AN ARCHAEOLOGICAL SURVEY OF THE P'ULI BASIN, WEST CENTRAL TAIWAN, REPUBLIC OF CHINA

Dissertation for the Degree of Ph. D.

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RICHARD BROWN STAMPS

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This is to certify that the

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presented by

RICHARD BROWN STAMPS

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Lawrence Robbins (JD)
Major professor

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ABSTRACT

AN ARCHAEOLOGICAL SURVEY OF THE P'ULI BASIN,
WEST CENTRAL TAIWAN, REPUBLIC OF CHINA

By

Richard Brown Stamps

The purpose of the research herein reported was to test the hypotheses of Dr. K. C. Chang, that in central Taiwan (1) there was a shift to slash and burn, root agriculture by Cord Marked pottery peoples at c. 9000 B.C., and (2) that another shift to grain agriculture by Lungshanoid peoples occurred at c. 2500 B.C. As a result of the research the first hypothesis is strongly questioned, while the second hypothesis was supported.

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Richard Brown Stamps

A DISSERTATION

Submitted to
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Department of Anthropology

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I express special appreciation to Dr. K. C. Chang for his invitation to participate in the Choshui and Tatu Project, as well as his guidance and suggestions both in and out of the field.

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I wish to thank all of the staff at the Institute of Ethnology, Academia Sinica, especially Y. Y. Li and

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S. H. Wang for their help and guidance in making my portion of the overall project work smoothly. Thanks to P. H. Liu and C. W. Liu for my introduction to P'uli and central Taiwan archaeology.

I also wish to thank Professor W. S. Sung and S. C. Huang of the Department of Archaeology and Anthropology, N.T.U. for sharing their experience and knowledge with me.

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Last but not least, thanks to my fellow archaeologists on the project: S. C. Huang, S. C. Lo, P. K. Sun, C. H. Tsang and C. K. Ho for their ideas, guidance and companionship.

Ideas came from each, but I accept responsibility for the contents of this work.

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CHAPTER I

INTRODUCTION

Statement of Purpose

The purpose of this paper and the research herein reported is to investigate the origins of agricultural activities in the uplands of west central Taiwan. An attempt is made to shed light in particular on the transition to an agricultural way of life by the people in central Taiwan, and, in general, by extension to a similar shift in other parts of Taiwan and all of East Asia. In doing this I have tried to shed light on the changing relationship between humans and their physical environment. More specifically, an attempt is made to study the reported changes in Taiwan's vegetation over the past fifteen thousand years. Have changes in the vegetation occurred? If so, when? Were these changes related to the movements of people into the area? Were these changes in the vegetation caused by peoples shifting from a hunting and gathering way of life to a settled village agricultural way of life? Or were there other causes?

It has been reported (Tsukada 1966, 1967; Chang and Struiver 1966; Chang 1969, 1970 A) that several shifts in Taiwan's vegetational cover have occurred in the past

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fifteen thousand years and that these changes have been induced by human activity. Dr. K. C. Chang of Yale University and the Academia Sinica in Nan Kang, Taiwan, noting the reported changes (Tsukada 1966) in Taiwan's vegetation at approximately 9000 and 2500 B.C., developed a hypothesis for further testing that explained these changes. He described them as first a shift from hunting and gathering activities to fruit and root agriculture (9000 B.C.) and later a shift to grain agriculture (c. 2500 B.C.). These hypothesized shifts in subsistence activities were attributed to peoples known archaeologically on Taiwan as the Corded Ware (pottery) peoples and the Lungshanoid peoples. It was the purpose of the archaeological research herein reported to test this general hypothesis.

Specific hypotheses tested in this paper are spelled out in Chapter II. It should be pointed out at this time, however, that the explicate hypotheses testing approach used in this paper is novel among studies of Taiwan archaeology. It was felt that in using this hypothesis testing approach we could maximize our return of data and information while answering questions with the minimum use of archaeological, financial and manpower resources. It was felt that this approach would not only meet one of the basic goals of archaeology by developing a cultural history

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of the area but that it would also go beyond this to test some explicit hypotheses important in developing law-like principles for explaining human behavior. It is hoped that well-tested hypotheses will aid in the search for the principles governing the trajectory of human development.

The general outline of the paper is as follows: First, a review of previous research in the literature to look at the work that has been done and the kinds of questions that are being studied. The second chapter is a statement of certain specific hypotheses to be tested. The third chapter deals with methods for testing the proposed hypotheses, the test implications for each and the data needed to accept or reject the test implications. The fourth chapter deals with the data collection methods used, and the fifth chapter with the analysis of that data. The final chapter deals with the conclusions of the study. It includes a cultural history of the P'uli Basin with a discussion of subsistence activities and a discussion of the proposed hypotheses where they are supported, rejected or modified in light of the recovered data. The importance of this study for Asian prehistory in general is then discussed. The appendix includes additional information regarding the ceramic classification (A), the lithic classification (B), and the sites located (C).

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Review of the Literature

In an attempt to evaluate the state of the art of archaeology dealing with Taiwan in 1972 and to set the stage for the research problems discussed in this paper, the following review of the literature is presented. Because the purpose of this review is merely to lay the groundwork for this report and is not an end in itself, it will be brief. Those interested in more detail are directed to Sung Wen-hsun's 1953/54 index; the Bulletins from the Department of Archaeology and Anthropology, National Taiwan University, and the Institute of Ethnology, Academia Sinica; and the introduction to K. C. Chang's 1969 work.

In the present review, an attempt is made to look at the work that has been done and the research goals that motivated those researchers. First we encounter the early period of discovery and testing. This is followed by a period of early synthesis. Next we will look at the post-World War II period. Then the work and questions from the 1960's and 1970's will be examined.

The earliest reported discovery of prehistoric remains in Taiwan was made by a Japanese school teacher in 1896. Stone implements were found at Chih-Shan-yen on the northern outskirts of Taipei. This led to the discovery of the Yüan-shan shellmound in 1897. At this early date

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basic questions about the cultural affinities of the islands' early inhabitants were asked. The Japanese anthropologist Torii Ryuzo (1897:118) wrote, "The Taiwanese Stone Age remains are certainly prehistoric, but the problem is who left them? Were these people Malays, Negritos, or Papuans? This should be further studied."

In 1930 Professor Utsurikawa Nenozō and other staff members of the Taihoku Imperial University investigated the site of K'en-ting in southern Taiwan. Stone burial cists were found at K'en-ting. This search was one of the first major excavations on the island.

For the next thirteen years several sites along the west coast were located and surface collections taken (Chang 1969:7; Sung 1953-1954). Similarities were observed between pottery, both black and painted, found on Taiwan and pottery from the mainland (Kokubu 1943; Kanaseki 1943).

In 1943 Kano Tadao published a general synthesis of the sites and materials that had been collected on Taiwan to that time. He divided the prehistoric peoples of the island into seven cultures, according to specific traits (an index fossil approach), and then suggested possible areas from which they had come. He described seven strata or cultures from early to late:

> (1) Cord-marked pottery, probably introduced from the Asian mainland; (2) check impressed pottery,

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> introduced from Central China; (3) black pottery, introduced from the eastern coastal regions of China; (4) the stepped adz, introduced possibly from Fukien; (5) Proto-Dongsonian stratum, introduced from Indochina before Chinese influence; (6) Megalithic Cultural stratum, probably related to Megalithic culture of French Indochina especially of Cambodia; and (7) Philippine Iron Age Culture stratum, confined to the east coast [Chang 1969:7].

His idea was that the prehistoric inhabitants of Taiwan migrated in waves from the Asia mainland to Taiwan where they maintained their cultural identity, some of them into the ethnographic present (Kano 1955; Miyamoto 1956). The important question of the day seemed to be from where did Taiwan's prehistoric peoples come? How were they related to the modern aborigine groups?

After the close of World War II, archaeological information was gathered from several sources. A Department of Archaeology and Anthropology was established at National Taiwan University (NTU), and several important surveys and small excavations were carried out there. Reports from earlier Japanese excavations began to appear (Kanaseki and Kokubu 1953). By 1954 K. C. Chang, a student of archaeology at NTU, was able to use excavated materials to develop the first major time-space synthesis of the prehistoric cultures in Taiwan. Chang grouped the prehistoric peoples into seven cultures, showing type sites and artifact inventories attributed to each. The general conclusion was that "most of the prehistoric inhabitants

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of Formosa were immigrants from the mainland of China. The formation of the prehistoric culture layers of the western coast of Formosa, therefore, cannot be understood unless the cultural stratigraphy of the mainland has been reconstructed." (Chang 1954:162). The major objective was to develop temporal sequences of spacially different cultural groups and then to show the origins of these cultural groups and how they related to each other.

The growing importance of Taiwan in the prehistory of East Asia in general and the islands of the western Pacific more specifically was seen by the publishing of the Special Taiwan Section of the 1963 Asian Perspectives. Topics covered included geology and ecology of Taiwan prehistory; recent excavations of key sites; external relations to the east, the north and the south and the position of Malayo-polynesian languages of Taiwan.

In 1963 K. C. Chang reviewed the contributions of individuals and institutions to the study of Taiwan's archaeology, and he noted that work was done "under the auspices of colleges, schools, museums, or the provincial and local Commissions for Historic Research" (Chang 1963a: 195). He suggested that research to that date had been directed toward the following three aims:

> (a) to group archaeological assemblages under a time-space framework; (b) to reconstruct the culture and society of prehistoric peoples in various periods and regions of the island; and

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> (c) to compare the island's prehistoric cultures and cultural elements with those in the adjacent areas of the Far East to determine their historic relationships [Chang 1963a:195].

As recently as 1963 progress toward answering the first two questions was slow. Of the several hundred known sites, few had been extensively excavated, and only a few of these were stratified sites. Important sites that had been tested included Fengpitou (Tsuboi 1956; Chang 1969), Tap'enk'eng (Liu 1964), Shuiyuanti (Sung and Chang 1954) and the Yüanshan shell mound (Chang 1956:377; 1969). From these stratified sites only general sequences could be detected; i.e., cord-marked pottery from the lower levels followed by the red pottery and then by the black pottery. No radiocarbon dates from Taiwan were available, and all sequences were relative. Chronological control was weak at its best.

Reconstructions of the culture and society of prehistoric peoples also suffered from the lack of large-scale excavations that might show things like settlement patterns, activity use areas, social stratification and subsistence patterns. In 1963 no pollen studies had been made, and with the exception of a study done by the geologist Lin Chao-chi little interdisciplinary work had been carried out. Of the above-mentioned research aims, the greatest success was in showing the relationship between Taiwan and the mainland. Both Kano (1952:181) and

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Chang had provided convincing evidence in the form of ceramic and lithic comparisons to show that Taiwan was influenced by the mainland. At the time, this was contrary to popular theory which related Taiwan linguistically with insular Southeast Asia. Chang states that with the excavation reports and information coming from the mainland the relationship with Taiwan was clearly shown.

> It is now solidly established insofar as the western coast of the island is concerned, that (a) its prehistoric cultural phases have as many horizons as there are on the opposite coasts of mainland China, and (b) each ceramic horizon of Taiwan is a local facies of a corresponding and identical horizon of the South China coast [Chang 1964a:197].

Ling Shun-sheng, a scholar at the Institute of Ethnology, Academic Sinica, independently came to a similar conclusion. After an extensive study of several cultural traits, including rafts (Ling 1956), kava-drinking (Ling 1958) and ancestral temples (Ling 1959), he concluded that South China was the ancestral home of the Malayo-Polynesians. He determined that these peoples were forced out or assimilated by the southward and eastward advance of Sino-Tibetan peoples. Remnants of these early peoples are the Naga in the west and the Taiwan aborigines in the east (Ling 1959: 182-184).

Another important synthesis of the archaeological, linguistic and cultural data of the Taiwan aborigines

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appeared in the spring, 1966 Bulletin of the Institute of Ethnology. Raleigh Ferrell, after a study of aboriginal language groups of Taiwan, divided them into three major groupings: Ataylic, Paiwanic and Tsouic. These major groupings were then compared with the three major archaeological cultures known at that time. His conclusions were:

> Archaeological data point clearly to a direct South China derivation for the overwhelming majority of the Formosan peoples and cultural traits. Close examination of cultural and linguistic data which show the present-day tribes to fall into three distinct groupings, also gives surprisingly explicit clues as to the possible affinity of each of the major groupings with one of the three major prehistoric traditions on the island. This in turn permits us to assign a tentative area of origin on the South China mainland for the speakers of the various present-day Formosan languages. The Atayalic/Cord-Marked Pottery Horizon shows clear affinities with the South and Southwest China region, and the Tsouic/North Formosan Proto-Lungshanoid (Yüanshan) Culture has unmistakable northern elements, and may represent the more northerly of the Austronesian mainland peoples who earlier occupied the entire eastern coastal region of China and probably extended as far northward as modern Japan and Korea. The Paiwanic/South Taiwan Lungshanoid-Geometric Horizons are probably from an area between the Ataylic and Tsouic areas on the mainland. Their culture was basically that of pre-Han Southeast China, and their spread to Formosa was part of the large-scale movements of Lungshanoid agricultural peoples from the Northwest China nuclear area into mainland Southeast Asia and the Pacific islands during the first and second millennia B.C. [Ferrell 1966:124].

Some changes have been required in the above scheme due to the addition of earlier dates, and Ferrell (1969:21-22, 73) has taken a more cautious stance on identifying specific

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modern groups with prehistoric cultures. This 1966 work, however, was representative of the research problems being studied at the time, principally the question where had the people come from?

In W. H. Sung's 1967 report, O-Laun-pi, A Prehistoric Site at the Southern Tip of Formosa, we see another example of detailed archaeology. This study, though, is still basically developing typologies and establishing time-space relationships. The basic questions are still: Who were these people? From where did they come, and when? Who are their descendants? How are they related to other prehistoric groups?

From Sung's report of the O-Laun-pi region, it appears that two groups of people have occupied the area. The first group, called the Stone Cist people, shows certain material cultural similarities with the earlier phase of the Lungshanoid culture at Fengpitou. Similar artifacts include the long-necked bottle, the high pedestal with cutouts, the hache pediforme stone knives, the thin plano-convex stone hoe, the c-type tridacna bracelet and the discoidal tridacna core. Sung also points out certain similarities with the coastal region of eastern Taiwan (Sung et al. 1967:46). Possibly the most interesting result of this research is the isolation of two different types of stone burial cists: the rectangular

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(presumably extended burial) cists that seem to fit into the Lungshanoid era, and the square (flexed burial) cists that are very similar to those used in the ethnographic present by the Parilarilao tribe in the village of Kuraluts in the foothills northeast of O-Laun-pi. The case for cultural continuity is strong. The finds from this area are interesting in light of the stone cists found by the author in the P'uli Basin (see pp. 34, 36, 49-50).

Prior to the important 1964-1965 Yale-National Taiwan University expedition to Taiwan, K. C. Chang noted the following specific problems (Chang 1969:9-12): First there was a lack of extensively excavated sites. Few relatively complete cultural assemblages were known for any of the prehistoric cultures, and those that were delineated had been defined on the basis of single traits. There was a need to understand better the relationship between the cultural traits and the natural environment. Second, Chang listed the problem of the very loose island-wide time-space framework. At that point he noted, "East Asia archaeology in general remains a pre-carbon-14 stage insofar as chronological assessment of data is concerned" (Chang 1969:10). Third, Chang looked at the island of Taiwan as if it were the crossroads between the Asian mainland and the insular area of the western Pacific. He

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suggested that it could be an important area for studies of the processes of cultural growth. He then listed seven specific questions regarding the relationship between prehistoric Taiwan cultures and possibly related cultures in Asia and the western Pacific. An attempt was made in the 1964-1965 expedition to answer some of these questions and firm up the chronological picture of the area.

This expedition's results appeared in 1969. They have given us the most complete synthesis of Taiwan's prehistory to date. Detailed results from the excavation of Fengpitou in the southwest and Tapenkeng in the north (the Taipei basin) indicate that a common Corded-Ware Culture came from the earliest levels at both sites (thus supporting the earlier work of Kano [1952]). This level was followed by the Lungshanoid culture in the southwest and the Yüanshan Culture in the north. The subsistence base for the Corded-Ware cultural horizon was not clearly understood, although a small number of stone implements, apparently used for cultivating purposes, and woodworking tools combine with the palynological evidence at Jihyüehtan, showing the burning of primary forests. This also suggests an early form of swidden agriculture, possibly root and fruit crops. By 2500 B.C. when the Lungshanoid and Yüanshan cultures appear on the scene, intensive agriculture

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(probably millet and rice) combine with some hunting, fishing and mollusks-gathering to form the subsistence base (Chang 1969:191-194).

An important section of Chang's 1969 work is devoted to comparative studies showing external affinities of the various cultural manifestations on Taiwan. He makes a very convincing case (although not totally accepted; see Treistman 1972) for the Yüanshan Culture's receiving influence from the South China Sea Coast and the Gulf of Tonkin, and for the Lungshanoid Culture's being directly related to the cultures of the southeastern China coastal areas. He goes so far as to delineate local Lungshanoid phases on Taiwan and trace them to their "close relatives on the mainland" (Chang 1969:238). Possible origins for the Corded-Ware Culture are not as clearly known. The Corded-Ware Culture is apparently a local manifestation of the widespread cord-marked pottery horizon of east Asia. Possible correlations exist with the Jomon in Japan, cord-marked pottery in Southeast Asia (including southern China) and the Kalanay complex in the Philippines (Chang 1970:175-176).

Another important section of his report deals with an attempt to bring together in an interdisciplinary manner results of geological and palynological information germane to a better understanding of Taiwan's prehistory. C. C.

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Lin's 1964 work dealing with the changes in the shorelines and Tsukada's 1966, 1967 study of pollen samples taken in central Taiwan are combined in a comparative study of the ecology and archaeology of Taiwan.

In conjunction with K. C. Chang's 1964-1965 research, Matsuo Tsukada collected six lacustrine cores in an attempt to study the past climatic changes of the island. The most detailed results came from the Jihyüehtan (Sun Moon Lake) core. The beginning of the Recent period, dated to about 11,000 BP, began with the "destruction of primeval forests, probably caused by early human activities" (Tsukada 1966:546). Although no direct connection could be made, it has been suggested that these "early human activities" were performed by the peoples of the so-called Cord-Marked pottery cultures (Chang 1969:191-194). Another important change in the floral situation of Taiwan appears to have occurred around 4500 BP. At this time there was a sharp increase of pollen from chenopodiaceae and large-sized grass which Tsukada (1966:546; 1967:50) considered to be cereal pollen. The finding of grass pollen, associated with an increase of subtropical secondary forest, suggested to Tsukada evidence for agriculture. This sudden change in the vegetation seems to correlate well with the influx of Lungshanoid and Yüanshan cultures from the Asia mainland (Chang and Struiver

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1966). As this work was being done on the west coast, other research was being carried out in eastern Taiwan.

In January and February 1969, Sung, Wen-hsun and C. C. Lin located a pre-ceramic, chipped flake tool industry in a series of sea caves on the east coast of Taiwan which they named the Changpinian. A 15,000 BP date (Radiocarbon 1973) was recovered, although Sung (personal communication) would like to push this date back even farther. Finds included flake implements, hand axes, choppers and several bone and antler objects. The importance of this find is that it pushes back the earliest date at which man was found on the island and is the first important pre-ceramic site yet found. Similar sites on the west coast have not been located.

Raleigh Ferrell (1969) seemed to have noted some of the more complex problems in relating modern groups with their prehistoric ancestors. In his concise but all-inclusive review of Taiwan archaeology, he pointed out that "Scientific archaeology in Taiwan is still in its infancy" (Ferrell 1969:4). In this light he did not try to connect specific tribes with specific prehistoric cultures as he had previously done in 1966.

Once again Ferrell used cultural and linguistic data to divide Taiwan's aborigines into three main groups, the Atayalic, the Tsouic and the Paiwanic (with subgroups

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Paiwanic I and Paiwanic II). These major groups are further subdivided into seventeen languages. Although the language picture for such a small area as Taiwan is so diverse, Ferrell felt that it was not necessary to invoke many separate waves of migration to explain the diversity. "Four or five thousand years in situ would be ample time to produce the differences seen in the present-day languages, even had the ancestral Formosans all arrived at once and spoken one single language" (Ferrell 1969:73). But because the archaeological evidence indicates the fairly sudden appearance of not one but three cultural complexes, he suggested that any number of migrations from one to four could be used to explain the present-day aboriginal situation. He suggested the following possibilities:

> (1) all the Formosan languages developed from one common ancestor in Taiwan; (2) two separate migrations, proto-Ataylic and proto-Paiwanic-Tsouic; (3) three movements, proto-Ataylic, proto-Tsouic, and proto-Paiwanic; and (4) four migrations, proto-Ataylic, proto-Tsouic, proto-Paiwanic I, and proto-Paiwanic II [Ferrell 1969:74].

He then went on to state that at that time (1969) there was no real scientific support for the "colorful but unlikely earlier hypotheses" which he (1966) and others (Kano 1952) had put forth. The emphasis was upon explaining the cultural and linguistic diversity in light of the limited archaeological evidence at hand.

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By 1970 W. H. Sung had finished his work at Olampi and was working on the Chang-pinian sites near Taitung. Richard Pearson (1972:317-330) had finished and published his archaeological survey of an area along the coast of southeastern Taiwan. K. C. Chang had finished his comparative study between the Lungshanoid site of Fengpitou and the Yüanshan site of Tapenkeng and published his general Prehistory of Taiwan (Chang 1969). The basic groundwork was complete and the stage set for more in-depth research to be carried out.

Archaeological advances in the 1960's had brought new information and new insights into Asian archaeology. Finds of early pottery in Japan (Kamaki 1965; Kotani 1969), early cultivated plants in Thailand (Gorman 1969) and sophisticated bronze metallurgy in parts of mainland Southeast Asia (Solheim 1968) called for new interpretations by world prehistorians regarding the development of human culture, the rise and spread of civilization. Earlier models for explaining culture change, for example Robert Heine-Geldern's (1932) migratory waves, no longer fit the data. It was realized at this time that European or American models of cultural dynamics could not be indiscriminately applied to all Far Eastern situations. At that point K. C. Chang (1970:MS) stated, "We are at the crossroads in the history of Far Eastern archaeology."

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In an attempt to understand better the prehistory of East Asia in general and Taiwan in particular, Chang proposed an intensive research project of a relatively small well-defined area in central Taiwan. The idea was to conduct an interdisciplinary "saturation" study of an area looking at the ecosystems of the present and the past. The project was a modest model of Richard MacNeish's work in the Tehuacan Valley in Mexico. It was a new and imaginative approach for Taiwan and indeed all of the surrounding areas.

By 1971 K. C. Chang was able to organize the Choshui and Tatu River Valley Project in Anthropological and Environmental Research. Support for the project came from the Chinese, from the National Science Council and from the United States National Science Foundation. The aim of the project was to investigate intensively the cultural ecology and history of a small, ecologically significant region, within an interdisciplinary framework. The specific objectives of the proposed research and its expected results were as follows:

a. Intensive studies of the geology, geomorphology, zoology, botany, and soils of the Choshui and Tatu river valleys. Studies in each field are important in their own right, but together they provide or begin to provide the basic data for the construction of the present ecosystem of the area.

b. An understanding of the major changes of the natural environments since the beginning of the

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> Pleistocene, involving the investigation of geology, analysis of old soils, identification of bony remains of animals from archaeological sites, and pollen analysis. Data along these lines provide the basis for reconstructing ancient ecosystems and for understanding man's place in them.
>
> c. Description and analysis of the cultures of the present inhabitants, emphasizing their settlement patterns, their different patterns of resource use, and their place in the current ecosystems.
>
> d. Reconstruction of past cultures and their histories, and understanding of the process of their development and change, especially with reference to their roles in ancient ecosystems and their various patterns of use of the natural resources [Chang 1971:MS].

The Choshui and Tatu river drainages were chosen for study because of the great variations of the natural environments and available resources. The area includes mountains, hills, terraces, basins and plains; i.e., all the major geomorphological planes found on the island as a whole. The vegetation, as a response to the different altitudes, temperature and rainfall patterns, ranges from arctic in the high elevations to subtropical on the western alluvial plain where the rivers empty into the ocean. In this area we see different ethnic groups occupying different zones and utilizing a variety of resources. This is partially the result of known historical movements but was also probably the result of differential adaptation of dissimilar environmental niches. Chang (1971:MS) in comparing the Chinese and assimilated plains tribes of the lowlands with mountain tribes from the central mountain range found

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significant differences. The 1959 records (Ch'en 1966: 134-135) show that in the relatively low and flat land of the P'uli Basin, 4,042 hectares of land were used for rice and 689 hectares were used for sweet potatoes, but in the high mountain valleys around Jen-ai only 942 hectares were used for rice, while 624 hectares were used for sweet potatoes and 450 hectares for millet. Treistman (1972:74) also noted that "settlement patterns appear to vary in relation to altitudinal zones":

> The Bunun, who inhabit the zone above 1000 m (30 percent live above 1500 m) live in small hamlets of dispersed homesteads, while the Tsou, over half of whom live below 1000 m, have centralized villages with satellite hamlets. The Atayal, distributed in the same zones, have occupied the high river valleys, where small dispersed villages tend to have alliances within each drainage system.

The suggestion is that differential use of natural resources is an important criterion that distinguishes cultural groups in the area (an idea that needs further testing through archaeological methods). The second point is that different areas have different potential resources, which may cause change in a group's adaptive mechanisms through which it secures a subsistence from the environment. The interplay between man and his environment is a delicate one, differences and changes on either end cause differences and changes on the other end. Through a study of that part of man's material culture by which he copes with his environmental resources we can better understand the people

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themselves. We must also be aware of the fact that differential adaptation by one group of people into two different environmental niches will produce through time what may appear to be two different groups.

Thus the theoretical focus of the project was the interaction between man and his environment. Archaeologically the project was divided into two stages: during the first stage (1972-1973) prehistoric sites were to be located, sites were to be ordered into a series of local chronological sequences and key sites selected for excavation in the second stage. The key sites were to be selected according to their chronological spread, topographical diversity, stratification, abundance of natural remains, etc.

The author was invited by Dr. Chang to join the first stage of the Choushui and Tatu Project and be responsible for the archaeological survey of the P'uli Basin on the upper reaches of the Tatu river.

Interest in the ecology of Taiwan and environmental effects on cultural groups was also noted by Judith Treistman. In 1972 she published a short but searching article in Science wherein she questions the "schemata" devised by ethnologists, linguists, archaeologists and physical anthropologists for explaining the cultural and linguistic diversity found in aboriginal Taiwan (Treistman 1972:74-76).

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Treistman, working in the high central mountain range in Nan-t'ou Hsien (county), found archaeological remains around the village of T'ungp'u (elevation 1000 m). A radiocarbon sample from one of her test pits yielded a date of A.D. 785 ±110 for the upper portion of the occupation layer. She felt that this date was too early to represent peoples who were "pushed out of the plains and into the mountains by a swelling population emigrating from the mainland" (Treistman 1972:75), as had been previously suggested by Chinese historians. She suggested instead that "The cultural ecology of aboriginal Formosa shows the adaptive dichotomy between uplands and plains that is typical of Southeast Asia" (Treistman 1972:74). She felt that there was sufficient time depth in the upland sites to allow for "internal differentiation and indigenous cultural change apart from external pressures" (Treistman 1972:75). The implication was that internal change could account for the cultural diversity found on Taiwan and that scholars need not invoke waves of populations migrating from the mainland.

Keeping the preceding review of archaeological work concerning Taiwan's prehistory in mind, the following questions are recognized as still unanswered and in need of further study.

--What refinements can be made on the local chronologies, especially the west coast plain area roughly between Taoyuan and Fengyuan, the central Taiwan area, the area south of the Choshui down to the Tainan area, the whole Central Mountain range, as well as the Ilan plain and the whole east coast?

--How do these local chronologies relate to the established chronologies from the Taipei Basin and Fengpitou?

--What has the environmental picture been for the past 15,000 years? Has it been stable or changing? Have there been significant changes in the flora or fauna?

--What was the relationship(s) between humans and their environment?

--What changes did different local ecological settings cause in human adaptive patterns to these different areas?

--What was the geographic distribution of recognized cultures?

--What changes, if any, do we see in the cultural remains through time? If there is stability, why? if there is change, why?

--Were there Chang-pinian-like peoples on the west coast?

--Was the early corded-ware culture found all over Taiwan or was it restricted? If restricted, why?

--What was the influence from the major Lungshanoid and Yüanshan centers in southern and northern Taiwan on the central west coast, the central mountain range and the east coast?

--Were there exchanges of materials and ideas? What kinds of exchanges?

--What were the subsistence bases for the different cultural groups, both temporally and spacially?

--What different levels of socio-economic development were reached in different areas and times? Why?

--What were the different settlement patterns through time? What were the different locational factors? Why did man settle at particular sites?

With these broad, general questions in mind for Taiwan as a whole, let us now turn to some more specific questions from the author's P'uli Basin study area.

--When did man arrive in the P'uli Basin and surrounding hills? Before pressure from Han Chinese agriculturists, as suggested by Ferrel (1969:4) and Treistman (1972:74-76), or later, as is generally assumed by traditional Chinese scholars (Hsieh 1964; C. Y. Chang 1953)?

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--What was the ecological situation of the Basin before humans arrived?

--What changes did humans make in the environment? Were they as significant as suggested by Tsukada (1966)?

--What were the subsistence bases for the cultural groups living in the Basin?

--What cultural changes occurred through time?

It is hoped that the answers to some of the specific questions concerning the P'uli area will add input in attempting to answer these broader questions, especially the questions dealing with the rise of agriculture.

In the next chapter certain specific hypotheses will be proposed; the testing of these hypotheses should help answer some of the above questions.

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CHAPTER II

HYPOTHESES TO BE TESTED

Dr. K. C. Chang has suggested several significant ideas that have been helpful in attempting to understand the prehistory of Asia. These hypotheses are related to the question of agricultural origins and as such are of fundamental importance to a major problem area in anthropology. At this time three of Dr. Chang's ideas will be formulated into specific hypotheses for further testing.

Hypothesis 1: As the result of swidden-type root and fruit agriculture in the uplands of central Taiwan, there was a change in the ecosystem at about 9000 B.C.

In Tsukada's 1966 report of "Late Pleistocene Vegetation and Climate in Taiwan (Formosa)," he found that the vegetation for approximately the last 65,000 years could be divided into four pollen zones. Concerning the most recent pollen zone which he estimates to have begun about 9000 B.C., he says "Zone R (Recent) begins with the destruction of primeval forests, probably caused by human activities, and with the rise of the subtropical and warm temperate species" (Tsukada 1966:546). Several issues of importance are raised here. Was the change in vegetation

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noted at Jihyüehtan an isolated occurrence or was it an island-wide phenomenon that could be repeatedly demonstrated from other pollen studies in the surrounding area? Was the change caused by either natural phenomena like forest fires or human activity like swidden agriculture? If so, what evidence do we have to support it?

This issue is important not only for understanding Taiwan's prehistory but for understanding the history of the greater areas of East Asia in general. Chang (1969: 193, 217-218) has used the Jihyüehtan pollen profile as suggested evidence showing the post-Pleistocene shift to early forms of agriculture. In discussing the corded-ware occupation and the problem of early forms of agriculture, Chang (1969:217-218) notes:

> --that at about 9000 B.C. the vegetational history at the Jihyüeh-t'an area underwent a clear and persistent change accounted for by the continuous burning of the primeval forests and the continuous replacement of secondary growths. Accidental burnings of the forest (such as forest fires) cannot account for the persistence of the new pattern of growth, and forest clearance by human hands is not likely to have been undertaken except for plant cultivation. Since the sequence at 4200 BP shows evidence of intensive farming and of grain cultivation, the contrast seems to suggest that the earlier form of agriculture was characterized by the cultivation of root and fruit crops. During this period--from 11,000 to 4200 BP--the only known prehistoric culture on the island of Taiwan was the Corded Ware culture described above, and the conclusion naturally follows that this culture was associated with an early form of root and fruit cultivation.

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Chang recognized that one cannot generalize about the horticultural activities of the whole island from only one palynological profile and that the Corded-Ware Culture in central Taiwan is not well established, but he felt that the concluded relationship "is credible on the grounds of comparative significance" (Chang 1969: 218). With these reservations in mind, Chang has suggested that the Corded Ware peoples were clearing the forests and cultivating root and fruit crops (Chang 1968a:82-83; 1968b:522-523; 1970:62-65). Because the pollen profile suggests a vegetation pattern that is not the primary forest or the later cereal or grasses, Chang follows Sauer's (1952:103-104) suggestion that root and fruit crops were cultivated prior to grass crops.

At this point it is necessary to ask why the single pollen profile from Jihyüehtan was so important, why Dr. Chang was willing to put so much emphasis on this one bit of limited data. The answer is seen, however, when we reflect back to the mid-sixties and remember the particular ideas that were being discussed. Gorman and Solheim 's (1968) finds from Southeast Asia were suggesting a new, separate and independent center for the beginnings of agriculture. The suggestion was made that the Southeast Asian finds might even predate those from the Near East. The primacy of the Near East as the hearth for world

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civilizations was being questioned. If an earlier center of agriculture and metal working could be located in Asia it would rip into tatters previous assumptions about the primacy of the Near East as the center for the origin of agriculture, metal working, urbanism, civilization and thus the whole of Old World prehistory. Nor only was there a suggestion of a separate and earlier center in Southeast Asia for the beginnings of civilization but also that there was a whole different set of dynamics going on dealing with culture change and ecological adaptation. Thus, even though it may have seemed that Chang (and even Solheim and Gorman) was grasping at straws, because of the potential implications of the finds, they were considered important.

It was in this context that the author conceived the idea to gather further data and test Hypothesis 1 which was fast becoming an accepted but untested fact. Therefore, it was important to determine first, number one, did Tsukada's pollen profile from Jihyüehtan truly reflect Taiwan's past vegetational history or was it a case of sampling error? And, secondly, if it occurred at that particular date, could this information be put together with Solheim and Gorman's data to develop an Asian agriculture horizon?

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Hypothesis 2: The swidden root and fruit agriculturists responsible for the 9000 B.C. vegetational change at Jihyüehtan were related to the Corded Ware peoples seen archaeologically at Fengpitou and Tapenkeng.

