A.L. van Gijn

Flint exploitation on Long Island, Antigua, West-Indies

Long Island, an islet off Antigua (West-Indies), forms the major source for flint in the Lesser Antilles. A survey of the islet has indicated the presence of various raw material sources. Test-excavations at the major flintknapping site of Flinty Bay show a very standardized reduction sequence. Apparently, the aim was to obtain high quality cores which could easily be transported.

1. Introduction

For quite some time archaeologists have been aware that good quality flint could be obtained on Long Island, an islet about a mile northeast of Antigua (fig. 1) (Davis 1974; Nicholson 1976b; Olson 1973). However, recently very little systematic research has taken place here. In the early eighties a small hotel was built in the southwestern part of the island; over the years the premises of the hotel were expanded and by 1988 about half the island had been affected (fig. 2). The archaeological sites which were destroyed by the building activities and the lay-out of the gardens have been sampled and described by D.V. Nicholson (Nicholson 1976a, 1976b, pers.comm.). In 1988 the Jumby Bay Resort, owner of Long Island, began selling plots along the coast for the construction of private villas. These new building plans threatened the largest known prehistoric site on the islet, *i.e.* the one along Flinty Bay on the north coast (fig. 2, scatters 1-3).

From March 7 to 26, 1989, a survey was undertaken by the Institute of Prehistory of the University of Leiden intended to document the Flinty Bay site, to locate and characterize the flint sources present, and to investigate the extent and character of the flint extraction sites on Long Island.

2. Inter-insular contact networks

Traditionally, Caribbean archaeologists have been concerned with similarities and differences between archaeological assemblages from different islands, as these could shed light on population movements (Rouse 1964). With a growing interest in archaeology for the socio-economic aspects of prehistoric peoples, this concern has been extended towards attempting to reconstruct inter-island contact-networks. Such relationships had to be maintained, if only to obtain marriage partners.

There are various ways to establish the extent and frequency of contact between islands, such as morphological similarities in artefacts (see also Hofman (1993) for ceramics and Kozlowski (1974) for the preceramic flint of the Greater Antilles), settlement patterns (a.o. Haviser 1990; Watters/Rouse 1989), and the distribution of prestige items (*cf.* Lundberg 1989; Schinkel 1992). A fourth, as yet hardly explored approach involves the analysis of the acquisition and distribution of rare but important raw materials. Due to the different geological character of the various islands, crucial raw materials were not available everywhere and had to be obtained from other islands, either by organizing an expedition, or by exchange or trade. One such material is flint. Both archaeologically and ethnographically, situations have been documented in which search parties were covering large distances to procure essential stones (Gould 1980; Gould/Saggers 1985; Olsen/Alsaker 1984), or very long exchange lines existed (McBryde 1986, 1991a, 1991b). A better understanding of the flint exploitation on Long Island, being a major flint source in the area, would be pivotal for inferences concerning the character of interinsular relationships.

3. Flint sources in the region of the Lesser Antilles

On the Greater Antilles, for example on Puerto Rico (Pike/Pantel 1974) and Hispaniola (Moore 1991; Veloz Maggiolo 1991), flint is commonly available. However, on the Lesser Antilles it is a rare commodity. No flint sources are known from Guadeloupe, Martinique and Dominica (Pinchon 1952), whereas Watters (1980) has not encountered any flint beds on Barbuda and Montserrat, despite of an intensive survey. On St. Kitts small flint pebbles can be collected on the beach (Walker 1979). A deposit of natural flint, not unlike the material employed by prehistoric communities on Saba, is found in the Point Blanche Formation on St. Maarten. A minor pebble occurrence of jaspis and flint on St. Eustatius appears not to have been used by the Indian communities there (Van der Valk 1992).

