2. SURVEY METHODS AND ANALYSES OF ARCHAEOLOGICAL MATERIALS

2.1 INTRODUCTION

2.1.1 The archaeology of regions

Since the late 1980s, interest in regional archaeological research has been increasing.[1] This can be attributed to two factors. The first is related to an increased awareness among archaeologists of the importance of and need for the management and the protection of the archaeological cultural heritage of the regions in which they work and a subsequent need to map entire areas. The second is related to the growing interest in studies of prehistoric social and political organisation, exchange and interaction. The interest in such studies, focusing on patterns of human behaviour, can only be satisfied through the study of entire social or political landscapes (Kowalewski 1990:33).

An efficient way of investigating the archaeology of regions, without causing too much damage to the archaeological record, is through regional survey. The importance of regional surveys has increased considerably over the past twenty years. Surveying is no longer seen as a technique to merely locate sites, in order to determine where to carry out intensive excavations at a later stage. It has now developed into an independent field of study. Without neglecting the rich archaeological data that intensive archaeological research through excavation yield, regional or micro-regional surveys may be needed for the archaeological study of patterns, reflecting spatial distributions of human activities in the past. If tightly constructed around relevant research questions, they may provide an adequate database for regional archaeological projects with limited resources. The East-Guadeloupe project is an example of such a project.

In order to present a substantive framework for the fieldwork executed on behalf of this project, the first part of this chapter seeks to provide an overview of regional surveying techniques in general, and an insight into the current state of affairs in the Caribbean and the study area in particular. The chapter subsequently focuses on the fieldwork carried out during the East-Guadeloupe project. It describes the strategies and methods of the field walking and sub-surface testing procedures. Then, the analyses of the pre-Columbian archaeological material provided by the surface and sub-surface procedures will be addressed.

2.1.2 Regional surveys

The most accurate way of investigating the archaeology of a region is to study it completely. Of course, logistical factors never allow such an approach. In addition, such an approach inevitably destroys the archaeological record for future generations. A good alternative to get a swift insight into the regional archaeological record is to carry out a systematic regional survey, which will allow accurate generalisations regarding *surface* distributions of archaeological material.

Although some authors advocate 'complete' surveys or surveys that are as detailed as possible in order to make such generalisations (e.g. Fish and Kowalewski 1990; Kamermans 1993; Shennan 1985), others (e.g. Van de Velde 2001) consider complete surveys to be an impossible ideal.[2] They question the reliability of archaeological surveys, since sites may have been eroded or covered by sediment. In addition, it is not very likely that all terrains are accessible and there is no chance of finding 'all' archaeological objects. However, there should be no misunderstanding about what is meant by full-coverage surveys. Fish and Kowalewski (1990:268) warn, "recovering 100% of anything, and verifying the claim, is impossible in archaeology". For them, full-coverage surveys do not prescribe survey intensity; the only prerequisite is that the observation density should be uniform (Fish and Kowalewski 1990:2). Survey intensity, or the detail and the scale of spatial observation, is determined by the research objectives, the characteristics of the archaeological data required, the characteristics of the terrain, and the projects' possibilities in terms of financial and human resources. Therefore, full-coverage surveys may be characterised by 5 m survey intervals, but they may also be as wide as 75 m, as long as they systematically cover the complete survey area. Parsons (1990) correctly points out that what is meant by 'full-coverage' and 'intensive survey' will vary from project to project.

Even within Fish and Kowalewski's definition, full-coverage surveys can be carried out in only a few projects. The possibility of doing so depends heavily on the characteristics of the survey area, including the dimensions, the accessibility of the terrain, and the soil cover. If the soil is covered by sediment, it may be necessary to execute a sub-surface survey by means of auger testing or the excavation of small test-pits within a grid. Sub-surface testing, however, is time-consuming and may limit the intensity of a survey considerably. The characteristics of the artefacts on the surface, such as their dimensions and the material of which they are made, may also greatly influence the speed, efficiency and accuracy of their identification on the surface. And finally, the capacity of the survey crew, including the number of participants and their

training, the available material in the field such as measuring equipment, and the time frame, is relevant to the dimensions of a region that can be covered completely by a survey.

These factors obviously restrict the possibilities for full-coverage surveys. Therefore, it is wise to select controllable sampling designs, whether they are random with a purposive or a systematic stratification, or systematic with an unaligned design, or random with a systematic stratification; these are thought to produce representative data with a predictive value (Flannery 1976:132). Van de Velde (1997) warns that few people are aware that transect walking, which is the most popular systematic survey technique, is selective by nature and therefore a sample.

2.1.3 Caribbean archaeological surveys

From 1907 until recently, archaeological reconnaissance studies have been frequently reported in Caribbean archaeology (e.g. Allaire 1974; Bodu 1985[c]; Boomert 1984, 1996; Branch 1907; Crock 1995; De Josselin de Jong 1947; Evans 1968; Sutty 1990).[3] Such studies concentrate on the identification of archaeological sites already known to professional or amateur archaeologists. From a regional perspective, they are unsystematic and they often result only in the affirmation of existing knowledge. The problem with such studies is that the incomplete inventories they provide are often widely used for the formulation and affirmation of ideas concerning pre-Columbian Amerindian site location and environmental adaptation (Gassies and Rousseau 1995[b]:36; Johnston and Lundberg 1985). Fish and Kowalewski (1990:263-264) note that reconnaissance surveys often fail to specify the areas examined, that they tend to contain a bias toward larger and more spectacular sites, and that they often seem to neglect remote or less accessible terrain. This situation may be also considered exemplary for the archaeological research on Guadeloupe in general (Gassies and Rousseau 1995[b]:36).

Systematic archaeological surveys with well-defined survey areas and survey strategies have generally been rather scarce in the Caribbean. An important impulse to improving this unfortunate situation was provided by Goodwin (1979). He created a multistage sampling design in order to provide an archaeological study of geographical distributions of Early Ceramic habitation sites on the island of St. Kitts. He applied an environmentally stratified survey procedure (Goodwin 1979:126). Randomly chosen quadrates, which represented one per cent of each stratum, were systematically surveyed. This first phase demonstrated that archaeological sites were related to fresh water sources and no sites were found above the 1000 feet contour boundary. Therefore, a second, purposive, survey stage was carried out, aimed at the study of transects bordering rivers or river drainages, up to this elevation. Although this method allowed Goodwin to define a hypothetical diachronic sequence of settlements for prehistoric St. Kitts, he had to conclude that the fieldwork did not allow generalisations on population growth, and that it was especially difficult to estimate component sizes of multi-component sites (Goodwin 1979:322).

Another regional survey was carried out by Watters (1980), contributing to the study of relationships between environmental variables and pre-Columbian site locations on the islands of Barbuda and Montserrat. Watters applied a simple random survey design, based on the survey of east-west oriented cross-island transects. As the number of sites discovered was very limited, sites that had previously been discovered outside the transects had to be included in the study in order to create a reasonably large database. This obviously imposed some limitations on the representativity, generalisability, and predictability of the data (Watters 1980:186). The results of the project were further strongly influenced by the inaccessible nature of the terrain and the depth of the soil, making it impossible to adequately survey the interior parts of Montserrat.

From the early 1980s onwards, further regional survey projects were carried out. Survey designs were largely based on the results of the studies by Goodwin and Watters by concentrating on the coastal areas of Caribbean islands. For some studies inland areas were surveyed as well. Among the most impressive are Keegan's (1985) investigations on the Bahamas and the surveys of 72 islands located off the central and western Venezuelan coast (Antczak 1998). Wilson (1989, 1991) carried out a complete survey of the coastal region of Nevis and the drainage guts as far as the inland topography seemed to permit settlement. Areas where settlement was less likely were randomly surveyed. Curet (1992), studying the development of chiefdoms in the Valley of Maunabo on Puerto Rico, investigated both the mountainous inland part and the coastal area of this region. Within the mountainous area, he surveyed a sample of three flat areas, based on earlier Puerto Rican studies that reported sites to be located on relatively flat terraces close to the junction of streams (Curet 1992:131). Other survey projects have been reported for Carriacou (Kaye *et al.* 2003), St. Vincent (Callaghan and Moravetz personal communication 2001), Barbados and Tortola (Drewett 1991, 1995[b]), St. Lucia (Keegan *et al.* 2002), St. Eustatius, Saba and St. Martin (Haviser 1985[a-b], 1988), among others. Systematic regional studies on Puerto Rico profit from the large amounts of archaeological data provided by contract archaeology projects that have been carried out on this island since the 1970s (e.g. Elliott 1987; Rodríguez 1990; Tronolone *et al.* 1990). On the other hand, several failings have been reported, the lack of problem-oriented research being the one most often criticised in academic studies (e.g. Curet 1992:38-39).

