

ATTITUDES OF ABORIGINAL SKELETONS EXCAVATED IN THE MURRAY VALLEY REGION BETWEEN MILDURA AND RENMARK, AUSTRALIA

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Abstract

The attitudes of burial of 72 skeletons excavated at seven sites in the Murray Valley in Victoria between Mildura and the S. Australian border and at one site at Lake Victoria, N.S.W., are described. The antiquity of the burials in Victoria is from 4,000 to 6,000 years B.P. Orientation varied widely, but the head was placed predominantly in a S. direction. Orientation at Lake Victoria was random, and the burials were comparatively recent. Extreme tooth wear to a helicoidal plane of occlusion was frequent. A unique burial with a widow's cap in place on the head is described. Cranial types are illustrated by reference to eight skulls. Methods of removing complete skeletons as they lay *in situ* are described.

Introduction

During 1967-69 the authors excavated Aboriginal skeletons in the general area which would have been inundated upon construction of the Chowilla dam some 30 km upstream from Renmark on the Murray River in S. Australia. Human skeletal remains were found widely distributed between Wentworth, N.S. Wales and the S. Australian border (Fig. 1), but the majority excavated came from eight burial sites.

The modes of burial and attitudes of these skeletons together with their antiquity and related matters are the subject of this paper.

Burial Sites

Of the eight burial sites concerned, seven were S. of the Murray River in Victoria and one was on the NE. side of Lake Victoria in N.S. Wales. The locations of the burial sites are shown in Fig. 1 and details of the individual sites are plotted in Figs. 2-3.

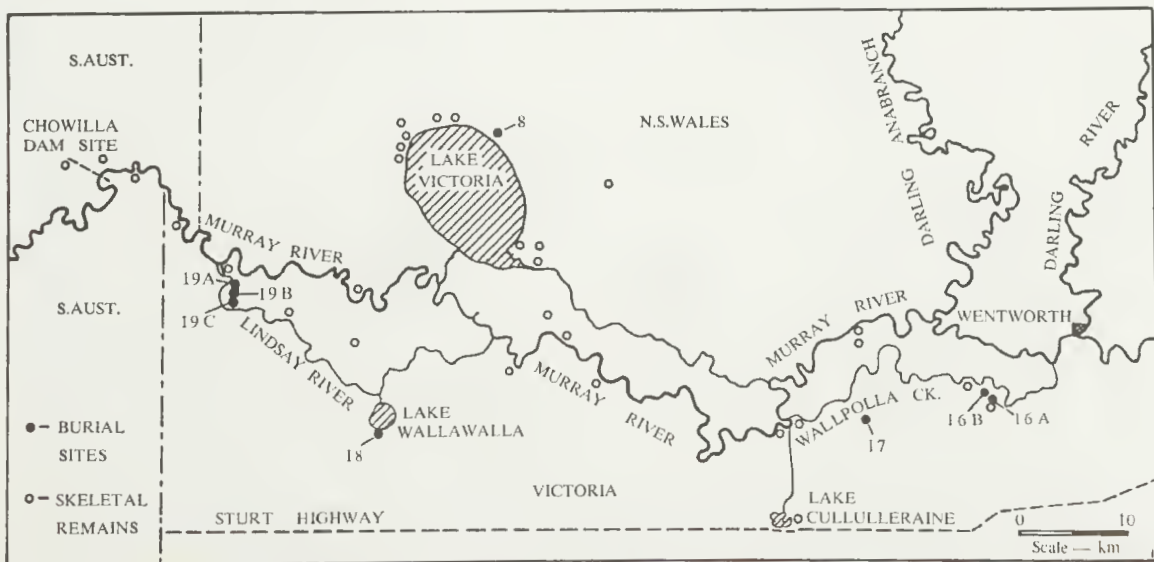


Fig.1—Location of human skeletal remains in and bordering on the proposed Chowilla inundation area on the River Murray, and locations of the burial sites examined.