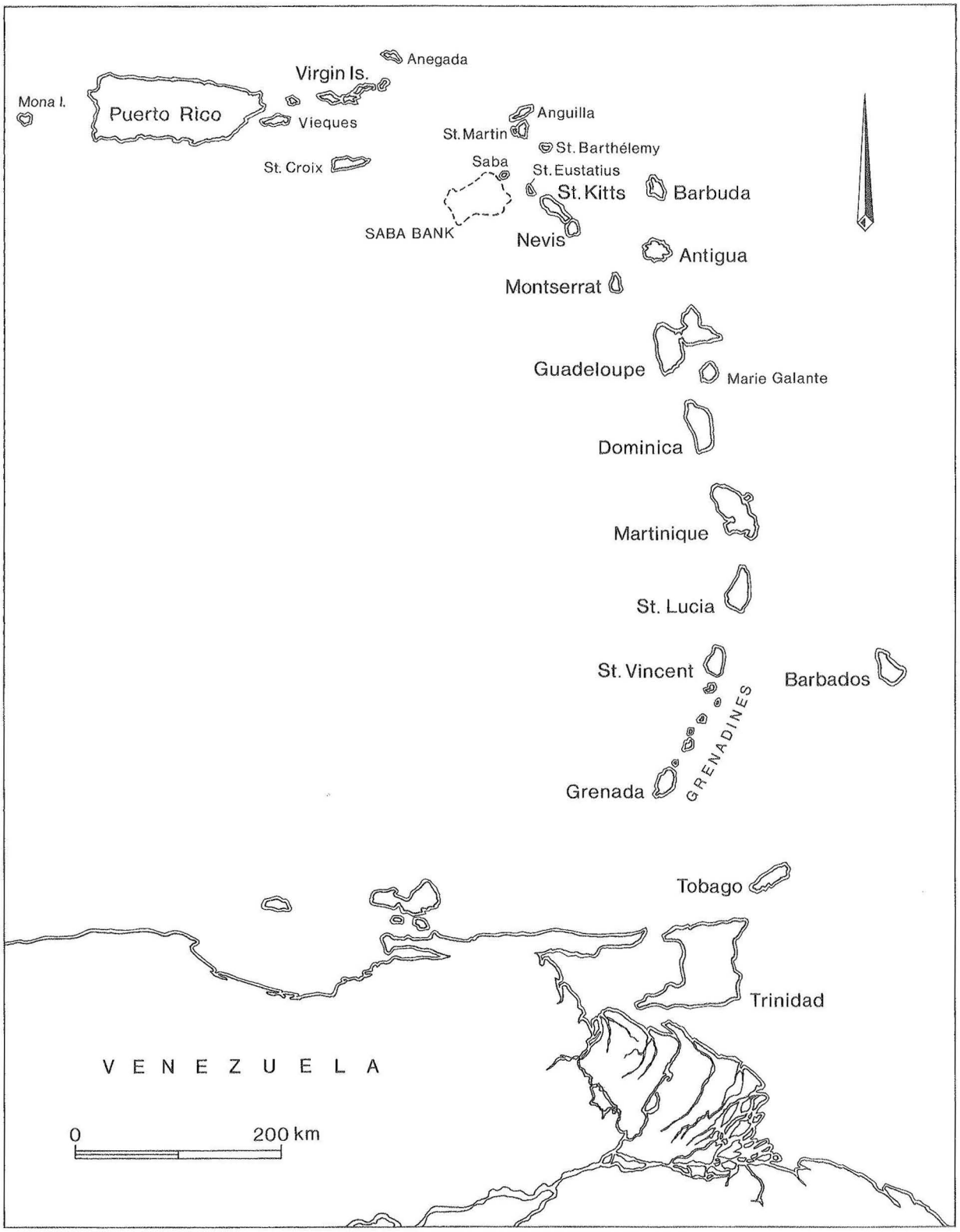

Figure 1. Map of the Lesser Antilles and Puerto Rico.

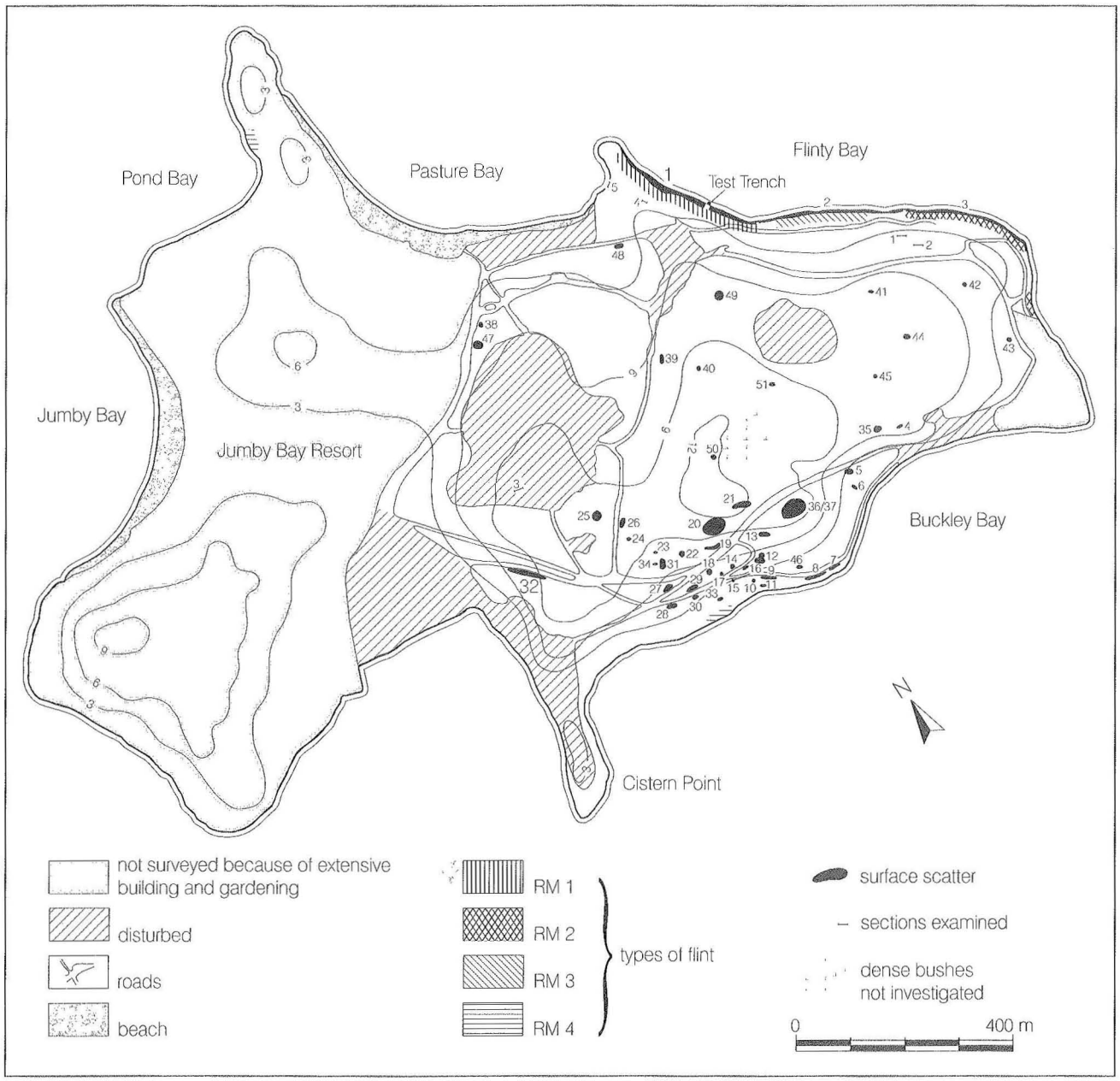

Figure 2. Long Island with the location of the flint sources, find scatters and test trenches.

The major sources of flint on the Lesser Antilles, presently known to us, are located in the northeastern part of Antigua and on adjacent Long Island.

4. Geology and prehistory of Antigua and Long Island

Geologically, Antigua can be divided in three very different zones (fig. 3). The southwestern part consists of volcanic deposits, remnants of the flanks of a large volcano originally located further west but completely eroded by the sea. The central zone is built up of a sequence of volcanic, marine, and fluviatile sediments; this may indicate that the lower flanks of the volcano periodically were below sealevel (Multer *et al.* 1986). The northeast, as well as nearby Long Island, is characterized by limestone strata of the so-called Antigua Formation. Both laterally and

