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Goemulgaw Lagal: Cultural and Natural Histories of the Island of Mabuyag, Torres Strait

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COVER

Image on book cover: Pearlshelling station at Panay, Mabuyag, 1890s. Photographer unknown (Cambridge University Museum of Archaeology and Anthropology: N23274.ACH2).

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Mabuyag (Torres Strait) in the mid-1980s: Archaeological reconnaissance of the island and midden excavations at Goemu

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Reconnaissance of Mabuyag in 1984 and 1985 revealed a wide variety of archaeological features including extensive midden deposits at the former village site of Goemu. Accounts of our investigations were given previously in several reports and a doctoral thesis on the ethnoarchaeology of the island, but not formally published. In this paper our research, which pre-dated recent landscape changes and has historical value, is documented. The archaeological features observed during the reconnaissance, most of which were associated with former settlement areas, are first described. A detailed account is given of the survey and excavations undertaken at Goemu in 1985. Survey of the c. 2 ha site revealed many surface deposits of midden material consisting of bone (mainly dugong and some turtle), shell and stones. The deposits comprised a large rectangular 'platform', six linear 'ridges', 95 round and ovoid mounds, and surface scatters of material. The main midden feature selected for excavation was the large platform and two adjacent ridges. A nearby mound was also partly excavated and 16 test pits were dug at intervals across the site. The results of the identification and quantitative analysis of samples of the excavated remains are described and evaluated. Interpretation of their socioeconomic significance, informed by ethnohistorical evidence, leads to the conclusion that some of the midden features had ceremonial significance and that turtle and dugong ceremonies were performed at Goemu. Some reference is made to more recent research by others that support our interpretation of the site, but no attempt is made to relate our results comprehensively to research carried out at Goemu since 1985.

❑ *Ethnoarchaeology, Mabuyag, midden formation, ritual, Torres Strait, turtle, dugong.*

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More than two-and-a-half decades have passed since, welcomed by the island community, we began ethnoarchaeological research on Mabuyag. We first visited the island in 1984 and returned for a longer period the following year. Accounts of our research were included in fieldwork reports and in a doctoral dissertation (Harris *et al*., 1985:44-50; Harris & Ghaleb, 1987; Ghaleb, 1990), but not formally published. We therefore welcome the opportunity to contribute a paper describing our initial reconnaissance and our investigations at the old village and ceremonial site of Goemu to this special issue of the *Memoirs of the Queensland Museum* | *Culture*.

CONTEXT OF THE RESEARCH

The impetus for our fieldwork on the island stemmed from a more general interest in the location of the western islands of Torres Strait as both a bridge and a barrier between the traditional hunter-gatherer economies of Australia and the partly agricultural subsistence systems of New Guinea. The question of how the islands functioned in historical times as a cultural divide, or filter, separating northern Australia from southern New Guinea was first investigated by one of us in a south-to-north ethnoecological reconnaissance of the islands in 1974 and in an archival study of their socioeconomic differentiation in the nineteenth century (Harris, 1975: 98-143, 1977: 439-59, 1979). These initial studies were followed in the early 1980s by a much larger-scale programme of archaeological, environmental and ethnographic research in the western islands, a central aim of which was to investigate patterns of settlement and subsistence that prevailed before European navigators, traders and missionaries began to have a sustained impact on the ways of life of the Islanders. The methods and results of this 'Torres Strait Research Project' (TSRP) were described in successive reports to the National Geographic Society (which mainly funded the project) and in several papers (e.g. Barham & Harris, 1983, 1985).

One important conclusion that emerged from these studies was that in the nineteenth century, and no doubt earlier, Mabuyag occupied an economically and socially strategic position in the mid-western Strait between the northern tip of Cape York Peninsula and the southern coast of New Guinea west of the Fly River, and that the island played a pivotal role in the trans-Strait network of inter-island and island-mainland maritime exchange and trade. An attempt based on ethnographic and historical evidence to reconstruct mid-nineteenth century population distribution and densities in the western islands also suggested that Mabuyag was then one of the most densely populated islands (Harris, 1979: 88-91), although subsequent research by Mullins (1992), citing documents in the Queensland State Archives not seen by Harris, showed that the 'pre-colonial' population of the island was probably closer to 300 than the figure of 600 postulated by Harris.[1]

Documentary sources, particularly the reports of A.C. Haddon (1890, 1904, 1912, 1935), record many aspects of the life and traditional activities of Mabuyag people in the late nineteenth century and stress the importance of crops and cultivated 'gardens', as well as of fish, marine turtles and dugongs, in the food supply of the Islanders (e.g. Haddon, 1890: 351, 1904: 284). It was because of the strategic position of Mabuyag and the evidently heavy past reliance of the population on marine resources and crop cultivation that we proposed to undertake, as part of the TSRP, an archaeological survey of the island. Provisional approval for the proposal was given by the Queensland Department of Community Services in Brisbane, dependent on agreement by the island's Community Council. One of us (DRH) had visited Mabuyag previously while engaged in the reconnaissance of the western islands in 1974 referred to above, but it was not until 1984 that, with the agreement of the Council, then chaired by Ron Whap, we began archaeological work on the island.

Prior to our research, the archaeological potential of Mabuyag had been only briefly and partially examined and one small excavation undertaken, on the islet of Pulu (Vanderwal, 1973: 178-80). In September 1984, when we visited the island for a week to conduct an initial archaeological survey, we had insufficient time to complete a full reconnaissance, but it became apparent that surface features of archaeological interest were more numerous and diverse than we had observed on the other western islands where, as part of the TSRP, we had undertaken fieldwork. During the week on Mabuyag we concentrated on locating as many sites as we could in the short time available and did not carry out any trial excavations. The abundance and variety of sites we found encouraged us to return to undertake selective, detailed archaeological investigations and, with the agreement of the Council, then chaired by Cygnet Repu, we did so in July 1985. During our main season of fieldwork, in July-September 1985, four members of the TSRP (Barbara Ghaleb, Sarah Goodale, David Harris and Lori Richardson) undertook further site reconnaissance on Mabuyag and carried out the survey and excavations at Goemu described here.

Our main aim in this paper is to publish an account of our investigations at Goemu so that the information becomes more generally accessible and, especially, more readily available for the people of Mabuyag themselves. However, in doing so it is important to emphasise that this is an account of studies undertaken more than 25 years ago and that we have not attempted to update our results, or their interpretation, in light of research carried out by others since then. This applies particularly to the comprehensive description in this volume of the recent archaeological investigations at Goemu by Ian McNiven and his colleagues. Although we refer occasionally in this paper to relevant points in their contribution, we have not attempted to relate systematically our results from the mid-1980s to theirs from 2005 onwards.

ARCHAEOLOGICAL RECONNAISSANCE OF MABUYAG [2]

While the main purpose of our contribution to this Memoir is to provide a full description of our investigations at Goemu, we start with a summary of the types and locations of archaeological features we observed elsewhere on the island. Our initial observations during the week we spent on the island in 1984 were followed in 1985 by more comprehensive archaeological reconnaissance. We classified the features we observed on Mabuyag and its offshore islets into seven types:

1. Midden deposits, primarily of two forms: discontinuous surface scatters of bone, shell and stone, and discrete circular or ovoid mounds averaging 1.0-1.5 m in diameter, sometimes bordered by large stones.
2. Stone-edged trackways, rectangles and circles associated with areas that our Islander informants recognised as former settlements.
3. Surface arrangements of large shells.
4. Ditches separating rectangular areas that were formerly cultivated, i.e. 'relict fields'.
5. Fish traps consisting of semi-circular or rectangular alignments of large rocks in shallow water immediately offshore.
6. Linear and circular stone arrangements, sometimes associated with shell, and animal effigies composed of rocks.
7. Rock-art designs (pictographs) of human, animal and other motifs painted on large granitic boulders.

While most of these types of feature were part of, or closely associated with, former settlement sites mentioned by Haddon, many of the fish traps, stone arrangements and pictographs were located away from the settlements. Haddon, who spent four weeks on Mabuyag in 1888, and a further five weeks there in 1898 accompanied by six other members of the 'Cambridge Anthropological Expedition to Torres Straits', compiled information on the traditional names of settlements and topographic features and later published a sketch map showing their locations (Haddon, 1904: 7). He identified five sites of 'old villages', three on the north coast: Panai (now Panay), Aubait (Awbayth) and Wagedugam (Wagadagam), and two on the east coast: Maidi (Maidh) and Gumu (Goemu). All five sites were associated with totemic clans, and at all but Maidh were also men's ceremonial grounds known as *kod* (referred to by Haddon as *kwod*). During our fieldwork in 1985, the place names on Haddon's map were discussed with several Islanders who confirmed many of them and identified other places not recorded by Haddon (Ghaleb, 1990: 129-137). Information from both sources was then combined to produce a revised map of traditional place names (Ghaleb, 1990: Fig. 4). Other areas of former settlement identified by Haddon (in addition to his five 'old villages'), confirmed by the Islanders in 1985, and visited by us are: Ii/Sopalai on the west coast, Maitan/Dadakul, Sao, and Kodakal/Dabungai (Dabangay) on the north coast, and Mui and Udai respectively north and south of Goemu on the east coast (Figure 1). As a prelude to the detailed account of our survey and excavations at Goemu, summaries are given below of the features we observed in 1984 and 1985 at these other settlement areas, at four of the 'old village' sites, and on three offshore islets, Pulu, Widul (Woeydhul) and Kwoikusigai (Kuykusoegay), which we also visited, as well as information about the fish traps, stone arrangements and pictographs.

FORMER SETTLEMENT AREAS (EXCLUDING GOEMU)

As Figure 1 shows, the 'old villages' and the other former settlement areas were all located in the island's lowlands, mainly along the

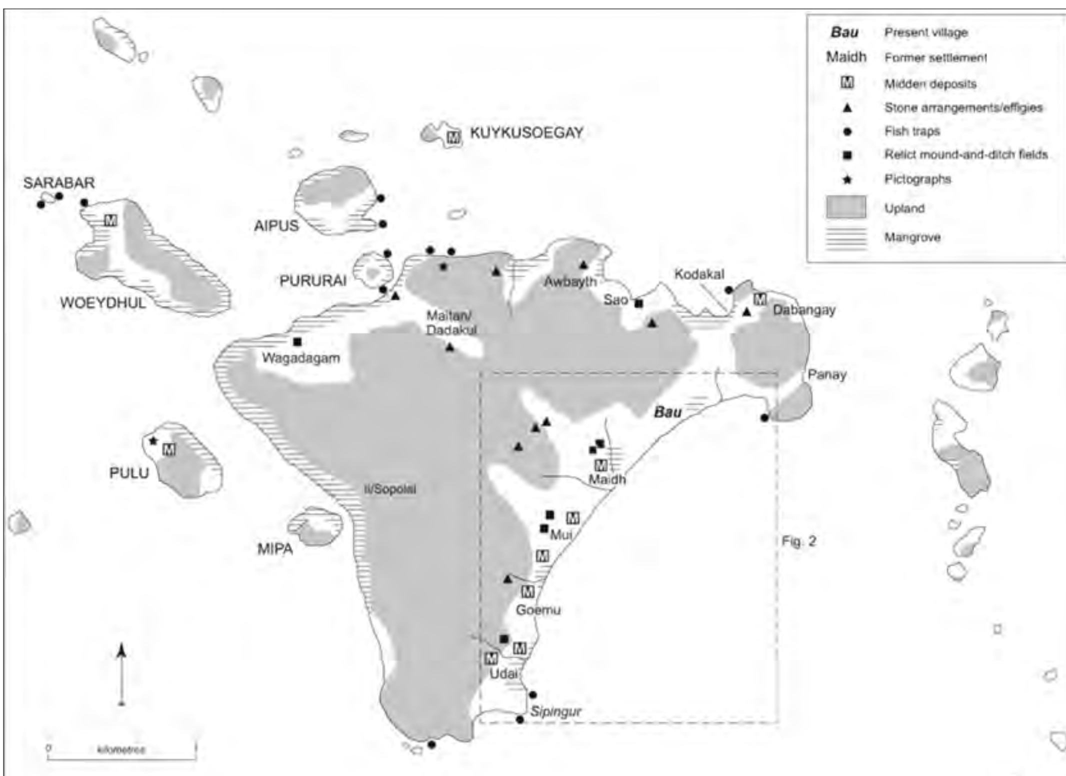

FIG. 1. Mabuyag: distribution of settlement sites and types of surface archaeological features (modified from Ghaleb, 1990: Fig. 6).

eastern and northern coasts. The references below to the clan totems of the 'old villages' are from Haddon (1904: 163-164, 172). In 1985 some information about more recent settlement history was given to us by a group of Islanders who said that several areas were temporarily reoccupied during the First and Second World Wars as a precaution against bombing attacks: Wagadagam in World War I and Udai, Goemu, Mui, Maidh, Saz and Sao in World War II; also that the islets of Aipus and Kuykusoegay were occupied in the 1870s to avoid contact with missionaries who had settled at Dabangay and Bau (Ghaleb, 1990: 133-134).

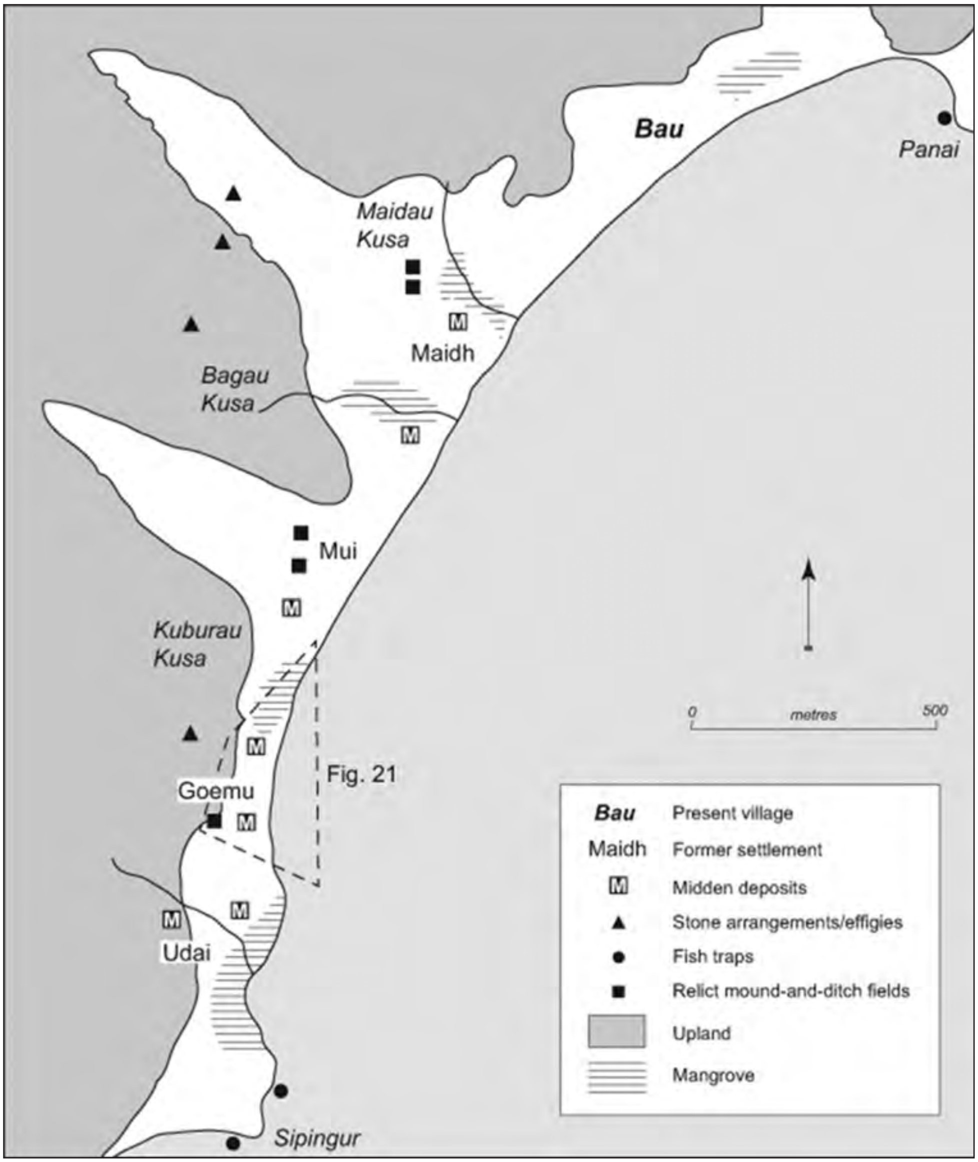

FIG. 2. East-coast lowland of Mabuyag showing location of the Goemu area and surface archaeological features (modified from Ghaleb, 1990: Fig. 7).

MAIDH

This 'old village' site occupied part of Mabuyag's east-coast lowland between two creeks known as Maidau Kusa and Bagau Kusa 0.5 km south of the modern village of Bau (Figure 2). In 1984 and 1985 it was mainly grass-covered with scattered trees growing on alluvial soil, and near the seaward edge a few coconut palms, at the base of which midden deposits were observed. There was evidence of relict ditched fields at the northern margin of the area and more extensive traces of former mound-and-ditch cultivation on the alluvium towards the inland edge of the Maidh lowland (Figure 3). The *tabu-surlal-gapu* (snake-turtle-sucker fish) clan was associated with the site of Maidh.

MUI

This settlement area was also in the east-coast lowland south of Maidh between the Bagau Kusa and Kuburau Kusa creeks (Figure 2). According to Haddon it was less important than the villages of Maidh and Goemu north and south of it, a view endorsed by Islanders we spoke to in 1985. At that time the coastal sand flat was grass covered with scattered coconut palms. To undertake a thorough survey would have required burning off the dry grass and in the time available we did not find any archaeological features on the sandy surface. However, prospecting inland along the seasonal creek bed and upslope into patches of woodland, several clusters of stone piles were found as well as circular and rectangular stone alignments and short sections of stone-edged trackway. These features were located on the lower hill slopes bordering the southern side of Mui in an area said to have been cultivated in the past, and the stone piles may be the result of clearing the rocky slopes for planting.

FIG. 3. Grass-covered former mound-and-ditch fields, east-coast lowland near Maidh, 1984 (Photo: DRH).

UDAI

The name Udai refers to a small alluvial lowland between a low rock ridge that formed the southern boundary of the Goemu settlement area and the rocky headland of Sipingur (Figure 2). It consists of a pocket of alluvium crossed by a stream which flows from 'Kwoiam's [Kuyam's] pool' (Yaza) in the hills inland. We traced a stone-edged trackway (Figure 4), with side branches, that ran about 200 m inland from the beach across the grass-covered lowland to the stony stream bed where, in thick woodland, 6-8 circular stone arrangements, each about 1 m in diameter, were found. Closer examination of the lowland (facilitated by the fact that much of the grass cover had been burned off by young villagers out pig hunting) revealed

FIG. 4. Part of a system of stone-edged trackways, Udai lowland, 1984 (Photo: DRH).

more side branches of the trackway system and several rectangular stone alignments that resembled house foundations. Many large linear and circular stone piles were also discovered in the woodland on the rocky slopes adjacent to the stream bed, and wild yams were growing in association with small stone piles and the remains of several types of shellfish. Around the western and southern margins of the grass-covered lowland there were stands of bamboo, coconut palm and *mekei* (*Terminalia catappa*): all useful plants which were probably planted at Udai. The bamboo, known as *upiyus*, is less robust than a thicker variety known as *merap* (which we found growing at the settlement site of Wagadagam) and it was said to have been valued in the past for making 'beheading knives' (*upi*).

We did not undertake a detailed survey of Udai but its close proximity to Goemu, whose clan territory extended through the area to Sipingur where fish traps were constructed, suggested that it might have considerable archaeological potential. We were told in August 1985 by one of the oldest Islanders, Mr Kame Pai Pai, that five families lived at Udai during the Second World War, and also that the stone-edged trackways were in existence before the First World War. We could not determine whether the trackways also pre-date the arrival of missionaries on Mabuyag in the 1870's, but, as their policy was to encourage Islanders to abandon their villages and settle at Bau, it seems unlikely that they would have promoted the construction of such trackway systems at Udai and elsewhere on the island. In the Haddon *Reports* there is no mention of stone-edged trackways but neither is there evidence that Haddon and his colleagues undertook any prospecting for archaeological features during their time on Mabuyag.

PANAY/DABANGAY/KODAKAL

This area comprises the northeast headland of Mabuyag. It consists of a high rocky promontory on the northwestern side of the headland overlooking a small bay to the west and a lower hilly area to the east, separated from the promontory by a broad valley ending in a gently shelving beach. The 'old village' of Panay, which was associated with the dhangal-koedal (dugong–crocodile) clan, was located at the southern margin of the hilly area, the ceremonial-village site of Dabangay was across the small bay at the northern end of the promontory, and Kodakal was on the small bay west of the headland. Our reconnaissance focused on Dabangay and Kodakal (Figure 1).

The archaeological features we observed consisted of stone-edged trackways; rectangular stone alignments which we thought represented either old settlement areas or former fields; discrete round and ovoid mounds of stone, bone and shell; relict mound-and-ditch fields; a double fish trap; and a stone arrangement in the form of a crocodile. The arrangement had been made very recently on the initiative of the village school and it reproduced, on a large scale in an accessible location, a much older stone effigy of a crocodile on a low ridge west of Dabangay between Kodakal and Sao. We were told that Kodakal was a former settlement area that had been leveled during construction of the Mabuyag airstrip and we found no surface signs of former occupation. However, there was a double fish trap at Kodakal, and two 1 m-wide stone-edged trackways were visible on the grass-covered slopes below the summit of the headland on the western side of Dabangay. They descended for distances of 100-125 m to the inland base of the hill where they joined another track that was partly traceable and may have connected the Kodakal fish trap area to the Dabangay beach, where there was a large oval midden mound (a.k.a. Dabangay Bone Mound – McNiven

& Bedingfield, 2008). This mound measured 12 x 9 m and 31 m in circumference and was littered mainly with fragments of dugong bone and shellfish (*Polymesoda*, *Nerita*, *Hippopus* and *Syrinx aruanus*), together with various modern materials (iron, plastic bottles, food tins, glass and teabags). At its southeastern end there was a large stone resembling the shape of a dugong and measuring 2.25 x 1 m. We were told that this area and the nearby smaller mounds (described below) were former ritual or sacred grounds. At the base of the hill just inland of the beach the track passed an area divided by lines of stones into several (possibly four) rectangular units which may represent old occupation areas or perhaps former fields.

Closer scrutiny of an area on the eastern side of the central valley at the back of Dabangay, where the grass cover had recently been burned, revealed a cluster of stone-bone-shell mounds closely associated with a complex of relict mound-and-ditch fields. Some 30 discrete mounds were also found, five of which were in the form of cylindrical, turret-like stone 'cairns' without surface bone and shell, while the remainder closely resembled, in form and surface materials, mounds at Goemu. The relict fields varied in size and shape and formed an integrated system, with transverse and longitudinal ditches orthogonal and parallel to the slope of the valley, which ended downslope at the top of the beach. We were particularly interested to find that parts of some of the field mounds and ditches appeared to underlie the edges of some of the stone-bone-shell mounds, suggesting that they pre-date the latter. A small test pit we dug at one of these locations did not produce any datable material; nevertheless we concluded that the apparent superimposition of the one type of mound on the other deserved more thorough investigation (see Duncan Wright's contribution to this volume for an account of his recent research at 'Dabangay village').

AWBAYTH/SAO

The 'old village' site of Awbayth and the nearby settlement area of Sao lie west of the Dabangay headland on the north coast where a low ridge separates two small bays from which valleys extend inland. Sao was located at the eastern bay and valley and Awbayth, which was associated with the *koedal* (crocodile) clan, was at the broader western bay and valley (Figure 1). At the northwestern end of Awbayth bay there is a small sandy beach – the only one on the north coast west of Dabangay – which we were informed was a favoured place for fishing. Our reconnaissance of the Awbayth/Sao area revealed relatively few archaeological features. At Sao we observed a small patch of relict mound-and-ditch fields in the northeastern corner of the valley just inland of coastal mangroves, where we also found a few fragments of quartz (lacking definite evidence of having been flaked). In the Awbayth valley the only archaeological features we discovered were two stone circles: a complete one 1 m in diameter next to a 75% complete one, 1.5 m in diameter, with two stones placed at its centre. On top of the high ridge that forms the western boundary of the Awbayth valley we found some other, lichen-encrusted stone arrangements: a circular one about 25 cm high, and two others which may be animal effigies but which were not clearly identifiable as such.

MAITAN/DADAKUL

This former settlement area occupied parts of the valley that extends northwest from the low col that gives access from the east-coast lowland to the northwest coast opposite Pururai Island. To reach the area we followed a path over the col and descended the west-facing slope, first through a dense grove of trees known as Dadakul and then along the gently sloping valley known as Maitan

(Figure 1). The grove consisted in part of a cluster of a large mango trees beside the rocky stream bed in the valley floor. Beneath the tree canopy we found rectangular stone alignments, linear stone piles up to 8 m long and 2 m wide, and a buttress-like stone wall along part of the stream bank. We were told that people used to live in the Maitan/ Dadakul area and that crops were formerly cultivated there. We followed the Maitan valley downslope from the edge of the mango grove at Dadakul to the back of the shore mangrove facing the islet of Pururai. It was grass-covered, with *Pandanus* trees established along the stream channel, but despite considerable search we found no traces of former field systems on the valley floor. However, we did observe extensive stone alignments, which may represent old field boundaries, on the rocky slopes of a side valley that enters the upper Maitan valley from the south.

WAGADAGAM

Wagadagam is reputed to have been one of the most important of the 'old villages'. It was mainly associated with the *koedal–tabu–wad–gapu* (crocodile–snake–fish (blenny?)–sucker fish) clan and was situated in the broad, gently sloping valley that descends to the shoreline facing the shallow bay between Pururai and Woeydhul islets (Figure 1). Although it appears to have been the main pre-missionary settlement on the northwest coast, our reconnaissance yielded little archaeological evidence of former occupation, despite the fact that most of the valley was at the time grassy 'parkland' with scattered trees rather than woodland. The only conclusive evidence of former occupation consisted of several relict mound-and-ditch fields in the northeastern quarter of the valley, downslope from the woodland edge where trees gave way to grassland. In this same location, upslope of the relict fields at the edge of the woodland, there was a large grove of tall bamboos growing around a water hole. Two of the oldest women we talked to in Bau, Mrs Yellub and Mrs Hankin, said that the bamboo at Wagadagam was the thickest and straightest on Mabuyag and was known as *merap*, in contrast to the more slender bamboo known as *upiyus* which we observed growing at Udai (see above). Specimens of both these forms of bamboo were collected and subsequently identified as *Bambusa arundinacea*, the natural distribution of which in Asia is thought not to extend to Torres Strait.[3] If so, it would be interesting to know when and how it was introduced to the islands, perhaps from New Guinea or farther west prior to the mid-nineteenth century. The close association of the bamboo grove at Wagadagam with evidence of relict fields accords with its role as a marker of former areas of cultivation elsewhere in Torres Strait, for example on the western island of Naghir (personal observation by DRH 1984).

II/SOPOLAI

This area of former settlement lies at the lower end of a small valley inland of a strip of dense mangrove that fringes the west coast opposite the small offshore islet of Mipa (Figure 1). Ii was identified by a large freshwater pool which persists through the dry season, and it is a site of mythical importance with well-remembered legendary significance. Sopolai, described by Mrs Yellub as 'where the water runs down at Ii', is said to have been cultivated in the past, although we did not find any evidence there of relict mound-and-ditch fields.

OFSHORE ISLETS

Three of the numerous islets located off the north and west coasts of Mabuyag were examined – Pulu, Woeydhul and Kuykusoegay (Red Fruit) (Figure 1).

PULU

Located about 0.75 km off the west coast of Mabuyag, this islet was described in detail by Haddon (1904: 3-5 & Plates I, II) who stated that it had been the main ceremonial ground or *kod* for the clans of Mabuyag and the island of Badu. Just inland from the beach at the western end of Pulu there was in 1984 an extensive grass-covered sand flat surrounded by huge granitic boulders, on the surfaces of some of which were painted abstract patterns and representations of animals and humans, partially obscured by mineral and organic staining. A large mound covered with dugong bones, fragments of shell and stone, and arrangements of large *bu* shells (*Syrinx aruanus*) described by Haddon were still in place (Figures 5, 6). It was in this area that Vanderwal (1973: 178-180) excavated a test pit. It was also the only location where we observed a close association between a midden mound, shell arrangements and pictographs (see McNiven *et al*., 2009).

FIG. 5. The grass-covered sand flat at the Pulu ceremonial ground (*kod*), 1984 (Photo: DRH).

FIG. 6. Arrangement of Syrinx shells (*bu*) at the Pulu *kod*, 1984 (Photo: BGK).

WOEYDHUL

Located north of Pulu about 0.5 km off the northwest coast of Mabuyag, Woeydhul was also reported as having a *kod* and an area of cultivation or 'garden' (Haddon, 1904: 3; Wilkin in Haddon, 1904: 290). At the northern end of the island, we observed a large (11 x 7 m) oval mound with dugong bones (50 m back from the beach), a fish trap, and on the tiny offshore islet of Sarabar a single and a double fish trap (Figure 7).

FIG. 7. Remains of three fish traps on the islet of Sarabar off the northwest coast of Mabuyag, 1985 (Photo: DRH).

KUYKUSOEGAY

Haddon (1904: 3) also stated that there was a *kod* on 'Kwoikusigai', although he did not know that this name referred to an islet about 1.75 km off the north coast. In its centre between rock outcrops we observed a linear midden deposit with a circular dugong-bone mound 1 m in diameter at its eastern end.