2.1.4 Archaeological fieldwork in the research area

Until the start of the East-Guadeloupe project, the number and the influence of contract archaeology projects on Guadeloupe were quite limited, except for archaeological projects at the pre-Columbian sites of Anse Ste. Marguerite (Rousseau *et al.* 1995) and Morel (Hamburg 2000[a]; Hofman *et al.* 2000). The near absence of such projects is remarkable since Guadeloupe, as a French department, takes part in the European 1992 Malta convention. Implementation of this convention elsewhere has led to the surveying of large areas for their archaeological potential, prior to building activities, and to subsequent excavations if needed. Considering the numerous construction activities on Guadeloupe and its annexes, possibilities for salvage archaeological research should be more prominent. However, until very recently, the traditional organisation of archaeological fieldwork on Guadeloupe appeared to have been hardly altered at all. Fortunately, the number of archaeological salvage operations being carried out on Guadeloupe has been increasing since 2001 (Chancerel 2001:4-6, 2002:4-5).

Archaeological research on Guadeloupe has traditionally focused on the small-scale study of large, principally coastal sites on the islands of Basse-Terre, Grande-Terre and Marie-Galante. Less fieldwork was conducted on the smaller Guadeloupe annexes of Les Saintes, La Désirade and Petite Terre. In 1993, a scientific and financial co-operation was signed between the archaeological service of the *Direction Régionale des Affaires Culturelles* (DRAC) of Guadeloupe and the Faculty of Archaeology of Leiden University.[4] Since then, larger-scale projects have been carried out on the larger islands, and some pioneering projects were carried out on the smaller annexes. This co-operation program existed until 2000.

A strong impulse to systematic archaeological fieldwork on Guadeloupe was provided by the French Ministry of Culture. It instructed the archaeological services of every DRAC in France and its overseas territories to work towards the completion of their *Carte Archéologique* or archaeological heritage inventory (Gassies and Rousseau 1995[a-b]). This instruction, enhancing possibilities for archaeological heritage management as well as scientific research, is well served by survey in general, and by systematic surveys in particular. For the *Carte Archéologique* project, more or less systematic regional surveys were conducted. These were carried out on a small coastal strip and some adjacent river drainages on the Leeward side of Basse-Terre (Gassies 1995[b], 1996[a], 1996[c]), in the mangrove area in the northwestern part of Grande-Terre (Rist personal communication 2000), and on Marie-Galante (Chenorkian *et al.* 1998; Gassies 1995[a], 1996[b]). Prior to 1998, no systematic regional surveys had been conducted at Pointe des Châteaux, La Désirade and Petite Terre.

At Pointe des Châteaux, archaeological fieldwork in the area selected for the present study has been limited to the large-scale excavations that have been conducted on a yearly basis at the site of Anse à la Gourde between 1995 and 2000. Before 1994, several excavation proposals were drafted; in 1973 by Père Barbotin and Edgar Clerc, in 1975 by Pierre Verin and in 1977 by Louis Allaire. Unfortunately, no reports from these campaigns are available, and it is as yet uncertain whether the latter two campaigns were carried out at all. The investigations of Pierre Bodu, carried out in 1984 and 1985, have been documented in more detail, but Anse à la Gourde has only been thoroughly investigated since 1994 (Bloo 1997; Bright 2003; Duin 1998; Grouard 2001; Hofman *et al.* 2001[a]; Kappers 1996; Kelly 2003; Knippenberg 2001[b]; Kraan 1998; Lammers-Keyzers in prep.; Nieweg 2000; Pater and Teekens 2004; Roetman 2003; Timmermans 2003; Viallon 2001[a-b]).[5] Besides these studies, no systematic archaeological research was carried out on the easternmost tip of Pointe des Châteaux. Nevertheless, the sites of Grande Saline and Petites Salines had already been reported in the DRAC archives.

At La Désirade and Petite Terre, the Fathers Pinchon and Guilbert, together with other local inhabitants, had been collecting archaeological surface finds from the early 1950s onwards. They also carried out small-scale and non-documented excavations, at, for example, the sites of Anse Petite Rivière and Voûte à Pin on La Désirade. Father Maurice Barbotin (1991) and Edgar Clerc, the latter being the founder of the Guadeloupe Historical Society and director of Antiquities since 1972, were the first in the 1950s to document their archaeological investigations of La Désirade and Petite Terre. Unfortunately, most of their documentation has been lost over the course of time. Nicholson (1975) reported a short archaeological visit to the Site du Phare at Petite Terre. Henri Petitjean-Roget (1983), director of Antiquities between 1984 and 1992 and curator of the departmental Schoelcher and Edgar Clerc Museums on Guadeloupe, visited some archaeological sites on La Désirade and Petite Terre. Under his supervision, Pierre Bodu started a reconnaissance survey of 17 pre-Columbian sites on these islands in 1984. Site descriptions and surface collections were made and test excavations were carried out at the sites of Anse Petite Rivière, Morne Cybèle-1 and Les Sables (Bodu 1984, 1985[a-c]).[6] The collections made by Pinchon, Guilbert and Bodu have been stored in the depot of the archaeological Edgar Clerc Museum in Le Moule (Guadeloupe).

Since 1994, archaeological teams from Leiden University have been investigating archaeological sites on La Désirade. Test excavations have been carried out at Morne Cybèle-1 and Morne Cybèle-2 (Hofman 1995; Hofman and Hoogland 1994) and Anse Petite Rivière (De Waal 1996[a-b]). Archaeological research at Petite Terre was not undertaken until recently, because local circumstances greatly hindered archaeological

research and overnight stays on these islands. At Terre de Bas, five pre-Columbian sites had been reported at the start of the surveys (Bodu 1985[c], Nicholson 1975).[7]

2.1.5 Conclusions

Despite the recently increased interest in regional studies and the subsequent need to carry out systematic surveys, archaeological fieldwork within the research area has been mainly limited to the study of isolated sites and to haphazard surveys. Apart from investigations at Anse à la Gourde, archaeological research at Pointe des Châteaux and on La Désirade and Petite Terre has been small-scale, non-systematic and, in most cases, poorly documented. In addition, few of the resulting archaeological collections, including those from Anse à la Gourde (Hofman *et al.* 2001[a]), Pointe Doublé and Morne Baie Mahault (Bodu 1984), Morne Cybèle-1 and Morne Cybèle-2 (Hofman 1995) and Anse Petite Rivière (De Waal 1996[a-b]), have been studied.

Caribbean surveys in general have been largely based on the studies by Goodwin (1979) and Watters (1980). They concentrate almost exclusively on coastal and riverine areas for the discovery of archaeological sites and survey designs are largely similar. However, there are factors to be considered that cause an overrepresentation of archaeological sites in coastal areas. These factors will be addressed in the following section.

2.2 FIELD METHODOLOGY OF THE EAST-GUADELOUPE PROJECT (1998-2000)

2.2.1 Introduction

The archaeological site inventory of the study area at the start of the project was considered to be far from reliable. This belief came about through awareness of several factors that result in a biased representation of site types, locations and periods. The first among these is that amateur archaeologists and many of their professional colleagues have tended to focus their interest on large settlement sites, preferably those which yield decorated artefacts. Secondly, in many cases, the coastal locations of known sites appear to reflect activity areas of both professional and amateur archaeologists instead of actual site distribution patterns. Coastal sites are usually more easily reached and observed than inland sites, and often they are uncovered as a result of construction activities related to urban or tourist development, illegal sand exploitation, or coastal erosion. Unfortunately, this also means that these sites are easily and frequently subject to illegal excavation. Thirdly, surface material of some sites will be more difficult to detect by means of a surface survey than that of others. This is particularly true for pre-Ceramic or a-ceramic sites. These often lack diagnostic material and, if present at all, flint flakes or other lithics are usually more difficult to observe on the surface than ceramics. The most important reason, however, for the absence of accurate site distributions within the study area is the lack of systematic and intensive surveys. However, such surveys are the only means of providing representative information on archaeological site patterns, as needed for the present study.