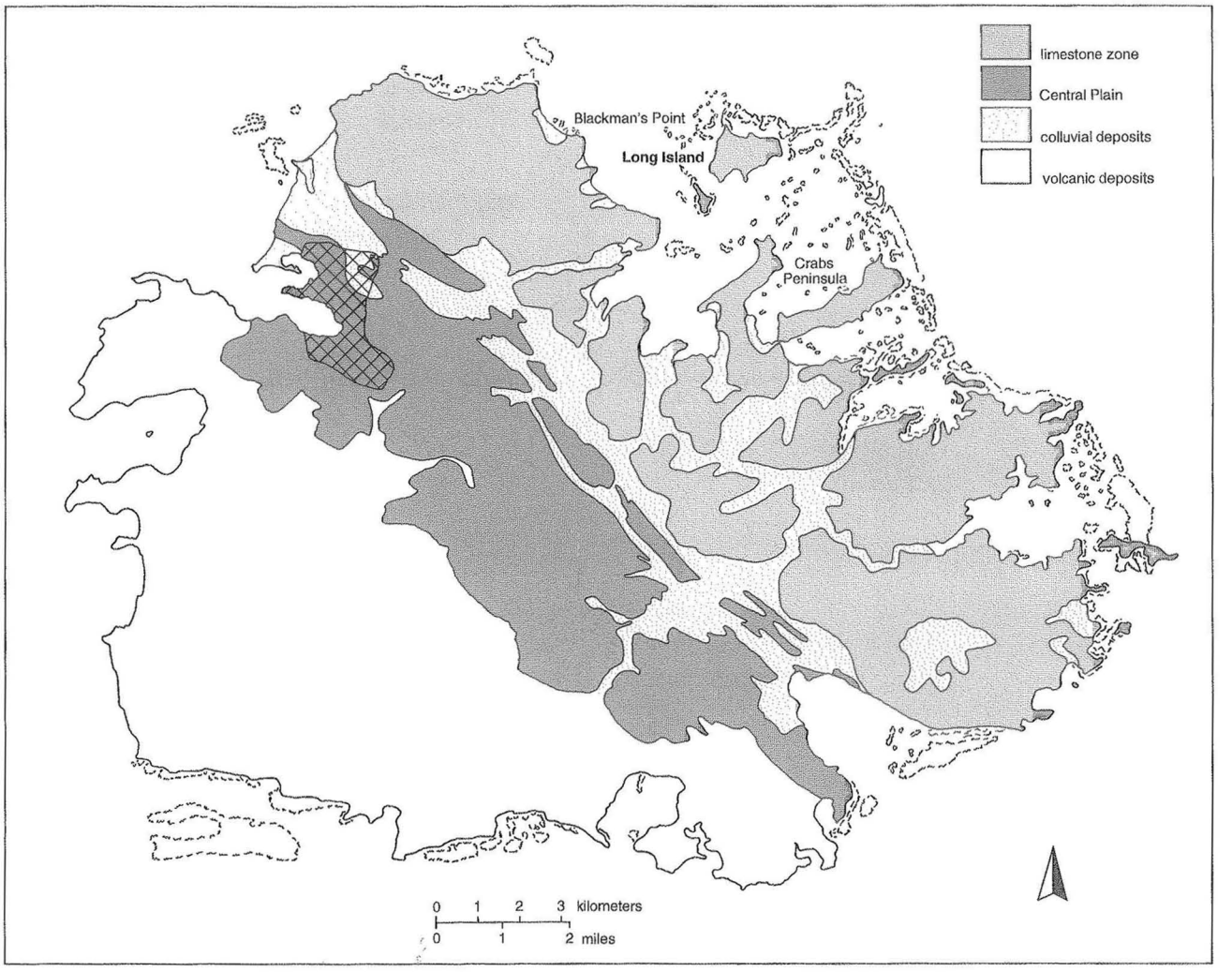

Figure 3. Map of Antigua and adjacent Long Island, with the geological zones differentiated by Multer *et al.* (1986, 2-2).

vertically these strata vary in composition, because they dip up to 15 degrees towards the northeast (fig. 4) (Multer *et al.* 1986). Some of these easily weathering limestone strata contain flint nodules. Northeastern Antigua and Long Island are the only places on the Lesser Antilles where these old sea-bottoms, deposited between 26 and 4 million years ago, come to the surface and, as a consequence, flint is abundant. The variation in limestone strata and the resulting differential weathering may also explain the coastline of northeast Antigua and Long Island: a multitude of bays, islands and peninsula's, with inter-spersed reefs. This landscape was highly attractive for prehistoric man.

Largely due to the tireless efforts of Rouse, the prehistory of Antigua is relatively well-known. Twenty-four sites can be attributed to the preceramic period (also referred to as the Archaic (Rouse 1992), the Meso-Indian stage, and the Ciboney-culture (Kozlowski 1974)) (Rouse 1992). One of the earliest is Jolly Beach, with a C14 date of 3725 ± 90 BP (Davis 1993; Rouse 1992). Virtually all these sites are shell-middens and most of them are located in the northeast. Here the landscape is most suited for the manner in which these prehistoric peoples were presumably living: as hunter/fisher/gatherers (Lundberg 1989). Indian Creek is the best-known site of the ceramic period.

As said above, Long Island is geologically similar to northeast Antigua and may well have been part of it during times when sealevels were lower. The northern shore of Long Island is bordered by an extensive reef-area. It has a

Figure 4. The sequence of limestone layers, dipping in northeasterly direction, is clearly visible at Cistern Point on the south coast of Long Island.

rather rugged shape, and it is exposed to the prevailing northerly winds; apart from the workshop at Flinty Bay (see fig. 2), archaeological sites have not been found in this area. The southern and western shores are more suitable for settlement; here most of the prehistoric sites are located, *i.e.* the preceramic sites of Cistern Point (Davis 1974) and Harbour (Nicholson pers.comm.), the large ceramic site of Jumby Bay, and the sites High Point South, High Point North, Buckley Bay, and Northwest, all four with a probable date in the ceramic period (Nicholson pers. comm.).[1]

Nowadays, the western half of Long Island has been transformed into a park-landscape. The centre of the islet has been destroyed by a large stone quarry. Most of the interior is covered with dense bushes which at places are very difficult to traverse. The coast itself is variable in character: in the south and west sandy beaches are interspersed with mangrove areas, whereas on the exposed northern and eastern shores rocky zones predominate.

5. Survey methods and test excavations

First of all, Long Island was intensively scrutinized for the presence of flint cobbles exposed in the limestone strata. This enterprise was facilitated by the presence of ditches for the wiring of the future villa's. Because a source for the type of flint worked at Flinty Bay could not be established, a 2 m deep trench was dug here to determine whether similar nodules as found at the surface were present in a limestone layer below.