FISH TRAPS

A distinctive feature of the archaeology of Mabuyag is the abundance of stone-walled fish traps relative to the small size of the island. In 1984 we located seven traps, one of which at Kodakal was a double feature. All were built on rocky foreshores, often close to stands of mangrove, on the north and east coasts. They were constructed by forming semi-circular or rectangular alignments of large rocks leading out from the shore into shallow tidal water. The people we spoke to about the traps, with the exception of Kame Pai Pai (see below), had no folk memory of them being used.

The double trap at Kodakal faces northwest. Its landward edge was 104 m long and there was a line of rocks 33 m from its northern end that partially separated the whole into two parts. Wave erosion had damaged the outer line of rocks that enclosed the trap, particularly at the southern end where it was barely traceable as it approached the mangrove-lined shore. The traps at Sipingur consist of two structures either side of the rocky headland: a D-shape trap on the north side and a smaller rectangular one on the south side (Figure 8). The rocks of both parts have been partly dispersed by wave action.

In 1985 we completed our survey of the fish traps, principally by means of a low-level helicopter reconnaissance of the coastline. Kame Pai Pai told us that the traps were known as *graz* and that fish trapped in them as the tide fell used to be (though not in his lifetime) speared, knifed or caught by hand, but not poisoned. However, he said that a fish poison from a plant known as *itamar* was used in coastal pools among the rocks (until its use was made illegal), and that he and others used to plant it, for example at Saz 'across the creek' south of Udai and on the 'old mounds' at Maidh. We were unable to find and identify *itamar*, but it is referred to by Haddon (1912: 159) as the leguminous plant *Indigofera australis*.

FIG. 8. Remains of two fish traps either side of Sipingur headland, southeast Mabuyag, 1985 (Photo: DRH).

The helicopter reconnaissance in 1985 revealed four more fish trap locations in addition to those found in 1984. The most remarkable of them was a cluster of three traps, a single and a double one, on the islet of Sarabar off Woeydhul (Figure 7). Figure 1 shows the locations of all the traps we recorded but there may be others, particularly on the offshore islets, that we failed to find by helicopter or dinghy. The absence of traps along the west coast, which was noted in 1984, was confirmed by our 1985 survey and their distribution along the east and north coasts suggests, as might be expected, a close connection with former areas of settlement, such as Udai, Panay, Kodakal, Maitan and Wagadagam, that were near suitable rocky sites on Mabuyag and/ or on nearby islets. The large number of fish traps we identified is particularly interesting as Haddon, who called them 'fish-weirs', stated that they were more common in the eastern islands of Torres Strait – although he did mention Mabuyag when referring to their presence on 'the eastern aspect of the large fringing reefs on a few of the western islands' (1912: 158).

STONE ARRANGEMENTS

During the reconnaissance in 1984 the only stone arrangement we found (apart from the many stone-edged trackways and associated rectangles and circles which are not included in this category of archaeological feature) was the recently constructed crocodile arrangement or effigy at Dabangay already mentioned. In 1985, however, several apparently old stone arrangements were discovered, by chance, in the interior of the island. They were characteristically placed on relatively smooth rock surfaces at vantage points overlooking areas of coastal lowland. In addition to the crocodile effigy of unknown age on a ridge between Kodakal and Sao, previously referred to, several small linear and rectangular stone arrangements were found on low rock outcrops overlooking the grassland and mangroves at the seaward end of the Maitan valley. Other circular and rectangular arrangements, and three turtle effigies, were discovered on high rock outcrops overlooking the east-coast lowland; and two arrangements which may be animal effigies were found on a ridge overlooking the Awbayth valley.

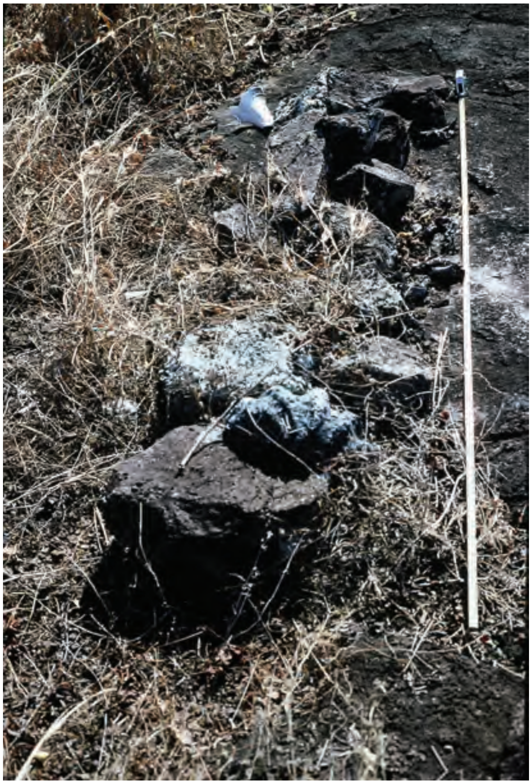

FIG. 9. Linear stone arrangement with shells in the Maitan valley, 1985 (Photo: DRH).

The most distinctive of the linear arrangements observed in the Maitan valley was an alignment of rocks, 1.75 m long, with a large clam shell (*Tridacna* sp.) at one end and several halves and fragments of *bu* (*Syrinx aruanus*) and *akul* (*Polymesoda erosa*) shells incorporated in it (Figure 9). The best preserved of the turtle effigies, which measured 2.17 m from head to tail, 1.42 m at its maximum width between the rear flippers, and 0.35 m to its maximum (dorsal) height, was on a smooth rock outcrop below the skyline overlooking the southern end of the east-coast lowland and directly above the area we labeled Gumu (Goemu) III (Figure 10). The other two turtle effigies were placed within 8 m of each other on a high

FIG. 10. Stone turtle effigy on a rock outcrop overlooking the east coast above Goemu III, 1985 (Photo: DRH).

rock outcrop farther north, overlooking the Maidh lowland. The better preserved of them measured 2.3 m long and 1.8 m wide (across both the front and the rear flippers) and the dimensions of the other (which could not be measured precisely) were very similar. On rock outcrops at the same elevation and a little farther south other stone arrangements were found: stone circles about 1 m across, a rectangle about 1.5 by 2.5 m, and several stone piles resembling small cairns (perhaps turtle lookout points). All these features, together with the turtle effigies, were heavily encrusted with lichens and did not appear to have been either made, or disturbed, recently. There was no means by which we could determine their age and none of the people we spoke to knew of them; nor are they mentioned in the Haddon *Reports*. Their former significance is uncertain, but the turtle effigies, and perhaps the crocodile effigy near Sao, probably had totemic significance because *surlal* (green sea turtle) was one of the clan totems of the people of Goemu and Maidh and *koedal* (crocodile) was the totem of the people of Awbayth.

PICTOGRAPHS

During our reconnaissance surveys of Mabuyag we did not attempt to search systematically for evidence of rock art (see Brady, this volume). In 1984 we observed the pictographs on granitic boulders at the *kod* on Pulu first described by Haddon (1904: 4-5) and mentioned above. The only other evidence of rock art we obtained was indirect. We were told of the existence of a white painting of a crescent moon on a relatively inaccessible rocky hillside overlooking the north coast between Awbayth and Pururai islet. It is a difficult location to reach on foot and we were unable to visit it, but we did confirm, looking through binoculars from Kuykusoegay islet, the presence of a crescent-moon design in white on a rock face in the expected location. This feature is not referred to in the Haddon *Reports*, but it is interesting to note that in one of the western-island folktales that he recounts (Haddon, 1904: 70-71) the cult-hero Kuyam made crescents like the moon out of turtle shell which had magical powers and were reverenced as *awgadh* (sacred/totem) by the Goemulgal.

RESULTS OF THE 1984 AND 1985 RECONNAISSANCE SURVEYS

The main impression of our reconnaissance surveys was the relative archaeological richness of Mabuyag compared both with the results of Vanderwal's archaeological survey of the island (1973) and of the fieldwork carried out by members of the TSRP on other western islands in the Strait: Muralag, Naghir, Mua, Badu, Dauan, and Saibai. The extent and diversity of the archaeological features found also contrasted with Haddon's (1890: 303) pessimistic view that it was 'improbable that much will ever be found to illustrate the former condition of the people'.

The spatial distribution of archaeological features we observed and the occurrence of certain plant communities (e.g. bamboo, mango) seemed broadly to confirm the pattern of former settlement documented by Haddon and recalled for us by local people. The overall pattern also gave some support to Haddon's statement that in pre-missionary times the Islanders lived 'scattered over the island' (1904: 172). However, we did not always find archaeological remains where the ethnographic evidence might have led us to expect them, for example at Wagadagam and Awbayth (although our prospecting did not routinely extend to clearing vegetation or excavating test pits).

The reconnaissance surveys provided substantial evidence related to past subsistence. The midden deposits, identified as surface scatters and variously shaped mounds, suggested heavy consumption of dugong and shellfish as well as some turtle. Remains of fish were not conspicuous, but this may reflect taphonomic factors related to skeletal and bone-element size and robustness, rather than the past contribution of fish to the food supply; and the presence of many fish traps suggested that fish (as well as shellfish and crustaceans) were an important source of food. Evidence of reliance on cultivated plants, particularly root and tree crops, was provided by the remains of mound-and-ditch fields associated with former settlement (Figure 1), and by rectangular and circular stone enclosures and stone piles of various shapes found on lower hill slopes and higher wooded hillsides. Although we were unable to date these features directly, our observations, together with Wilkin's statement that 'on Mabuiag ... The gardens ... were once second only to the sea as a source of subsistence' and his reference to many place names of former 'garden' sites (Wilkin in Haddon, 1904: 284, 290), as well as information we received from Islanders, suggested that agriculture had been more important in the past and was perhaps of considerable antiquity on Mabuyag.

We were also able to relate information from the ethnographic record relating to former totemic clan affiliation to three of the stone features we observed: the turtle effigy above the site of Goemu (in the territory of the *kaigas-surlal* clan), the midden mound and associated dugong-shape stone at Dabangay, where the *dhangal* clan held their ceremonies; and the crocodile effigy near the site of Awbayth, where the *koedal* clan lived. Also, material of European origin, such as glass and iron fragments found on the surface of many of the sites, suggested that people had lived at or at least visited these sites since the mid-nineteenth century.

In addition to activities that can be expected to have taken place at settlement sites and might leave archaeological traces, such as eating, sleeping and tool manufacture, we considered whether, given the kind of site-specific ethnography available for Mabuyag, it might also be possible to detect aspects of ceremonial behaviour in the archaeological record. One site, the Goemu 'old village', was therefore chosen for detailed study in the hope that it might be possible to interpret the archaeological remains discovered there in relation to past ceremonial life as well as traditional patterns of settlement and subsistence.

IDENTIFICATION OF THE *WIWAI* TURTLE SHRINE AT GOEMU

Reconnaissance of the Goemu area in 1984 revealed surface scatters of midden deposit and discrete midden-mound features (littered abundantly with dugong remains) in close proximity. Partial investigation of one of the mounds (No. 52) proved particularly interesting. It was c. 1 m in diameter with a circumference of 7.8 m and was surrounded by large stones, the largest of which when upright measured just over 1 m in length (Figures 11, 12). Due to the short time available to us that year we only 'dissected' it to get an impression of its composition. The interior

FIG. 11. Mound 52 at Goemu I with standing stone in situ at left, 1984 (Photo: DRH).

FIG. 12. Close-up of standing stone (*adil*) at Mound 52 (one of three described by Haddon, 1904: 334-336), 1984 (cf. Fig. 16) (Photo: DRH).

FIG. 13. In-situ view of the top of the coral 'head' in Mound 52, Goemu I, 1984 (Photo: BGK).

FIG. 14. Part of the interior of Mound 52 showing some of the dugong ribs that encircled the coral 'head', 1984 (Photo: BGK).

consisted primarily of dugong bones (skull and rib fragments that represented, judging by the number of mandibles, a minimum number of six dugongs) and angular chunks of stone of varying size (derived from bedrock). The shellfish remains represented seven species, and there were a few fish bones, pieces of turtle carapace, six smooth stones, (some with 'pecked' ends that may indicate their use as hammerstones) and fragments of quartz. There was also an additional feature that appeared to be unique: a large (14.6 cm x 13.2 cm) coral 'head', resembling the top of a human skull, surrounded by a circle of dugong ribs (Figures 13, 14). No human remains were found. A bulk sample of the mound deposit taken for laboratory sieving to test for the recovery of small-animal and plant remains proved to be relatively sterile. Four similar mounds were recorded close to Mound 52, although locating them proved difficult because of tall, dense stands of grass which covered the entire area. It seemed likely that clearance of the grass might reveal other features.

The following day, back at the village of Bau, another interesting discovery relating to Goemu was made. In front of the side of the church that faced the sea, we noticed a large spherical stone of red granite. Upon enquiry, we were told that it was an important ceremonial stone from the time before the missionaries which had been brought from Goemu by them and placed beside the church. We were then given permission to measure and photograph it (Figure 15).

FIG. 15. The *wiwai* stone by the entrance to St Mary's Anglican church, Bau village, 1984 (Photo: DRH).

Familiarity with the various subsistence-related ceremonies that Haddon recorded as traditionally held by the Goemulgal brought one in particular to mind: the *wiwai* stone ceremony (Haddon, 1904: 334-336). A large spherical red granitic stone, the description and measurements of which given by Haddon precisely fitted those of the stone in front of the church, had been the centre-piece of a turtle-increase ceremony around which dances were performed before turtle hunts (Figure 16). The ceremony was carried out at Goemu, under a *komak* (mango) tree, during the green sea turtle breeding season to ensure hunting success. An in-situ photograph of the stone (from Haddon, 1904: Plate XXI, Fig.2, reproduced here as Figure 17) convinced us that the one outside the church was indeed the *wiwai* stone. In addition, and to our surprise, the one mound we had studied the previous day at Goemu appeared to be located precisely where the ceremony was held. This conclusion was based on the location of the mound and on the morphology of the large stones remaining around it in 1984, i.e. the shape and position of the three upright stones (*adil*) pictured by Haddon. Thus, while the rest of the 'wiwai turtle-shrine' (Haddon, 1904: 335) remained at Goemu, the stone itself must have been transported to the church site at the village sometime after 1888 or 1898 when Haddon visited Mabuyag.

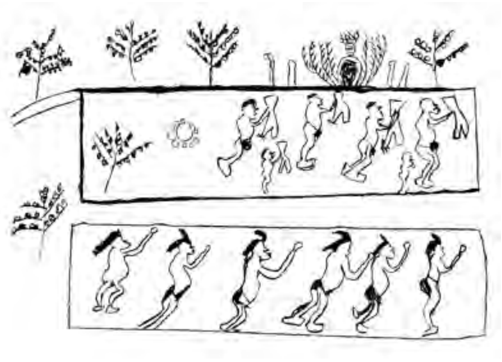

FIG. 16. Late nineteenth century drawing by a Mabuyag Islander of the *wiwai* shrine at Goemu (from Haddon, 1904: 336).

FIG. 17. The *wiwai* shrine at Goemu (from Haddon, 1904: Plate XXI, Fig. 2).

The results of our reconnaissance survey of the area and our 'dissection' of Mound 52 in 1984, combined with the existence of the ethnographic record of past subsistence practices and ceremonial life at Goemu, convinced us that we should give priority in our 1985 field season to a detailed investigation of the whole site.

1985 SURFACE SURVEY OF THE GOEMU VILLAGE SITE[4]

Goemu 'old village' occupied part of the southern half of Mabuyag's east-coast lowland south of the smaller sites of Maidh and Mui (Figure 2). Most of the site occupied a coastal sand-flat that was divided by seasonally flooded creeks into three sectors of unequal size which we labeled, from south to north, Gumu [Goemu] I, II and III (Figures 18, 19). The only feasible method of clearing the site prior to surveying it was to burn the dry grass that covered most of the area (Figure 20). We therefore sought the permission of the Chairman of the Community Council to burn the area south of Kuburau Kusa (creek). This permission was readily granted – the Islanders themselves commonly burn grassy areas in the dry season, especially when hunting feral pigs – and two days were then spent burning off the surface cover of vegetation. Eventually most of the area was cleared of its grass cover, revealing dense and extensive midden deposits that included a surprisingly large number of mounds.

The midden deposits were so widespread and varied in surface form and composition that we decided to map the entire area in detail. The only practicable way of carrying this out was by tape-and-compass survey, supplemented by sketch maps of the more complex parts. This task took four team members ten days to complete, and in the course of the survey other archaeological features were discovered in addition to the midden deposits, notably a small area of relict mound-and-ditch fields comparable in form to those found at Mui, Maidh, Sao and Wagadagam. The 1985 plan of the Goemu area that resulted from the tape and compass survey is reproduced here, with numbers added to mounds and test pits (Figure 21).

FIG. 18. Aerial view northeast over sectors I, II and III of Goemu, 1985 (cf. Fig. 21) (Photo: DRH).

FIG. 19. Aerial view west over Goemu III with its northern boundary marked by the line of Kuburau Kusa (creek) and rocky hillslope beyond, 1985 (cf. Fig. 21) (Photo: DRH).

FIG. 20. View northeast across Goemu I, II and III prior to burning the grass cover; Bau village in distance upper right, 1985 (Photo: DRH).

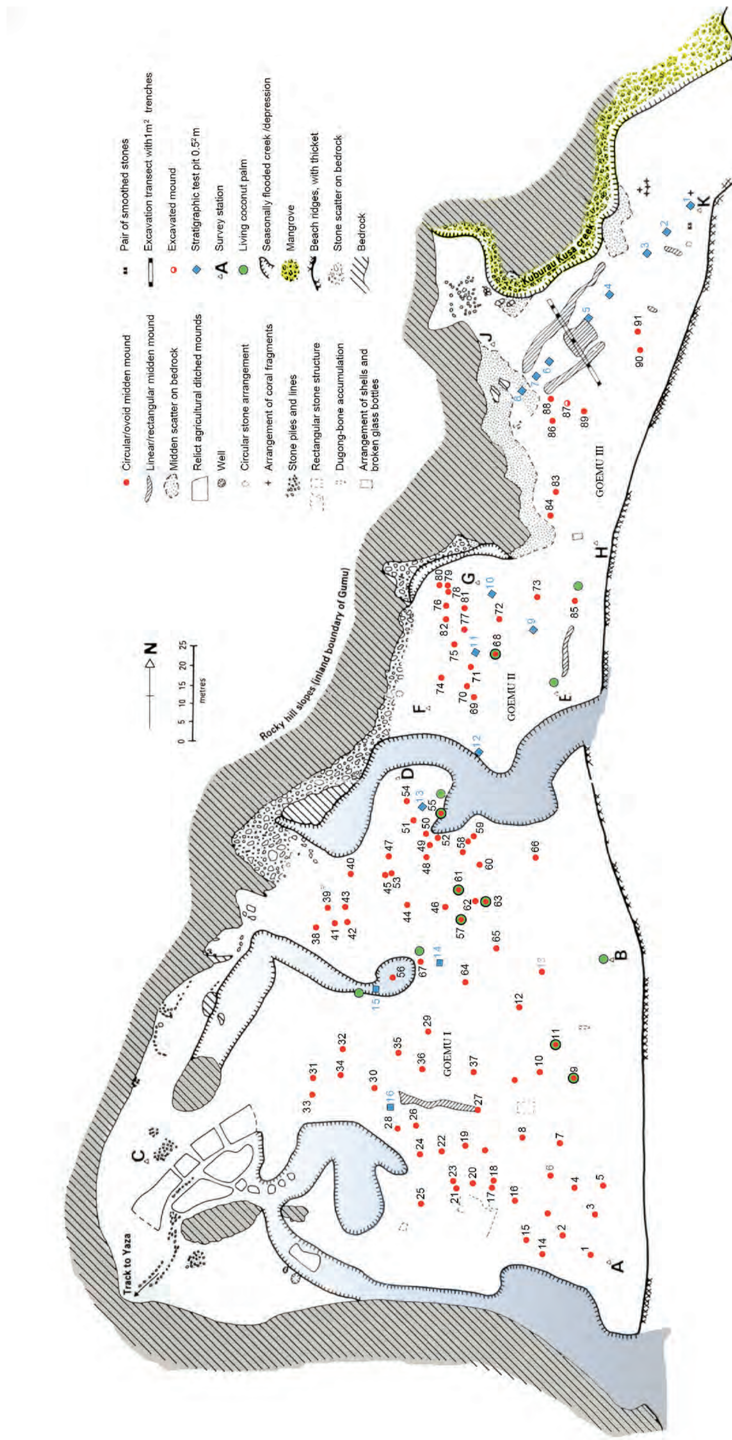

FIG. 21. Archaeological survey of the Goemu area (drawn from survey data by D.R. Harris 1985 with addition of mound and test pit numbers and other minor modifications 2011; our records lack numbers for the three unnumbered mounds shown in Goemu I, and the number 58 identifies two adjacent mounds).

SURFACE FEATURES

Our 1985 survey revealed that archaeological features were present on the surface of an area of approximately 20,000 m^2 (2 ha) which extended 325 m north-south parallel to the coast and between 140 m and 20 m east-west, the width varying according to the distance from the beach ridge to the base of the rocky hill slopes. The most abundant and widespread archaeological features found on the surface were midden deposits consisting of (mainly dugong) bone, shell and angular chunks of stone. They existed in three forms: (1) circular or ovoid mounds averaging 1.0-1.5 m in diameter and 30 cm in height, sometimes bordered by large stones or *bu* shells; (2) larger linear and rectangular accumulations, one of which exceeded 30 m in length; and (3) discontinuous surface scatters. The survey revealed a total of 95 mounds, the great majority of which were located in the largest sector of the site (Goemu I), and seven linear / rectangular midden accumulations, one each in Goemu I and II and five in Goemu III. In Goemu III there was a unique combination of midden features consisting of a midden 'platform', 8 m long by 5-7 m wide, bordered by two 'ridges' respectively 35 m and 20 m long (with average heights of 18 cm and 28 cm) aligned in a northwest-southeast direction on either side of the platform's inland and seaward edges (Figure 21). There were also discrete mounds and surface scatters of midden close to this feature. The mounds varied in size and the materials on them consisted of bones, shells and stones, including some worked artefacts. We recorded the dimensions and the materials on the surface of each mound (see Appendix 1).

In addition to the midden deposits, four other types of archaeological feature were found at Goemu: (1) the relict mound-and-ditch fields already referred to, 12 of which were located and mapped; (2) a stone-edged path or trackway leading from the fields over the rocky boundary ridge at the southwest corner of Goemu I; (3) two wells at the southern boundary of Goemu I near the relict fields; and (4) other stone features consisting of four circular stone arrangements, several discrete piles of stones, and two rectangular stone structures resembling house foundations (Figure 21). The largest of the rectangular stone structures, close to the southern boundary of Goemu I, was associated with several scattered fragments of rusted metal (evidently the remains of corrugated iron roofing and of a large drum used as a water container). Enquiry in the village of Bau established that this was the site of a house built in 1947 and occupied for five years by the Pai Pai family: one of the families traditionally associated with the Goemu area. The second, smaller stone rectangle, about 25 m northeast of the first, also appeared to be a recent house foundation (but has since been identified as a grave – see McNiven *et al*., this volume). The stone-edged path, about 1 m in width, led upslope out of the southwest corner of Goemu I, crossed a rocky ridge just inland of the small alluvial lowland of Udai and continued as far as a ravine where freshwater could be obtained from rock pools throughout the dry season. This area, like Goemu itself, was associated with the cult-hero Kuyam. The water source was referred to as Kuyam's pool, Yaza, or Kuikuyaza and was created according to Islander mythology by Kuyam's spear, which, to quench his thirst, he thrust into the rock from which water gushed forth and has 'never ceased to flow', forming pools below (Haddon, 1904: 82). We were told that when people lived at Goemu, and at Udai, water was carried in containers from the main pool by way of the stone-edged path and also along a similar path which crossed Udai. This water supply may have been used to water crops, as well as for domestic purposes, because the path to Goemu I led directly to the small area of mound-and-ditch fields (Figure 21). Kame Pai Pai recalled that he and his father used to plant sugar cane, taro, banana and manioc on these mounds.

Our survey of Goemu revealed several unique archaeological finds as well as the main types of feature already mentioned for other parts of Mabuyag (Figure 21). Individual finds included, at Goemu I, a surface accumulation of dugong bones that was not part of a mound (Figure 22); a mound surrounded by 28 *bu* shells, a second surrounded by nine, and a third by five (upon two of which we also found ground *Conus* shell ornaments known as *dibi-dibi* (Figures 23, 24c, 24d); and, at Goemu III, a rectangular arrangement of *bu* and *alup* shells (*Syrinx aruanus* and *Melo* sp.) and of broken glass bottles (which we thought might mark a recent grave – see McNiven *et al*., this volume); two arrangements of coral fragments; and a pair of smoothly rounded stones lying on the sand surface, one of which was pecked (Figure 25).

FIG. 22. Surface accumulation of dugong bones in the southern part of Goemu I, 1985 (cf. Fig. 21) (Photo: DRH).

FIG. 23. Surface accumulation of *bu* shells (*Syrinx aruanus*) and stones, Goemu I, 1985 (Photo: DRH).

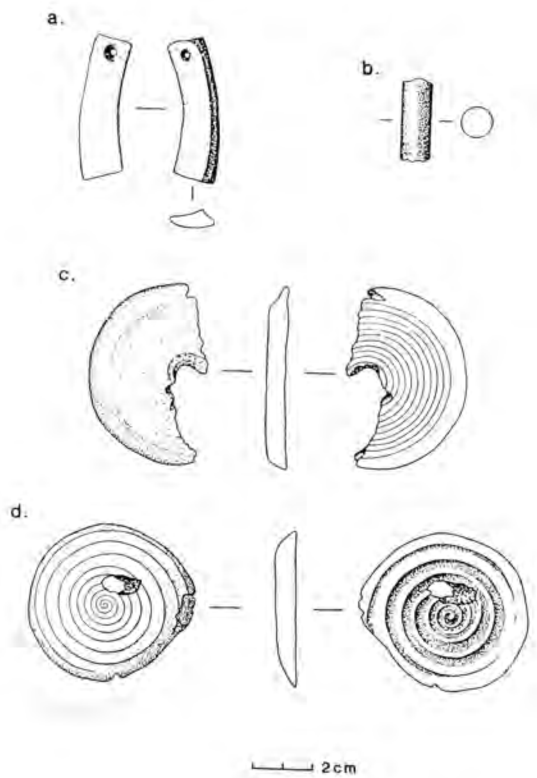

FIG. 24. Ground-shell artefacts: a) shaped and perforated fragment of *Hippopus* or *Tridacna* sp., b) ground cylindrical fragment of unidentified shell, c) half of a ground and perforated apex of *Conus* shell (*dibi-dibi*), d) ground and perforated apex of *Conus* shell (*dibi-dibi*).

FIG. 25. Pair of smoothly rounded stones, Goemu III, 1985 (cf. Fig. 21) (Photo: BGK).

MIDDEN DEPOSITS

After completion of the tape-and-compass survey of Goemu, data sheets were devised to record the presence of any artefacts and animal remains on the surface of each midden feature. When bone was present, the type of animal and the element was recorded if identifiable; remains of shellfish were also recorded and unknown taxa collected for identification. All artefacts (primarily stone and shell) were collected, as well as examples of different types of stone. Each feature was described briefly, noting the occurrence of the different kinds of remains, and photographed. The areas surrounding the midden features were also examined and significant finds mapped and collected. Tables 1 and 2 and Figures 26–29 summarise the occurrence of the surface materials observed on the 95 mounds recorded (see Appendix 2).

TABLE 1. Marine mollusc taxa identified from the surface survey of Goemu I, II, III.

Family	Genus	Species
1. SANDY HABITATS (foreshore, bars and lagoons)		
Bivalves		
Arcidae	*Anadarac*	*antiquata*[e]
Cardiidae	*Acrosterigma*	*elongatum*[e]
	A.	*rugosa*
Lucinidae	*Codakia*	*tigerina*
Fimbriidae	*Fimbria*	*fimbriata*
Mesodesmatidae	*Paphies*	*striata*[e]
Mactridae	*Mactra*	*alta*[e]
Tellinidae	*Tellina*	*scobinata*[e]
	T.	*palatum*[e]
	T.	*remies*
	T.	*crucigera*[e]
Psamnobiidae	*Asaphis*	*violascens*[e]
Veneridae	*Gafrarium*	*tumidum*[e]
Gastropods		
Cerithiidae	*Rhinoclavis*	*vertagus*
	Cerithium	*nodulosum*
	C.	*columna*
	Pseudovertagus	*aluco*
Naticidae	*Polinices*	*mammilla*
	P.	*flemingiana*[e]
Strombidae	*Strombus*	*luhuanus*

TABLE 1. cont.d.

Family	Genus	Species
2. ROCKY HABITATS (foreshore and headlands)		
Bivalves		
Chamidae	*Chama*	*pulchella*
	C.	*lostoma*[e]
Ostreidae	*Saccostrea*	*echinata*[e]
Spondylidae	*Spondylus*	*nicobaricus*[e]
	S.	*squamosus*
Tellinidae	*Asaphis*	*violascens*[e]
Gastropods		
Planaxidae	*Planaxis*	*sulcatus*[e]
Neritidae	*Nerita*	*albicilla*
	N.	*polita*
	N.	*plicata*
	N.	*undata*[e]
Trochidae	*Monodonta*	*labio*[e]
3. CORAL-REEF HABITATS (outer edges, flats and rubble)		
Bivalves		
Arcidae	*Anadara*[c]	*antiquata*[e]
Pteriidae[d]	*Pinctada*	*margaritifera*
	P.[c]	*maxima*[e]
Tridacnidae[d]	*Hippopus*	*hippopus*
	Tridacna	*croceae*
	T.[c]	*maxima*
Gastropods		
Fasciolariidae[d]	*Pleuroploca*	*filamentosa*[e]
Cypraeidae	*Cypraea*	*monetae*
	C.	*annulus*
Muricidae	*Chicoreus*	*brunneus*
	C.	*capucinus*
	Vitularia	*miliaris*
Strombidae	*Lambis*	*lambis*

TABLE 1. cont.d.

