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FROM THE SITE OF PEARLS, GRENADA: EXOTIC LITHICS AND RADIOCARBON DATES

As the southernmost island of the Lesser Antilles, Grenada would have been the first reached during the rapid movement of Saladoid peoples from mainland South America through the West Indies. It is possible that, at least initially, Grenada's population density was greater than reached on more distant islands, and it is likely that Grenada's location only 90 miles north of Venezuela enabled the early colonizers to maintain close contacts with the mainland. In the archaeological record, contacts between Grenada and the mainland should be expressed by the presence of "exotic" artifacts on the island. The sources of such artifacts and the dates of their manufacture can provide clues concerning the trading relationships, origins,l and development of prehistoric Antillean cultures.

The site of Pearls (Gren-A-1) was first excavated by Ripley Bullen, who concluded that its Saladoid pottery belonged to "the earliest ceramic period of Grenada" (1964: 22). The site originally covered at least 25 acres (op cit: 18), but has since been disturbed by construction of the airport, and more recently by removal of rich midden for agricultural purposes and by looting. The looters have been finding artifacts made of a "green stone". Controlled test excavations conducted in August of 1988 and January of 1989 revealed numerous other exotic lithics as well, none of which are mentioned by Bullen in his 1964 report.

After briefly describing the test excavations and the geology of Grenada, this paper will list the exotic lithics recovered form the site of Pearls. "Exotics" are considered to be those rocks or minerals of non-local origin. Possible geologic sources of some artifacts will be discussed, but space limitations preclude an examination of all ethnographic references and archaeological reports concerning the rock and mineral types. Additionally, radiocarbon dates associated with diagnostic vessels and sherds will be given, leading to the first absolute dates for the Saladoid colonization of Grenada. Finally, the cultural implications of the exotic artifacts at Pearls will be reviewed briefly. This paper is a preliminary report; a synthesis will be presented at a later date (Cody 1990).

TEST EXCAVATIONS

Two small test excavations were made at the site of Pearls in August of 1988 and January of 1989. The work was conducted under a grant form the Foundation for Field Research (FFR), which has been sponsoring a site recording and testing program on Grenada since 1986. The 1 x 3 m test unit (Unit A) excavated in August of 1988 was placed in a shallow, undisturbed area of the site, for use as a chronological control. The cultural deposit extended to 50 cm depth below datum (DBD), and had a considerably lower artifact (and faunal remains) density than was found in the second test unit.

In January of 1989 we returned to the site and placed a second test unit near a favored looters' pit, where overburden from airport construction created a large

mound. This Unit (Unit B) was set up to measure 3 m square; however, we first excavated one quadrant to determine where the overburden ended and the intact midden began. The first 60 cm depth contained about one piece of recent asphalt per level; the final 60 cm (to 120 cm DBD) contained large potsherds, intact vessels, and whole shells. With the density of finds, excavation of the single quadrant proved so time consuming that the rest of the unit could not be completed in the time remaining.

Both units were excavated in 10-cm arbitrary levels and screened through 1/8" mesh. Work was conducted by Fountain volunteers from the U.S. and by Grenadian volunteers; it was directed by Thomas Banks (Director, FFR) and myself (cf. Cody and Banks 1988). All artifacts obtained from the excavations are currently held at the Grenada National Museum. [1]

GEOLOGY OF GRENADA

Grenada's geologic history began in the Upper Eocene, when eruptions of a submarine vent deposited layers of shale, volcanic sandstone, and graywacke (Martin-Kaye 1969: 202; Tomblin 1975: 472). In the Oligocene and Miocene, reefal limestones grew on the submerged island, but the lenticular deposits indicate continued volcanic activity (op cit: 473). At the end of the Miocene the Andean orogeny caused Grenade to uplift and emerge. Early eruptions of the main volcanic centers occurred in the Pliocene; in the Pleistocene St. Catherine and others erupted. "Hornblende and hypersthene andesites form the central cores and much of the pyroclastic debris" (Martin-Kaye 1969: 203). The craters of Grand Etang, Lake Antoine, Punchbowl, and Plaisance represent recent explosion features, but apart from a submarine eruption grenada has not felt volcanic activity in historic times (ibid). The most distinctive features of Grenada's geology, especially in comparison with the other Lesser Antillean islands, is its unusually large proportion of mafic, silica-undersaturated basalts (ibid; Weyl 1966). Quartz is not a common mineral (Earle 1924: 5).

