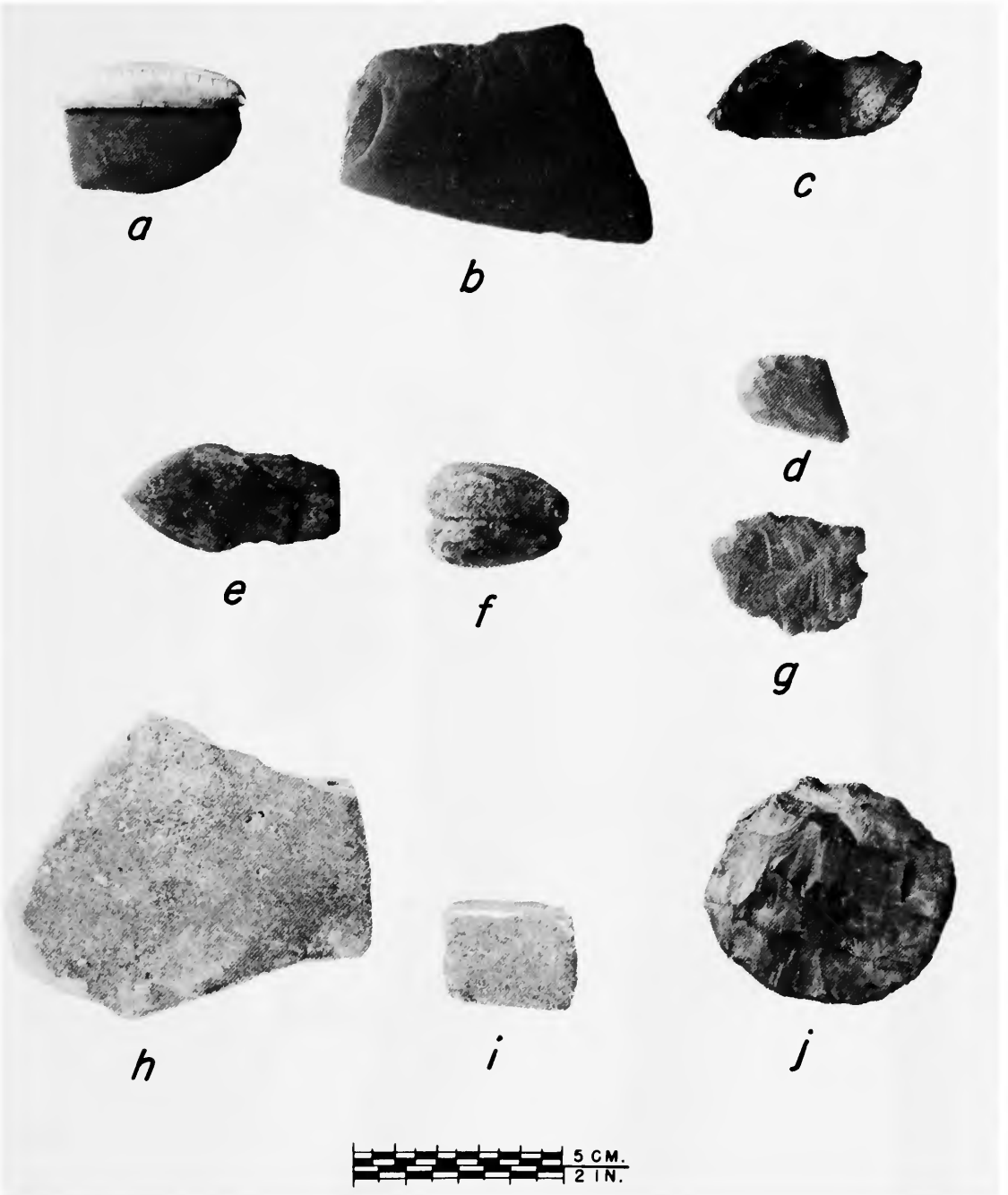

PLATE 90.—Late Thule artifacts, level A–2: *a*, ulu; *b*, ulu blade; *c*, *d*, *g*, retouched flake knives; *e*, slate knife blade; *f*, notched pebble; *h*, *i*, whetstones; *j*, bifacial core.

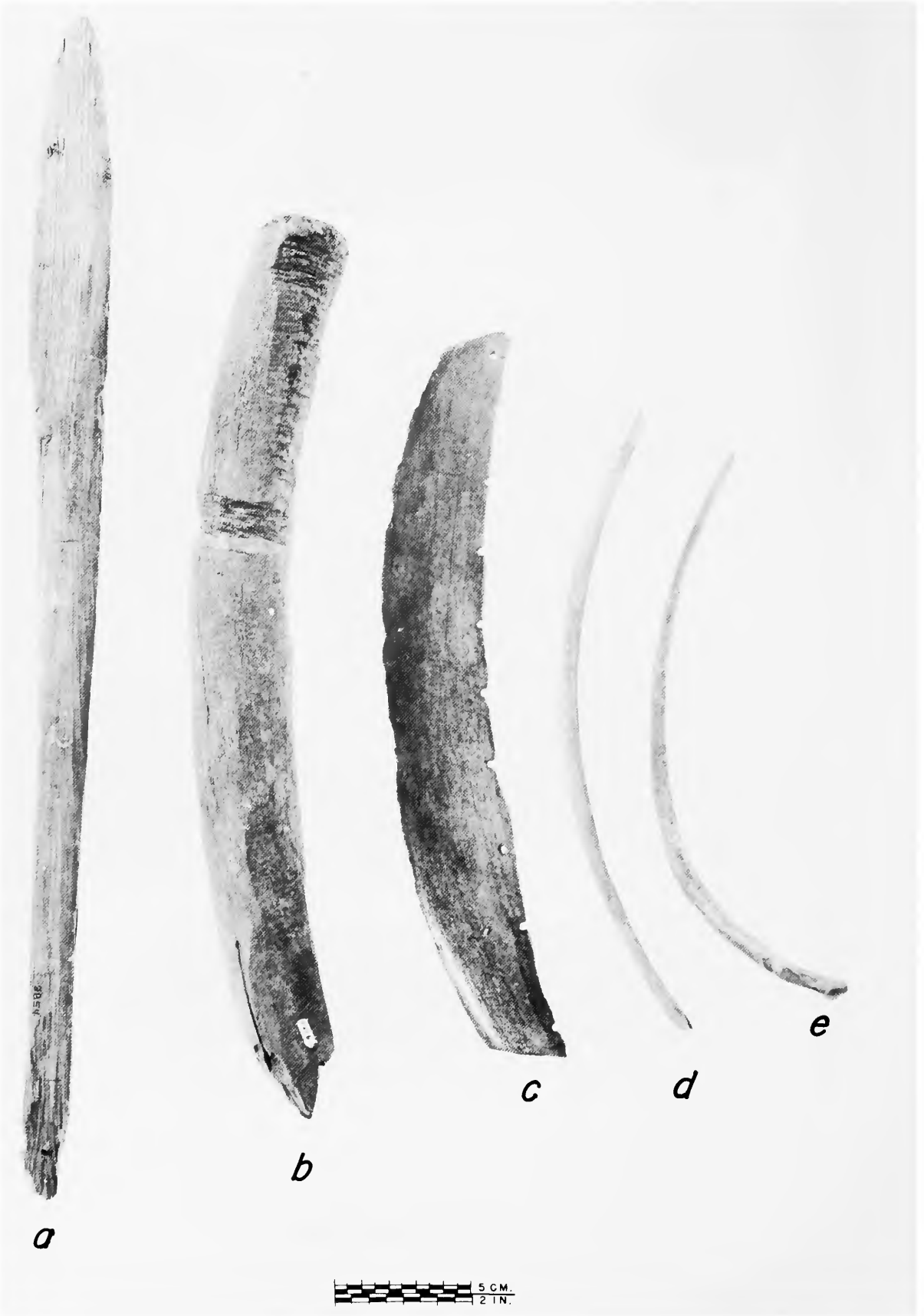

PLATE 91.—Late Thule artifacts, level A–2: *a*, paddleshaped wooden object; *b*, whale rib ice pick; *c*, snow shovel blade; *d*, *e*, marrow extractors or rib scrapers(?).

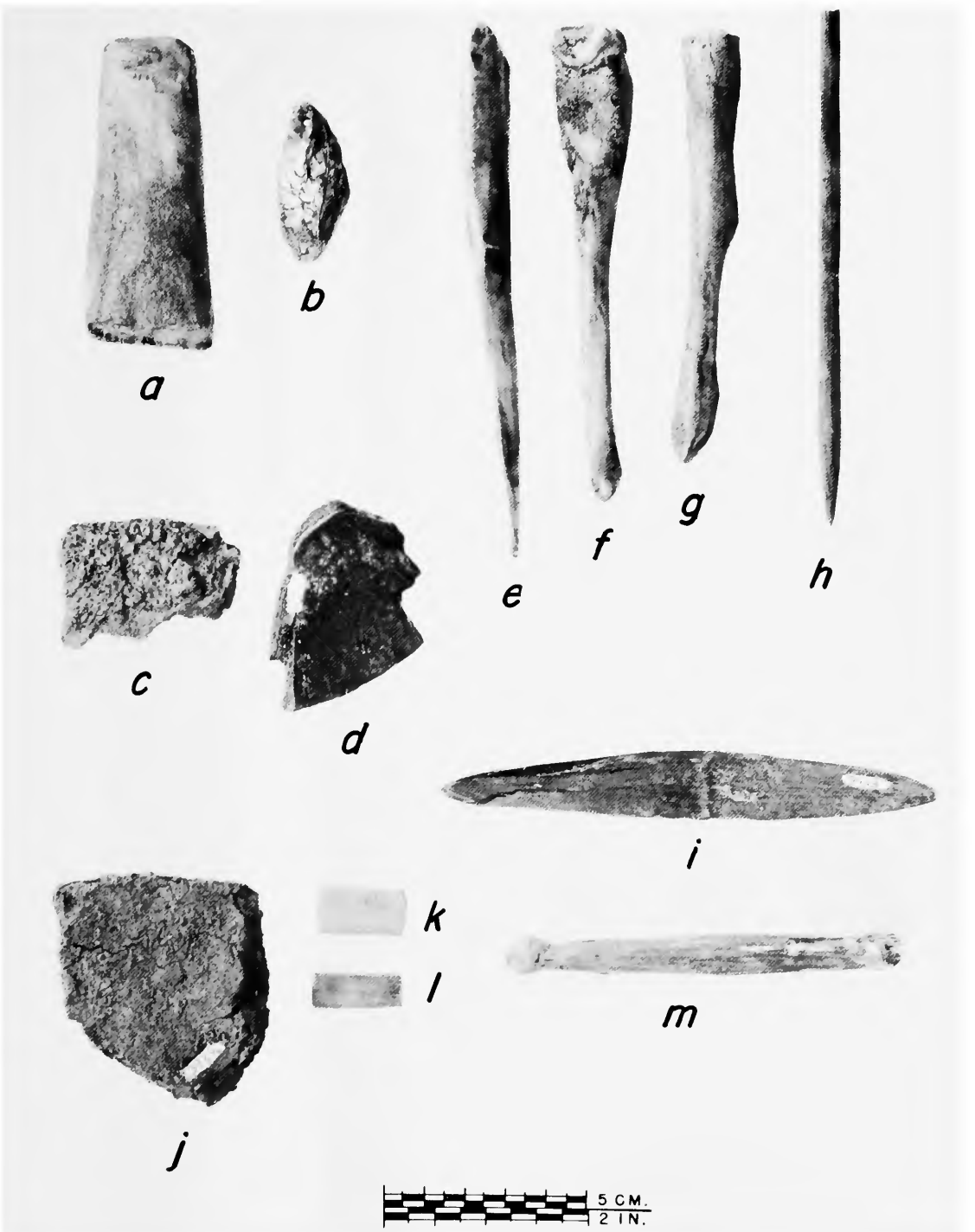

PLATE 92.—Late Thule artifacts, level A–2: *a*, antler wedge; *b*, amber pendant; *c*, *j*, potsherds; *d*, wooden bowl fragment; *e*, ivory awl; *f*, *g*, bone scrapers; *h*, pointed wooden shaft; *i*, baleen object; *k*, *l*, unidentified wooden squares; *m*, net float bar.

PLATE 93.—Late Thule artifacts, level A–3: *a*, Nuwuk closed socket harpoon head; *b*, Thule IIb harpoon head; *c*, harpoon head preform; *d–f*, slate end blades; *g*, wooden snow goggle fragment; *h, i*, harpoon shaft ice picks.