Family	Genus	Species
Trochidae	*Trochus*	*niloticus*[e]
	T.	*pyramis*
	Angaria	*delphinus*[e]
Turbinidae	*Turbo*	*squamosus*[e]
	T.	*brunneus*
	T.	*cinereus*
Volutidae	*Melo*[c]	*amphora*[e]
4. MANGROVE HABITATS (outer zone, inner zone and landward edge)		
Bivalves		
Arcidae	*Anadara*[c]	*granosa*
Corbiculidae	*Polymesoda*[c]	*erosa*[e]
Gastropods		
Turbinellidae[d]	*Syrinx*[c]	*aruanus*
Potamididae	*Telescopium*	*telescopium*
	Terebralia	*sulcata*[e]
Neritidae	*Nerita*	*planospira*
Volutidae[d]	*Melo*[c]	*amphora*
	M.	*umbilicatus*
5. DEEP-WATER HABITATS (>8m)		
Cephalopods		
Nautilidae	*Nautilus*[c]	*pompilius*[e]

([e] = taxa also found in excavations, [d] = also found at marine depths >8m, [c] = possibly ceremonially significant).

TABLE 2. Categories and types of artefacts found on midden features and adjacent areas, surface survey, Goemu I, II, III (* artefacts drawn, see Figs 30–35).

Description	No.	Average dimensions		Probable function (based on Haddon)
		Length (cm)	Width (cm)	
SHELL				
Shaped fragments of *Hippopus hippopus**	2	8	3.5	adze
Ground-edge fragment of *Hippopus* or *Tridacna* sp.	1	5	4.5	?
Shaped and perforated fragment of *Hippopus* or *Tridacna* sp.*	1	5	1.3	Ornament
Perforated fragments of *Pinctada* sp.*	3	3	3	Ornament
Ground-hinge fragment of *Pinctada* sp.*	1	6	3.5	Scraper to soften leaf strips for basketry
Crescent-shaped hinge fragments of *Pinctada* sp.*	6	7	4	Unused scraper?
Ground and perforated apexes of *Conus* sp.*	2	5.5	5.5	Ornament, neck (*dibi dibi*)
Perforated valve of *Anadara antiquata**	1	6	4	Ornament, belt, or instrument, rattle
Ground-cylindrical fragment of unidentified shell*	1	2.7	1	Ornament, nose pin?
STONE				
Rhyolite ground cobble fragment with bifacially battered edge*	1	13	9	Axe
Rhyolite (thick) flake with bifacial retouch	1	10	9	?
Rhyolite ground spatulate*	1	7.5	2.3	File?
Basalt (thick) flake with bifacial retouch*	1	10	9	?
Basalt flake with possible edge damage	1	4.5	4	?
Basalt hinge flake with possible edge damage	1	10	6.5	?
Granite elongate riverine cobble with battered edge	1	12	6.5	Axe
Granite riverine cobble (half) with pecked edge	1	6.5	4.7	Pounder
Obsidian fragment	1	2.2	1.3	?
Unidentified ground fragment with battered edge*	1	4.5	3	Adze
Vein quartz multi-platform core	1	6.5	6	Stone-tool manufacture
Vein quartz large-core fragment	1	7	7	Stone-tool manufacture
Vein quartz large-core flake*	1	4.5	4.5	?
Vein quartz fragments	?	1.2	0.05	Cutting tools or debitage

TABLE 2. cont.d.

Description	No.	Average dimensions		Probable function (based on Haddon)
		Length (cm)	Width (cm)	
FIRED CLAY				
Clay tobacco pipe stem from Glasgow, Scotland c. 1863-1910*	1	7.6	1	Smoking
GLASS				
Fragments on surface of 28 % of the mounds	-	-	-	?
METAL				
Fragments on surface of 5% of the mounds	-	-	-	?

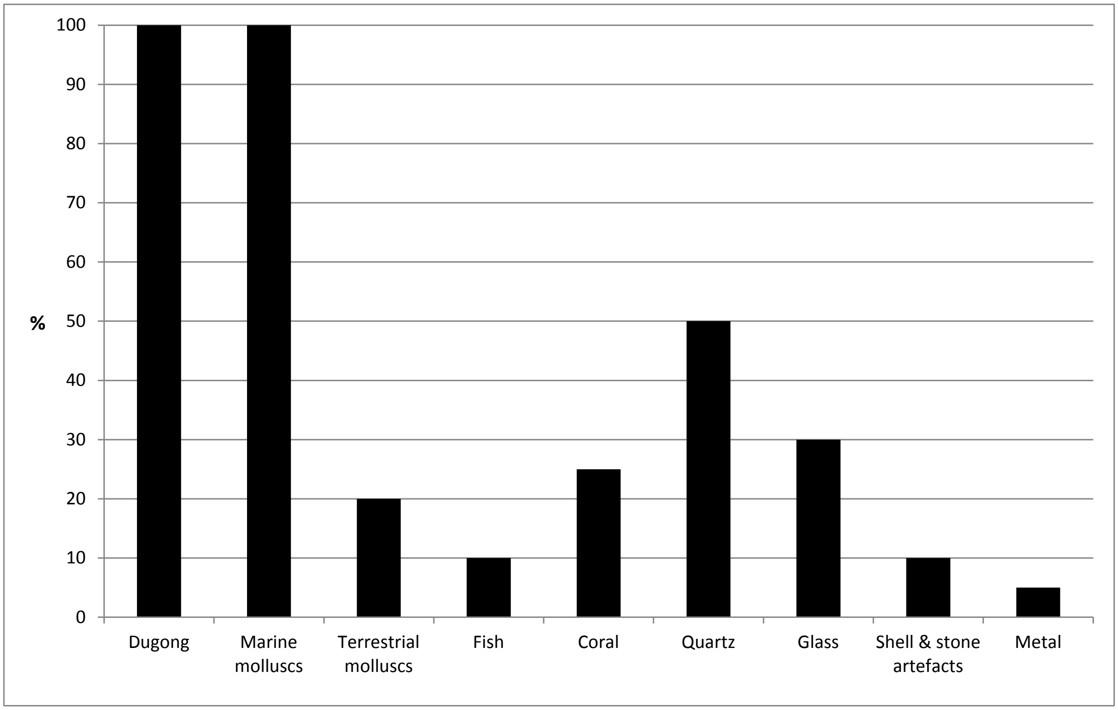

FIG. 26. Percentage occurrence (presence/absence) of material remains on surface of the 95 midden mounds, Goemu I, II, III.

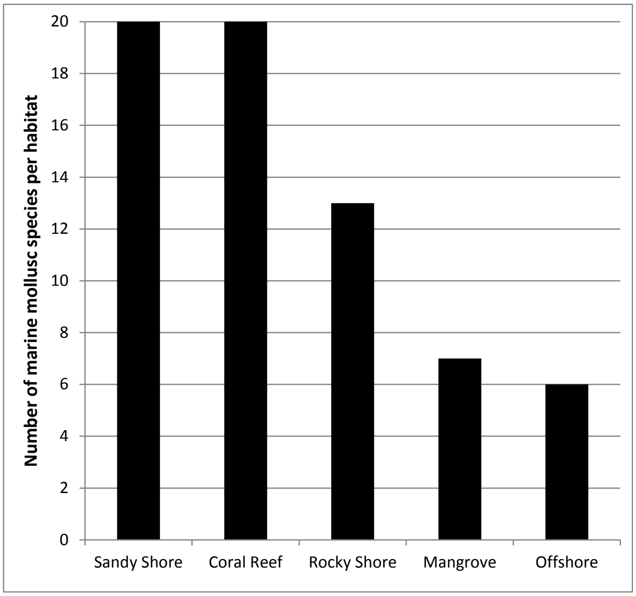

FIG. 27. Number of species of marine mollusc on surface of the midden mounds by habitat, Goemu I, II, III.

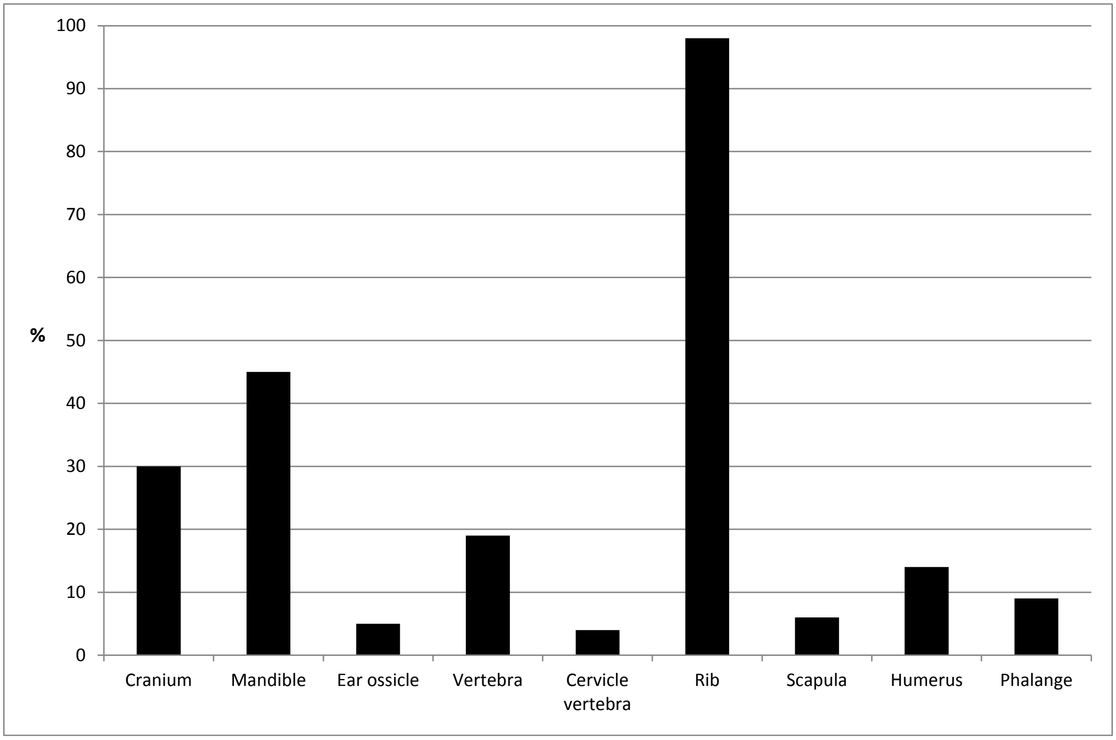

FIG. 28. Percentage occurrence (presence/absence) of dugong elements on surface of the midden mounds, Goemu I, II, III.

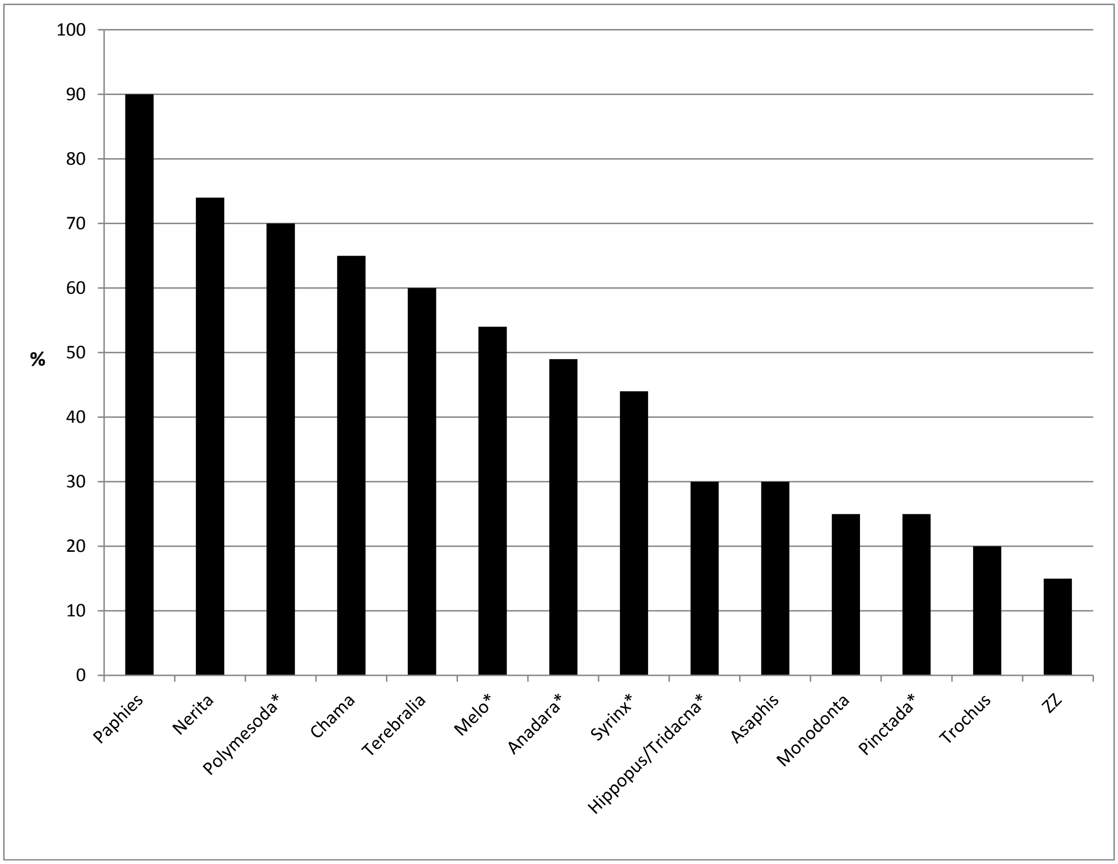

FIG. 29. Percentage occurrence (presence/absence) of marine mollusc taxa on surface of the midden mounds, Goemu I, II, III; * = genera of known ceremonial significance, ZZ = 46 additional species on < 15% of the mounds, one ceremonial: *Nautilus* 6%.

The surface of the midden scatters and particularly of the raised (mound) features appeared to consist predominantly of two types of marine-animal remains (dugong bone and marine mollusc shell) and angular fragments of the island's bedrock. Fragmented dugong bones and shellfish were recorded from the surface of every feature studied (100% occurrence). Fragments of skull (i.e. cranium, ear ossicle, mandible) and rib were the most frequent dugong bone elements found (present on 75% and 98% of the mounds respectively), with four other elements represented to varying extents (vertebrae 23%, humeri 14%, phalanges 9%, scapulae 6%) (Figure 28). The 59 shellfish species identified occur in four near-shore habitats, all close to the site: sandy, coral reef, rocky, and mangrove (listed in order of species abundance), and one off-shore habitat: deep water. Thirty-three of the species were gastropods, 25 were bivalves, and one was a cephalopod (Table 1). However, only seven species were found on 50% or more of the mounds. Fish bones were recorded infrequently (12%), and fragments of turtle bone were found (superficially) only on the unique 'platform and ridge' feature at Goemu III, although during the 1984 field season we found five pieces of carapace in Mound 52 at Goemu I.

Fragments of vein quartz were found on 49% of the mounds, along with seven pieces of stone which (unlike the quartz fragments) showed clear signs of human modification. In addition, a fragment of a small ground-stone adze and a few small shell adzes were found, as well as ground fragments of pearlshell (*Pinctada* sp.) and of a large clam shell (*Tridacna* or *Hippopus* sp.). Ground and perforated apexes of cone shells (*Conus* sp., the *dibi-dibi*), perforated *Anadara antiquata* bivalves, and perforated fragments of pearlshell and giant clam were found, as well as crescent-shape hinge fragments of pearlshell (Table 2 and Figures 24, 30–35).

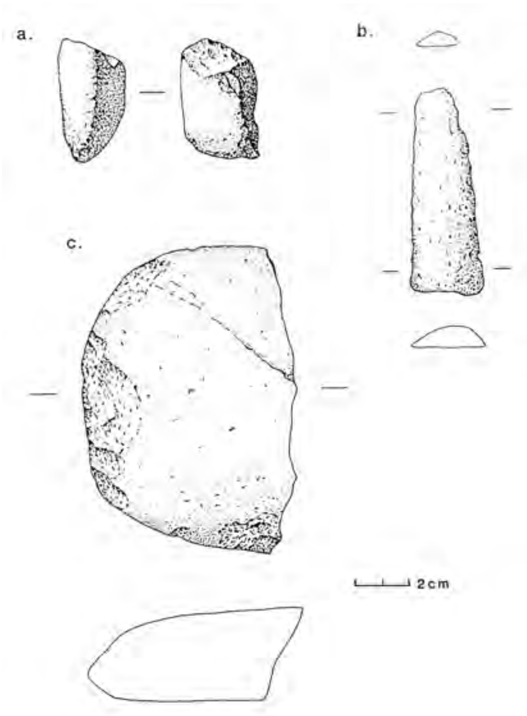

FIG. 30. Ground-stone artefacts: a) unidentified ground-adze fragment with battered edge, b) rhyolite ground spatulate file(?), c) rhyolite ground cobble axe(?) fragment with bifacially battered edge (rhyolite identifications by Jane Roberts, Institute of Archaeology, London, and artefact definitions based on discussions with Rhys Jones at the Institute, 1986).

Three pieces of basalt and one of obsidian were the only inorganic materials we found that do not occur naturally on the island (other than items of European origin such as fragments of glass, iron, and part of a clay pipe). The clay pipe was manufactured in Glasgow (Scotland) c. 1863-1910 (see Dane & Morrison, 1979: 50).

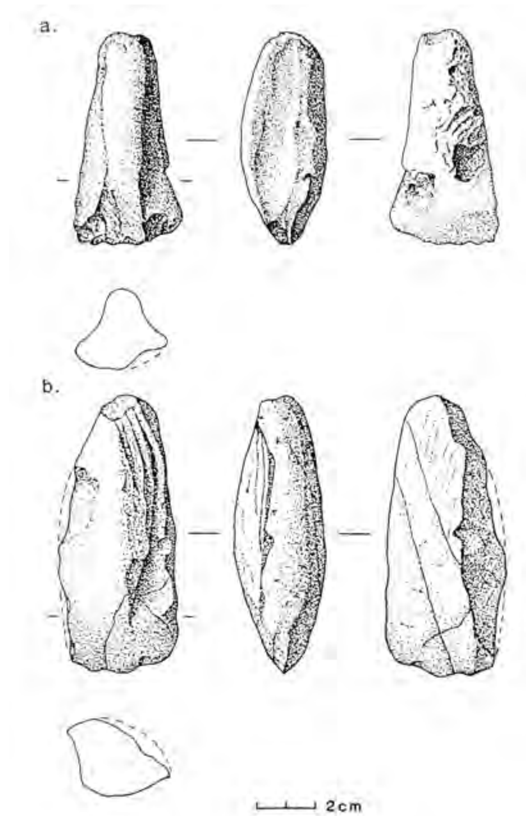

FIG. 31. Shell adzes of *Hippopus hippopus* a) and b).

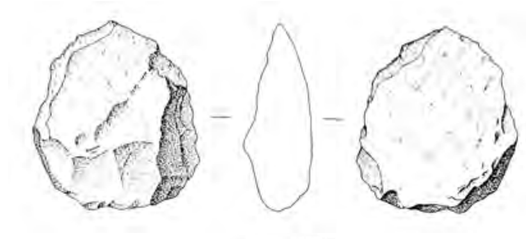

FIG. 32. Basalt cobble flake with bifacially battered edge.

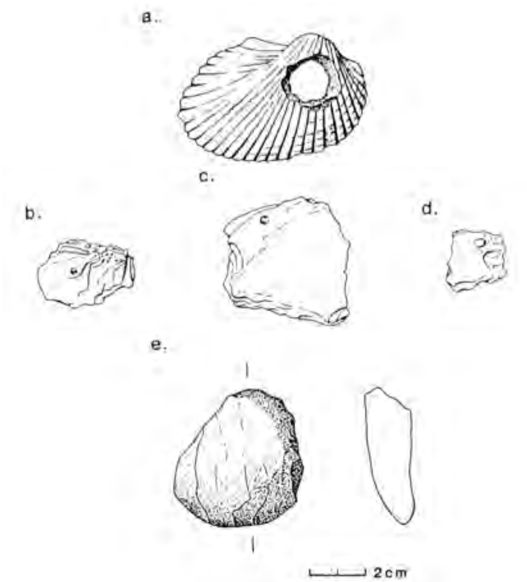

FIG. 33. Shell artefacts: a) perforated valve of *Anadara antiquata*, b) c) d) perforated fragments of *Pinctada* sp., e) edge-ground fragment of *Hippopus* or *Tridacna* sp.

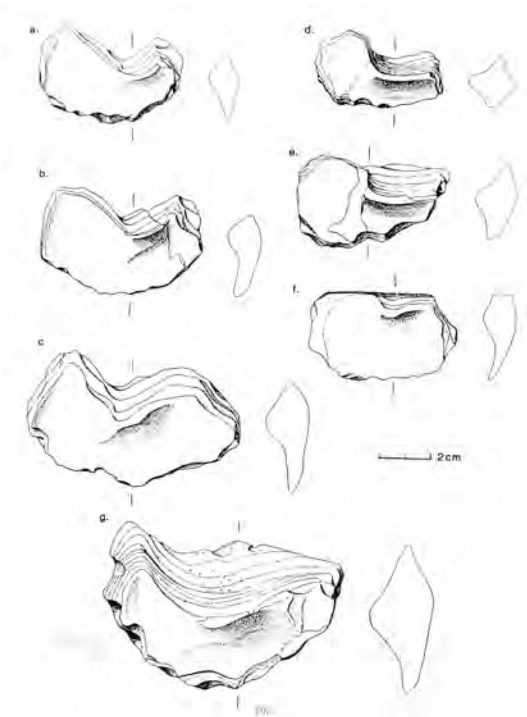

FIG. 34. Shell artefacts: a) b) c) d) e) g) worked fragments of *Pinctada* sp., f) worked and ground-edge fragment of *Pinctada* sp.

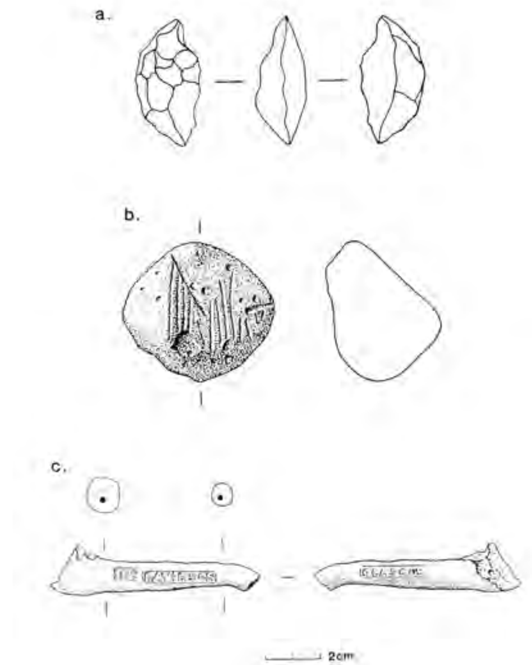

FIG. 35. Worked stone and fired clay artefacts: a) vein-quartz large-core flake, b) ground pumice scraper(?), c) clay-pipe stem from Glasgow, Scotland, c. 1863-1910 (Dane & Morrison, 1979: 50).

The results of our mapping and surface survey of Goemu clearly indicated that the whole of the c. 2 ha area had been used extensively in the past, but identifying exactly how it had been used was not easy. There were no apparent areas of former habitation, except perhaps on the level sand areas between the mounds, the largest of which were along, and just inland of, the beach front (Figure 21): a location that would be consistent with mid-nineteenth century descriptions and drawings of habitations in the western islands of Torres Strait (see, e.g., Haddon, 1912: Plate 24, Fig. 2). We could not estimate from the surface evidence the time period over which Goemu may have been inhabited, although shell adzes and ground cone-shell ornaments, for example, hint at pre-European patterns of subsistence and exchange, and the occurrence of European materials in many parts of the site certainly indicate post-European contact Islander activity.

Despite the fact that the animal remains noted were only quantified in relative terms (based upon visual surface inspection) they provide some indication of past Islander diet. Dugong bones (with most parts of the skeleton represented) were the most abundant, together with a wide range of shellfish. The highest species diversity related to three coastal habitats (coral reef, sandy and rocky foreshore), all in close proximity to Goemu (Figure 27). The diversity of mangrove species identified was lower than that from the above three habitats, but the main edible species were present and the number of shellfish identified may reflect mangrove ecology (i.e. fewer mangrove species) more than cultural preferences. Three shellfish genera could have come from marine depths greater than 8 m (*Melo*, *Syrinx*, *Nautilus*) and *Nautilus* certainly did (although their shells are frequently found on the shore, having been washed-up during high tides).

Some shellfish species, described in the mid-nineteenth ethnography as having been associated with ceremonies, were found either fragmented or whole on 28 of the midden features. The occurrence of each taxon varied: *Syrinx aruanus* 42%, *Hippopus* and *Tridacna* spp. 31%, *Pinctada* sp. 25%, *Nautilus* 6%. As noted in the previous section, three of the mounds at Goemu I were unique in being surrounded by whole *bu* shells (28, 9 and 5 shells respectively), with ground cone-shell ornaments (*dibi-dibi*) on two of them. Two *bu* shells were also found associated with a stone pile we discovered after clearing part of a grassy depression in Goemu I (Mound 56, Figure 21), and there was a small (c. 10 x 6 cm) red and yellow coloured stone standing upright on the surface in the centre of the pile. This patch of grass (which stays green even through the dry season) was regarded by the Islanders as the 'landing place' of the cult-hero Kuyam (Figures 36, 37).

An unexpected result of the survey was the abundance of dugong remains on the surface of the 95 mounds to the virtual exclusion of turtle remains. However, as has already been mentioned, turtle bone was present on the 'platform and ridge' feature at Goemu III, and five carapace fragments were found in Mound 52. The low percentage (12%) of fish remains present on the mounds may well reflect their relative invisibility and/or taphonomic biases against their preservation.

FIG. 36. The landing place of the cult-hero Kuyam with grass cut over the central mound, Goemu I, 1985 (Photo: DRH).

FIG. 37. Close-up of red and yellow coloured stone in centre of the mound in 'Kuyam's landing place', Goemu I, 1985 (Photo: DRH).

Former agricultural practices at Goemu were indicated by the relict mound-and-ditch field system at Goemu I and possibly also by the finding of three shell adzes. We could not directly date either type of evidence, but Haddon reported that shell axes (although not shell hoes) were used and that gardens were dug and planted with pointed wooden sticks (1890: 354, 1912: 125-126, 145).

We found very little evidence of past stone tool technology (Table 2 and Figures 30, 32). The diversity of types of stone found that may have been worked, and the rarity of such 'artefacts', suggests opportunistic selection for use. However, stone was present on the surface of all midden features recorded, and consisted of both igneous and metamorphic raw material types. The igneous rocks are divisible into extrusive acidic, intrusive acidic, extrusive basic and mixed sedimentary-pyroclastic types. The extrusive basics (basalt and obsidian) are the only type which appears not to occur on Mabuyag, and may have come from the geologically younger eastern islands of Torres Strait (Willmott *et al*., 1973; see also von Gnielinski, this volume). All the above types were found either on midden surfaces or in the intervening areas and came to a total of 17 igneous and two metamorphic specimens. Seven stone artefacts were clearly tools or the products of tool making (Table 2 and Figures 30, 32). The fragments of vein quartz found on 49% of the mounds may represent a quartz technology, comparable to others studied elsewhere in the world (e.g. Flenniken, 1981; Sussman, 1985; see also McNiven, 2006), or they may possibly be by-products of local erosion.

The mixed sedimentary-pyroclastic type was the most abundant rock found. It occurs widely as bedrock on Mabuyag, and angular fragments of various sizes are ubiquitous in the landscape. They were a dominant feature of the mounds at Goemu. Such rocks were used for various purposes: bordering village paths, encircling gardens or individual plants, and as a major constituent of the earth ovens (*kap mauri* or *amai*) built for cooking foods, in particular turtle and damper (bread). Additional uses of this type of stone were recorded in other archaeological contexts, for example in the stone-edged trackways, rectangles and circles, rectangular and linear alignments, stone arrangements including effigies, and fish traps already described.

As already mentioned, three small shell adzes were found and possibly one other type of shell used as an implement (a pearlshell scraper) (Figures 31, 34). Several fragments of different types of shell ornament were also found (Figures 24, 33) for which the mid-nineteenth century ethnography provides possible interpretations (Table 2). The two ground cone-shell discs (*dibi-dibi*) and some of the fragments of pearlshell (*Pinctada* sp.) may symbolize power or wealth and be products of pan-Strait exchange, as well as the flakes of basalt and the piece of obsidian.

In light of the information in the mid-nineteenth century accounts about artefacts constructed of bone, shell and stone that were associated with rituals related to hunting, warfare, birth and mortuary practices, and the existence of 'dugong-bone' mounds in five of the traditional Goemulgaw *kod* locations (on the offshore islets of Kuykusoegay, Woeydhul and Pulu and the clan localities of Dabangay and Goemu) it seemed plausible that (some of) the midden features at Goemu, as well as at Dabungay, Pulu, and perhaps Kuykusoegay and Woeydhul, represented loci of past ceremonial as well as mundane activities.