EXOTIC LITHICS

Amethyst: Of the exotic rocks and minerals recovered in the two test excavations conducted at Pearls, amethyst is the most abundant. In Unit A it was found in all stages of manufacture (Figure 1), from unworked crystals to chips to bead blanks to partially drilled beads to complete, cylindrical beads. The chips and flakes of amethyst were present in every level, but were particularly abundant 30 - 40 cm DBD. This level contained worked amethyst crystals, two discoidal bead blanks, and a polished, cylindrical bead blank. One amethyst bead each was found in every level of Unit A except the first, 0 - 10 cm DBD. In Unit B amethyst chips were found in the overburden levels and in the level 70 - 80 cm DBD (10 - 20 cm below the overburden). The amethyst ranges in color from dark purple to light violet. Some crystal chips contain bands of color in otherwise clear quartz.

Quartz Crystal: Clear quartz crystal was found associated with the amethyst in the test excavations at Pearls. In Unit A two crystal quartz beads were found 20 - 30 cm DBD (Figure 2); and one bead, 30 - 40 cm DBD. One orange quartz,

discoidal bead blank was also found 30 - 40 cm DBD. Crystal quartz chips and flakes were found in every level in Unit A, and down to 80 cm DBD (20 cm depth below overburden) in Unit B. Unworked quartz cobbles were found as well in Unit B in the disturbed stratum (40 - 50 cm DBD) and at 40 - 50 cm depth below the overburden (100 - 110 cm DBD).

Chalcedony: A third variety of quartz was also recovered from the test excavations at Pearls: chalcedony. Light- to dark-brown and orange-red carnelian was most frequently found already manufactured as complete cylindrical or faceted beads or bead blanks. In Unit A one carnelian bead fragment (apparently broken during perforation) was found 20 - 30 cm DBD, and two cylindrical beads were found 30 - 40 cm DBD. In Unit B one carnelian bead each was found in the 30 - 40 cm and 70 - 80 cm levels; bead blanks were recovered from the 50 - 60 cm and 60 - 70 cm levels (60 cm and below is in the intact deposit).

Chert flakes were recovered from every level of Units A and B, although not in the quantity with which quartz crystal and amethyst were found. A chert scraper was found in the 30 - 40 cm level of Unit A and in the 40 - 50 cm level (overburden) of Unit B. One small chert core was excavated in situ, 65 cm DBD (in the first level below the overburden) in Unit B. A green, 65-cm long, tapered whetstone that was found in the 110-120 cm level (50 - 60 cm depth below overburden) of Unit B has been identified as microcrystalline quartz.

Unidentified Rock Type: Besides the quartz minerals, the lithic type most frequently used in bead manufacture was a rock with a light colored groundmass and black inclusions. Some specimens appear to be a marble-like metamorphosed limestone; others, like diorite. Until the rock is identified, its source cannot be inferred; however, it should be noted that only complete, cylindrical beads (or bead blanks) and no waste flakes have been found in the test excavations at Pearls. Beads made of this rock type were recovered from every level, 0 - 40 cm DBD in Unit A, with three from the 30 - 40 cm level. One was also found in the first (overburden) level of Unit B, and in the 70 - 80 cm level (10 - 20 cm depth below overburden) in Unit B.

Pyrite: One octahedral crystal of pyrite was recovered from the bottom level of Unit B (110 - 120 cm DBD; 50 - 60 cm depth below overburden).

Nephrite: The ornamental stone that has drawn considerable attention to Pearls and that has engendered looting of the site has commonly been referred to as jade of "greenstone". I had the opportunity to photograph two artifacts owned by a Pearls local: one is a pendant resembling a frog (Figure 3) and the other is in the shape of an axe (Figure 4). In our test excavations, we recovered four fragments and one bead of "greenstone" from Unit A, and one complete but small "greenstone" artifact from Unit B.

The "greenstone" artifact from Unit A, pictured in Figure 5, appears to be a chip from a larger piece. It featured two incised lines on its polished face, terminating at a fractured edge. The mineral is dark green, opaque, with a silky luster. The fractured edge reveals a fibrous habit. This artifact was found 20 - 30 cm DBD in Unit A; two other nondiagnostic "greenstone" flakes were found in the same level, while a third piece was found 30 - 40 cm DBD. All were recovered from the screen. The "greenstone" artifact pictured in Figure 6 was found in situ, 38 cm DBD (in the overburden) in Unit B. It is complete, measuring 48 mm in length, 7 mm in width, and 3 mm in thickness. It features a rectangular plan, and tapers at the ends to 2 mm thickness. The mineral's color is variegated green, white, and

brown.

Mineralogist Dr. Richard Berry of San Diego State University examined grains from the artifact pictured in Figure 5 and 6 with a petrographic microscope, using the oil immersion technique. He found the refractive index of each to be 1.61, which corresponds to nephrite (Klein and Hurlbut 1985: 416). This identification was corroborated by determination of the artifacts' specific gravity with a Jolly balance. The specific gravity of each is 2.9, again within the range of nephrite (Desautels 1986: 13). Nephrite is a tough, felted variety of actinolite. It is important to note that the significance of identifying "greenstone" lithic types lies in tracing their geological sources, for in essence they are all a cultural jade.