Three survey campaigns were designed to provide this information and to create a reliable archaeological database. In addition, relevant unpublished archaeological collections from sites in the research area were studied. The survey campaigns were made possible as the archaeological service of the DRAC of Guadeloupe supported financial demands to the French Ministry of Culture (De Waal 1997, 1998[b], 1999[g]) and allowed the fieldwork to take place. The first 10-week campaign aimed at the survey of Pointe des Châteaux and an orientation visit to Petite Terre, during which Terre de Haut was surveyed. Two surveyors, aided by two students from the Anse à la Gourde field school, carried out this fieldwork in 1998. Six surveyors conducted the second 10-week campaign on La Désirade and Petite Terre in 1999. The final campaign was carried out by five surveyors and consisted of a six week measuring project of test unit locations at Pointe des Châteaux and on La Désirade and Petite Terre. During this last campaign, additional archaeological fieldwork was carried out as well, including auger testing at the Pointe des Châteaux beaches, the survey of a 1.5 km block west of the site of Anse à la Gourde and the survey of the southern coastal plain of La Désirade. The following sections will address the strategies and methods of these fieldwork campaigns.

2.2.2 Survey strategies

As outlined above, earlier research in the study area has not provided the reliable data required for the research questions as formulated in section 1.3, since it focused on the study of isolated sites, and it was influenced by research biases. The 1998-2000 fieldwork campaigns were supposed to fill this gap of data, and an attempt was made to design a less biased survey strategy. This was expressed in the fieldwork objectives. In the first place, the surveys should provide a reliable pre-Columbian site inventory. This should include all types, functions, locations and periods of sites. At the very least, they should procure a representative sample inventory that would allow generalisations both on the presence and absence of sites in certain areas. Secondly, detailed site descriptions should be obtained, to better understand spatial artefact distributions, geological and archaeological stratigraphies, site functions, and chronological assignments. Finally, it should be possible to estimate the efficiency and

accuracy of the inventory.

2.2.3 Survey methods

The fieldwork methodology of the East-Guadeloupe project has been described in detail in the field manuals (De Waal 1998[a], 1999[a]) and in the final fieldwork report for the DRAC (De Waal 2002[a-c]). The following text is merely a summary. While the field manuals discuss the fieldwork for the different islands separately, this summary presents it as whole and only highlights some relevant differences. It proved to be quite difficult to design one single survey strategy since survey methods had to be adjusted to suit the particular physical characteristics of the different parts of the study area.

The following section is organised according to the main distinction that was made during the fieldwork: field walking procedures, subsurface testing and test unit positioning. Private archaeological collections of local inhabitants of La Désirade were also studied. Unfortunately, these were not of great use for the inventories, since information on find locations and archaeological context could not be recorded in most cases.

2.2.3.1 Field walking procedures

The first part of the fieldwork included an intensive field walking program. Surface surveys were deemed possible as sedimentation appears to have been very limited throughout most of the study area. The field walking program consisted of parallel transects, separated by 10 or 20 m intervals (fig. 2.1).[8] Some locations where the survey results did not meet the expectations at all, however, were walked again using

Fig. 2.1. Surveying the eastern part of La Désirade.

transects separated by 5 m intervals. This was done, for example, for Anse Tarare on Pointe des Châteaux. None of the revisited locations revealed sites. Transects were 1 m wide since this is the maximum area that can be overseen at a moderate walking speed. Parallel transects were chosen as the basic survey technique, in order to reduce orientation problems and logistical problems in the field (*cf.* Plog 1976:139; Plog *et al.* 1978:401; Watters 1980:171; Watters and Scaglion 1980:341), which are among the most limiting factors of Caribbean surveys (e.g. Haviser 1985[a]:67). It was easy for survey participants to find and to document transect starting points, since the coastal topography provided useful orientation. Transect starting positions were chosen in the field. In addition, transect surveying is usually considered useful at early project stages when little information is available on the range of archaeological material types, relative density and degree of clustering within a region (Schiffer *et al.* 1978:12; *cf.* Watters and Scaglion 1980:339).

The efficiency of the transect intervals was tested by a so-called 'zigzag' survey technique, randomly checking the interval surfaces in order to see if concentrations of archaeological material had been missed. Steep slopes, where *in-situ* material could not be expected, were not included in the study. To avoid observational bias towards favourable locations, the transects were compass-oriented north-south covering the coastal as well as the inland areas, and thus different topographic features and different geological and vegetation zones. Moreover, when present in the transects, natural or anthropogenic sections were studied for the presence of artefacts. Gullies and ravines were examined for the presence of fresh-water sources and for the presence of large boulders with pre-Columbian petroglyphs. Transect surfaces were cleared, if necessary, with machetes in order to optimise observation. Due to time constraints, survey areas could not be walked again to improve observation under different conditions. The sandy beaches at Pointe des Châteaux and on La Désirade and Petite Terre, however, were surveyed several times and in different weather conditions. No new sites were discovered.

In the initial phase of the project, each transect was described on a transect survey form summarising administrative information, information on factors influencing

Fig. 2.2. Surveyed areas and possibly eroded coastal zones on Pointe des Châteaux.

the observation capacity of crew members, and environmental information that influenced presence and visibility of material on the surface and accessibility of terrain (appendix 1). On La Désirade, these detailed, but time-consuming descriptions were replaced by short descriptions of the survey zones.

For all discovered concentrations of archaeological material, surface collections of diagnostic material were made in the field. If present in the surface concentration, decorated sherds, fragments of rims, bases, griddles, appendages and other ceramic objects, and lithic, shell and coral artefacts were collected. If not, an arbitrary sample of non-diagnostic material was obtained. It is obvious that chronological assignments, which had to be based on ceramic evidence, were mainly determined using surface material, of which generally rather small samples had been collected. The samples include material from all over the concentration, thus collected outside transects as well. In addition, off-site material found in transects was collected. Although such samples do involve selection biases and loss of provenience information (Plog *et al.* 1978:406; Van de Velde 2001:27), they may be useful for attaining rough and general site characterisations. Rims of vessels and griddles and decorated pottery fragments, which are the fragments most susceptible to collection biases, often provide useful functional and chronological indications. It is true, however, that percentages of decoration of the pottery samples, that are generally rather small, may turn out to be rather high as a result of these biases. The collection of surface material