Chang (1969:217-218) suggests that Tsukada's (1966:546; 1967:49) observed shift in the pollen profile was caused by human activity and that the only known prehistoric culture on the west coast dating to that time period was the Corded Ware culture best described from remains at Fengpitou and Tapenkeng. Thus Chang thought the vegetational change at Jihyüehtan was caused by Corded Ware peoples. Because the 9000 B.C. change in vegetation preceded a later 2500 B.C. shift to cereal grain agriculture (see Hypothesis 3), Chang felt that the earlier shift was to more extensive use of root and fruit crops. This proposed root and fruit agricultural pattern is suggested as the subsistence base for the Corded Ware peoples of Fengpitou and Tapenkeng. The importance of this connection between an early form of root crop agriculture and the Corded Ware pottery peoples is seen in the implications for the independent beginnings of agriculture in Asia. Chang notes:

> Cord-marked pottery assemblages were the only archaeological evidence of human activities on the island at that early date [written before Sung's work at Changpin], and this forest disturbance strengthens the view that gardening

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> probably had an early beginning in the cord-marked pottery horizon of coastal China and Southeast Asia [Chang 1968:83].

Thus, the verification of this hypothesis would strengthen the case for Southeast Asia as an independent center of domesticated plants, as well as supporting the idea (Sauer 1952:103-104) that root crops generally preceded grain crops in the developmental sequence of tropic agriculture.

Hypothesis 3: As a result of Lungshanoid agriculturists moving into the uplands of central Taiwan, there was a change in the local vegetation about 2500 B.C.

Tsukada (1966:546; 1967:62) says that at 4200 ±60 BP (Y-1612) in the Jihyüehtan pollen profile a dramatic increase in the frequency of grass pollen (about one-third of the total grass pollen may be cereal species) together with Liquidambar and chenopodiceae indicate intensified agricultural activities." According to Chang (1968:523; 1969:193-199, 208, 220) and Chang and Struiver (1966: 539-542), the increase in grass pollen that Tsukada observed was due to the influx of Lungshanoid cereal agriculturists into Taiwan from the southeastern coast of mainland China. Chang's suggestion is that the Lungshanoid archaeological remains which he finds in central and southwestern Taiwan were left by the people that caused the change seen in the Jihyüehtan pollen profile. Inclusive in this hypothesis is the question of whether or not the

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observed change in the vegetation indeed took place in other areas of Taiwan or in just this one area.

The next chapter deals with the methodology used by the author to test the hypotheses as stated above.

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CHAPTER III

METHODS FOR TESTING HYPOTHESES

At this point it is necessary to discuss methodologically how to test the above stated hypotheses so they may be rejected or supported. Some hypotheses may be tested by direct observation, "the sun is shining," while others must be tested through indirect observations, "a certain group of people lived here in the past." Under the second method, because we cannot directly observe people living in the past, we must set out additional statements or test implications about conditions in the world that can be exemplified or demonstrated if the hypothesis is correct. Through direct observation these test implications are evaluated to see if they are exemplified in the world, and the hypothesis is accepted, rejected or modified in accordance with the results of the direct observations. As stated by Watson, LeBlanc and Redman (1971:8), to test a hypothesis:

> the invesitgator deduces from it propositions called test implications that must be exemplified in the world if the hypothesis is empirically correct. Ordinarily the investigator deduces several such test implications. Because the test implications follow from the hypothesis logically, they must be true of the world. However, the reverse is <u>not</u> necessarily the case: Because the test implication is found to be true of the world does not mean that the hypothesis may be empirically

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> true because it has not been shown to be false (disconfirmed). That is, the general form of the law does not say that the test implication is true if and only if the hypothesis is true; it leaves open the possibility that the test implications could be true even if the hypothesis is false.

It should also be pointed out that we cannot prove a hypothesis (or any proposition in a scientific paradigm) to be true, we can only "gain increasing confidence that it is not false. One can, however, demonstrate the falseness of a proposition through its failure to have correct implications for the data" (Chartkoff 1975:3).

In trying to assess the validity of the hypotheses stated in Chapter II as possible explanations of the observed phenomena, the following test implications were developed.

Test Implications for Hypothesis 1:

T. I. 1. If root and fruit agriculturists began swidden agriculture in the uplands of Central Taiwan around 9000 B.C., then we would expect to find a change in the vegetation reflected in the pollen record from the original primary forests to secondary growth.

T. I. 2. If there were swidden agriculturists in the area at 9000 B.C., archaeologically we should find sites dating to that time period.

T. I. 3. If the people were root and fruit swidden agriculturists, we should find proportionally higher percentages of swidden-related agricultural tools than

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hunting-type tools or tools generally used in the production of cereal grain crops. For example, there should be tree-cutting tools like axes or adzes for barking or cutting down trees and digging devices, with a general lack of reaping knives and grinding and milling devices.

Test Implications for Hypothesis 2:

T. I. 1. If the root and swidden agriculturists in the uplands of central Taiwan are related to the Corded Ware peoples in other parts of Taiwan, similar cord-marked ceramics should appear in the archaeological record of the area. Similar ceramic vessel shape and decorations should be represented in the central Taiwan materials from that time period.

T. I. 2. The lithic inventory ought to be similar also, if there is a direct connection.

Test Implications for Hypothesis 3:

T. I. 1. If there were an influx of village grain farmers into the uplands around 2500 B.C., we should notice a change in the palynological record to reflect an increase in grass or cereal pollen and related forms around this time.

T. I. 2. If there were an influx of people at this time, there should be an increase in the number of sites and artifacts in the archaeological record.

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T. I. 3. If there were an influx of peoples, the sites and artifacts at this time can be expected to differ from those of previous periods.

T. I. 4. If the population were involved in cereal grain agriculture, we should expect to find a proportionally higher percentage of tools that relate to the production of cereals (for example, reaping knives, hoes, grinding or milling stones, etc.) than other types of tools.

T. I. 5. If the village farmers in the P'uli Basin were related to the Lungshanoid peoples, we should find similar ceramic shapes, decorative motifs and manufacturing techniques.

T. I. 6. If the population were an extension of Lungshanoid peoples from the west coast of Taiwan, we should expect to see similar lithic remains from both areas.

In order to assess the above test implications, it was determined that certain classes of data would have to be collected. More specifically the major classes of data required included: verification of and locational information about sites; pollen samples for use in reconstruction of the vegetational history of the basin; radiocarbon samples to develop the local chronology; ceramics to use in the development of an internal chronology within the area and for comparisons with other archaeologically recognized groups on Taiwan; and a sample of the stone

artifacts for comparison with outside groups and an indication of the types of subsistence activities practiced by the people. In the next chapter the data collection methods used to obtain this information are discussed.

CHAPTER IV

DATA COLLECTION METHODS

In an attempt to fulfill the goals of the larger project as well as to examine the hypotheses set forth in Chapter II, the following classes of information were sought: site locational information (elevation, land form, soil, slope), faunal remains, soil samples (for pollen analysis and chemical analysis), datable materials and man-made remains.

Stratified Sampling Zones

In attempting to locate the archaeological sites and recover the desired information, a stratified sampling program (Watson, LeBlanc and Redman 1971) was set up according to the different land forms found in the basin. To better understand the geomorphology of the P'uli area, a brief history of the physiography of the basins in central Taiwan is given here.

In studying the physiographic history of the basins in central Taiwan, it is observed (Tomita 1951:3-5) that the Early Tertiary basins were formed by down-warping and faulting in an area of low relief that had been leveled in a previous subcycle of erosion. This down-warping and

Fig. 1
Landforms in the P'uli Basin
(after Tomita 1951)

faulting caused a series of mountain lakes to form. Fine-grained particles of clay and sand were carried into the lakes by slow-running rivers from the surrounding area of low relief. Then the whole island experienced an uplift that rejuvenated the streams and started the erosion cycle over again. Relatively coarse materials (5-8 cm in diameter) were deposited in the basins and formed the lower gravel beds. The basins filled and became dry land. The area was again affected by an uplift with faulting and the rejuvenation of the streams. The basins were now surrounded by high mountains, and the fast-moving streams carried boulders and coarse gravel (15-20 cm in diameter) into the flat basins forming extensive alluvial fans. The streams have continued to dissect the basin floors. Five major plains can be isolated (Tomita 1951:3-5). These five topographic plains and the surrounding slopes and mountains were chosen and designated as zones for the stratified sample (see Fig. 1). The different plains, as described by Tomita (1951:4-5), varied not only in elevation but also in the history of deposition, the amount and direction of slope, material of which they are made up and the soil cover. Fig. 2 shows the zones one through six from which the samples were taken.

Survey Procedures

Each of the six zones was surveyed on foot, and finds were plotted on 1: 25,000 maps and panoramic photos.

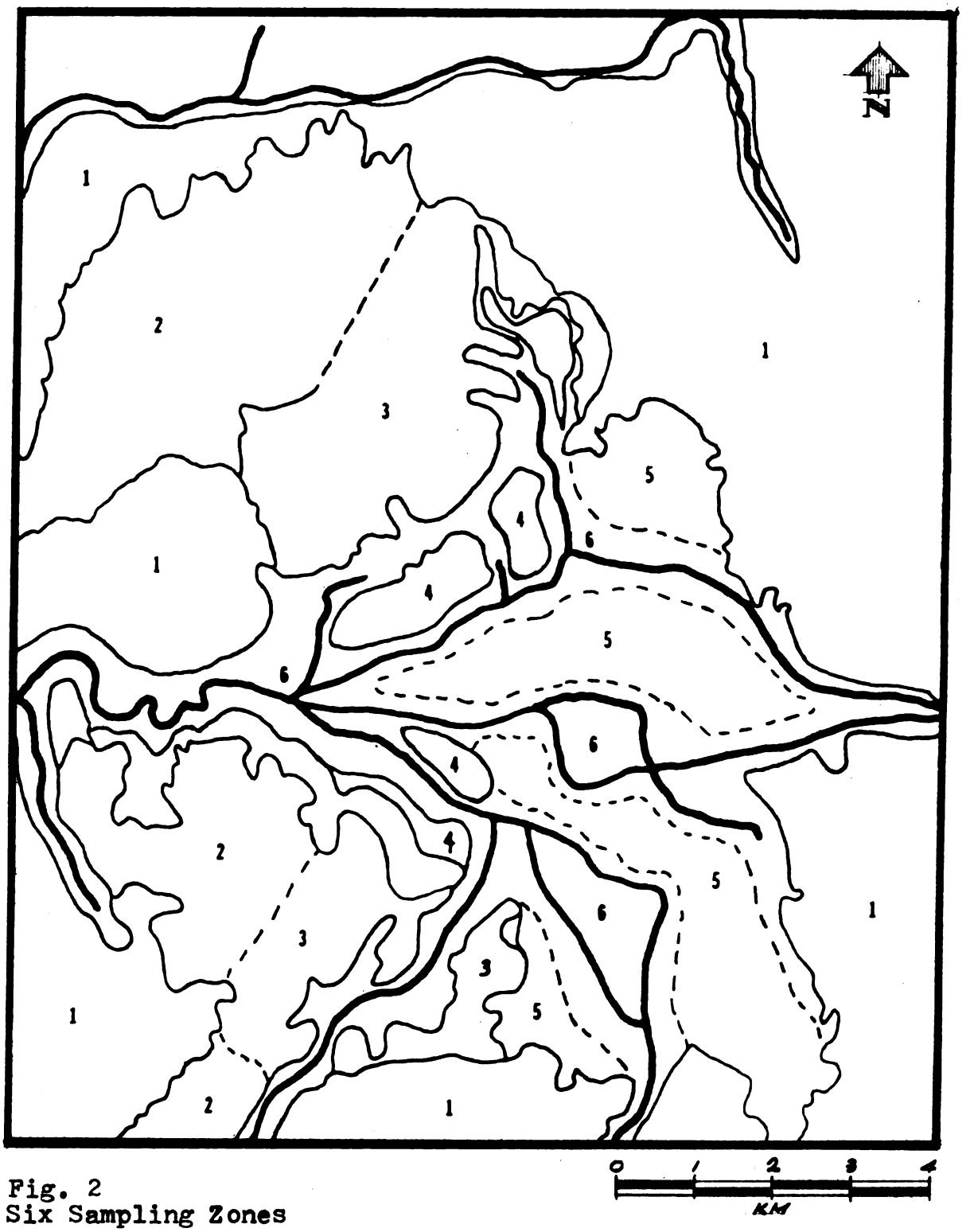


Fig. 2
Six Sampling Zones

The survey procedure consisted of walking each of the designated plots in a zigzag pattern. On the ground, surveys were supplemented with interviews of local farmers and workers. On several occasions they were able to take us directly to concentrations of artifacts or areas where stone coffin cists had been encountered during their labors. Plots were selected from each of the zones in a manner to insure that each variation of the zone was sampled. Some bias was noted in that the recovery rate from the areas of dense overgrowth consistently produced less than areas that had been cleared for farming. The effect of modern farmers was, however, a mixed blessing; several sites that had been previously reported (Liu 1956:55-57) could not be relocated.

A partial explanation for the present absence of remains in areas where they were previously reported is that the land has been intensively cleared, re-landscaped and farmed. Many large features (stone cists, house remains, etc.) and even smaller artifacts have been destroyed and/or removed. Interviews with local Chinese farmers disclosed the fact that they did not recognize most of the lithic remains or pottery fragments as being man made. The initial reaction to this problem still stands: "So much has been altered that it is felt that our sample [however large] will surely be biased and not

truly represent all of the activities that transpired here in the past. This problem must be recognized and dealt with in the interpretation stages of analysis" (Stamps 1972:2). Enough index artifacts remain to work with time-space problems, but in most of the sites in-depth settlement pattern studies, activity area studies or studies of architecture will be very difficult. A total of twenty-eight sites were located. An explanation of the numerical system used for designating sites and provinces is presented in Appendix C.

As sites were located in the survey effort, surface collections were made. At all but three of the sites (PL 21, PL 28 and PL 29), a total collection was made. At these three sites, artifacts were too numerous for a one hundred percent collection, so only a representative sample of the artifacts (tools and waste flakes) was taken. If the site displayed some unique feature or contained a large number of artifacts, test excavations were conducted. Test pits or trenches were located in areas of high artifact density to maximize the information retrieval. On certain occasions test pits were limited by the presence of modern features, such as tombs in the graveyards, modern buildings and agricultural crops the farmers were unwilling to have disturbed.

Test Excavations

Excavations were carried out using a light hoe and basket for soil removal where possible, and trowels and brushes when cultural materials were encountered. Materials from the test pits were screened through 1/4 inch screens and bagged according to levels. Excavations were begun in arbitrary 10 cm levels until the natural stratigraphic levels were encountered. Then levels were dug according to the natural stratigraphy, although if layers were greater than 20 cm thick, the artifacts were bagged into upper or lower portions of the level. Materials were washed, dried and labeled in P'uli before being boxed for shipment to Taipei for further analysis. Notes and drawings in the field were part of the preliminary interpretation, but most of the analysis was done in the laboratory at the Institute of Ethnology, Academic Sinica in Nankang.

An attempt to recover bones for Faunal analysis by the zoologists participating on the project was foiled by the chemical make-up of the soil which destroys bone in a short time. As an illustration of this, the remains of a middle-aged woman buried thirty years ago were examined by the author during a bone-cleaning and reburial ceremony. It was noted that in just this short period of time only the long bones in the legs and arms, the pelvis, a few

vertebrae, a few ribs and the skull remained. C. J. Shih (1953:14), in trying to explain the lack of skeletal remains in burial cists and bones in general from the site of Tamalin, suggested that they have been destroyed by the soil or by white ants.

Fourteen charcoal samples were recovered in the process of excavation. These were immediately placed in new plastic bags and kept separate from the other remains. Samples were submitted to Dr. Y. C. Hsü at the Radiocarbon Laboratory, Department of Physics, National Taiwan University. The results appear in Chapter V of this paper.

Soil samples were taken from each distinct level and the underlying sterile soil at each test pit. Three sites from dispersed areas of the basin were chosen from which to extract pollen samples in an attempt to reconstruct the vegetation history of the basic (Chung, Hwang, Stamps 1973). A control profile was also taken at Wai-chia-tao-keng, Yu Chih on the southern rim of the P'uli Basin by the geologists on the project. Results of the pollen analysis appear in Chapter V.

CHAPTER V

DATA ANALYSIS

This chapter includes the results of the stratified survey, a chronology for the archaeological remains found in the P'uli Basin and a description of the Pleistocene and Holocene vegetational sequences in the basin.

Results of the Stratified Survey. At this time we will describe each of the survey zones and the sites from those zones.

Zone 1. This sampling zone was made up of the mountain slopes that formed the perimeter of the basin. The elevation varied from 500 m at the edge of the basin up to 1924 m at the peak of Kuan-tao mountain on the northeast side of the basin. The watershed on these slopes was inward toward the basin. The mountains are composed of clay slate with varying degrees of soil cover, although it is generally shallow. The gradient of the slope varied, but it is generally quite steep and in some instances is a vertical cliff. Little of the original vegetation cover remains. Most of the area has either been used for slash and burn agriculture or to grow

hillside tea or fruit trees. Almost all large trees have been harvested by local lumber interests. Most of the hillsides are now planted with rows of fast growing pines which are harvested after about ten years and used in the construction industry (in a manner similar to our use of 2" x 4" or 2" x 6" beams). The original forest is characterized by broad-leaf evergreens with hard oak (Quercus glauca), rock oak (Quercus gilva), camphor trees (Cinnamomum spp) machilus, acorn trees and several kinds of firs (Liu and Liu 1959:note 3). Sites numbered 24, 27, 36, 37, 38, 39, and 40 were located in Zone 1 (Fig. 3).

Site 24 was located on a steep slope on the northern side of the basin just above 600 m elevation contour. There is a small stream one quarter of a kilometer to the west of the site. There was no sign of an occupation area, only a scattering of artifacts. Three stone hoe fragments, two adzes, three notched net sinkers and two polished slate fragments were located in the surface collection. One of the polished slate pieces was perforated similar to the rectangular reaping knives (see Appendix B). The presence of the hoe fragments and reaping knives suggests some kind of cultivation. Modern Bunun farmers still practice slash and burn agriculture on similar steep slopes. The net sinkers may have been used in the nearby stream.

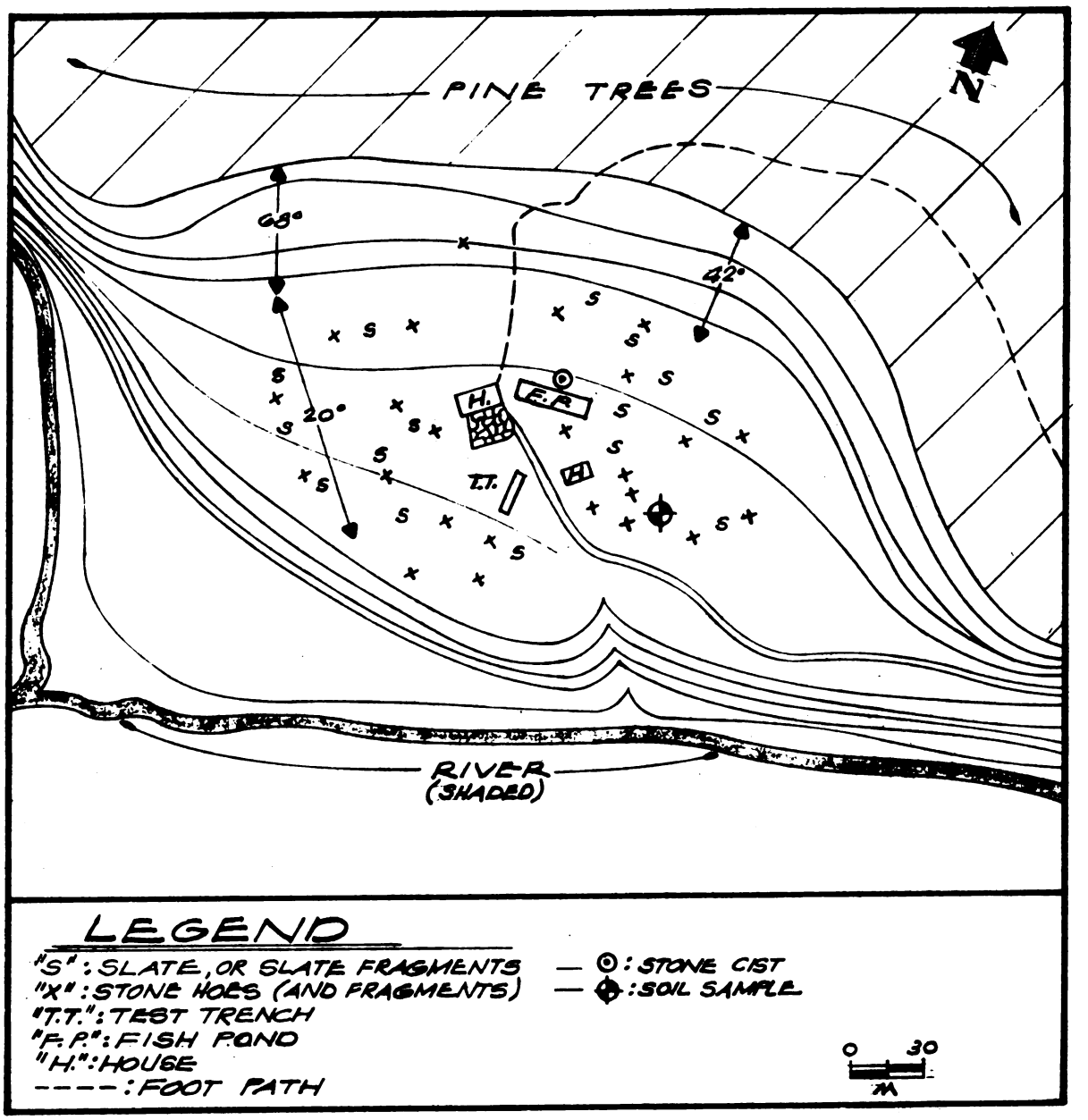


Fig. 4
Site P.L. 38

Site 27 is located on the top of a hill in the southeastern part of the Hsiao-pu-she area. Three stone hoes and one piece of polished slate were found. No other artifacts or features could be located. The area was probably cultivated at some time in the past.

Site 38 is located on a hillside flat on the north bank of the Mei-chi River, seven kilometers east of the town of P'uli (Fig. 4). The elevation is 730 m above sea level. Soil here is a very dark brown. The soil cover is as deep as 1.5 m in some places. This area is currently being cultivated by a Chinese farmer who has capped a small spring up the hill from the site. He mentioned discovering "many slab stone boxes" in the process of terracing and landscaping the area. The farmer remember them as being found in a row, end to end about 50 cm deep, but in no particular direction. He removed the slate slabs and used them for a floor in his house, a table and benches as well as a patio drying yard that was made up of about eighty pieces. Some of the larger pieces measured in cm:

Length	Width	Thickness
186	52	3
154	35	3
140	36	2.5
84	45	2
90	49	2

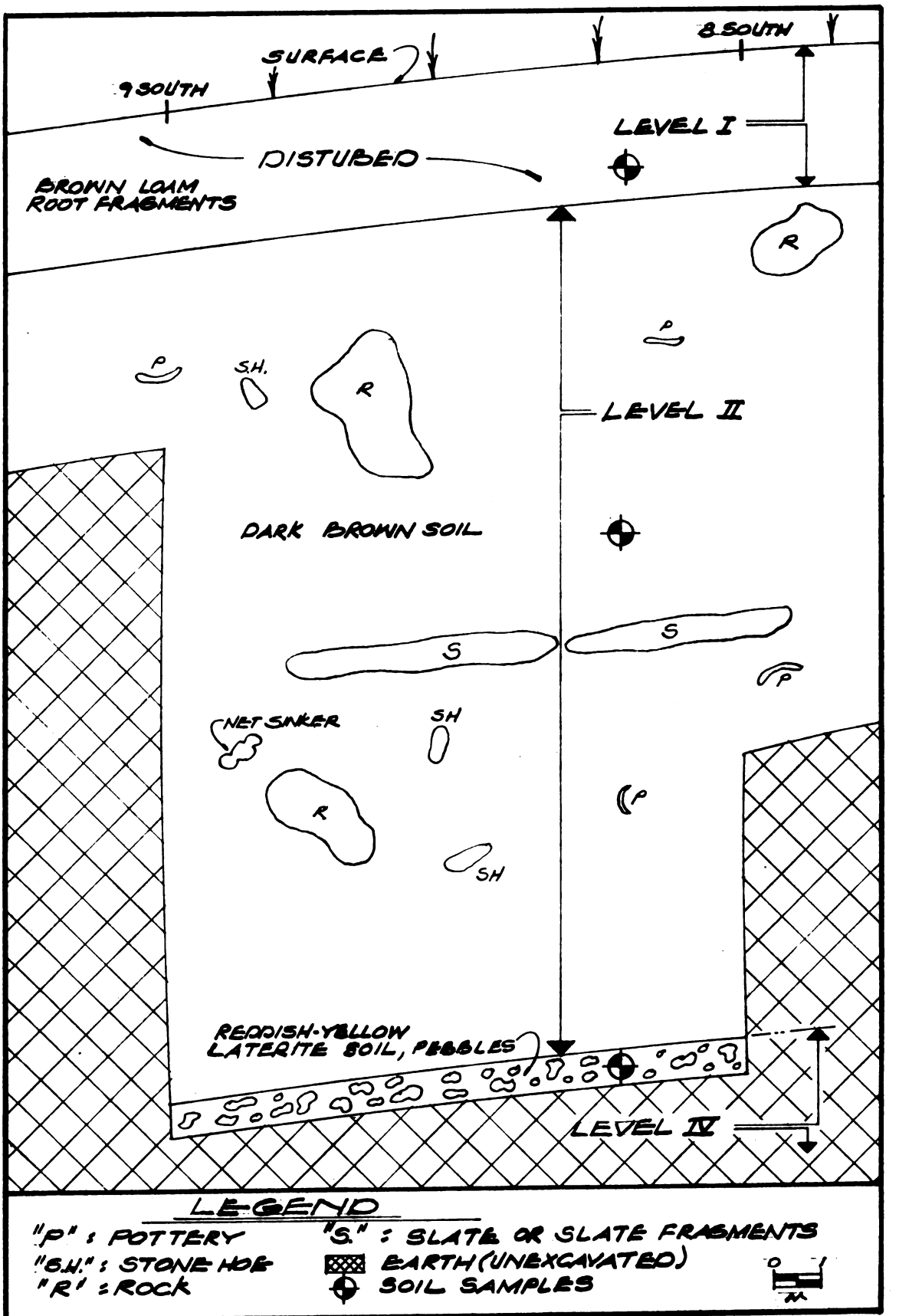
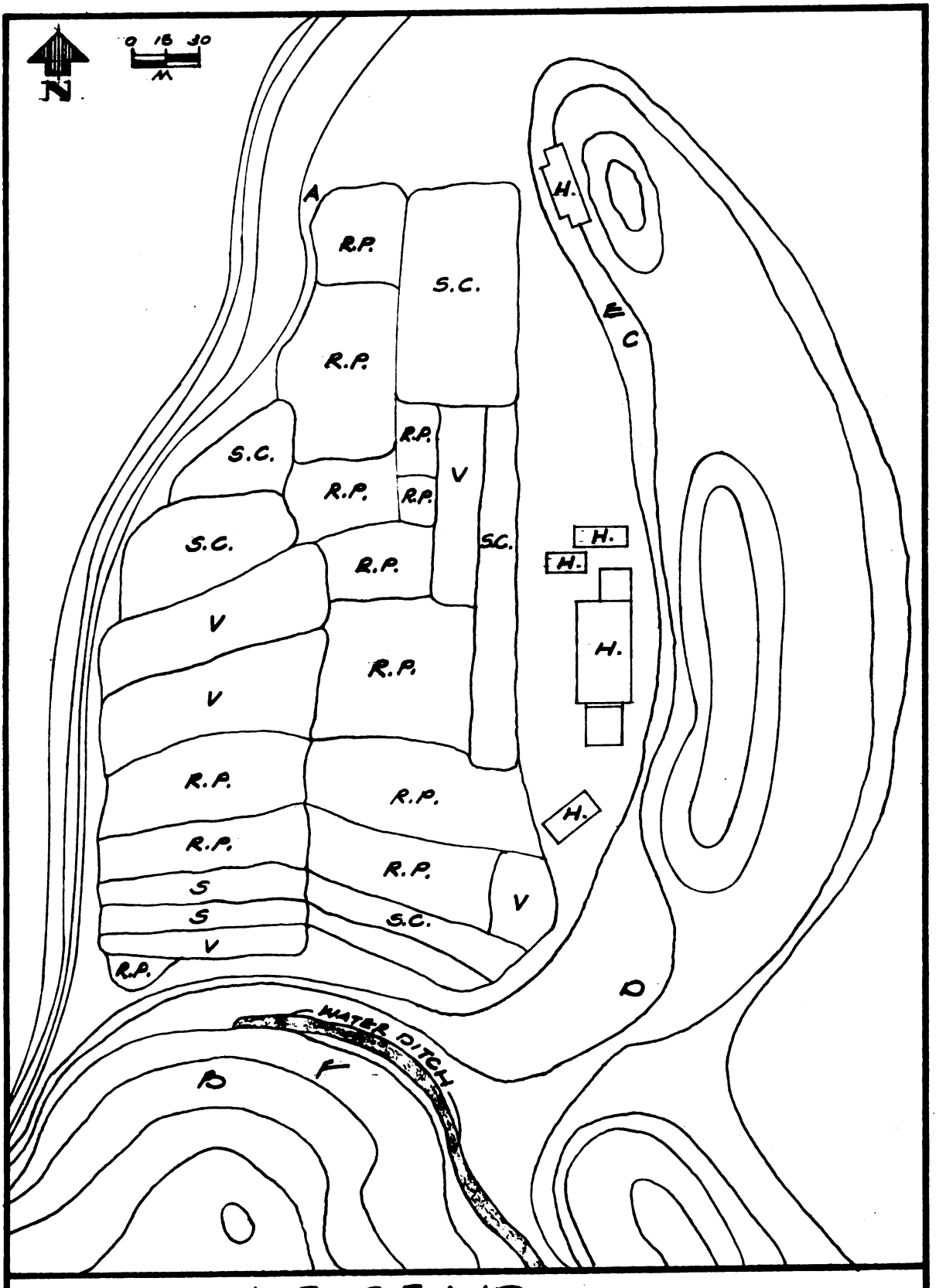


Fig. 5 Site P.L. 38, profile drawing of west wall in test trench (between 8 and 9 meters south)

The source for these slate slabs is some 6 km away and their procurement, shaping and transportation represent no small expenditure of energy. A surface collection at the site produced several stone artifacts and a few pottery fragments. In an attempt to gather a more representative sample from the site and possibly locate one of the slab stone cists in situ, a 50 cm by 12 m test trench was excavated. Four levels were defined (Fig. 5): the uppermost level, when dry, was a light gray color disturbed by farming activities; the second level was a dark, moist, rocky level in which potsherds and several stone hoes were found; the third level was a lens of reddish clay which yielded sherds, a net sinker, some charcoal and two polished slate tool fragments; the fourth level was sterile, rocky soil. Slate slabs from a collapsed stone cist were found in a northeast by southwest orientation. All but one verticle slab on the southwest end had fallen over. The cist itself was full of dirt, with no human remains or grave goods.

A total of 36 stone artifacts and 138 potsherds were recovered from the excavation. Of the stone artifacts, 72 percent were rectangular or ovaloid stone hoes (Figs. 31, 32). Examples of the smallest rectangular hoes found in the P'uli survey came from this site. The ceramics from the site are of the SWK LBG/C class (see Appendix A, p. 128).



LEGEND

"A" - "F" : ARTIFACTS, TEST PITS — "H": HOUSE, BUILDING
"R.P." : RICE PATTIES — "S.C." : SUGAR CANE — "V" VEGETABLES

Fig. 6 Site P.L. 39

which dates to the early period of occupation in the basin. Pollen samples from this site were taken and analyzed (see pp. 94-99).

The concentration of artifacts, the large number of stone cists and the color of the soil suggest to the author that this site was once a small hamlet. The good soil, the near-level land and the abundant water all suggest agricultural activities. This is supported by the presence of 72 percent stone hoes, only one net sinker and no arrow points. If the site had been used more for hunting activities or by hunters and gatherers, we would expect to find more arrow points and no ground cultivating tools.

Site 39 is also located on a flat area overlooking the Mei-chi River. Site 39 is 2.5 km east of site 38 on the south side of the river (Fig. 6). The elevation is 770 m. It is also located just below a spring on the mountain. This spring has been channeled into rice paddies and sugar cane fields by Chinese farmers who presently occupy the site. The soil here is also dark and fertile. Measurements revealed that the dark soil was 60 cm deep in one area and 80 cm deep in another. Several slate fragments were found scattered around the area. These may have come from slab stone cists or from remains of prehistoric houses. The surface collection produced fewer artifacts than at site

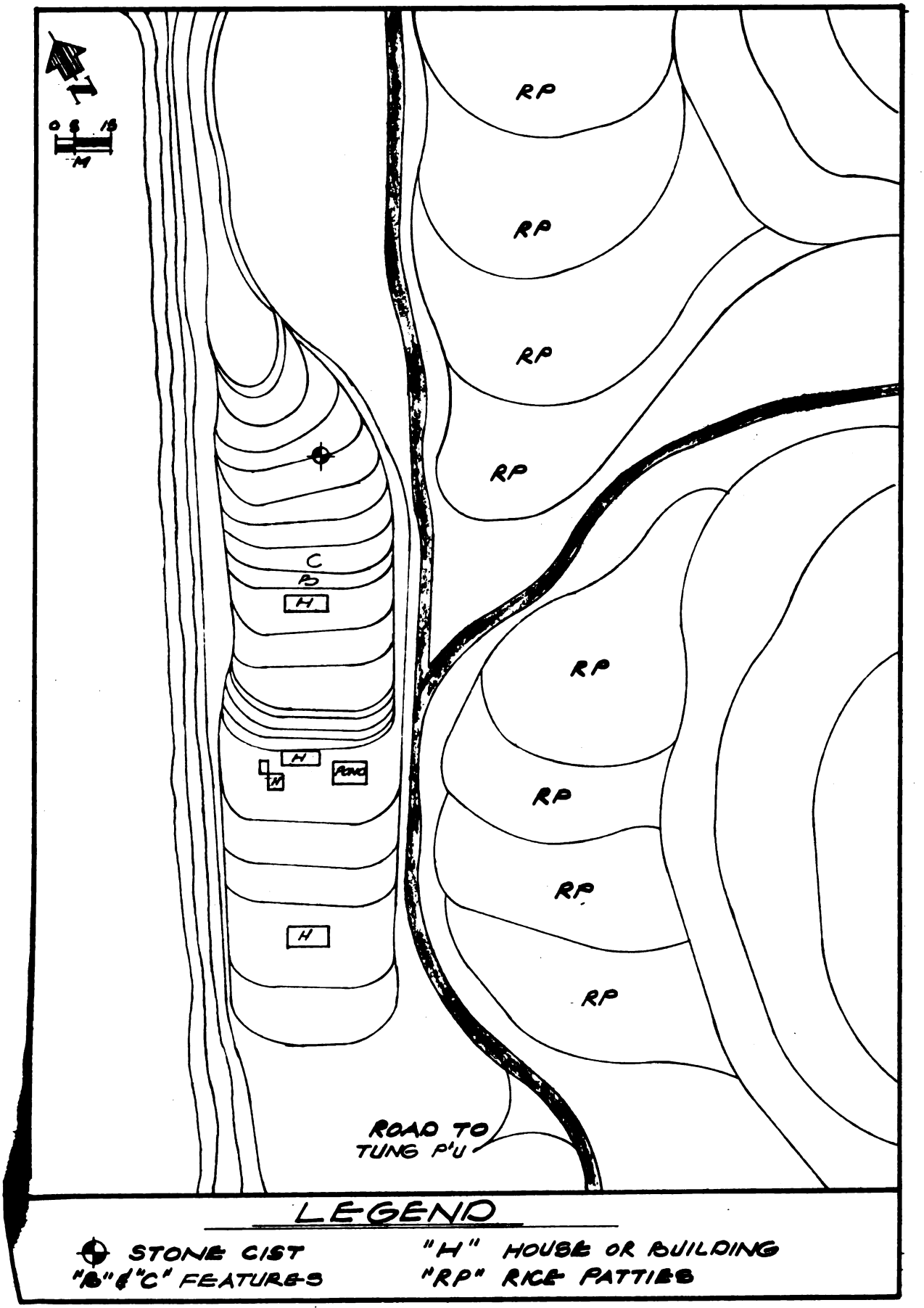


Fig. 7 Site P.L. 37

38. Thirteen pieces of worked stone were recovered: 5 stone hoes, 5 sandstone fragments, 1 net sinker and 2 disk shaped pieces of worked stone (the waste centers of bracelets drilled with the use of large diameter bamboo and an abrasive). Two pecked stone bowls were also located at the site, but their origin was in question. Only three light brownish gray sherds were found. The site could have been a prehistoric hamlet or merely an outlying field worked by people living in other areas.