Schist: Two pieces of micaceous schist (approx. 7 cm square) were recovered from the same level as the pyrite in Unit B (110 - 120 cm DBD; 50 - 60 cm depth below overburden). One has three incisions, like cut marks, running against the direction of foliation.

Turquoise: Two small (5 mm diameter) beads have been tentatively identified as turquoise. They are light blue, massive, and about 6 on Moh's scale of hardness. In accordance with Pogue's (1915: 25) description, grains under the microscope are irregular, with occasional fibers, and under crossed nicols polarized light is admitted through the thinnest edges. The indices of refraction are 1.61 and 1.63. One bead was found 30 - 40 cm DBD in Unit A; one was recovered 40 - 50 cm DBD in Unit B.

GEOLOGICAL AND CULTURAL OCCURRENCES OF AMETHYST AND NEPHRITE

Of the minerals recovered from the site of Pearls, amethyst and nephrite appear to be the most significant: amethyst because of its quantity on Grenada and yet apparent scarcity elsewhere: nephrite because of its prehistoric and historic value. In the West Indies, amethyst in any abundance from a prehistoric cultural context has been reported only Montserrat (Harrington 1924: 184 - 89) and Vieques, Puerto Rico (Chanlatte Baik and Narganes Storde 1983). Of course, Bullen (1964) did not record the presence of amethyst at Pearls, and the likelihood remains that amethyst remains to be reported in the future from more Antillean archaeological sites.

It should be noted here that a quantity of amethyst surpassing that found at Pearls was recovered during a salvage excavation at the Saladoid/Troumassoid site of Grand Anse Beach (Gren-G-7) in August of 1987 (cf Banks 1988). The specimens were either unworked or partially worked crystals or waste flake material; no amethyst beads or bead blanks were found. Several tens of grams of amethyst were recovered from every 10-cm level of seven meter-squares units. Clearly, amethyst is not uncommon in archaeological contexts on Grenada.

Geologically, however, amethyst is relatively scarce in comparison to more common minerals, requiring special conditions for its growth (Vos 1985: 129). Amethyst grown i cavities, such as lava vesicles, pegmatitic pockets in the center of granitic rocks, and in faults and fissures through which hot waters and gases escape (op cit: 130). Holden (1925) lists six types of occurrences, including "amygdaloidal cavities in mafic lavas such as basalt" (Vos 1985: 134). The nearest known amethyst deposits are in Brazil.The states of Bahia and Minas Gerais are the most

important producers,and the best known amethyst deposit is knows as Grota do Coxo, near Jacobina in the center of Bahia state (Cassedanne and Sauer 1987: 11; O'Donoghue 1987: 75). According to Sauer (1982: 86), at the Grota do Coxo deposit "crystals of diameters often exceeding ten centimeters, display a deep violet colour, verging on black, in their upper extremity. The base ranges form hyaline to translucent, with hematite and pyrite rims."

In comparison with the other Lesser Antillean islands, Grenada contains an exceptionally high proportion of mafic basalts (Tomblin 1975: 477). The natural occurrence of amethyst on Grenade, therefore, cannot be ruled out; it would be fruitful to conduct a geological search. Trace element signatures of amethyst from known source localities and from archaeological contexts need to be compared before the source of the amethyst found at Pearls can be determined.

The geological occurrence of nephrite is significantly different from that of amethyst. Nephrite is found in metamorphic rocks; it is frequently associated with schists, gneisses, serpentines, and metamorphosed limestones (Desautels 1986: 15). It may occur in situ in masses, lenses, stringers, or nodules (ibid), or as alluvial boulders and pebbles with a brown rind due to weathering (Webster 1983: 258). In South America the only confirmed reference to the geological occurrence of nephrite is from Baytinga in Bahia, Brazil (Ball 1941: 38; Hardinge 1961: 36; Hussak 1904; Ihering 1904; Webster 1983: 260).

References to "green stone" in both the historical and archaeological literature concerning the West Indies, cannot be assumed to mean nephrite. Identifications of "green stone" artifacts from Vieques, Puerto Rico (Chanlatte Baik 1983; Chanlatte Baik and Narganes Storde 1983) primarily include serpentine, malachite and jadeite; in the Greater Antilles the geological sources of these lithic types are geographically closer than those of nephrite. Wagner and Schubert (1972) discuss the possible Caribbean sources and the production of serpentinite artifacts found in the Venezuelan Andes.