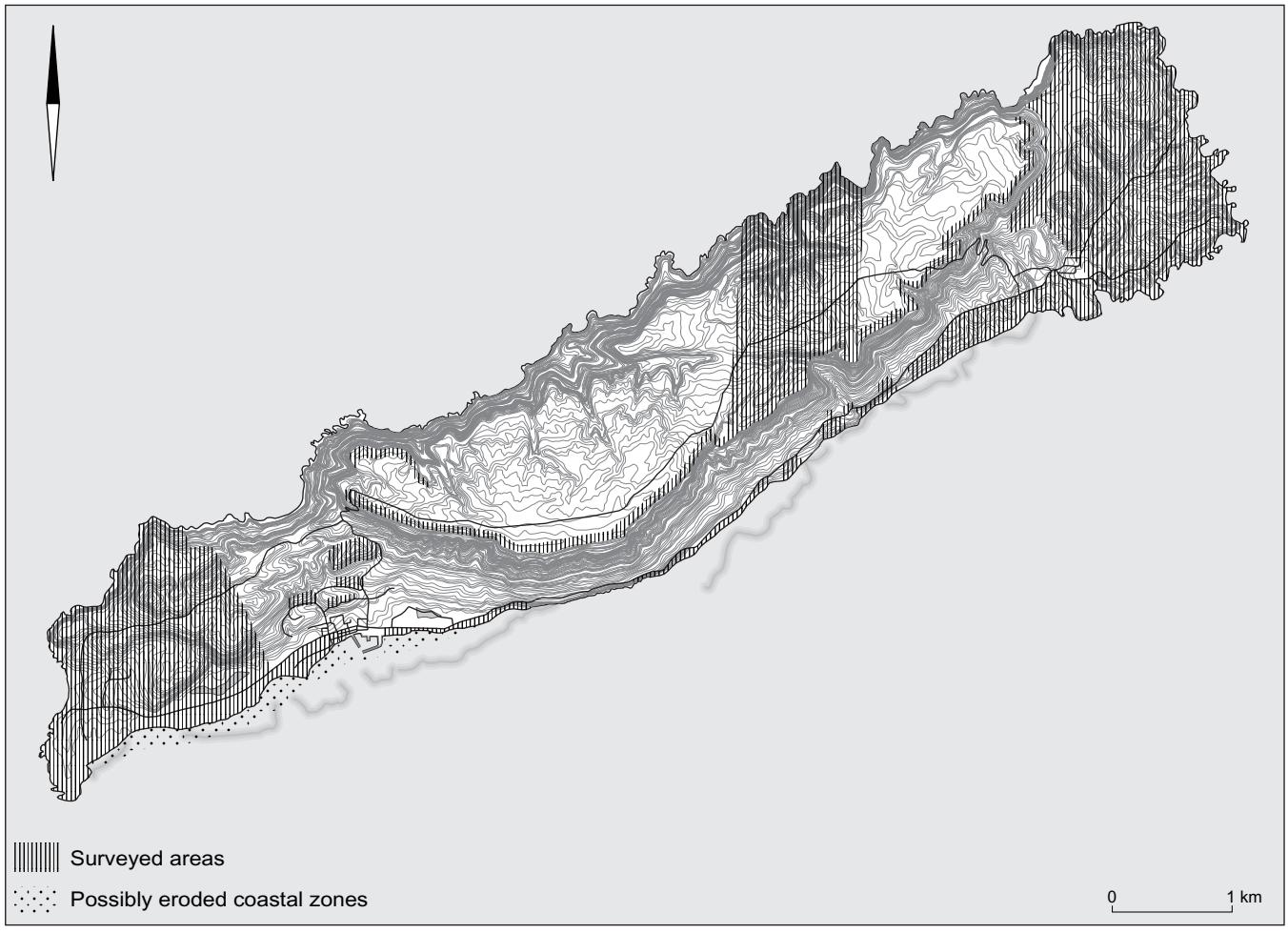

Fig. 2.3. Surveyed areas and possibly eroded coastal zones on La Désirade.

was necessary, although it causes damage to the visibility of and the spatial distributions within surface concentrations (Plog *et al.* 1978:405), as a result of the unfamiliarity of part of the survey crew with the local ceramics.[9] Collection of the material provided the opportunity of studying it in a standardised way by one person and reanalysing it at a later stage. One of the premisses in collecting site samples was that archaeological material left at site surfaces would be sufficient to allow relocation and characterisation of the sites in the future. It should not be forgotten, however, that surface distributions appear to change regularly (section 5.2.1). Isolated finds, or off-site material, and surface concentrations of archaeological material were mapped on aerial photographs that had been enlarged to 1:5000 scale.[10] As a result of limited possibilities for topographic measuring in the field, transects could not be divided into collection units based on a grid, which would have facilitated generalisation of field data at a later stage.

The focus of the survey was on the recovery of archaeological sites. Although it cannot be denied that site definitions are often rather vague interpretations, possibilities for a regional non-site study were considered to be too limited within the study area, as a result of the characteristics of the surface material (section 1.4.3). Off-site data were used as merely complementary to the site data collected. As a result of this site-focus, problems related to the transformation from walkers' counts to densities, as tackled by Van de Velde (2001:25), are negligible.

Standard descriptions were made of the archaeological sites, which may consist of one or more surface concentrations (SC). Site description forms (appendix 1) provide information on informants, the current owner of the terrain and earlier research and archaeological collections. Secondly, they include data on site dimensions, reflecting the spatial distribution of pre-Columbian archaeological material over the surface, co-ordinates, status, and thickness of the archaeological deposits.[11] Then, terrain descriptions and a sketch of the local situation were provided. The surface material and its distribution were characterised and site location variables, as introduced in section 1.4.4, were reported. Finally, it was decided whether sub-surface tests were to be made. It should be remarked here that for only a few sites, the study of surface distributions provided an impression of the functional areas within sites. In most cases, only the refuse or midden areas could be identified, if present. In some cases, the location of dwelling areas of settlements could be hypothesised, but areas used for cultivation, burial practices or other special activities could not be properly identified on the basis of only surface data and small-scale sub-surface information. According to Barker (1991:5) essential features of sites, such as shape, size and chronological information of artefact concentrations remain reflected at the surface in a quite stable manner. Data from other regions suggest, however, that the amount of archaeological material at the surface may vary enormously over time, even during a single field season (e.g. Bintliff and Snodgrass 1988:509). For the study area, no quantitative data are available on this topic. However, repeated surface observations at the À l'Escalier site on La Désirade, carried out in 1997 and 1999, suggest that the density of surface material at this site is constantly changing.

The area selected for study at Pointe des Châteaux could be completely surveyed in the above-described manner, using 10 m intervals, as a result of the limited dimensions of the area (fig. 2.2). This detailed investigation served as a pilot study for the fieldwork on the larger island of La Désirade (De Waal 1999[b]). As results from the 10 m intervals at Pointe des Châteaux did not justify continuation of this time-consuming approach, intervals were set at 20 m on La Désirade.

On La Désirade, which could not be surveyed completely, four survey zones were defined, including the plateaus in the eastern part of the island, the central plateau, the hills at the western part of the island, and the southern coastal plain (fig. 2.3). The eastern plateaus and the western hills were completely surveyed, as was the southern coastal plain. On the latter, however, various parts were disturbed and others could not be studied as a result of present habitation. The central plateau was the most difficult and time-consuming to survey, since its vegetation entailed problems in accessibility, orientation, and observation. Moreover, as a result of individual and unofficial land claims by many of the inhabitants of La Désirade (section 4.5), it proved to be very complicated and time-consuming to get fieldwork permissions. On the plateau, a 1 km wide sample block was systematically surveyed, extending both to the west and to the east of the site of Morne Cybèle-1, which is without doubt one of the most intriguing sites of the island. In addition, a 60 m wide area running along the whole southern border of the plateau was surveyed, in order to find out if Morne Cybèle-1 was the only site situated there. An attempt to survey the northern border of the plateau had to be abandoned due to its impenetrable vegetation.

The survey of Petite Terre was greatly hindered by the impenetrable vegetation, consisting for an important part of dense acacia forests and mancenilla trees that easily cause serious burning scars after contact with bare skin and eyes, and the local research conditions. Although Terre de Haut was completely surveyed at 10 m intervals during a two-day orientation visit in 1998, the vegetation on Terre de Bas made it impossible to completely survey this area intensively and systematically. It was decided to focus on the sites that had been reported earlier at Terre de Bas (e.g. Bodu 1985[c],