Site 37 is situated on a flat point that juts out from the steep slopes above the confluence of two fast-running streams (Fig. 7). It is in the mountains of the southeast quarter of the basin. Actually, the P'uli Basin itself cannot be seen from this site--only the rather narrow canyon that turns just before it joins the basin. The point that juts out from the mountain has been terraced and is currently planted in orange trees. When the original terracing was done, several stone cists were destroyed. Our surface survey located one rather small rectangular cist (101 cm long, 37 cm high, 45 cm wide) still intact in the side of a terrace. It was on a northeast, southwest orientation. Further investigation found it to be silted in and filled with fine grain soil but with no human remains or burial goods. Also located in the side wall of one of the terraces at this site was a dish-shaped impression

115 cm across and 30 cm deep. Several pieces of charcoal were recovered from inside the feature. Its function could not be established. The only artifacts recovered from this site were two oval-shaped hoes. The site was probably occupied, as suggested by the presence of the hoes, the stone cists and the dish-shaped depression, but only by a few people probably for a short duration or seasonally. The charcoal sample that was recovered from the depression was dated by the NTU radio carbon laboratory as "modern" (NTU-198). For discussion of dates, see pp. 93-94.

Site 36 lies on a gently sloping peninsula that comes out from the southern mountains onto the flat basin floor. No artifacts were found, but broken slate slabs were found scattered over the slope. The purpose of the slab fragments is unknown.

Site 40 was located by Hwang and Liu, the geologists working on the project. This site is located on a high ridge in the southwestern quarter of the basin. Artifacts, including stone hoes (one spatula example), polished adzes, a small spear point and slate fragments were found on the crest of the ridge and down both sides. Both the soil cover and the cultural deposit were thin. An interesting fact about this site is that the nearest water was several kilometers away. The site was probably an outlying field

which was only occupied during times of spring planting or fall harvest.

Zone 2. This sampling zone is found only on the western half of the basin. It consists of slightly undulating tablelands that slope gently from west to east. These tablelands are made up of upper gravels, covered with deeply colored reddish laterite soil. The elevation of this zone is around 700 m above sea level. The original vegetation has been removed and the area is currently planted with rice, bamboo and shu-shu.

No archaeological sites were found in this zone. Liu (1956:56) refers to one example of chipped stone tools found in 1902 by a Japanese official. Attempts to relocate this site or any others were unsuccessful. The lack of sites may be due to a general lack of water, to some unknown characteristic of the red soil or some other unknown factor.

Zone 3. Zone 3, like the previous zone, is an upper gravel bed tableland, covered with deep reddish laterite soil; however, it is lower in elevation (from 700-500 m) and is more eroded than Zone 2. It also slopes from west to east. Eight archaeological sites are found in this zone, although it is noteworthy that they are all on the border of this and other zones.

Site 25 is located on the southwest corner of a small hill in the Hsiao-pu-she area on the north side of

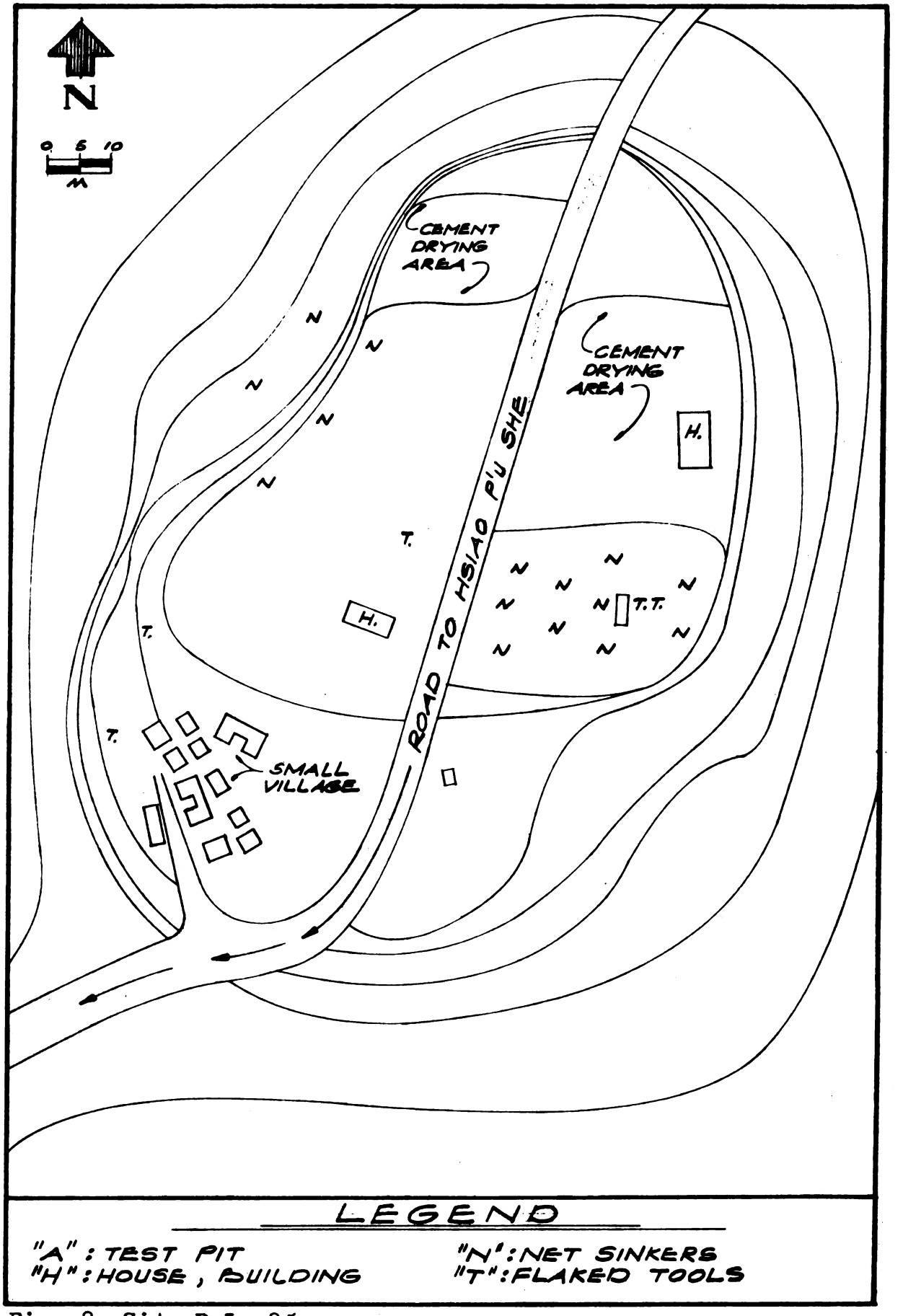


Fig. 8 Site P.L. 25

the basin (Fig. 8). A small stream runs past the hill on the west side. The site slopes gently to the southwest. Elevation of the site is 520 m. The surface collection produced 5 stone hoes, 12 sandstone fragments, 2 adzes, 1 reaping knife, a polished cube, but most surprisingly 17 notched net sinkers. A 1 x 2 m test pit at the site (25A) produced more of the same kinds of artifacts, but also 78 brownish orange potsherds. The sherds came from an undisturbed level at the bottom of the test pit (Fig. 9). These classes of sherds (HPS BO/C and HPS BO/M)[1] were also found at site 28 less than a half km to the northwest. Because both sites have the same classes of pottery, and because the HPS BO pottery is similar to the dominant pottery (SWK LBG/C) at site 28, the two are considered to be contemporaneous. This is supported by the fact that similar lithic assemblages are found at the two sites. At site 25, 65 percent of the recognizable lithics recovered were notched net sinkers and 33 percent stone hoes. The suggestion is that fishing activities were quite important at this site. In recent times carp, white fish, silver fish, loach, croaker and catfish have been caught in nearby lakes and streams.

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[1]See Appendix A for an explanation of the abbreviations of pottery types.

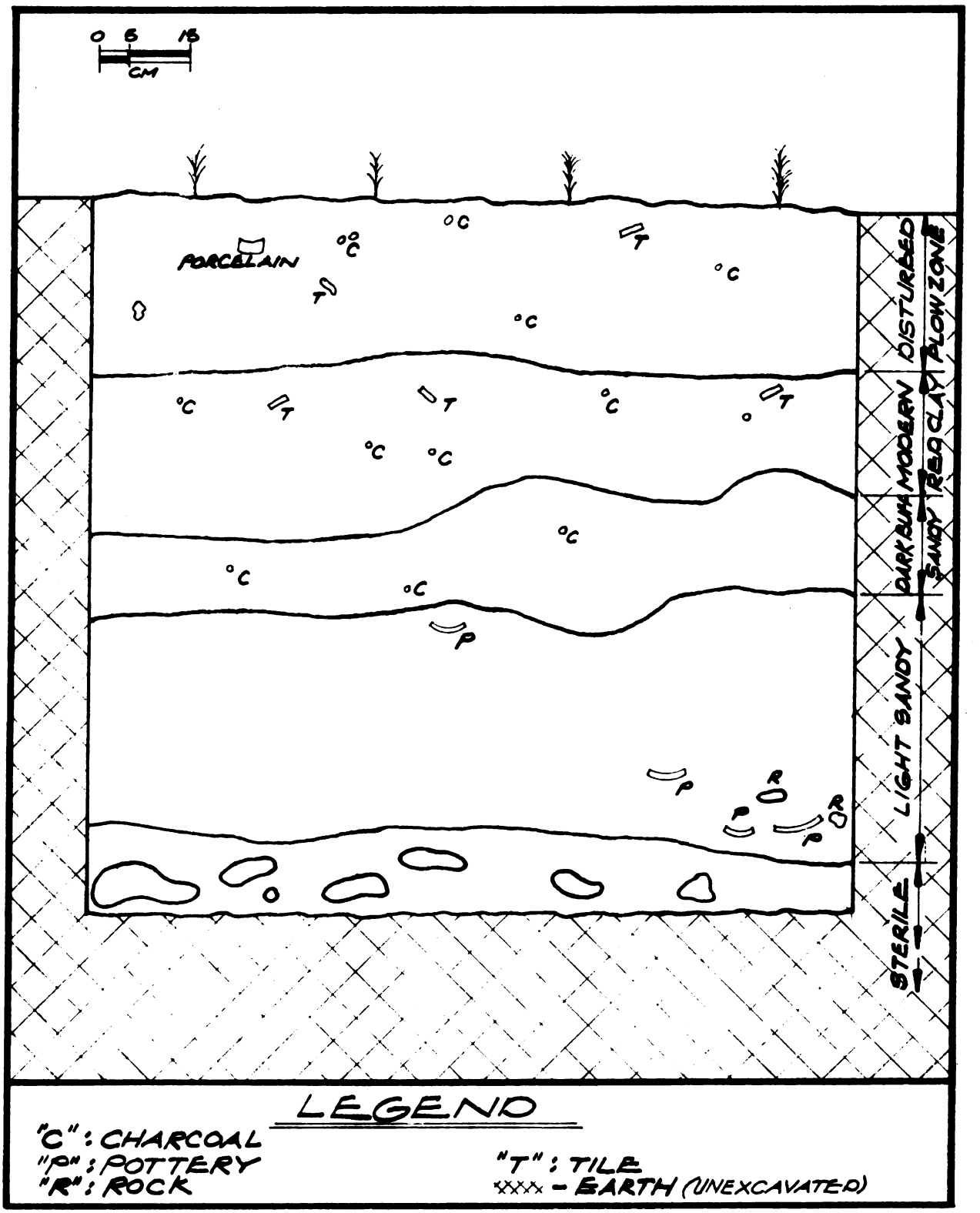


Fig. 9 Site P.L. 25, profile drawing of east wall in test pit A.

Less than one half km to the north is site 28, situated on the crest of a low finger-like ridge that juts out into the Hsiao-pu-she area. On the point of this ridge is located the Chieh-ling-shih temple. The site begins immediately behind the temple and spreads up the hill for approximately one half a kilometer. The elevation is 500 m, with a 4 percent gradient to the south.

This site was extremely productive and yielded 136 pieces of worked stone in the surface collection. Because of the large numbers of artifacts located at the site, the collection effort was divided into three zones. A comparison later showed, however, that the same types of artifacts, in similar percentages, were found from each of the zones. Stone hoes were most numerous, making up 52 percent of the total collection. Trapezoid, spatula, rectangular, ovaloid and pointed shaped hoes were all found at this site. Nineteen percent of the artifacts were notched net sinkers, 2 percent were adzes, 2 percent were knife fragments and 1 percent was polished slate point fragments.

A 1 x 2 m test pit near the center of the site (where 8 sherds had been found) yielded only 8 stone artifacts but 62 potsherds. The ceramics came from one cultural level and were of three main calsses: PL GS/M, SWK LBG/C and HPS BO/M and F. Most numerous were the SWK LBG/C sherds

that date to the Shuiwaku Period. A few bits of scattered charcoal were found in the test pit, although not enough for a radio-carbon date sample.

The presence of pottery and the wide range of artifacts suggest that the site was once a hamlet or small village site. Terracing by modern farmers, however, has probably removed evidence of any structures. No stone burial cists were found here.

Agricultural activities seem to have predominated at the site, as is suggested by the large number of stone hoes. The small number of reaping knives (only 2 percent), however, suggests either a different method of harvesting (as mentioned by Chen 1968, where the foxtail millet ear is plucked with the stock) or possibly different types of crops being cultivated at this site. The fact that 19 percent of the artifacts were net sinkers and only 1 percent were projectile points implies that fishing was much more important than hunting. Hunting, however, could have been carried on with the use of traps and snares, as it still is in certain aboriginal areas of Taiwan today (Chen 1968:30, 33-39).

Site 35 is located on the eastern slope of a small hill on the eastern edge of the Zone 2 tableland near Hsiao-pu-she. From the site only two net sinkers, two hoes and a waste flake were recovered. The site represents no more than a campsite or more likely a field.

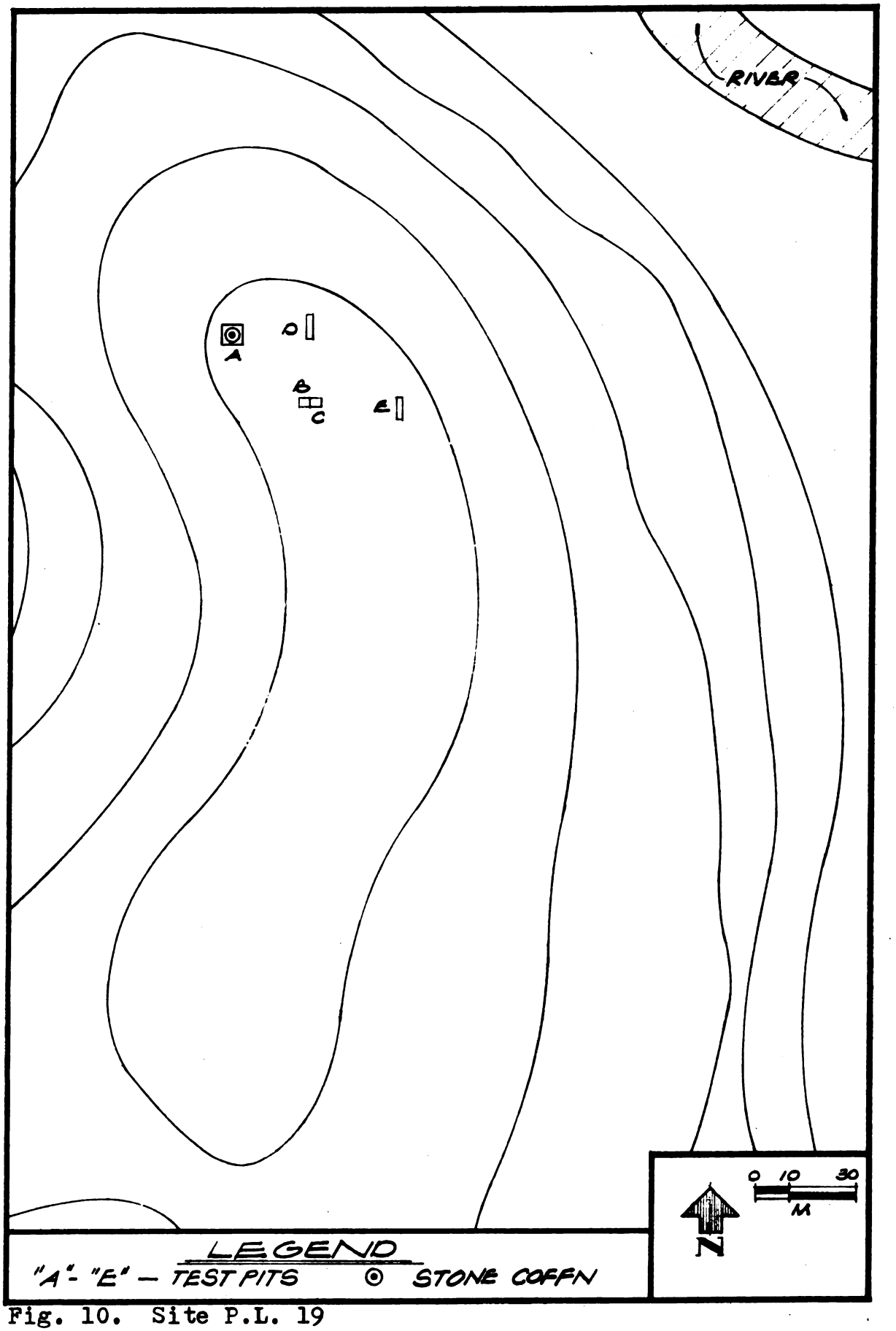


Fig. 10. Site P.L. 19

Site 41 likewise is a small site west of Hsiao-pu-she. Seventeen artifacts were recovered, 35 percent hoes, 53 percent net sinkers (both notched and grooved) and the remainder, sandstone waste flakes. The site was probably an outlying work site, possibly a fishing station. Two different streams do run within a kilometer of the site.

Site 44 is located on the sloping tableland approximately one kilometer west of site 28. Sixteen hoes and sandstone fragments were recovered. No pottery or worked slate were found.

Most of the sites located in Zone 3 were found in a semicircle around the Hsiao-pu-she area on the north side of the P'uli Basin. A survey of the tablelands in Zone 3 on the southwest side of the basin located no sites.

A survey of the north-south ridge on the east side of the Tao-mi stream did produce three artifact concentrations. The largest was site 19 located on the northern end of this ridge (Fig. 10). The site has an elevation of 470 m and towers over the surrounding area. Steep cliffs surround the site on the north, east and west. A surface collection produced both stone tools and pottery sherds. Test pits were put in at five different areas of the site. Test pit 19A was located on the northwestern part of the site. A large rectangular slate slab on the surface

indicated a possible structure or a burial cist in this area. Only one level was encountered. It ranged from the surface to a depth of 30-40 cm and was made up of brown soil mixed with pottery and charcoal. The charcoal was collected and submitted for dating. The results showed a "modern" date (NTU 204), which agreed with the find of a small metal pipe from this level. Protruding from the east sidewall of the test pit was a 60-cm-long piece of worked slate. After finishing the test pit down into sterile soil, the area around the long slab was cleared. A 60 by 44 cm rectangular cover of worked slate was found 10 cm below the surface. When the cover was removed it exposed a 54 by 55 cm box made of four upright slabs. At the time, two large ant nests were located inside. It was cleared to a depth of 55 cm, where three large stones were encountered. There was no slab base in this cist. Beneath the three large stones was the reddish, sterile gravel soil. This cist fits the description given the author of burial cists used by aborigines in the P'uli area in the early part of the century. From test pit 19A one rectangular, three oval and one waisted-shaped hoes, two adzes and 92 sherds were recovered. Of the pottery sherds, 76 were H LBG/C, the major type found in the Modern Period. Eight SWK YO/M, four PL GS/M and four SWK LBG/C sherds were recovered from 19A. The second test pit, made up of

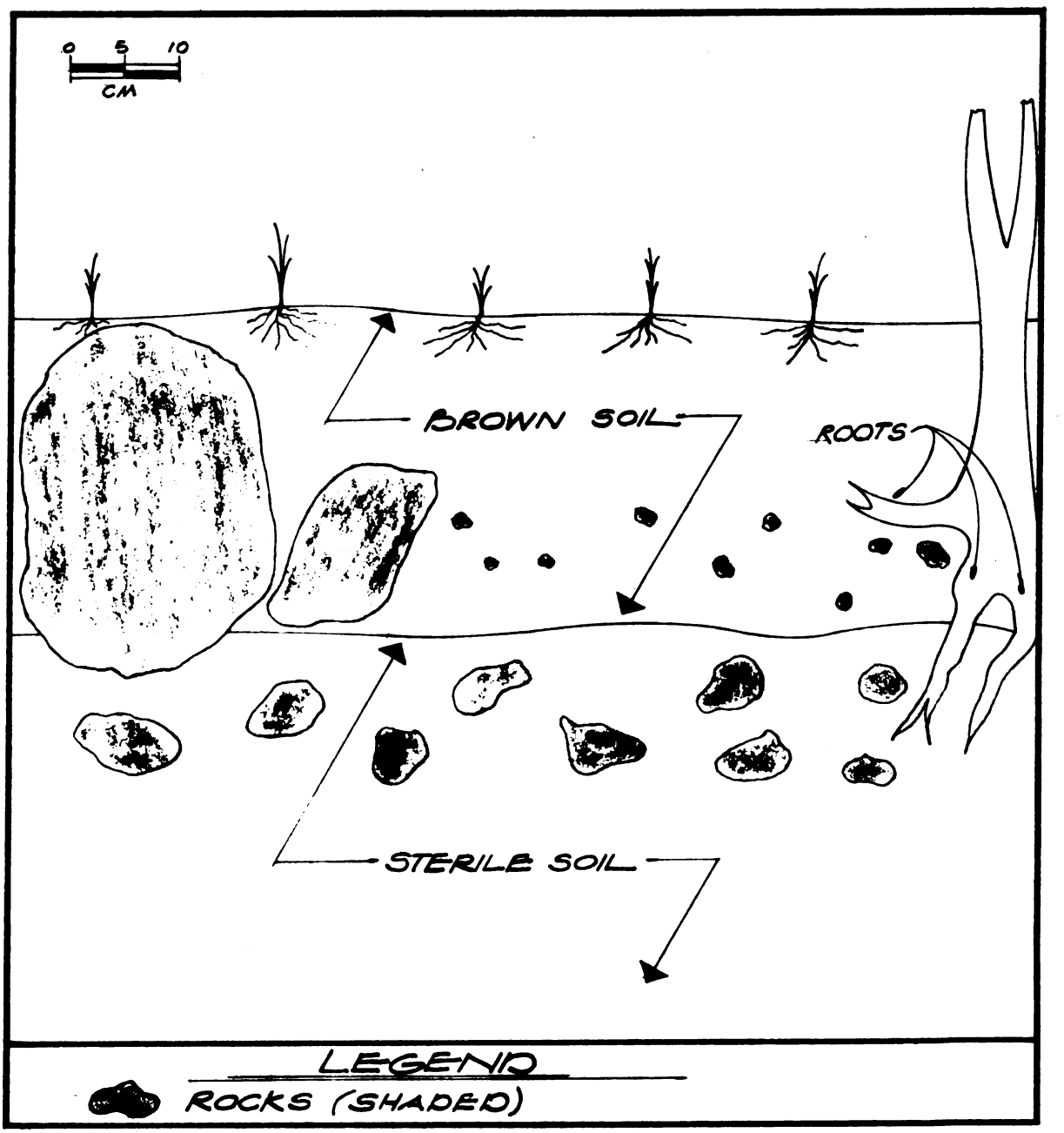


Fig. 11 Site P.L. 19 South profile, test pit B

squares B (Fig. 11) and C, also yielded only a shallow cultural deposit (30-40 cm). The only features located were one large flake, three net sinkers, several fire-cracked rocks and 259 potsherds. The dominant class of pottery again was H LBG/C. Test pit 19D was 1/2 m by 4 m. It also contained only one cultural level between the surface and the sterile subsoil at 55 to 60 cm. This test excavation produced 91 sherds (84 were H LBG/C), 1 grooved net sinker and 1 grooved pebble. Fifteen large rough sandstone cores and 65 flakes or fire-cracked rocks and 1 small grinding slab also came from this trench. Test pit 19E was a 1 by 2 m pit on the east side of the site. This excavation had only 1 stone hoe but several rough cores and flakes and 415 pottery sherds. H LBG/C accounted for 355 of the 415 sherds. Although the cultural materials were found deeper at 19E (down to 117 cm), no features or different stratigraphic cultural levels could be discerned.

Of the total 924 pottery sherds found at site 19, 774 or 83 percent were of the H LBG/C class. One of the differences between this site and the other sites was the large amount of rough cores and fire-cracked rocks. Also different was the fact that no knives or projectile points were found. Perhaps this was because metal knives and points were traded in from the Chinese on the coast. Metal

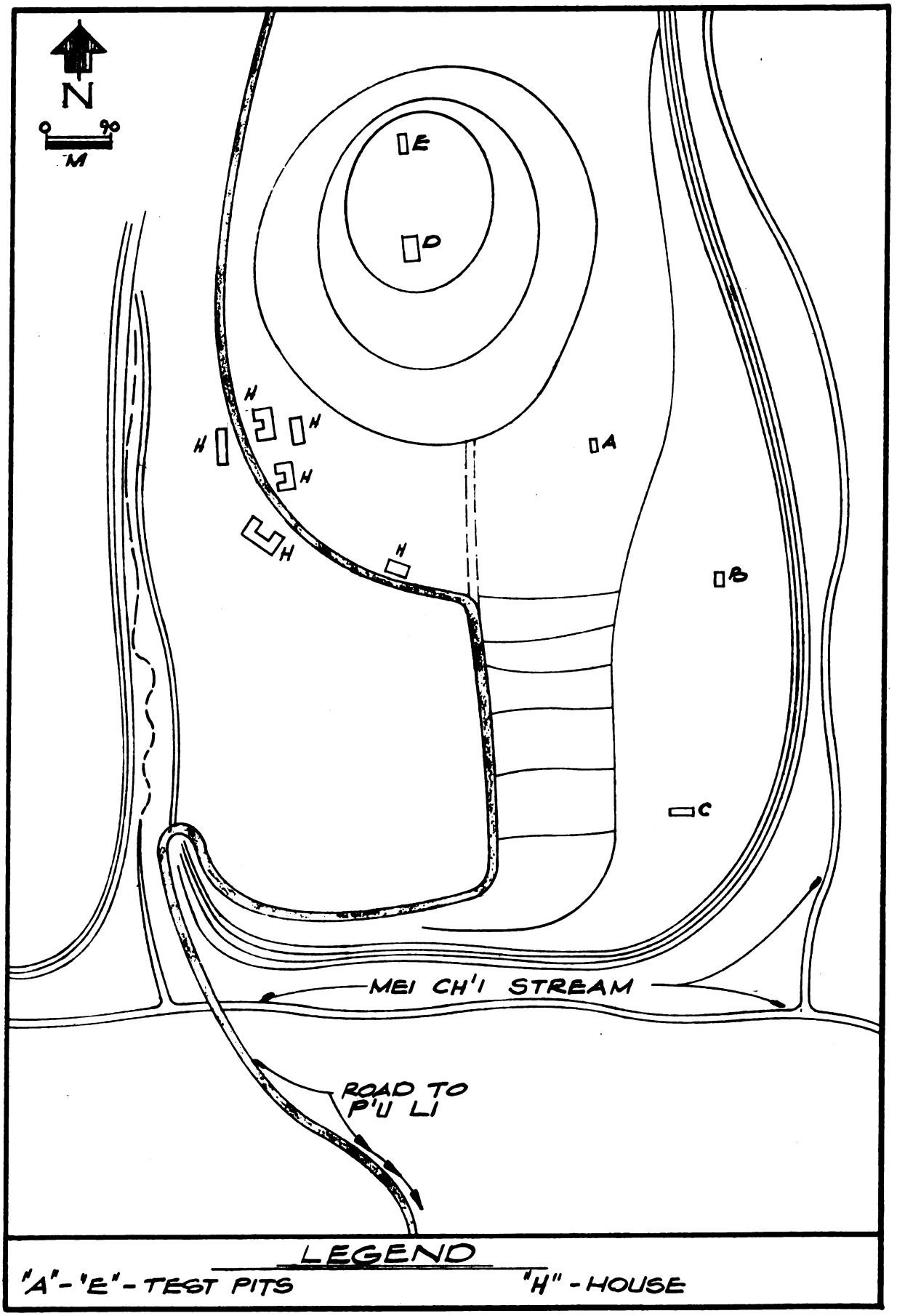


Fig. 12 Site P.L. 29

artifacts being more rare would likely not have been discarded but would have been reused or made into something else. The large numbers of pottery sherds, tools, cores and flakes suggest that the site was important, but probably in the Modern Period.

South along the ridge from site 19 are sites 32 and 33. The former, located on the top of the ridge, was a disturbed burial cist; and the latter, located halfway down the eastern slope, was where three H LBG/C sherds were found.

Zone 4. This sampling zone is assumed to have been developed by streams flowing from zones 2 and 3 (Tomita 1951:4). Zone 4 has been subdivided by erosion into several scattered, narrow plains, all of which are almost completely flat. This zone is composed of gravel beds covered with 1-2 m of laterite soils. The soils are somewhat lighter in color, particularly near the surface. The elevation is around 450 m. Archaeologically, this was the most productive area of the survey; thirteen sites are located on these flat river terraces.

Site 29 (Fig. 12) is located on the southeast corner of the terrace in the Shui-wa-ku district. This terrace is the first one up from the basin floor. A vertical cliff drops some 20 m to the river below. The Hsiao-pu-she stream flowing from the north joins the Mei-chi stream flowing from the east at the base of the cliff

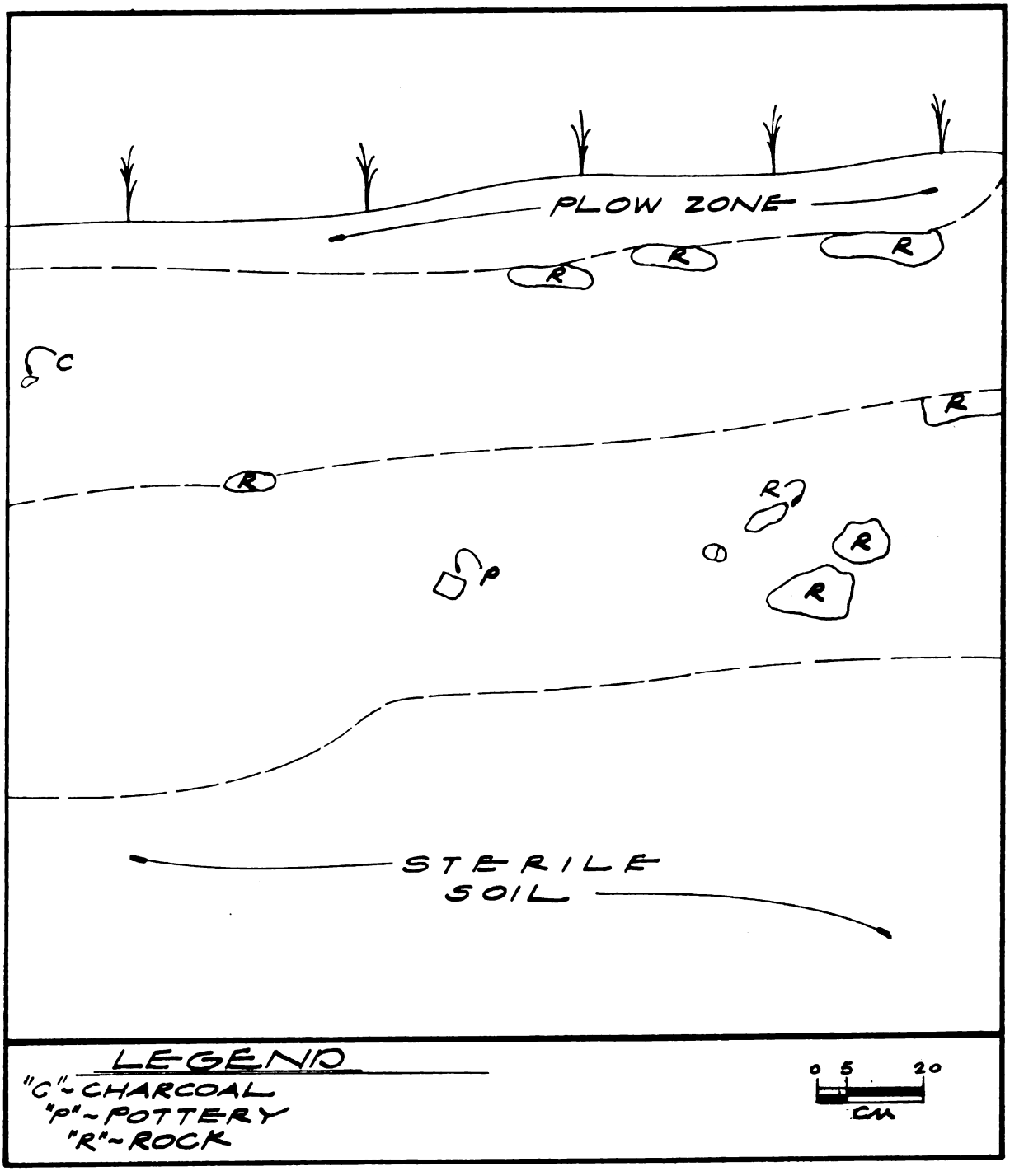


Fig. 13 Site P.L. 29B, profile drawing of west wall

and flows westward. Ample water for culinary purposes and fishing activities is available the year round. The land is level and the soil fertile.