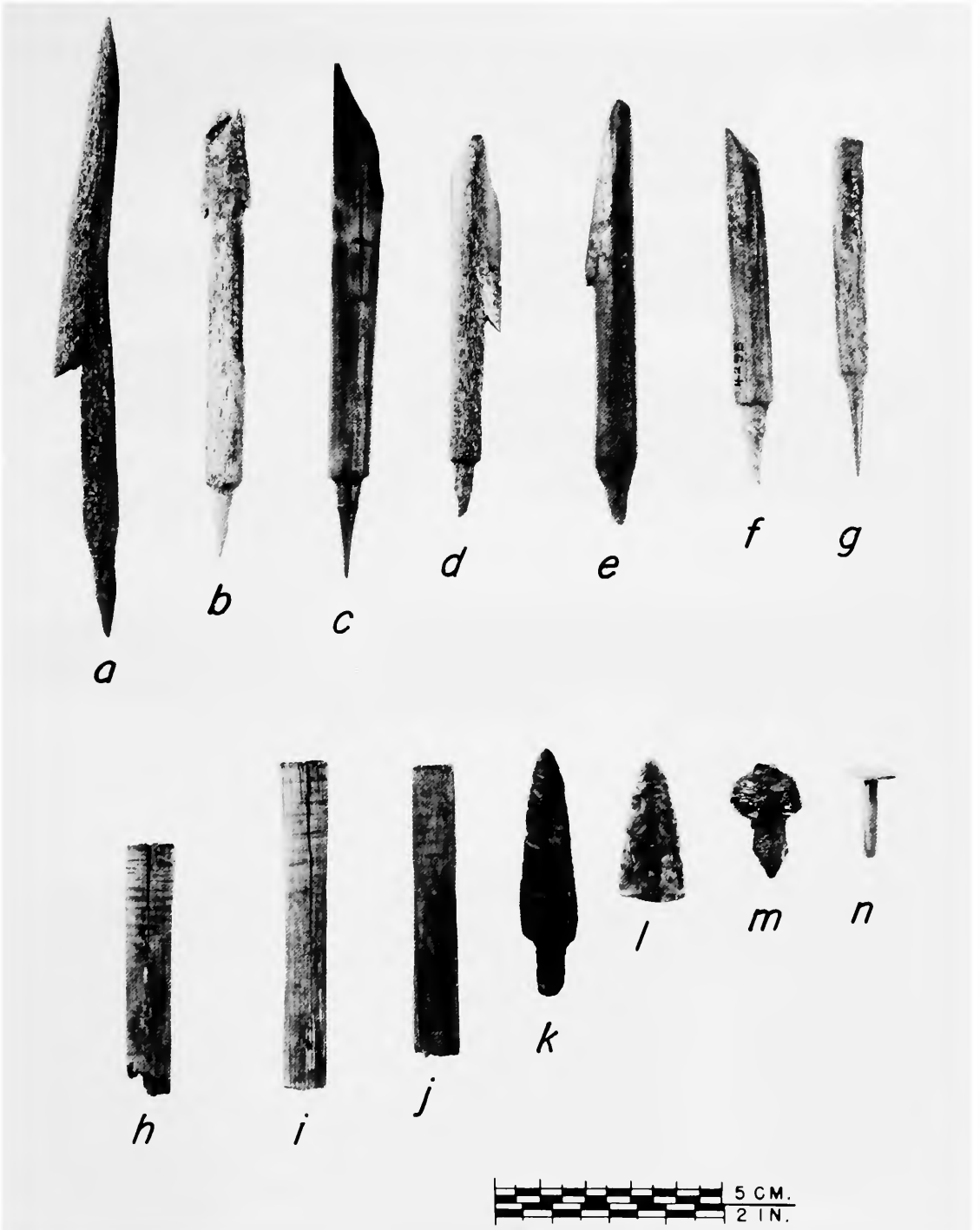

PLATE 94.—Late Thule artifacts, level A–3: *a–g*, antler arrowheads; *h–j*, arrowshaft fragments; *k, l*, chert arrowheads; *m*, seal float mouthpiece stopper; *n*, labret.

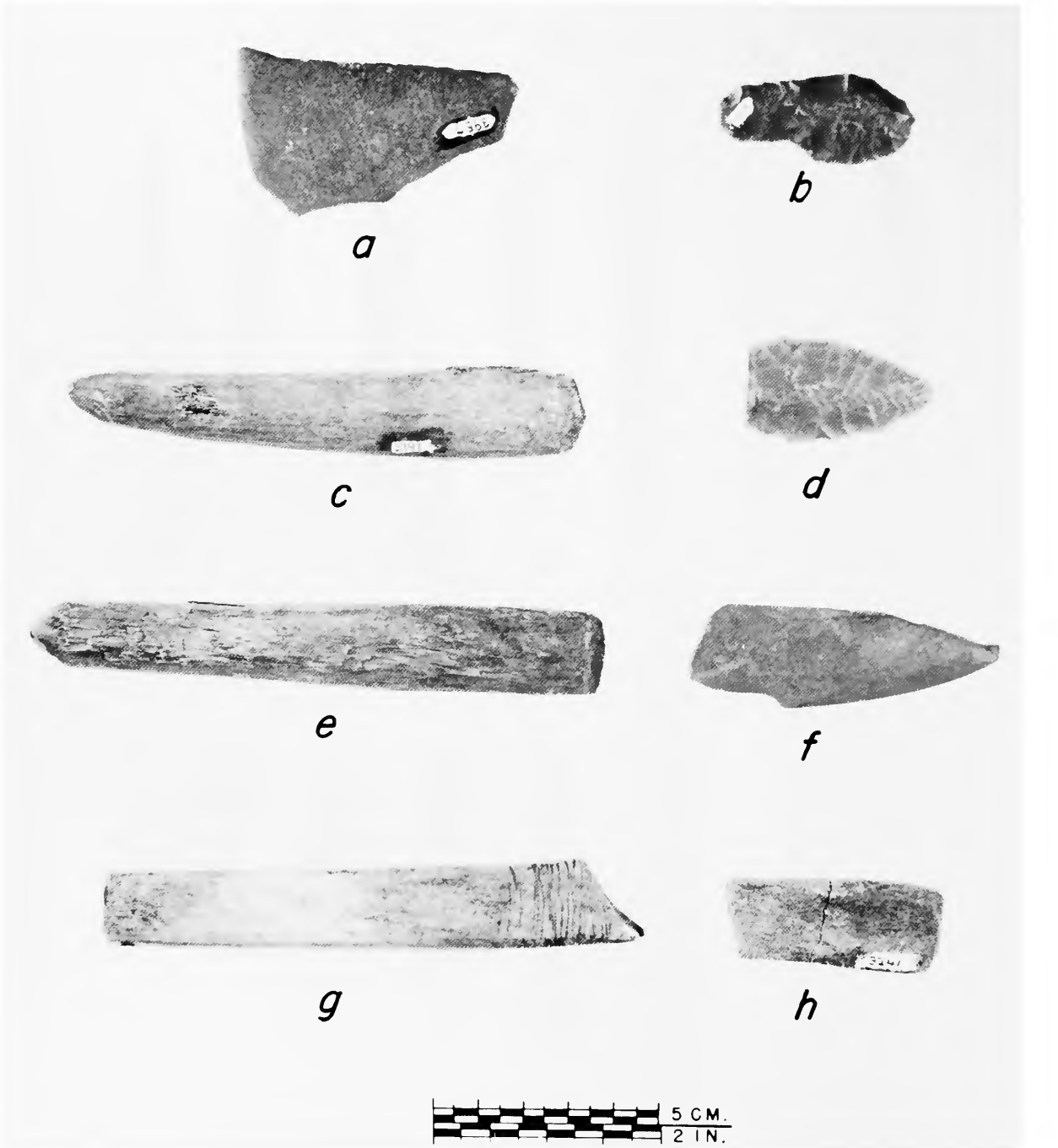

PLATE 95.—Late Thule artifacts, level A–3: *a*, ulu blade; *b*, *d*, chert knife blades; *c*, *e*, *g*, knife handles; *f*, slate knife blade; *h*, whetstone.

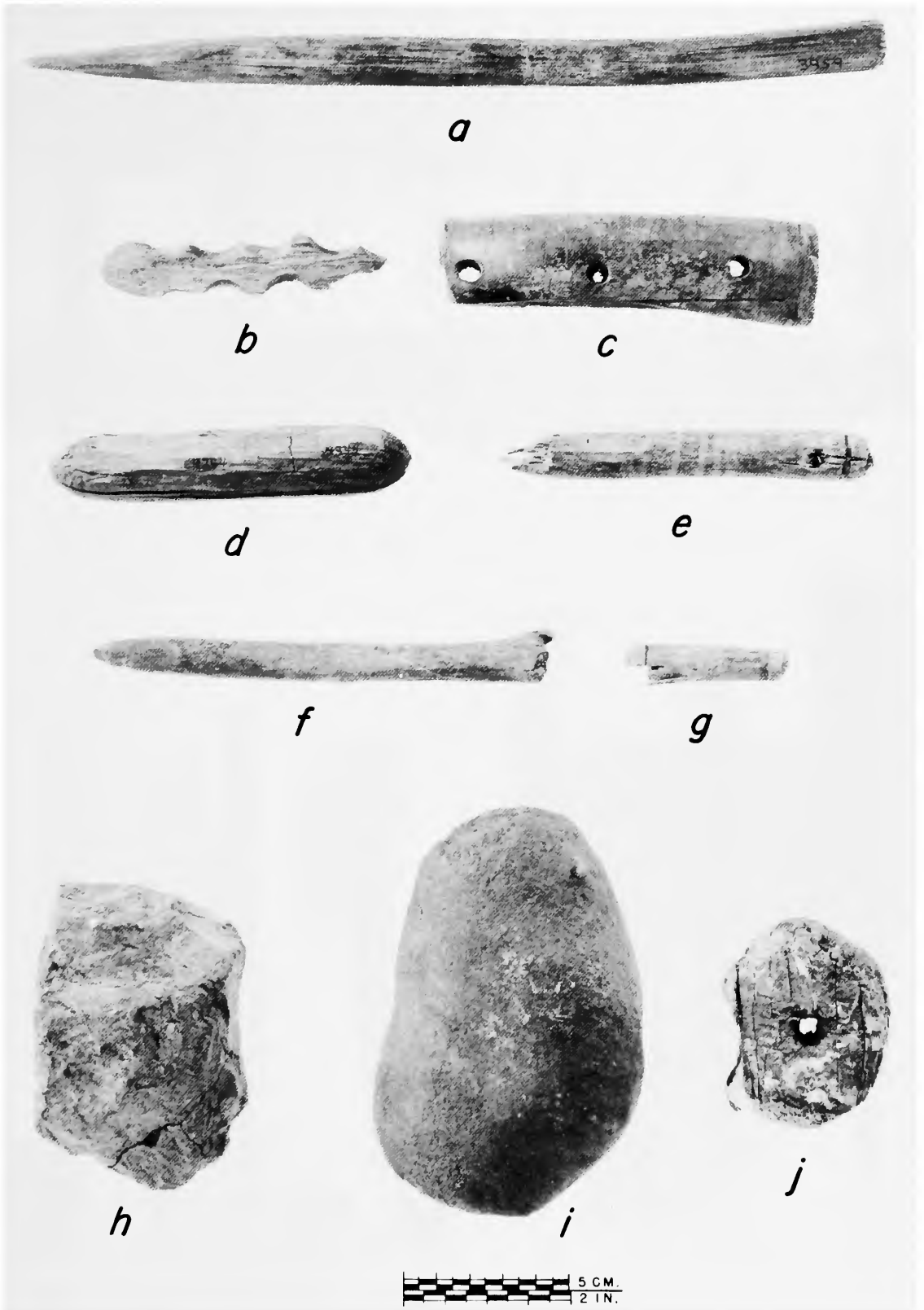

PLATE 96.—Late Thule artifacts, level A–3: *a*, hide peg; *b*, fire drill platform fragment; *c*, drilled ivory object; *d–g*, miscellaneous wooden objects; *h*, lump of coal; *i*, bone crusher; *j*, bone hammerhead.