It was with this possibility of ceremonial midden mounding activities that we decided to undertake test excavations at Goemu. The surface composition of the midden features did suggest that they mainly represented refuse from past food-related activities, but the quantity, distribution, and diversity of the deposits seemed unusual and enigmatic. Also, the only subsurface investigation we had carried out (in 1984), when we 'dissected' Mound 52, had revealed a central arrangement of dugong ribs encircling a spherical piece of coral which resembled a human cranium (Figure 13). This suggested that at least some of the midden features might testify to more than the processing, consumption and disposal of food.

Our excavation strategy was designed to sample some of the morphologically distinct midden features to see if we could reach a better understanding of their past significance in relation to settlement, subsistence, and ceremonial activities. We aimed to answer four main questions: 1) how representative were the surface remains of the underlying deposits?; 2) would excavation and quantification of the remains clarify the extent, morphology and surface composition of the deposits?; 3) would investigation of the vertical depth and horizontal extent of the level surface scatters of midden deposit indicate, more clearly, the nature and extent of former settlement?; and 4) could a chronology of occupation be established based upon the radiocarbon dating of remains from within the deposits?

EXCAVATIONS AT GOEMU: AIMS AND METHODS [5]

Our survey of Goemu demonstrated the widespread occurrence of two types of midden deposit – mounds and discontinuous surface scatters – and it also revealed the existence of the unique 'platform-and-ridge' feature at Goemu III. Our primary objective was to understand the past functions and age of the midden deposits by analysing and dating excavated samples and investigating further the stratigraphy of the whole site by digging a series of test pits across it. We decided to focus our main efforts in the rest of the 1985 field season on Goemu III where our excavations were designed to explore the relationship between the surface morphology and composition of the deposits and their underlying composition by sampling all the features of the platform-ridge complex, associated surface scatters and a nearby mound (no. 87). The (0.50 m^2) test pits were dug along transects across Goemu I, II and III (numbered from north to south, Figure 21) to provide stratigraphic information on the site as a whole and further explore the relationship between surface midden remains and what lay buried beneath them. The locations of the 16 pits were therefore chosen to include areas both with and without remains visible on the surface. Prior to digging each test pit a photographic record and a written description of the surface materials were made, as was a photographic and written record of the stratigraphy and content (see Appendix 3). Samples of the layers exposed in each pit were also taken.

THE PLATFORM–RIDGE TRANSECT

The platform-ridge complex and nearby surface scatters were sample-excavated using five 1 x 1 m squares (trenches) at intervals along a 25 x 1 m transect across both types of deposit (Figure 38). Three of the squares were located on the platform-ridge complex itself (GH, M, and T), in order to sample areas on the platform and the ridges on either side, and the other two were located on surface scatters, one inland (E) and the other seaward (Y) of the complex (Figures 21, 39–41). Two 50 cm^2 sections (strictly 'quadrangles' but here referred to as quadrants) were excavated in each of the squares (Figure 42). Prior to excavation, photographs were taken, descriptions made, and the surface materials collected. Excavation was carried out with fine picks and brushes in 5 cm spits unless a change in the deposit was detected. Because of the density of bone, shell and stone, and the compactness of the deposits, it was not possible to use trowels without damaging the remains, and excavation was therefore slow.

FIG. 38. View northwest along the platform-ridge transect, Goemu III, 1985 (Photo: DRH).

FIG. 39. Surface of inland Square E, platform-ridge transect, Goemu III, 1985 (Photo: DRH).

FIG. 40. Surface of Square GH, platform-ridge transect excavation, Goemu III, 1985 (Photo: DRH).

FIG. 41. Surface of seaward Square Y, platform-ridge transect excavation, Goemu III, 1985 (Photo: DRH).

FIG. 42. Two quadrants in Square E excavated to sterile beach sand at 25 cm depth, platform-ridge transect excavation Goemu III, 1985 (Photo: DRH).

Photographs and detailed notes were taken throughout excavation. To ensure the complete recovery of remains, fine-sieving was carried out on site. All excavated material was first passed through 4 mm-mesh sieves and then 2 mm-mesh sieves. Samples of the 2 mm residue from each spit were then examined for smaller remains. The total volume of material from each spit was weighed to determine the bone/shell/stone ratios throughout the deposit. The different types of remains were sorted and bagged separately in the field. The rocks uncovered (mainly angular fragments of bedrock) were, due to their quantity and weight, counted, measured, weighed and left on the surface, except for a small sample kept for identification. Excavation proceeded until sterile deposits were reached, on average at a depth of between 35 and 40 cm. Stratigraphic descriptions were made of each excavation, and samples were taken of the levels at which colour changes occurred. These were determined by eye and by reference to a Munsell soil-colour chart. A photographic record of each excavation was made, but due to time constraints it was not possible to document each spit excavated with detailed drawings. At the conclusion of the excavations, a large proportion of the excavated material and all the soil samples were shipped to London where they were further sorted, identified and analysed.

MOUND 87

The mound was located approximately 8.0 m southwest of the eastern end of the excavation transect and 3.0 m southeast of midden-ridge II (Figure 21). From its surface composition it appeared to be a pile (c. 23.5 cm high and 3.0 m in circumference) of chunks of bedrock, remains of a variety of shellfish species, and fragments of dugong bone. It was chosen for excavation because it was relatively small and close to the platform-ridge complex. Before excavation began, a detailed surface description was made, photographs taken, and the surface materials collected. The mound was then divided into four wedge-shape quarter sections (strictly ‘quadrants’), and the two inland-facing quadrants (NW and SW) were excavated (Figure 43). We had insufficient time to excavate the entire mound. Because of the density of the remains and the shape of the mound it was not possible to excavate in 5 cm spits so a different method was used. Each excavated layer consisted of a) all the exposed remains (angular rocks and some bone and shell), which were removed by hand, and b) the remaining loose matrix, which was then removed until the next layer was clearly exposed. The larger remains were bagged separately on site, and the deposit sieved and weighed as described for the transect excavation. The rocks were also counted, measured, weighed and left on site. Excavation continued until the bottom of the last layer was level with the ground surface around the mound and two small test pits were dug below that level. Stratigraphic samples and photographs were taken and much of the excavated material was shipped to London for analysis.

FIG. 43. Mound 87, two inland-facing quadrants excavated, Goemu III, 1985 (Photo: DRH).

EXCAVATIONS AT GOEMU: STRATIGRAPHY, MATERIAL REMAINS AND RADIOCARBON DATING

PLATFORM–RIDGE TRANSECT EXCAVATIONS

Due to time restrictions, it was only feasible to analyse in detail three 50 x 50 cm quadrants from three transect excavation squares (Squares E, M, and Y). The three quadrants chosen for analysis (ENW, MSE and YSE) appeared to provide an optimal cross-section of the variation noted in the deposits during excavation and a preliminary sort of the material remains. The two squares excavated that were not studied in detail sampled parts of midden-ridge I (GH) and midden-ridge II (T), on the western and eastern sides respectively of the platform. Although morphologically distinct from the platform, the density and composition of the ridge deposits did not appear to vary as markedly from MSE as did those from either ENW or YSE.

The excavation of each of the five squares revealed a relatively shallow stratigraphy of midden deposit overlying beach sand but there were differences between the stratigraphy of the platform-ridge complex and the surrounding level areas. Both the ridges and the platform were raised features. The average heights of ridges I (c. 30 m long and 3 m wide) and II (c. 20 m long and 2 m wide) above the level ground surface were respectively 28 cm (average of 15 measured heights) and 18 cm (average of 10 measured heights), and the average height of the platform (c. 8 m long and 5-7 m wide) was 15 cm (average of four measured heights). When the average heights of the ridges and platform were subtracted from the total thickness of the excavated deposit, the depth of the deposit from Squares GH, M and T was similar to the midden depth in Squares E and Y on the level areas. In other words, there were only slight differences in the subsurface thickness of the midden deposit across the transect (determined in the five squares excavated), the average depth being 26 cm. Some post-depositional disturbance was indicated by the presence of roots and recent rodent droppings throughout all levels in all five squares.

ENW

The surface consisted of a scatter of shellfish remains (*Mesodesma* [now *Paphies*] and *Chama*) of moderate density[6] and small fragments of dugong rib and turtle carapace, with a few small fragments of quartz and pumice and chunks of island bedrock. The upper 10 cm was a tightly compacted very dark grayish brown deposit (Munsell colour scale 10YR 3/2) consisting of a moderate density of fragments of bone, shell, and pumice. Just below 15 cm there was a change to a lower density of the fragmented remains and the deposit became sandier and lighter in colour (10YR 5/2, grayish brown). Larger pieces of pumice were found between 22 and 23 cm and grass roots were still apparent when sterile beach sand was reached at 25 cm.

MSE

The surface was covered by a dense scatter of comminuted bone (dugong rib and skull fragments, turtle carapace, skull and one phalange), shellfish (*Paphies*), and large and small pieces of island bedrock. The upper 15 cm was a tightly compacted dark-brown deposit (10YR 3/1, very dark gray) with a dense accumulation of bone and stone, some shell, and dense root infiltration. At 15 cm there was a change to a slightly lighter matrix (10YR 3/2) although the density of the bone did not change and the shellfish remains increased. The deposit became lighter between 20 and 25 cm (10YR 4/2, dark grayish brown) and the bone less dense below 30 cm. The deposit became sandier with less bone and shell between 30 and 40 cm, and lighter (10YR 4/1, dark gray). By 48 cm there was little midden material, an increase in pumice, and the deposit was lighter (10YR 5/2) and sandier. Sterile beach sand was reached at 50 cm.

YSE

The surface was covered with very few remains: one large piece of island bedrock, two valves of *Paphies*, and several small unidentifiable fragments of bone. The excavated deposit was light grey (10 YR 3/2) with a low density of small fragments of bone, shell and stone throughout the upper 25 cm. Excavation continued to 45 cm, although the deposit was almost sterile between 25 and 35 cm, lighter (10YR 4/2), and contained some pumice and grass roots. The transition to sterile beach sand (10YR 6/3, pale brown) occurred at 40 cm below the surface.

MOUND 87 EXCAVATION

The NW and SW quadrants were excavated with NW analysed in detail. The surface of the NW quadrant was made up of many chunks of bedrock, ten species of shellfish, one chiton plate, and fragments of dugong skull, rib and a humerus. The shellfish consisted of five rocky-habitat species (*Nerita* sp., *Monodonta* sp., *Chama* sp., *Asaphis* sp., *Spondylus* sp.) and a chiton (*Acanthozostra* sp.); two coral-reef species (*Turbo* sp., *Melo* or *Syrinx aruanus*); one sandy-habitat species (*Paphies* sp.), and one mangrove species (*Polymesoda* sp.). A few small land snails (*Torresitrachia torresiana*), fragments of coral, and a quartz flake were also found.

The mound was excavated in seven layers. Each consisted primarily of chunks of bedrock and dugong bone which were removed by hand. The remaining deposit was then collected and sieved to reveal the next layer of stone and bone. The first layer was the most densely packed with stone and bone and there was a substantial decrease in material below Layer 3. Stone increased in Layer 5 and fragments of glass were found in Layers 4 and 6. Layer 7 just above the ground surface contained very few remains. At its base there were no visible rocks or animal remains although the deposit was still dark. To determine the depth and content of this basal deposit two small test pits were dug: one in the middle of the surface where the two quadrants had met, and the other at the northern edge of the NW quadrant at its boundary with the surrounding ground surface. In both pits the dark matrix continued to a depth of 25-30 cm below the ground surface. Few midden remains were present, and the underlying deposit was beach sand.

COMPARISON OF THE COMPOSITION OF THE MOUND AND TRANSECT EXCAVATIONS

In its composition the mound differed most conspicuously from the transect in the number (indicated by weight) of chunks of bedrock present, in the abundance of dugong-bone fragments compared with the other types of remains, and in the high diversity of shellfish species recorded on the surface. Table 3 compares the weights of residue (matrix without artefactual material) and rocks in the excavated levels of the transect and the mound. Because the total amount of deposit in each sample was different the results could not be compared accurately, but the comparison did indicate (when the relative density of midden remains per quadrant was also taken into account)

TABLE 3. Summary of weight of excavated matrix (without artefactual material) and rocks, transect and mound excavations, Goemu III.

	Residue Weight (kg)	Rock Weight (kg)	Quadrant (50 x 50 cm) Depth (cm)
MSE	70	5.0	50
ENW	58	1.1	25
YSE	132	4.0	40
M87	7	19.5	-

that a) there was an abundance of stone from the mound deposit with little matrix; and b) MSE and YSE had similar rock weights but markedly different residue weights. When the overall density of midden remains (other than stones) in each deposit was taken into account, it was clear that the variation in residue weight related to the quantity of animal remains found in each level, the midden remains being nearly four times greater in MSE than YSE.

THE TEST PITS

The sixteen 0.50 m^2 test pits we dug across Goemu (four each in Goemu I and II and eight in Goemu III, Figure 21) allowed us to investigate more widely the relationship between level surface areas (both with and without visible midden remains) and their underlying composition, as well as providing valuable stratigraphic information on the site as a whole.

Midden deposits were found in all but two of the test pits (No. 14 in Goemu I and No. 9 in Goemu II) and the average depth of deposits in the remaining 14 pits was 28 cm. The relative abundance of remains on the surface, observed and recorded as light, moderate or dense,[6] accorded with the subsurface abundance in 11 (69%) of the pits (Figure 44). The five exceptions were one pit with dense remains on its surface and few within it in Goemu I; two pits with a moderate density of surface remains and very few within them in Goemu II; and one moderate surface scatter with few subsurface remains and one light surface scatter with abundant subsurface remains in Goemu III. Of the 14 pits that contained midden deposits, seven contained a low density of remains, one a moderate amount, and six an abundant amount. We dug eight of the pits in Goemu III because this area was the focus of our excavations, and five of them contained a high (four of the five) or moderate (one) density of remains.

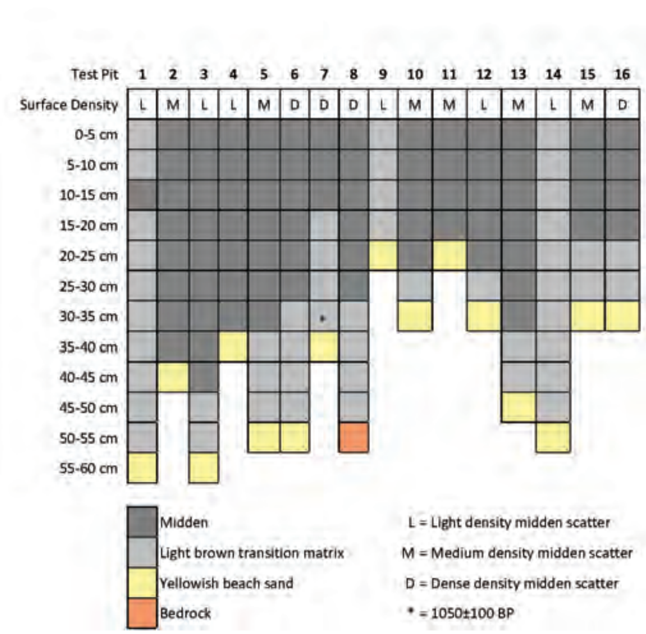

FIG. 44. Generalised test-pit stratigraphy, Goemu I, II, III.

The overall impression gained from the test pits was that midden deposits were present across much of Goemu, but that they were in general shallow (none greater than 50 cm deep) and graded into a light-brown deposit without remains overlying yellowish beach sand. The only example of a midden deposit resting on bedrock was Test Pit 8 dug closest to the junction of the beach flat and the inland hill slope, which also overlaid a transition layer of light-brown deposit 20 cm thick (Figure 44). Although the remains recovered from the 14 pits with midden deposits were not analysed quantitatively, the superficial appearance of the composition and range of thickness of the deposits was similar to the variation seen in the transect quadrants that we excavated. The most conspicuous difference between the transect and the test-pit deposits was the density of remains in the upper 15-30 cm of the platform-ridge complex (i.e. the amount of midden above the level ground surface), which was more a difference of degree than of kind.

The distribution of the midden remains across the Goemu site revealed by the test pits, and the underlying types of deposit present, suggested that people had mainly occupied level sandy areas directly inland of the beach. The only definite indication of the period of time over which the cultural deposits might have accumulated came from two charcoal samples that were radiocarbon dated (see below). The two dates (c.1050 and c.550 BP), one from the transition deposit at 42 cm below midden remains in Test Pit 7 and the other at 35 cm in midden in Square M, suggested that human activity had taken place at Goemu, either continuously or episodically, over at least several centuries prior to the arrival of pearlshellers and missionaries in the second half of the nineteenth century. Indeed, the younger date correlates well with the AMS radiocarbon date on charcoal of c. 500 years ago obtained recently by Ian McNiven from a linear midden feature (Ridge 1) close to Square M (see below).

We concluded that the occurrence of the shallow midden deposits we documented across most of Goemu could represent either activity over an extensive area during periods of widespread occupation, or more discrete and patchy use of areas that spread out laterally over time. If the deposits represented a cumulative spread of settlement there might be evidence of this process in the material culture recovered. The only stratified remains of European origin we found were fragments of green bottle glass in the lower layers of Mound 87. This could imply either that the mound was built after the platform-ridge complex, when glass had reached Mabuyag through trade with Europeans or from shipwrecks, or, alternatively, that the mound was built in the same time period as the platform-ridge feature but with different materials. We only studied the internal composition of one other mound (No. 52 in Goemu I, see above) and it did not contain European materials. It was clear that, to determine the temporal relationships of the varied surface features at Goemu, excavation and radiocarbon dating would have to be carried out on a much larger scale than we could undertake – work that has, fortunately, since been undertaken by Ian McNiven and his colleagues (see McNiven *et al*., this volume).

RADIOCARBON DATING OF CHARCOAL SAMPLES

A major disappointment of our excavations in 1985 was a general lack in the midden deposits of charcoal fragments of sufficient size and structural coherence to be radiocarbon dated by the then conventional method (before the AMS technique became widely available). However it did prove possible to date two samples of such fragments. The first came from Test Pit 7, situated 12.5-13.0 m southwest of the centre of the transect excavation in Goemu III. The charcoal was recovered from an intact pocket of deposition at a depth of 42 cm in the pit, at the junction of lower, lighter brown midden soil and the basal beach sand that underlies the midden deposits. The sample could therefore pre-date the accumulation of the overburden of midden materials (bone, stone and shell in a brown soil matrix which gets progressively lighter in colour with depth down to 42 cm). We speculated that it might represent the remains of an earth oven (*amai*) or camp fire on the surface of the basal sand and/or date the beginning of midden accumulation at this location. The charcoal almost certainly derived from an artificial fire because it was found at the transition from the beach sand to the midden soil and because natural fires are unlikely to have occurred in the sparsely vegetated beach environment before people occupied the island. The sample consisted, after pre-treatment, of 1.30 g of structurally coherent charcoal fragments. It gave an uncalibrated radiocarbon age of 1050±100 BP (Beta-21386 and see Figure 44) and thus indicated considerable time depth for human activity at Goemu.

The second charcoal sample was obtained from one of the five squares excavated along the platform-ridge transect. It came from the northeast quadrant of Square M at a depth of 35 cm in dark brown midden deposit containing abundant bone, shell and stone. It consisted of a single fragment of charcoal that weighed 1.80 g after pre-treatment and gave an uncalibrated radiocarbon age of 600±70 BP (Beta-21385), thus clearly demonstrating pre-European occupation of that part of the site. It also matches quite closely the AMS charcoal date obtained by Ian McNiven from the base of his Square A in the linear midden feature (Ridge 1) 5 m northwest of our Square M (see McNiven *et al*., this volume).

In addition to the two main samples, we obtained and dated a third charcoal sample. It came from the southwest quadrant of Square M but consisted not of a single fragment from a given depth but of a collection of small charcoal fragments that were dispersed through 10 cm of the deposit between 30 and 40 cm depth. It weighed 2.17 g after pre-treatment and gave an uncalibrated radiocarbon age of 'modern' (Beta-21384), which accorded with the presence of grass roots and rodent droppings in the excavated deposit (Figure 45). This result suggested that the small fragments of charcoal might have been washed down the soil profile (probably during successive wet seasons), and it highlighted the undesirability of combining dispersed fragments from a bulk sample in order to get enough charcoal for a conventional radiocarbon date.

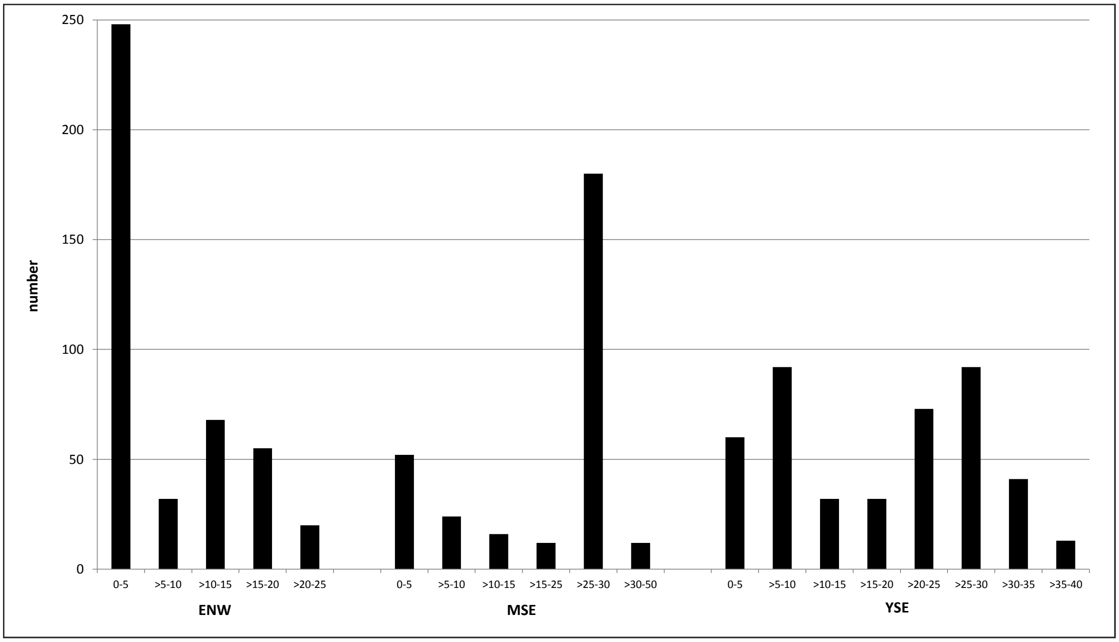

FIG. 45. Number of modern rodent droppings per quadrant level, transect excavation, Goemu III.

ANALYSIS AND INTERPRETATION OF THE REMAINS EXCAVATED FROM THE TRANSECT SQUARES AND MOUND 87 AT GOEMU III [7]

COMPOSITION OF THE DEPOSITS

The diversity of types of material remains found in the excavated deposits resembled that recorded in the surface survey. Fragments of dugong, shellfish, turtle and fish, with almost no bird or rodent remains, were found in addition to pieces of quartz, island bedrock, pumice, and charred plant remains. However, quantification of the material afforded a somewhat different view of the relative importance of the finds, particularly in relation to the animal remains. The only other evidence of Islander technology was the small fragments (on average between 1 and 8 mm in length) of quartz found during the sorting of the 2 mm-mesh sieve residue, but the quantities recovered did not suggest that (if they were debitage of stone-tool manufacture) they represented debris from in-situ knapping.

The most dense (per 5 cm level excavated) and deepest deposit of the three transect quadrants came from MSE and the deposit in ENW was denser overall than that in YSE. These findings were in accordance with the relative abundance of midden material noted on the surface of the squares prior to excavation. However, in spite of differences in the total number of fragments found in each category of remains in the three quadrants, the types of category (e.g. dugong, shellfish, fish) and the diversity of components within each (e.g. element type or species), as well as their relative abundance, did not vary greatly. This statement can be exemplified by a consideration of some of the results of the analysis of the shellfish remains. The Minimum Number of Individuals (MNI) of shellfish identified per quadrant (combining the MNI for all the shellfish species per quadrant) was approximately four times greater in MSE (810) than in ENW (204) and YSE (197), although the diversity of the species present was high in each (between 70% and 78% of all species identified) and their relative abundance in each sample was fairly constant (with two species in the smaller sample of ENW not found in MSE).

Study of the fish remains, on the other hand, suggested that sample size might be more closely related to taxonomic diversity, at least at the family level. The maximum number of fish families identified (11) came from MSE where the total sample contained nearly 16,000 fish bones. This compared with four families identified from ENW, with fewer than 2,000 bones, and three families from YSE with a total of approximately 1,500 bones. However, the types of cranial elements – both those that were (e.g. dentary, premaxilla, pharangeals) and were not (e.g. teeth, jaw, skull) identified to family – and their relative abundance, did not vary significantly, even with such large differences in sample size.

Similar consistencies in assemblage composition to those of the fish remains were revealed by analysis of the dugong and turtle bones. In each of the quadrants fragments of three dugong elements (rib, skull, and vertebra) comprised, on average, 93% by weight of the total assemblage. ENW and YSE had few remains of turtle, but fragments of three elements (carapace, phalanges, and vertebrae) were present in both quadrants as well as in MSE, although on average carapace fragments comprised 91% by weight of the assemblages.

The above examples from the analyses of the animal remains indicate that although the actual amount of midden material from each quadrant varied considerably, with the greatest variation being between the sample of platform deposit (MSE) and those from the two surface scatters (ENW, YSE), the overall diversity of the types of remains, of element type, and of species, and the relative abundance of each, were fairly constant. The extent to which both turtle and fish remains were visible on the surface of the excavated quadrants, was, however, a poor indication of their subsurface presence or abundance.

PROCESSING OF THE ANIMAL REMAINS

All the remains were initially sorted and analysed in accordance with the excavated 5 cm-thick spits. Data-scoring sheets were designed to record a range of attributes of the dugong, turtle, fish and shellfish remains recovered. The remains studied came from two categories of sample (which were initially excavated and weighed together): one consisted of the larger bone and shell fragments (or more complete specimens of the latter) that had been removed and bagged separately after being weighed and sieved on site; and the other consisted of the smaller fragments recovered from laboratory sorting of the 2 mm sieve remains. The laboratory sorting process produced most of the fish remains studied, a large proportion of the shellfish remains, and many bits of dugong and turtle bone, much of which had to be classified as mixed (dugong and turtle) unidentifiable bone fragments.

Once sorted, the large animal remains were washed, dried, and, as with the smaller ones, identified[8] to type of animal and family, and to species and element where appropriate. Fragments of bone and shell that could not be placed in either sample category were classified as unidentifiable. All the large animal-bone fragments (complete specimens comprised 4% of the total sample of the dugong and turtle remains studied), were measured, counted, weighed, and sided (as either from the left or right side of the animal) when possible. All the fish and shellfish remains were counted, weighed, and sided when possible, with measurements taken of only one type of shellfish (*Paphies*) on account of its abundance and completeness. Four types of superficial damage were recorded on all the animal remains: a) animal teeth marks (dog or rodent); b) (possible) butchery marks; c) discolouration believed to be due to exposure to fire, i.e. charred; d) visible marks which did not look like any of the above, i.e. unidentifiable. The degree of natural weathering was recorded from one type of element only: dugong rib fragments (see below). Three stages were recognised: 0 = bone surface shows no sign of cracking or flaking due to weathering, 1 = bone shows cracking parallel to fibre structure, 2 = outermost concentric thin layers of bone show flaking and perpendicular cracking (after Behrensmeyer, 1978). The variation in the colouration and state of preservation of the shellfish remains observed on the surface of Goemu and in the excavated deposits was too great to justify recording types of superficial damage for this category of remains (other than perforations). The degree of comminution (size range) of the most abundant dugong and turtle elements (rib and carapace) was noted.

TAPHONOMY OF SUPERFICIAL BONE DAMAGE

To assess the degree to which natural weathering processes and/or human activities affected the condition of the archaeologically recovered bone, the dugong, turtle and fish remains were studied closely for superficial signs of alteration. The types of damage observed fell within the following four categories: 1) natural weathering, in the three stages noted above, 2) non-human animal alteration (gnawing by dogs and rodents), 3) human-related alteration (charring and butchery), and 4) unidentifiable. It was hoped that the degree of weathering observed on one type of bone found throughout the excavated deposits (dugong rib) might give an indication of the relative period of time over which the deposits accumulated, i.e. whether the remains were buried rapidly or left exposed on the surface. If rapid burial took place this could imply either that the remains were covered up in a 'primary' context where the bone-related activity (butchery or consumption) was carried out, or that they were covered rapidly in a 'secondary' context (i.e. if transported some distance from the 'primary' area of activity). Thus, rapid burial of bone remains, indicated by minimal signs of weathering, would not necessarily imply a particular behaviour that led to their deposition. High frequencies of weathered animal remains might suggest a slow rate of midden accumulation. This, coupled with the horizontal extent and shallow depth of midden deposits across Goemu, might support the view that occupation was widespread across the area (whether continuously or episodically) – unless weathering of animal remains occurred rapidly when they were exposed to the fluctuations of a seasonally wet-dry tropical climate.

Leaving aside questions about the precise behavioural context or rate of midden accumulation, the degree of weathering on the bones and their abundance in these kinds of deposits was more likely to indicate whether many or few agents had affected them: potentially many if exposed for a long period of time, few if buried rapidly. However, in trying to determine the range of agents that could have modified the bone assemblage and thus infer to what extent the patterns might be related to human behaviour, it was important to estimate the length of time that the bone might have been exposed. In the light of this difficulty, it was hoped that other types of superficial damage such as butchery marks or charring, might (if identified) provide information on the behavioural context in which they were deposited, or at least some evidence for types of bone alteration that were clearly related to human activity.