The site had recently been plowed, exposing hundreds of artifacts. The site was divided into five areas, and a representative sample was taken from each. Five test pits were opened at various parts of the site. Only one cultural level, however, could be distinguished (Fig. 13). The thickness of this cultural deposit varied between 40 and 75 cm. No structural features or burial cists were located, although interviews with local farmers revealed that several stone cists had been encountered and removed in the process of clearing the land for modern agriculture. A total of 251 stone artifacts and 1,497 potsherds were recovered from site 29. Ninety percent of the ceramics came from test pits B and C. SWK LBG/C sherds accounted for 91 percent of those recovered from the site. A full range of artifacts including spatula, rectangular, ovaloid, necked and pointed-shaped hoes, K'o halberds, adzes, net sinkers (73 out of 74 were the grooved variety), semi-lunar, crescent and rectangular knives and points were found. One charcoal sample from this site has been dated to 2381 $\pm$ 71 BP (NTU 200). Pollen samples were also taken from this site (see Section C). The site was probably a village from which agricultural, fishing and hunting activities all took place.

Site 42 is located on the south side of a small terrace near Chung-niu-k'eng. Only nine artifacts were recovered, five hoes and four waste flakes. The local farmer, however, showed us what was left of one rectangular stone cist (42 cm high and 52 cm wide) destroyed in building his farmhouse. He mentioned digging ten others in the process of landscaping his farm. He remembered that they were always in an east-west orientation but in no set pattern. Although only a few artifacts were found, the large number of burial cists would suggest that the site was occupied for some time.

Site 43 is located on the river terrace above the village of Ch'ih-k'an. The Mei-chi stream runs west at the base of the cliff where the site is located. Traces of red soil are seen, although the soil is darker in the immediate area. After locating fourteen stone hoes and four flakes in a surface collection, we talked with the local farmer, who directed us to a spot in his bamboo grove where he had encountered a stone cist while planting bamboo shoots. He remembered destroying about ten others. We were able to locate in our test pit the remaining cist. It was rectangular in plan, 60 cm wide at the cover, 33 cm from cover to base, and at least 180 cm in length (the west end was obscured by the roots of a bamboo clump that the farmer would not allow to be removed). The orientation

of the cist was east and west (10° north of east). It was 70 cm below the surface of the ground. This particular cist was important because it was the only one in which artifacts were located in situ. Two oval-shaped hoes were found in the eastern end of the cist. Local collectors (Hsieh, Tien-hua--personal communication) claim to have found a wide variety of tools in the stone cists. The site yielded only 26 pottery fragments of the H LBG/C variety. This site like the previous one was probably a small habitation site.

The Ai-lan terrace, in the center of the basin, is also in the Zone 4 survey area. This terrace has been inhabited repetitively for at least the last 3000 years. Site 22, located on the western end of the terrace, revealed a thin scattering of hoes, halberds and adzes, as well as two rectangular stone cists. The area is presently a modern graveyard. On the south side of the terrace midway between the east and west ends was located another site, numbered 26. No features were located; however, seven stone hoes, four notched net sinkers, a semi-lunar reaping knife, a k'o halberd (see Appendix B) and three waste flakes were found. The area had been recently plowed, increasing our recovery rate, but previous plowings had undoubtedly destroyed other artifacts. This area, near the village of Ai-lan, has been occupied by sinicized aborigines for over one hundred years.

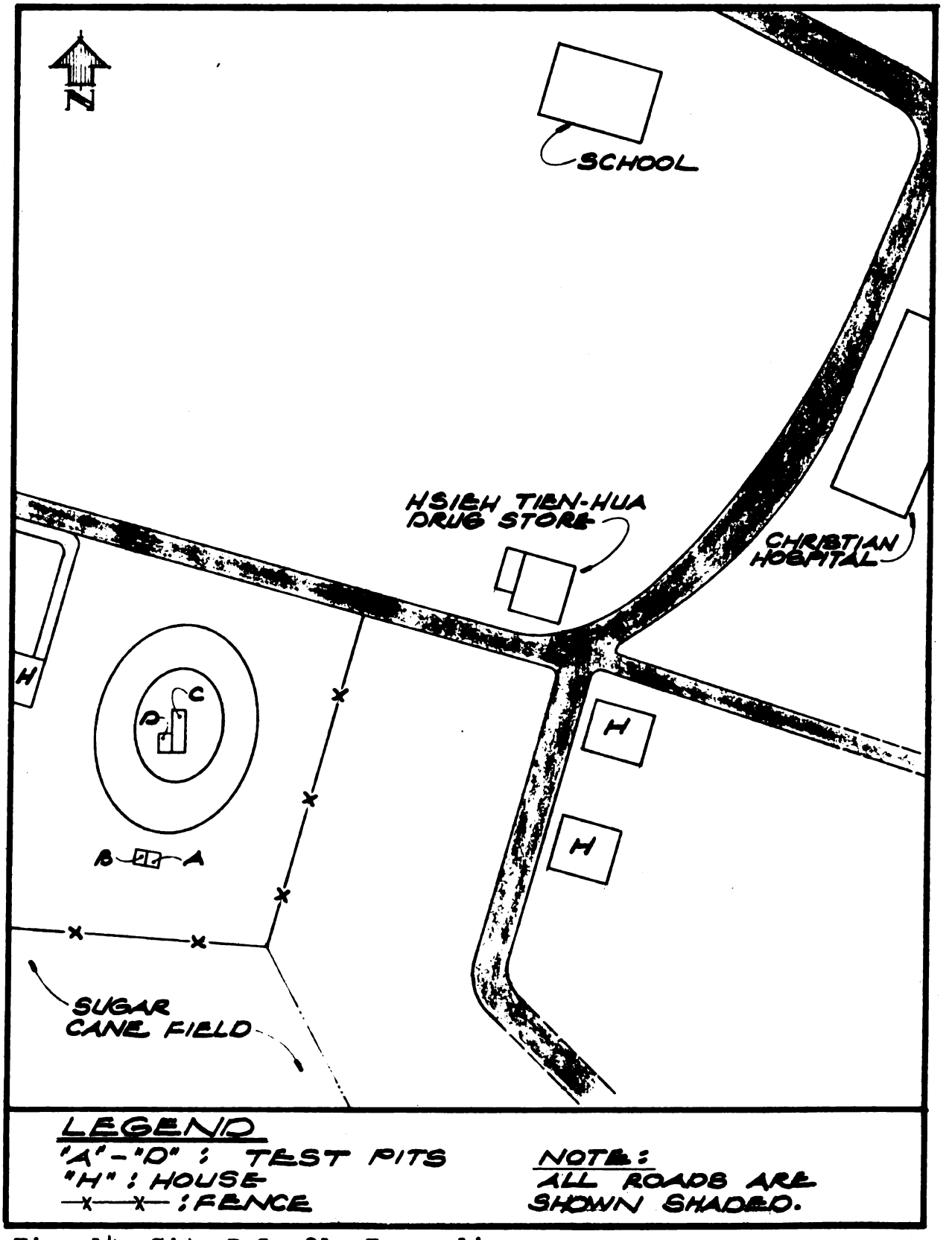


Fig. 14 Site P.L. 21, Ta-ma-lin

The most important site on the Ai-lan terrace is site 21 (Fig. 14), Ta-ma-lin, that was studied by the Japanese twice in 1938, by Liu, Chih-wan in 1947, and by Shih Chang-ju in 1949 (Shih 1953:13-15). The 1959 excavations located 5 burial cists, 8 fire pits (?), 3,000 potsherds and 1,000 pieces of worked stone. The worked stone recovered included hoes, halberds, adzes, net sinkers, reaping knives and projectile points. Shih also found no bones in the burial cists and attributed their destruction to the chemical makeup of the soil or to white ants (Shih 1953:14). Ants' nests were found in two of the cists that we uncovered in 1973. Pottery vessels recovered by Shih were in both basin and bottle shapes. Decorations included cord marks, hand prints, incising and painting. Chang (1969:205-206), after comparing the pottery and stone tools from Ta-ma-lin, placed it in the Ying-P'u Horizon, which he dated to approximately 1100-200 B.C. In Chang's (1974: 272-73) most recent update of the cultural history of central Taiwan, he has expanded this time period to from 1500 B.C. to A.D.700 and renamed it the Tamalin Phase.

A collection was made from this site so that comparisons could be made with other sites in the basin. A small mound 2 m high and 25 m across was tested. A 1 by 2 m pit (labeled A, B) was excavated on the west side immediately off the mound, and a 1 by 3 m pit (labeled C) was

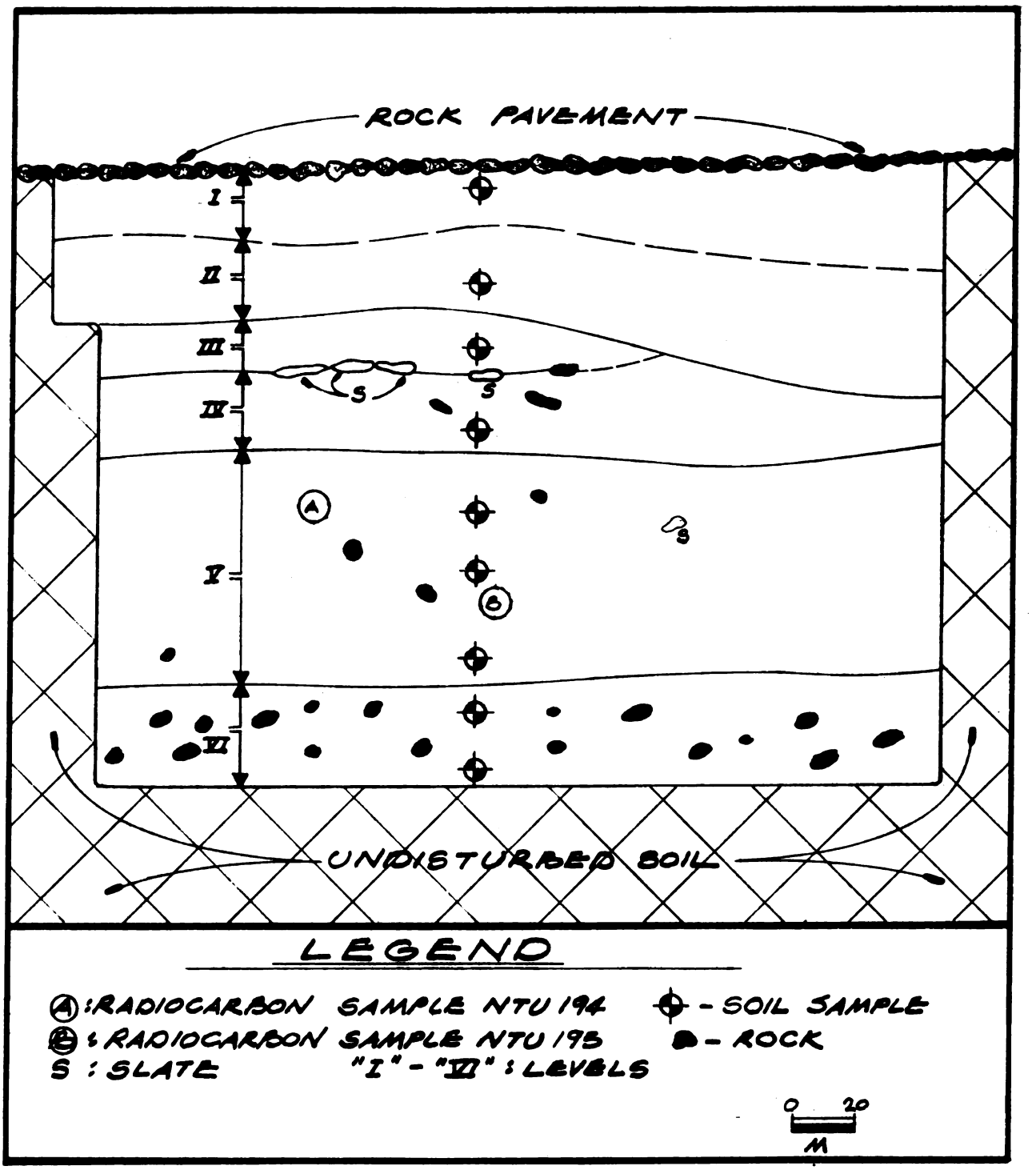


Fig. 15 Site P.L. 21, profile drawing of west wall in test pit C

placed in the center of the mound. Excavations in pits A and B reached sterile soil at 80 cm. The stratigraphy and the artifacts from pits A and B showed no sign of more than a one time period being represented. Test pit C, however, uncovered six different stratigraphic levels above the sterile gravels that lay at a depth of 230 cm (Fig. 15). Test pit D was a 1-1/2 by 1 m enlargement on the southwest side of test pit C. Soil samples for pollen analysis were taken from test pits A, B and C. All but the earliest levels in pit C contain similar ceramics classes and probably date to the same time period. The ceramics from level 6, at the bottom of the pit, differ in frequency from those found in the later levels. The fact that several SWK LBG/C sherds, the index type of sherds found in sites from the Shuiwaku Period, are also found in level 6 suggests that the site was first occupied in Shuiwaku times and then again later in Tamalin times (see TML LBG/C and LBG/M, Appendix B). The majority of the 4,555 sherds recovered from this site date to the Tamalin Period. In fact, only 27 sherds from other sites are classified as sherds of the classes found at Ta-ma-lin. In broad terms, the gray ceramics found at Ta-ma-lin are similar to the gray wares found in other areas of central Taiwan (Chang 1969:206) and P'uli Basin. More specific ceramic traits, however, tend to isolate site 21 at Ta-ma-lin from the other

sites in the basin. This isolation was probably due to a temporal difference.

The full range of stone artifacts recovered in the overall survey were also recovered at site 21. Stone hoes accounted for only 13 percent of the lithics recovered, but trapezoid, spatula, rectangular, oval and waisted examples were found. K'o halberds made both from sandstone and slate were uncovered. Adzes, net sinkers (both grooved and notched) and rectangular reaping knives were discovered. Awls made from slate, nepherite and shist were located. Also of interest were sixteen quartz flakes found scattered through the levels of pits C and D. The most striking find from this site, however, was 49 projectile points and 13 partially completed blanks or cut slate fragments. Twenty-six percent of the lithics recovered were points or point fragments. Willow-leafed, triangular and tanged examples are all present at this site (Figs. 38, 39). Unique to this site was the find of three "boot-shaped" pieces of polished slate (Fig. 41). Their function is unknown. Interviews with local residents revealed two large collections made by amateurs. One collection from this area, made by Hsieh Tien-hua, consists of close to a thousand artifacts. A long-time resident of the area, Mr. Hsieh claims to have recovered artifacts from most of the construction sites in the last fifty years. He estimates that eighty stone cists

have been destroyed on the southeast end of the Ai-lan terrace. Another neighbor, a competing collector, claims to have cleared approximately thirty cists from his and surrounding property. Both men agreed that most of the cists were empty, although occasionally one would contain pottery or worked stone. They also confirmed the general east-west orientation. Hsieh claimed that the cists were wider on the east end and narrower on the west end, to accommodate extended burials with the feet to the west and the wider shoulders to the east.

Site 21 was undoubtedly a large village where a variety of subsistence and community activities took place. The level land around the site with its thick, fertile soil cover is ideal for agriculture. Streams and a spring provide water and fishing resources. This site is also located at a natural crossroads where the Nan-chiang stream flowing east to west is joined by the T'ao-mi stream which flows north from the mountain basins located to the south. Ta-ma-lin was the largest and most productive site located in the P'uli Basin.

Another site of extreme interest is number 30, located on the northeast corner of the Ai-lan terrace (Fig. 16). The site is located in a modern cemetery. Workers excavating dirt to pile over the tops of modern Chinese graves had encountered three slate, stone burial

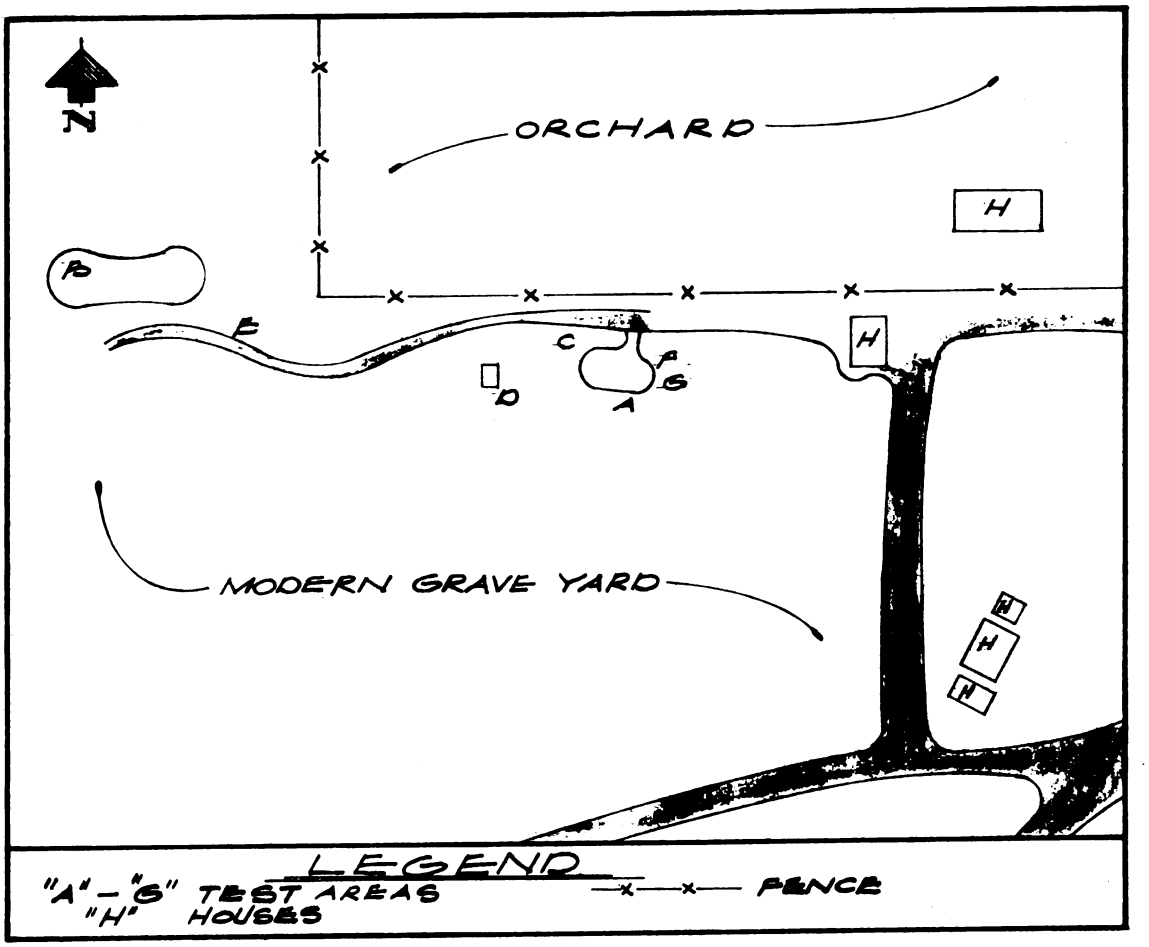


Fig. 16 P.L. 30

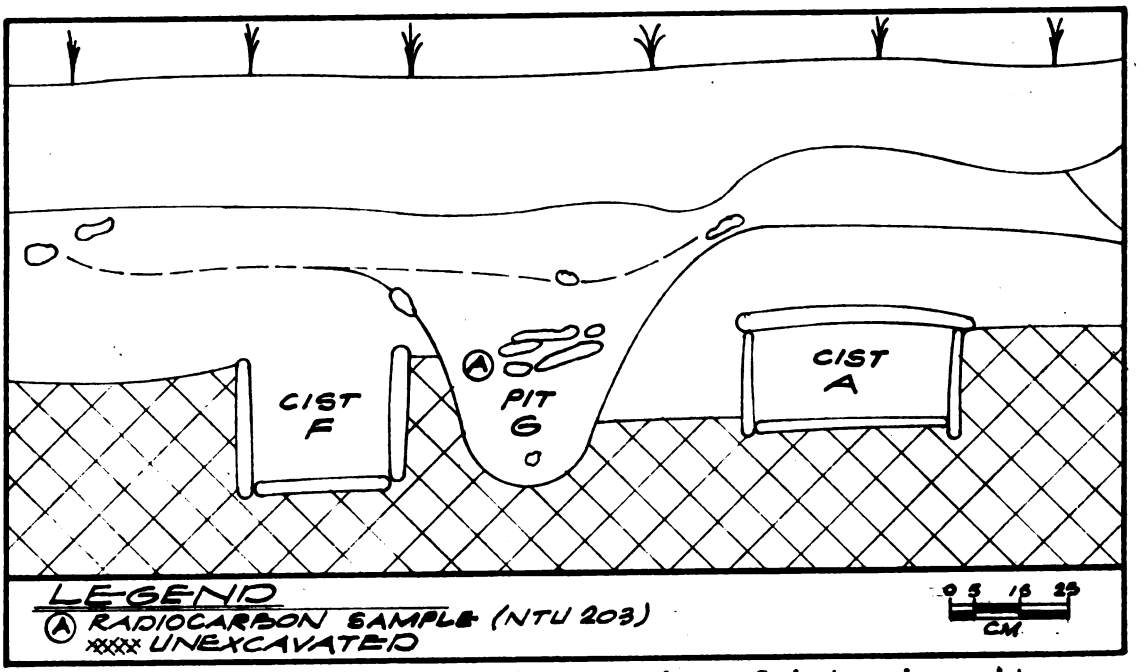


Fig. 17 Site P.L. 30, profile drawing of intrusive pit between burial cists A and F.

cists. A closer search and test excavations uncovered five rectangular cists, one intrusive pit and two areas with concentrated horizontal slate slabs. The maximum cist measurement in cms were:

Feature (cist)	Height	Width	Length	cm below surface
30A	36	51	179	72
30B	25	54	189	65
30 E-1 (disturbed)	20?	36?	150?	50
30 E-3	37	43	170	22
30 F (disturbed)	28	45	?	72

All of the cists were oriented east and west and made of slate slabs with both covers and bottoms. Cist 30B had a 4 cm hole in the center of the bottom. Liu (1956:83) illustrates an example from Ta-ma-lin with a hole in the cover. All of the cists had filled with fine soil that washed in through the joints. No bones or grave goods were located in any of the cists. An intrusive pit 46 cm wide and 56 cm deep was located between cists 30A and 30F. The top of the pit was on a level equal to the cultural materials found above cists 30A and 30F (Fig. 17). From this pit several waste flakes, one hoe, one polished slate k'o halberd, an adze, four slate fragments and five river pebbles were recovered. A radiocarbon sample from this pit was dated at 3207 $\pm$ 96 (NTU 203). The associated stone cists were at

least this old or older. Two other radiocarbon dates came from areas with concentrations of horizontally-laid slabs. It was thought that these slabs may have been the remains of house floors or living areas. Structural remains, however, could not be located. The floor in 30C-2 was dated to 3282 ± 98 BP (NTU 201). This was the earliest date obtained from the survey. Another possible floor (PL 30 D-2) was dated to 2994 ± 90 (NTU 202). The ceramics from site 30 are of the SWK LBG/C and SWK YO/C class, both of which are characteristic of the Shuiwaku Period. The stone artifacts suggest that both agriculture and fishing were practiced. The importance of this site is that it not only provides several more examples of burial cists but also provides dates for the ceramics found in the Shuiwaku style.

The Nan-chia stream cuts through the 450 m terrace isolating the Ai-lan portion in the center of the basin from a section that merges with the slopes on the south rim of the basin. Located on this southern terrace is site 2. The site is level, with thick soil cover. Water resources are located to the north and east from the year-round streams--the Nan-chiang and the T'ao-mi. The recovery of net sinkers (21 percent) suggests that fishing was important. Trapezoid, spatula, rectangular and oval shaped hoes constituted 42 percent of the stone tools

recovered. One grooved pebble, one worn quartz crystal and a rectangular reaping knife were also found. A small stone cist was found. The base slab was 27 cm wide and 60 cm long. There was no cover stone and the sides leaned in, touching at the center to form a triangular cross section. Vertical slabs were placed at both ends. The orientation was east and west. Three rectangular hoes and seven SWK LBG/C sherds were found in the fill around the cist.

South and east of site 2 is a mountain spur that juts north into the basin. On the east side of this spur was located a small flat area with artifacts on the surface. The area was designated site 34. The surface collection produced two spatula hoes, three flakes, one slate k'o halberd and three grooved net sinkers. A 1 by 1 m test pit near the center of the site contained a rectangular cist 95 cm below the surface. The cist was on an east-west orientation. The length was 200 cm, the width 65 cm and the depth 32 cm. Eight H LBG/C sherds were recovered. The thin scattering of artifacts suggests only a short occupation time for the site.

Immediately south from the previous site is a small hill which is being eroded by a tributary of the Nan-chiang stream. Protruding from the face of the cliff was half of a stone cist. The area was designated site 31. A surface

survey in the area recovered seven hoes, two net sinkers (one grooved and one notched) and one k'o halberd. No ceramics were recovered. The local farmer said that in clearing the land he had thrown many hand-sized pieces of worked stone over the cliff. The stone cist measured 30 cm high, 46 cm wide and 104 cm long. It may well have been longer, but the eastern end is now missing. The area was probably occupied as a living site at least briefly. The gentle hill could easily have been farmed and the nearby streams fished.

Zone 5. This sampling zone is found mainly on the eastern half of the basin. It is made up of old flood plains or river terraces with no laterite soil cover. The general slope is from east to west. In this sampling zone only two sites were located.

Site 23 was located south and east of the town of P'uli in a brickyard. Excavations for clay had uncovered a "stone box" which contained what the owners described as a semi-lunar knife, a polished adze, two bracelet cores and a piece of worked stone. The description of the stone box fits the rectangular stone cists found elsewhere in the basin. The cist was estimated to have been 180 cm long. This site has since been totally destroyed by the mining of clay for bricks.

Site 46 is located on a very rocky, terraced area in the southeasternmost corner of the basin. Only two

artifacts were found: a small stone hoe and a worked slate fragment. These artifacts may well have been discarded by peoples just passing through the area, for no concentration of artifacts or soil color change was noted.

Zone 6. This is the lowest zone in the basin; it includes the recent flood plains and is lower than zone 5 by 2-5 m. There is no laterite soil cover and the slope is from east to west. Only one site was located in this zone.

Site 45 was a stone cist in a Korean apple orchard. The orchard is on top of an alluvial fan formed by a stream which descends from between two steep mountains. The cist was roughly square, 50 x 42 cm. The depth of the slabs (there was no bottom) was 80 cm. A local farmer who had dug others in the same area said they had been made by aborigines at the turn of the century. He claimed to have witnessed the burial of an aborigine in a similar cist. The body was placed in the cist in an upright, flexed position.

Summary of Survey Results

The total survey located 28 sites or artifact concentrations. The most heavily occupied area was the river terrace in zone 4, where ten sites were located. Figure 18 lists the sites found in each zone. No correlation could be shown for sites from different time periods being located

Zone	Sites by Identifying Number	Total
1	24, 27, 36, 37, 38, 39 and 40	7
2	-	0
3	25, 28, 35, 41 and 44, 19, 32, 33	8
4	29, 42, 43, 22, 26, 21, 30 2, 34, and 31	10
5	23 and 46	2
6	45	1

Fig. 18. Sites located in each of the sampling zones.

in any particular sampling zone. The preferred site locations were near streams or sources of water, on relatively level ground, in an area with good soil cover.

Chronology of the P'uli Basin Archaeological Remains. Fourteen charcoal samples were recovered and submitted for radio carbon dating (Fig. 19). The resultant dates combine with the ceramic analysis (Appendix A) in distinguishing three major temporal periods of occupation for the P'uli Basin. On the basis of stylistic similarity, the following periods were isolated: Shuiwaku Period (1332-431 B.C.), Tamalin Period (247 B.C.-A.D. 167), and Modern Period (A.D. 1500-present) (Fig. 20). These periods generally correspond with Chang's (1974:272) Tamalin Phase (1500 B.C.-A.D. 700) and Historic Phase (A.D. 1650 to present). The Shuiwaku and Tamalin Periods designated for

Number	Locality	B.P. (Half-Life = 5570)	B.C. and A.D. (Half-Life = 5570)
NTU-201	P'uli 30, C-2	3282 ± 98	1332 ± 98 B.C.
NTU-203	P'uli 30, G	3207 ± 96	1257 ± 96 B.C.
NTU-202	P'uli 30, D-2	2994 ± 90	1044 ± 90 B.C.
NTU-200	P'uli 29, B-3	2381 ± 71	431 ± 71 B.C.
NTU-196	P'uli 21, D-3	2197 ± 66	247 ± 66 B.C.
NTU-195	P'uli 21, D-5	2104 ± 63	154 ± 63 B.C.
NTU-194	P'uli 21, C-4	1846 ± 55	A.D. 104 ± 55
NTU-193	P'uli 21, B-4	1837 ± 55	A.D. 113 ± 55
NTU-192	P'uli 21, A-4	1783 ± 53	A.D. 167 ± 53
NTU-197	P'uli 37, B		Modern
NTU-198	P'uli 37, C		Modern
NTU-204	P'uli 19, A-1		Modern

Fig. 19 Radiocarbon dates from the P'uli Basin

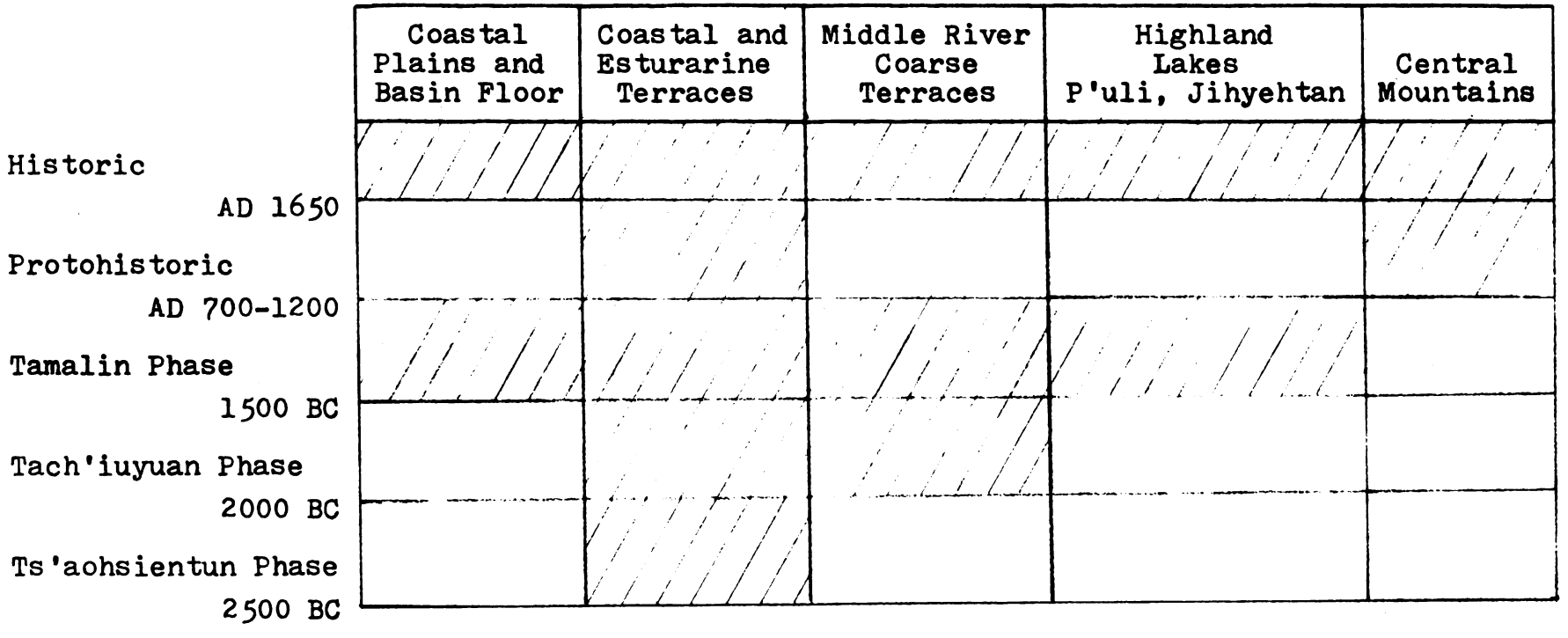


Fig. 20 Cultural phases in Westcentral Taiwan (after Chang 1974:272)

the P'uli Basin are grouped together by Chang as the Tamalin Phase.

Shuiwaku Period. This period is chiefly characterized by the presence of SWK LBG/C pottery. Examples of this pottery type are found at sites numbered PL 19, PL 21C-6, PL 28, PL 29, PL 30 and PL 38.