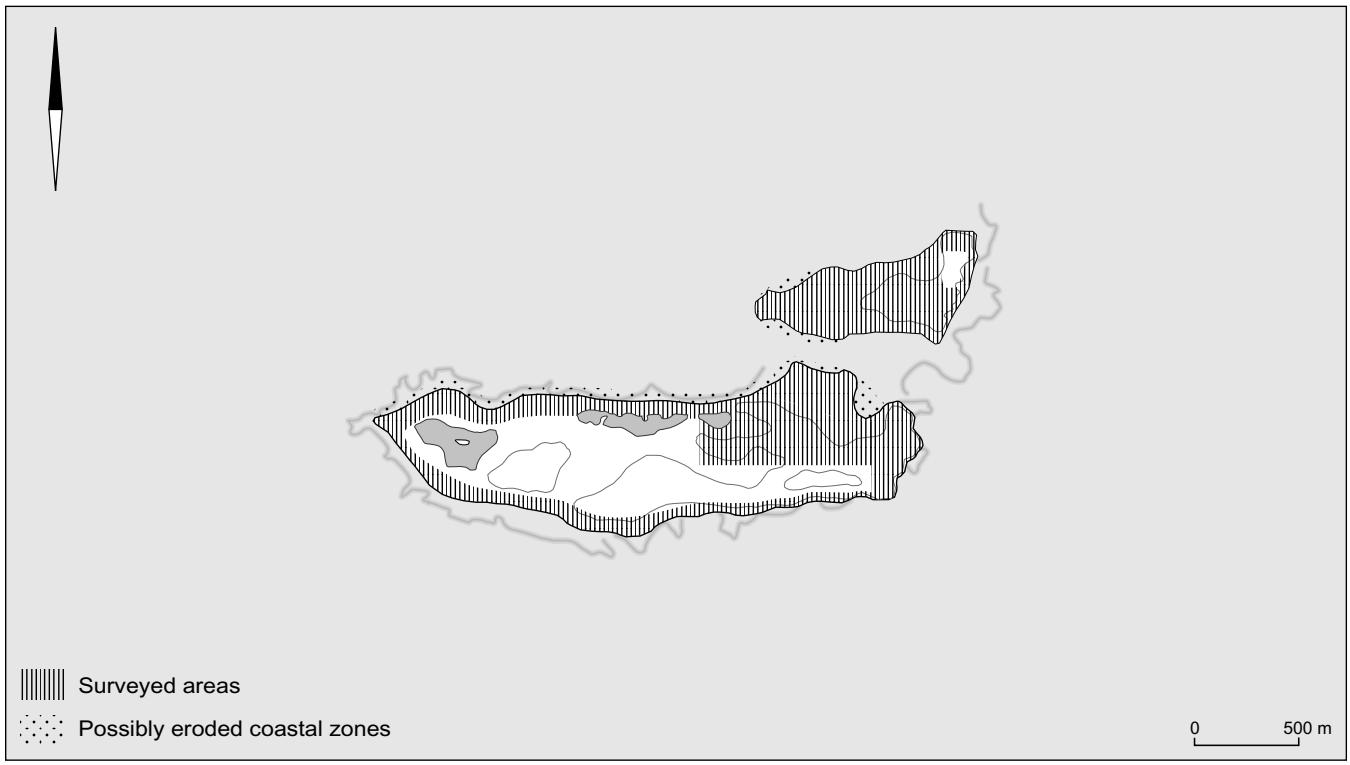

Fig. 2.4. Surveyed areas and possibly eroded coastal zones on Petite Terre.

Nicholson 1975), but since surroundings and access routes of the individual sites were intensively surveyed, a selective but important part of the island was still studied (fig. 2.4).

2.2.3.2 Sub-surface testing

Since it is known that the surface often reflects the sub-surface situation poorly (e.g. Versteeg *et al.* 1993), several sites were selected for additional sub-surface testing. Being the most time-consuming part of the fieldwork this had to be kept to a minimum. Only those sites were selected that gave reason to believe that their archaeological deposit was vertically stratified and not just limited to the surface (0-5 cm), and in particular those sites which were expected to be multi-component. Moreover, a sample of all types of sites at various locations in the study area was to be tested.

The excavation of 1 m^2 test units, or series of them, was aimed at the collection of information on geological and archaeological stratigraphies and on site formation and deformation processes as well as collection of a sample of preferably diagnostic archaeological material that could help to provide a chronological and cultural context. In addition to this material, *Cittarium pica* samples for ^{14}C dating were collected if available, although as yet, with few exceptions, no financial opportunity has presented itself to have them analysed. Therefore, chronological assignments had to be almost exclusively based on ceramic evidence.

Test unit locations were decided based on personal observation of surface survey information and they were randomly chosen in areas with relatively dense archaeological deposits, without covering the site with a grid system. The locations, all with a north-south orientation, were measured by GPS (Global Positioning System) and infrared theodolite. Test units were excavated as is common practice in Caribbean archaeology (Watters 1980:254; Hofman *et al.* 2001[a]; Hoogland 1996). They were excavated in 10 cm arbitrary levels, while taking geological and archaeological layers into account, until the bedrock was reached (fig. 2.5). Archaeological material from these levels was hand-sorted from 2/5 inch dry sieve residues, and archaeological and geological information was documented on test-unit records (appendix 1). However, for

Fig. 2.5. Sub-surface testing at the Aéroport site, La Désirade.

the two 1 m^2 test units excavated at Pointe Gros Rempart and for the two 1 m^2 test units excavated at Pointe Séraphine, 20 x 20 cm samples from the north-west corner were sieved over 2 mm screens. In addition, at a few sites where units displayed unusual features or densities of faunal material, samples for archaeozoological analysis were wet-sieved over 1 mm and 2 mm screens. This has been done for 5 litre samples from levels 6 and 7 of unit 1, and from levels 5 and 6 of unit 2 at the À l'Escalier site at La Désirade. The hearth-feature 001 of level 7 of unit 2 at the Site du Phare at Petite Terre, and features 001 and 002 at the Petites Salines site at Pointe des Châteaux were sampled in a similar way (site catalogues, appendices 2-4).

Additional subsurface information was provided through auger testing, particularly at individual sites. At Pointe des Châteaux, all the sandy beaches on the northern coast of the study area could be tested in 2000 as well. One series of tests, separated by 20 m intervals was placed in the middle of the beach between the dunes and the tide-line using a 10 cm diameter riverside auger. First a small unit was excavated for each test, measuring 50 x 50 cm at least, to prevent collapsing of the hole. Then, auger tests were done until groundwater levels or the bedrock were reached, or until depths between 1.70 and 1.90 m were reached where further testing proved impossible. The auger testing campaign of Petite Terre's beaches, planned for 2000 as well, could not be authorised by the *Office National des Forêts* (ONF) within the available timeframe.

2.2.3.3 GPS positioning of test unit locations

The location of each test unit was measured using two Leica SR261 GPS-receivers and two Leica CR344 field manuals (fig. 2.6) and a Sokkia SET 4B infrared theodolite. If not hindered by local vegetation, the northwest corners of the units were measured. As a result of the dimensions of the research area, the relative scarcity of IGN reference points and the unfamiliarity of the archaeological survey crews with GPS co-ordinate system transformation, this turned

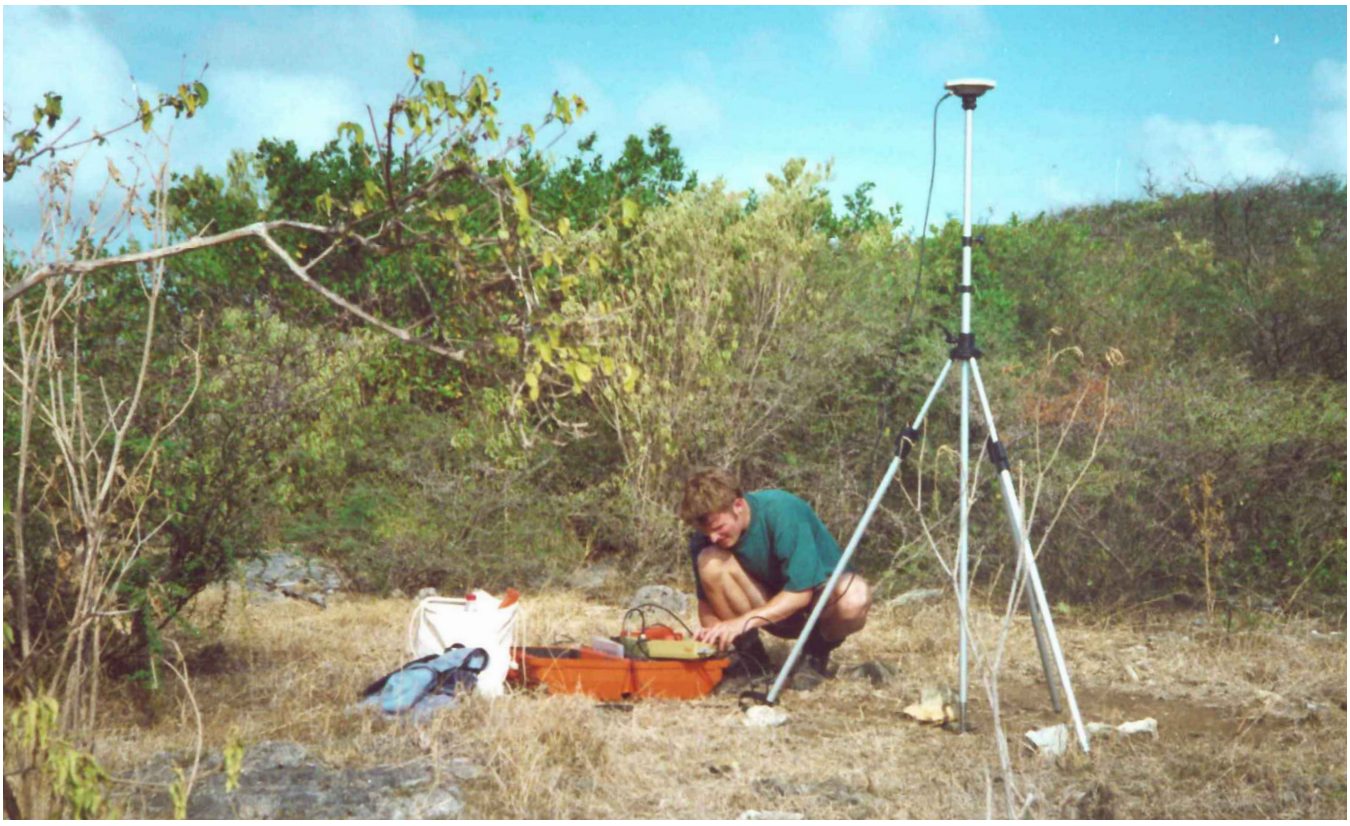

Fig. 2.6. Performing GPS measurements at the Nord Morne Zambi site, Pointe des Châteaux.