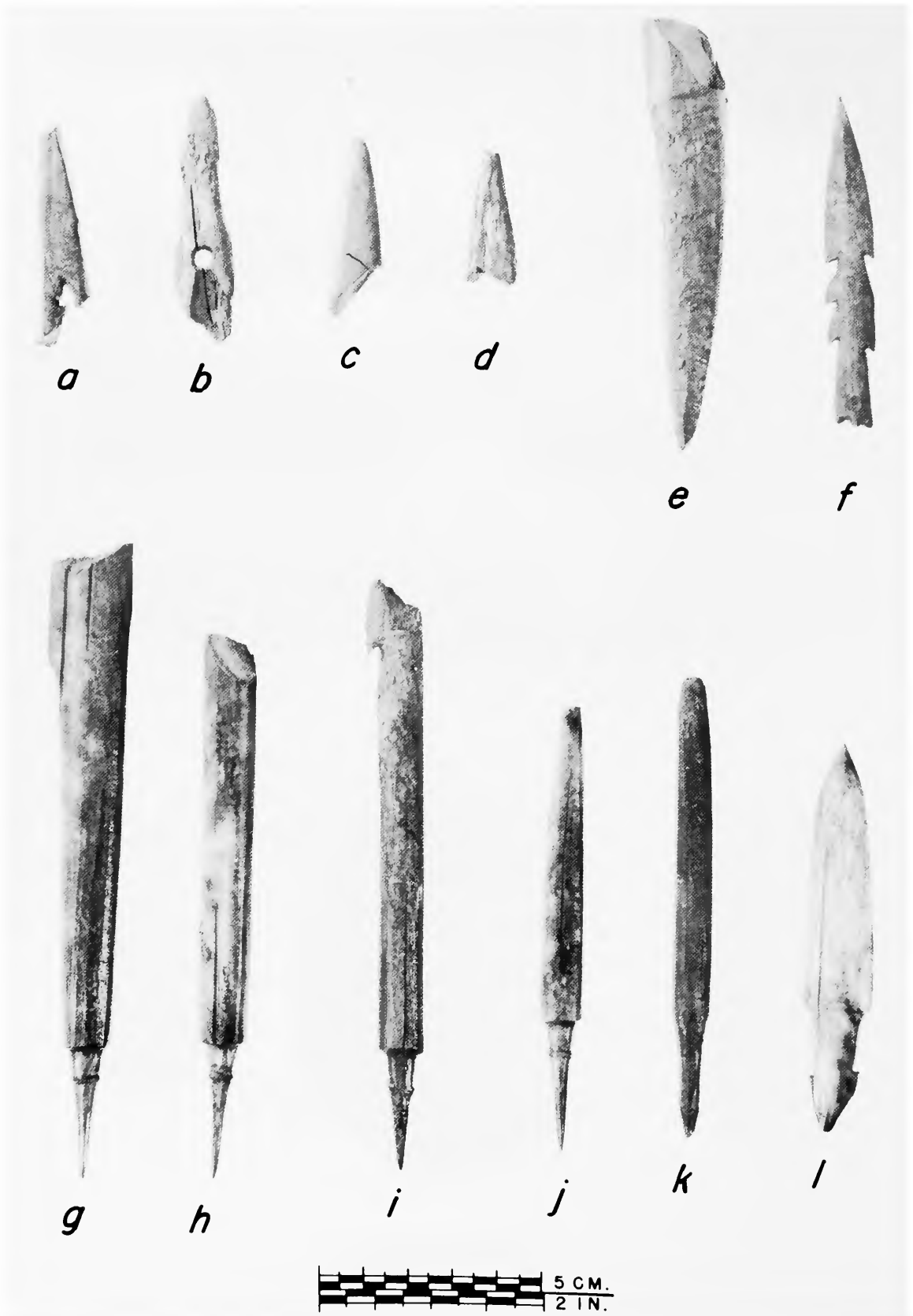

PLATE 97.—Late Thule artifacts, level A–4: *a*, Thule IIa harpoon head; *b*, harpoon head fragment; *c*, *d*, harpoon foreshaft fragments; *e*, harpoon ice pick fragment; *f–l*, antler arrowheads.

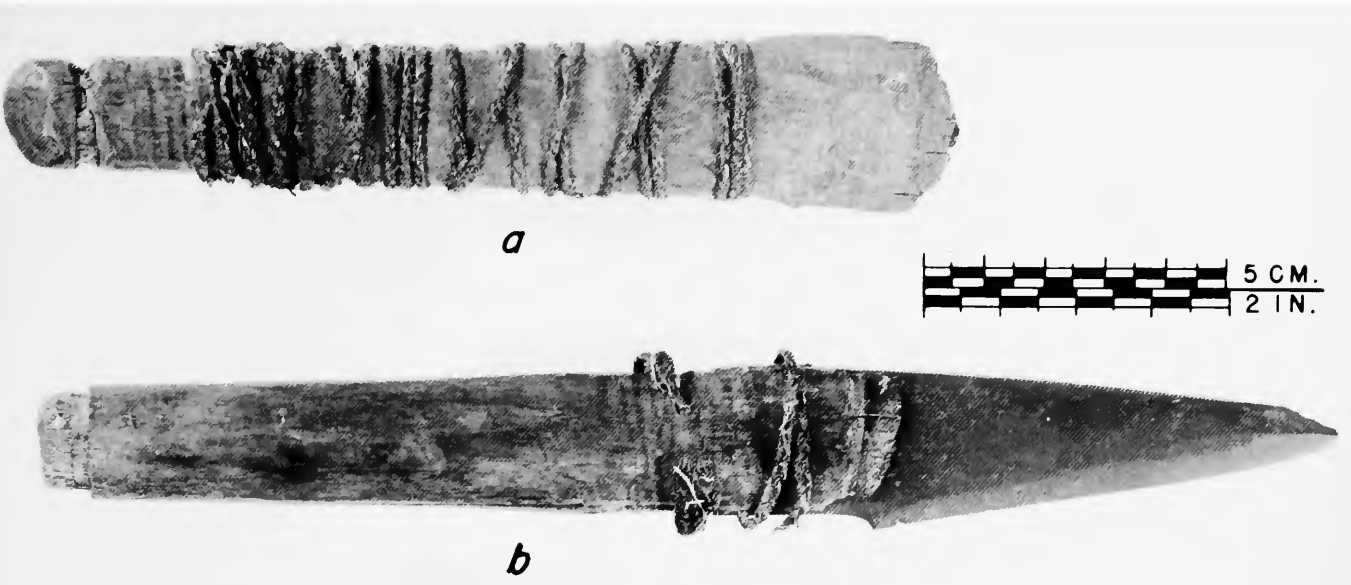

PLATE 98.—Late Thule artifacts, level A–4: *a*, knife handle; *b*, man's knife.

PLATE 99.—Late Thule artifacts, level A–4: *a*, gauged drill; *b*, whetstone; *c*, unidentified antler object; *d*, *g*, knife blade fragments; *e*, *f*, chert drill bits; *h*, side scraper; *i*, potsherd.

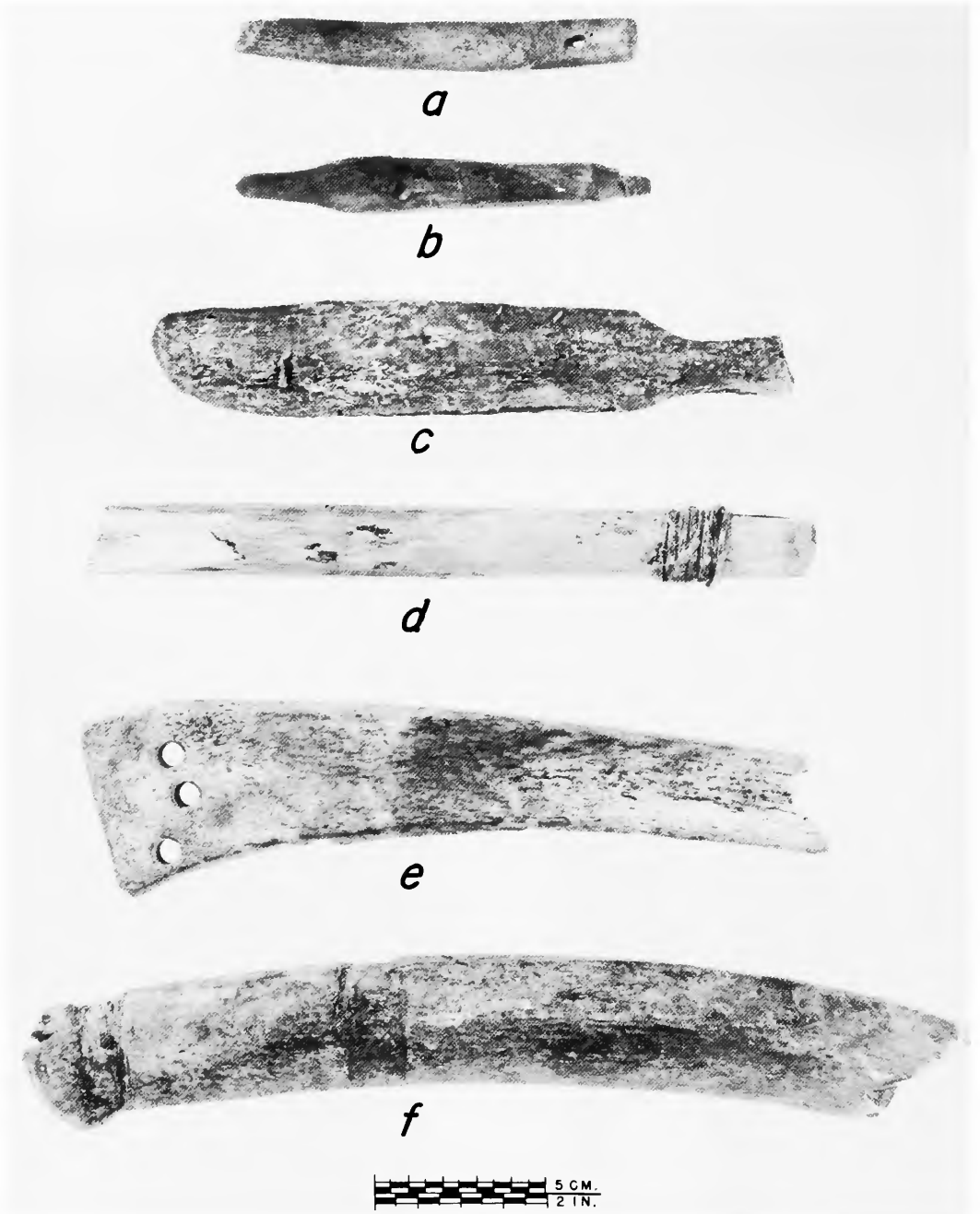

PLATE 100.—Late Thule artifacts, level A–4: *a*, unidentified handle; *b*, awl handle; *c*, baleen knife; *d*, knife handle; *e*, adz handle; *f*, whale rib ice pick.

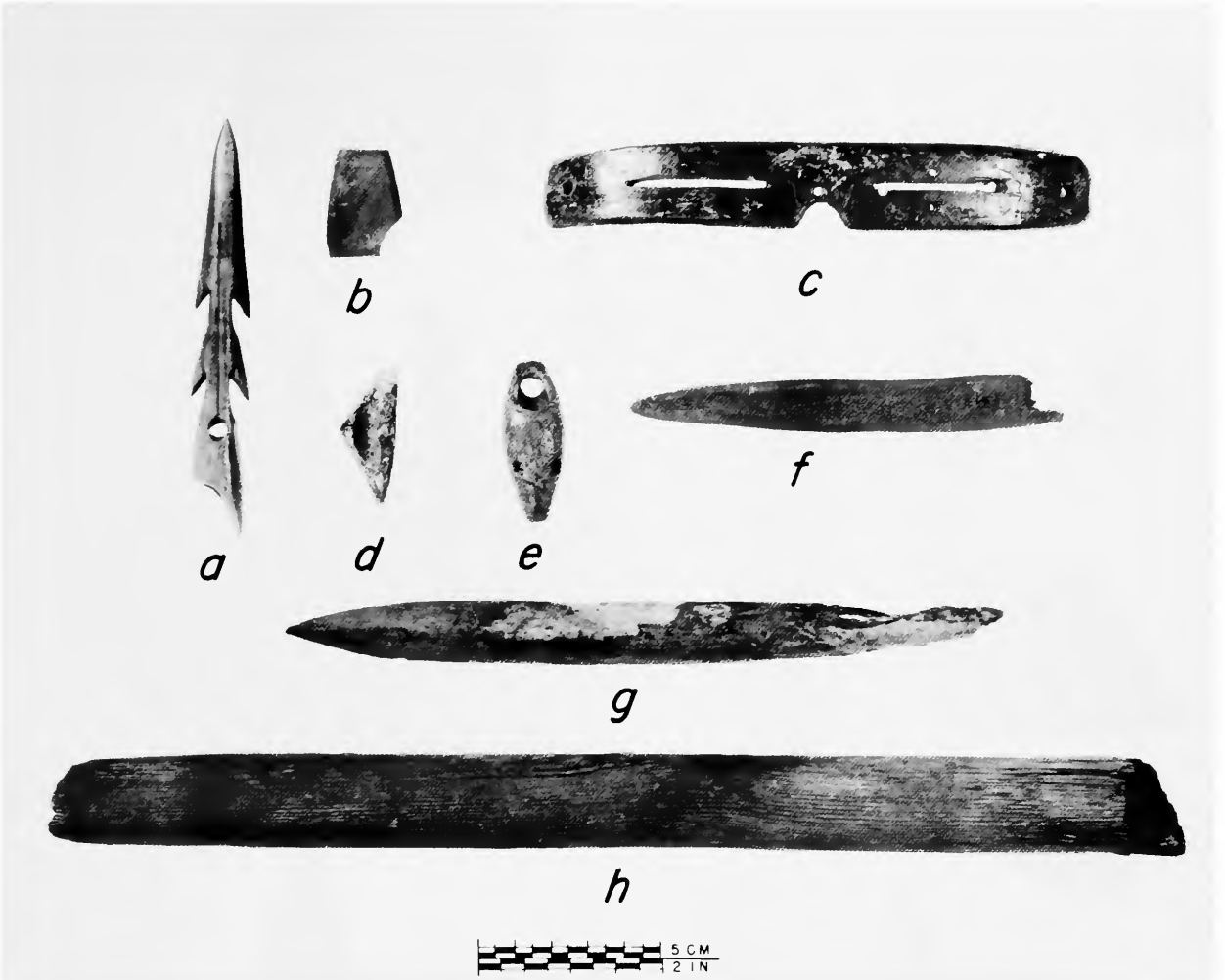

PLATE 101.—Late Thule artifacts, level A–5; *a*, Utkiavik closed socket harpoon head; *b*, slate end blade; *c*, baleen snow goggles; *d*, harpoon head fragment; *e*, seal drag handle; *f*, *g*, harpoon ice pick fragments; *h*, harpoon shaft fragment.