The earliest date for this period comes from PL 30C-2 and dates to 3282 ± 98 BP (NTU 201). The sample was recovered from what appeared to be an occupation level 42-55 cm from the surface in good association with horizontal slate slabs, SWK LBG/C pottery, flaked and polished tool fragments and burial cists (PL 30A and F). Another sample from an intrusive pit between the burial cists (PL 30A and F) yielded a slightly more modern date of 3207 ± 96 (NTU 203). A third date of 2994 ± 90 (NTU 202) from PL 30D-2 is also found in association with the same pottery and tool types. The site seems to have been occupied over at least a 288-year period, although it was not determined if the occupation was continuous or reoccurring. A similar pottery and lithic assemblage is also found at PL 29. The single radiocarbon charcoal from this site (PL 29B-3) dates to 2381 ± 71 BP (NTU 200). From that level and the level below came several polished adzes, polished slate arrow points, reaping knife fragments, flaked hoes, double-grooved net sinkers and polished slate

k'o halberd fragments. The suggestion is that the site had been occupied for several years before the dated level.

A surface collection and text excavation at PL 38 produced only SWK LBG/C sherds. Although the stratigraphy showed two different stratigraphic levels, the artifact inventory was the same. Even though stone hoes predominated, polished k'o halberds, adzes, reaping knives and a net sinker were also found. Of special interest were five flaked hoes which were much smaller (average 9 cm x 4.5 cm x 1.4 cm) than most of the others found in the basin.

Another important site from this period was PL 28, located on the slope behind (and probably under) the Chieh Ling Temple in Hsiao-p'u-she. Although only 65 potsherds were recovered, they represent four different types, all characteristic of the Shuiwaku Period. This site was most important, however, because it yielded 157 lithic artifacts which help us to show the range of variation in the lithic tool types for this time period.

At PL 21 several SWK LBG/C sherds were found scattered through the various levels, suggesting that this style of ceramics continued in a very minor way after the Shuiwaku Period. The majority of this type, however, came from the lower levels; 78 percent of those recovered from PL 21C test pit came from the lowest level.

Tamalin Period. Possibly the largest and unquestionably the most productive site in the basin in Ta-ma-lin (PL 21). In the 1972 excavations, three test excavations were made across the street to the southwest from Hsieh, Tien-hua's drugstore. Test pit A-B was on the level ground, pits C and D were on the top of a 2 m mound. The earliest date for the site is 2197 ± 66 BP (NTU 196) from test pit D level 3, 70 cm from the surface. This date is somewhat out of sequence with two other dates from test pit C immediately to the east that came from levels 4 and 5 at 125-150 cm and 150-180 cm, respectively. The level 4 date is 1846 ± 55 BP (NTU 194) and the level 5 date is 2104 ± 63 BP (NTU 195). No particular disturbance was noted in direct association with any of the samples, although ants were noted as far down as 110 cm and roots at 115 cm. Perhaps the D3 sample was disturbed by the later inhabitants of the site. The date itself seems to fit fairly well with the others for the site in general, but it seems to be out of sequence for that profile. Two additional dates were derived from a shallow test pit (PL 21A-B) west of the mound. The date from the east end of the trench was 1783 ± 53 BP (NTU 192); the date from the west end was 1837 ± 55 BP (NTU 193).

Previous to 1972 the remains from Ta-ma-lin have been dated by comparisons with the site of Ying-p'u 40 km

downstream, which yields similar pottery. The dates from Ying-p'u are 2970 ± 80 BP, 2810 ± BP and 2250 ± 60 BP (Chang 1969:206). The dates recovered in 1972-73 from Ta-ma-lin are later in time than those from Ying-p'u. It must be remembered, however, that these dates did not come from the earliest levels, suggesting an earlier beginning date for the Tamalin Period. The fact that Ta-ma-lin is in the uplands away from the mainstream of coastal cultural activity also makes it conceivable to picture the Ta-ma-lin portion of the Ying-p'u horizon as exhibiting a certain amount of cultural lag, therefore coming a little later in time. It appears that the Tamalin Period began sometime after or toward the end of the Shuiwaku Period by at least 249 B.C. and lasted until at least A.D. 167, but probably longer.

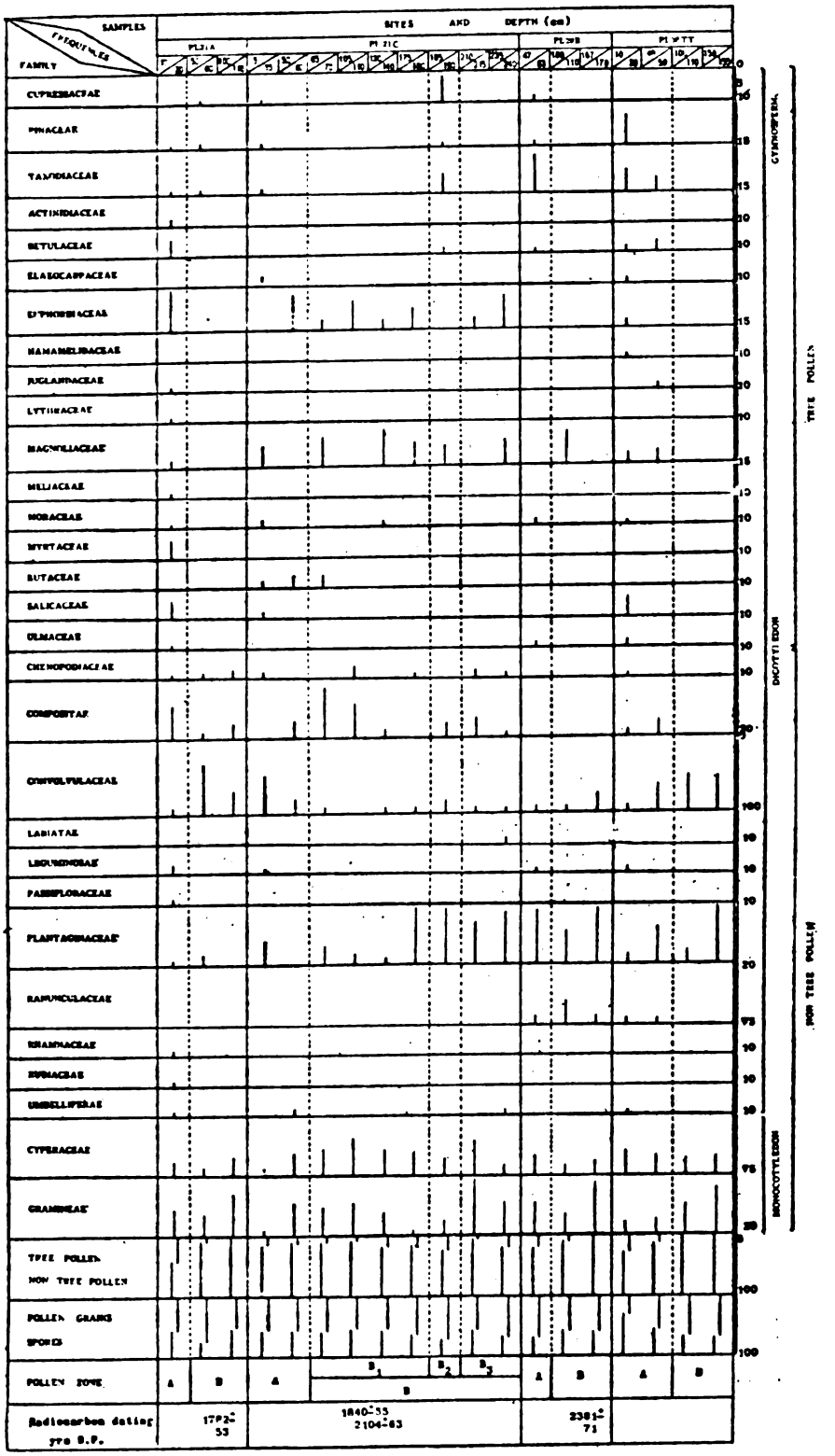
It is difficult to explain why during this period Ta-ma-lin is the only site to be found that exhibits its unique ceramic inventory. The lithics from this period in general (with the exception of the long arrow points and the tanged arrow points) are quite similar to those from previous and later periods.

Modern Period. Two sites that produced "modern" dates share in common with five other sites a type of pottery named Hsü--light brownish gray, coarse (H LBG/C). Sites with this type of pottery include the Hsü site (PL

19), PL 33, PL 34, PL 41, PL 43 and PL 45. These sites share a common lithic inventory with the previous periods although hoes and net sinkers predominate. There is a higher percentage of discarded flakes and cores from PL 19. Another unique feature for this time period is the appearance of smaller, more rectangular burial cists. Examples of this type of cist are found at PL 19 and PL 45. Early Chinese settlers observed these burial cists being used by aborigines in the area. The excavations around the burial cist at the Hsü site which produced one of the "modern" dates also produced a small metal tobacco pipe, probably a trade item from the coastal Chinese.

Although the lithic inventories from all the P'uli sites are basically the same (with some minor variation), the ceramics break down into three main divisions. From the radiocarbon dates we have been able to fix these three divisions into a temporal sequence: the Shuiwaku Period, the Tamalin Period and the Modern Period.

Pleistocene and Holocene Vegetational Sequences in the P'uli Basin. In an attempt to answer the questions raised concerning the proposed shifts in the vegetational cover of central Taiwan (hypotheses 1 and 3) during the last 15,000 years, soil samples were collected from the different levels at all of the test excavations in order to extract pollen samples and from them reconstruct the



Pollen diagram of 19 samples from 3 sites of P'u-li Basin, central Taiwan. Percentage of pollen and spore based on the total palynomorphs and percentage of TP and NTP based on the sum of (TP+NTP)

Fig. 21

vegetational history of the area. The assumption was made that if there was a loss of tree cover in the Jihyüehtan Basin that a similar phenomenon would occur 11 km (7 miles) to the north in the P'uli Basin.

Samples from three sites, PL 21, 29 and 38 (including the underlying sterile soil), and a control core drilling were submitted to Dr. Huang, Tseng-chieng and Chung, Thein-fook of the Pollen Laboratory, Botany Department, National Taiwan University. Extraction of fossil palynomorphs was made by using the Chung and Huang (1972) method. A minimum of 500 grains of palynomorphs were counted for each sample. For observation and identification, the Olympus Photomax microscope and standard references (see Chung, Huang and Stamps 1973: 186) were used. About 7,000 microfossils were extracted and identified from the 19 samples at the three sites. More than 5,000 of them were pollen grains and fern spores and about 2,000 were fungi spores. Due to insufficient references for the fungi spores, they were not identified. The palynomorphs of 3 families of gymnosperms, 25 families of dicotyledons, 3 families of monocotyledons and 7 families of pteridophyte were identified.

The pollen diagram (Fig. 21) was constructed by using a sum of the total fossil pollen grains. From the pollen diagram, non-tree pollen (NTP) was observed to be

generally abundant (averaging over 70 percent) in all assemblages. Two pollen zones, i.e., zone A and zone B, can be classified according to the pollen spectra. Zone B can be subdivided into three subzones: B_1, B_2 and B_3. Zone A, which comes from the surface level of each site is characterized by subtropical vegetation with few temperate forest elements, namely pollen grains of Pinaceae, Betulaceae, Magnoliaceae, Euphorbiaceae, Rubiaceae, Leguminosae and Convolvulaceae. Zone B, which comes from the lower levels of the sites, can be divided into three palynomorphic zones: in subzones B_1 and B_3 mostly NTP grains, such as Convolvulaceae, Plantaginaceae, Compositae, Cyperaceae, Gramineae and Chenopodiaceae were observed; in subzone B_2, which is found only at PL 21C (185-190 cm from surface on the C5, C6 level boundary), tree pollen (TP grains such as Pinaceae, Taxodiaceae and Betulaceae) was found quite abundantly. Fern spores of Cyatheaceae, Pteridaceae, Gleicheniaceae, Schizaeaceae, Blechnaceae, Davalliaceae and Adiantaceae were found abundantly in all levels.

Results of the pollen analysis show that for zone A (approximately A.D. 1500 to present) the land has sustained both crop cultivation (indicator plants: Ipomoea spp. and cereal) and tree plantation (indicator plants: Cryptomeria, Cunninghamia, and Pinus). Subzone B_2 (sometime

before 154 B.C.) also shows a similar pattern of tree cover but without the obvious cultivated crops. Subzones B_1 and B_3 are represented mostly by shrubs or herbs. The data obtained from all the profiles at all the sites show that deforestation occurred previously to zones A and B. The earliest date in association with zone B is 2881 from PL 29B-3. The samples taken from the archaeologically sterile soil beneath each of the sites show that the vegetational shift from tree pollen to non-tree pollen had already taken place and did not coincide with the appearance of or shifts in human artifacts.

Partial results from the Yu-chih control site, Wai-chia-tao-keng profile show that forest vegetation is found at a depth of 8.4 m, which has been dated to 25,000 BP (Chung et al. 1973:188). At the 8.4 m depth TP was dominant with Tsuga, Abies, Picea, Betulaceae, Fagaceae, Elaeocarpaceae, Euphorbiaceae Trapa and genera Cyperus, Carex and Scirpus of the Cyperaceae. The plant community of this sampled area showed a warm to cool climate condition. Two other samples from the Wai-chia-tao-keng profile were taken, one from a depth of 7.9 m and another from a depth of 5.9 m. The results of these two samples show a temperate to subtropical forest condition with such components as Betulaceae, Fagaceae, Hamamelidaceae, Aquifoliaceae and Pinus. From these samples there was no

significant indication that the forest pollen assemblages (found at 8.4 m) had been destroyed or that there was any direct evidence for man's cultivation of this land. It was noted, however, that TP grains decreased slightly in number toward the surface from the depth of 7.9 to 5.9 m. The detailed results of the Wai-chia-tao-keng profile are eagerly awaited.

CHAPTER VI

CONCLUSIONS

Cultural History of the P'uli Basin. The earliest remains found in the P'uli Basin fit into what has been designated as the Shuiwaku Period (Fig. 3). By 1322 B.C. and possibly a few hundred years earlier, we find scattered settlements on the terraces above the year-round streams. The sites are on generally level ground, with good soil cover, near reliable water sources. The extensive artifact inventory appears on the scene full blown, with no signs of a local developmental sequence. The ceramic industry for this time period includes seven different types of pottery: Shuiwaku light brownish gray, coarse and fine; Shuiwaku yellow orange, coarse and fine; Hsiao-p'u-she brownish orange, medium and fine; and P'uli gray sandy, medium (see Appendix A). The lithic inventory includes: flaked stone hoes, reaping knives (rectangular and crescent), net sinkers (notched and grooved), adzes, k'o halberds and arrow points. The hoes, knives and adzes, along with the site location near streams with level ground and good soil, suggest agricultural activities. This correlates well with the findings of Chang (1969:64, 220;

1974:50) and Treistman (1972:74) who infer grain cultivation from the finds of agricultural tools. Adzes used for wood cutting, hoes used for earth moving and soil preparation and reaping knives used for cutting grass are all well recognized elements in the Lungshanoid tool assemblage found in Taiwan and coastal southeast China. Grain impressions on pottery (Chang 1969:220) suggest that millet or rice was cultivated. Treistman (1974:74) in talking with the local Bunun aborigines in central Taiwan found that they recognized the stone hoes found archaeologically as tools used by their ancestors. Chen, Chi-lu (1968:19-31) in discussing the agricultural activities of Taiwan's aborigines notes that the following varieties of plants were cultivates: cereals--three types of millet, sorghum, maize, Job's-tears, dry rice and goosefoot; five types of beans and peanuts; five tuber or root crops including sweet potato, taro and yams; three types of stimulants; fifteen fruits; three condiments; three plants for fiber; and seven others including sugarcane, bottle-gourd, sponge-gourd, bamboo, etc. Chen further notes that the aborigines cultivate their land chiefly by the slash and burn method.

The fact that so few grind stones were found suggests that the grains that were produced were not ground into flour, but were instead prepared by pounding them with

a wooden pestle in an hour-glass shaped mortar made from the trunk of a tree (see Chen 1968 fig. 8). Cereals were first pounded, then boiled in ceramic pots to make a porridge. In boiling cereals, vegetables, salt and other condiments were sometimes added. Starchy tubers, which were important in the aborigine diet, were either boiled or baked (Chen 1968:59).

The net sinkers and arrow points found suggest that fishing and hunting also contributed to the people's diet. The forests abound with deer, water-deer, bear, squirrels, bat, civet, mountain cat, macaques, badger and marten (Ch'en 1969:note 2). These animals are an important supplement to the diet of the modern mountain people and would have been a valuable resource to prehistoric peoples of the area. The lakes and rivers also contain a large number of food fishes--carp, white fish, silver fish, loach, croaker, catfish and swamp eel (Chen 1969:note 2) which the aborigines catch with nets, scoop nets, hooks, traps, arrows or poisoning. For the Thao tribe that now lives on the shores of Jihyüehtan (Sun Moon Lake), fishing is an important part of their staple diet. The high percentage of net sinkers found suggests that this resource was important to the prehistoric people also.

Stone cists capable of accommodating extended burials were also found from this period. Not enough

difference was seen among the burial cists of this period, however, to suggest any major social or economic stratification among these people.

The basin was probably first populated during the Shuiwaku Period by small, scattered but interacting (as suggested by the similar artifacts) hamlets of farmers. There was probably frequent movement of the hamlets as suggested by the time gaps between the radiocarbon dates at PL 30. This may be due to the practice of shifting cultivation or slash and burn agriculture. The settlement location in addition to the artifact inventory suggests that grain agriculture supplemented by hunting and fishing were the subsistence base of the people.

In the Tamalin period there were important changes taking place. Changes in settlement patterns, stratigraphy, vegetation and material culture are noted. There was a coalescing of small hamlets into large villages. A noted change in the stratigraphy at PL 21C-6 to C-5 suggests that something happened at this time. The soil in level C-6 was very rocky, while level C-5 contained fewer rocks and had a high clay content. A change in the frequence of ceramics is demonstrated by a loss of almost all of the Shuiwaku light brownish gray, coarse pottery and the Tamalin light orange, coarse; at the same time, all of the other pottery types register an increase. It should also

be remembered that at this time there was a slight shift in the pollen profile to the B_2 zone which reflected more forest-tree vegetation. The site was probably abandoned at the end of level C-6 at which time it lay fallow allowing the forest to regenerate itself. Then in C-5 times it was reoccupied and never allowed to return to forest. This dominant site was located just south of the center of the basin on the terrace overlooking the convergence of the Nan Chiang River and the Tao-mi stream. A similar lithic industry (with only the addition of a few new arrow point variations, tanged and serrated) suggests a subsistence pattern similar to the previous period as discussed above. Stone burial cists are abundant and varied in size. Content and energy expended in the preparation of the burial cists varies greatly. Ceramic types increase to ten, and the total sherd density also increases. All of the ceramic types are similar to the Yingp'u ceramics as defined by Chang in 1969 (p. 205), or the Gray-Black pottery as redefined by Chang (p. 50) in 1974.

As mentioned above, it appears that the Tamalin Period represents a shift in the settlement pattern from scattered hamlets to a larger, more centrally located village. The fact that this shift seems to coincide with the new input in the ceramic record of Yingp'u elements may or may not be causal. Did a few people come in from

the coast, overpower and unite a few hamlets and force out the others? Was there an indigenous, local development that culminated in the development of a larger village at Ta-ma-lin, with self-fostered contacts with the coast? Whatever the case, during the Tamalin Period the Ai-Lan terrace seems to have been an area of comparatively high population density. This suggestion is supported by the abundance of artifacts as well as by the large number of burial cists. Interviews with two local collectors revealed that they were aware of approximately 110 cists that had been uncovered. If the general assumption is correct that differential burial customs are an indication of social stratification (Brown 1966; Saxe 1968), then we can suggest that at least a certain amount of social stratification was present. Some burials were extremely simple, while others displayed varying degrees of luxury in grave goods (pottery, stone tools, etc.).

Following the Tamalin Period, the archaeological record is ellusively blank until the Modern Period. At this time several smaller, widespread sites again appear on the terraces around the basin. Hsü light brownish gray pottery predominates, with lesser amounts of Shuiwaku yellow orange and some Shuiwaku light brownish gray, coarse. The lithics are not as well represented; i.e., stone hoes and grooved net sinkers are most abundant. During this time

we find not only rectangular burial cists but also smaller square cists for upright flexed burials. Local informants recall the use of these square cists as recently as forty years ago.

Several artifacts recovered from the survey were taken to Chung-Chen-tsün, a Bunun village southeast of P'uli, for possible functional identification by the people. Although these tools are not in use today, they were known to the older people and recognized as tools used by their ancestors. The crescent reaping knives were said to be "for cutting grass," the hoes for digging, the spindle whorl for making thread and a long arrow fragment for use as a knife. The net sinker was thought to be a head ornament, and the waste plug from the center of a drilled earring was thought to be money. The general conclusion of the author was that the Bunun people were directly or indirectly the descendants of the peoples found archaeologically in central Taiwan.

Review of the Hypotheses. At this point we will reexamine the original hypotheses in light of the new data in an attempt to accept, reject or modify them as they do or do not conform to the test implications.

Hypothesis 1: As a result of swidden-type root and fruit agriculture in the uplands of central Taiwan there was a change in the ecosystem at about 9000 B.C.

The first test implication (TI-1) stated that if such a change did occur, we would expect to find a change in the vegetation from the original primary forests to secondary growth, reflected in the pollen record. This test implication at present cannot be accepted or rejected because our pollen record from the excavated sites is too recent. The forthcoming results from our central core at Wai-chiao-tao-keng hopefully will shed new light as to the date of the shift from original tree pollen to non-tree pollen and the rate at which it occurred. The shift from TP to NTP took place before the settlement of the earliest of our test sites. The pollen zone from the archaeologically sterile soil underlying each site already displayed NTP vegetation. This test implication must be held as neutral until further data becomes available.

The second test implication (TI-2) stated that if there were swidden agriculturists in the area at 9000 B.C., archaeologically we should find sites dating to that time period. Our intensive survey of the P'uli Basin and all of its various land forms did not produce any datable remains to this time period. Although the problem of sampling error is always present--either due to the destruction of ancient sites by modern occupants or to human error on the part of the surveyors--the conclusion is that there were no sites dating to 9000 B.C. in the P'uli Basin. This

evidence strongly suggests that the Basin was not occupied before 9000 B.C. Thus we must reject the second test implication. The fact that Liu and Liu (1957) and Sun Pao-kang (1973 personal communications) did not find materials dating to 9000 B.C. in the Yu-chih and Jihyüehtan Basins immediately south of the P'uli Basin tends to support this conclusion.

The third test implication (TI-3) suggests that if the people who occupied the area at 9000 B.C. were swidden agriculturists there should be swidden-related tools in the artifact assemblage. For lack of an artifact assemblage from this period, this test implication is also rejected.

Given the results of the test implications, Hypothesis 1 is rejected because there is no verification of the fact that the swidden agriculturists who were to have caused the TP to NTP change in the vegetation were in this area. Verification of the TP to NTP shift itself is still forthcoming (see TI-1 above).

Hypothesis 2: The swidden root and fruit agriculturists responsible for the 9000 B.C. vegetational change at Jihyüehtan were related to the Corded Ware peoples seen archaeologically at Feng-pitou and Tapenkeng.

The first test implication (TI-1) states that if the people who caused the vegetational change in central

Taiwan were related to the Corded Ware peoples in other parts of Taiwan, similar cord-marked ceramics should appear in the archaeological record of the area. This test implication, like the previous hypothesis, is rejected on the grounds of negative evidence: no concentrations of coarse cord-marked pottery were found.

The second test implication (TI-2), which holds that the lithic inventories should be similar if there is a direct connection between the Corded Ware peoples of southwestern and northern Taiwan with those in the central uplands, is rejected on the same grounds as TI-1.

With the rejection of both test implications, this hypothesis is also rejected. The Corded Ware peoples located in other areas of Taiwan cannot presently be shown to have occupied the P'uli Basin. This is not to exclude, however, the possibility of isolated groups which may have been in other areas of central Taiwan.

Hypothesis 3: As a result of Lungshanoid agriculturists moving into the uplands of central Taiwan, there was a change in the local vegetation about 2500 B.C.

The first test implication (TI-1) suggests that if there were an influx of village farmers into the uplands, we should notice a change in the palynological record to refelct an increase in grass or cereal pollen and related plant forms at about this time. This test

implication was neither rejected nor strongly supported. There was no distinct change in the pollen profile between the sterile soil beneath the sites and the soil in the lowest levels of the sites. The vegetation cover was mainly shrubs and herbs. The steep increase in grass pollen that Tsukada noted at Jihyüehtan (1966:546) was not noted in P'uli, even though its presence along with Chenopodiaceae was observed (Chung et al. 1973: table 4). Liquidambar, which Tsukada also associated with intensified agricultural activities, was noted only in a modern context from the P'uli profiles. Thus this test implication is neither accepted nor rejected, but neutral.

The second test implication (TI-2) states that if there were an influx of people at this time, then there should be an increase in the number of sites and artifacts in the archaeological record. Although the time sequence is somewhat later (1332 B.C.), the Shuiwaku Period does exhibit a sharp increase in the number of sites widely distributed over the basin. This test implication is supported, although the time of the influx of people into this area must be modified to a period approximately 1000 years later.

The third test implication (TI-3) says that if there were an influx of peoples, the sites and artifacts would differ from those of previous periods. This test

implication was deleted because a previous occupation could not be demonstrated.

Test implication four (TI-4) stated that if the population were involved in cereal grain agriculture, we should expect to find a proportionally higher percentage of tools that relate to the production and use of cereals, like reaping knives, hoes, grindstones, etc. This test implication is strongly supported by the fact that reaping knives and hoes have been found from all of the larger sites (see artifact descriptions from individual sites in Chapter V). Grinding stones were less prominent, but examples were seen at Ta-ma-lin (PL 21) and the Hsü site (PL 19).

Test implication five (TI-5) deals with ceramics, stating that if the village farmers in the P'uli Basin were related to the Lungshanoid peoples, we should find similar ceramic shapes, decorative motifs and manufacturing techniques. This test implication is also strongly supported by the P'uli survey. The ceramics from the P'uli Basin share similar shapes, manufacturing techniques and surface decorations with the Lungshanoid sites in central and southwestern Taiwan (see Appendix A).

The sixth test implication (TI-6) suggests that, as in ceramics, also in lithics there should be similarities if the P'uli population is an extension of the Lungshanoid

peoples on the west coast of Taiwan. This test implication is strongly confirmed. Size and shape of hoes, adzes, k'o halberds, arrow points, stone knives and net sinkers support the relationship between P'uli and the Lungshanoid populations of west Taiwan.

A review of the test implications for Hypothesis 3 shows that TI-1 was neutral, TI-2 was confirmed (but modified), TI-3 was deleted, TI-4 was confirmed, TI-5 was confirmed and TI-6 was confirmed. The result was a modification of Hypothesis 3: there was a movement of Lungshanoid agriculturists into the uplands of central Taiwan by at least 1332 B.C., which had at least a slight effect on the local environment.

Significance of the Study. The original goals of this study were (1) to unearth a series of pollen profiles that would confirm at least three marked changes in the vegetational cover (TP-NTP-grass/grain) in the P'uli Basin over the past fifteen thousand years and (2) to explain these changes by demonstrating a shift in artifact tool types and frequencies that reflected changing adaptive subsistence activities. These goals were only partially fulfilled.

The question still remains as to how marked a change in the vegetation cover, if any, did occur 12,000 years ago in the Jihyüehtan area. As mentioned previously, the results

from the Wai-chia-tao-keng profile should be helpful, and the results are eagerly awaited.

If Tsukada's (1966, 1967) reported changes in the floral cover of central Taiwan did occur, what were the causes? It may be that the change in vegetation, which Tsukada dated to 9000 B.C., was the result of a slight climatic shift. Tsukada (1967:62) noted, "distinct evidence of warming climate . . . with a relative rise of the warm-temperate genera and a disturbance (with a steady rise of the total percentage of the secondary forest, shrubs, herbs and Pteridium)." Could the "disturbance" have been caused by the "warming climate" instead of the human activity that has been suggested?

If the proposed 9000 B.C. change in the flora at Jihyüehtan can be verified as having been caused by humans, which group of people were they? As yet, we cannot relate the suggested 9000 B.C. change noted at Jihyüehtan with any particular group of people. Intensive survey by the author in the P'uli Basin and a survey of the Yüchih Basin and upper portions of the Choshui River Drainage as part of the Choshui and Tatu Project failed to locate any evidence for sites dating to the suggested early period (Sun, Pao-Kang personal communication). These more recent surveys tend to support the failure of Liu and Liu (1957) to locate early sites in the Jihyüehtan area.

The suggestion that the proposed change in central Taiwan's vegetation at 9000 B.C. was caused by peoples related to the Corded-Ware Culture noted archaeologically at Fengpitou, in the south, and Tapenkeng, in the north, is now strongly questioned. We are again at a loss for evidence (direct or suggested) as to their exact placement in the chronology of Taiwan's prehistory. Were they earlier or later than 9000 B.C.?

The results of our research also bring into question the subsistence base of the Corded-Ware peoples living in other areas of Taiwan, and by extension, other areas of Asia. Chang (1969:217-218) suggested that their food economy was based upon root and fruit crop horticulture as an intermediate step in the transition from a subsistence base relying exclusively on collected foods to a subsistence base of primarily grain crop agriculture. Again we are faced with an unanswered question: what was the subsistence base of the Corded-Ware peoples? Sauer's (1952:103-104) model as used here by Chang cannot be verified. With our present understanding of Taiwan prehistory, it cannot be used as a case to demonstrate Sauer's hypothesis that root and fruit horticulture generally preceded grain agriculture in the developmental sequence of tropic agriculture. This is not to say that Sauer's hypothesis is invalid, but

merely that the uplands of central Taiwan cannot be used to support it.

The major point of our research appears to be that we must remove the uplands of central Taiwan as a possible supportive example showing Southeast Asia as an independent center wherein the domestication of agricultural crops took place. Supportive, verifying evidence for Professor Chang's hypothesis to demonstrate the independent development of domesticated plants in Taiwan could not be found in the uplands of central Taiwan. The earliest agricultural activities in the area appear full blown on the scene. The discovery of these later Lungshanoid remains in the P'uli Basin appears to fit in well with the cultural sequence for western Taiwan (Chang et al. 1974) which was on the receiving end of peoples and ideas from southeastern China (Chang 1969).

Further research in central Taiwan, especially of an interdisciplinary nature, is of great importance in understanding the development of agriculture in Asia. The lower Choshai and Tatu River Valleys pass through and help create the kind of environment that Sauer (1952) suggested would be the area in which the first farmers in Southeast Asia developed. Chang (1974:50) is "increasingly convinced that the people of Taiwan and the southeastern coasts of China and Indochina, whose cultural inventory is

characterized by Coarse Cord-marked pottery of the Ta-pen-Keng type (Chang 1967), were among the earliest cultivators of Southeast Asia." He now recognizes that the transition from food-gathering to food-producing may well not have taken place in this area, but by working together in an interdisciplinary atmosphere we can gain the necessary understanding of ancient ecosystems and the roles early peoples played in manipulating and changing these ecosystems through their various adaptive strategies. The Corded-Ware culture on Taiwan appears to be part of a wider horizon of Cord-marked pottery sites from Japan through China, south into Indochina (Chang 1970; 1974:50; Watson 1971:9-13). More work must be carried out, however, before the relationship between these areas can be clearly shown. By better understanding the ecosystem and cultural adaptation of the Corded-Ware peoples on Taiwan, we should be able to shed light on the broader questions of the Cord-marked pottery cultures throughout Asia. We are still faced with this question: what were the causes and events leading up to the development of agriculture in this area?

POST SCRIPT

As a result of the 1972-73 field work in the P'uli, Yüchih and Jihyüehtan areas, Dr. Chang (1974:50-51) has

altered his view concerning the archaeological sequence for the area:

> If the P'uli basins (including Lake Jihyüehtan) were not inhabited until this phase [2500 B.C.], and if the people having the Coarse Cord-marked pottery were confined to the coast, then the deforestation shown on Tsukada's pollen core at Lake Jihtan at 12,000 B.P. could not have been caused by slash-and-burn farming of the Coarse Cord-marked pottery people, as I believed (K. C. Chang 1967; K. C. Chang et al., 1969). I refrain from making a final judgement on the matter until there is more excavated material, but the above point should now be noted.

Appendix A: Ceramic Classification

In an attempt to test the hypotheses spelled out in this paper, to establish an internal chronology, to show external affiliations with the surrounding areas and to develop a local cultural history for the P'uli Basin, the following ceramic study was undertaken. From the survey 7,892 sherds were recovered. No complete vessels were found, but several large sherds provided information regarding the shapes and surface treatments used by the people. Sherds recovered either from the surface collection or test excavations were washed in water with light brushes, dried and labeled in P'uli. Some of the SWK LBG/C was very fragile and crumbled as it was removed from the excavations or during the washing process. A preliminary analysis of the ceramics was carried out in P'uli, but the final sorting and comparing was accomplished in the third-floor laboratory at the Institute of Ethnology in Nan Kang. After the sorting was completed and classes of ceramics defined, some reconstructions took place to facilitate the profile illustrations and rubbings that were then made. An index set of examples for each of the described classes was compiled. The collection, along with

the index set of examples, was then packed for storage in the Archaeological Museum (Kao-ku-kuan), Academic Sinica, Nan Kang.

In dividing up the ceramic collection, certain criteria were seen as more important in setting up the different ceramic classes. Most important were: color, temper size and surface treatment. Also important but somewhat secondary were hardness, paste and shape. The shape designations follow Chang 1969. Temper particle sizes were handled as follows: 0-1 mm = fine; 1-2 mm = medium; larger than 2 mm = coarse. The color determinations were made according to the Munsell system under fluorescent lights. Hardness was judged according to the Molis scale. Following is a list of the ceramic classes as defined by the author according to their characteristic traits:

Name of Ceramic Groupings		Abbreviation
Tamalin	dark gray / medium	TML DG/M

Count: 130, 1.64% of total recovered ceramics

Color: dark gray to black

Temper: medium size, slate and quartz sand

Hardness: 3.5

Average sherd size: 5.2 x 3.9 cm

Thickness: max. 8 mm, min. 5.5 mm, mean 6.7 mm

Shape: The most common shape was the slightly flared-mouthed jars. One rather wide and high-necked sherd appears to have been made to receive a lid (see Fig. 24e). Rim diameters range from 18.5 to 11.2 cm with a mean of 14.3 cm (62.6).

Surface treatment: The majority of the sherds were smooth, with no surface decoration. One sherd was incised with two parallel lines and also had a row of small shell impressions (Fig. 28D). Compare Sung and Chang 1954: Pl. II, 10.

Comments: All but the one incised and shell-impressed sherd came from PL 21. 98.4% of the sherds were associated with the Tamalin Period artifacts, although 7.6% came from the earliest level at PL 21 that fits into the Shuiwaku Period.