Secondly, the part of the island not yet affected by the building activities of the Jumby Bay Hotel was surveyed. Because of the presence of impenetrable shrubs in the interior, it was impossible to survey systematically. Instead,

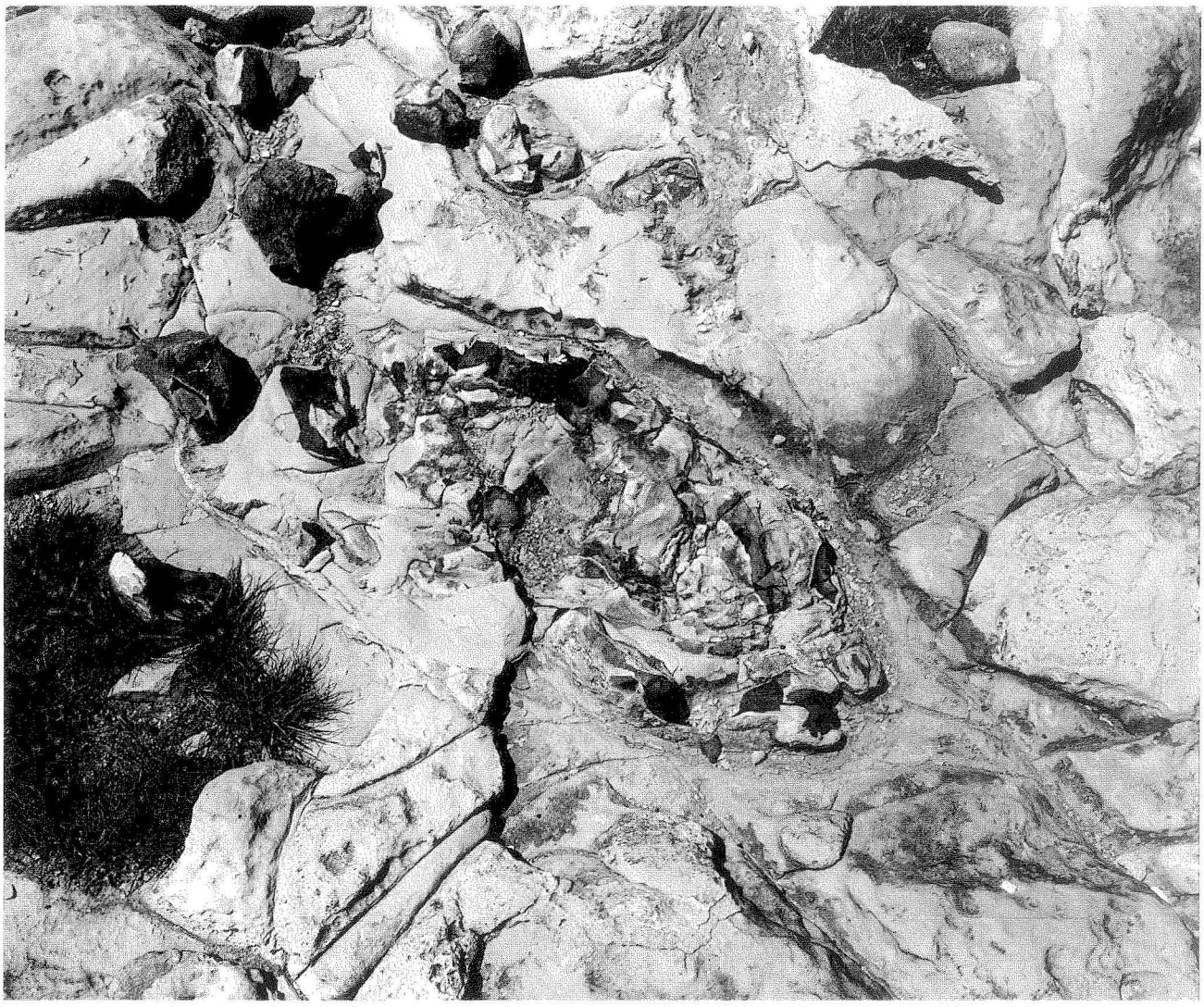

Figure 5. Flint nodule in the hard ledges of the northeastern coastline.

we tried to "cover as much ground" as possible; the limited dimensions of the area to be surveyed (half of a 1 × 1.5 km island) made this feasible.

When planning the survey, it was intended to describe every flint scatter encountered, concerning characteristics as distribution, density, size classes, and basic technological categories.[2] However, large parts of the uncultivated interior of Long Island appeared to be covered with flint debris so that one could hardly differentiate individual scatters.[3] It was therefore decided to concentrate on the coast, where distinct concentrations of finds could be distinguished, and sample and describe only a few (arbitrarily defined) scatters in the interior; most of our samples are therefore located along the coast or somewhat inland (fig. 2). Flinty Bay, being a large site (150 × 6 m), was arbitrarily divided in thirteen areas which were individually described and sampled. Altogether, 53 surface scatters were studied and samples were taken from them (fig. 2).

Thirdly, in order to have a better understanding of the Flinty Bay site and hoping to obtain some dating evidence, a sounding of 3 × 1 m was made here. This small excavation also enabled the collection of a "clean" sample of the knapping debris, not influenced by any previous haphazard surface collection. Comparison of the exact counts of the excavated samples and the estimates of the various flint concentrations made in the field, revealed that

Figure 6. Photo of one of the minor *in situ* occurrences of flint along the southern coast of Long Island.

the number of cores, flakes and blades was overestimated, whereas blocks and splinters had been underestimated. Similarly, the larger size classes were overrepresented as compared to the smaller fraction.

6. The availability of flint sources on Long Island

As stated above, an intensive search was undertaken for *in situ* flint sources. Only at three places could flint be found in its limestone matrix, but it concerned minor exposures and the flint in question seldom turned up in the archaeological flint scatters. The major *in situ* source (hereafter referred to as RM2) was located along the eastern part of Flinty Bay in the hard ledges which had been exposed by the eroding forces of the sea (fig. 5). The flint occurs in clusters and, often, it is almost "stirred" in the limestone. Its colour is brown, the cortex is unweathered and light grey. The nodules display an irregular shape and have very small dimensions. These features, as well as the fact that the flint has numerous inclusions, flaws, and circular breaking planes, make this raw material less suitable for flaking purposes. This type of raw material mainly occurs in the ceramic assemblages. The other two *in situ* sources (RM4) have been located along the cliffs on the

Figure 7. Scatter "32" behind Cistern Point.

south coast, between Cistern Point and Flint House (fig. 6) and along Pond Bay. It concerns very small circular nodules of greyish colour, measuring 5-7 cm in diameter. As these nodules are relatively small and not available in large quantities, they did not appear in the archaeological flint scatters and probably were not exploited by prehistoric man.

The major kind of raw material (referred to as RM1), having the widest distribution, could not be found *in situ*. Most probably, the limestone layers which contained this kind of flint have been eroded long ago, leaving the nodules scattered over much of the northern half of the island. The highest density of this type of flint is found along Flinty Bay where an enormous quantity of flaking debris of this raw material is present (fig. 2). The flint varies in colour from reddish-brown via orange to light-yellow. The cortex has a rusty colour. The nodules mainly have a cylindrical shape, but more circular varieties occur as well; their length ranges from a few cm to a maximum of 30 cm, clustering around 20 cm. The flint displays a fine grainsize and it is very homogeneous with few intrusions, making it highly attractive for flaking.