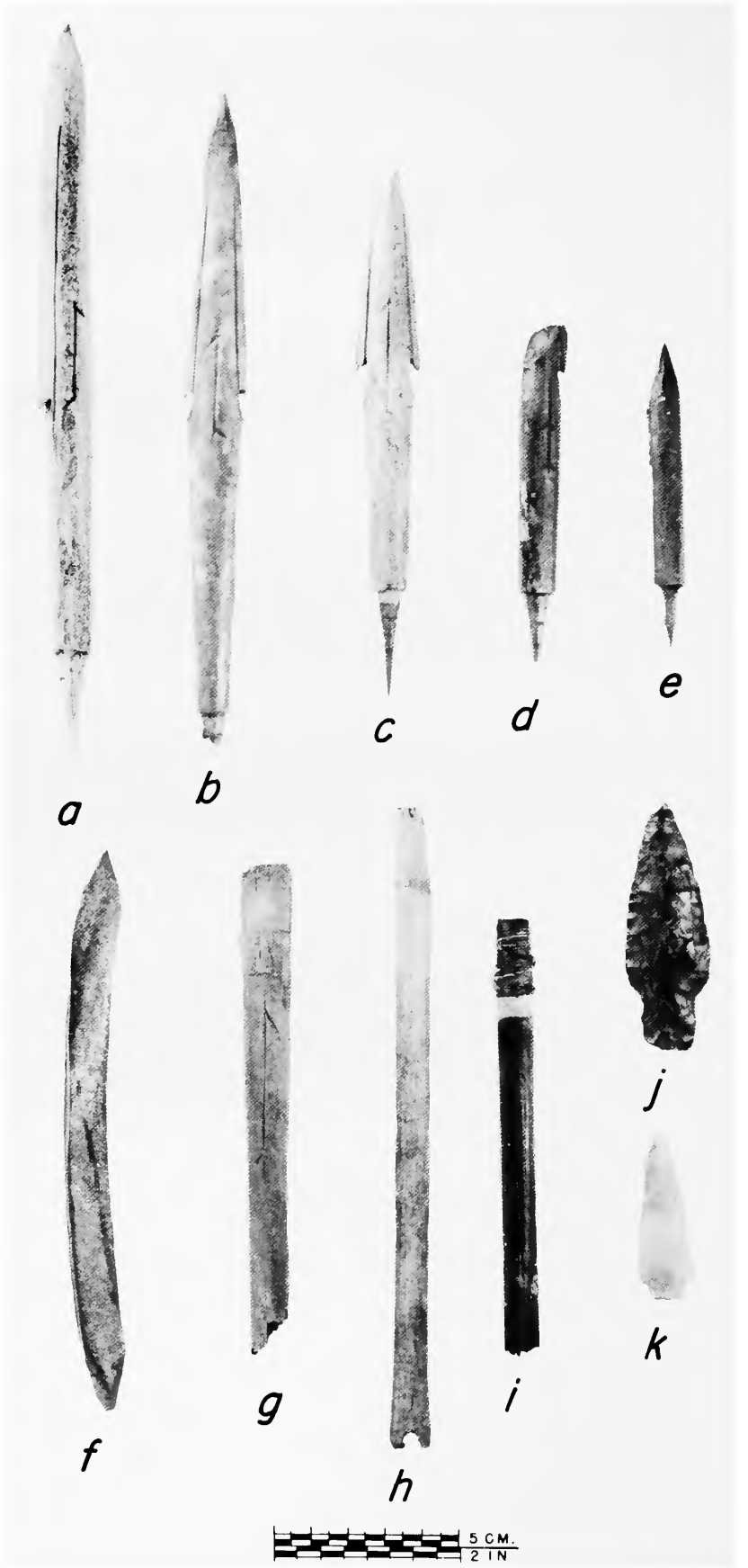

PLATE 102.—Late Thule artifacts, level A–5: *a–e*, antler arrowheads; *f*, antler arrowhead preform; *g–i*, arrowshaft fragments; *j*, *k*, chert arrowheads.

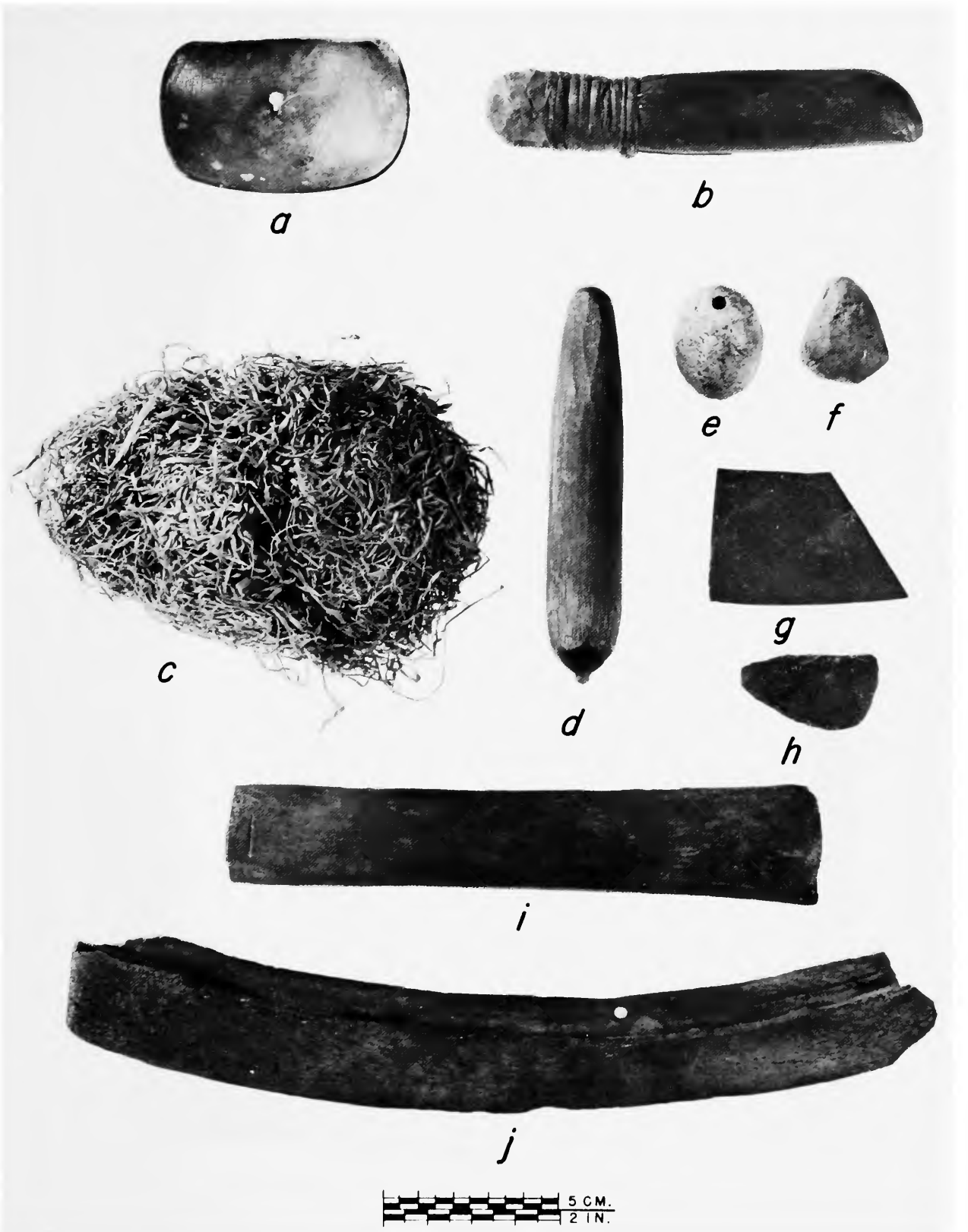

PLATE 103.—Late Thule artifacts, level A–5: *a*, fat cup; *b*, scraper; *c*, wood shaves bundle; *d*, fire drill spindle; *e*, *f*, bola weights; *g*, *h*, ulu blades; *i*, knife handle; *j*, snow shovel blade.

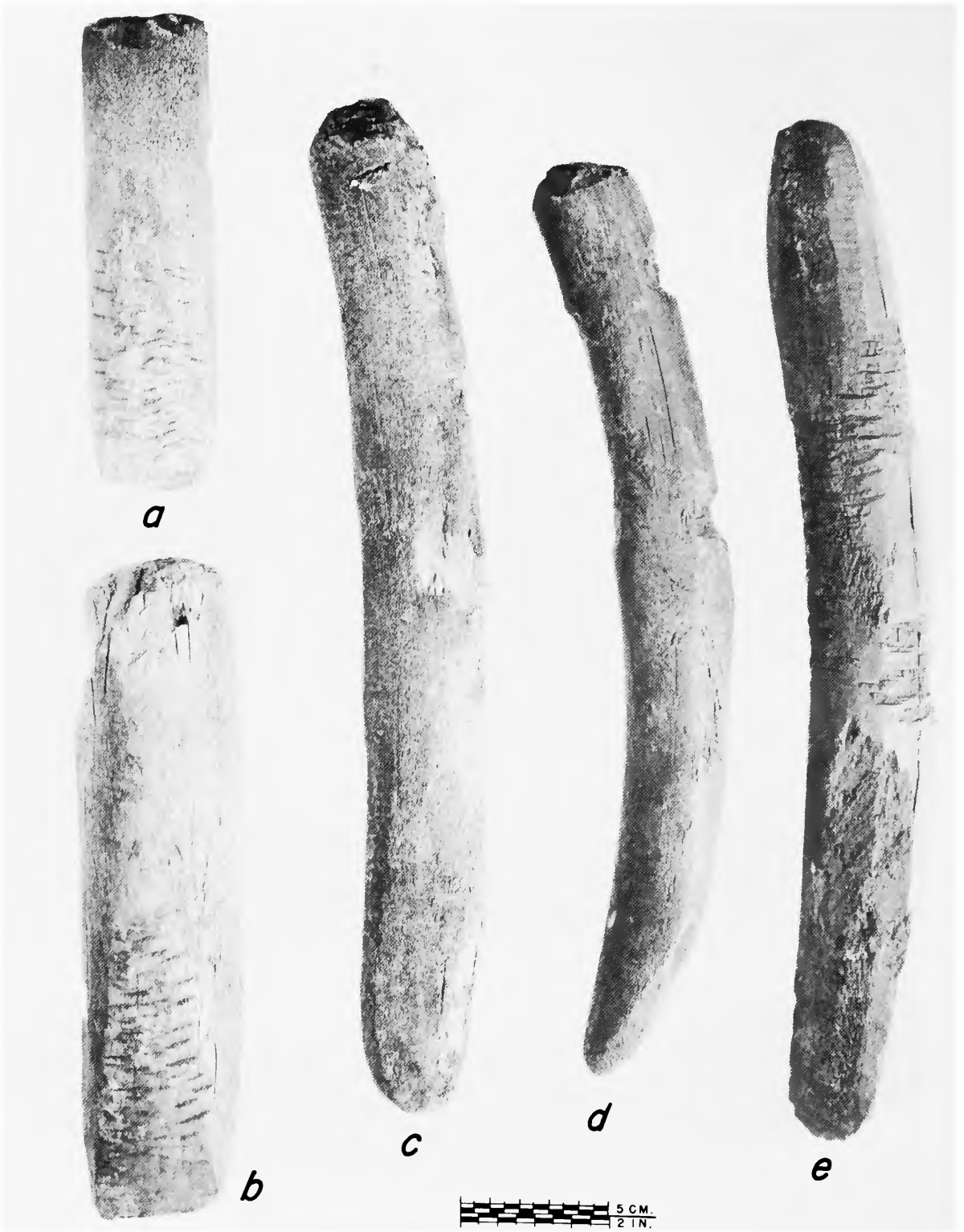

PLATE 104.—Late Thule artifacts, level A–5: *a*, *b*, large whale rib wedges; *c–e*, whale rib ice picks.