In his translation of the *Dictionary* of the Reverend Father Breton (1635 - 1656), Petitjean-Roget observes that green stones are often mentioned, and are of two different types: "Breton writes '*tacaoua* = green stone; *tacoulaoua* this one is of a lighter color; they serve as a protection against gravel, epilepsy, and help women in labor. The wives of the savages hang them from their necks, as one of the most precious jewels received from the men who bring them from the Mainland'" (1963: 50). Roth (1915: 290 - 291) amasses a number of references to "Amazon stone" or nephrite from the guianas and Surinam, and Boomert (1987) follows up with a comprehensive review and discussion of the stones in ethnohistoric and archaeological contexts from Amazonia, the Guianas, Venezuela, and the West Indies.

Specific references can be found to what is likely to be nephrite from sites in the Lesser Antilles, including frog-shaped pendants from Montserrat (Harrington 1924; Olsen 1975), as well as St. Vincent (Bullen and Bullen 1972: Pl. XIXf; Fewkes 1922: 122), St. Kitts (Fewkes 1922: Pl. 36c), Guadeloupe (Clerc 1970: Fig. 27), and a couple of specimens form Trinidad (Fewkes 1922: 75; de Booy 1918: 486). Haag (1970: 132-33) describes petaloid celts made of "jadeite or jade-like stone" from St. Lucia, but he says the specific gravity of the large forms approaches 4.0 - too heavy for nephrite or even jadeite or serpentine (Desautels 1986: 13). Green stone beads on Martinique are mentioned by Labat (1970: 71-72, 76). Nephrite artifacts have also been found on Vieques, near Puerto Rico (Chanlatte Baik 1983; Chanlatte Baik

and Narganes Storde 1983), on Puerto Rico (Sued Badillo 1976), and on St. Croix, Virgin Islands (Vescelius and Robinson 1979).

Given that both amethyst and nephrite have apparent possible ties to Brazil, and that the other forms of quartz (rock crystal and chalcedony), as well as the schist and pyrite, are geologically compatible with the first two minerals, it is noteworthy that the only reference to turquoise from eastern South America is again from Brazil. "In a place called Serrote da Lagoa Seca, near the tiny village of Casa Nova, state of Bahia, a turquoise vein cut the local Pre-Cambrian gneiss. This deposit, the first to be discovered in Brazil, was flooded by the waters of the Sobradinho dam" (Sauer 1982: 118). It is not the goal of this paper to source the exotic lithics from Pearls, yet a cautionary statement should be uttered at this early stage of the study. While Occam's razor leads us to the nearest geologic sources known today in South America, the possibilities that aboriginally exploited sources may have been lost, or that more distant and more plentiful sources in Central America were used, cannot be dismissed until greater information is available.

RADIOCARBON DATES

Before the timing of the exchange and manufacture of the exotic lithic artifacts can be discussed, radiocarbon dates are needed. Three radiocarbon age determinations were obtained from the limited test excavations conducted at Pearls.[2] All dates are from shells found in Unit B, associated with diagnostic vessels and sherds. Because we are still working out the stratigraphy of the site, the dates ar not internally consistent. However, they do provide the first absolute dates available for Saladoid occupation of Grenada, and indicate the approximate timing of the manufacture of exotic lithic artifacts at Pearls. Additional excavation and radiocarbon age determinations (preferably from actual carbon samples) are needed to supplement and explain those reported here.

The first radiocarbon age determination was taken from an *Astraea* shell found 74 cm DBD (14 cm below overburden), associated with a white-on-red vessel. (In Figure 7 it lies on the upper left, in back of the pot.) An inverted, bell-shaped bowl with composite contours, the vessel is complete except for its two missing strap handles. The rim and base are painted red; the collar is buff and painted with two white, longitudinal rectangles bisected by one white, horizontal line each (Fig. 8). The radiocarbon date is 1725 $\pm$ 54 years before present (YBP).

The second date, 1914 $\pm$ 51 YBP, comes from a complete *Turbo* shell found inside a utilitarian, undecorated vessel. An unrestricted bowl with two strap handles, the vessel was found upside-down, with its base broken and missing (Figure 9). The shell was recovered from 75 - 80 cm DBD, resting against the interior wall just below the missing base.

The third radiocarbon date was taken from a *Turbo* shell recovered in the 110 - 120 cm level. Its problematical age is 1711 $\pm$ 74 YBP. An associated artifact from 110 cm DBD is an adorned platter end (Figure 10), so closely resembling one from Carriacou pictured in Fewkes (1922: Pl. 64b) as to lead one to believe they were modeled by the same artisan. Another associated artifact is an hemispherical adorno decorated with white-on-red painted crosshatching, a trait characteristically considered Ronquinan or mainland Saladoid; and from the same level also comes a turtle effigy bowl, generally considered Cedrosan Saladoid. The conjunction of

Ronquinan and Cedrosan ceramic customs could point to their transition at Pearls, or perhaps to continued interaction with the mainland. Again, it should be emphasized that more stratigraphic excavations, careful pottery analysis, and radiocarbon dates are needed.