Tamalin brownish gray / coarse TML BG/C

Count: 43, .54%

Color: brownish gray, inside and outside fairly uniform, although slight variations were noted, some exteriors darker than interiors and vice versa.

Temper: large bits of smooth slate granules and small pebbles (Wentworth scale)

Hardness: 3.5

Average sherd size: 4 x 3 cm

Thickness: max. 8 mm, min. 6 mm, mean 7 mm

Shape: Very few of this class of ceramics were found, less than one percent. Only 11 rim sherds were recovered, and from these it was not possible to reconstruct the complete vessel shape, although they appear to be jar fragments. The lips tend to be more vertical with little outward flare. Rim diameters range in size from 18.3 cm to 10.3 cm with an average of 14.7 cm (δ4.1).

Surface treatment: No decorations were found, and the surface of the sherds was smooth. The large bits of temper appear to have been smoothed into the vessel while the paste was still plastic.

Comments: Most of the sherds were recovered from PL 21 in the upper levels, although a few were recovered from PL 28 in a lower level.

Tamalin brownish gray / medium TML BG/M

Count: 409, 5.18%

Color: brownish gray, sometimes with dark gray on the inside surface

Temper: medium size, slate and some sand

Hardness: 3

Average sherd size: 5.7 x 4.7 cm

Thickness: max. 8 mm, min. 5 mm, mean 7 mm

Shape: The majority of the vessels in the group are jars with either outward flaring or vertical mouths

(Fig. 24). One example of a high, wide neck or a ring foot was found (Fig. 24aa). Also, one example of a small bowl was found (Fig. 24bb).

Surface treatment: Several examples of check-impressed sherds were found (Fig. 27a-e,g,i). These are similar to check-impressed sherds from Matoulu (Sung and Chang 1954: Pl. II, 15-17, 20-21), Fantzuyuan (Shih and Sung 1956: Pl. VI, 10-16) and Fengpitou (Chang 1969:Fig. 51, 28). One sherd (Fig. 27j) was impressed with a series of evenly spaced, short horizontal lines. This sherd was similar to one found by Sung and Chang (1954: Pl. II, 12) at Matoulu. Another sherd (Fig. 27h) displayed impressed circles, as if made by a grass stem, between incised horizontal lines. Similar impressed circles are seen from Fantzuyuan (Shih and Sung 1956: Pl. VI, 8). Sizes of the rim diameters range from 24.4 cm to 10.1 cm with an average of 17.7 cm (δ4.7).

Comments: The sherds appear to be handmade with a brownish slip. This type of pottery is found in all levels at PL 21. No examples were found from other sites. This type of pottery is associated with the Tamalin Period.

Tamalin brownish gray / fine TML BG/F

Count: 21, .26%

Color: brownish gray

Temper: fine

Hardness: 3

Average sherd size: 4.8 x 1.9 cm

Thickness: max. 7.5 m, min. 6.1 mm, mean 6.5 mm

Shape: One bowl fragment was recovered. The lip of the rim was so formed that a lid could rest on the inside (Fig. 24cc). The rim was 17 cm in diameter.

Surface treatment: The sherds were generally smooth, although some examples had inclusions of fine sand in the slip. Two examples were noted with fine cord-marks and one was check-impressed (Fig. 28e, f, g).

Comments: All of the examples of this type of ceramics came from above level 6 at PL 21C and are associated with the Tamalin Period.

Tamalin light brownish gray/coarse TML LBG/C

Count: 1801, 22.82%

Color: light brownish gray

Temper: large bits of smooth, slate granules and some small to medium size pebbles (one pebble was 14 mm in diameter)

Hardness: 3.5

Average sherd size: 5.3 x 4.6 cm

Thickness: max. 11 mm, min. 3 mm, mean 6.4 mm

Shape: Jars are the form most frequently recovered. Both vertical and outflaring mouth (Fig. 22) forms are present, the outflaring being most numerous. None of these appear to have been especially prepared for lids, although one lid handle was found (Fig. 22u, see Chang 1969, Fig. 59, 1-3). Two examples of high, wide necks were found (Fig. 22x, y). Several small pots were also found, one with an applique decoration and one with a handle (Fig. 22v, w). Rim diameter ranges from 22.7 cm to 13 cm with a mean of 19.4 (σ5.5).

Surface treatment: All of the examples had a plain surface, although a thin slip may have been applied to smooth and seal the vessels.

Comments: All of this class of ceramics come from PL 21. The majority of these sherds, however, come from the upper levels of the site; for example, test pit C produced from the lowest to the highest levels the following: C-6 = 7, C-5 = 36, C-4 = 251, C-3 = 168, C-2 = 92, C-1 = 261. This shift in frequency between levels C-6, C-5 and especially C-4 suggests a change taking place at this time.

Tamalin light brownish gray / medium TML LBG/M

Count: 1779, 22.54%

Color: light brownish gray

Temper: medium size slate granules

Hardness: 3.5

Average sherd size: 4.6 x 3.5 cm

Thickness: max. 13 mm, min. 3 mm, mean 6.4

Shape: Jars are the most frequently recovered shape with both vertical (Fig. 23a-j) and outflaring mouths (Fig. 23n-q, s-bb). One high, wide neck was found (Fig. 23m). One rim was fitted for a lid (Fig. 23l), and one lid handle (?) was recovered (Fig. 23r). One ringed foot was also found (Fig. 23k). The rim diameters varied from 24.3 cm to 14.3 cm with an average of 17.5 cm (63.4).

Surface treatment: Most surfaces were plain, although one rather coarse cord-marked sherd (Fig. 28a) and one sherd with incised parallel lines and impressed circles (Fig. 28b) were found.

Comments: Most of this class of ceramics come from PL 21 and fit into the Tamalin Period. Examples are found from the earliest level but jump significantly from 79 in level C-6 to 263 in level C-5.

Tamalin light brownish gray / fine TML LBG/F

Count: 60, .76%

Color: light brownish gray to brownish orange

Temper: fine, with some small bits of mica

Hardness: 3.5

Average sherd size: 4 x 2.8 cm

Thickness: max. 5.5 mm, min. 3.2 mm, mean 4.2 mm

Shape: The one surviving rim fragment had a 3 cm high and 6.5 cm wide neck (Fig. 23cc).

Surface treatment: One fine cord-marked sherd was recovered.

Comments: Examples of this type all come from PL 21 and are associated with the Tamalin Period.

Tamalin light orange / coarse TML LO/C

Count: 129, 1.63%

Color: light orange

Temper: coarse, slate and sand

Hardness: 2.5

Average sherd size: 3.5 x 2.5 cm

Thickness: max. 7.2 mm, min. 6.2 mm, mean 6.7 mm

Shape: Only three rim sherds were recovered, and they exhibit three different forms: a high-necked jar; a large, more vertical-mouthed jar; and a small flaring-mouthed pot (Fig. 23 ff.) (compare with Lin 60: Pl. 13, 1). The rim diameters ranged from 22.5 to 12.1 cm, with a mean of 16.6 cm.

Surface treatment: No special surface decorations were noted for this class of ceramics. The coarse temper in many instances would protrude through to the surface.

Comments: Although found in several levels at PL 21, the majority came from the lowest levels. A few sherds were also found from PL 28 in the lowest level of test pit B. This ceramic type was probably begun in Shuiwaku times and carried on to a lesser degree into the Tamalin Period.

Tamalin light orange / medium TML LO/M

Count: 194, 2.46%

Color: light orange

Temper: medium size quartz and slate sand

Hardness: 3.5

Average sherd size: 4.1 x 3.4 cm

Thickness: max. 10 mm, min. 4 mm, mean 6.1 mm

Shape: Generally, smaller pots were most frequent. One possible beaker was found (Fig. 25k). Two high, wide necks (Fig. 25i, j) and one Tou ring foot (Fig. 25m) were found. Rim diameters ranged from 16.2 cm to 10.2 cm, with a mean of 13.0 cm (δ2).

Surface treatment: Less than 2% of the sherds had any surface decorations. The decorated sherds that were found were too fragmentary to reproduce. They included incised lines and some impressions.

Comments: All examples of this class of ceramics also come exclusively from PL 21 and fit into the Tamalin Period.

Tamalin light orange / fine TML LO/F

Count: 16, .20%

Color: light orange, some light brownish gray on inner surface

Temper: fine, slate and quartz sand

Hardness: 3

Average sherd size: 3.8 x 3.1 cm

Thickness: max. 7 mm, min. 5 mm, mean 6 mm

Shape: One low, slightly outflaring neck fragment from a jar was found. Rim diameter measured 12.2 cm; the opening measured 10.6 cm.

Surface treatment: The surface was not decorated and was generally smooth. In some instances the temper was visible on the surface.

Comments: This ceramic class, of minor importance, was found only at PL 21 in the Tamalin Period.

Shuiwaku light brownish gray / coarse SWK LBG/C

Count: 2093, 26.52%

Color: light brownish gray

Temper: coarse slate and quartz sand granules

Hardness: 2.5

Average sherd size: 3.3 x 2.8 cm

Thickness: max. 7 mm, min. 2 mm, mean 4.7 mm

Shape: SWK LBG/C displays a unique rim profile that had an "S" shape with an inward flare of the lip (Fig. 26v-11). These sherds are generally thinner and tend to break just below the neck, giving us little information about the rest of the vessel shape. Four examples of bases were found which were made by attaching a low ring of clay to the body of the vessel (Fig. 26j-m). Four large jar fragments were found (Fig. 26r-u). Five basin or bowl fragments were noted (Fig. 26a-e). A high percentage of broken neck fragments were also found. A few examples of outflaring and vertical mouths were recovered (Fig. 26f-i, n-q). Rim diameters vary from 32.6 cm to 9.1 cm, with a mean of 18.8 cm (δ 6.9).

Surface treatment: Less than 2% of the sherds were decorated. One coarse, cord-marked sherd is shown in Fig. 29d. Most sherds had a plain, smooth surface, some with a slip.

Comments: This class of ceramics is found at PL 2, 19, 21, 28, 29, 30 and 38. It is the most popular pottery type in the Shuiwaku Period. Although found scattered in several later levels at PL 21,

78% of this class of ceramics is concentrated in the earliest level (C-6).

Shuiwaku light brownish gray / fine SWK LBG/F

Count: 35, .44%

Color: light brownish gray

Temper: fine pieces of sand, slate

Hardness: 3

Average sherd size: 3.5 x 2 cm

Thickness: max. 6.5 mm, min. 4 mm, mean 5.5

Shape: One vertical-mouthed jar was recovered. One bowl fragment and one base fragment were also found. Rim diameters of 19.6 cm and 16.4 cm were recorded.

Surface treatment: Examples of fine cord-marks, check impressed and incised circles were all found on SWK LBG/F pottery (Fig. 29, a-c).

Comments: This ceramic class, which is numerically of minor importance, comes exclusively from PL 29 and dates to the Shuiwaku Period.

Shuiwaku yellow orange / coarse SWK YO/C

Count: 146, 1.85%

Color: yellow orange on exterior surface, interior varies to light brownish gray

Temper: coarse slate and quartz granules

Hardness: 3

Average sherd size: 2.7 x 2.5 cm

Thickness: max. 5.5 mm, min. 5 mm, mean 5.2

Shape: Two rim sherds display an "S" shape profile Fig. 25hh, ii) similar to the SWK LBG/C. Two other jar fragments were recovered (Fig. 25kk, ll). Rim diameters were quite uniform with an average of 15.8 cm; the largest was 17.2 cm, and the smallest was 14.6 cm.

Surface treatment: Two rather coarse cord-marked sherds (Fig. 29e, f) were uncovered, while the majority were plain.

Comments: SWK YO/C sherds are found at PL 29 and 30 in association with radiocarbon dates and fit in with the Shuiwaku Period.

Shuiwaku yellow orange / medium SWK YO/M

Count: 43, .54%

Color: yellow orange

Temper: medium size slate and some quartz sand particles

Hardness: 3

Average sherd size: 3.7 x 2.5 cm

Thickness: max. 7.3 mm, min. 4.5 mm, mean 5.9

Shape: No rim sherds were found. One neck fragment had an interior diameter of 13 cm.

Surface treatment: one fine cord-marked sherd was found (Fig. 29i).

Comments: All but one of the sherds placed in this class come from PL 19. By association with other ceramics and a radiocarbon date these sherds fit into the Modern Period, but by comparison they are similar to the SWK YO/C that dates to the earlier Shuiwaku Period. Two explanations are suggested. One is that the yellow orange pottery tradition that had early beginnings in the Shuiwaku Period carried on through time into the Modern Period. The other is that PL 19 was occupied during both periods, and the earlier sherds were mixed in with the later remains.

Shuiwaku yellor orange / fine SWK YO/F

Count: 14, .18%

Color: yellow orange

Temper: fine

Hardness: 3

Average sherd size: 3.5 x 1.5 cm

Thickness: max. 7 mm, min. 4 mm, mean 5.5 mm

Shape: All of the SWK YO/F sherds were too small to give any shape information.

Surface treatment: No surface decorations were noted.

Comments: This type of ceramics appears to be a variation of the other yellow orange ceramics and is of minor importance. All examples come from PL 29 and date to the Shuiwaku Period.

Hsü light brownish gray / coarse H LBG/C

Count: 801, 10.14%

Color: light brownish gray

Temper: coarse granules of slate and quartz sand

Hardness: 3.5

Average sherd size: 5.2 x 4 cm

Thickness: max. 8 mm, min. 3 mm, mean 5.3 mm

Shape: The majority of the rim sherds present a vertical profile that suggests they were basins (Fig. 25r-aa). Two outflaring neck sherds, one vertical and one "S" shaped rim were found (Fig. 25p, q, o and n). One fragment slants gently inward, suggesting that it came from a wide-mouthed pot (Fig. 25bb). The basin rim diameters range from 24.7 cm to 10.4 cm with an average of 21.7 cm (δ 4.2).

Surface treatment: Several surface decorated sherds were noted for this type of ceramics, including check-impressed, incised lines and incised herring-bone patterns (Fig. 29g, h).

Comments: Examples of H LBG/C come from PL 19, 33, 34, 41, 43 and 45. This ceramic class is the common denominator for the Modern Period.

P'uli gray sandy / medium PL GS/M

Count: 62, .79%

Color: gray to dark gray

Temper: medium size pieces of slate sand found in great abundance

Hardness: 2.5

Average sherd size: 2.6 x 2.2 cm

Thickness: max. 4.2 mm, min. 3.2 mm, mean 3.3

Shape: No sherds of sufficient size were recovered to indicate shapes.

Surface treatment: Examples of fine cord-marking, incised cross-hatching and impressed circles were found (Fig. 29j-l). Because of the high sand content the sherds have a rough feel.

Comments: PL GS/M was excavated from PL 19, 28 and 29. Although only a small number of sherds were recovered, they are found in association with both Shuiwaku Period ceramics and Modern Period ceramics. This may be due to a minor but long-lived tradition of this type of ceramics or to the mixing of levels at either PL 19 or 29. The latter is suggested, that PL 19 had both an early and a late occupation (although the shallow stratigraphy did not show it).

Hsiaopushe brownish orange / medium HPS BO/M

Count: 44, .56%

Color: brownish orange

Temper: fine to medium size slate and quartz sand

Hardness: 3.5

Average sherd size: 4.4 x 3.2 cm

Thickness: max. 6.8 mm, min. 4.5 mm, mean 5.6 mm

Shape: The few rim sherds recovered suggest that out-flaring lip jars of medium size were most numerous. The average rim diameter was 17.7 cm.

Surface treatment: Most of the sherds were smooth on the surface. One example had a thick slip with light crazing.

Comments: Examples come from PL 25 and 28. They fit into the Shuiwaku Period.

Hsiaopushe brownish orange / fine HPS BO/F

Count: 54, .68%

Color: brownish orange to dark gray

Temper: fine

Hardness: 2.5

Average sherd size: 2.6 x 2.1 cm

Thickness: max. 5.5 mm, min. 4.5 mm, mean 5 mm

Shape: Only one large fragment was found, and it looks like a medium-sized jar, with an estimated rim diameter of 18 cm.

Surface treatment: The surface was generally smooth and occasionally showed signs of a polish.

Comments: As was the case with HPS BO/M, this type of ceramics comes from PL 25 and 28 and fits into the Shuiwaku Period.

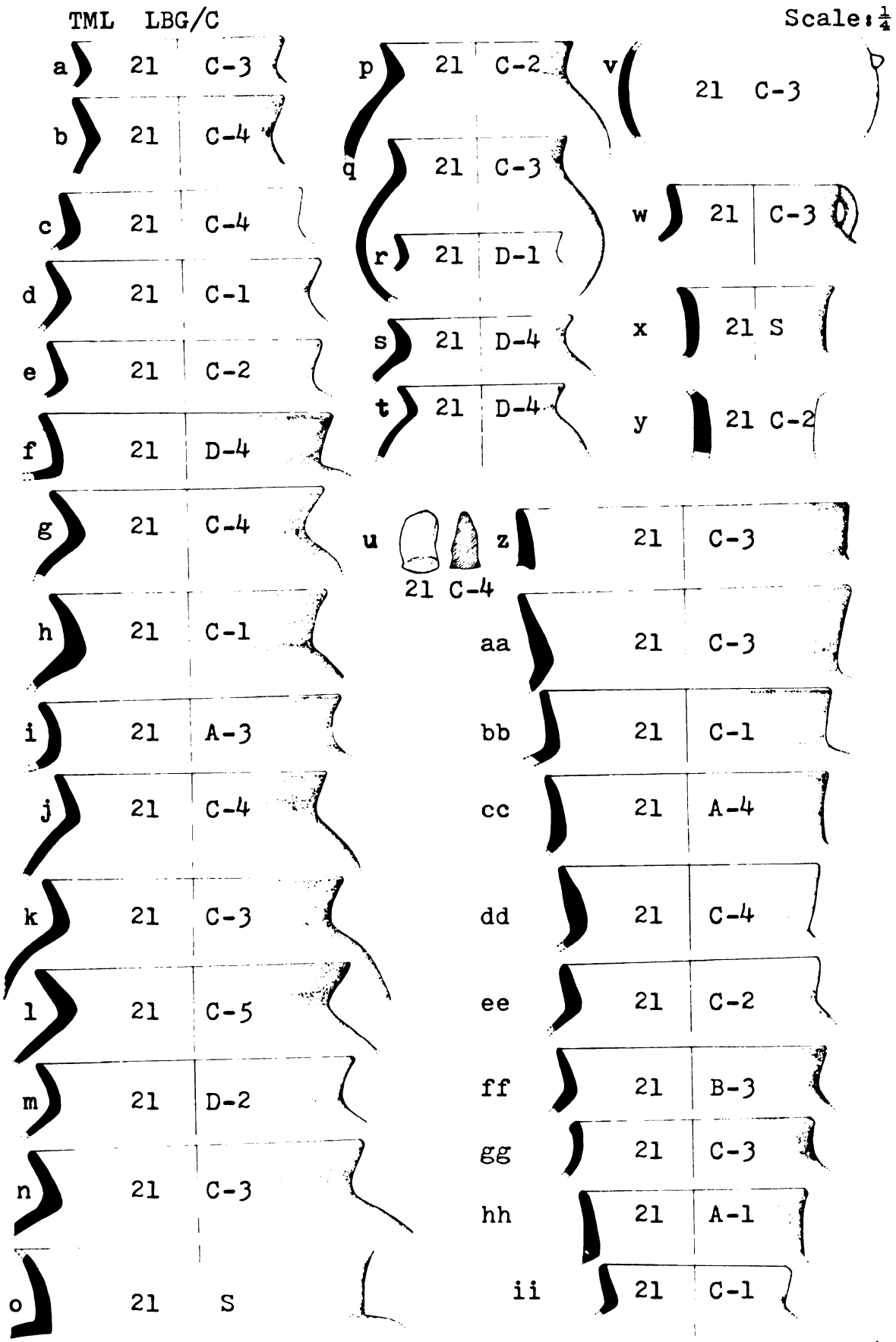


Fig. 22 Profiles of the Tamalin light brownish gray/coarse pottery. The numbers (e.g., 21 C-3) refer to the site, the test pit and the level from which the sherd came.

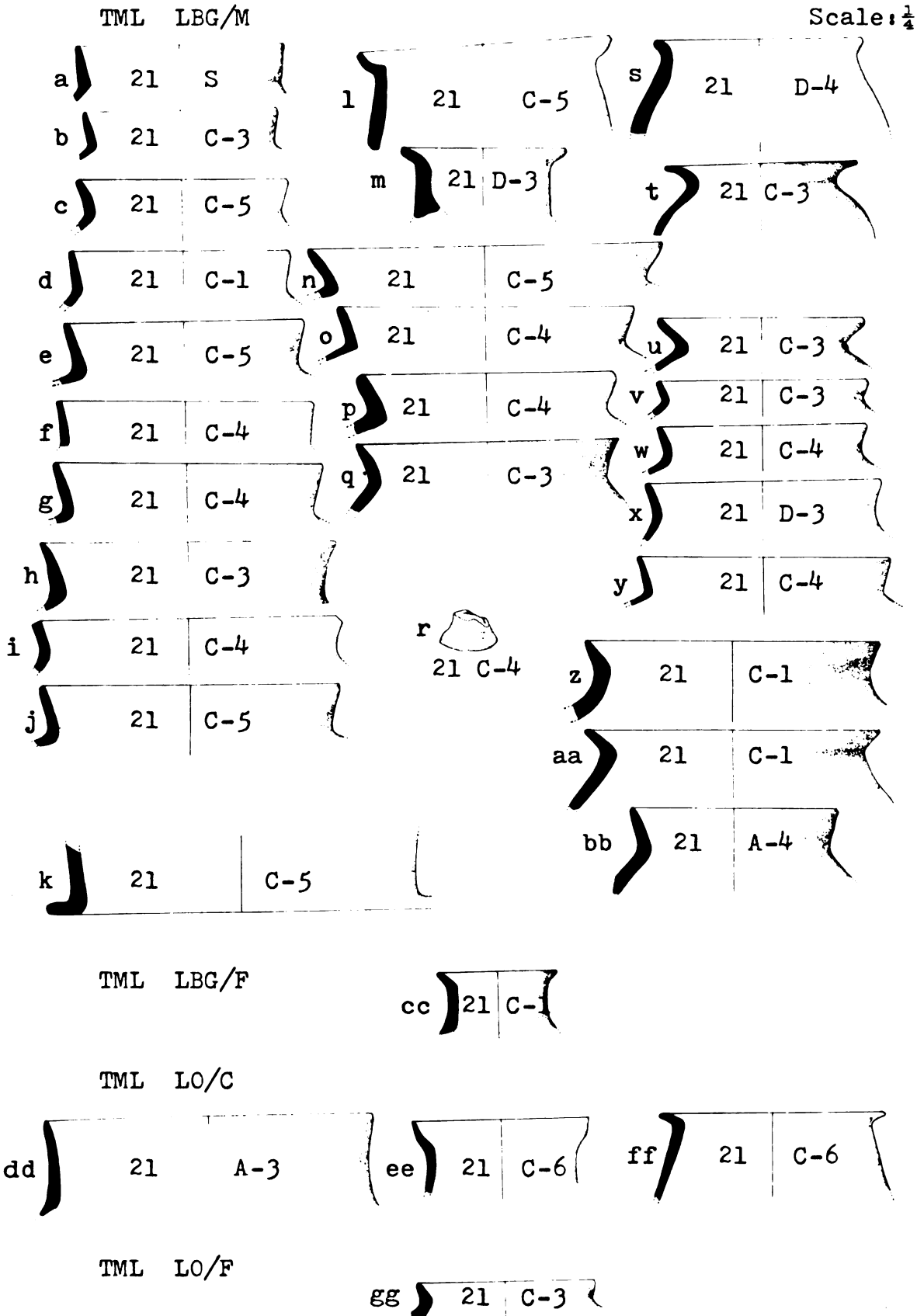


Fig. 23 Profiles of the Tamalin light brownish gray/medium; Tamalin light brownish gray/fine; Tamalin light orange/coarse and Tamalin light orange/fine pottery.

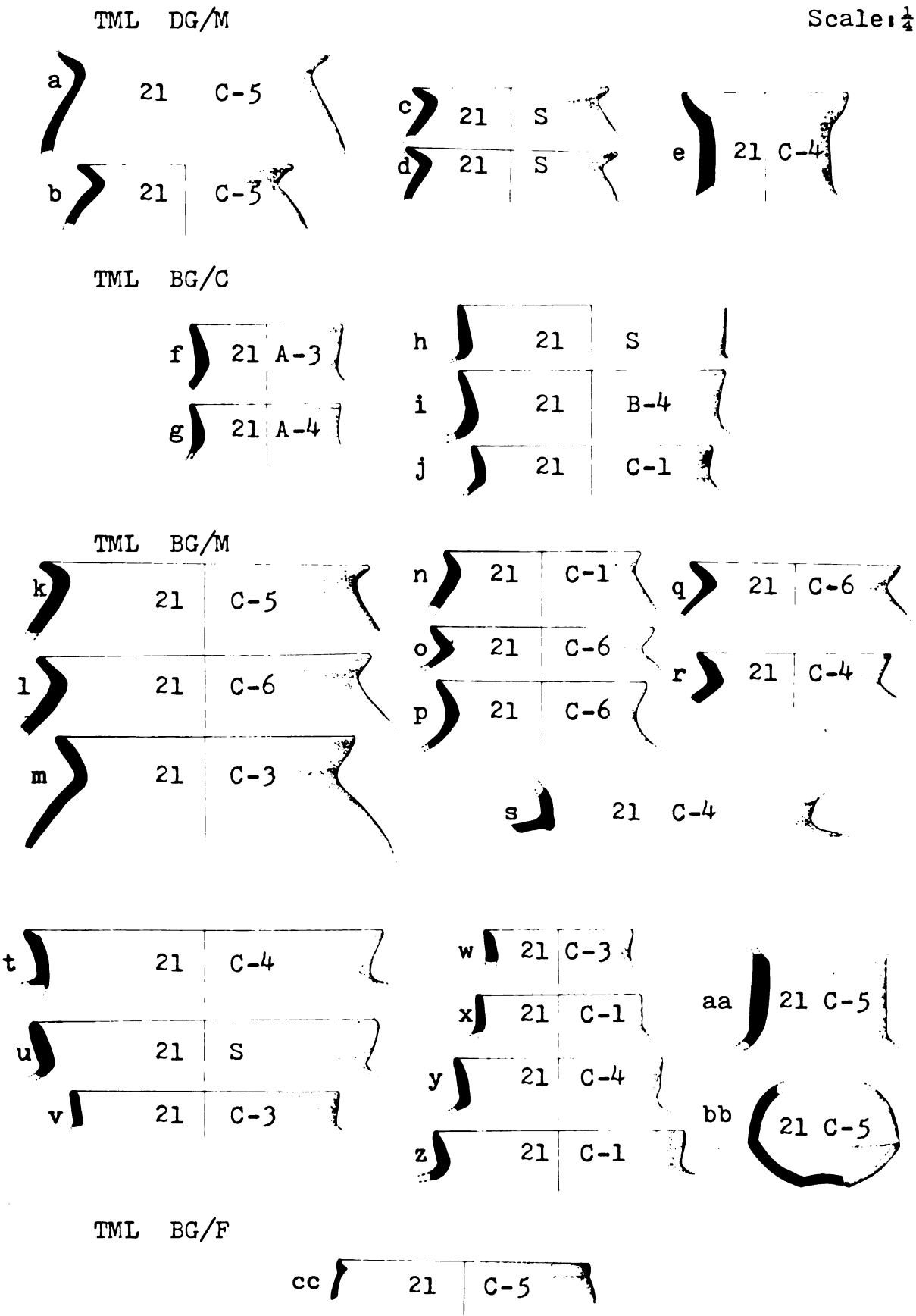


Fig. 24 Profiles of the Tamalin dark gray/medium; Tamalin brownish gray/coarse; Tamalin brownish gray/medium and Tamalin brownish gray/fine pottery.

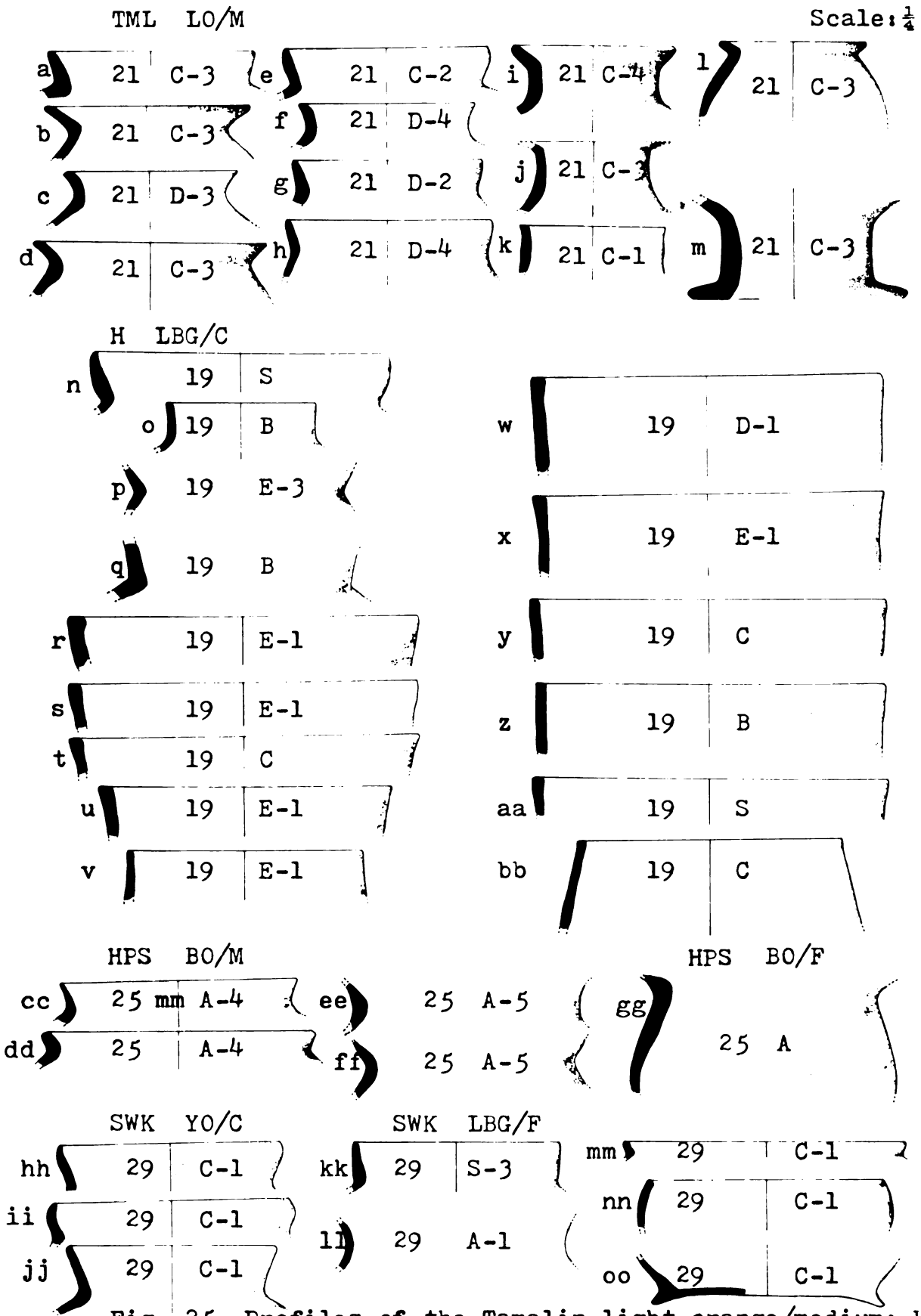


Fig. 25 Profiles of the Tamalin light orange/medium; Hsu light brownish gray/coarse; Hsiaopushe brownish orange/medium; Hsiaopushe brownish orange/fine; Shuiwaku yellow orange/coarse and Shuiwaku light brownish gray/fine pottery.

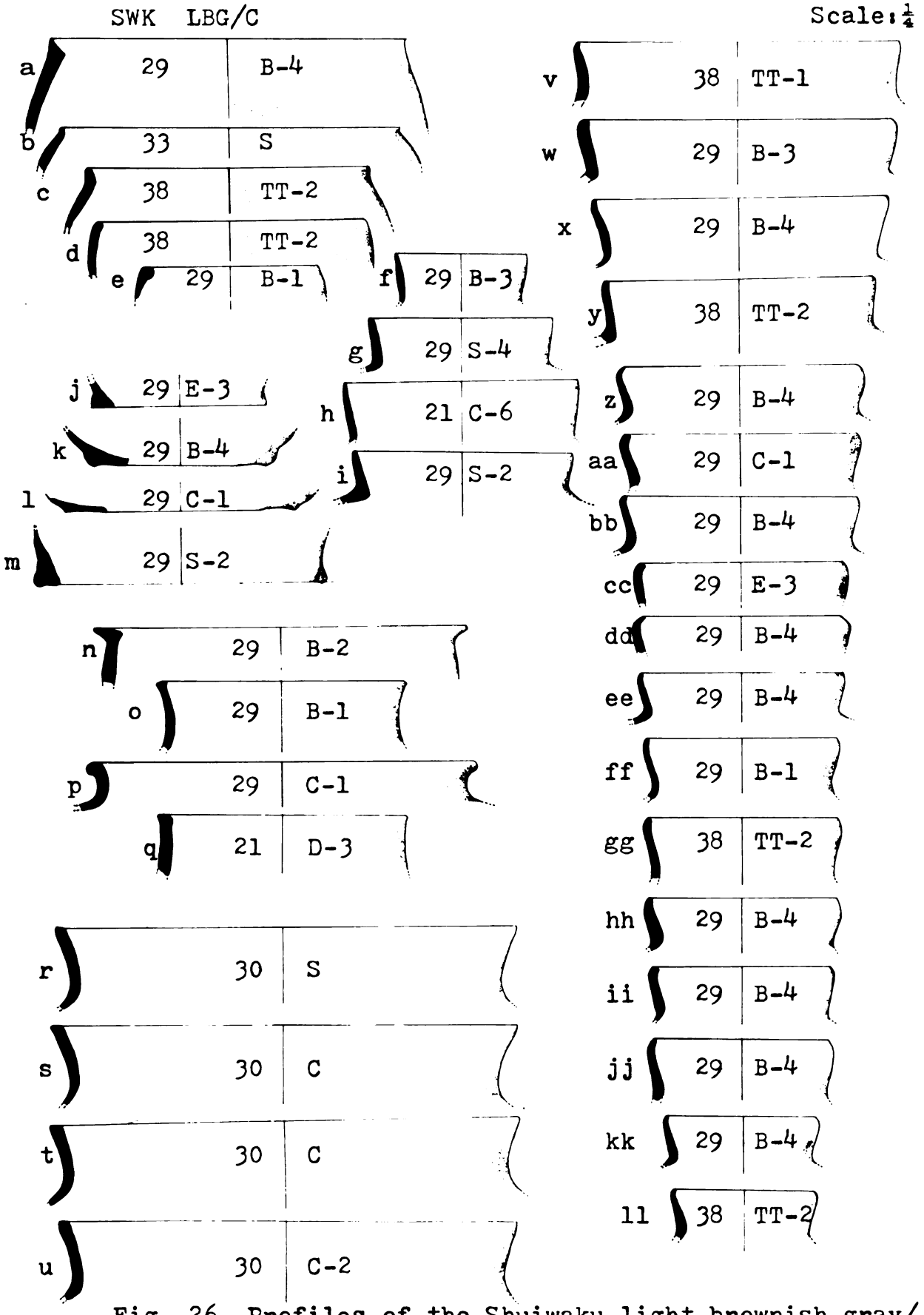


Fig. 26 Profiles of the Shuiwaku light brownish gray/ coarse pottery.