A last type of raw material (referred to as RM3) was found along the eastern part of Flinty Bay (fig. 2). It concerns pebbles lying on the beach, with a rolled cortex of light-grey colour; the colour of the flint itself can be described as various shades of grey. It was apparently not flaked; all identified hammerstones, however, are made of this type of raw material (Verpoorte 1993).

7. Survey results: variability in the reduction sequences

The majority of the flint scatters was located on the sheltered, southern side of the island. As said, the interior has probably been so disturbed by the sugarcane cultivation in previous centuries, that flint is found everywhere, without apparent concentrations. Most of the flint scatters which were described and sampled in the field proved to be undiagnostic when attempting to reconstruct the reduction sequence. They consisted of a large amount of waste, for the most part displaying natural fractures due to exposure to extreme temperature differences. Two exceptions were apparent, *i.e.* the large flint concentration along Flinty Bay (scatters 1, 2 and 3) and scatter "32" behind Cistern Point[4] (fig. 2); both can be considered real archaeological sites.

7.1 Site "32"

At site "32", two conch shell hand celts were found along with some pottery; this indicates that it probably concerns a mixed site, with both preceramic and ceramic material. The site is located in a rocky matrix and lacks a stratigraphic sequence (fig. 7); it measures 60 × 12 m. It is situated in a very sheltered area of the island, overlooking the mangroves along the southern shore. Because the site was immediately threatened by building activities and as it was one of the remaining two real archaeological sites we

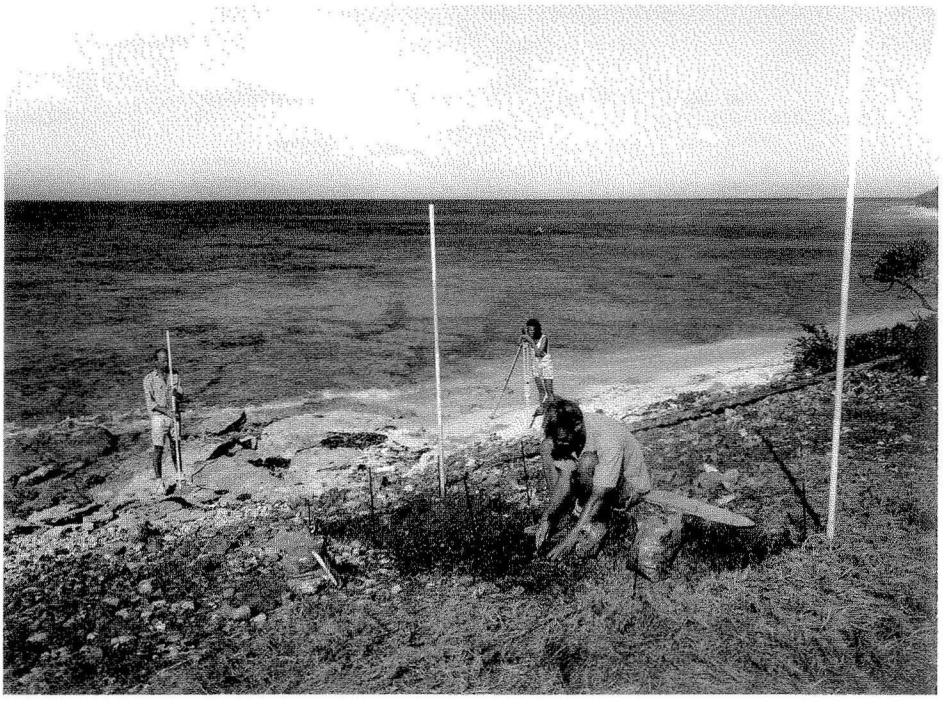

Figure 8. Excavation at Flinty Bay.

know on the island, it was decided to collect all the surface material instead of describing and sampling only a small portion. Scraping of the surface produced altogether 2,850 flint artefacts, next to a small number of sherds and bones, and an enormous amount of shell-debris. The contemporaneity of the various finds is uncertain, because of the shallow depth of the archaeological deposit and the rocky matrix. The sherds postdate 600 AD (det. C. Hofman).

The composition of the flint assemblage is quite different from the one of Flinty Bay. Corecaps and primary and secondary blades are largely lacking, whereas the number of tertiary blades, and especially flakes, is considerable. This would indicate that the primary stages of production took place elsewhere, perhaps at Flinty Bay. Two different technologies could be differentiated: one directed at the production of small flakes and splinters, making use of inferior raw material (RM2), the other comparable to some extent to Flinty Bay in the sense that use was made of the same high quality material RM1 aimed at the production of long blades. The fact that some retouched implements were found, as well as various other find categories, notably shell-debris indicative of shellfish-consumption, would suggest that we are dealing here with a regular settlement area. Whether the location served as settlement during both the preceramic and ceramic periods is impossible to determine at the moment, because we cannot yet accurately differentiate the finds from both periods.

7.2 The flint workshop along Flinty Bay

In contrast, the assemblage from Flinty Bay seemed to be quite homogeneous; because of the large quantities of diagnostic debitage present, it was decided to make a 3 × 1 m sounding at this site (fig. 8). Artefacts were present in the uppermost 20-30 cm of the soil which had formed on the marly limestone. The trench yielded 13,643 artefacts, 8,766 of which were larger than 2 cm (Verpoorte 1993, 32). Sole use was made of the high quality RM1. Clearly, the reduction sequence was extremely standardized, directed at the production of blade-cores. The percentage of artefacts with cortex was very high. Large numbers of corecaps were encountered (fig. 9), as well as primary and secondary decortication blades and flakes (fig. 10). Exhausted cores and tertiary blades were largely absent, whereas retouched implements were lacking altogether. Virtually all the cores retrieved, mostly precores, showed flaws of some kind, either inclusions in the flint or flaking errors. Most of the cores displayed opposed platforms. Core-preparation was done very carefully and was probably performed by hard-hammer percussion. First, a corecap was removed and the platform was prepared; most platforms are facetted, displaying two or more negatives. Next, the edge of the platform was retouched, either on the platform or on the dorsal face. The creation of a rib on the core-face, to guide the "peeling-off" of the core, was done by means of a crested blade. Dimensions of the removed blades were *c.* 9.5 × 3.0 cm, the average length of the cores retrieved was *c.* 12 cm