CULTURAL IMPLICATIONS

As indicated by pottery belonging to the "Pearls series of the Insular Saladoid period" (Bullen 1964) and by radiocarbon dates from the first two centuries A.D., the site of Pearls was one of the first colonized by agricultural Amerindians from mainland South America. Some pottery design elements, such as white-and-red painted crosshatching, retain closer affinities with South America than with other Antillean islands. It is likely that most of the exotic lithics cited in this paper originated form South America; the question remaining concerns the role of the site of Pearls in the manufacture and distribution of these artifacts.

The artifacts recovered, from Unit A especially, indicated that beads were being manufactured at the site of Pearls. Given the fact that beads were found in every stage of manufacture, from chipped amethyst and quartz crystals to bead blanks to partially drilled beads, it appears that the raw material was brought to the site and worked there. In the bottom level of Unit A (40 - 50 cm DBD), a small drill bit was found in association with a fractured amethyst bead. Not even one centimeter long, the drill bit is a hard stone point that would have been suitable for being "set in the end of a wooden shaft and revolved in alternating directions between the hands" (Orchard 1975: 46). All of the beads feature biconical perforations.

Another artifact that may be associated with ornament manufacture is a chert whetstone found in the bottom level of Unit B (50 - 60 cm below the overburden). In shape it is identical to one pictured in Holmes (1919: 346, fig. 202), who writes that "It cannot be said with certainty... whether a particular form was employed exclusively or even partially in the shaping of stone, and many of the implements probably served for the treatment of other materials, as shell, bone, wood, and metal, as occasion required" (op cit: 345). He continues, "their greatest field of usefulness was, no doubt, in the shaping and finishing of minor artifacts and in giving surface finish to sculptures generally" (ibid). On Moh's Scale, this artifact has a hardness of 7, while nephrite has a hardness of 6.5. Is would not have been impossible to work nephrite with the chert whetstone.

Besides the exotic lithics that comprise the focus of this paper, it should be noted here that ornaments made of other materials were found at the site of Pearls. Numerous discoidal shell beads, tubular bone beads, spherical and discoidal pottery beads, and a shark's tooth pendant with two perforations (80 - 90 cm DBD, Unit B) could have been manufactured on site. A discoidal pottery stamp for body paint (also form 80 - 90 cm DBD in Unit B), featuring an appliqued figure, indicates additional concern with ornamentation in other media.

Bullen calls Pearls "a large and important center during the early part of the Christian era" (1964: 22). Subsequent to Bullen's work, the identification of at least seven exotic lithic types indicates that the site was a locus for exchange of exotics and production of ornaments. While some of the exotic lithics that moved through the early Saladoid exchange network have been identified in this paper, further work

is needed concerning their spatial and temporal distribution.

Distribution of Saladoid artifacts on the South American mainland indicates that the initial colonizers of the West Indies originated from and had ties to Venezuela and the Guianas. With expansion to the island of Grenada, as well as to the rest of the Antilles, interaction and exchange clearly persisted. Given Grenada's position only 90 miles north of Venezuela, Pearls could have been a first and last stop during travel to and from the islands. With additional excavations at Pearls, analysis of stylistic, morphological, and compositional ceramic attributes, and geological sourcing of lithic artifacts, the continuity of the prehistoric cultural interactions and the routes of exchange can be discovered.

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NOTES

1. The test excavations at Pearls indicated the necessity of a comprehensive exploration of the site; accordingly, William Keegan (University of Florida) and I have initiated a large-scale project at Pearls with FFR support.

2. The radiocarbon age determinations were calculated by the University of Georgia, Center for Applied Isotope Studies (1989). Dates are normalized to 1950 A.D. and are corrected.

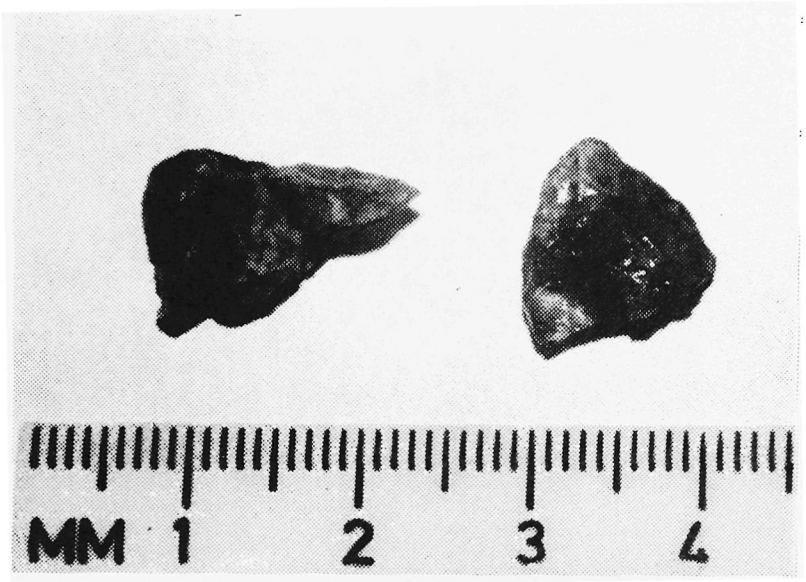

Fig. 1. Amethyst.