Natural weathering of dugong rib fragments and effects of human and animal activity

To assess the length of time over which the midden deposits might have accumulated, and thus to gauge the likelihood of bone destruction arising from exposure to a variety of natural weathering and/or human-related agents, one type of bone element was chosen for more detailed taphonomic study. Dugong rib fragments were selected on account of their robustness, their abundance throughout the excavated deposits, and the existence of a control sample of weathered ribs collected on Mua in 1984.[9]

The degrees of surface weathering (0: no cracking or flaking; 1: parallel cracking; 2: parallel and perpendicular cracking and flaking) recorded from the archaeological rib fragments were noted for each level (spit) throughout the excavated quadrants (Table 4 summarises their percentage occurrence). It is important to note, however, that the degree of weathering on both the modern and the archaeological specimens was rarely consistent across the surface of a particular complete bone or fragment. Most of the surfaces of the modern ribs collected showed all three stages of weathering. This

TABLE 4. Percentage occurrence of stages of weathering on dugong rib fragments per quadrant, transect and mound excavations, Goemu III.

	Total No. of Fragments (kg)	Unweathered (Stage 0) (%)	Weathered (Stages 1 & 2) (%)
MSE	127	47	53
ENW	40	25	75
YSE	18	44	56
M87	95	15	85

appeared to be due to differential exposure of the bones' surfaces to natural weathering processes (e.g. sun and rain). For example, most of the bones were partially buried in the soil and/or were infested or covered by grass roots. There were also extreme differences in weathering between the side of the bone that had been exposed to the sun and its underside that had remained resting on the ground. Because the variety of surface weathering observed on the modern bone was so great, the weathering stage of the archaeological bone was determined by reference to the most extreme damage noted.

In the three transect quadrants and the NW quadrant of Mound 87 a higher percentage of the bone fragments was weathered (combining categories 1 and 2) than not weathered. Moderate to heavily weathered bones were found throughout most of the midden levels. In MSE, the quadrant with the greatest number of rib fragments (127), twice as many weathered than unweathered fragments were present in the top 5 cm of the deposit. Weathered bones dominated until about 20 cm below the surface where there was a slight increase in unweathered bones. A few fragments with some degree of weathering continued throughout the deposit (to a depth of 45 cm), but there were very few highly weathered fragments below 10 cm. Finding moderately weathered bones throughout the deposit suggested that the remains were exposed as the deposit built up. If there had been much post-depositional mixing between the uppermost and the deepest levels, one would expect a greater number of highly weathered bones below 10 cm, and not the increase in the relative number of unweathered fragments found between 20 and 35 cm (unless, of course, the higher number of unweathered fragments below 20 cm represented greater fragmentation of ribs with both weathered and unweathered parts). However, those were the only levels excavated in which an articulated part of an animal skeleton was found (immature vertebral column). The vertebrae were also studied for signs of weathering and all 91 were classified as 0, showing no signs of surface damage. So, perhaps in this part of the quadrant the levels were deposited and covered within a relatively short period of time.

In ENW (sample size 40), only the upper 15 cm of deposit contained dugong rib fragments, within which there were three times as many weathered as unweathered bones. (The top 15 cm was also where the majority of all the midden remains in this quadrant was found.) All but one of the unweathered fragments occurred in the top 5 cm, as well as most of the highly weathered fragments. With almost all the unweathered bone in the top 5 cm of the deposit, and significantly higher numbers of weathered fragments between 5 and 15 cm, the deposit appeared to have been mixed subsequent to deposition, unless the remains in the upper level were covered more quickly than those below.

In YSE there were very few dugong remains. There were only 18 rib fragments, two more of which were weathered than unweathered. They were found mainly in the top 20 cm and were distributed fairly evenly throughout the levels, with the same number of weathered fragments (4) in the uppermost level as in the lowest (15-20 cm) level, and in both levels at least twice as many as the unweathered ones. The bones of this sample may have been exposed in the process of being buried, or they may – after being weathered on the surface – have been subsequently mixed into lower levels.

In the NW quadrant of Mound 87 there were six times as many weathered as unweathered dugong rib fragments, and they dominated all levels. This suggests either that the bones were exposed for considerable periods of time as the mound built up, or that they were collected from the surface already highly weathered, if the mound was built over a shorter period of time. We could not determine whether the weathered bones were in-situ or scattered through the deposit as a result of post-depositional mixing (but by using the AMS radiocarbon dating technique it might now be feasible to build a chronology of bone and/or shell deposition).

Summary of the patterns of superficial bone damage

All the identified bone was examined carefully for types of superficial damage that might indicate particular types of pre- or post-depositional human and non-human activity. The results of the recording of possible marks on dugong and turtle bones of butchery, charring, and gnawing by dogs and rodents, and of unidentifiable marks, are summarised in Table 5. Only 7% of the total sample of dugong bones studied was identified as having possible[10, 11] butchery marks: 1% from MSE, none from ENW, 4% from YSE, and 2% from Mound 87, and an even smaller percentage from all the turtle remains (2%). This contrasts with the high (78%) proportion of bones with signs of charring: 54% dugong and 24% turtle. However, the percentage of charred dugong remains may be artificially high due to the small size of the sample from YSE (28 fragments), which resulted in nine charred fragments representing 32% of the assemblage. Dog and rodent teeth marks were identified on bone fragments from each quadrant and the Mound 87 quadrant, although in relatively small quantities. The combined occurrence of both types of tooth mark was just over 10% for all the dugong remains and 3% for all the turtle remains.

TABLE 5. Percentage occurrence of superficial marks on dugong and turtle remains per quadrant, transect and mound excavations, Goemu III.

	Total No. Bones (Dugong & Turtle)	Butchery Marks (%)	Charred (%)	Dog/ Rodent Teeth Marks (%)
MSE	1517	1.3	7.5	3.1
ENW	161	1.0	16.0	1.0
YSE	296	4.4	43.0	6.4
M87	255	2.0	11.0	3.0
Total:	2227	8.7	77.5	13.5

With higher totals of weathered than unweathered dugong rib fragments in each quadrant, as well as throughout most of the other excavated levels, there was little evidence to suggest rapid burial of the midden deposits. The one exception was MSE, where 20 cm of the deposit (from 15 to 35 cm below the surface) appeared, due to the articulation of part of a dugong vertebral column and the absence of signs of weathering, to have been deposited in a relatively short period of time. If the midden remains were left exposed one would expect natural weathering and the actions of humans (e.g. walking and burning off vegetation) and other animals (e.g. eating and gnawing of bones by dogs and rodents) to cause a significant amount of bone loss. Both the patterns of bone element-type frequency and quantity, and the size of unidentifiable fragments (in addition to the high percentage of weathered bone from each deposit excavated), suggested biases in the bone assemblages attributable to factors other than intentional human actions. However, a variety of human activities could also have produced similar effects (cf. discussion below of the fish remains). The low percentage of possible butchery marks on bones may reflect both human and non-human agents that could have obscured or destroyed traces of cut marks, such as throwing bones into fires, clearing areas by burning vegetation, damage by dogs and rodents, and exposure to natural elements.

ANALYSIS AND INTERPRETATION OF THE DUGONG AND TURTLE REMAINS

Fragmented remains of dugong and marine turtle were found throughout all the excavated deposits. The greatest quantity of dugong and turtle bone and the highest representation of elements were found in MSE, followed (in order of decreasing abundance) by Mound 87, ENW, then YSE for dugong remains, with the patterns of abundance reversed (YSE, ENW, M87) for turtle remains (Figures 46, 47). In general, the dugong and turtle bones and the other types of remains found appeared to be randomly distributed throughout the deposits, the main differences being in the density of material both within and between the quadrants. In MSE the high concentration[12] of bone, shell and stone fragments started to decrease below 25 cm, and below 15 cm in ENW and YSE. Midden remains were recovered to approximately 45 cm depth in MSE, down to 25 cm in ENW, and between 30 and 35 cm in YSE.

As already mentioned, by far the most abundant elements representing dugong and turtle were fragments of dugong rib and turtle carapace (Figures 48, 49). If the abundance of vertebral fragments in MSE is disregarded, fragments of skull (cranial and mandibular) were overall the second most abundant type of dugong element (Figures 50–52). The high percentage of vertebral fragments in MSE is due largely to the only (apparently) non-random distribution of bone found, which consisted of part of an articulated immature vertebral column (unfused centra and processes) found between 15 and 35 cm below the surface. Bones of the forelimb were present in three of the four samples (all but ENW), but comprised only 2% by number of the total dugong remains. The second most abundant elements of turtle were forelimb and hindlimb phalanges, found in the three transect quadrants. They comprised 3% of

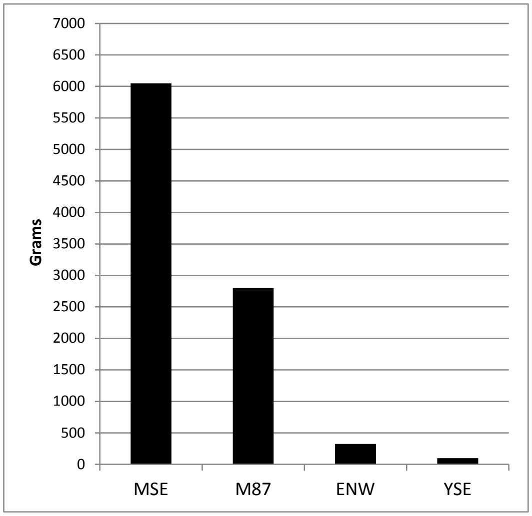

FIG. 46. Dugong remains per quadrant (by weight), transect and mound excavations, Goemu III.

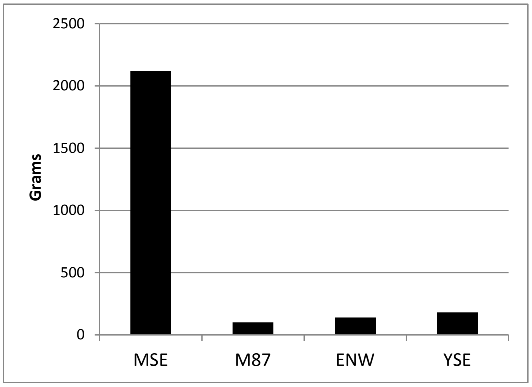

FIG. 47. Turtle remains per quadrant (by weight), transect and mound excavations, Goemu III.

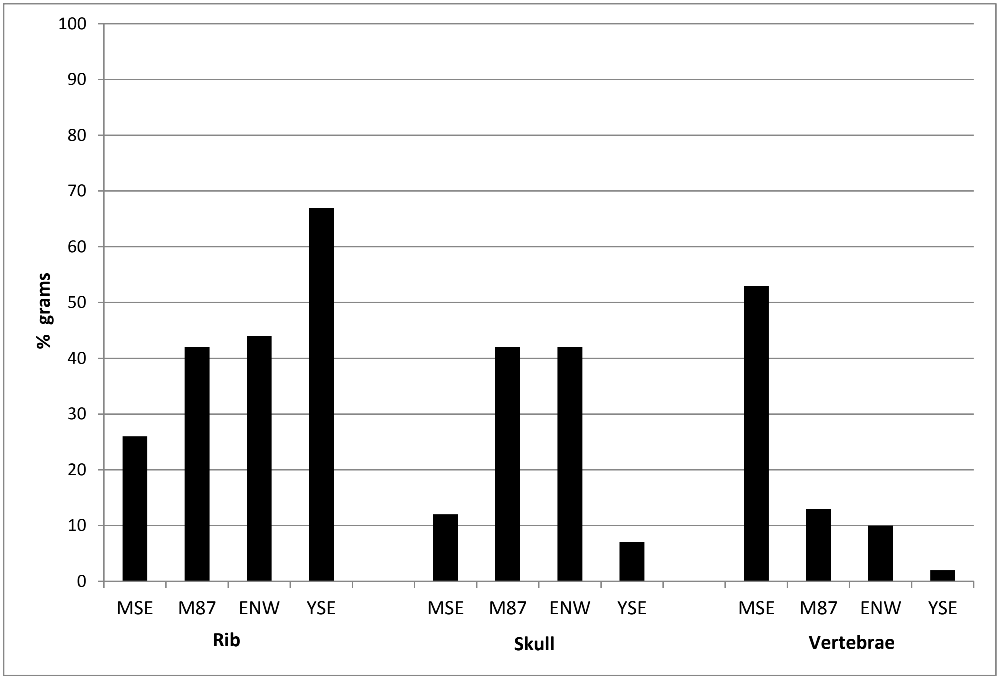

FIG. 48. Percentage occurrence (by weight) of the three most abundant dugong elements, transect and mound excavations, Goemu III.

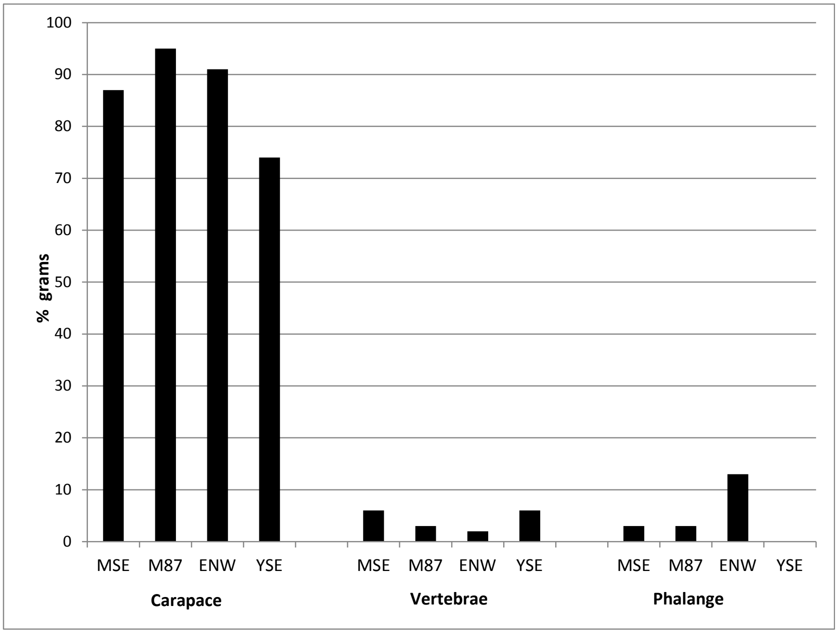

FIG. 49. Percentage occurrence (by weight) of the three most abundant turtle elements per quadrant, transect and mound excavations, Goemu III.

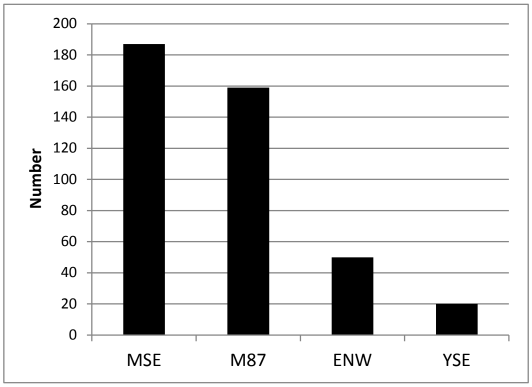

FIG. 50. Dugong rib and skull fragments (numerically), transect and mound excavations, Goemu III.

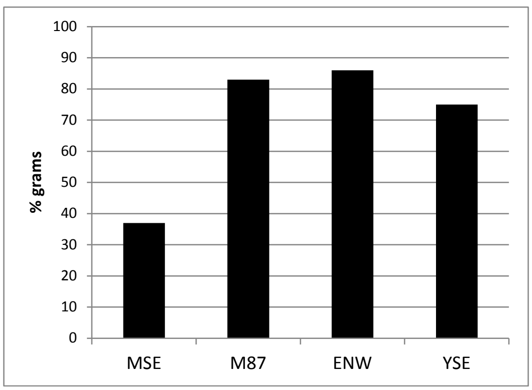

FIG. 51. Percentage occurrence (by weight) of dugong rib and skull fragments, transect and mound excavations, Goemu III.

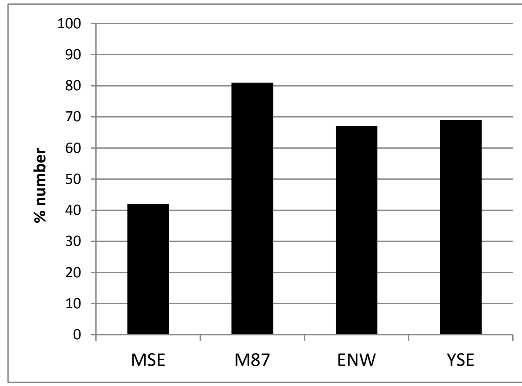

FIG. 52. Percentage occurrence (numerically) of dugong rib and skull fragments, transect and mound excavations, Goemu III.

TABLE 6. Summary of unidentified bone fragments per quadrant by weight and number, transect and mound excavations, Goemu III.

	Weight (g)	Number
MSE	4397	10,892
ENW	868	2120
YSE	440	1772
M87	329	156

the total turtle remains, and 3% of the turtle remains from MSE, which contained 30 phalanges (Figure 49).

The most abundant category of bone remains in the transect quadrants by weight and number (e.g. MSE: 4400 g and 10,892 in number), is the 'mixed' (either dugong or turtle) category of unidentifiable fragments (Table 6). Eighty percent of the fragments in MSE were 1-2 cm in size (greatest length or width), and the quantity of this size increased with depth (i.e. greater fragmentation at lower levels). In the Mound 87 deposit dugong rib and skull fragments by weight were three and a half times greater than the mixed unidentified fragments, but there were more of the unidentified fragments by number. Dugong rib and skull fragments are the densest bones of the skeleton, so it is not surprising that they outweighed the category of fragments that were generally small and structurally amorphous. However, the dugong rib and skull fragments were relatively more abundant in Mound 87 than in the three transect quadrants (Figures 50–52). The range of turtle elements identified from the transect and mound excavations and the range of dugong elements identified from the excavations and the surface survey are summarised in Figures 53 and 54. The age, sex and Minimum Number of Individuals (MNI) were calculated from the analysis of both the dugong and the turtle remains.

The dugong (*Dugong dugon* Müller 1776) or ‘sea cow’ is one of four related species of herbivorous marine mammal, all of which are endangered.[13] Prior to 1985, over a decade of research focused on Australia’s northeastern coastal waters had produced data on the behaviour and physiology of the dugong (e.g. Heinsohn, 1972, 1977, 1978; Heinsohn & Birch, 1972; Husar, 1975; Marsh *et al*., 1978; Spain & Heinsohn, 1974), but no definitive life-history information was available and therefore little was known with certainty about the movement, reproduction, growth and ageing of dugongs (Heinsohn, 1972; Marsh, 1980). This lack of data, particularly on growth and ageing, restricted what could be inferred from the archaeological remains of dugong recovered at Goemu and meant that their interpretation would necessarily be tentative.

The total dugong MNI from the excavated deposits was seven (three in MSE, two in Mound 87, and one each in ENW and YSE). Of these, five dugongs were identified as immature, based upon the presence/absence of articular ends with signs of incomplete epiphysial fusion, or on the epiphyses themselves, and on tusks that had not yet erupted. The age of sexual maturity of the dugong was not definitely known and was thought to be related to the region it inhabited, with estimates ranging from two to three years to between five and 14. Research also indicated (Marsh, 1980: 191) that tusks erupted in male dugongs after puberty at 12 or 14 years of age, or possibly later, and only rarely in females. Thus the recovery of unworn (i.e. unerupted) tusks from one of the quadrants (MSE), as well as bone fragments with unfused epiphyses, suggested the presence of an immature

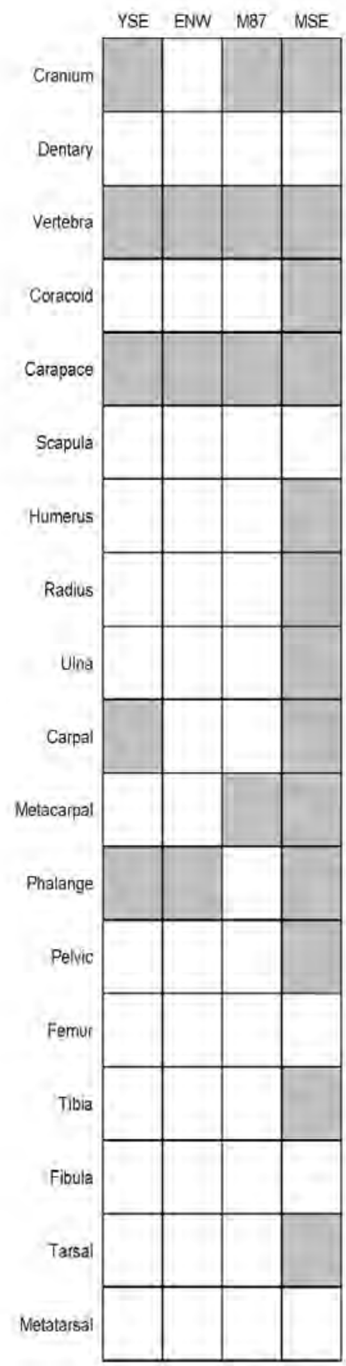

FIG. 53. Summary of turtle elements identified, transect and mound excavations, Goemu III.

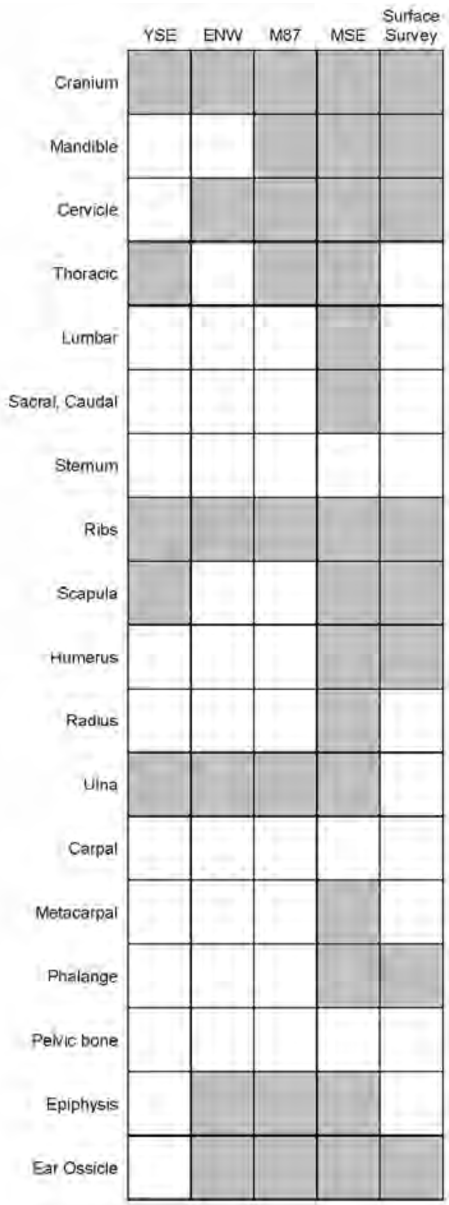

FIG. 54. Summary of dugong elements identified, surface survey, Goemu I, II, III, and transect and mound excavations, Goemu III.

dugong the age of which could have been anywhere between two and 14 years. In the 1980s there appeared to be no information on the timing of epiphysial fusion in the dugong, although it probably occurs in this pre-puberty range of years. However, rather than try to determine the precise age of the dugong when it was captured, it seemed more significant to estimate its approximate size, and hence the amount of food that it would have provided.

It had been suggested that sexual maturity in both males and females occurred at a body length of approximately 2.4 m, and that this length could be reached by two years of age (Heinsohn, 1972; Marsh, 1980). Thus, although more immature than mature dugongs were represented in the MNI's, the animals when caught may already have attained the average adult body size and weight (i.e. 2.4-2.7 m in length and between 230 and 360 kg in weight (Husar, 1975). The usable meat on a dugong is estimated to be 20% to 26% of the total body weight, with a yield of up 4-5 gallons (18-23 litres) of oil (Heinsohn, 1978), representing 35% body weight of usable meat and fat (Nietschmann, 1984).

The sexing of dugongs based upon skeletal remains can be ambiguous, as it appears that the only element which allows one to distinguish between the two sexes is the tusk. As stated above, tusks seldom erupt in females so an erupted (worn) tusk is likely to represent a mature male, while unerupted tusks can indicate an immature male or female, or a mature female. Parts of four individual tusks were found in the bone assemblage, all from MSE. Three were fully erupted, and probably represented a minimum of two mature male dugongs. The fourth was unerupted and therefore came from either one immature male or female, or a mature female. In both ENW and YSE the remains studied did not suggest the presence of more than one dugong, and in each the individual was immature. The MNI of two in Mound 87 represented one immature and one adult dugong, based upon the identification of two (nearly complete) fragments of left mandible and two left ulnae fragments, one of which had an unfused epiphysis.

The MNI's calculated for turtle in the three transect quadrants were the same as for dugong. A minimum of three individuals were present in MSE, based upon the identification of three left ulnae, with no indication of more than one each in ENW and YSE. The Mound 87 turtle remains also did not indicate more than one animal. Although fairly extensive ecological, and some historical, research had been carried out on marine turtles (e.g. Carr, 1952; Bustard, 1972), and on the green sea turtle in particular (e.g. Nietschmann, 1976, 1984; Parsons, 1962), these studies provided little information of relevance to the interpretation of skeletal remains of turtles.

Six species of marine turtle inhabit the coastal waters of northeastern Queensland: *Chelonia mydas*, *Natator depressus*, *Eretmochelys imbricata*, *Caretta caretta*, *Lepidochelys olivacea* and *Dermochelys coriacea*. They are commonly known respectively as the green sea, flatback, hawksbill, loggerhead, Pacific or olive ridley and leatherback and are distinguished from each other primarily on the basis of phenotypic variations (e.g. differences in head and body shape, size, and colouration). Certain differences in skeletal morphology, i.e. in skull and lower jaw (dentary), can help to distinguish between species. However, these identification criteria were derived from study of complete specimens with attention focused upon differences in overall morphology (Carr, 1952: 342-343). In the 1980s it appeared that no research had been carried out on how to distinguish species by differences in the most abundant (fragmented) skeletal elements of turtles found in archaeological deposits, i.e. carapace and plastron.

In our investigations we assumed that most of the turtle remains found represented the green sea turtle. This assumption was based upon information from contemporary ecological and ethnographic work carried out in Torres Strait (Bustard, 1971; Nietschmann, 1976, 1984), and nineteenth century scientific and ethnographic accounts, which all indicated that of the six species present in the region only three were (and are) exploited by Islanders: the green sea, the flatback and the hawksbill. The green sea turtle is consistently recorded as both the most common and the most highly prized for food, whereas the hawksbill was said to have been caught primarily for its shell which was used as a raw material for artefacts, with its flesh only occasionally eaten.[14]

The excavated turtle bone consisted primarily of fragments of carapace and plastron which form the bony plates that make up the convex upper 'shell' and the flat lower 'breast' plate. Measurements of size and weight recorded from a sample of 54 green sea turtles caught by Torres Strait Islanders in the 1970's indicated that carapace length can range from 70 to 114 cm, the width from 60 to 90 cm, and plastron length from 60 to 90 cm. Weights for the entire animal ranged between 50 and 200 kg, with an average size of 130 kg (Nietschmann, 1984). Marine turtles' bones grow incrementally without epiphysial fusion, and there was little information available on the relationship between their size and the age of the animal. Therefore the archaeological remains were considered to represent immature or adult (or small and large) turtles based upon how the measurements of the complete forelimb and hindlimb bones compared with measurements taken on similar elements of a small and a large green sea turtle caught and butchered on Mabuyag during our 1985 field season.

The size range of the three complete turtle intermedium carpals from MSE suggested an adult and an immature individual, and at least one male, which was identified from the presence of a strongly curved forelimb first-digit distal phalange that males use to maintain a hold on the female's carapace while mating (Carr, 1952: 348; Bustard, 1972: 19). The length of two complete forelimb third proximal phalanges from YSE suggested an adult turtle, and a strongly curved first-digit distal phalange, as in MSE, represented a male. The two phalanges from ENW were fragments, but the projected lengths suggested an adult. The turtle remains from Mound 87 did not appear to represent more than one turtle and the projected sizes of some of the small and relatively numerous (17) fragments of metacarpals/tarsals, and one complete phalange, suggested an adult turtle. The excavated deposit contained the second highest quantity of total fragments of dugong and element types represented, but fewer turtle remains than in any of the three quadrants. Hypothetical implications of the minimum numbers of both dugong and turtle, inferred from the excavated remains, are considered below.

Particular elements of both dugong and turtle were consistently the most abundant types identified from the four quadrants studied, irrespective of the variation in the overall abundance of bone remains in each sample. In addition, the elements were generally those with the highest frequency in each skeleton (dugong rib and turtle carapace/plastron) and those that are also structurally the most robust; and, as indicated by the average size of both the green sea turtle and the dugong, one complete skeleton of either could potentially generate a large amount of fragmented bone.

The dugong and turtle remains were almost entirely (as with the other types of midden remains) highly fragmentary. The only exception to the generally comminuted state of the excavated bone was the articulated portion of the vertebral column of an immature dugong that occupied approximately 20 cm of midden deposit in MSE. Upon close examination, the bone was found to be in a 'fresh' unweathered state, with no superficial damage such as marks of butchery or animal gnawing apparent. It was not clear why this part of the animal had been discarded in an articulated condition, but it had definitely been treated differently from the rest of the animal remains, which were disposed of (or subsequently altered) in a manner that resulted in deposits of jumbled mixtures of fragmented bone and stone of varying density.