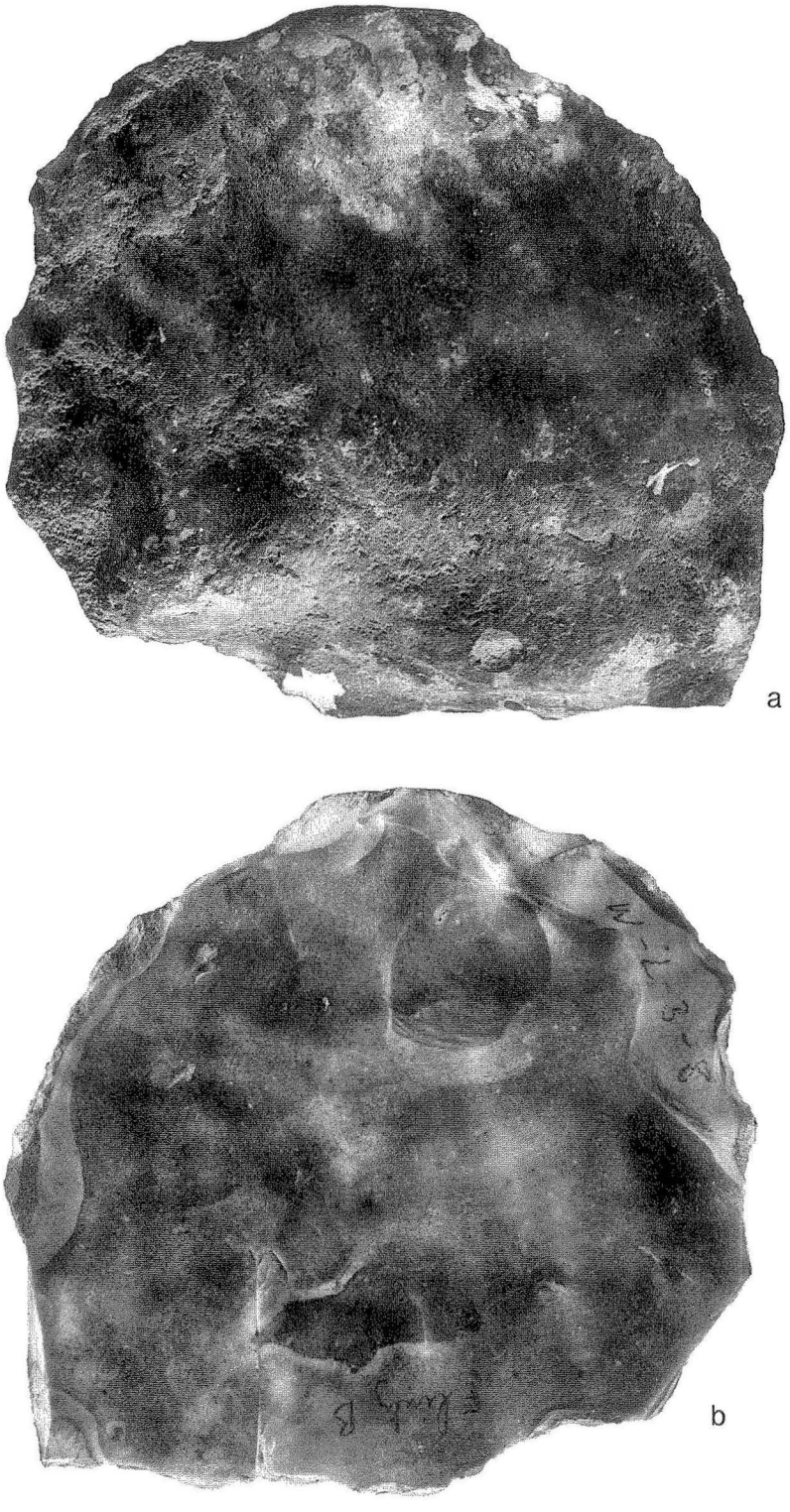

Figure 9. Core cap , a characteristic waste product of the reduction sequence: a) dorsal aspect, b) ventral aspect (scale 1:1).

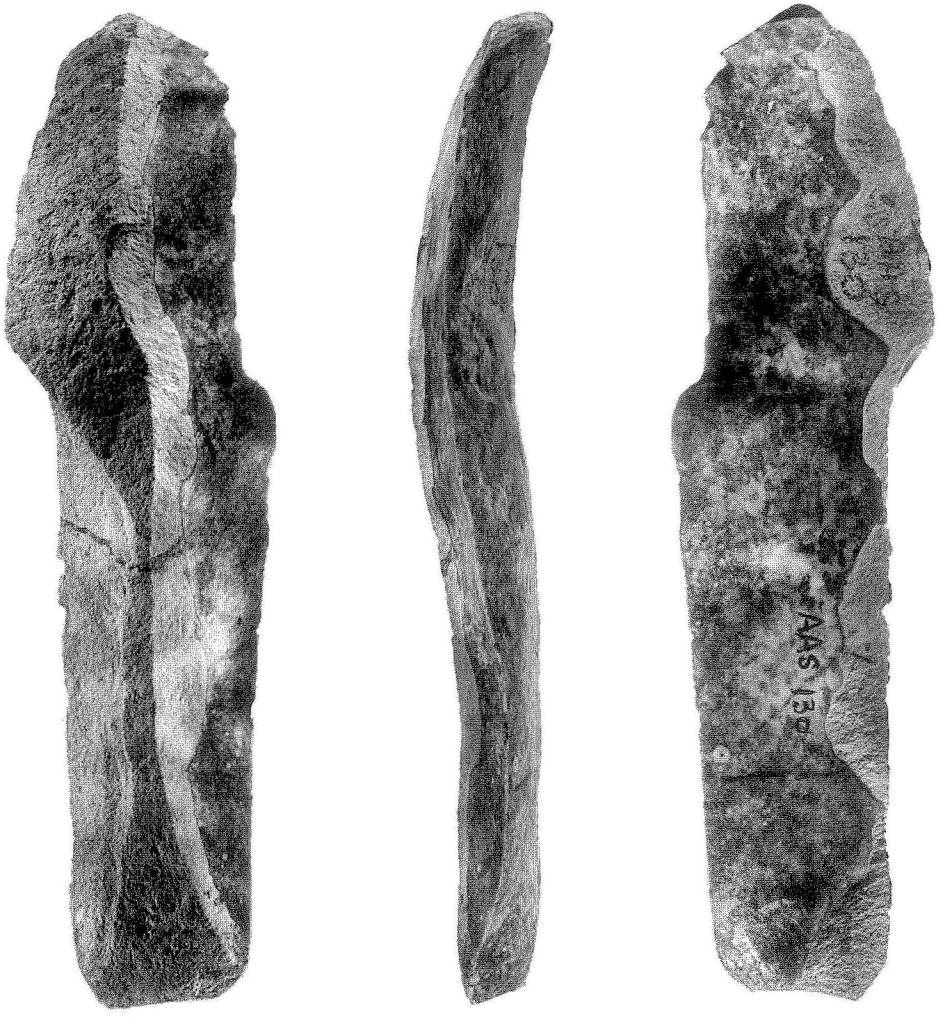

Figure 10. Secondary blade, characteristic for the preceramic period (dorsal, profile and ventral view, scale 1 :1).