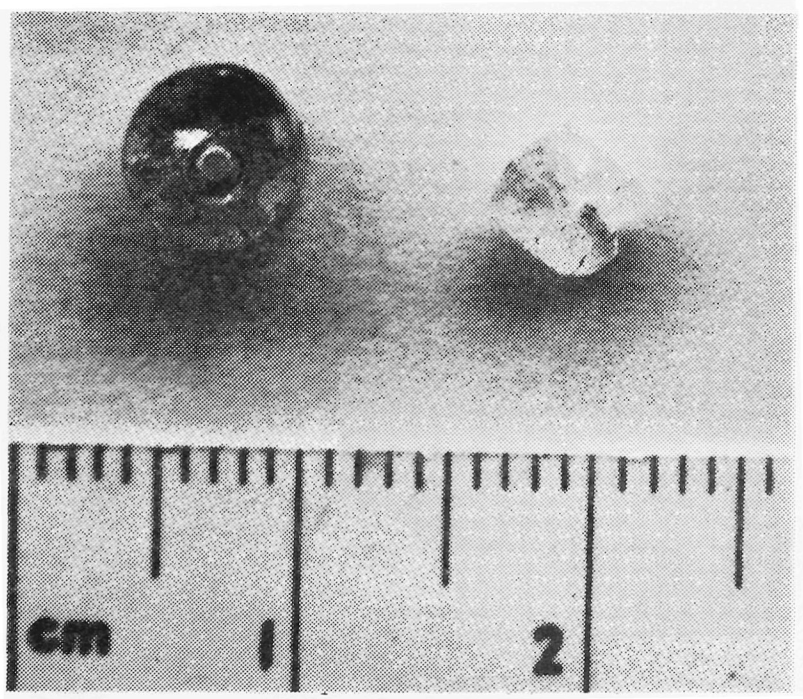

Fig. 2. Quartz beads (Unit A, 20-30 cm DBD)

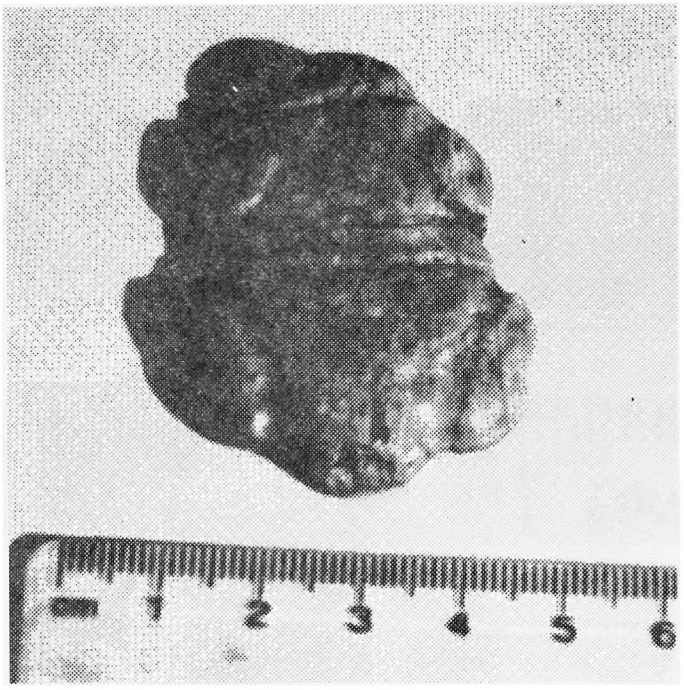

Fig. 3.

Fig. 4.

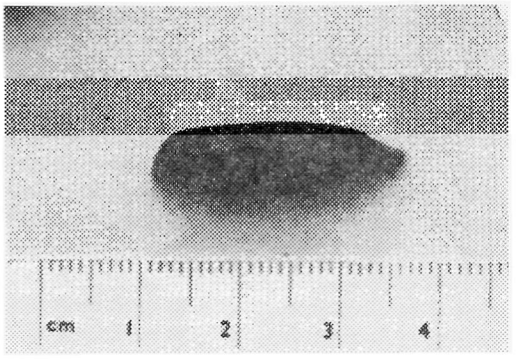

Fig. 5. (Unit A, 20-30 cm DBD)