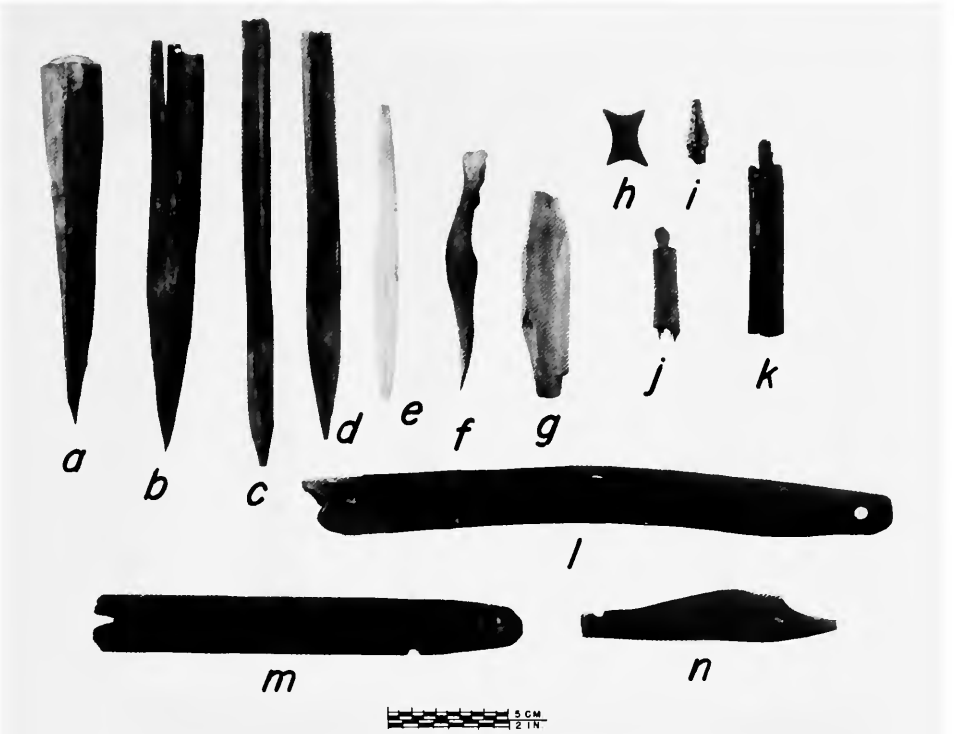

PLATE 105.—Late Thule artifacts, level A–5: *a–d*, hide pegs; *e–g*, bone scrapers; *h*, gaming piece; *i*, chert drill bit; *j*, *k*, toy bow fragments; *l*, kayak rib; *m*, *n*, unidentified wooden objects.

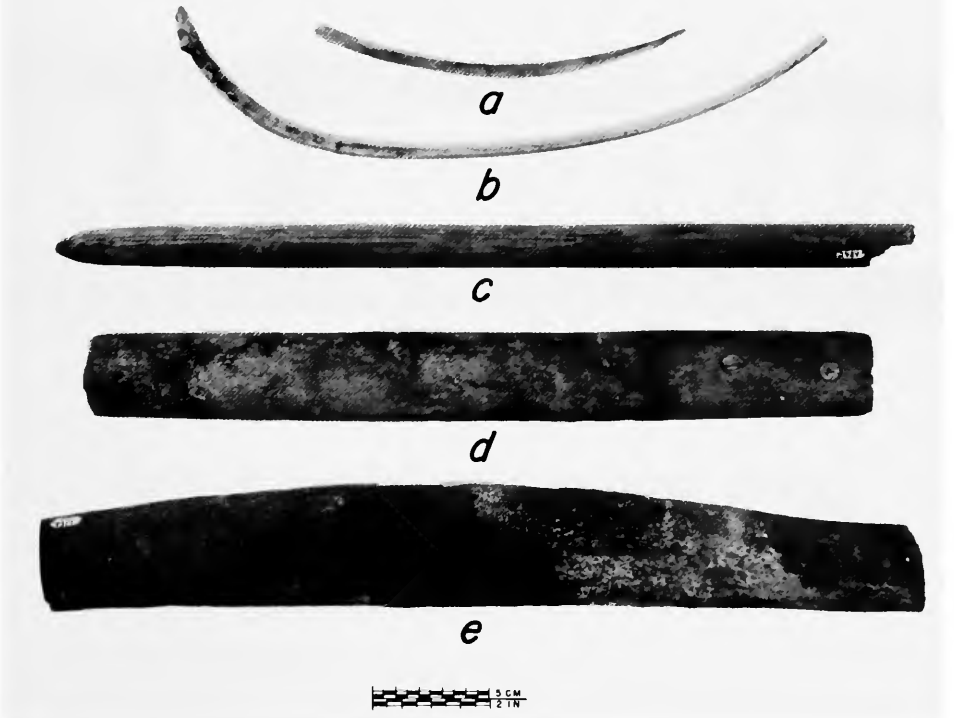

PLATE 106.—Late Thule artifacts, level A–5: *a*, *b*, marrow extractors or rib scrapers (?); *c*, wooden shaft; *d*, sled shoe; *e*, sled shoe preform.

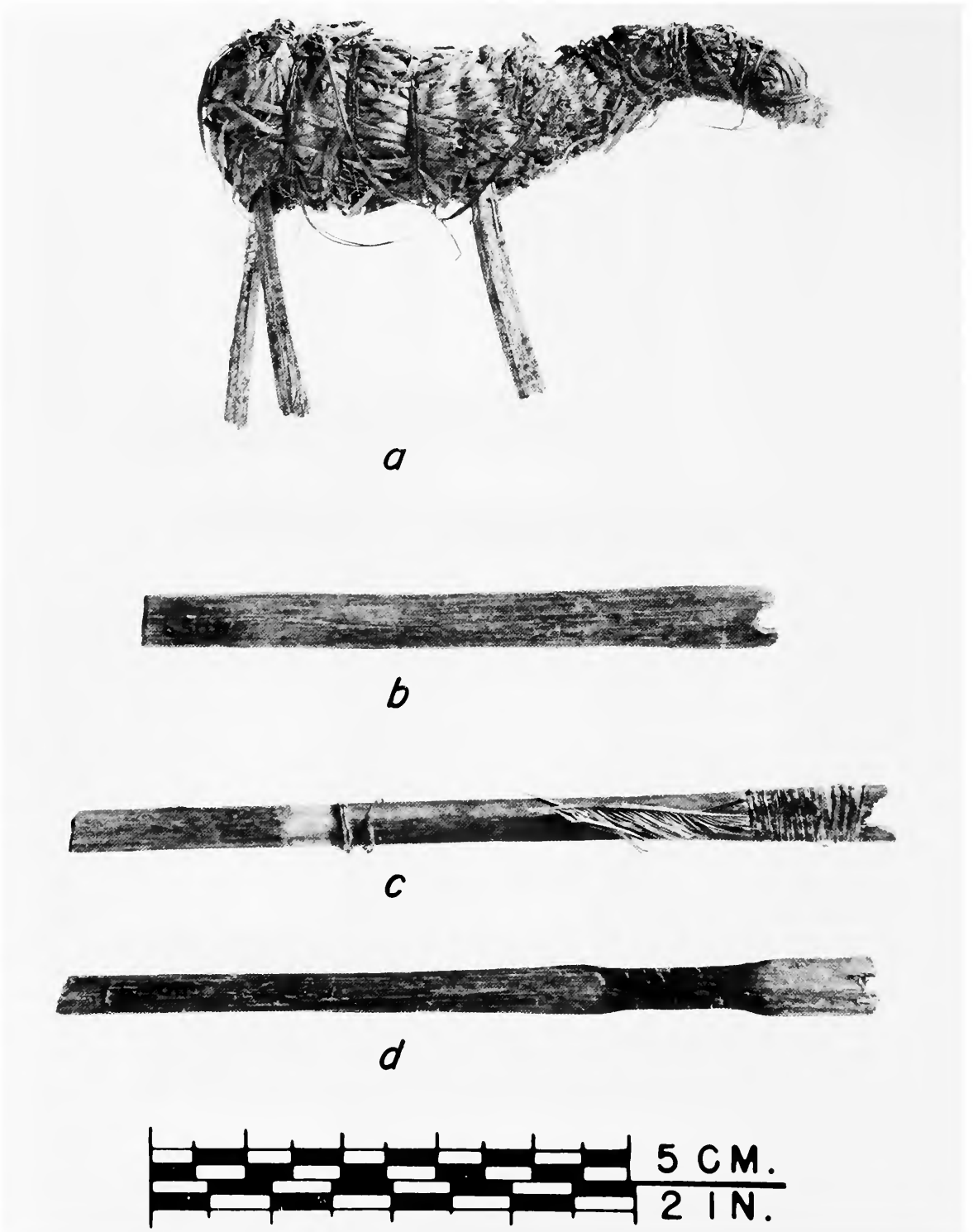

PLATE 107.—Late Thule artifacts, level A–5: *a*, grass caribou effigy; *b–d*, arrow effigies.

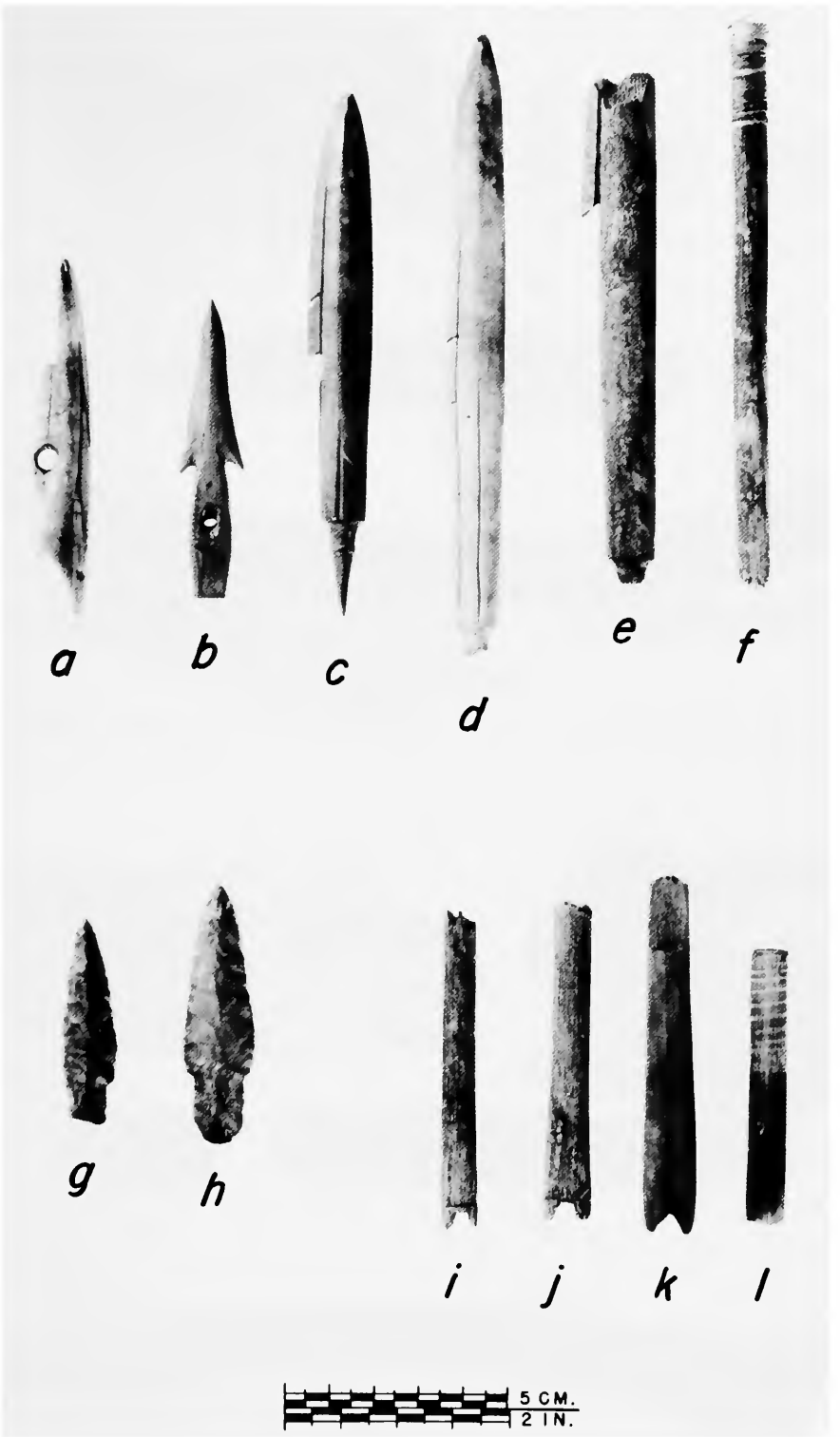

PLATE 108.—Late Thule artifacts, level A–6: *a*, Nuwuk closed socket harpoon head; *b*, darting harpoon head; *c–e*, antler arrowheads; *f*, *i–l*, arrowshaft fragments; *g*, *h*, chert arrowheads.