(Verpoorte 1993). Incidentally cores were rejuvenated, for example by removing the platform; the resulting flakes are often called tablets and were sometimes found.

It seems that the knapping area[5] along Flinty Bay should be interpreted as a flint collection and primary production site. The reduction sequence was aimed at the production of high quality cores, with primary and secondary decortication flakes and blades as characteristic waste products. It is not sure where the flint source was located. It is unlikely that the flintknappers would have transported the tons of nodules to this place, to flake them here. Flinty Bay is exposed to the prevailing winds; due to the reefs and rocks it would have been difficult to come to shore at this spot. Most probably, therefore, the cobbles had weathered out of a specific limestone stratum which only came to the surface at this part of the island. It was knapped on the spot.

Whether the flintknappers were actually living on Long Island is not entirely clear. At site "32" a few tertiary blades of the Flinty Bay type of raw material were found. Davis found similar implements at the preceramic site of Cistern Point[6], which he considers to be a settlement because of the presence of food debris (Davis 1974). Additionally, Flinty Bay flint is reported from Antigua itself, from both the preceramic site of Jolly Beach (Rouse 1992) and the ceramic site of Indian Creek (Nicholson 1976b). It was even observed at an early Saladoid site on

Montserrat (Nicholson 1976b). The facts that the reduction strategy was aimed at removing all superfluous waste material and that only perfect cores were taken from the site suggests that the knappers intended to cut down on the weight to be transported. This indicates that the majority of the knappers did not live on Long Island, but on "mainland" Antigua or other nearby islands. Further reduction must have taken place at the settlement sites there, because evidence for such activities is lacking on Long Island. Obviously, this does not exclude the possibility that some of the flintknappers did live on the islet: the presence of two preceramic sites with food debris can be considered proof of this. The predomination of tertiary blades on site "32" provides additional evidence for the existence of a (temporary) settlement site.

A serious drawback is that it has proven impossible to date the Flinty Bay site. Pottery was not present, nor carbonized wood or bone. Most researchers assume that the site dates from the preceramic (Davis 1974; Nicholson 1976b; Rouse 1992). One argument in favour of a preceramic date is the sophisticated flint technology displayed here, something which is generally not associated with the ceramic period (Nicholson 1976a, 259). What little we know of the flint technology during the ceramic period points to a somewhat haphazard reduction strategy, to the manufacture of tools based on small flakes. Nevertheless, we should seriously consider the possibility that the site reflects ceramic exploitation. Geologists postulate a sealevel rise around 200 BC, in which case a preceramic flint exploitation site at Flinty Bay would have been washed into sea. Yet another possibility may be that we are dealing with remnants of gunflint production. The sheer size of the flaking area and the systematic reduction sequence would argue in favour of such an hypothesis (*cf.* Gould 1981). However, gunflint production always took place with a steel hammer (a.o. Gould 1981; Knowles/Barnes 1937) and the platforms on the cores and flakes of Flinty Bay do not display evidence for the shattering which is characteristic of steel hammer percussion. I would suggest that this latter argument prevails and that, until proven otherwise, the Flinty Bay area be considered a prehistoric knapping site. An attribution to either preceramic or ceramic will have to wait until reliable samples of flint implements from datable settlement sites become available.

8. Concluding remarks

The archaeological survey of Long Island has shed more light on the most important flint extraction site known on the Lesser Antilles. Various types of raw material could be identified. The major production site is located along Flinty Bay, where enormous quantities of debitage were found: corecaps, primary and secondary blades and flakes and discarded cores displaying flaws of various sorts. Exhausted cores, tertiary flakes and blades, and retouched implements were entirely lacking. Clearly, the aim of the production was to manufacture high quality cores, which were transported from the site to be "peeled" elsewhere, most likely to Antigua or other nearby islands. Although the basic reduction sequence was uniform, differences in platform preparation were noted: some cores displayed retouching on the platform itself, some on the dorsal face. Such variation may indicate that various groups of people were visiting the site to obtain the necessary raw material. More extensive excavations could illucidate this further.

Future research should be directed at a detailed analysis of raw material used and technological features displayed by the flint implements deriving from other islands, most importantly "mainland" Antigua. The specific island context of the region allows a very fruitful application of a regional approach towards flint technology. Technological features on the flint artefacts found on different islands and the nature of the discard products present may indicate the stage of production during which the flint was transported there. Such information can illucidate whether the Long Island flint was exploited by one group of people and then transported further (*cf.* McBryde 1986, 1991a, 1991b; Torrence 1986), or the extraction location was directly accessible to different island communities (*cf.* Gould 1980).

Acknowledgements

Foremost I would like to thank the Jumby Bay Resort, in particular Don and Karen Tate, for their support and interest. Not only did they encourage the research, they also provided us with room and board. Desmond Nicholson, director of the Museum of Antigua and Barbuda, was a constant source of inspiration. He allowed us access to all the material he had collected on Long Island over the years and he showed us flint sources and archaeological sites on "mainland" Antigua. I am very grateful to the staff who did a formidable amount of work in the short period the campaign could last; members included John Hagen, Corinne Hofman, Menno Hoogland, Jan Pauptit and Alexander Verpoorte. This research was partially funded by WOTRO (W28-248 (86)). I thank Corinne Hofman and Peter Akkermans for commenting on an earlier draft of this paper.

notes

1 Nicholson, director of the Museum of Antigua and Barbuda in St. John's, Antigua, has documented all the Long Island sites and has collected numerous artefacts.

2 The survey description form included the following variables:
1. date, name of the surveyor, surface of the scatter in meters.
2. density (on the form indicated by drawings of possible distributions).
3. technology (% of nodules, flake- and blade-cores, primary, secondary and tertiary flakes, blades, crested blades, blocks, splinters, hammerstones).
4. description of the retouched tools.
5. presence of cortex (in %), burning (in %), and patination (in %) and colour of the flint.
6. size classes (<1 cm, 1-5 cm, 6-10 cm, >10 cm) in %.
7. presence of other find material (pottery, bone, shell, coral, stone, and carbon) and an interpretation of the character of the site (settlement or workshop).
8. interpretation and estimate of the homogeneity.
9. on the form a grid was present to make a plan of the scatter, and notes could be made as to the contents of the samples taken.