The most abundant type of bone recovered, by weight and number, was the category described as mixed-unidentifiable. The surfaces of these fragments of dugong and turtle bone were so corroded that it was impossible to determine to which animal they belonged. The characteristics of the fragments – their average size, abundance through the deposits, and the extent of surface corrosion – suggested that they had been exposed to pre- or post-depositional destructive agents related to natural weathering processes and/or human activities. If the bone remains did represent refuse from past meals discarded in habitation areas they would probably have been exposed to a variety of natural and human agents capable of altering their morphology. In fact, there was little in the internal composition of the excavated deposits, or in the nature of the remains themselves, to suggest that the midden material represented anything other than accumulations of past refuse. Although there were some differences in the relative abundance and types of the remains in each deposit, the most striking contrasts between them were in their surface morphology. Possible interpretations of these differences in surface morphology and the types of remains present are considered further below in the summary of the results of our research at Goemu.

The minimum number of dugongs and turtles was the same in each of the transect quadrants – three each from MSE, one each in ENW and YSE – but differed in the Mound 87 quadrant which had an MNI of two dugongs and one turtle. The extent of midden deposits revealed by the test pits indicated that the deposits we excavated represented a very small percentage of the remains present across the Goemu site. Without more extensive excavation and quantification of the remains recovered it was difficult to judge how representative the excavated deposits were of the site as a whole. Analysis did however indicate that the differences in midden composition related more to the quantity than to the diversity of the remains recovered.

An attempt was made to evaluate the importance of dugong and turtle in past Islander diet by estimating the total quantity of these foods represented by the midden deposits. The first step was to produce an estimate of the amount of dugong and turtle in all the midden deposits at Goemu. The MNI values of the three types of deposit excavated (level, platform and mound) were first assumed to be representative of the same types of deposit that were not excavated. Estimates of the total surface area (in m^2) of each type were then multiplied by their respective MNI's to produce the numbers of dugong and turtle hypothetically represented in the midden deposits of the entire site. Thus, to calculate the MNI of dugong and turtle for the platform at Goemu III, a MNI of 12 for each animal (per m^2) was multiplied by the platform's total surface area (c. 48 m^2) to give totals of 576 dugongs and 576 turtles. The MNI's of dugong and turtle were then calculated for the two ridges adjacent to the platform, the two smaller ridges in Goemu I and II, all the midden mounds at the site, and the whole of the level area (which was assumed to contain midden remains throughout). Although the ridge deposits adjacent to the platform were sample excavated (Squares GH and T), they were not analysed quantitatively, but because the deposits appeared to be very similar in composition and density to the platform quadrant MSE an estimated MNI of 10 dugongs and 10 turtles was used to calculate the total MNI for these and the other two midden ridges. As all but two of the 16 test pits dug produced midden remains it was further assumed that all the level areas were underlain by some midden deposits. The next step was to estimate the surface area of each type of deposit, which produced totals of approximately 19,600 m^2 for level areas, 180 m^2 for mounds, 170 m^2 for the ridges and 48 m^2 for the platform. The resulting overall estimates of the numbers of dugong and turtle represented in the midden deposits of the entire site were respectively 22,676 and 22,076.

Proceeding from these hypothetical totals, further estimates were made (described in Ghaleb, 1990: 267-269) of the probable numbers of dugongs and turtles consumed at Goemu by members of the *kaigas-surlal* clan (assumed to consist of 56 people) averaged over a period of between 460 and 860 years (based on the two radiocarbon dates we obtained). The resulting conclusion was that between 26 and 49 dugongs and between 25 and 48 turtles would have been consumed per year. On the basis of known average weights of the animals (dugong 250 kg, turtle 130 kg) and percentages of edible meat and fat (dugong 35%, turtle 50%), and taking the higher of the annual estimates of the numbers of animals captured (respectively 49 and 48), it was then calculated that the total amounts of meat/fat consumed per person per year would have been approximately 77 kg of dugong and 4.6 kg of turtle.

Interesting though these hypothetical results were, it was clear that they were based on assumptions that could not be verified without more archaeological and historical data than were available. For example, we could not be sure that the amounts of dugong and turtle represented by the midden deposits at Goemu were consumed only by the one clan described ethnographically as having lived at the site. It was also probable that meat consumption among members of the clan was unequal due to age differences and restrictions related to gender and/or status, which would reduce the estimate of the total number of consumers and therefore the average intake of meat and fat per person. More uncertainty has arisen recently in relation to the assumed clan size and the dating of occupation of the site. The clan size of 56 was derived from Harris's (1979) estimates of 600 for the 'pre-European' population of Mabuyag and an average clan size of 56, but this now appears to have been an overestimate (see the introduction to this paper and Note 1); and the radiocarbon dates now available from McNiven's work at the site would require a reconsideration of our inferences about when and for how long Goemu was occupied (see McNiven *et al*., this volume).

ANALYSIS AND INTERPRETATION OF THE SHELLFISH REMAINS

As expected from the results of the surface survey of Goemu, shellfish remains were present throughout the excavated midden deposits. Twenty-eight species were identified from the excavated remains (16 bivalves, 11 gastropods, 1 cephalopod), slightly less than half the total of 59 identified from the surface survey (25 bivalves, 33 gastropods, 1 cephalopod). Remains of bivalve and gastropod species were found that represented all five of the habitats represented in the survey: sandy, rocky, coral reef, mangrove and deep water, but with a smaller range of species in each. The largest difference in species diversity between the surface and the excavated samples was in the number of gastropod species, with twice as many, or more, in the surface survey from each habitat except deep water (Table 7). However, the five habitats were represented, according to species' abundance, in the same order in the surface and the excavated samples, i.e. sandy, coral reef, rocky, mangrove and deep water.

TABLE 7. Summary of diversity of marine mollusc species by habitat, surface survey, Goemu I, II, III and transect and mound excavations, Goemu III.

	Surface	%	Excavated	%
SANDY		34		36
Bivalves	13		9	
Gastropods	7		1	
ROCKY		19		25
Bivalves	5		4	
Gastropods	6		3	
CORAL-REEF		33		29
Bivalves	5		2	
Gastropods	14		6	
MANGROVE		14		7
Bivalves	2		1	
Gastropods	6		1	
DEEP-WATER		2		3
Gastropods	1		1	
Total:	59		28	

Consistent with the relative overall abundance of the other types of animal remains, almost three times as many fragments of shellfish were recovered from MSE than from ENW and YSE, and nine times as many as from Mound 87: the totals were respectively 3279, 1170, 1071, and 324. Even with this large variation in the totals, the number of species (all habitats combined) in each of the transect quadrants was similar (19, 21, and 19, respectively) with diversity fairly high (on average 70% of the 28 species identified were found in each). Fewer

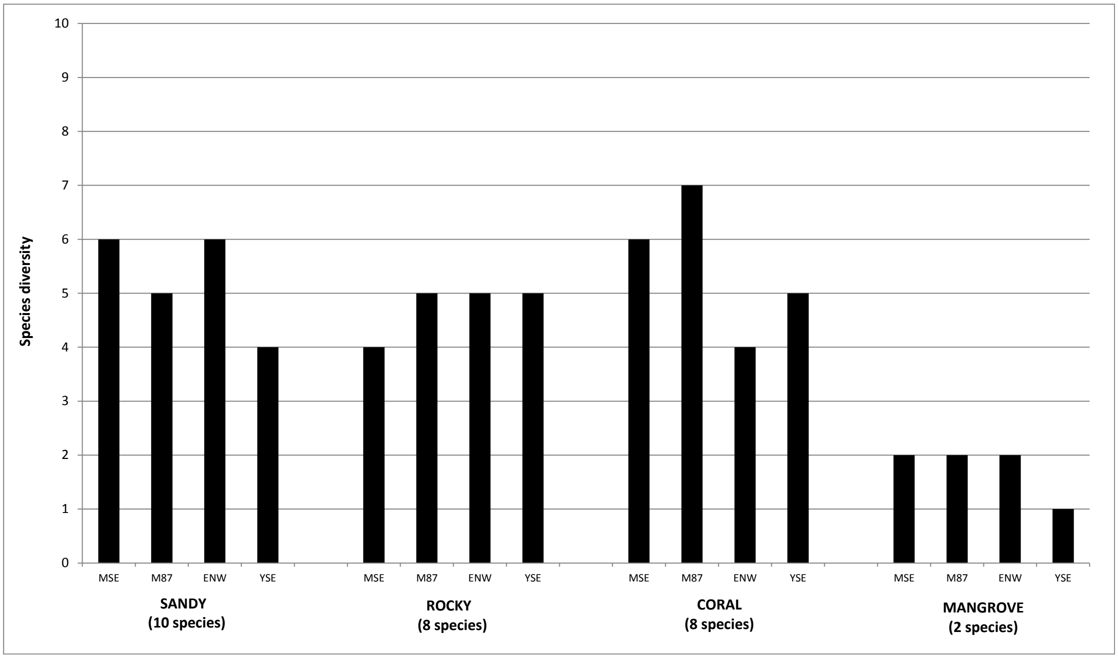

FIG. 55. Total number of marine mollusc species by habitat, per quadrant, transect and mound excavations, Goemu III.

species (15) were represented in the Mound 87 quadrant, i.e. 54% of the 28 possible species (Figures 55, 56).

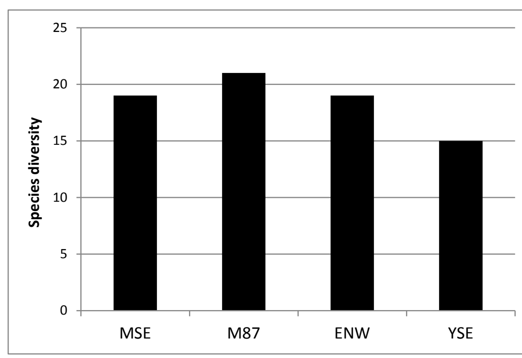

FIG. 56. Total number of marine mollusc species per quadrant, transect and mound excavations, Goemu III.

The single most abundant species found throughout each deposit was a small (c. 12 mm x 15 mm) bivalve which inhabits sandy shores, not far below the surface and just above the daily mean tide level: *Paphies striata*. The total number of fragments of *Paphies* per quadrant was consistent with the order of the overall abundance of shellfish remains in them: MSE (1256), ENW (241), YSE (207), Mound 87 (130). The second most abundant sandy-habitat species were three members of the genus *Tellina: T. palatum, T. scobinata,* and *T. crucigera*. Because the individual totals of fragments of these three species were low, they were analysed together for each quadrant and totalled 176, 39, 74 and 10 respectively. The number of species from sandy habitats (10) was slightly higher than from rocky (8) and coral reef (8) habitats, but the total of *Paphies* fragments (1,834) from the four quadrants greatly exceeded the total from other sandy-habitat species (368). The total number of fragments from the rocky-habitat species (1,022) was far greater than the total number of fragments from the coral reef species (180) and almost three times greater than the total fragments of sandy-habitat species when *Paphies* was excluded. Only two species came from the mangrove habitat and the total number of fragments representing it (70) was less than half those from the coral-reef habitat. Fragments of the deep-water dwelling *Nautilus* sp. were only found in YSE (20 fragments), and four fragments of sea urchin (*Echinodermata* sp.) were found in ENW. Crustaceans were represented by 416 fragments of crab claw (343 from MSE), and none came from Mound 87. On account of their size these probably came from the small species that inhabit the coral reefs, although some might represent mangrove species.

Of the total number of shellfish fragments (5,844) only 40% were unidentifiable, mainly because of their small size and condition. They comprised 33% of the shellfish remains in MSE, 20% in ENW, 18% in YSE and 10% in Mound 87, with an average of 20%. In addition to the numbers of fragments, the Minimum Number of Individuals was recorded for each species. The combined MNI total for all species (1,392) was less than a quarter of the total number of shellfish remains (5,844), and two and a half times less than the total number of identified shellfish fragments (3,491). Nearly 60% of the MNIs identified came from MSE, with an average of 14% from ENW, YSE and Mound 87 (Table 8).

TABLE 8. Summary of marine mollusc fragments per quadrant (total and Minimum Number of Individuals), transect and mound excavations, Goemu III.

	MNI	Total	% MNI of Total	% Total of Total
MSE	810	3,279	58	56
ENW	204	1,170	15	20
YSE	197	1,071	14	18
M87	181	324	13	6
Total:	1,392	5,844		

Three shellfish taxa mentioned in connection with ceremonial features in the mid-nineteenth century ethnographic records were present in the excavated deposits. A combined total of 73 fragments (MNI 21) of *Pinctada* sp. (pearlshell) were found in the four quadrants (35, 18, 18, 2). The shells of one species (*P. maxima*) are recorded as having been worn as breast-plates across Torres Strait and they were an important item of exchange between Islander and neighbouring mainland groups. Fragments of *Tridacna* sp. were found in MSE (12) and ENW (1), total MNI 4, and *Nautilus pompilius* (20, MNI 12) in YSE, and both were described as used in the ornamentation of the 'funeral' screens seen on the island of Naghir by MacGillivray (1852) and Brierly (Moore, 1979). However, none of these species was present throughout the deposits, nor was any very abundant, and *Tridacna* and *Pinctada* may have been collected for food. It was also of interest that the only remains of ethnographically 'symbolic' shellfish found in Mound 87 were two fragments of pearlshell. Fragments of pierced shell were, however, found on the surface of other mounds (Figures 24, 33).

The relative percentage occurrence of the shellfish species identified from the surface survey afforded a somewhat different view of the most abundant types of shellfish exploited in the past. *Paphies* remains were the most frequent species found on the midden features (87% occurrence), which was consistent with the excavated results, but two mangrove species, *Polymesoda* and *Terebralia*, which were scarcely represented in the deposits were found on 73% and 61% of the mounds respectively. Two rocky-habitat species were found frequently (between 60% and 80%), which was consistent with the excavated remains, but four species that were not abundant in the quadrants occurred on between 40% and 60% of the surface features:

Melo sp., *Anadara* spp., *Syrinx aruanus* and *Tridacna* and/or *Hippopus* spp. Fragments of *Pinctada* were present on 25% of the mound surfaces, three of which were pierced (Figure 33). Only one shell artefact was found in the excavated deposits, a ground cylindrical piece of shell from the eastern wall of YSE, whereas 17 were found during the surface survey (Table 2 and Figures 24, 31, 33, 34).

As explained previously, most of the shellfish species identified live in four near-shore habitats, all of which occur close to the Goemu site. Species of *Tridacna* and *Melo* can be found in either shallow or deep water coral reef habitats, but *Nautilus* only inhabits deep waters. However, empty *Nautilus* shells commonly wash up on the shore during high tides and so those found in the midden deposits may not have been collected alive.

Although the sample sizes varied, the diversity of shellfish species from each quadrant was fairly constant. Species diversity may not, however, be the best indicator of the species most heavily exploited. The sandy-habitat species were the most numerous (10, with the 3 species of *Tellina* combined for analysis), but only one species was present in abundance. The species from rocky habitats were the most consistently abundant: the total number of fragments from rocky-habitat species was five and a half times greater than the total from coral reef habitats, fourteen and a half times greater than the fragments from mangrove species, and three times greater than the total number of sandy-habitat fragments when *Paphies* was excluded.

The overall condition of the shellfish remains was good, if fragmentary, and they contained the smallest average percentage (20%) of unidentified fragments of the four most abundant types of animal remains. In addition, the quantities of remains originally discarded may be more accurately represented for shellfish than for the other food types because of the robustness of the parts on which the calculation of MNIs are based (bivalve hinges and gastropod apexes).

The four habitats represented by the shellfish species identified from the deposits were all accessible within a few minutes walk of Goemu, so unless major changes in coastal morphology had occurred during the centuries when the site was occupied it seemed surprising that exploitation would have focused on one small sand-dwelling species and four rocky-habitat species – assuming that the deposits analysed were representative both of the midden remains across the entire site and of the variety of shellfish gathered by the Goemulgal. The differences noted in species diversity and relative abundance of species between the surface and the excavated samples might imply that the samples were not large enough to be representative of midden composition across the site as a whole. However, the range of species identified in both contexts pointed to eclectic patterns of shellfish exploitation, and the generally small quantities of shellfish remains suggested that they were a supplementary food rather than a dietary staple (at least in terms of the amounts consumed, as opposed to the frequency of consumption).

ANALYSIS AND INTERPRETATION OF THE FISH REMAINS

The impression we had of the importance of fish remains in the midden deposits during excavation was similar to that gained from the surface survey – that they were of minimal significance – but the results from sorting the 2 mm sieve deposit indicated otherwise. Fish remains were present throughout the excavated transect deposits and amounted to 19,186 in total. In contrast, the excavated Mound 87 quadrant produced almost no fish remains: just a few fragments of spines and vertebrae. But there was a large discrepancy in sample size from the three transect quadrants, 82% of the fish remains being recovered from MSE. Although the number of fish bones in the total assemblage was relatively high, it was difficult to gauge how many fish they might represent because the poor condition of the bone rendered 77% (or slightly more) of the fragments unidentifiable, and because one fish skeleton can decay into many fragments of bone. Therefore no attempt was made to calculate Minimum Number of Individuals, as was done from the remains of dugong, turtle and shellfish.

MSE

A total of 15,647 fish bones was analysed from the quadrant MSE. The remains were found throughout the ten excavated levels (spits) and occurred in greatest number between 15 and 30 cm (the levels in which the articulated portion of dugong vertebral column was also found) (Figure 57).Twenty-three percent of the bones were classified as identifiable (26% on average per level) and were either cranial element fragments or vertebrae (Figure 58). The remaining 77% were classified as unidentifiable and

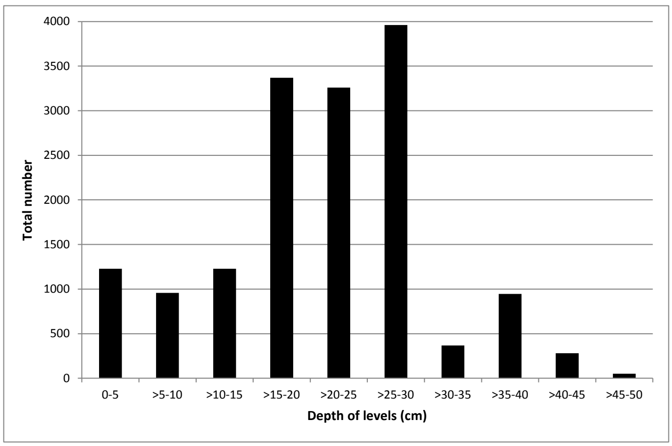

FIG. 57. Total number of fish bone fragments per level, Square M, Quadrant SE, transect excavation, Goemu III.

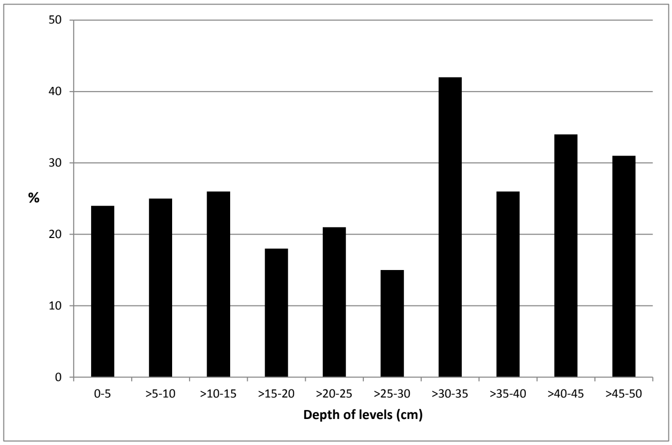

FIG. 58. Percentage of fish bone identified per level (cranial elements and vertebrae), Square M, Quadrant SE, transect excavation, Goemu III.

were either nondescript very small (0.5-1.5 mm) fragments (60%), or fragments of fish spines (15%). The 23% of identifiable fish remains consisted of 59% vertebrae and 41% cranial elements, the vertebrae comprising 13% and the cranial elements 9% of the total assemblage. The vertebral remains were from bony (teleost) fish (77%) or cartilaginous (elasmobranch) fish (23%). The cranial fragments were divided into two categories: those identified only to element type (56%) and those identified to element and family (44%). Nearly 60% of the cranial fragments identified to element only were either teleost teeth, skull or jaw (premaxilla and dentary) fragments, and 60% of the elements identified to family consisted of premaxilla, maxilla, pharangeal, dentary and articular bones (Table 9 and Figures 59, 60).

TABLE 9. Percentage occurrence of identified fish remains (vertebrae and cranial elements) per quadrant, transect excavation, Goemu III.

	Total No. Fish Bones	% Ident.	Vertebrae			Cranial		
			% of all Ident. bones	% Teleost	% Elasmob.	% of all Ident. bones	% Ident. to Element only	% Ident. to Element & Family
MSE	15,647	23	59	77	23	41	56	44
ENW	1,847	19	49	77	23	51	52	48
YSE	1,692	14	59	74	26	41	67	33

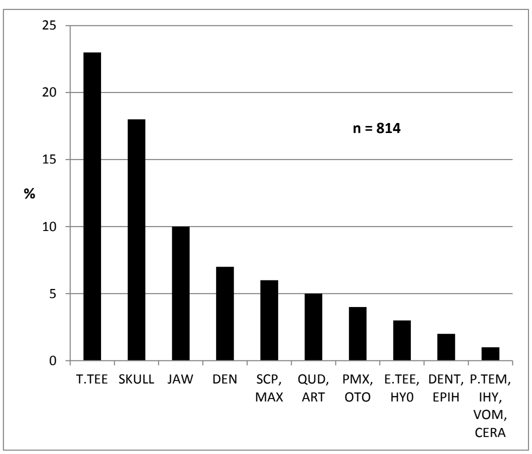

FIG. 59. Percentage occurrence of fish cranial bones identified to element, Square M, Quadrant SE, transect excavation, Goemu III.

ANG	Angolar
ART	Articular
CLE	Cleithrum
CERA	Ceratohyal
DEN	Dentary
DENT	Denticles
E.TEE	Elasmobranch teeth
EPH	Epihyal
EPI	Epihyal
HYO	Hyomandibular
IHY	Interhyal
I.PHAR	Infer. Pharyngeal
JAW	Premaxilla & Dentary
MAX	Maxilla
OPER	Operculum
OTO	Otolith
PAL	Palatine
PH.T	Pharyngeal teeth
P.TEM	Post Temporal
PMX	Premaxilla
PSP	Parasphenoid
QUD	Quadrate
R.S.	Ray spine
S.CLE	Supra Cleithrum
S.PHAR	Super. Pharyngeal
SCP	Scapula
TEE	Teeth
T.TEE	Teleostan teeth
URO	Urohyal
VOM	Vomer

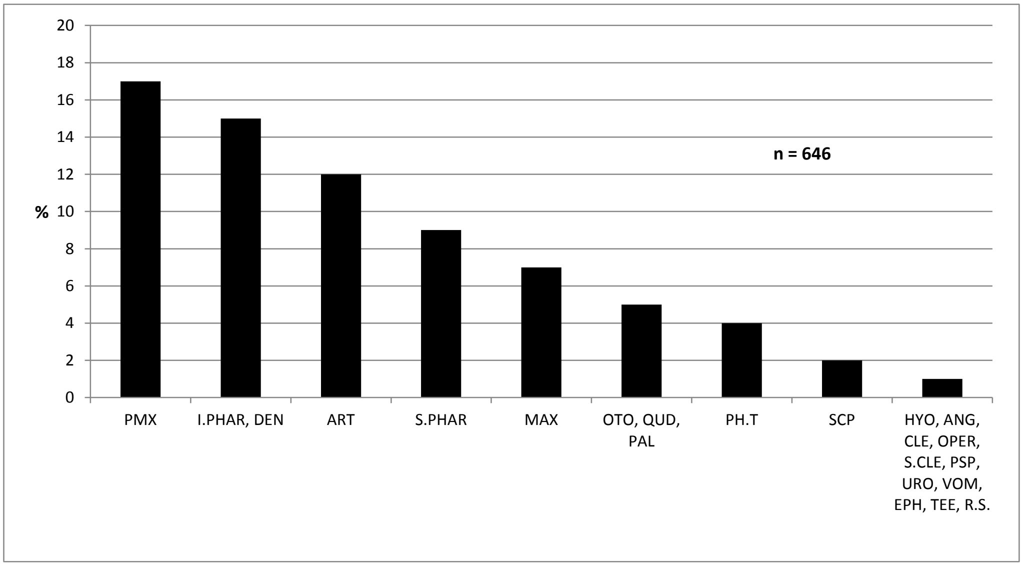

FIG. 60. Percentage occurrence of fish cranial bones identified to element and family, Square M, Quadrant SE, transect excavation, Goemu III.

ENW AND YSE

The total number of fish bones from quadrants ENW and YSE (1,847 and 1,692 respectively) was between eight and nine times smaller than the total found in MSE. The percentage of fish bones identified per quadrant was also smaller, comprising about one fifth (19% and 14%) of the total sample compared to one quarter in MSE. The percentage occurrences of vertebral and cranial fragments and of the sub-divisions in each category (teleost versus elasmobranch and identification of element only versus element and family) are summarised in Table 9 which shows that the percentage ratios of the different categories in each quadrant did not vary significantly across the samples although the sample size did. The number of bones identified to element and family was the smallest percentage in each example (44%, 48%, 33%), comprising only 4% of the total sample from MSE, 5% from ENW and 2% from YSE (Figures 61–66).

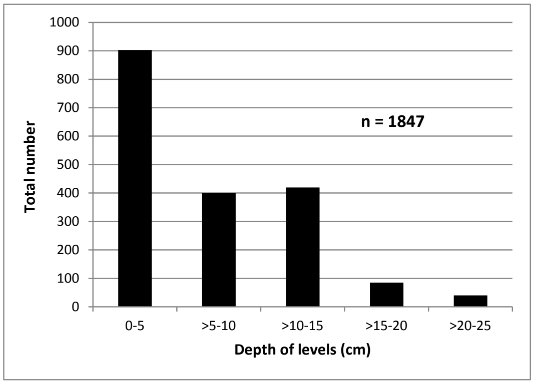

FIG. 61. Total number of fish bones per level, Square E, Quadrant NW, transect excavation, Goemu III.

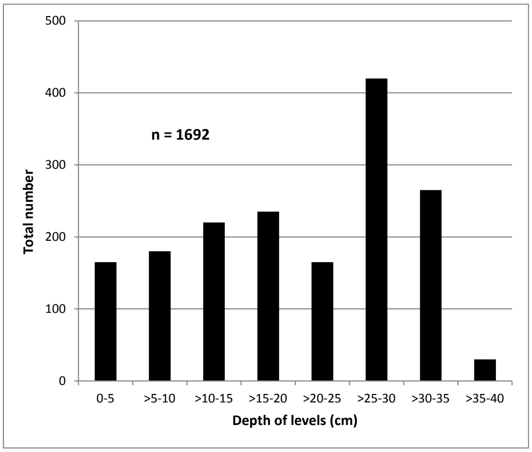

FIG. 62. Total number of fish bones per level, Square Y, Quadrant SE, transect excavation, Goemu III.

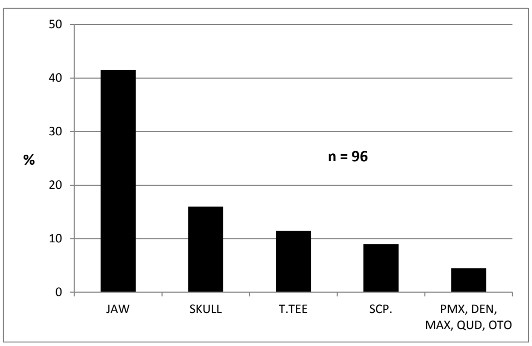

FIG. 63. Percentage occurrence of fish cranial bones identified to element, Square E, Quadrant NW, transect excavation, Goemu III.

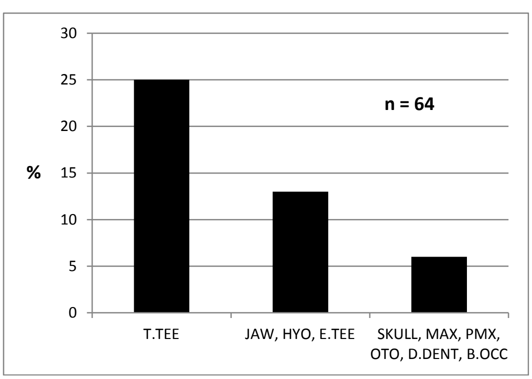

FIG. 64. Percentage occurrence of fish cranial bones identified to element, Square Y, Quadrant SE, transect excavation, Goemu III.

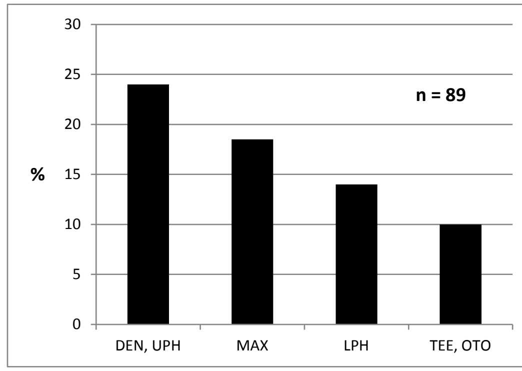

FIG. 65. Percentage occurrence of fish cranial bones identified to element and family, Square E, Quadrant NW, transect excavation, Goemu III.

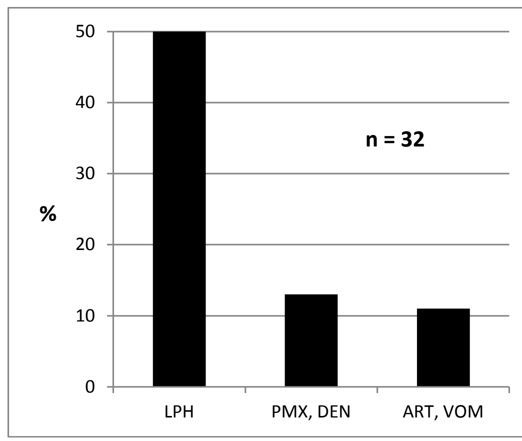

FIG. 66. Percentage occurrence of fish cranial bones identified to element and family, Square Y, Quadrant SE, transect excavation, Goemu III.