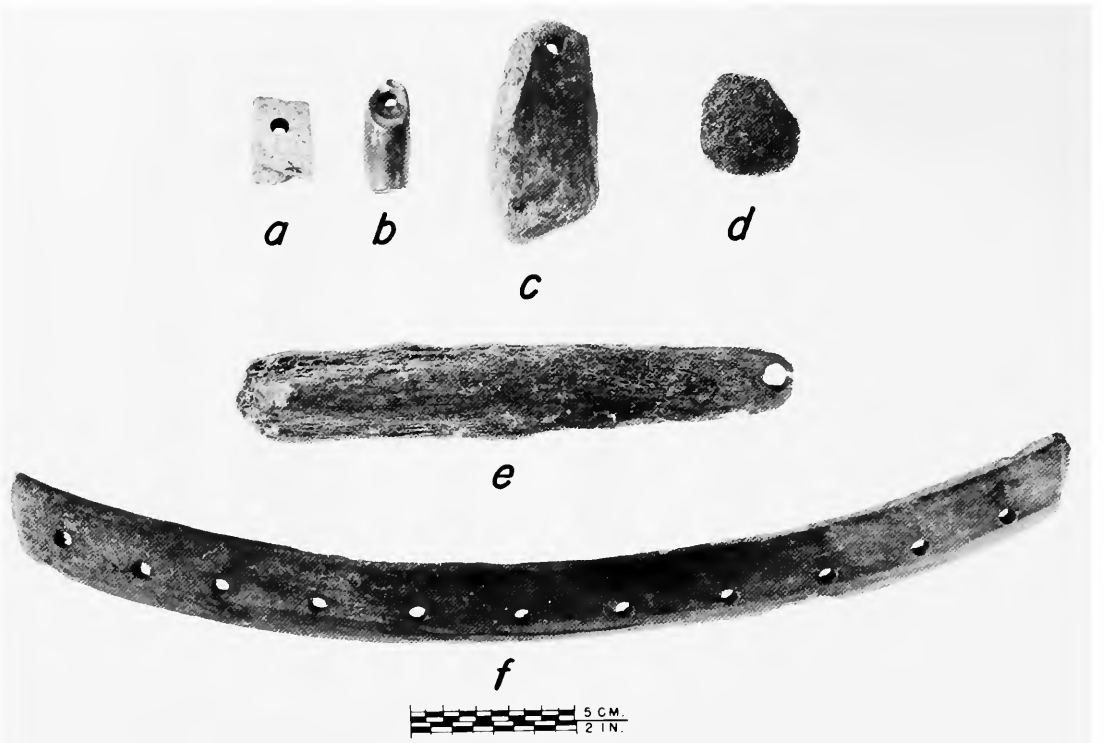

PLATE 109.—Late Thule artifacts, level A–6: *a–d*, bola weights; *e*, bone weight; *f*, snow shovel blade.

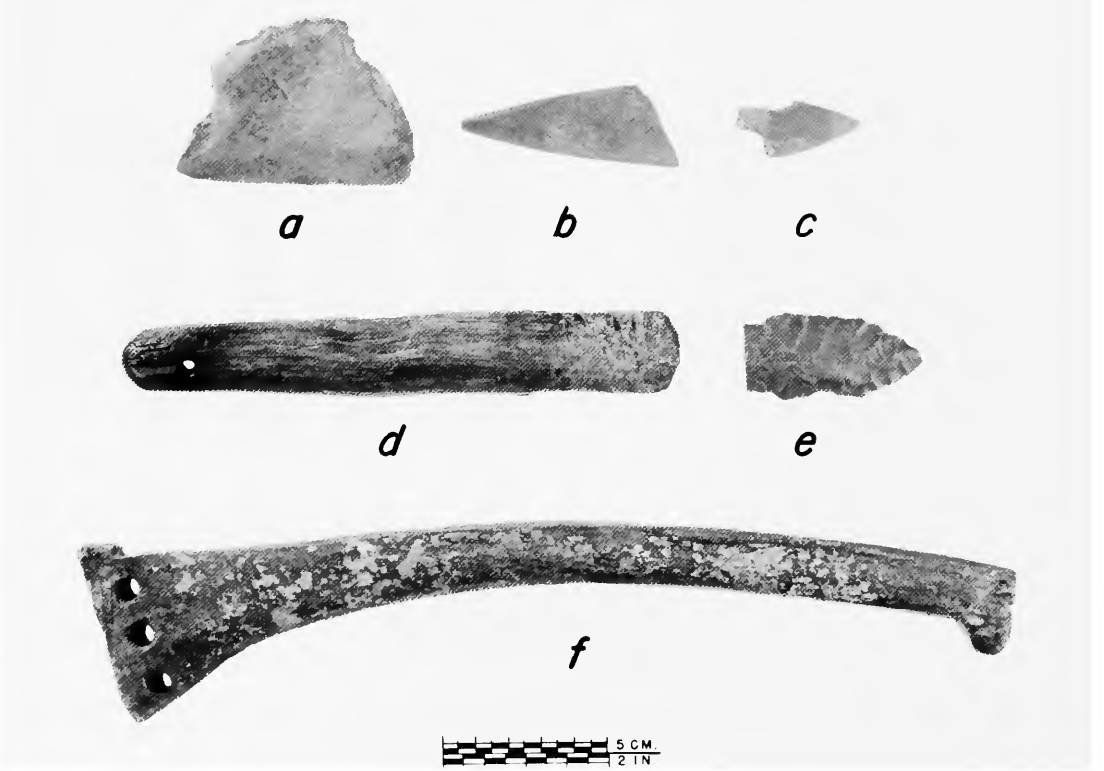

PLATE 110.—Late Thule artifacts, level A–6: *a*, *b*, ulu blades; *c*, slate knife blade; *d*, knife handle; *e*, chert knife blade; *f*, adz handle.

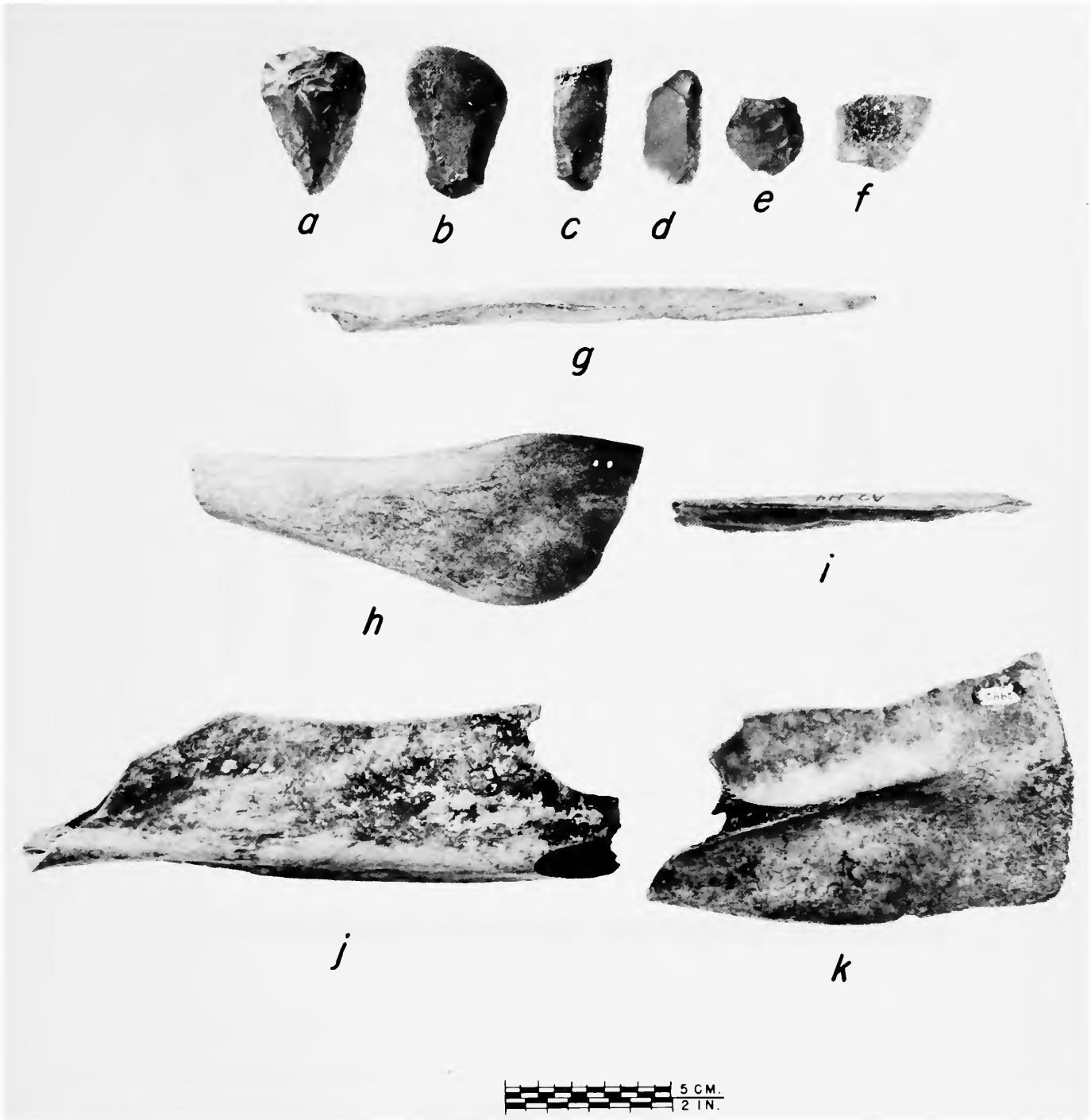

PLATE 111.—Late Thule artifacts, level A–6: *a–d, f,* chert scrapers; *e,* pebble end scraper; *g,* bone scraper; *h,* two-piece ice scoop; *i,* bone scraper; *j, k,* scapula scrapers.

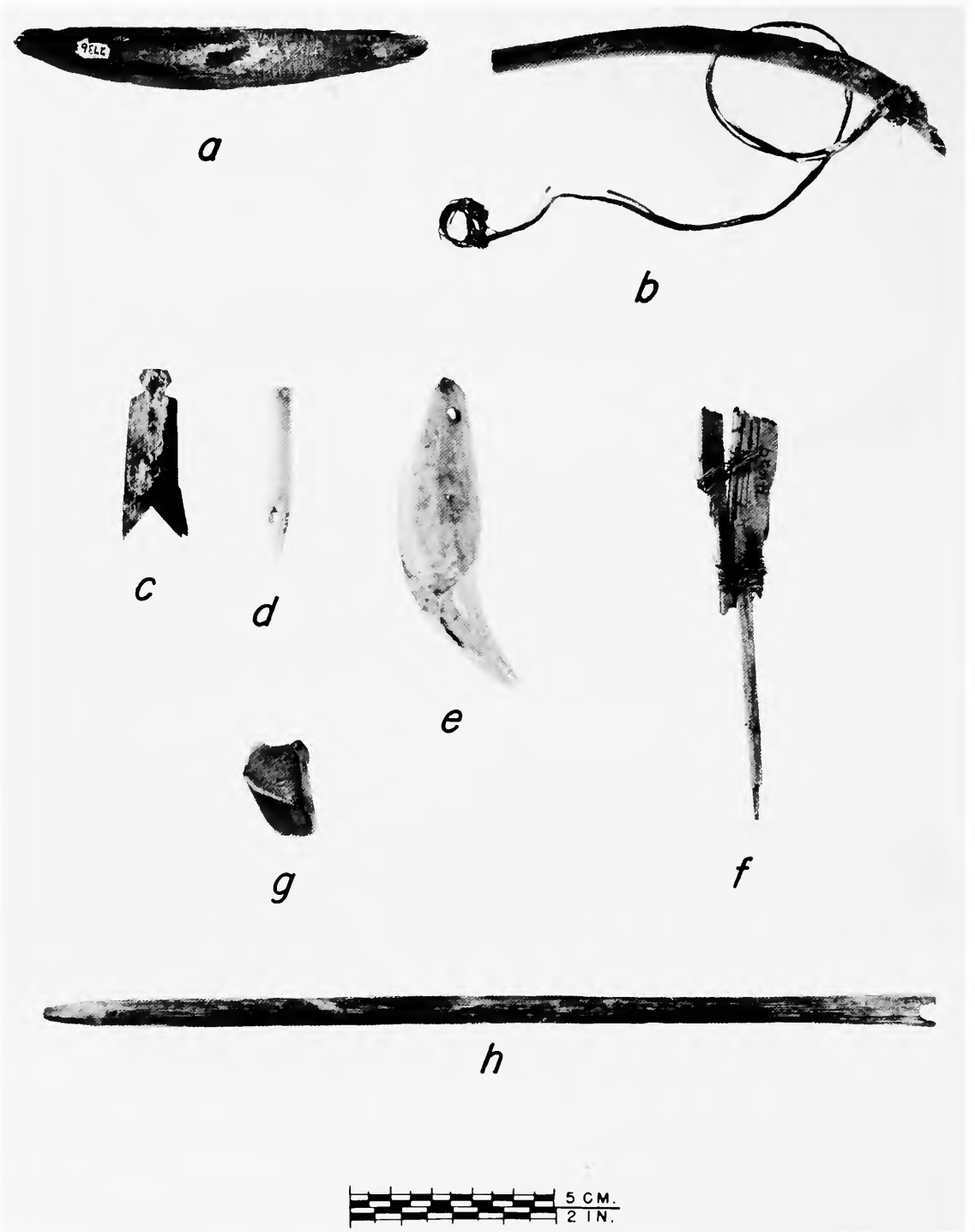

PLATE 112.—Late Thule artifacts, level A–6: *a*, unidentified baleen object; *b*, tied rib; *c*, toy bow fragment; *d*, unidentified ivory object; *e*, drilled bear tooth; *f*, unidentified wooden object; *g*, lead ore nodule; *h*, toy arrowshaft.