Fig. 27. Surface decorations on pottery, arranged by ceramic classes with provenance data for each example.

	TML	BG/M	
a.	PL 19	B	check impressed
b.	PL 21	D-3	check impressed
c.	PL 21	D-3	check impressed
d.	PL 21	D-3	check impressed
e.	PL 21	D-3	check impressed
f.	PL 29	B-3	cord impressed
g.	PL 21	D-2	check impressed
h.	PL 21	D-3	impressed circles
i.	PL 21	C-1	check impressed
j.	PL 21	D-4	horizontal lines

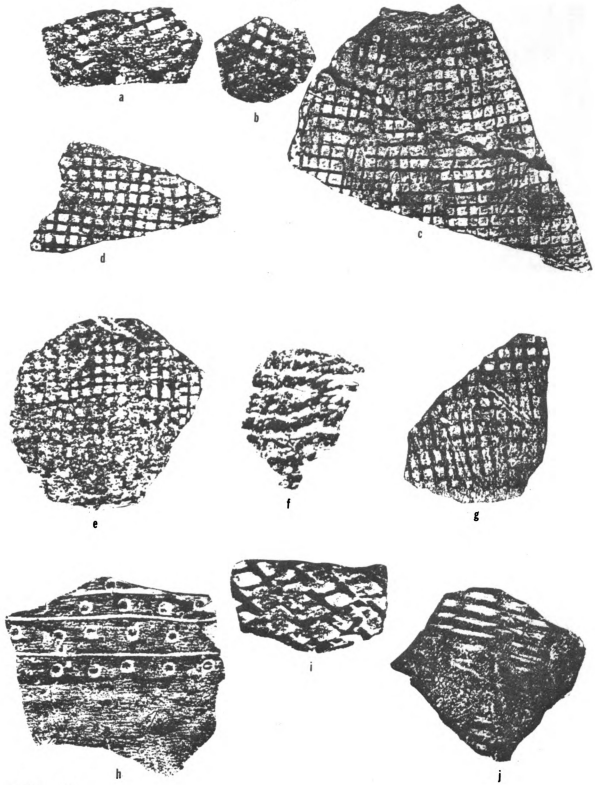


Fig. 27

Fig. 28. Surface decorations, arranged by ceramic classes with provenance data for each example.

			TML	LBG/M	
a.	PL	21	D-3		coarse cord-marked
b.	PL	21	C-5		parallel lines, impressed circles
			TML	LBG/F	
c.	PL	19	B		fine cord-marked
			TML	DG/M	
d.	PL	28	A-2,3		shell impressions
			TML	BG/F	
e.	PL	19	B		fine cord-marked
f.	PL	19	B		check impressed
g.	PL	19	B		fine cord-marked

Fig. 28

Fig. 29. Surface decorations, arranged by ceramic classes with provenance data for each example.

			SWK LBG/F	
a.	PL	29	C-1	Fine cord-marked
b.	PL	29	B-4	check impressed
c.	PL	29	C-1	incised circles
			SWK LBG/C	
d.	PL	29	B-4	coarse cord-marked
			SWK YO/C	
e.	PL	29	C-1	coarse cord-marked
f.	PL	29	C-1	coarse cord-marked
			H LBG/C	
g.	PL	19	B	check impressed
h.	PL	19	B	incised lines, herring-bone pattern
			SWK YO/M	
i.	PL	29	C-1	fine cord-marked
			PL GS/M	
j.	PL	19	B	fine cord-marked
k.	PL	29	C-1	incised crosshatching
l.	PL	29	B-4	impressed circles

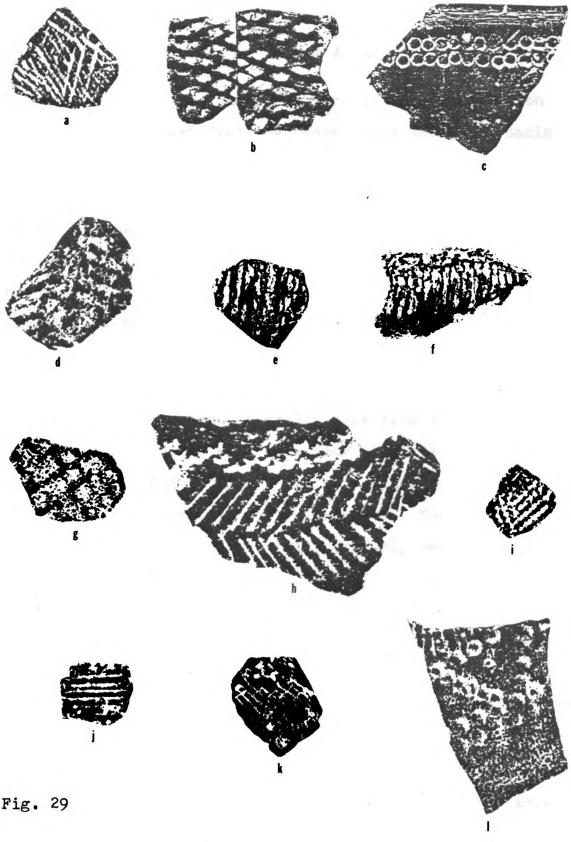


Fig. 29

Appendix B: Stone Artifacts

To facilitate the identification and description of the 908 stone artifacts recovered from the P'uli Basin survey, the following index was set up. Artifacts are generally classified according to Chang's 1969 descriptions, although descriptions from Sung et al. (1967) and Liu and Liu (1957) were also used in some cases. Quartz, nepherite, shist, chloride shist, sandstone and slate were all used as the raw material for 31 different kinds of stone artifacts. Hoes were most commonly made from sandstone, while net sinkers, arrow points, k'o halberds and reaping knives were generally made from slate. The majority of the adzes were made from chloride shist. Of the artifacts, 638 could be classified; the remainder were waste flakes or unclassifiable fragments. The majority of the artifacts recovered were most probably used in subsistence activities. These included tools used in agriculture; i.e., adzes for woodcutting, hoes for working the earth, reaping knives for cutting and harvesting grass seeds, a large number of net sinkers and several polished slate projectial points. The last suggest that fishing and hunting activities were also going on. Several k'o halberds or spear-point-shaped objects were recovered. Whether these were actually used as spear points, stone daggers or more

elaborate hoes is still being questioned. This author tends to think they may well have been used as hoes.

The most abundant single class of artifacts was stone hoes, of which 293 were recovered (46 percent). The sizes ranged from 8.9 x 4.3 x 1.6 cm to 24.2 x 11.4 x 3.4 cm. Several different shapes were noted. An analysis of the hoes was made according to shape. Figs. 30-34 illustrate examples of pointed, ovaloid, rectangular, trapezoid, spatula and waisted or necked-shaped hoes. The rectangular and oval-shaped hoes predominated, accounting for 65 percent of all the hoes; the rectangular examples numbered 93, and there were 99 oval examples.

The shape or size of the hoes did not, however, seem to correlate with any specific time periods and/or other types of tools from the survey or site location.

Net sinkers constituted 17.8 percent of the tools recovered. Both grooved and notched examples were found (Figs. 35, 36). Grooved examples were found by Chang (1969:Pl. 92 H-K) as far north as Ta-pen-keng in the Taipei Basin and by Sung et al. (1967:Pl. XVII) as far south as O'luan-pi on the southern tip of the island. Several examples have also been found in central Taiwan by Liu (1960:Pl. 11) at Chün-kung-liao. The notched examples found in P'uli are less common. The fact that thirteen of the twenty-eight sites located produced net

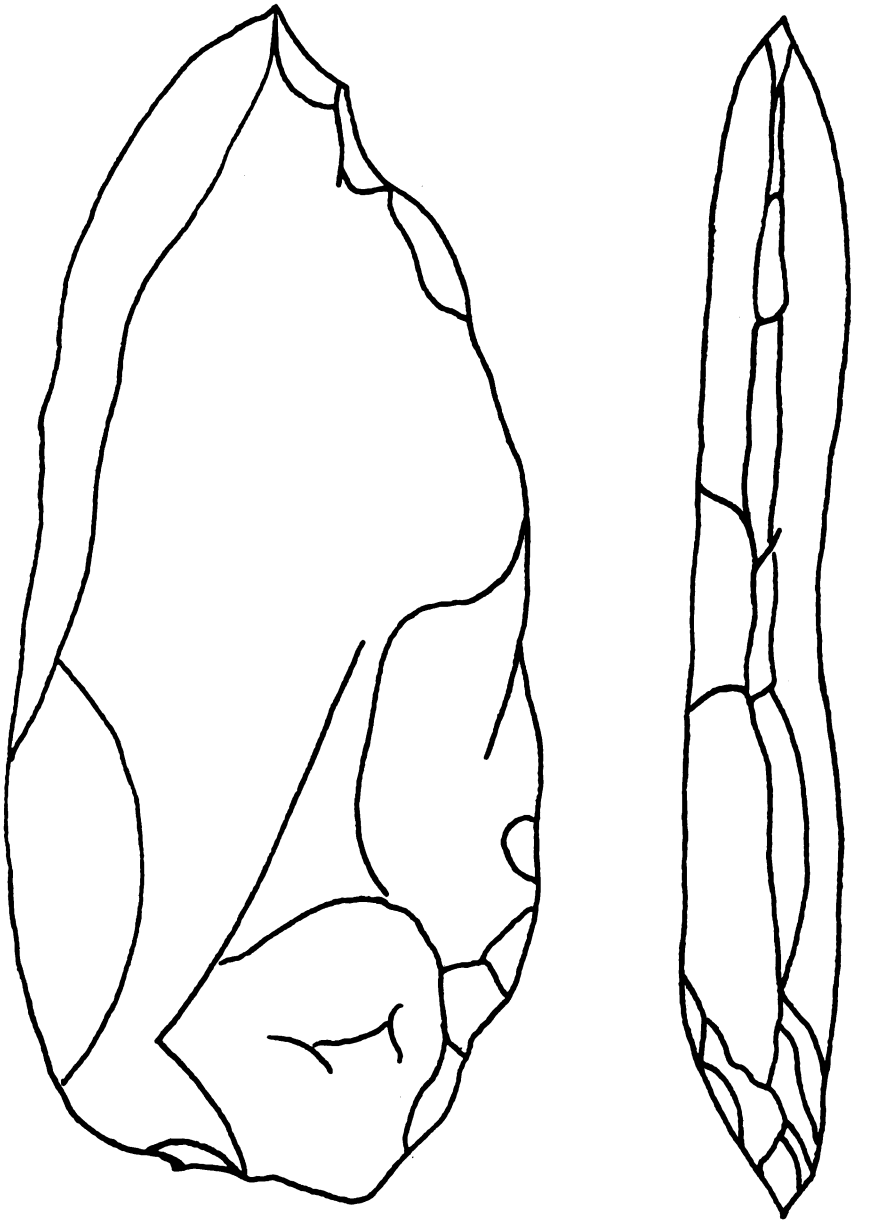
sinkers suggests that fishing was an important subsistence activity. This seems logical when we consider the fact that several of the streams flowing through the basin produced fish used by the local inhabitants until quite recently. Ch'en (1968:42-45) mentions the use of nets, hooks and poisonous plants among central Taiwan aborigines in their fishing activities.

Thirty stone adzes were found (Fig. 37). Adzes are usually thought of as woodworking tools. The fact that so few adzes were found (4.7 percent) suggests that woodworking was not a major activity.

Sixty polished slate arrow points were recovered. These represent 9.4 percent of the recognizable tools. Willow-leafed, triangular and tanged shapes were represented. One example of a serrated edge (at the base of the blade) was found, and one perforated triangular point was found (Figs. 38, 39). Arrow points were only found at four of the twenty-eight sites.

Examples of 27 stone knives were found. Semi-lunar, crescent and rectangular shapes are represented (Figs. 40, 41). These knives are generally associated with the harvesting of millet and dry rice (Chang 1969:71-75; Chen 1968:321-322). Knives were found at eight of the twenty-eight sites.

Other artifacts recovered include four stone awls, three discoidal tridacna cores (see Sung et al. /1967:Pl. XXI and p. 337), four grooved pebbles, two spindle whorls, one polished cube, several perforated slate fragments (ornaments?), two stone bowls and two boot-shaped polished slate artifacts.



Scale: 1-1

Fig. 30
Example of a pointed shaped hoe from site PL 28 S-1, No.7.

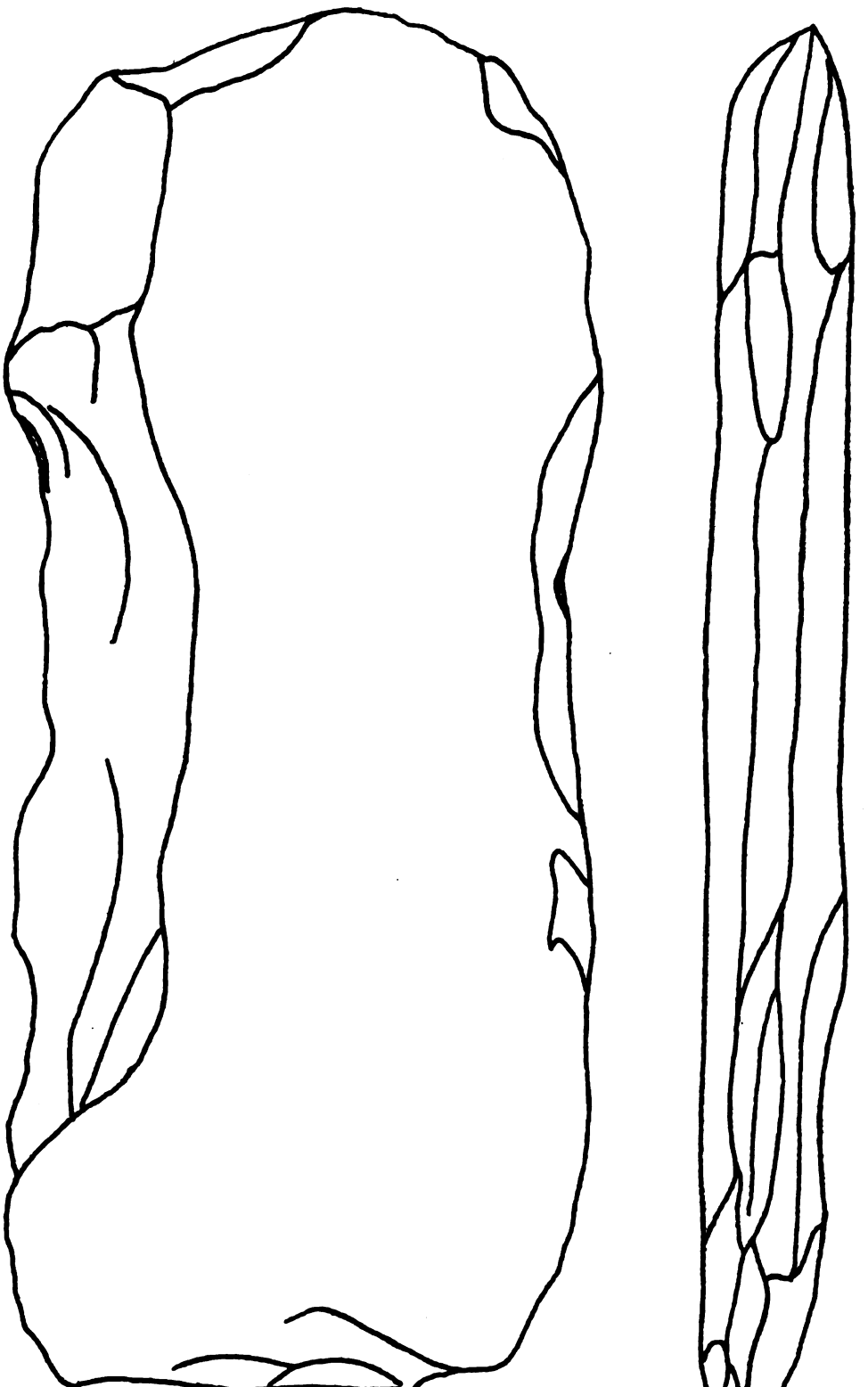


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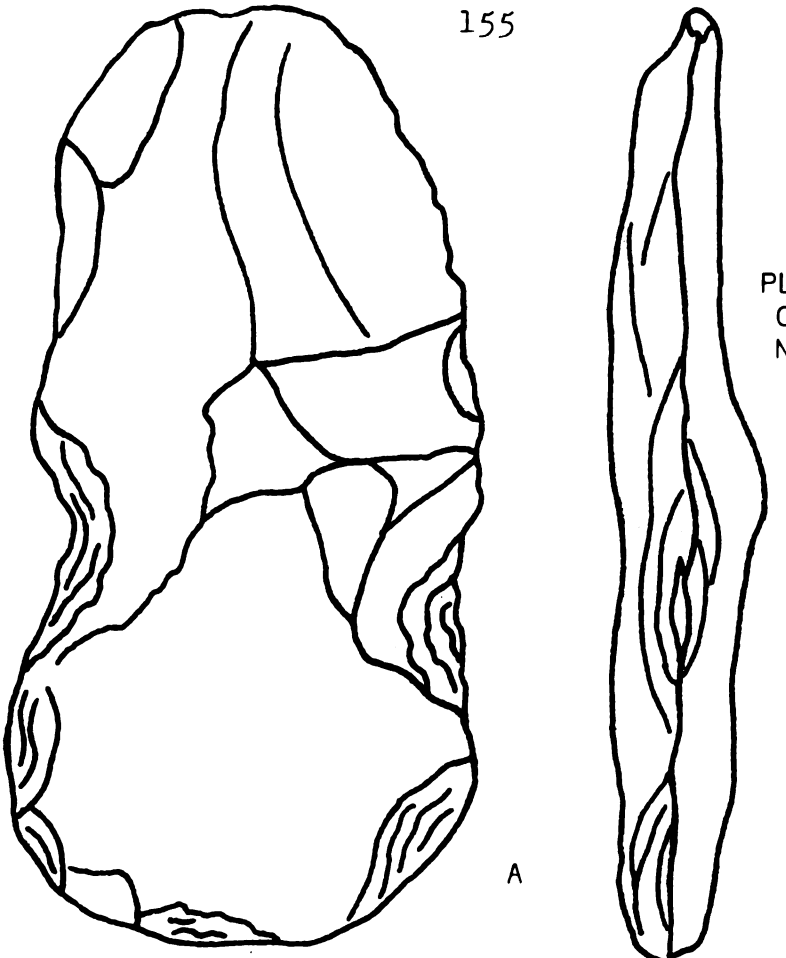
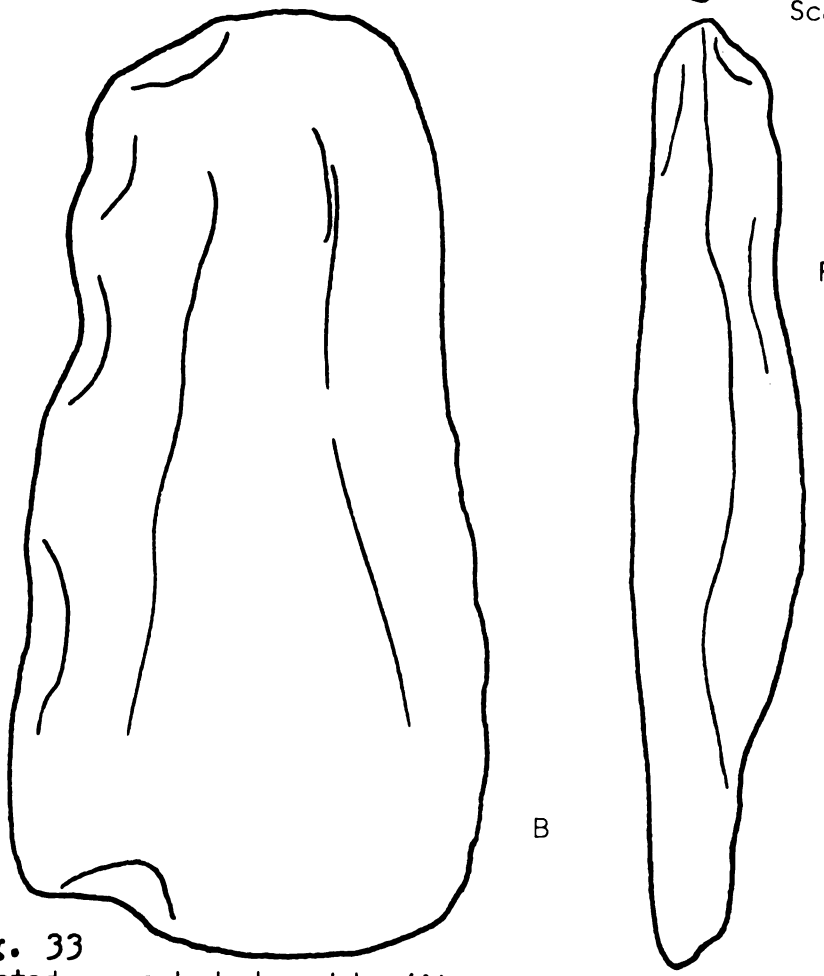
Fig. 32
Example of a rectangular shaped hoe from PL 28 S-1, No.3.



A

PL 29
C-1
No. 2

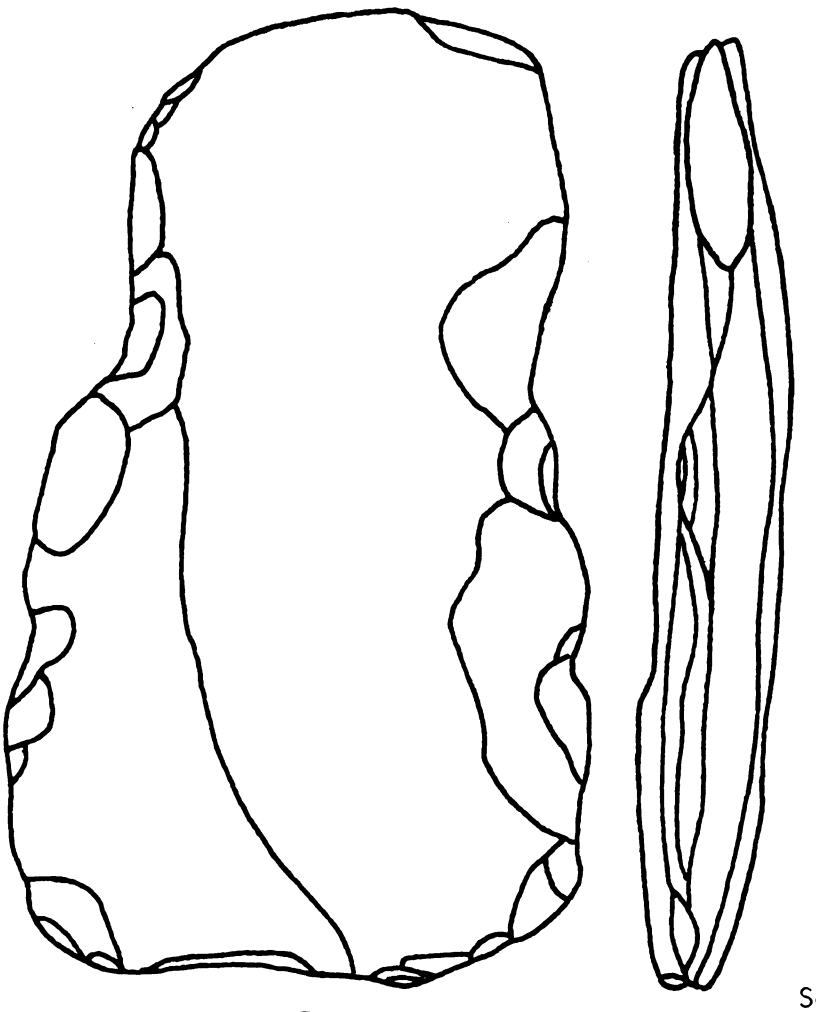
Scale: 1-1



B

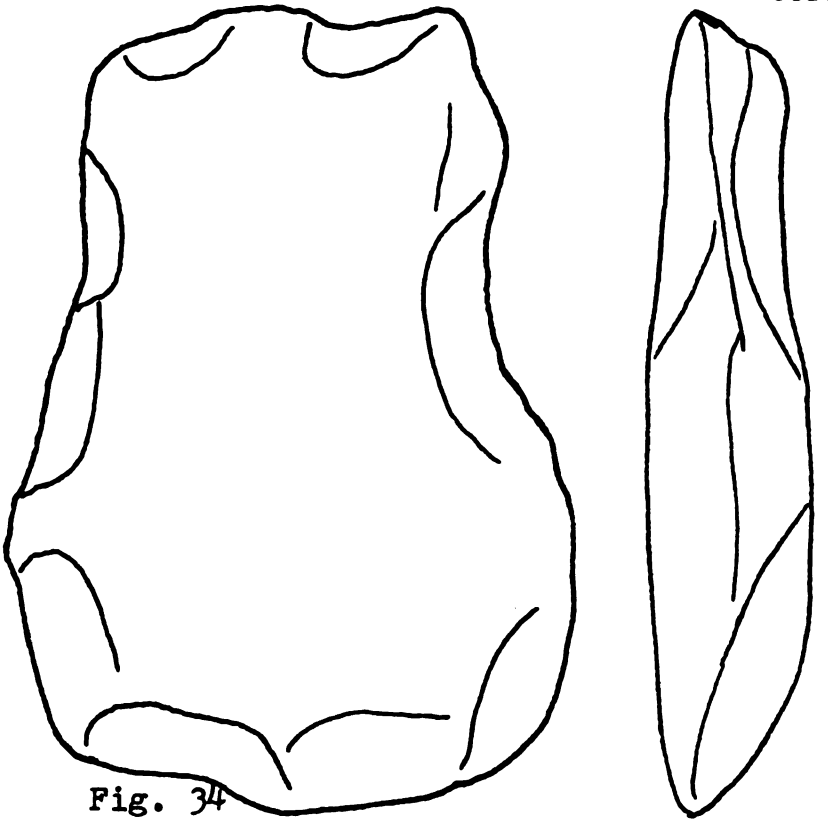
PL 2
S
No. 7

Fig. 33
Waisted or necked shaped hoe(A), trapezoid shaped hoe(B).



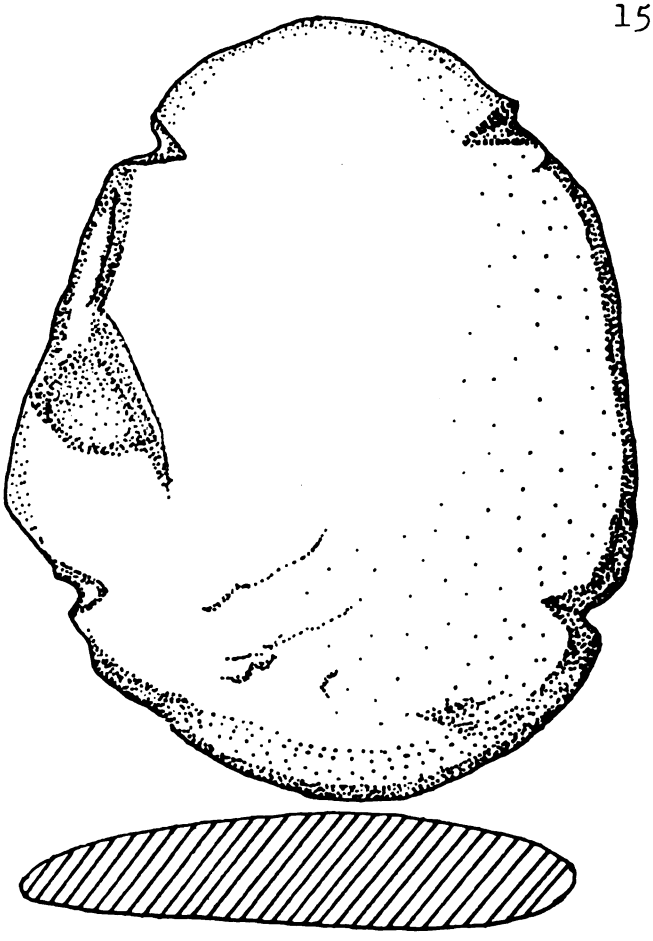
PL 2
S
No. 2

Scale: 1-1

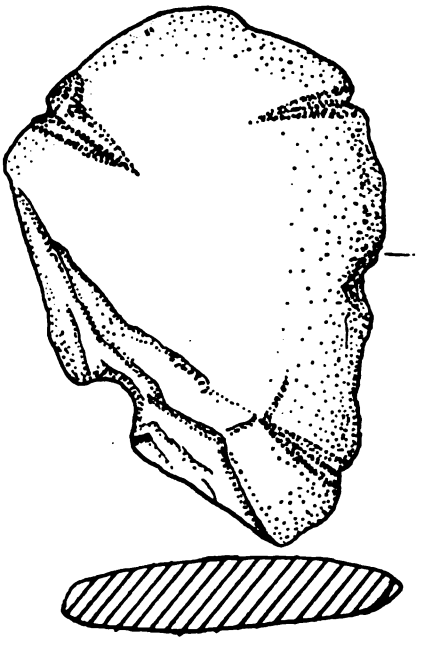


PL 2
S
No. 12

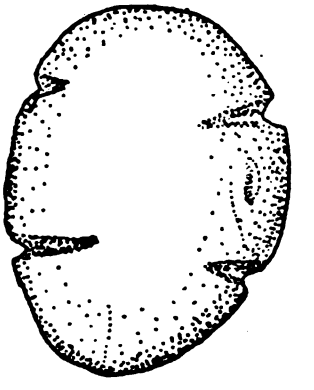
Fig. 34
Examples of spatula shaped hoes.



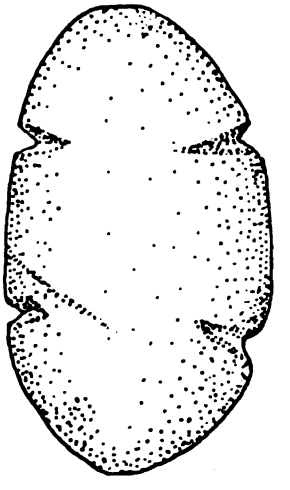
PL 25 S No. 24



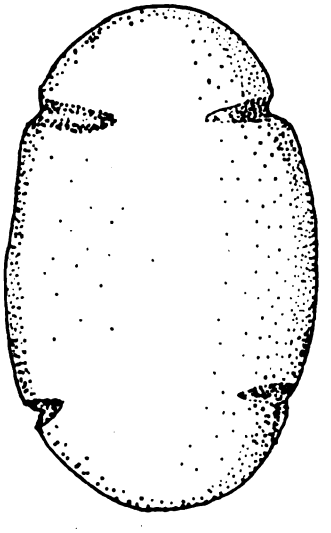
PL 26 S No. 15



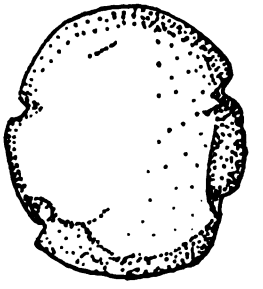
PL 25 S No.37



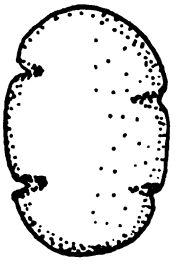
PL 25S No.31



PL 25 A-4 NO.5



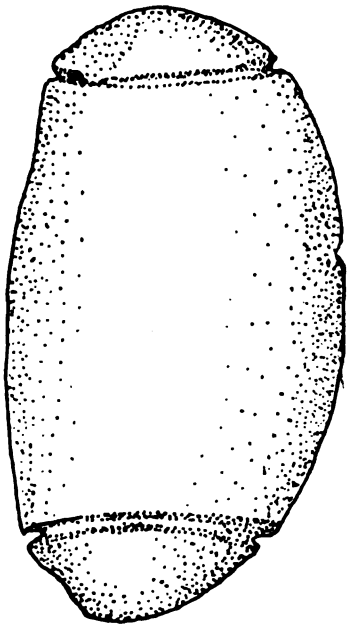
PL 25 S No.39



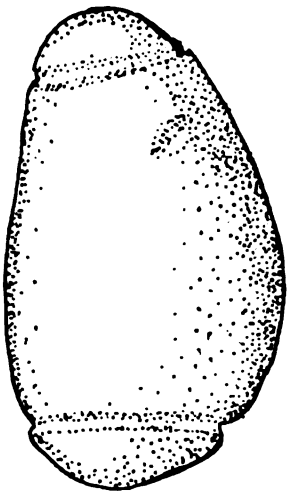
PL 41 S No. 9

Scale: 1-1

Fig. 35
Examples of grooved net sinkers.