ART	Articular
B.OCC	Basio-Occipital
D.DENT	Dorsal denticle
DEN	Dentary
E.TEE	Elasmobranch teeth
HYO	Hyomandibular
JAW	Premaxilla & Dentary

LPH	Lower Pharyngeal
MAX	Maxilla
OTO	Otolith
PMX	Premaxilla
QUD	Quadrate
T.TEE	Teleostan teeth
URO	Urohyal
VOM	Vomer

Species of fish from eleven families (nine bony, one cartilaginous) were identified in the excavated samples studied. The fish families represented were (in order of abundance): Labridae, tuskfish (*Choerodon* sp.); Scaridae, parrotfish (*Scarus* sp.); Lethrinidae, bream or sweetlip (*Lethrinus* sp.); Centropomidae, sand bass, or jewel-eye (*Psammoperca* sp.); Serranidae, coral trout and cod (*Plectropomus* sp. and *Epinephelus* sp.); Chaetodontidae, sea perch (*Lutjanus* sp.); Carangidae, trevally (*Caranx* and/or *Gnathanodon* spp.); Pomadasyidae, morwong or sweetlips (*Plectorhynchus* sp.); Mugilidae, mullet (*Mugil* and/or *Liza* spp.); Dasyatidae, stingrays, and Carcharhinidae, sharks.

The majority (in MSE and ENW) or all (in YSE) of the fish remains identified to family level came from only three families: Labridae, Scaridae, and Lethrinidae, the combined percentage occurrence of which was, on average, 94% of the total sample (Figures 67–69). The only family within which it was possible to distinguish between different species, based upon skeletal morphological differences, was Serranidae.

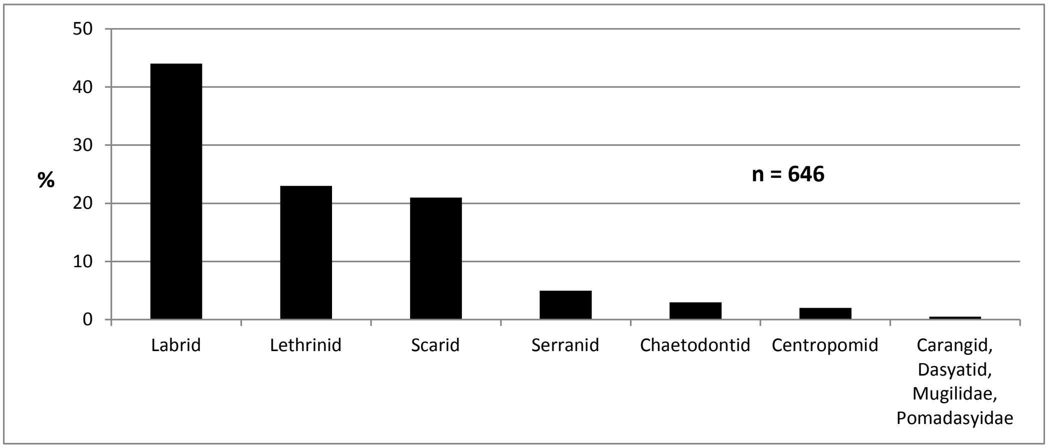

FIG. 67. Percentage occurrence of fish families identified by cranial element, Square M, Quadrant SE, transect excavation, Goemu III.

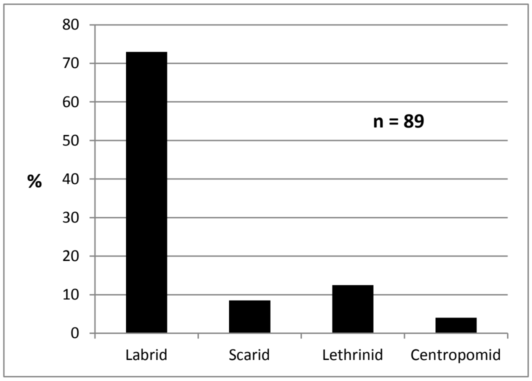

FIG. 68. Percentage occurrence of fish families identified by cranial element, Square E, Quadrant NW, transect excavation, Goemu III.

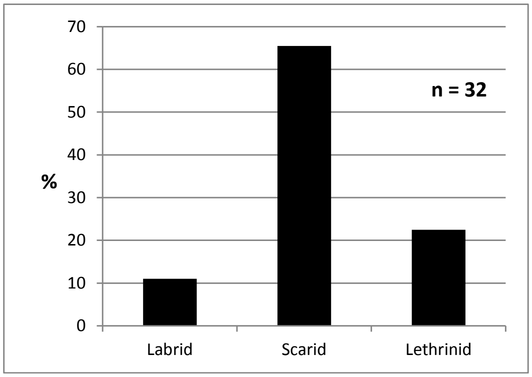

FIG. 69. Percentage occurrence of fish families identified by cranial element, Square Y, Quadrant SE, transect excavation, Goemu III.

One member of Dasyatidae was identified to family but not genus on the basis of a tail spine. The one specimen (a lower jaw tooth) of shark recovered was identified to genus (*Carcharhinus* sp.) and was described as a whaler shark, approximately 4-5 feet long (Roly Mckay, Queensland Museum, pers. comm. 17 October 1985). The percentage of elasmobranch vertebrae (the most commonly preserved element of cartilaginous fish), which comprised approximately 25% of the vertebra in each quadrant, did however suggest the presence of a greater species diversity of cartilaginous fish than could be identified (Table 9).

All eleven fish families identified from the excavated transect quadrants inhabit areas of the near-shore zone. Their habitats include sandy foreshore, lagoon, estuary, fringing reef, mangrove, and rocky headland, with most species found in more than one of these habitats. Carangidae (trevally) also commonly inhabit offshore reefs and deeper waters. All of these habitats, except estuary, occur close to Goemu, and all but one of the types of fish identified could have been either speared or caught with hook and line. Scarids (parrotfish) will rarely take a bait on account of their molar-like grinding 'beaks' (formed by the premaxilla and dentary) evolved for browsing upon living corals and coralline algae, but they can be speared or picked up by hand if trapped among the coral reef flats at low tide (Grant, 1982: 571; Ghaleb, 1998).

The total of 11 fish families identified in the midden deposits constitutes a very small proportion of the over 150 fish families whose habitat-range extends into Torres Strait (Munroe, 1967; Grant, 1982). Moreover, only three of the taxa identified were present in any quantity. But it must be remembered that only 19% of the nearly 20,000 fish bones analysed were classified as identifiable, with an even smaller percentage identified to family (4% on average). So, to assess more closely the significance of these results it is necessary to consider how two factors hindered the identification of the remains to family level: the fact that the available comparative collection of modern specimens was not comprehensive, and the condition of the remains.

As mentioned previously, a comparative collection of animal taxa that could be expected to be found in archaeological contexts on Mabuyag was made and shipped to London to aid the identification of the remains. The modern specimens were assembled mainly by one of us (BGK) in Torres Strait during the 1984 and 1985 field seasons, and because we did not know which taxa might be found in the excavated deposits all types of fish that were available (from the Islanders, from personal fishing, or frozen from a store on Thursday Island) were taken and prepared. The collection amounted to 40 specimens representing 16 families and 19 species. Four specimens were not caught near Mabuyag: a mackerel (Scombridae) caught trawling off the coast of Muralag, a spinefoot (Siganidae) caught off Mua, a mullet (Mugilidae) bought on Thursday Island, and a parrotfish (Scaridae) which was sent to London by a colleague working on the Pacific island of Tonga.

The 12 families of which species were obtained on Mabuyag represented the types of fish most commonly caught by (some of) the Islanders during part of the dry season (June-August) in 1985 (i.e. Labridae, Lethrinidae, Serranidae, Carangidae, Pomadasyidae, Chaetodontidae, Centropomidae, Teraponidae,[15] Exocoetidae,[15] Belonidae,[15] Dasyatidae and Ostraciontidae). Islanders provided names for an additional 11 types of fish which were not caught during our stay on Mabuyag. These 11 species represented eight families: Chaetodontidae (1 species), Carangidae (2), Echeneidae (1), Sillaginidae (1), Siganidae (1), Scatophagidae (1), Mugilidae (3) and Scaridae (1). Three of these fish were said to have been caught frequently during other times of the year: two types of mullet, one described as found near the shore or in mangroves: *murgurdal* (?*Liza vaigiensis* or *Mugil cephalus*); the other from the shore or near the jetty: *mackeer* (?*Mugil georgii)*; and *cubbim*, the black spinefoot (*Siganus spinus*), which was described as caught primarily during *kuki* (the wet season).

Almost all the fish were caught with plastic-reel hand lines and small to medium-size jabbing hooks, off the side of a dinghy, from the beach, or from rocks along the shore of Mabuyag or nearby islands. Occasionally men speared fish in the coral reefs while diving from a dinghy. All the Islanders that we came to know personally had favourite fishing spots that they frequented time and time again, from which the same range of species was caught. When asked why these particular locations were chosen the Islanders said that they were pleasant locations at which to fish, such as rocky headlands, small offshore islets, or over particular areas of offshore reefs, where they knew which species they would catch (i.e. their favourites for eating).

Four types of fish were most commonly caught in 1985: 1) tuskfish, *bila* or *danghal wap* (*Choerodon albigena* and *C. schoenleinii*); 2) snapper bream, *poo-ood* (*Lethrinus fletus*); 3) coral trout, *whittee* (*Pleitropomus leopardus*); and 4) two species of trevally: Papuan whitefish (*Caranx sansun*), and golden *zerr-moi* (*Gnathanodon speciosus*). These species represent respectively the Labridae, Lethrinidae, Serranidae and Carangidae. Thus, out of a potentially much larger range of fish inhabiting the coastal waters of Mabuyag, the Islanders were targeting relatively few species to eat. This pattern of fishing, combined with the short period of time during which specimens could be collected, allowed only a relatively small number of species to be prepared for the comparative collection.

The number of species collected directly influenced identification of the archaeological fish remains. Thus, over half of each sample of cranial elements was not identified to fish type because of the inadequacy of the available comparative material However, although the number of modern fish skeletons collected did limit the extent to which cranial remains could be analysed, a more significant reason was the overall poor condition of the bone, which rendered 77% of the fish remains unidentifiable. This high figure is reduced to 60% when the percentage of bone that could have been identified if in better condition is considered because 17% of the remains were fish-spine fragments, which, regardless of their condition, generally only indicate that fish are present. With such a high percentage of unidentifiable fragments, it is important to consider what agents could have been responsible for, or contributed to, the condition of the fish bone assemblage.

Assuming that the fish bones represent the remains of past meals discarded in living areas, the first question to consider is how the high percentage of unidentifiable remains may have related to various types of human activity that could have damaged or destroyed the bones of the fish that were consumed. For example, the quantity and condition of the bone could have been affected by pre-depositional activities such as methods of preparation (extent of butchery), cooking (direct or indirect exposure to fire, i.e. roasting, baking or boiling), and consumption (chewing or swallowing bones). The condition of any discarded bone could also have been affected by post-depositional activities such as where bones were discarded, into fires or on the surface of the site; variations in the location and length of occupation of different parts of the site resulting in trampling effects and changing exposure to hearths; site-surface clearance by burning or other means; and the intentional introduction of domestic dogs or pigs and/or the unintentional introduction of rodents or other wild animals. Alternatively or in addition to these possibilities, the condition of the fish bones could have been affected by organic and inorganic processes that can alter bone both above and below ground, such as sun, wind, rain, organisms in the soil, and the action of plant roots.

The results of the weathering analysis carried out on dugong rib fragments indicated that throughout the deposits bone had been exposed to natural weathering prior to burial. Thus, while exposed, a range of human and non-human influences could have affected the fish bone. The percentage occurrence of element types of the dugong, turtle and fish remains identified, and the comminuted condition of most of the excavated bone, supported this inference without necessarily indicating the types of destructive agents responsible. Indeed, the evidence did not allow the relative contribution of human activities and non-human processes to the deterioration and destruction of fish bones to be determined.

On the assumption that most of the animal remains found in the deposits derived from meals, one might expect to find some indications on the bones of processing and consumption. Study of the superficial damage on the dugong and turtle remains indicated that over half of the combined samples were charred (78%) and a small percentage of all the bones (8.7%) had possible butchery marks on them. The only kind of damage noted on the surface of the fish bones was discolouration due, perhaps, to exposure to fire. It was present on only about 3% of the remains and might have resulted from intentional or unintentional exposure to fire. The small quantity of fragments that showed signs of charring could imply that fish were cooked in ways that protected the bones from direct contact with flames or hot ashes, such as boiling, roasting or wrapping fish before baking, or, conversely, just that most of the fish bone exposed to fire did not survive.

It is interesting to note that although the abundance of particular element types found in each archaeological sample probably reflected survival of the most robust elements, three of the four most abundant fish families identified archaeologically were (in 1985) the favourites targeted and most commonly caught: labrids, lethrinids and serranids. However, one fish not caught was relatively abundant in the midden deposits: the parrotfish (Scaridae). It was the only type of fish found archaeologically that is seldom caught with a hook and line, but we could not discover why it was apparently not now caught on Mabuyag. One Islander, Kame Pai Pai, referred to it as *oodoom* and said it lived in the east (the eastern Torres Strait Islands) although we found no reference to it being absent in the western Strait (cf. Munroe, 1967; Grant, 1982). It is possible that parrotfish were favoured in the past but no longer are, or perhaps they were formerly caught in the fish traps, such as the double trap at Sipingur south of Goemu (see above). The traps provide the only definite archaeological evidence of past fishing technology, although a perforated valve of *Anadara antiquata*, which might have been used as a net weight, was found on the surface at Goemu (Figure 33a).[16]

In general, it is difficult to determine precisely which or how many of the possible bone-altering human and natural agents discussed contributed to the condition of the fish (and other animal) remains, because different processes can affect bone in similar ways. No doubt a combination of processes altered the fish bone discarded during the centuries Goemu was occupied. Also, regardless of just how the bones were damaged, more evidence of fish has probably been lost than of the other sources of animal food represented by the midden remains, principally because fish bones are the least robust. However, this comparative lack of archaeological evidence is compensated by descriptions of fishing in the Haddon *Reports* which show that it was an important pre-European subsistence activity on Mabuyag.

SUMMARY OF THE RESULTS OF THE ARCHAEOLOGICAL RESEARCH AT GOEMU[17]

The test pits and excavated quadrants indicated that midden deposits were extensive and consistently shallow across the entire Goemu site. Although the abundance of remains suggested past activity throughout the area, no specific evidence of settlement locations, such as hearths or postholes, was identified. Also, there was little in the remains recovered to suggest whether or not the many midden accumulations and the mound-and-ditch relict fields had formed or been constructed, and used, contemporaneously. The only stratified material discovered of European origin – fragments of glass in Mound 87 – indicated (unless the fragments intruded after the mound was created) that it had been made sometime after Torres Strait Islanders had access to glass. Our radiocarbon date from Square M (and other dates now obtained near it by Ian McNiven) suggest that at least that part of the site was used quite intensively, intermittently or continuously, from about 500 years ago and on into the period when historical records relating to Mabuyag begin in the mid-nineteenth century.

We began our research at Goemu by examining and recording the midden deposits and other surface features and mapping their distribution over the entire area (Figure 21). The surface deposits were all dominated by remains of dugong and shellfish and pieces of bedrock. The most striking contrasts among the many raised midden accumulations were in their morphology, especially in their height and shape, but there were also some interesting differences in the composition of the surface deposits, for example in the presence of whole *Syrinx* shells, large stones, or artefacts such as perforated and ground fragments of shell. The diversity of the midden materials on the surface raised the question of how it might be related to past activities on the site. We decided to investigate this relationship by sampling a range of different surface deposits by excavation, and identification and quantitative analysis of the remains, in the hope that variations in their types and abundance would provide evidence of the past functions of the different deposits. By digging a series of test pits across the site we also hoped to gain a better understanding of stratigraphy, and of the relationship between surface remains and subsurface composition, across a much larger area than it was possible to sample by excavation.

In general, the density of the midden remains on the surface of the excavated and stratigraphically sampled areas was an accurate indication of the density of remains underneath. However, differences and similarities existed between the types of remains identified on the surface and within the excavated deposits. Remains of turtle were found on the surface only on the platform-and-ridge feature but they were an abundant component of all the transect quadrants excavated and were present in most of the test pits. Fish remains were not apparent on the surface of the transect quadrants although they were abundant in the deposits. Artefacts were scarce on the surface and in all the deposits. Comparisons between the surface and subsurface composition of Mound 87 revealed a much higher diversity of shellfish species on the surface than in the deposit, with consistently few remains of turtle and fish both within it and on the surface, and an abundance of dugong remains and stone (fragmented bedrock) throughout.

Analysis of the excavated remains from the three types of superficial deposit (level surface, platform, and mound), demonstrated that the greatest difference between the middens' internal composition was in the relative abundance of the types of remains found, not in their diversity. These results further highlighted the distinctiveness of the superficial morphology of the midden features across the site. However, there were quite marked differences in the relative abundance of remains in the two raised-midden deposits we excavated: the platform and the mound. Dugong remains were a dominant component of both, but they dominated in the mound to the virtual exclusion of all other types of animal remains. The fragments consisted almost entirely of rib and skull, and although they were in general highly weathered they were less fragmented than the dugong bones in MSE and there were few fragments that could not be identified. In contrast, the dugong skeleton was represented more completely by the remains in the platform deposit, but with a higher degree of fragmentation and a higher percentage of unidentifiable remains. The deposit also contained abundant remains of turtle and fish, together with shellfish and some crustaceans.

In addition to variation in the surface morphology and the surface and subsurface composition of the midden deposits, the three methods of investigation we used (mapping and description, stratigraphic testing, and excavation and analysis), revealed differences in the depth of the deposits. Light to dense deposits were found, on average, to a depth of 25 cm below the level surface of the excavated parts of the platform and ridge features and the surface scatters, but not below Mound 87. Thus the mound was the only feature apparently built on level ground with few remains underneath it, whereas dense deposits extended below the platform and ridge features; and the remains of the former were considerably more concentrated, although they extended to a similar depth (25 cm) as the deposit below the excavated surface scatters.

The fragmented, generally compacted, assortment of animal remains and pieces of stone suggested that the surface and interior of the deposits consisted overwhelmingly of discarded cooking and food refuse. It was hoped that the identification and quantification of the excavated remains would demonstrate the extent to which the various animals had contributed to the diet (seasonally or year-round), and thus allow inferences to be drawn about food preferences and the (relative) amounts of time spent in different subsistence activities. However, interpretations based on either of these modes of analysis (species identification and quantification) are not straightforward because the significance of the results relies on how representative the remains are of what was originally eaten and discarded.

The results of some of the analyses, for example weathering, and percentage occurrence of element types, indicated that much information was lost due (probably) to pre- and post-depositional factors conducive to the destruction or obliteration of animal remains. Thus, definitive statements cannot be made about the range and relative contribution of animal species to past diet, and the conclusions drawn here from analyses of the data are necessarily somewhat tentative and cursory. Nevertheless, it is evident that the four major animal taxa identified (dugong, turtle, fish, and shellfish) were routinely exploited and were the staple sources of meat in the diet.

The archaeological bias in favour of the survival of animal remains and the greater susceptibility of plant remains to decay impeded investigation of the nature and extent of past plant exploitation. Fragments of charcoal were found in small quantities throughout the deposits, and much of the dark staining of the midden matrix was probably due to decomposed organic debris, but we did not recover any type of plant tissue other than (charred) wood. Inferences about past plant exploitation could however be derived from the results of ethnobotanical research previously carried out on Mabuyag and elsewhere in the Torres Strait region (Harris, 1975, 1977). This suggested that a variety of tuberous, tree and other crops were probably cultivated on Mabuyag in pre-European times – yams, taro, sweet potato, banana, mango, coconut, sugar cane – and that they would have provided an abundant supply of carbohydrate and some protein through the dry season and to a lesser extent during the wet season. Also, edible products would have been obtained from various wild plants, such as the fruit of the *wangai* (*Manilkara kauki*), the tubers of the 'Polynesian arrowroot' (*Tacca leontopetaloides*) and the fruit (technically embryo) of a species of mangrove (*Bruguiera gymnorhiza*).

The animal remains did not suggest any specific season of occupation at Goemu because, according to present-day ecological data on the species concerned, all those identified could have been exploited throughout the year. Fluctuations in the abundance and ease of availability of green sea turtles, and to some degree of dugong populations and some species of fish, do occur, but lack of behavioural information about them negated any attempt to infer seasonal variations in their exploitation. Seasonal exploitation might have been inferred from bones of birds that migrate seasonally across the western Strait, such as the Torres Strait pigeon (*Ducula spilorrhoa*) and the rainbow bee-eater (*Merops ornatus*), but we found only one fragment of bird bone (a shaft) and it could not be identified to species or genus. The mounds and ditches of the relict field system in the southwestern corner of the site (Figure 21) did imply the seasonal harvesting of a food resource (tubers and other crops), but we were unable to date the fields and so could not determine whether they were contemporaneous with the accumulation of the midden deposits.

Evidence of the processing of animal foods was scarce and ambiguous, and of techniques of procurement almost non-existent. Some superficial marks on 8.7% of the dugong and turtle bone fragments suggested butchery with an object sharp enough to slice into bone, and dark colouration on 78% of them probably indicated exposure to fire, although this could have occurred after bones were discarded and/or burnt in natural or humanly induced site-clearance fires. A few stones were found during the surface survey which appeared to show signs of having been used as pounders.

The offshore fish traps were the only direct evidence of technology related to animal procurement. If artefacts used to procure food were made out of bone, shell, stone or clay, it is likely that some evidence of them would have been found in the excavated deposits, but no fish hooks, bone points or similar tools were found. There appeared to be very little evidence of Islander technology in the deposits, except the abundant fragments of angular rock that may be the remains of earth ovens. Chips of vein quartz were recovered which could have been used for cutting purposes, hafted or perhaps on their own, and a piece of pumice with striations on one side might possibly have been used as a smoothing instrument (Figure 35b). A ground cylindrical piece of shell was also recovered, apparently a fragment of the original artefact, but with no obvious function (Figure 24b).

The surface survey yielded more abundant technological remains, including several pieces that appeared to have been worked. They consisted of a) three pierced fragments of pearlshell; b) two (possibly three) fragments of shell adze and one of a stone adze; c) four fragments of ground shell, three of which were pierced; d) six worked hinge fragments of pearlshell; e) an elongated and pointed flat stone with ground and smoothed edges, half of a large stone with ground edges, and half of a large cobble with a bifacially ground and battered edge; f) a large cobble flake unifacially worked with a battered edge; and g) a few vein quartz cores, flakes, chips and igneous flakes (Figures 24, 30–35 and Table 2). In the absence of specific local ethnographic information it was impossible to deduce the precise functions of most of these artefacts or to infer the technology used to exploit any of the animal species the remains of which were found.

The most parsimonious general interpretation of the composition of the raised-midden accumulations at Goemu was that they were areas of refuse discard. However, their morphological characteristics and density across the surface of the site suggested alternative or additional interpretations when mid- and late-nineteenth century accounts of western Torres Strait and the Haddon *Reports* were considered. Mabuyag is referred to in several of the nineteenth century accounts, but it is the information in the Haddon *Reports* which – even though it was recorded at the end of the nineteenth century after European influences had brought about many changes – provides the most valuable insights into the traditional way of life and material culture of the island, including references to Goemu and the other four 'old villages', all of which were also associated with ceremonial *kod* sites. Our archaeological reconnaissance of Mabuyag and three of the offshore islets indicated that the most extensive and highest density of midden remains were at Goemu, although we also found abundant and morphologically diverse surface accumulations of remains at Dabangay. In the next section we consider the relevance of the ethnohistorical information contained in the Haddon *Reports* and earlier nineteenth century accounts to an overall interpretation of Goemu's highly distinctive archaeological signature.

THE SOCIOECONOMIC SIGNIFICANCE OF THE ARCHAEOLOGICAL REMAINS AT GOEMU

The availability of ethnohistorical information about Mabuyag in the nineteenth century allowed more refined interpretation of the socioeconomic significance of Goemu than could be inferred from the archaeological remains alone, but it also introduced greater interpretative ambiguity. For example, the *kod* sites were generally open spaces 'permanently set apart for ceremonial purposes' but they 'also could be made temporarily wherever there was a "camp"' (Haddon, 1904: 365) and such everyday activities as cooking, eating and sleeping took place near them. This close association of *kod* sites with general living areas made it very difficult to distinguish archeologically between remains derived from ceremonial and non-ceremonial (mundane) activities, even though various types of constructed features (see below), some of which could leave archaeological traces, were associated with *kod* locations.

Other interpretative ambiguities arose from the Islanders' versatility in the use of certain types of natural (unworked) objects such as shells and stones. *Bu* shells (*Syrinx aruanus*) were sometimes used in ritual contexts (e.g. at the Pulu *kod*, Figure 6) but also as water containers and cooking pots, and unaltered stones and other types of shells were recorded as having both domestic and ceremonial uses such as pounders and 'gods'. Nor did food remains provide unambiguous archaeological signatures of either ceremonial or everyday domestic activities because – although some foods were eaten at *kod* sites by men only, such as dugong and turtle during totemic-taboo ceremonies associated with the first catches of the hunting season – the remains also represented refuse from ordinary non-ceremonial meals. However, although it was not feasible generally to distinguish ceremonial refuse from that of daily life, it did prove possible to relate several of the surface archaeological features at Goemu to rituals recorded as having taken place there.

As well as our discovery of the location of the *wiwai*-stone shrine (see above) and hence the area where the turtle-increase ceremony was held, there were other possible examples of close correspondence between the ethnography of ceremonially significant features (none recorded as having been located in a *kod*) and their archaeological presence. The most compelling such example related to the platform-ridge complex in Goemu III. The surface survey showed that, in addition to its unique morphology, it was the only midden deposit on which there were visible turtle remains. Fragments of turtle carapace are quite robust and if discarded at Goemu they would probably have survived, so this observation was unexpected. Examination and analysis of the platform-ridge deposits excavated (Squares M on the platform, GH and T on the two ridges) and in the adjacent level areas (Squares E and Y), as well as the stratigraphy of the test pits, demonstrated that turtle remains were an abundant internal component of the deposits (and were also present in the mounds although in relatively small quantities). The fact that turtle remains were only apparent on the surface of the platform-ridge complex suggested a possible relationship to one of the ceremonial structures described by Haddon (1904: 330-331): the *agu*. *Agu* were long bamboo platforms covered with coconut-palm leaves on which the heads and shells of turtles were placed and around which men danced swinging bullroarers, before and after turtle hunts during *surlal*, the season of the copulating turtle (Figure 70a). Before setting out men swung bullroarers over and round the canoe to bring success in the hunt (Figure 70b). At Goemu each canoe was represented by its own *agu* so, archaeologically speaking, there could have been traces of several on the site, not only on the platform but also perhaps on the adjacent ridges and also – although we did not find turtle remains on the surfaces of either – on the two linear middens in Goemu I and II.

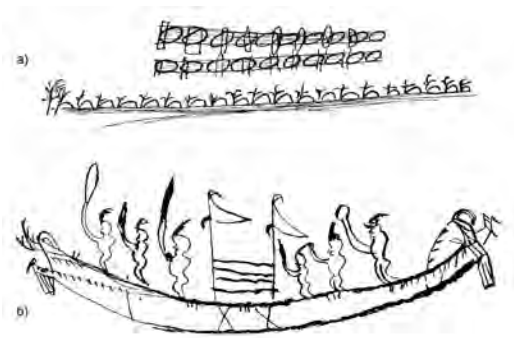

FIG. 70. Drawings by Mabuyag Islanders (from Haddon 1904: 331) of a) a turtle platform (*agu*) seen from above and one side, b) a canoe turtle ceremony at Goemu.

Although not apparent on the surface at Goemu, turtle remains were a dominant component of all the subsurface midden deposits examined, whereas dugong remains were present on the surface and were also abundant in the excavated and sampled subsurface deposits. The prevalence of dugong remains on the surface suggested that there may have been a relationship between the raised midden features and dugong hunting, although (unlike the turtle ceremonies) there is no mention in the Haddon *Reports* of dugong ceremonies at Goemu. There are however many references in the nineteenth century accounts of the western Torres Strait Islands to the use of dugong remains in contexts unrelated to hunting, which suggested that they may have had more general significance as symbols of power and/or strength. Although the archaeology alone suggested no more than that the dugong and turtle remains represented refuse from cooking and eating, references in the ethnohistorical accounts to 'ceremonial' or 'spiritual' features referred to as 'shrines' state that they were often piles and arrangements of the remains of animals that provided food – precisely what we observed at Dabangay and on Pulu, Woeydhul and Kuykusoegay islets as well as at Goemu.

There are only a few references in the ethnographic accounts to the functions of such midden features. Some are described as cairns or lookout points related to hunting and usually located on hillsides or cliffs; others are associated with ceremonial activities at *kod* sites or to burial practices. The midden features at Goemu were too low and too numerous to have served as lookout points, but (in addition to the *wiwai* and *agu* ceremonies already mentioned) it seemed possible that the many mounds we observed might have been 'shrines' symbolising some sort of power or magic related to hunting, to warfare or, possibly, to individual men. It also seemed plausible that some of the features might be related to human burial and/or to honouring the dead. For example, Haddon (1904: 368) stated, when referring to Kuyam's cairn above Goemu on the crest of a hill overlooking Pulu islet, that there was formerly 'a custom of erecting a memorial cairn independently of [a] grave'.