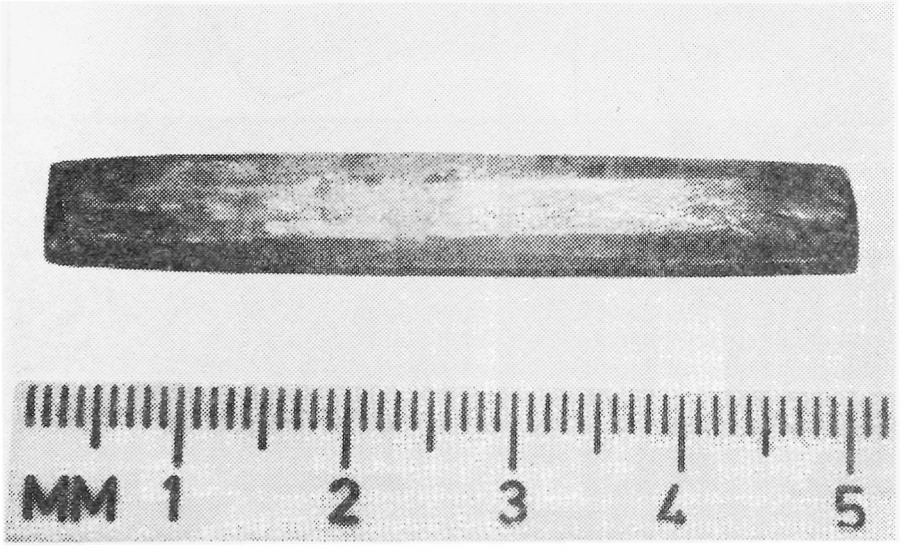

Fig. 6. Nephrite (Unit B, 38 cm DBD)

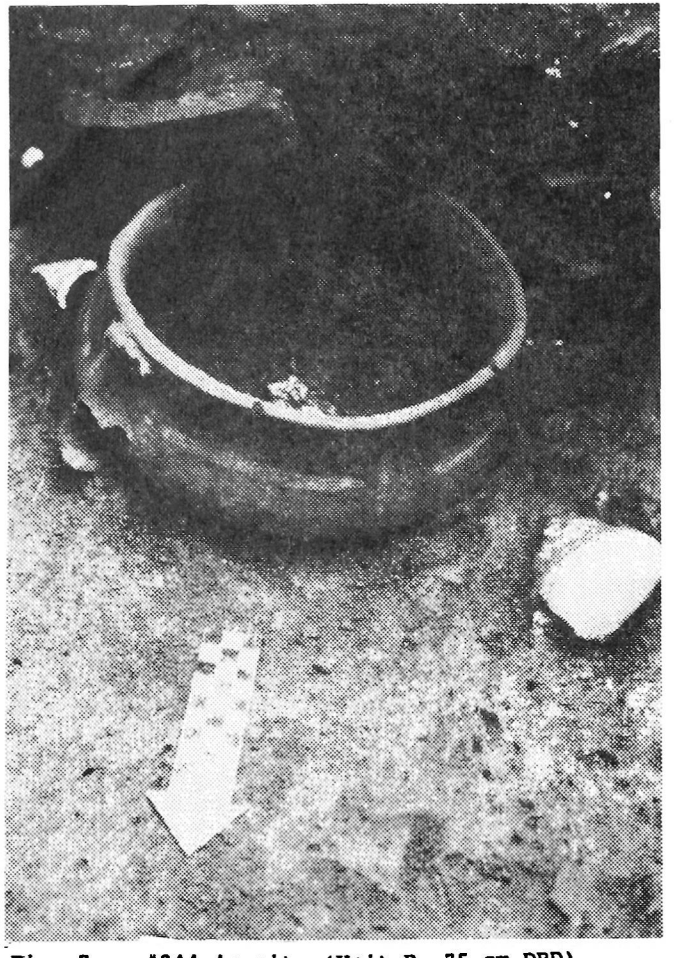

Fig. 7. #244 in situ (Unit B, 75 cm DBD)