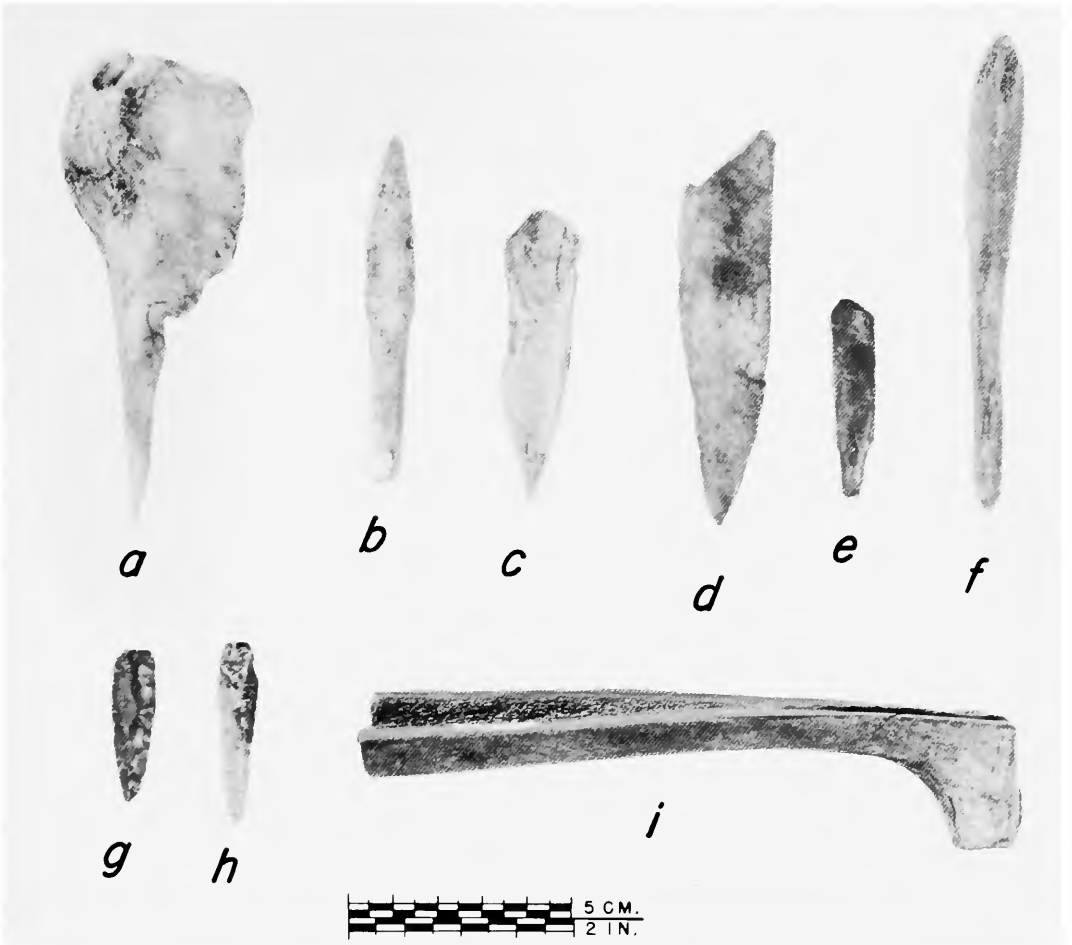

PLATE 113.—Late Thule artifacts, level A–6: *a, c, d,* bone awls; *b, e, f,* gauged drills; *g, h,* chert drill bits; *i,* cut antler.

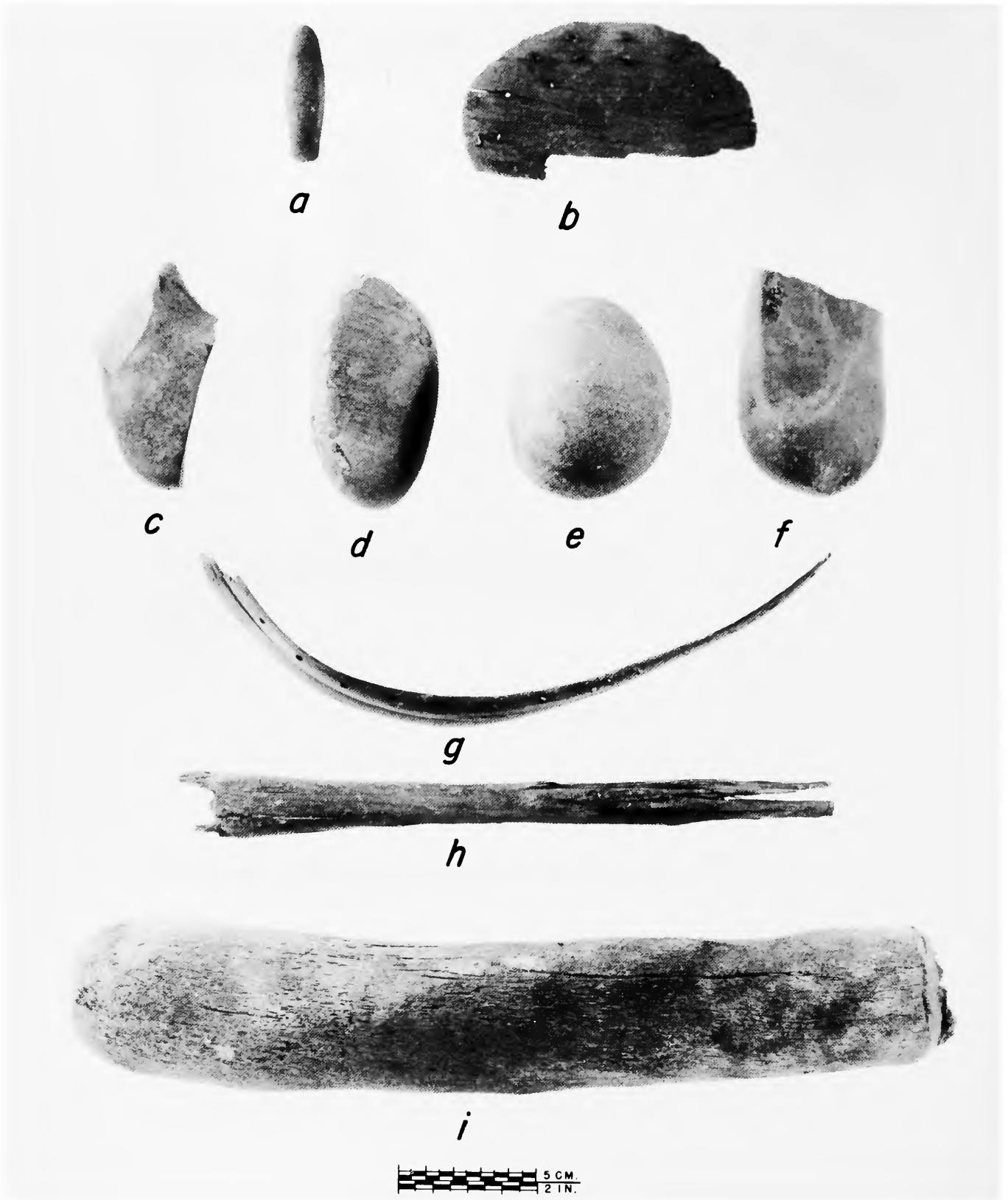

PLATE 114.—Late Thule artifacts, level A–6: *a*, ground slate nodule; *c–f*, miscellaneous stone artifacts; *b*, bucket bottom; *g*, ice scoop rim; *h*, wooden handle; *i*, bone maul.

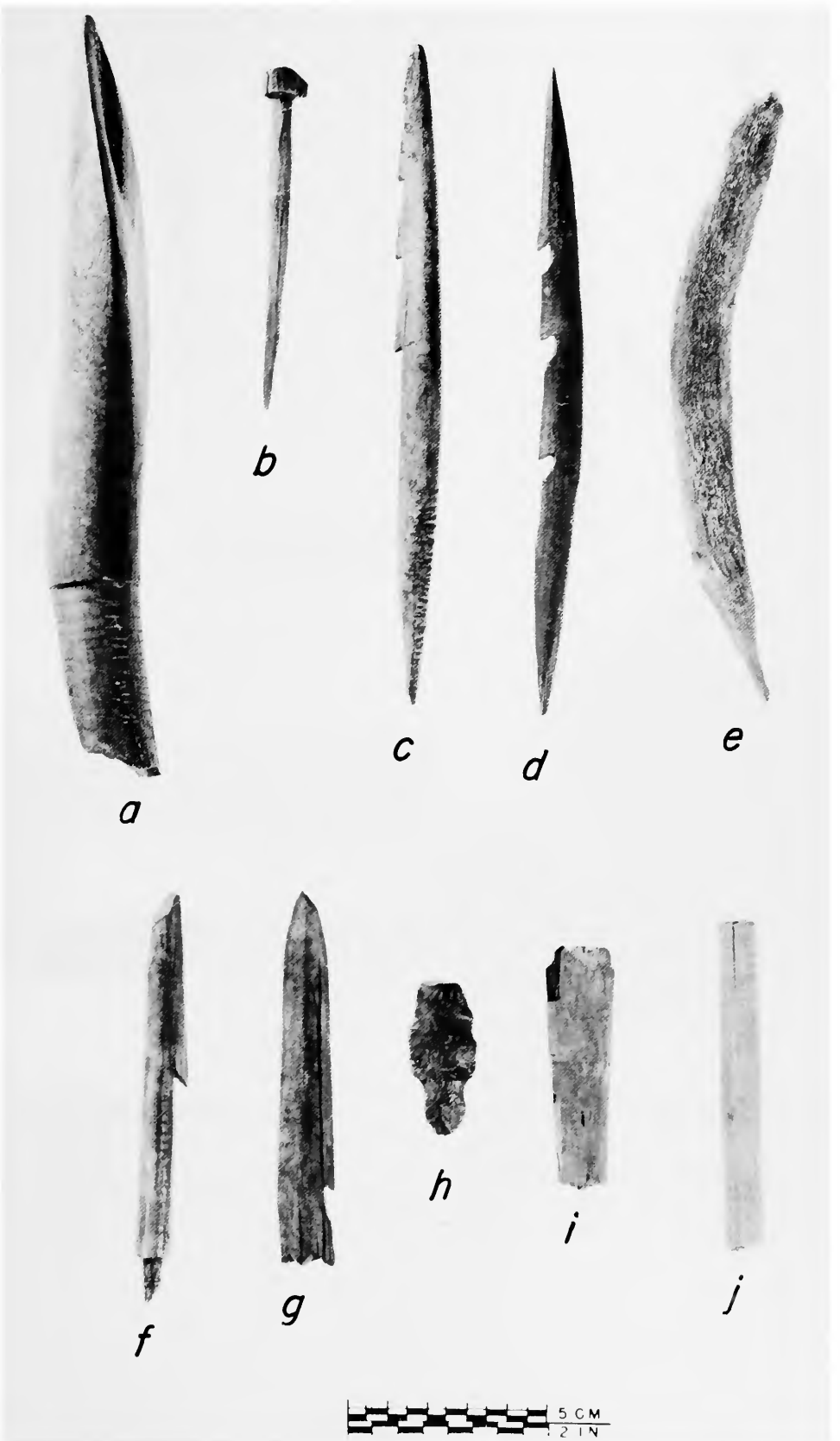

PLATE 115.—Late Thule artifacts, level A–7: *a*, harpoon ice pick; *b*, wooden wound pin; *c*, *d*, Leister barbs; *e*, antler arrowhead preform; *f*, *g*, antler arrowhead fragments; *h*, chert arrowhead; *i*, *j*, arrowshaft fragments.