out to be one of the major obstacles during fieldwork. In 2000, two students from the Department of Geodesy of the Delft University of Technology (the Netherlands) were asked for assistance. They developed one single design and planning for the measuring campaigns for both Pointe des Châteaux and La Désirade; another design had to be made for Petite Terre since the islands are more remote and only one IGN reference point is available there. This is the Petite Terre lighthouse where GPS and theodolite cannot be positioned. On Pointe des Châteaux and La Désirade, local IGN reference points were used to measure base lines to a GPS reference station that had a fixed location during the fieldwork. As soon as the position of the reference station had been fixed, base lines were measured to the points from which the units could be measured. For Petite Terre, base lines towards three points were measured from La Désirade (Visschers and Lesparre 2000). Petite Terre is situated at approximately 12 km from the reference point on La Désirade, while the maximum acceptable base-line distance is 15 km for the GPS equipment used (Polman and Salzmann 1996). Starting from those three points at Petite Terre, short local base lines were measured from which the co-ordinates of the test units could be positioned. For sites with more than two units, two reference points were measured by GPS and the others by infrared theodolite (Visschers and Lesparre 2000). Unfortunately, due to logistical factors, it turned out to be impossible to use the electronic field manual of the theodolite, which resulted in manual registration, and thus a great loss of valuable time.

The co-ordinate system that is used on Guadeloupe is the Guadeloupe - Ste. Anne system, which uses UTM projection (north, zone 20) and the International-Hayford 1909 ellipsoid. For the heights, two other, independent systems are in use: at Pointe des Châteaux the 1988 IGN system (Guadeloupe) and on La Désirade the 1992 LD IGN system (Guadeloupe/La Désirade). In addition to these systems, the WGS84 system has been used, which is the system in which GPS measurements take place (Visschers

and Lesparre 2000).

In order to combine GPS and theodolite data, transformation parameters were created in Ski, which is Leica GPS software, by using the co-ordinates of points that are known in the IGN local system as well as WGS84. For Pointe des Châteaux a total of 11 sets of co-ordinates in both systems could be used and for La Désirade 12 sets were available. Preliminary co-ordinates were determined for the reference stations and for the points where the mobile station of the GPS had been measuring. After error detection, using Ski and Microsoft Excel, the results were calculated in a least squares adjustment using Scan 3, which is Delft Department of Geodesy software. Scan 3 produced 3-D co-ordinates of the IGN points, the reference points, the points where the mobile GPS station had been measuring and the test unit corners. The accuracy of the unit co-ordinates turned out to be good and sufficiently accurate to guarantee GPS relocation of the units in the future. The standard deviation for Easting and Northing was 2.5 cm at Pointe des Châteaux and La Désirade and 4.5 cm at Petite Terre, while the mean deviation for the orthometric height – which is the height relative to sealevel as it would be measured by levelling – was 20 cm at Pointe des Châteaux and on La Désirade and 21 cm on Petite Terre. This standard deviation is high as a result of the poorly known geoid, transformation between orthometric and ellipsoidal GPS heights. The relative accuracy of orthometric heights, compared to nearby points on a single site, is nearly the same as that of the ellipsoidal heights; 3.5 cm for Pointe des Châteaux and La Désirade and 6.5 cm for Petite Terre (Visschers and Lesparre 2000:41).

2.3 ANALYSIS OF THE ARCHAEOLOGICAL MATERIALS COLLECTED

2.3.1 Introduction

Artefact analysis includes all phases from collecting the finds to the analysis of the various material categories. The archaeological material collected during surface surveying and sub-surface testing was cleaned on Guadeloupe, and the different material categories were separated. Before storage in the Edgar Clerc Museum, the material was sent to Leiden University for analysis. However, part of the 1999 material from La Désirade and Petite Terre could be directly investigated and stored on Guadeloupe. It included all shell food remains and coral fragments from the test-units. The data from the analyses were processed in Microsoft Access 97 and used for the site descriptions presented in the site catalogues (appendices 2-4). The methods of analysis of pottery, stone, shell and coral artefacts, and shell and vertebrate food remains are presented below.

Earlier reports on the collections from Anse à la Gourde (e.g. Hofman *et al.* 2001[a]) at Pointe des Châteaux and from Morne Cybèle-1 and Morne Cybèle-2 (Hofman 1995) and Petite Rivière (De Waal 1996[b]) on La Désirade were also used in the present study. These collections had previously been analysed at Leiden University according to the same procedures as described in the ensuing sections.

In addition to this material, collections from earlier archaeological research in the study area were studied at Leiden University. These collections, accrued between the 1950s and the 1990s, had been stored in the depot of the Edgar Clerc Museum. There were few if any fieldwork reports or material descriptions concerning the majority of these collections. The main focus in the study of these collections was on the ceramics in the hope of attaining additional information on functions and chronological assignments of the sites already reported at the start of the East-Guadeloupe project. However, some of the faunal samples were studied as well (appendix 5). While the archaeological context of the ceramics could be tracked to some extent, the other archaeological find categories, including shell, stone and coral artefacts, appeared to have been haphazardly collected and documented. This turned out to be particularly true for shellfish subsistence remains, which were largely absent from the collections. Therefore, they have not been included in the descriptions in the site catalogues.

2.3.2 Analysis of the surface finds

Surface finds collected during the survey consisted of pre-Columbian ceramics and artefacts of shell, stone and coral, as well as colonial artefacts. The analysis of these materials aimed at providing chronological assignments and at quantification in number and weight primarily. Per surface collection, the different artefact categories were counted, weighed and their occurrences were plotted on the aerial photographs to obtain a general insight in surface distributions. This was also done for off-site material. As mentioned before, the off-site material has only been used as a complement to the site data. Since a detailed study of this material turned out to be impossible within the project's timeframe, the off-site data await further study and presentation.

The pottery, being the most abundant and most diagnostic category in the surface collections, was studied for its stylistical or morphological characteristics. Of course, possibilities to do so were limited due to heavy fragmentation and weathering of the material. However, in many cases it turned out to be possible to assign ceramics to Early Ceramic or Late Ceramic Ages. Chronological assignments of the shell, stone and coral artefacts could not be specified in more detail than being pre-Columbian or not. Raw materials and functions

of these artefacts were studied as well. As for the colonial artefacts, mainly ceramics, no efforts were made for further chronological or functional analysis, as this was beyond the scope of this study.

2.3.3 Analysis of the archaeological material from the test units

The excavated pre-Columbian materials include ceramics, lithic, shell and coral artefacts, coral fragments without evidence of modification, shell food remains, faunal remains, and human skeletal remains. No botanical samples were taken, since no deposits were encountered with a sufficiently good conservation. Charcoal was found in too limited amounts to allow ^{14}C or macro-botanical analyses. Incidental colonial material also occurred, but this was only quantified in number and weight and it has not been presented in this study. Charcoal fragments as well as colonial material have been preserved and stored in the depot of the Edgar Clerc Museum.

The pottery analysis carried out in the present study can be characterised as an analysis of stylistic and morphological features of the pottery as proposed by Hofman (1993). No detailed technological or functional information was obtained, and quantitative analyses could not be executed due to the incomplete nature of the sample. In order to standardise the recording of the various stylistic and morphological characteristics of the pottery, a description form was used. This was based on the form Hofman (1993) designed for the study of Saban pottery assemblages, which has been used since 1993 for all analyses of Caribbean ceramics carried out at Leiden University.