PL 29 S-2 No.25



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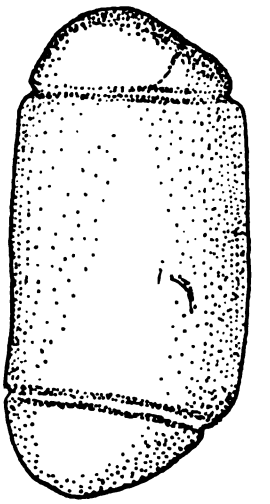
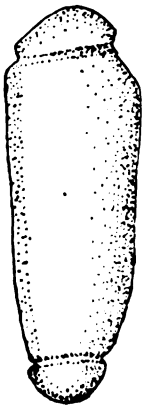
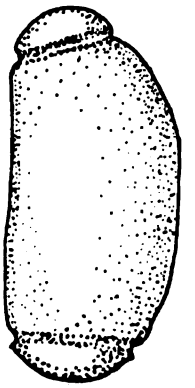


PL 29 S-3 No.31

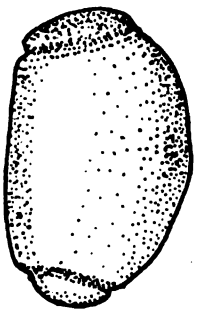
PL 30 E S



PL 29 S-2 No. 38



PL 34 S No.8



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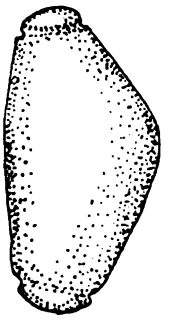
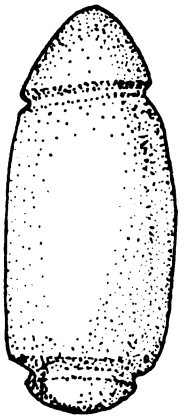


PL 41 S No. 10



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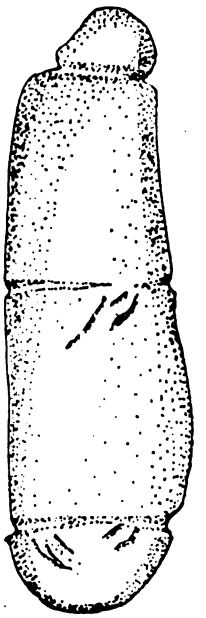
Scale: 1-1



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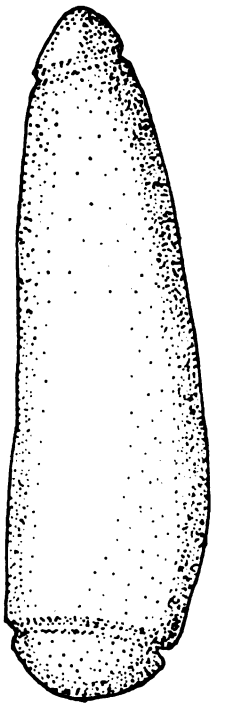
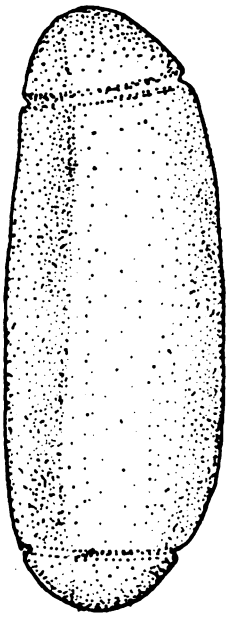


PL 29 S No.19



PL 29 S-3 No.26

Fig. 36
Examples of notched net sinkers.

Scale: 1-1

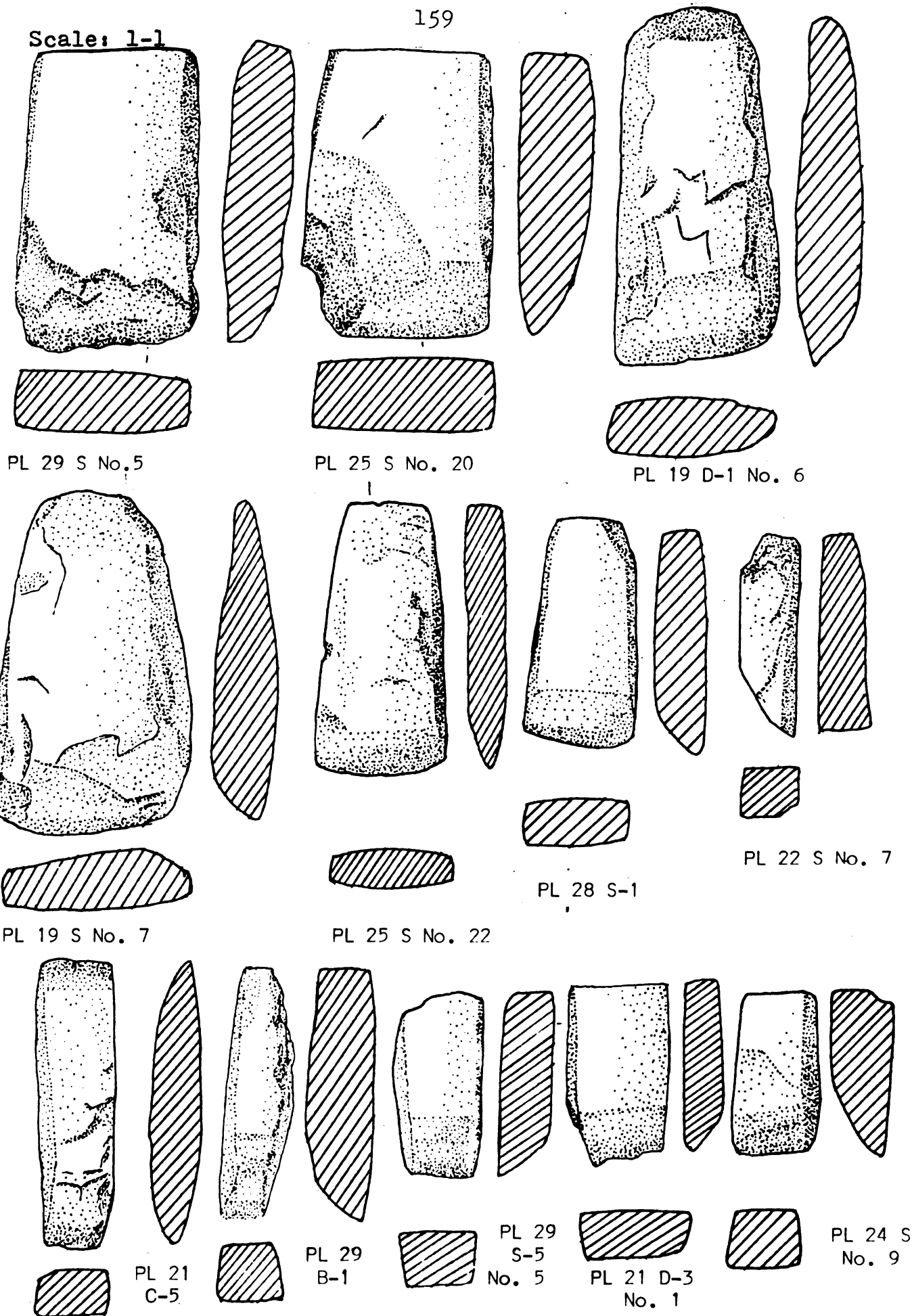


Fig. 37 Examples of adzes from the P'uli Survey.

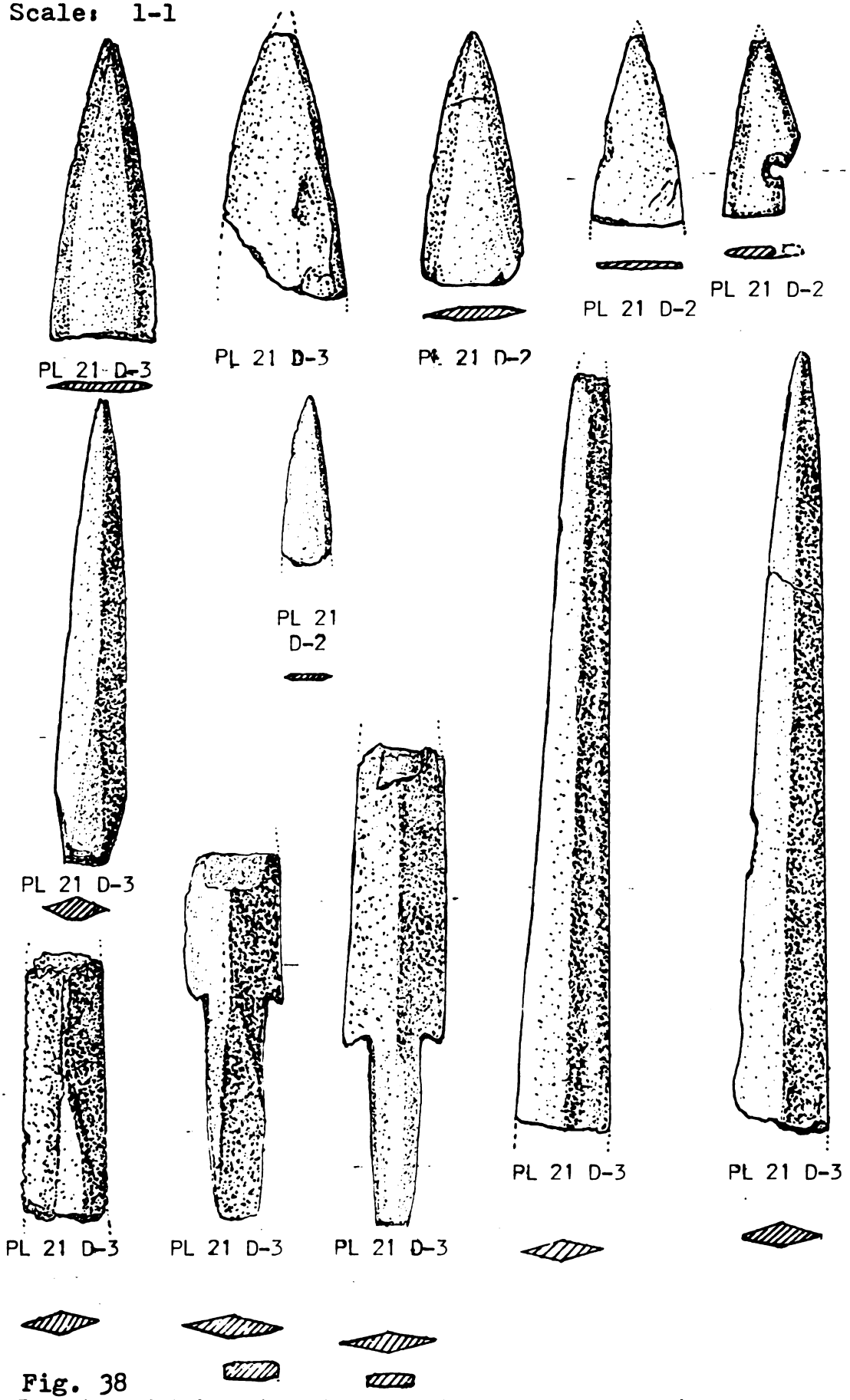
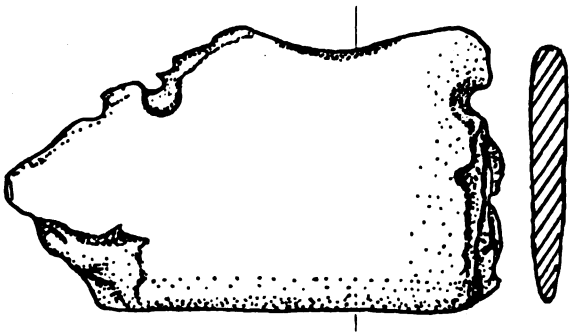


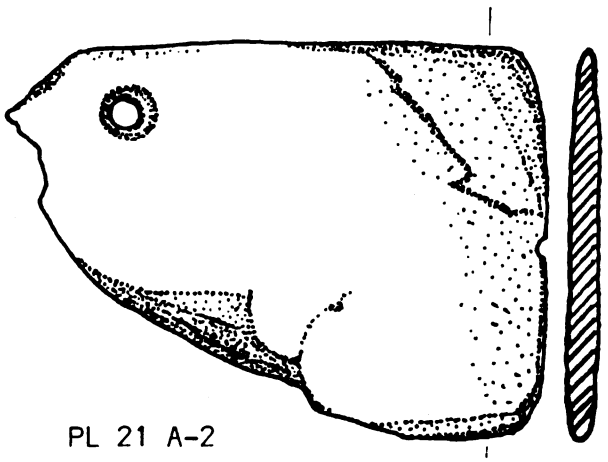
Fig. 38
. Examples of triangular, tanged and serrated arrow points.

Fig. 39
Examples of willow leaf and triangular shaped arrow points.

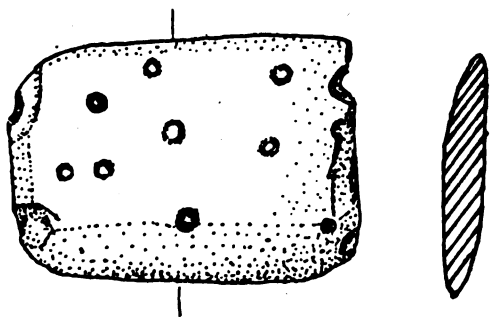
Scale: 1-1



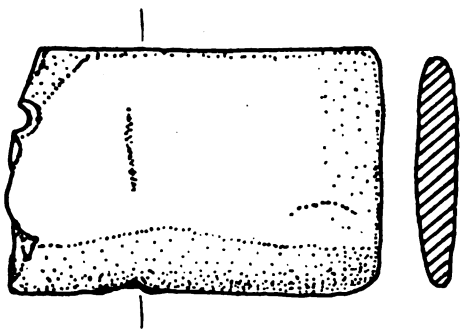
PL 21 C-4



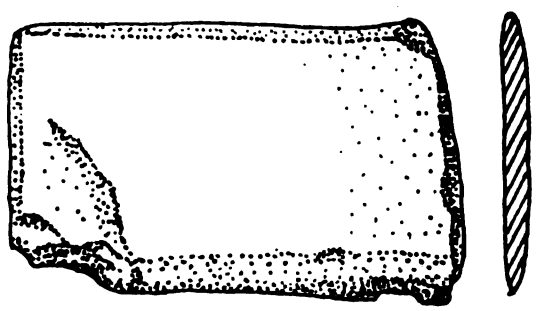
PL 21 A-2



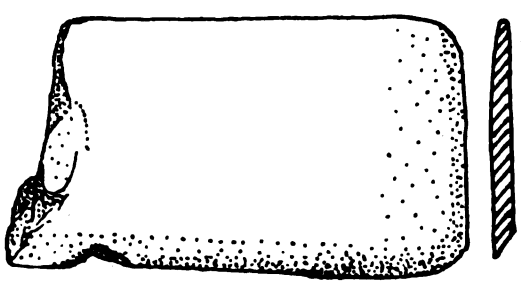
PL 29 S-3



PL 25 S



PL 21 S



PL 28 TT-1

Fig. 40
Examples of rectangular knives.

Scale: 1-1

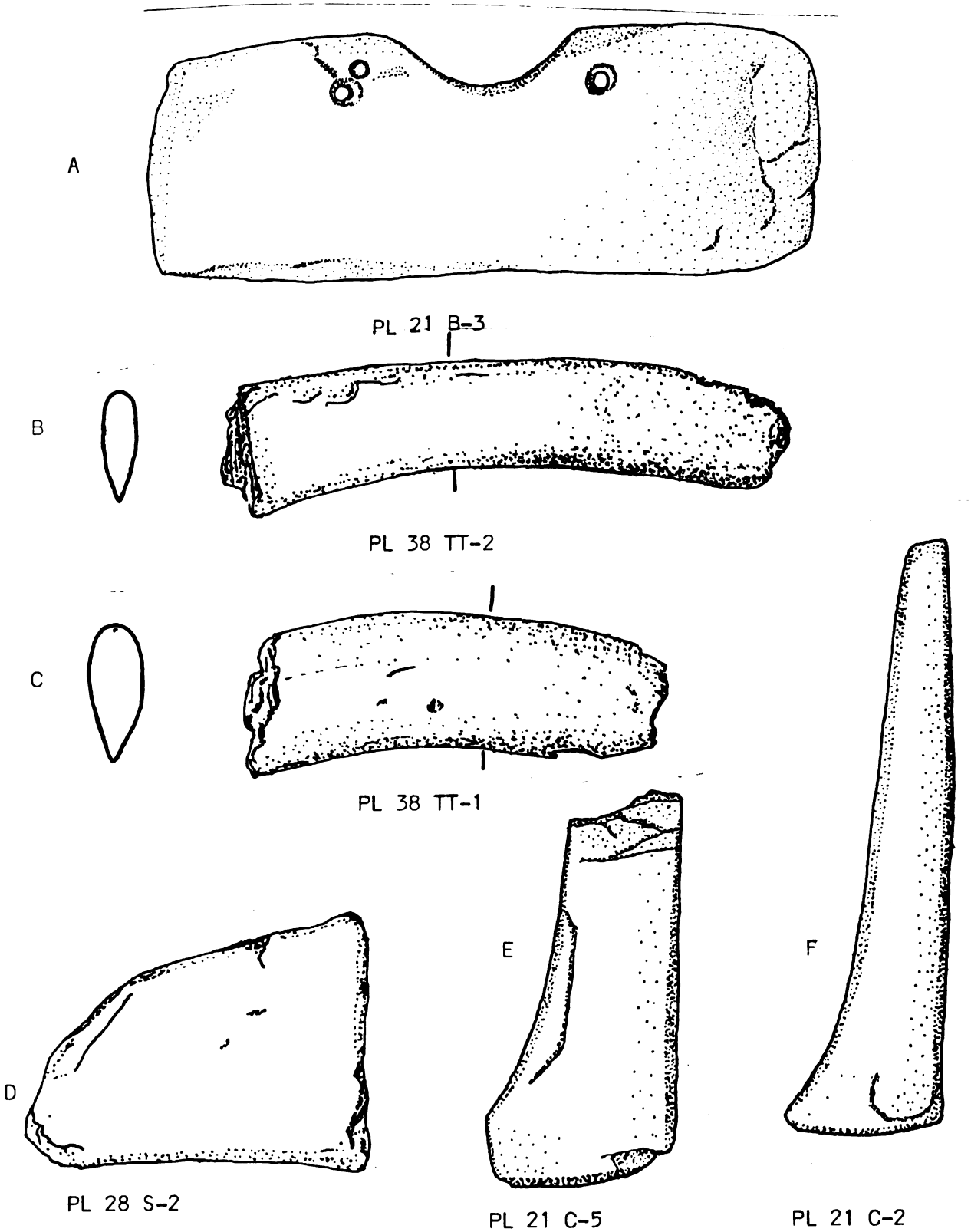


Fig. 41 Examples of stone artifacts: knives - A - rectangular; B, C - crescent shaped; D - semi-lunar; unknown - E, F - boot-shaped objects.

Appendix C: Summary of Sites

This appendix brings together in one place the summary of data for all of the sites located during the survey. For convenience in retrieval of information, each site was given a numeric designation as it was located. A file was kept on each site that included the initial survey sheet, maps, photos, drawings of test pit profiles, artifacts, features and any additional information. All of the stone artifacts were drawn and photographed. Drawings and photographs were filed within the folder for the site from which they came. This information is available from the author for the use of future researchers.

In the fifty-year interval between 1895 and 1945 when Taiwan was part of the Japanese Empire, several Japanese officials made collections of prehistoric artifacts. Liu (1956:55-57) lists nineteen villages and neighborhoods which were reported by the Japanese officials and local collectors to have produced artifacts. An attempt to locate sites in these designated areas was disappointing and only three sites previously mentioned could be relocated. Therefore, sites listed by Liu (1956:55-57) but not relocated in 1972-73 kept Liu's original numbers (i.e., 1-19), while new sites were assigned numbers 20-46 as they were located.

A site, for purposes of the survey, was defined as any location where evidence of prehistoric human activity could be found. Evidence for activities of prehistoric peoples was usually seen by the presence of stone tools, ceramics, worked slate fragments or specific features--most often stone burial cists. Sites were recorded in the notes with an arabic numeral preceded by a PL for P'uli. The following abbreviations were also used in the notes and to mark the artifacts: S = surface collection (may be divided into S-1, S-2, S-3, etc. to designate subdivisions over a large area); TT = test trench; A, B, C = labels for test pits; Roman numerals were used to designate stratigraphic levels in the test pits, with I closest to the surface.

Sites located in the 1972-73 Survey

P.L. 2

Sampling Zone: 4

Type of collection: 100% surface collection and one test pit

Ceramics: sherd count = 7; types represented = one

Lithics: total number = 33; types represented = trapezoid, spatula, rectangular, ovaloid hoes; sandstone fragments; grooved and notched net sinkers; rectangular reaping knife and a grooved pebble.

Other features: small burial cist

Time periods represented: Shuiwaku Period

Possible function: small hamlet? field?

P.L. 19

Sampling Zone: 3

Type of collection: 50% surface collection and five test pits (A-E)

Ceramics: sherd count = 915; types represented = six

Lithics: total number = 161; types represented = rectangular, ovaloid and waisted hoes; adzes; grooved net sinkers; cut slate fragments; one grooved pebble and 136 sandstone fragments.

Other features: small square burial cist, a small metal pipe (Chinese trade ware)

Time periods represented: Modern Period

Possible function: small hamlet, fields

P.L. 21

Sampling Zone: 4

Type of collection: 100% surface collection, test pits

Ceramics: sherd count = 4,688; types represented = ten

Lithics: total number = 185; types represented = quartz flakes; awls; trapezoid, spatula, rectangular, ovaloid and waisted hoes; sandstone wasteflakes and fragments; slate and sandstone k'o halberds; chisel; adzes; grooved and notched net sinkers; slate fragments and rectangular reaping knives; projectile points; disc shaped waste plugs, boot-shaped artifacts and slate ornaments.

Other features: clay spindle whorls

Time periods represented: Shuiwaku and Tamalin Periods

Possible function: village site

P.L. 22

Sampling Zone: 4

Type of collection: 100% surface collection, examined native excavations

Ceramics: sherd count = 0, types represented = 0

Lithics: total number = 8, types represented = spatula and rectangular hoes, k'o halberds and adzes.

Other features: rectangular burial cist

Time periods represented: Shuiwaku or Tamalin Periods

Possible function: field? small hamlet?

P.L. 23

Sampling Zone: 5

Type of collection: surface collection, interviewed local inhabitants about collections they had made

Ceramics: sherd count = 0, types represented = 0

Lithics: total number = 4, types represented = adzes, semi-lunar reaping knife and disc-shaped waste plug

Other features: rectangular burial cist

Time periods represented: ?

Possible function: ?

P.L. 24

Sampling Zone: 1

Type of collection: 100% surface collection

Ceramics: sherd count = 0, types represented = 0

Lithics: total number = 10, types represented = rectangular hoe, sandstone fragments, adzes, notched net sinkers and reaping knives

Other features: none

Time periods represented: ?

Possible function: field

P.L. 25

Sampling Zone: 3

Type of collection: 100% surface collection, test pit

Ceramics: sherd count = 77, types represented = two

Lithics: total number = 71, types represented = spatula, rectangular and ovaloid hoes; sandstone fragments; adzes; notched net sinkers; slate fragments and a rectangular reaping knife

Other features: none

Time periods represented: Shuiwaku Period

Possible function: small hamlet? field?

P.L. 26

Sampling Zone: 4

Type of collection: 100% surface collection

Ceramics: sherd count = 0, types represented = 0

Lithics: total number = 16, types represented = rectangular and ovaloid hoes; sandstone fragments; slate k'o halberd; notched net sinkers and semi-lunar reaping knife

Other features: none

Time periods represented: ?

Possible function: field?

P.L. 27

Sampling Zone: 3

Type of collection: 100% surface collection

Ceramics: sherd count = 0, types represented = 0

Lithics: total number = 4, types represented = trapezoid and ovaloid hoes and slate fragment

Other features: none

Time periods represented: ?

Possible function: field?

P.L. 28

Sampling Zone: 3

Type of collection: 100% surface collection, test pit

Ceramics: sherd count = 65, types represented = 4

Lithics: total number = 151, types represented = trapezoid, rectangular, ovaloid, pointed and irregular hoes; sandstone fragments; slate k'o halberds; adzes; notched net sinkers; slate fragments; reaping knives and two pointed fragments

Other features: none

Time periods represented: Shuiwaku Period

Possible function: small hamlet

P.L. 29

Sampling Zone: 4

Type of collection: representative surface collection (c. 50%), test pits

Ceramics: sherd count = 1,572, types represented = 10

Lithics: total number = 251, types represented = spatula, rectangular, ovaloid, waisted, pointed and irregular hoes; sandstone waste flakes and fragments; slate k'o halberds; a chisel; adzes; grooved net sinkers (one notched sinker); slate fragments; reaping knives; projectile point fragments and a grooved pebble

Other features: Burial cists had been found by farmers but were not in evidence in 1972-73.

Time periods represented: Shuiwaku Period

Possible function: hamlet or village, fields?

P.L. 30

Sampling Zone: 4

Type of collection: Test pits

Ceramics: sherd count = 242, types represented = 2

Lithics: total number = 45, types represented = spatula and rectangular hoes, sandstone waste flakes and fragments, slate k'o halberd, adze, two grooved and one notched net sinker and slate fragments

Other features: five rectangular burial cists, two areas with horizontal slate slabs and one intrusive pit

Time periods represented: Shuiwaku Period

Possible function: hamlet?

P.L. 31

Sampling Zone: 4

Type of collection: 100% surface collection

Ceramics: sherd count = 0, types represented = 0

Lithics: total number = 10, types represented = trapezoid, ovaloid and irregular hoes; one chipped rectangular slate k'o halberd and net sinkers--one each, grooved and notched

Other features: rectangular burial cist

Time periods represented: ?

Possible function: small hamlet? field

P.L. 32

Sampling Zone: 3

Type of collection: surface examination

Ceramics: sherd count = 0, types represented = 0

Lithics: total number = 0, types represented = 0

Other features: A stone burial cist had been destroyed by modern farmers and the larger slate fragments reused in the construction of a water cistern.

Time period: ?

Possible function: burial

P.L. 33

Sampling Zone: 3

Type of collection: 100% surface collection

Ceramics: sherd count = 3, types represented = 1

Lithics: total number = 0, types = 0

Other features: none

Time periods represented: Modern Period?

Possible function: field? path?

P.L. 34

Sampling Zone: 4

Type of collection: 100% surface collection, test pit

Ceramics: sherd count = 8, types represented = 1

Lithics: total number = 11, types represented = spatula, hoes, sandstone fragments, slate k'o halberd, grooved net sinkers and slate fragments

Other features: a rectangular burial cist

Time periods represented: Modern Period?

Possible function: burial? field?

P.L. 35

Sampling Zone: 4

Type of collection: 100% surface collection

Ceramics: sherd count = 0, types represented = 0

Lithics: total number = 4, types represented = rectangular and ovaloid hoes, sandstone fragment and a notched net sinker

Other features: none

Time periods represented: ?

Possible function: field?

P.L. 36

Sampling Zone: 1

Type of collection: 100% surface collection

Ceramics: sherd count = 0, types represented = 0

Lithics: total number = 0, types represented = 0

Other features: Although no ceramics or tools were found, a large quantity of slate fragments, which are not found naturally in this area, were located.

Time periods represented: Modern Period?

Possible function: building site?

P.L. 37

Sampling Zone: 1

Type of collection: 100% surface collection, test pit

Ceramics: sherd count = 0, types represented = 0

Lithics: total number = 2, types represented = ovaloid hoes

Other features: One short rectangular burial cist and one dish-shaped depression

Time periods represented: Modern Period

Possible function: small hamlet?

P.L. 38

Sampling Zone: 1

Type of collection: 100% surface collection, test pits

Ceramics: sherd count = 138, types represented = 1

Lithics: total number = 36, types represented = trapezoid, rectangular, ovaloid, pointed and irregular hoes; sandstone fragments; slate k'o halberds; one grooved net sinker and a slate fragment

Other features: several rectangular burial cists had been destroyed by the present owner

Time periods represented: Shuiwaku Period

Possible function: hamlet, fields

P.L. 39

Sampling Zone: 1

Type of collection: 100% surface collection, test pit

Ceramics: sherd count = 3, types represented = 1

Lithics: total number = 13, types represented = trapezoid, rectangular and ovaloid hoes; sandstone fragments; grooved net sinker and two disc-shaped waste plugs

Other features: none

Time periods represented: Shuiwaku Period

Possible function: field, small hamlet?

P.L. 40

Sampling Zone: 1

Type of collection: 100% surface collection

Ceramics: sherd count = 1, types represented = 1

Lithics: total number = unknown. This collection was made by Mr. Hwang and Mr. Liu, and the artifacts were returned to the Geology Department at National Taiwan University. The author did examine the site and the collection, and it contains hoes, adzes, a small spear point and slate fragments.

Other features: none

Time periods represented: ?

Possible function: field?

P.L. 41

Sampling Zone: 3

Type of collection: 100% surface collection

Ceramics: sherd count = 4, types represented = 1

Lithics: total number = 17, types represented = spatula, rectangular and ovaloid hoes; sandstone fragments plus grooved and notched net sinkers

Other features: none

Time periods represented: Modern Period?

Possible function: field?

P.L. 42

Sampling Zone: 4

Type of collection: 100% surface collection

Ceramics: sherd count = 0, types represented = 0

Lithics: total number = 9, types represented = rectangular and ovaloid hoes and sandstone fragments

Other features: rectangular burial cists

Time periods represented: ?

Possible function: hamlet? burial

P.L. 43

Sampling Zone: 4

Type of collection: 100% surface collection, test pit

Ceramics: sherd count = 19, types represented = 1

Lithics: total number = 22, types represented = trapezoid, rectangular, irregular, spatula and ovaloid hoes and sandstone fragments

Other features: a rectangular burial cist

Time periods represented: Modern Period?

Possible function: burial, field

P.L. 44

Sampling Zone: 3

Type of collection: 100% surface collection

Ceramics: sherd count = 0, types represented = 0

Lithics: total number = 16, types represented = trapezoid, rectangular, ovaloid and waisted hoes and sandstone fragments

Other features: none

Time periods represented: ?

Possible function: field?

P.L. 45

Sampling Zone: 6

Type of collection: 100% surface collection, test pit

Ceramics: sherd count = 4, types represented = 2

Lithics: total number = 0, types represented = 0

Other features: a square burial cist

Time periods represented: Modern Period

Possible function: burial

P.L. 46

Sampling Zone: 5

Type of collection: 100% surface collection

Ceramics: sherd count = 0, types represented = 0

Lithics: total number = 2, types represented =
rectangular hoe and slate fragment

Other features: none

Time periods represented: ?

Possible function: field? path?

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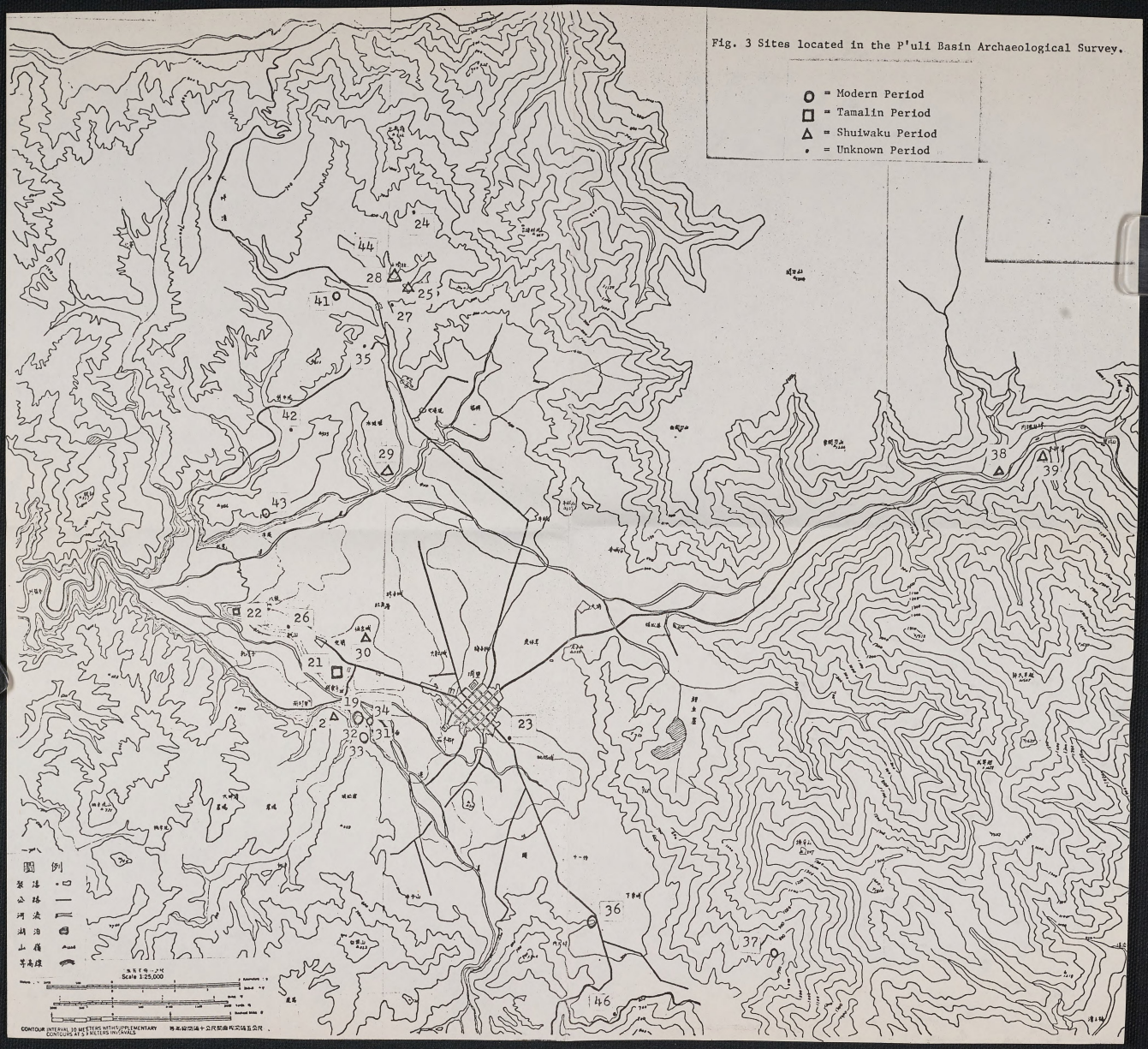
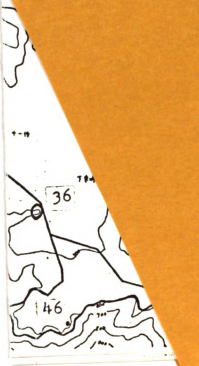


Fig. 3 Sites located in the P'uli Basin Archaeological Survey.
= Modern Period
= Tamalin Period
= Shuiwaku Period
= Unknown Period
Scale 1:25,000
CONTOUR INTERVAL 10 METERS WITH SUPPLEMENTARY CONTOURS AT 5 METERS INVERVALS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