3 Several authors had noted the presence of circular scatters of flint, which some interpreted as knapping floors. Historical information, however, reveals that from 1750 until *c.* 1850 the island was used for the cultivation of sugarcane; later, freed slaves grew various crops on the island. The fields were cleared of the larger stones which were collected on piles. Through time these piles slumped down to circular concentrations. Three 1 × 1 m squares were dug into two of such circular concentrations (scatter nrs 28 and 31, see fig. 2). Counts of the various size classes confirmed that these "flaking floors" only contained the larger fraction and lacked the characteristic small flaking debris.

4 This is probably the same site as Harbour, reported by Nicholson as being a preceramic settlement.

5 At Flinty Bay Olson (1973) noted the presence of several flint knapping floors, circular in shape with large stones which he interpreted as seats for the knappers. We found no traces of such stones, nor of discrete, circular flaking floors. The site consists of a long stretch of almost solid flaking debris.

6 We attempted to locate this site but without success. The area displays lots of bulldozer tracks and most likely this site was destroyed.

references

Davis, D.D. 1974 Some notes concerning the Archaic occupation of Antigua, *Proc. of the fifth International Congress for the study of pre-Columbian cultures of the Lesser Antilles*, 65-71.

1993 Archaic blade production on Antigua, West-Indies, *American Antiquity* 58, 688-697.

Gould, R.A. 1980 *Living archaeology*. Cambridge.

1981 Brandon revisited: a new look at an old technology. In: R.A. Gould/M.B. Schiffer (eds) *Modern material culture. The archaeology of us*. New York, 269-282.

Gould, R.A. S. Saggers 1985 Lithic procurement in Central Australia: a closer look at Binford's idea of embeddedness in archaeology, *American Antiquity* 50, 117-136.

Haviser, J.B. 1990 Geographic, economic and demographic aspects of Amerindian interaction between Anguilla and St. Martin-St. Maarten, *Paper presented at the 55th Annual Meeting of the Society for American Archaeology*, Las Vegas, Nevada, April 1990.

Hofman, C.L. 1993 *In search of the native population of Pre-Columbian Saba (400 - 1450 AD). Part one. Pottery styles and their interpretations*. Thesis, Leiden.

Knowles, F.H.S. A.S. Barnes 1937 Manufacture of gunflints, *Antiquity* 11(42), 201-207.

Kozlowski, J.K. 1974 *Preceramic cultures in the Caribbean* (= Prace Archeologiczne Z 20). Warsaw.

Lundberg, E.R. 1989 *Krum Bay, Virgin Island*. Thesis University of Illinois, Urbana.

McBryde, I. 1986 Artifacts, language and social interaction: a case study from southern Australia. In: G.N. Bailey/P. Callow (eds), *Stone Age prehistory*. Cambridge, 77-94.

1991a Stone quarries, production and exchange in Aboriginal Australia: some case studies, *Paper presented at the VI International Flint Symposium*, Madrid.

1991b Flint on the rim of a continent; exploitation of flint sources on the Nullarbor Plain, Australia, *Paper presented at the VI International Flint Symposium*, Madrid.

Moore, C. 1991 Cabaret, lithic workshop sites in Haiti. In: E.N. Ayubi/J. Haviser (eds) *Proceedings of the thirteenth international congress for Caribbean archaeology*, Curaçao, 92-103.

Multer, H.G. M.P. Weiss D.V. Nicholson 1986 *Antigua; reefs, rocks & highroads of history*. St. Johns.

Nicholson, D.V. 1976a An Antigua shell midden with ceramic and archaic components, *Proceedings of the sixth International Congress for the study of pre-Columbian cultures of the Lesser Antilles*, 258-263.

1976b Artifact types of preceramic Antigua, *Proceedings of the sixth International Congress for the study of pre-Columbian cultures of the Lesser Antilles*, 264-268.

Olsen, A.B. S. Alsaker 1984 Greenstone and diabase utilization of the stone age of Western Norway: technological and sociocultural distribution, *Norwegian Archaeological Review* 17, 71-103.

Olson, F.	1973	Did the Ciboney precede the Arawaks in Antigua?, *Proceedings of the fourth International Congress for the study of pre-Columbian cultures of the Lesser Antilles*, 94-102.
Pinchon, R.	1952	Introduction à l'archéologie martiniquaise, *Journal de la Société des Américanistes* 41(2), 305-52.
Pike, D.W. A.G. Pantel	1974	First flint worksite found in Puerto Rico, *Proceedings of the fifth International Congress for the study of pre-Columbian cultures of the Lesser Antilles*, 140-142.
Rouse, I.	1964	Prehistory of the West Indies, *Science* 144, 499-513.
	1992	*The Tainos. Rise & decline of the people who greeted Columbus*. New Haven.
Schinkel, K.	1992	The Golden Rock features. In: A.H. Versteeg/K. Schinkel (eds), *The archaeology of St. Eustatius: The Golden Rock Site*. St. Eustatius, 143-212.
Torrence, R.	1986	*Production and exchange of stone tools*. Cambridge.
Veloz Maggiolo, M.	1991	*Panorama historico del Caribe Precolombino*. Dominican Republic.
Valk, van de L.	1992	The physical environment of Golden Rock. In: A.H. Versteeg/K. Schinkel (eds), *The archaeology of St. Eustatius: The Golden Rock Site*. St. Eustatius, 14-30.
Verpoorte, A.	1993	Veldverkenning van de vuursteen voorkomens en werkplaatsen van Long Island, Antigua, West-Indies. MA thesis Leiden.
Walker, J.	1979	Analysis and replication of lithic artifacts from the Sugar Factory Pier Site, St. Kitts, *Proceedings of the eight International congress for the study of pre-Columbian cultures of the Lesser Antilles*, 69-79.
Watters, D.R.	1980	*Transect surveying and prehistoric site locations on Barbuda and Montserrat, Leeward Islands, West-Indies*. Thesis, Pittsburgh.
Watters, D.R. I. Rouse	1989	Environmental diversity and maritime adaptation in the Caribbean area. In: P.E. Siegel (ed.) *Early ceramic population lifeways and adaptive strategies in the Caribbean* BAR Int. S.506, 129-144.

A.L.van Gijn
Instituut voor Prehistorie
P.O. Box 9515
NL 2300 RA Leiden