The pottery description form registers the counts of the various ceramic categories represented and the morphological description of rim sherds larger than 5 cm. It also records the number and weight of sherds of rims, bodies, bases, griddles, and appendages and registers the number of sherds larger than 5 cm. The sherds finished with a red, beige or black slip or paint are counted, as well as those representing different decoration modes. Special attention is also paid to the number of different base shapes and griddle rim shapes (fig. 2.7) represented, and the number of different appendages or other pottery items in the sample. The rims larger than 5 cm are studied and numerical codes are used to record their characteristics. These include vessel shape and wall profile (fig. 2.8), lip shape and rim profile (fig. 2.9), wall thickness, orifice diameter and percentage of the rim present, decoration,

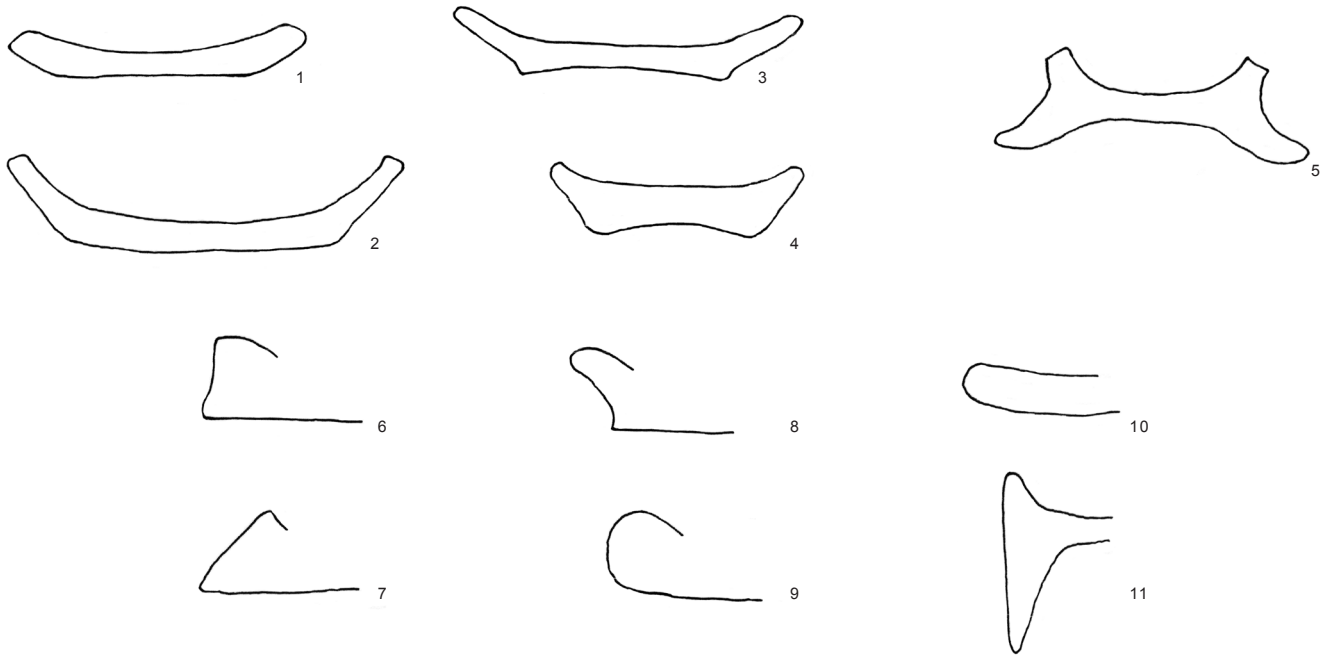

Fig. 2.7. Base shapes (1: flat; 2: convex; 3: concave; 4: concave high; 5: pedestal or annular) and griddle rim shapes (6: straight; 7: triangular; 8: overhanging; 9: rounded; 10: unthickened; 11: legged); (after Hofman 1993).

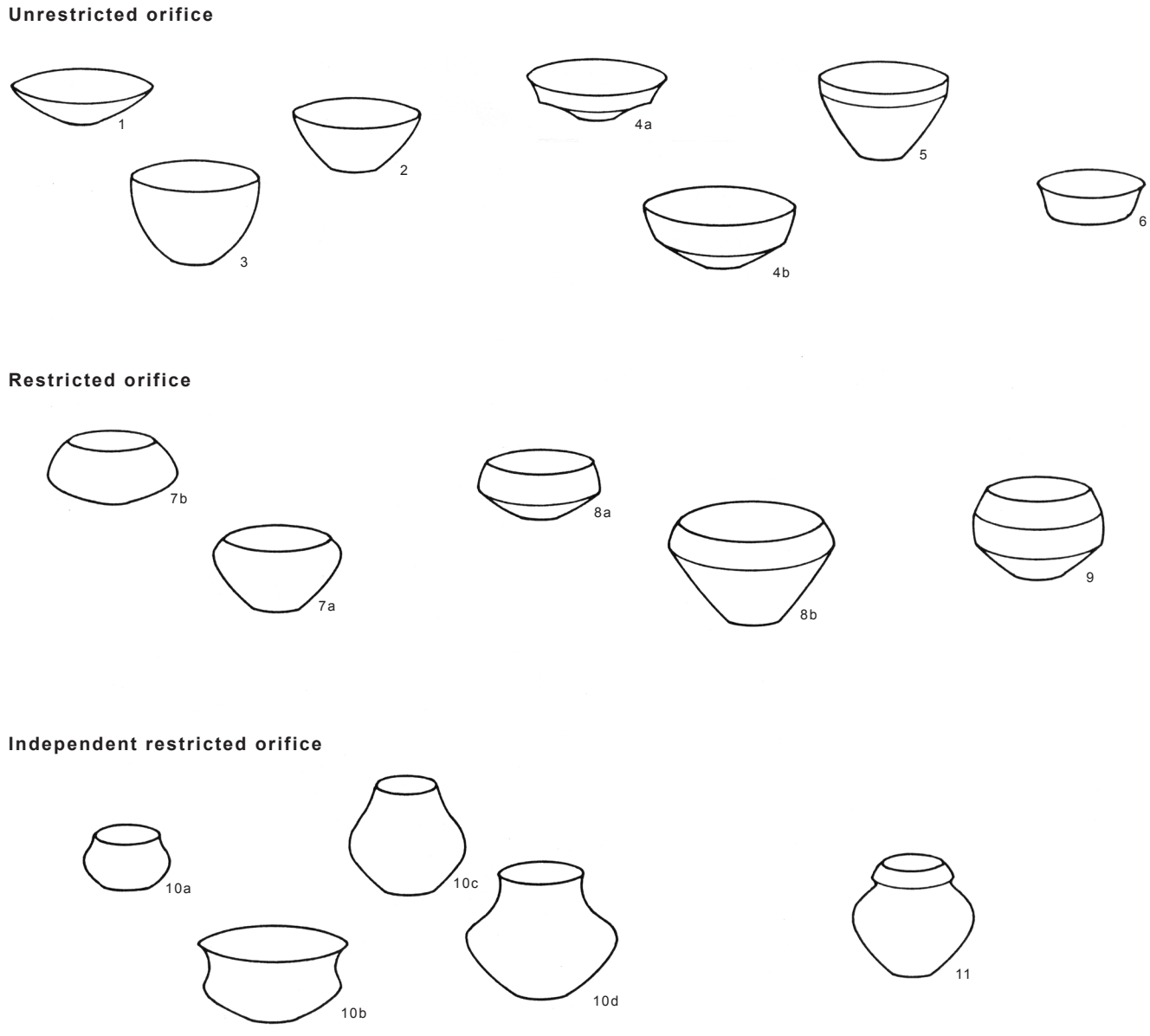

Fig. 2.8. Vessel shape categories (1: dish with unrestricted simple contour; 2: bowl with unrestricted simple contour; 3: jar with unrestricted simple contour; 4a-b: dish or bowl with unrestricted composite contour; 5: jar with unrestricted composite contour; 6: bowl with unrestricted inflected contour; 7 a-b: bowl with restricted simple contour; 8a: bowl with restricted composite contour; 8b: jar with restricted composite contour; 9: bowl with restricted complex contour; 10a-d: bowl or jar with independent restricted inflected contour; 11: Bowl or jar with independent restricted complex contour); (after Hofman 1993).