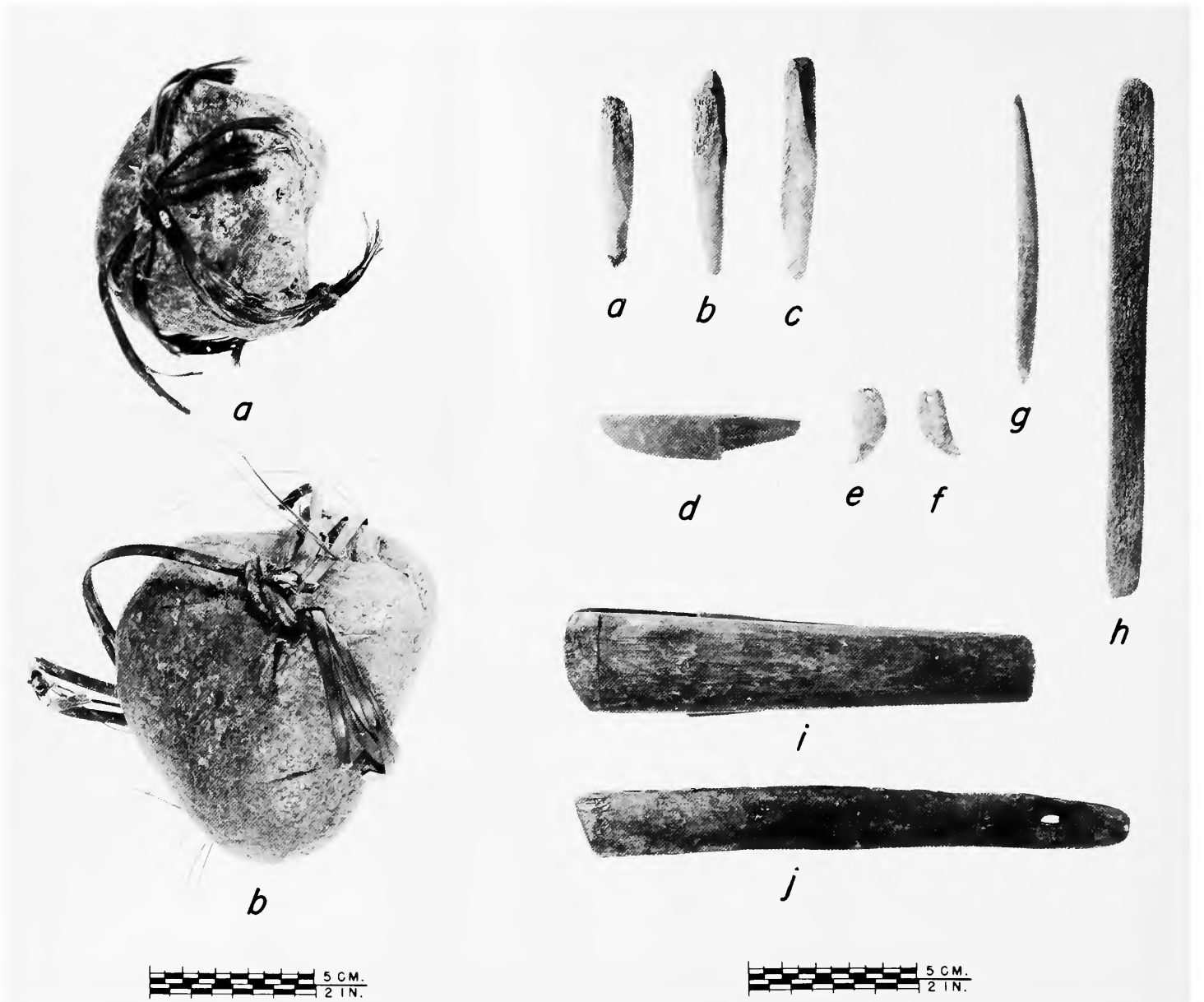

PLATE 116.—Late Thule artifacts, level A–7: *a*, *b*, stone net weights.

PLATE 117.—Late Thule artifacts, level A–7: *a–c*, gauged drills; *d*, slate knife blade; *e*, *f*, drilled teeth; *g*, engraving tool; *h*, unidentified bone tool; *i*, *j*, knife handles

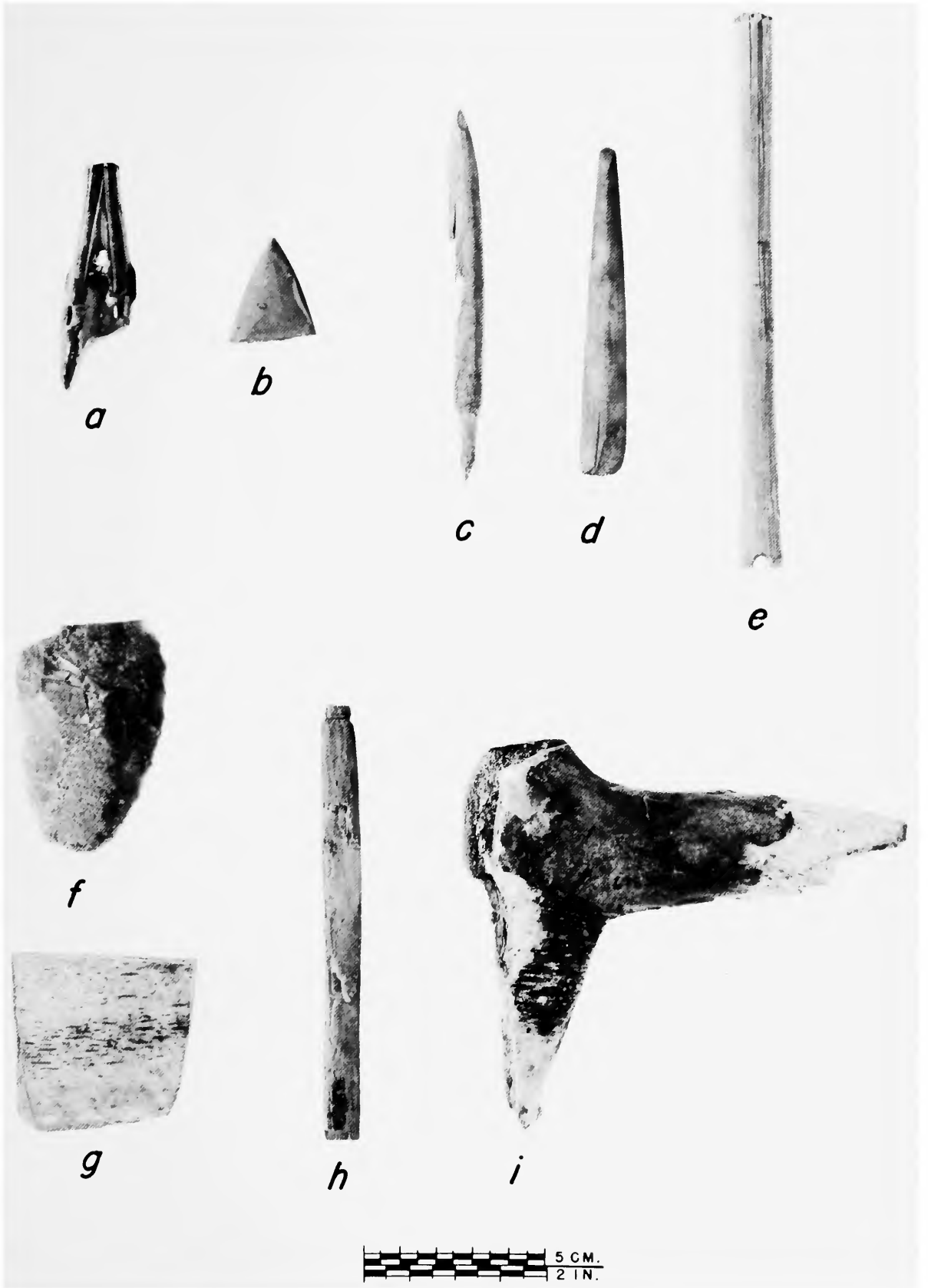

PLATE 118.—Late Thule artifacts, level A–8: *a*, Thule II open socket harpoon head; *b*, slate end blade; *c*, *d*, antler arrowheads; *e*, arrowshaft fragment; *f*, side scraper; *g*, bone wedge; *h*, toy bow fragment(?); *i*, adz handle.

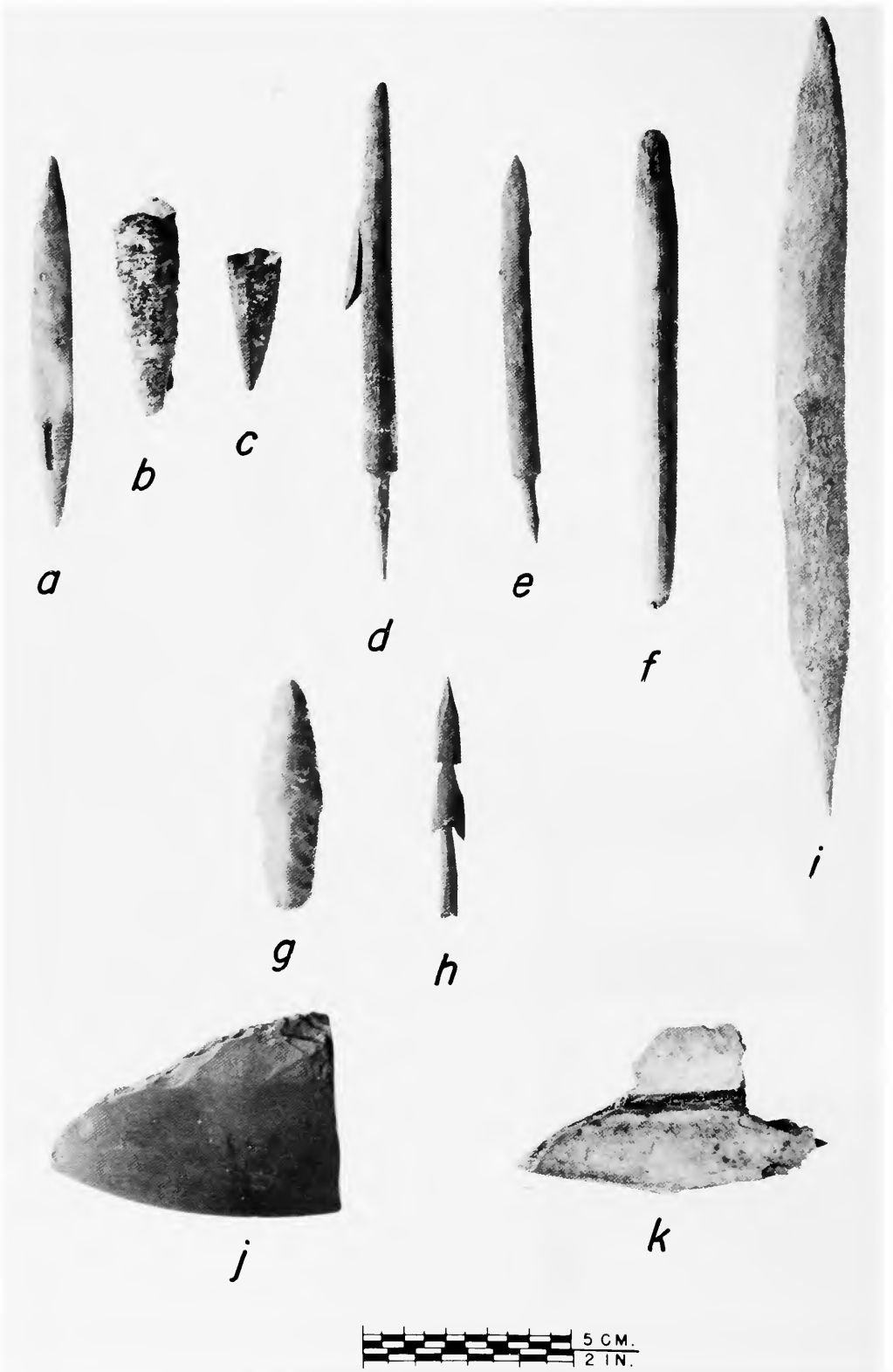

PLATE 119.—Late Thule artifacts, level A–9: *a*, harpoon foreshaft; *b*, *c*, harpoon ice pick fragments; *d*, *e*, antler arrowheads; *f*, fire drill shaft; *g*, chert arrowhead; *h*, wooden arrowhead; *i*, antler arrowhead preform; *j*, ulu blade; *k*, scapula scraper.

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