CONCLUSION

The insights derived from the ethnographic evidence, which suggested that some at least of the midden features at Goemu had ceremonial importance, raised the question of whether all the remains on the surface should be interpreted as having had ritual significance. Although we could not establish when the many mounds, the platform-ridge complex and the two other linear middens had been constructed and whether they were contemporaneous, it seemed likely that at least some of them had been the sites of ceremonies. However, despite the wealth of information about the social contexts of settlement and subsistence on Mabuyag contained in the Haddon *Reports* and the other nineteenth century accounts, which analysis of the archaeological remains alone could not reveal, we were, with few exceptions such as the turtle-increase ceremonies already mentioned, unable to postulate with confidence the precise nature of the ritual significance of most of the midden features. Nor could we determine from the ethnohistorical sources whether the clans of Mabuyag used Goemu mainly seasonally or year-round or to what extent the remains represented refuse generated by a single clan or by multi-clan events – questions of direct relevance to interpretation of the abundance of midden deposits across the site.

The opportunities we were kindly afforded by the people of Mabuyag in 1984 and 1985 to visit the island and study in particular the remarkable 'old village' site of Goemu demonstrated both the limitations of the knowledge that could be gained from the archaeological remains and the insights into their former socioeconomic significance that could be derived from the ethnohistorical sources and the testimonies of present inhabitants. The archaeological evidence from the mounds, surface scatters and subsurface horizons of fragmentary, weathered and charred midden remains yielded direct and indirect information about the foods eaten and thus the habitats exploited, methods of food preparation and cooking, types of technology, exotic materials indicative of external contacts, and the extent and duration of occupation of the site. But without the insights into past economic activities, ceremonial practices and social organization afforded by the unusually rich nineteenth century ethnographic data contained mainly in the Haddon *Reports*, inferences from the archaeological evidence would have been largely restricted to aspects of subsistence and settlement. The possibility of integrating archaeological and ethnographic evidence from Mabuyag, and in particular Goemu, offered a unique opportunity to develop a more holistic approach to understanding the past than 'midden archaeology' had usually afforded.

It is very pleasing that our initial attempts over 25 years ago to investigate the site and try to understand its economic and social significance have since been followed by the more sophisticated and comprehensive programme of research at Goemu by Ian McNiven and his colleagues. As a result, our conclusion that some at least of the many midden features we recorded at Goemu were ritual sites (as well as depositories of domestic refuse) has been greatly reinforced. This applies particularly to the dugong bone mounds, which McNiven *et al*. now refer to as 'specialized ritual bone mounds' and have dated on Mabuyag and Pulu to within the past 400–500 years. That this phenomenon at Goemu is part of a more widespread tradition of ritualized marine midden formation in Torres Strait is now evident (McNiven, 2013; McNiven and Feldman, 2003; McNiven and Wright, 2008), but it is perhaps most clearly expressed, and now most fully studied, at Goemu, which might justifiably be regarded as the 'type site' of ritual midden-mound formation and research.[18]

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APPENDIX 1. GOEMU MOUND DATA.

Mound #	Rocks	Pumice	Large land snail	Milky quartz	Clear quartz	Coral	Dugong	Turtle	Fish
1	✓				✓		R, H, M, SA, V		V
2a	✓			✓			R, S, H		V
2b	✓			✓			R		
3				✓			R		
4							R, V		
5				✓			R, V, SA, M		
6				✓			R		
7							R		
8				✓			R, M		
9				✓			R, M		
10a				✓			R, M, H, S, P		V
10b				✓			R, P, V		
11				✓			R, S		V
12							R		
13							R		
14							R, LB		
15				✓		✓	R, S, V		
16				✓			R, SA		
17				✓		✓	R		
18							R		
19				✓			R, V		
20				✓			R		
21				✓		✓	R, M, H, V		
22				✓			R, V		
23							R		
24						✓	R, M, V, F		
25							R		
26				✓			R		
27				✓			R, M, S		
28							R		
29				✓			R, V		

Glass	Ceramic	Metal	Hortizontal Dimensions (m)	Comments
✓			6.1x7.1	
			2.0x1.6	
			-	Relatively light midden surface scatter
			1.6x2.1	Very small
W, C		sink stopper	2.7x2.7	Tree in
BN			9.4x4.7	double
			2.6x2.4	Tree in
B, G, W			2.5x2.2	Coconut tree in middle
G, W			3.4x3.8	Collected bivalve. Coconut tree depression
G, BN			1.6x1.4	With coconut tree
G			4.2x3.8	Interesting stone material
G, B			-	Midden scatter
G, B			2.4x2.3	Nice pink smooth stone
G			3.0x3.5	
			2.5x2.1	Coconut tree depression
		✓	2.2x2.9	Very flat, hardly a mound
W			2.3x4.2	Large stones surround, depression in middle, pink quartz collected
			2.6x2.1	Very flat, battery, yucca plants
			1.8x2.2	Small, slightly raised and discrete. Cone shells to collect
			1.0x1.1	Very small, flat, spread out
G			4.9x3.6	Large, relatively high, oblong, relatively discrete
			1.9x1.5	Small with yucca plants
W, G			2.4x2.6	Flat, rocky, discrete
G		can	3.1x3.0	Flat, depression in middle, ?bivalve & ?gastropod collected
G		tin	2.4x2.6	Small, very stony
G			2.9x2.9	Relatively high and discrete. ?gastropod collected
			2.2x2.4	Flat and spread out
BN			2.8x2.1	Relatively high and discrete. Depression in middle.
G			22.2x4.3	End of ridge, large flat and spread out. ?bivalve collected.
			2.7x2.7	Relatively high and discrete
			2.4x3.0	Depression in middle

Appendix 1. cont.d

Mound #	Rocks	Pumice	Large land snail	Milky quartz	Clear quartz	Coral	Dugong	Turtle	Fish
30			✓	✓			R, M, P, V		
31			✓			✓	R, S		
32									
33							R		
34			✓	✓			R		
35			✓	✓			R, S		
36a							R		
36b							R		
37							R		
38			✓			✓	R, S, H, M		
39						✓	R, M		
40				✓			R, M		
41			✓			✓	R, P, M		
42							R, P, M		
43			✓				R, M		
44			✓				R		
45a			✓	✓			R, M		
45b							R, M		
46				✓			R, M		V
47			✓			✓	R, M, V		
48			✓	✓		✓	R,M		
49			✓			✓	R, M, S		
50			✓			✓	R, M, S		

Glass	Ceramic	Metal	Hortizontal Dimensions (m)	Comments
			3.5x2.8	Large, flat, discrete. Depression in middle. *Dibi dibi*, cone shell, bivalve collected
			3.4x4.8	Large, relatively discrete. Coconut tree in the middle
			2.2x2.7	Not very high, discrete. Stone circle and ~10 *bu* shells.
			2.3x2.5	Coconut tree in middle. Not much material
			1.6x2.0	Small, discrete, flat. Stone surround
			2.9x2.8	Large, flat, discrete. Coconut tree depression
W			3.5x3.1	Relatively flat, very rocky. Large coconut tree depression
W			-	Relatively high and discrete. Lots of rocks. Coconut tree depression
			2.6x2.6	Not much on the surface. Coconut tree depression
			3.8x3.5	Large, high, discrete. Large stones. ?bivalve
			3.2x3.5	Medium, relatively flat and discrete. Not much material
			3.2x4.0	Relatively high, discrete. Nice smooth ½ stone collected. Not much material
			1.7x1.3	Very small, not very high with lots of stone but not much else. ?bivalve collected
			1.6x1.8	Small and relatively flat and discrete, not much material
			1.6x1.4	Very small, primarily stone and dugong bone
			1.7x0.8	Small, very flat, not much material, one *bu* shell
			3.6x3.3	Large, relatively flat and discrete, primarily stone and dugong bone
			-	Small, attached to Mound #45a, primarily stone and dugong bone
			4.1x4.2	Large, high, discrete, not much material, ?bivalve collected
			2.1x2.4	Relatively discrete, flat. Primarily bone and stone, disturbed
			2.8x3.1	Relatively high, discrete, not high diversity, ?bivalve collected
			1.6x1.4	Very small, many stones, pierced pearl shell fragment
			2.1x2.1	Relatively medium height, discrete, primarily stone and dugong bone

Appendix 1. cont.d

Mound #	Rocks	Pumice	Large land snail	Milky quartz	Clear quartz	Coral	Dugong	Turtle	Fish
51			✓			✓	R, M, V		
52			✓			✓	R, S		
53				✓		✓	R, M, S, V		
54				✓		✓	R, M, F		
55							R, M, S		
56							R, V		
57				✓			R, S		
58							R, S, SA, M, H, V		
59							R, P		
60				✓		✓	R		
61							R, S, V		
62				✓			R, S		
63				✓			R, S		
64							R		
65			✓				R, V		
66									
67							R, S		
68	✓	✓		✓			R		
69	✓	✓		✓			R, S		V
70	✓	✓		✓		✓	R, M, O		
71			✓	✓	✓		R, P		J
72	✓			✓			R, V		

Glass	Ceramic	Metal	Hortizontal Dimensions (m)	Comments
			2.2x2.2	Relatively high, small, discrete, ?gastropod collected
			2.2x2.1	Mostly surrounded by stone, primarily stone
			5.2x4.1	Large, high, discrete
			4.1x4.6	Large, high, discrete, oblong, much on surface, primarily stones and dugong bones
			2.2x1.6	Discrete with coconut tree in the middle
G			3.5x3.5	Kuyam's Landing Place, primarily stone. ½ smooth red & yellow stone, dugong rib, *bu* shell fragments, bailer
			0.9x1.8	Coconut tree, ?gastropod collected, not much material, flat
			-	On slope, not a mound but a dense scatter, much dugong bone
			-	Flat, not a mound, ?bivalve collected
BN			2.9x2.4	Relatively high, round, discrete. Collected object with holes
			1.8x1.6	Live coconut tree, hardly distinct accumulation, primarily stones and a few bones
			2.9x2.4	Between 2 coconut trees, relatively flat and discrete, not much material
			1.1x1.6	Live coconut tree, hardly a mound, slightly more recognisable than Mound #61
			2.8x8.9	Long, flat, not a mound, fine midden deposit, little surface scatter, coconut tree depression, see Test Pit #14
			1.9x2.1	Not a mound, small surface accumulation, *Tellina* shell collected
W, BN			1.6x1.4	Primarily dugong, very comminuted, possibly complete skeleton because of bone density
BN			2.9x2.5	Coconut tree depression, relatively large, flat and discrete. Bivalve and gastropod collected
			3.1 x3.0	Live coconut tree, primarily *Anadara*, one large stone
BN			2.5x 2.7	Discrete and relatively high, much stone
			2.8x3.0	Large 1/3 *bu* shell in centre. Collected 2 x *Pinctada* sp. ?artefacts
		Bullet shell	3.2x2.8	Discrete, collected stone artefact and *Turbo* shell
			-	Large, spread out. Human bones.

Appendix 1. cont.d

Mound #	Rocks	Pumice	Large land snail	Milky quartz	Clear quartz	Coral	Dugong	Turtle	Fish
73				✓			R, V		
74			✓	✓		✓	R, M		
75							R, M, P, S		
76							R, M		
77				✓			R, M		V
78				✓			R, S, H, V		V
79				✓			R, M, S		
80				✓			R, M, S		
81							R, M		
82							R, M, S		
83							R, H, M, V		
84				✓		✓	R, S, O		
85							R		
86				✓			R, V, H, V		
87							R, M, H (immature)		V
88							R		
89							R, M, P, O		V
90							R, M		
91							R, M, V, SA, O		

DUGONG BONE: R = rib, V = vertebrae, M = mandible, P = phalange, S = skull, SA = scapula, H = humerus, LB = long bone, F = femur, O = ossicle, J = jaw

GLASS: W = white, C = clear, G = green, B = blue, BN = brown

Glass	Ceramic	Metal	Hortizontal Dimensions (m)	Comments
			-	High, large, discrete. 2x *Pinctada* artefacts?
			2.0x2.6	Discrete, high. *Pinctada* artefact?
			2.0x2.3	Large, flat, dispersed
			1.8x1.7	Small, flat, discrete, primarily *Chama*.
			1.8x3.1	Smooth stone fragment
			3.2x3.0	Coconut tree in middle
			2.2x3.2	Low, flat, discrete
			1.5x1.7	Small, flat, on minor slope
			1.7x1.8	Small, flat, on minor slope
			1.8x0.8	Dugong bone scatter, termite nest
BN	?		3.3x3.6	Large, high, discrete. Collected *Tellina* shell
			2.9x3.0	Large, discrete, relatively high
			1.6x2.5	Live coconut tree, very weathered comminuted bone, little other material
			3.4x3.5	Large, high, discrete
			1.8x1.8	½ excavated
			2.2x1.9	Flat, discrete, almost all rocks, little dugong. Collected *Hippopus* fragment
			-	Flat, not a mound, barely discernible
			-	Flat with 5 large stones. Collected shell? fragment
G			-	Flat, long, not really a mound. Collected smooth-ended stone

APPENDIX 2. GOEMU MOUND SHELL OCCURRENCE

Mound #	Paphies	Tellina	Chama	Chiton	Monodonta	Nerita	Asaphis	Pinctada	Spondylus	Turbo	Cypraea	Trochus	Strombus	Melo amphora
1	✓	✓	✓		✓	✓	✓	✓		✓?		✓		✓
2a	✓		✓		✓	✓		✓		✓		✓		✓
2b	✓	✓	✓			✓	✓			✓				✓
3	✓	✓	✓										✓	✓
4	✓	✓	✓		✓	✓							✓	✓
5	✓		✓				✓					✓	✓	
6	✓		✓	✓		✓					✓			
7			✓			✓	✓	✓					✓	✓
8	✓		✓				✓							✓?
9	✓	✓	✓			✓				✓				
10a	✓		✓	✓		✓	✓							
10b	✓		✓			✓					✓	✓		
11	✓		✓			✓								✓
12	✓		✓			✓								✓
13	✓					✓								✓
14	✓					✓						✓		✓
15	✓		✓		✓	✓			✓	✓		✓		✓
16	✓		✓			✓								✓
17	✓		✓		✓	✓				✓		✓		
18	✓		✓		✓	✓								✓
19	✓		✓			✓						✓		✓
20	✓		✓		✓	✓				✓		✓		✓
21	✓		✓		✓					✓			✓	✓
22	✓		✓		✓	✓	✓			✓				✓
23	✓		✓		✓	✓	✓							✓
24	✓		✓			✓	✓				✓	✓		
25	✓		✓			✓								✓
26	✓		✓			✓								✓
27	✓	✓	✓		✓	✓	✓			✓				✓
28	✓		✓			✓								✓
29			✓			✓							✓	✓
30	✓	✓	✓			✓	✓							

Murex	Cerithiidae	Tridacna	Pleuroploca	Melo umbilicatus	Syrinx	Lambis	Nautilus	Pinctada margaritifera	Hippopus	Anadara	Polymesoda	Terebralia	Gafrarium
			✓	✓				✓	✓	✓	✓	✓✍	
					✓	✓			✓		✓	✓	
								✓		✓	✓	✓	
		✓										✓	
									✓	✓	✓		
		✓			✓					✓	✓	✓	
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		✓						✓		✓	✓	✓	
										✓	✓		
		✓									✓	✓	
					✓			✓	✓				

Appendix 2. cont.d

Mound #	Paphies	Tellina	Chama	Chiton	Monodonta	Nerita	Asaphis	Pinctada	Spondylus	Turbo	Cypraea	Trochus	Strombus	Melo amphora
31	✓		✓			✓	✓					✓		
32	✓												✓	
33	✓		✓			✓							✓	✓
34	✓	✓	✓			✓	✓						✓	
35	✓	✓				✓							✓	
36a	✓		✓			✓					✓			
36b						✓							✓	
37	✓													✓
38		✓												
39	✓	✓	✓			✓	✓							✓
40		✓				✓						✓		
41						✓								
42							✓							✓
43														✓
44	✓	✓												
45a	✓													
45b														✓
46	✓					✓						✓	✓	✓
47	✓					✓								
48	✓					✓								
49	✓													
50	✓	✓												
51	✓					✓	✓							✓
52	✓		✓			✓								
53	✓	✓	✓			✓	✓							✓
54	✓					✓	✓					✓	✓	✓
55	✓	✓				✓							✓	✓
56												✓		✓
57	✓		✓			✓	✓							
58	✓		✓	✓		✓								✓
59	✓	✓	✓			✓								
60	✓		✓			✓					✓			✓
61	✓			✓										
62	✓					✓								
63	✓													✓
64	✓					✓								

Murex	Cerithiidae	Tridacna	Pleuroploca	Melo umbilicatus	Syrinx	Lambis	Nautilus	Pinctada margaritifera	Hippopus	Anadara	Polymesoda	Terebralia	Gafrarium
			✓		✓					✓	✓	✓	
					✓					✓			
					✓				✓	✓		✓	
			✓		✓						✓	✓	
					✓				✓		✓		
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					✓					✓	✓	✓	
		✓			✓			✓			✓	✓	
										✓			
					✓						✓		
							✓				✓	✓?	
					✓					✓	✓	✓	
											✓	✓?	
											✓	✓	
											✓	✓	
											✓	✓	
												✓	

Appendix 2. cont.d

Mound #	Paphies	Tellina	Chama	Chiton	Monodonta	Nerita	Asaphis	Pinctada	Spondylus	Turbo	Cypraea	Trochus	Strombus	Melo amphora
65	✓	✓				✓								
66													✓	
67	✓		✓			✓	✓							✓
68	✓		✓			✓								✓
69	✓		✓		✓	✓	✓				✓			✓
70	✓	✓	✓	✓	✓	✓	✓	✓						✓
71	✓	✓	✓		✓	✓	✓			✓				✓
72	✓		✓			✓								
73	✓		✓		✓	✓			✓		✓			✓
74	✓		✓	✓	✓	✓	✓				✓			✓
75	✓		✓			✓								✓
76	✓	✓	✓									✓		
77	✓		✓		✓		✓							
78	✓	✓	✓	✓	✓	✓								✓
79	✓		✓			✓	✓							
80	✓		✓		✓	✓								
81	✓		✓		✓									
82	✓		✓		✓	✓				✓		✓		✓
83	✓	✓	✓			✓			✓	✓				✓
84	✓		✓				✓				✓		✓	✓
85														✓
86	✓		✓		✓	✓		✓				✓		
87	✓		✓		✓							✓		✓
88	✓		✓			✓								
89	✓	✓	✓		✓	✓	✓							
90	✓		✓			✓				✓				✓
91	✓		✓		✓	✓						✓		

Murex	Cerithiidae	Tridacna	Pleuroploca	Melo umbilicatus	Syrinx	Lambis	Nautilus	Pinctada margaritifera	Hippopus	Anadara	Polymesoda	Terebralia	Gafrarium
											✓	✓	
		✓			✓						✓		
										✓	✓	✓	
											✓	✓	
		✓	✓		✓		✓	✓		✓	✓	✓	
								✓	✓	✓	✓	✓	
					✓			✓		✓	✓	✓	
					✓			✓		✓	✓	✓	
										✓	✓	✓	
					✓					✓	✓	✓	
			✓		✓								
								✓		✓	✓	✓	
		✓			✓			✓		✓	✓	✓	
											✓	✓	
										✓	✓	✓	
					✓							✓	
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APPENDIX 3. GEOMU TEST PIT DESCRIPTIONS

Test pit #	Surface description	Excavation description
1	Fine grey sand with charcoal flecks and grass fragments probably from recent burning. No shell, bone or stone visible.	Very little midden material. Five stones, three shell fragments (all *Chama*) and 10 bone fragments at 10-15cm below surface only. Charcoal within upper 10cm. Sediments grade from lighter brown to yellowish brown with depth. Hard to determine transition to basal sand but probably occurs at 55-60cm depth. No distinct pumice layer.
2	A moderately dense scatter of stones, shell (*Anadara*, *Chama*, *Paphies*) and bone fragments (mainly dugong). All material hand collected and bagged.	Midden material abundant to 40cm depth. Transition to basal beach sand at 45-50cm – this 5cm layer contains much pumice and a few bone fragments, very light in colour (yellowish brown). One whole valve of *Anadara*.
3	A thin scatter of small fragments of shell and bone, plus two whole *Paphies*. And three small stones. Matrix a mix of minute shell and stone fragments interspersed with grey brown soil and charcoal fragments. Material culture collected and bagged.	Midden material abundant to 45cm, soil matrix blackish brown to that depth, then slightly lighter brown to 50-55cm; from 55-60cm (bottom of pit) transition to the yellow-brown basal beach sand with pumice.
4	Thinly scattered midden debris consisting of small shells and shell fragments (mostly *Paphies*), a few small bone fragments and scattered stones; similar to Test Pit #3 but more stone and shell. Grey-brown soil and charcoal fragments.	To 35cm – matrix contained very few large midden fragments, then to 55cm [pit base]. Dark brown horizon from surface to c.30cm in the west and east sides but to 40cm on the south side (towards the 'platform' crossed by the 25cm excavation trench). Abrupt transition from dark to light sand (especially compared with Test Pits #2 and #3). Very few large bone and stones recovered, a few pieces of pumice at 35cm.
5	About 50% of the surface has a scatter of midden debris, mainly bone but also some stone and shell. The other 50% consists of dark brown soil matrix, small grass tussocks and a scatter of charcoal. All bone, shell and shell collected and bagged.	0-10cm with very little midden debris with bottom at 75cm. Main midden layers to 35cm in west, east and south sides and to c.55cm in north side. Rocks of *kup mauri* size and small bone fragments and a small amount of shell. Although pit was located at northern edge of the main midden 'platform' it contained surprisingly little midden material. From 35-50cm light brown more sandy soil replaced the darker midden soil and first pumice at 35cm on the south side. On the north side the transition layer and lighter brown [soil] less distinct at ~55-65cm [but] at 50cm over most of pit. One whole *Andara* at 50cm and quartz from 40cm (bagged separately).

Appendix 3. cont.d

Test pit #	Surface description	Excavation description
		The difference in the level of the transition to basal sand between the north and south sides (15cm) suggests that the midden 'platform' and its associated two midden ridges (MRI and MRII) may rest on a higher sand (old dune?) surface of the original beach.
6	A dense scatter of mainly small fragments of bone, stone and shell. Matrix of dark brown soil. Material collected and bagged.	Top 30cm very dark midden soil with stones, bone fragments but very little shell. 0-30cm dense bone/stone accumulation. Transitions to lighter [coloured soil] at 30cm, more shell here – two *Chama* bagged. Excavated to basal at 50-55cm – no pumice concentration found, almost none in pit.
7	A dense scatter of mainly small fragments of bone, stone and shell and quite abundant (c.25). Little matrix. Collected.	Dark brown to light ~17cm. First 15cm less bone than Test Pit #6, ~more shell but small. Pumice at 20cm. 30-35cm more abundant. First beach sand at 30cm. Two pockets of charcoal bagged together. Third pocket 42-50cm. Transition 35 to max. 50cm, average 45-50cm.
8	A dense scatter of stone, shell and bone, overall larger than Test Pits #6 and #7. Pumice.	Very compact bone etc on top 5cm midden – dark brown midden soil with *kap mauri* size stones, bone, shell down to 30cm – decrease pumice at 30-35cm. Sandier grey-brown soil to 50cm. First hit bedrock south wall of pit. Excavated to 50-60cm. Northern edge junction of bedrock, 2cm veneer of beach sand, possibly old beach edge on bedrock. South wall of pit at base soil is darker than along other sides, no beach sand.
9	A thin scatter of pumice on a light grey sandy matrix with very little bone and a few small shell fragments.	Top 15cm is medium brown humic soil that is sandier at 15-25cm. At 25cm is pumice down to 40cm – pumice is abundant throughout. No midden material.
10	A medium dense scatter of small fragments of stone, bone, pumice and shell. Three quartz flakes.	Excavated to 45cm. Top 25cm is medium brown soil with sparse midden debris – more shell than in other pits, less stone, pumice, bone fragments small and sparse. 25-30/33cm lighter brown sandier soil [then] yellowish basal beach sand. On this surface [30-33cm] patches of grey/black ashy colouration – some charcoal in sides of pit, possibly northern margin of an area of human activity.

Appendix 3. cont.d

Test pit #	Surface description	Excavation description
11	A medium dense scatter of small fragments of stone, pumice, bone and shell in a matrix of medium brown soil.	Excavated to 50cm. Top 20cm is medium brown soil with sparse midden material and little bone, shell, and more stone (smaller). 20-25cm is lighter. At 25cm abrupt change to 7-8cm layer of whitish beach sand with a dense (10cm) layer of pumice; below more white sand with charcoal flecks in between white sand lenses above and below pumice. From an old burnt surface?
12	Nothing collected.	First 20-23cm is dark brown soil with small amounts of midden material. ~25cm lighter brown sandier soil. At 25-28cm abrupt change down to 50cm with very few pumice [pieces].
13	A scatter of small pieces of pumice, small stones, small fragments of bone and shell, matrix of medium brown soil. Collected and bagged.	Excavated to 50cm. First 35cm is medium brown soil with abundant, relatively large fragments of bone, *kap mauri* sized stones, and a small number of shells. From 35-45cm soil is lighter brown and sandier at 45cm. There is a transition to yellowish basal beach sand with roots. Pumice at 40cm, not a distinct horizon.
14	Covered with fine beach sand, shell fragments with a scatter of small pumice [pieces], bone fragments and small stones.	Excavated to 50cm. No midden material. Upper 17-20cm is medium brown sandy soil with many fine grass roots [to] 20-30cm. Lighter brown sandier soil [from] 27-30m. 50cm is light basal sand, rocks.
15	Obscured by grass. Removal [revealed] *kap mauri* stones.	Excavated to 40cm. Top 20cm abundant midden material – bone, stone, less shell (all medium size), dark matrix. Lighter at 20cm to 30cm. At 30cm gradation to yellowish white basal sand.
16	Dense scatter of very small marine shells and shell fragments, medium brown soil with wood and charcoal fragments, small bone, stone, no pumice. Collected.	Excavated to 50cm. Top 17cm is light brown sandy soil almost no midden remains, five bone fragments, three shell fragments and one stone small. 17-30cm lighter brown sandier. At 30cm yellow-white [soil] with a few stones. Profile looks ‘natural’.

ENDNOTES

1. In Harris's (1979: 91) paper the figure of 600 is proposed, but due to a proof-reading error it is incorrectly given as 300 in Table I on p. 90 which, ironically, accords with Mullin's more plausible estimate.
2. This section is based on the descriptions of sites and features previously given in Harris & Ghaleb (1987: 27-34) and Ghaleb (1990: 147-170).
3. The correct taxonomic name of this species is now *Bambusa bambos* (L.) Voss which takes priority over the synonym *Bambusa arundinacea* (Retz.) Willd. (Xia & Stapleton 1997) (see also McNiven, 2008: 453-454).
4. This section is based on the accounts previously given in Harris & Ghaleb (1987: 7-12, 19-20) and Ghaleb (1990: 179-210).
5. This and the following main section of the paper are based mainly on Ghaleb (1990: 213-235) and for the radiocarbon sub-section also on Harris & Ghaleb (1987: 15-19).
6. All the surfaces of the squares excavated or sampled for stratigraphy, and the surfaces of the test pits, were described subjectively in the field, without quantification, as covered with a light, moderate or dense scatter of midden remains.
7. This section of the paper is based mainly on Ghaleb (1990: 235-300).
8. Much of the identification of the animal remains was carried out at the Institute of Archaeology in London by reference to modern comparative specimens that we had collected in Torres Strait.
9. Two complete skeletons, one mature and one immature, had been deposited in 1978 at the back of the beach just south of St Paul's village on the east coast of the island of Mua, and left there until 1984 when an Islander offered to show them to us and allowed us to collect the remaining bones. As much as possible of the immature skeleton was recovered, and representative elements were taken of the mature one.
10. Identification of the butchery marks was carried out by Ghaleb on the basis of her previous research on superficial damage to archaeological bone (Ghaleb, 1983).
11. Without experimental replication of butchery marks on dugong and turtle bone using stone, shell and metal tools, or SEM examination of the possible butchery marks, their identification must remain tentative.
12. This part of the midden deposit is best described as an agglomerate; i.e. tightly packed bits of bone, shell and stone, so much so that it was not possible to excavate by trowel and instead fine picks and brushes were used.
13. The other species are the West Indian manatee (*Trichechus manatus*), the West African manatee (*T. senegalensis)* and the South American manatee (*T*. *inunguis*).
14. Bustard (1972: 90) states that the hawksbill is seldom eaten in northern Australia because the flesh is poisonous, at least at certain times of the year, and that in the New Guinea region deaths have resulted from eating it. He says most Torres Strait Islanders avoid the flesh for this reason but that those who do eat it claim it is safe if the poisonous parts are removed before cooking.
15. The absence of members of these three families from the archaeological samples is not surprising on account of their small size (some between 8 and 10 cm in length) and the fragility of their bones.
16. However, only one pierced valve was found, and it is stated in mid- and late-nineteenth century ethnographic accounts and reported by Haddon (1912: 159) that the Western Islanders did not use fishing nets.
17. This and the following section of the paper are based mainly on Ghaleb (1990: 301-309, 373-379).
18. That ritual dugong-bone mounds are not associated only with Torres Strait has been shown by the recent discovery of one of Neolithic age on the coast of the Oman Peninsula at the southern end of the Arabian Gulf (see Méry *et al*., 2009).