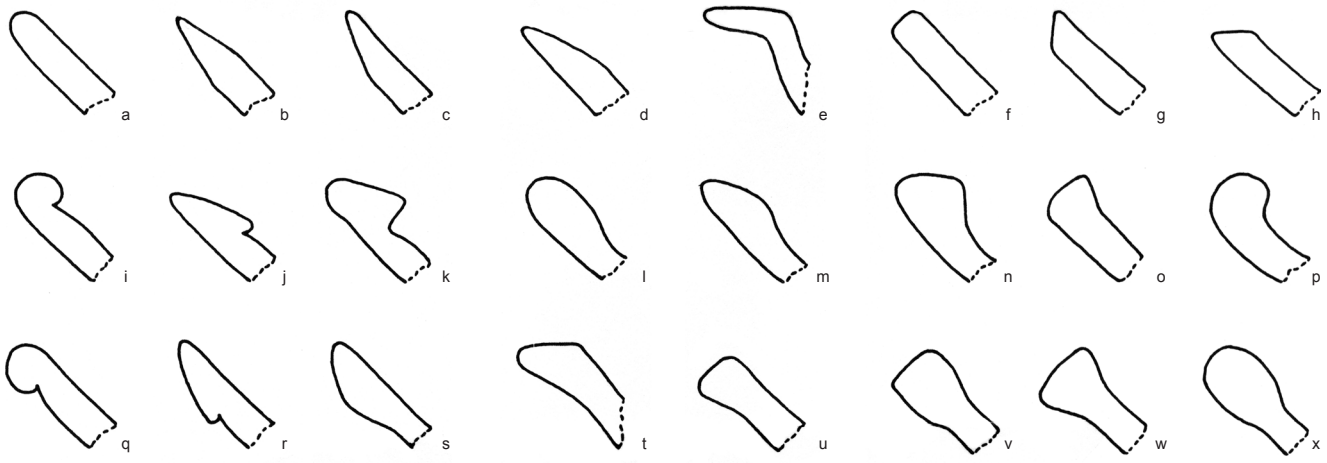

Fig. 2.9. Lip shapes (a-d: rounded; e: flanged; f: flattened; g-h: bevelled; i-p: inward thickened; q-u: outward thickened; v-x: double thickened); (after Hofman 1993).

Munsell chart colours, firing atmosphere, surface finishing, and the presence of red slip. These characteristics are used to describe the pottery assemblages and to assign them a place within the regional chronological framework.

Knippenberg (Leiden University) provided short descriptions of the stone artefacts, recording artefact type, macroscopic identification of the rock type and provenance of the raw material. For the study of shell and coral artefacts, the use of simple description forms proved useful in the registration of various artefact functions and raw materials. These forms register find numbers, raw materials, dimensions and weight, and functions, as well as remarks on production technology for each artefact. Use-wear analysis has not been carried out. The outcomes of the analyses may provide information on procurement strategies and the various technological stages in the process used to produce stone, shell or coral artefacts.

Remains of the shellfish consumed and other faunal remains are studied to obtain information on shellfish gathering, fishing and hunting strategies, the exploitation of different ecological zones for food resources and on diet components of the pre-Columbian inhabitants of the research area. Seasonal information could not be obtained. Shell food remains recovered during the project were classified by means of a description form that was drawn up by Brokke (1996) and refined by Nieweg (2000). This form lists the most common shellfish species in the Caribbean. The form registers number and weight of complete shells, shells that had been opened to extract the animal, individuals, and of the fragments per species. Complete shells include complete gastropods for bivalves, with two matching valves, without apparent damage to the shell and chitons of which anterior and posterior valves can be counted together with six intermediate valves. Opened shells include gastropods with meat extraction holes and bivalves with only one complete valve. Individuals are counted on the basis of the presence of the umbilicus or anterior side for gastropods, the umbo with teeth or bivalves and one posterior or anterior valve or six intermediate valves for chitons (Nieweg 2000:10-11). In addition, total weights per species are listed. The descriptions of shell food remains in the site catalogues (appendices 2-4) list MNI (minimum number of individuals) counts and weights, weights of fragments, whether burnt or not, and the total weights of the main consumed shell species for each site. MNI estimates are based on the sum of complete shells, opened complete shells and individuals. The mollusc reference collection of Leiden University was consulted in order to standardise species identifications.

Faunal remains were studied by Nokkert (appendix 5) using reference collections from the Natural History Museum in London and a private reference collection for the ascription of the remains with element and taxon, with subsequent calculations of the number and weight of the fragments and MNI calculations per taxon. Although interesting results were thus obtained, the size of the screen mesh used, 2/5 inch, was probably unsuitable for obtaining very reliable samples of faunal material.[12] Small-sized vertebrates and invertebrates with remains smaller than the mesh size used may have been underrepresented. Changes in the average sizes of the animals

over time, which can be a result of human overexploitation, could therefore, for instance, not be studied (Grouard 2001; Wing personal communication 1999). The collection of finely screened samples, however, would have imposed serious logistical problems during the survey, as it would have required wet sieving procedures on site, which is impossible at the majority of the sites, or transportation of bulky non-sieved material to the field laboratories. The survey was designed to provide a general regional overview and herein a regional but relative comparison of differences and similarities of the faunal assemblages obtained from sites with different functions and from sites located in different zones. Despite the above-mentioned sample problems, these aims could largely be accomplished with the gathered animal remains.

A small amount of heavily fragmented human skeletal remains was found as well. These were also analysed by Nokkert, using reference collections from the Natural History Museum in London.

2.4 CONCLUSIONS

The East-Guadeloupe surveys were designed to swiftly provide a detailed and systematic archaeological site record for a small region. As a result of encountered environmental constraints, related to impenetrable vegetation in most cases, and archaeological diversity, representing different kinds of sites in varying settings including caves, beach areas or elevated plateaus, it turned out to be quite complex to develop one single best survey strategy. Standardisation was not very easy since the survey methods described in section 2.2.3 had to be adapted to the local situations in many cases.

Surface finds provided only a very general insight in regional surface distributions. Diagnostic material was largely absent, which hindered detailed chronological or functional information. This is a problem especially for Late Ceramic assemblages since decorated sherds are scarce. Test unit material was in most cases more informative. However, for some sites that were characterised by a thin layer of heavily fragmented and non-diagnostic sherds this still remained a problem. Since this problem is encountered in most survey studies in the Caribbean (*cf*. Watters 1980:209), the need is felt to carry out larger-scale excavations at such sites, in order to understand better what they actually represent.

Notwithstanding the above mentioned constraints, the East-Guadeloupe regional surveys resulted not only in the creation of a useful regional archaeological database for the present study (site catalogues, in appendices 2-4), but they have also contributed to an important degree to the *Carte Archéologique* inventory project for the department of Guadeloupe.

NOTES

1 In this study, a region is considered to be any area larger than the one immediately surrounding one single archaeological site. Within this definition, a region may include several islands, an island, or part of an island.

2 Complete surveys have also been termed 'full-coverage', 'total' or '100%' surveys (e.g. Fish and Kowalewski 1990; Shennan 1985).

3 The present overview is limited to regional or micro-regional surveys aimed at the recovery of pre-Columbian archaeological material. Site level surveys have not been included.

4 The regional archaeological service was created in 1992 as a part of the DRAC of Guadeloupe and André Delpuech (1992-1999) and dr. Antoine Chancerel (1999-present) were appointed as regional archaeological curators.

5 The French archaeologist Bodu worked on Guadeloupe in fulfilment of his military service in 1984 and 1985.

6 These include the sites of Anse Petite Rivière, À l'Escalier, Morne Cybèle 1-3, Grotte le Baigneux, Les Sables, Pointe Mansénillier, Léproserie, Pointe Doublé, Morne Baie Mahault, Le Cocoyer, Grotte de Grande Anse, Voûte à Pin, Anse des Galets, Tropique, and Pointe à Godard (*cf*. site catalogue in appendix 3).

7 These include the sites of Site du Phare, Baleine du Sud, Trou Canard, Mouton de Bas, and Est de Mouton de Bas (*cf*. site catalogue in appendix 4).

8 Although transect is generally used to label a rectangular block, in which walking and observation of several lines takes place (*cf*. Flannery 1976:138), in this study a transect is a line that is actually a 1 m wide continuous observation and sampling unit.

9 All survey participants, however, were trained in surface collecting of ceramics and lithics. The latter is particularly important since lithic artefacts are more easily missed in surface surveys than ceramics.

10 The originals are IGN (*Institut Géographique National*) photographs of Pointe des Châteaux (1989): 1:8000; La Désirade (1993): 1:30,000; Petite Terre (1948): 1:20,000.

11 Co-ordinates for site registration in the DRAC inventory were

taken from the 1:25,000 IGN map ‘St. François, La Désirade, îles de Petite Terre’.

12 As remarked earlier, some 1 mm and 2 mm samples have been collected as well.