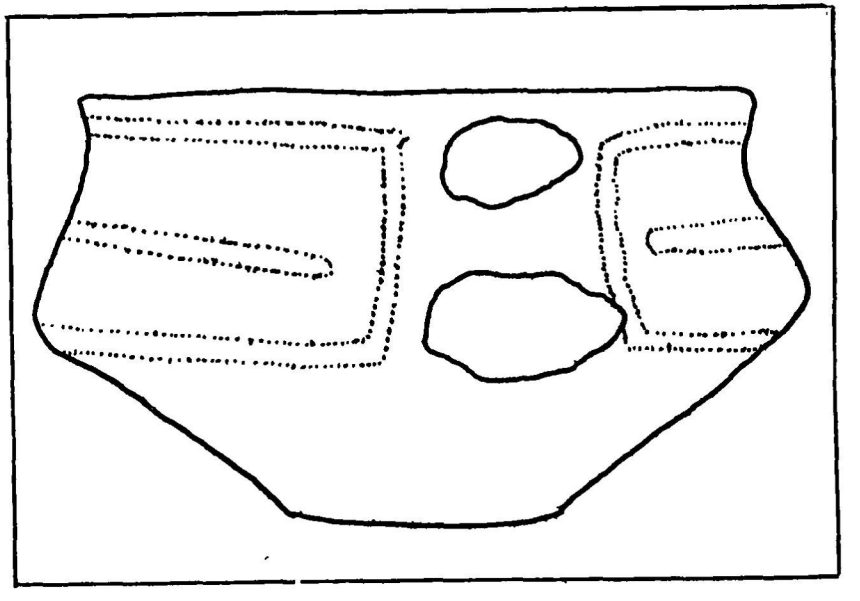

Fig. 8. Profile of #244

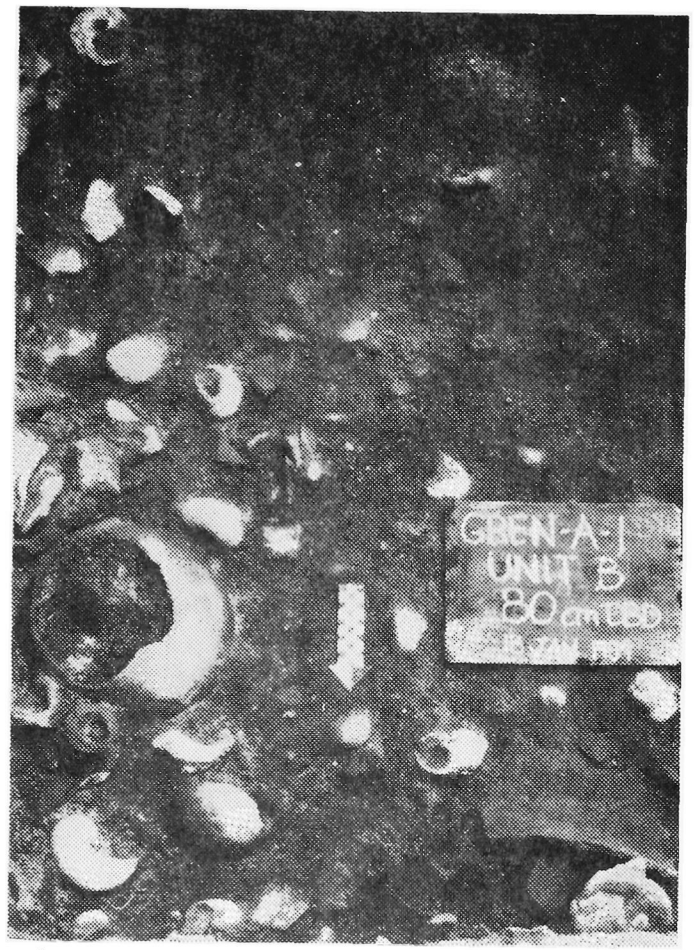

Fig. 9. #341 in situ (Unit B, 80 cm DBD)

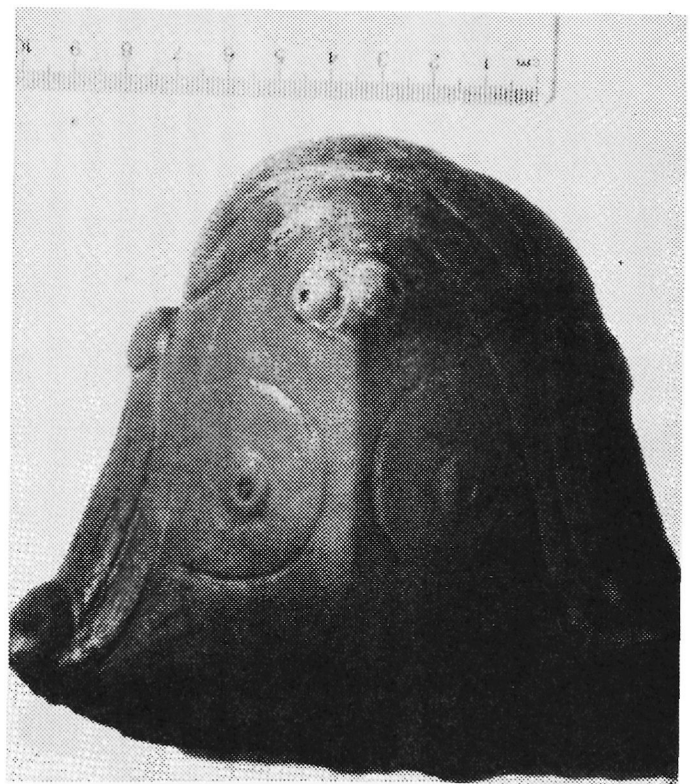

Fig. 10. #488 (Unit B, 110 cm DBD)