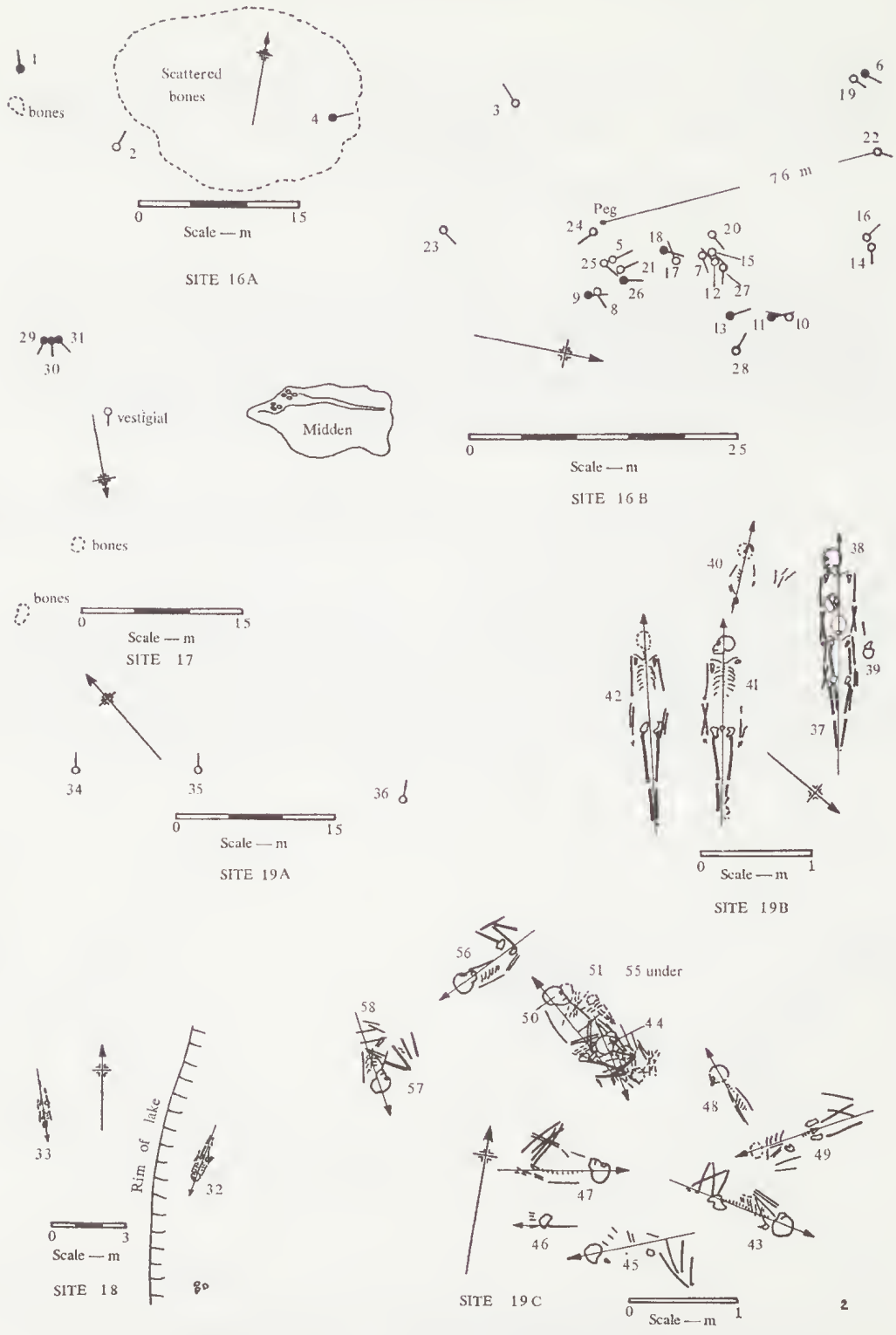


Fig. 2—Plans of burial sites 16A-B, 17, 18, 19A-C.

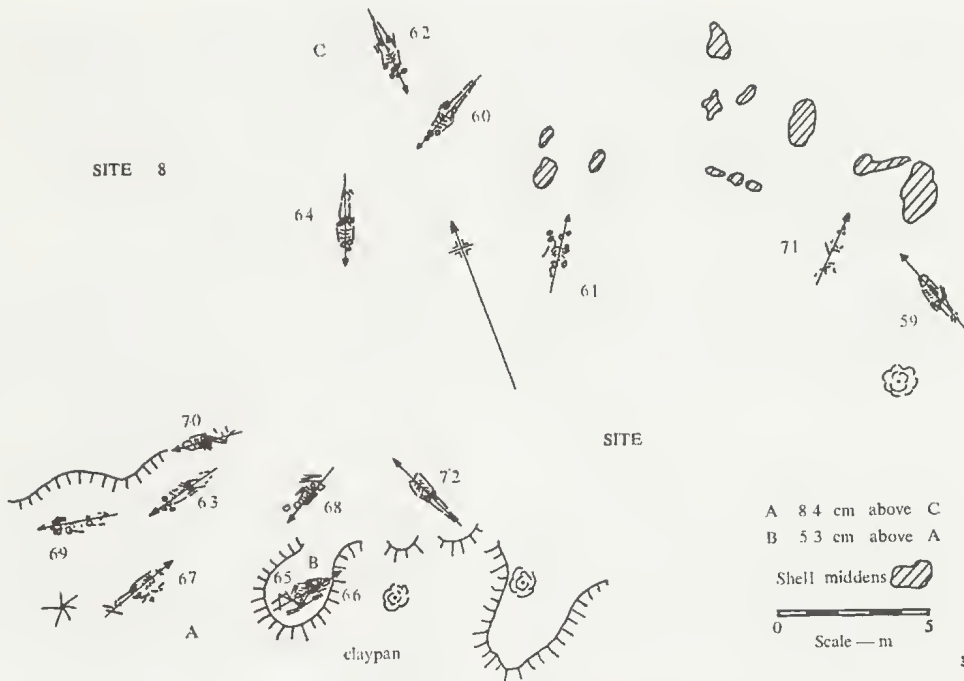


Fig. 3—Plan of burial site 8.

Victorian Sites

The seven Victorian sites are referred to by co-ordinates from the Australian Army Survey (1:250,000) Mildura map SI-54-11, Ed. 1, Ser. R 502.

Site 16A. Grid reference 482,779. The site is in the Lybra Paddock of Keera Station. It is portion of a fluvatile terrace, somewhat eroded, partly in a bend of the Wallpolla Creek, almost surrounded by a belt of Black Box (*Eucalyptus largiflorens*) and Murray Pine (*Callitris preissii*) with *Mesembryanthemum* flats. The sediments are lightly compacted.

The burials were located in the SE. portion of a sand rise. The skeletons recovered were adjacent to an eroded area covered with scattered bone fragments, indicating that a number of other skeletons had previously been exposed by wind action, disintegrated and scattered. Four skeletons (Nos. 1-4) were excavated, and their relative positions are shown in Fig. 2. The orientation of the bodies is indicated by a line and the head by a circle. A solid circle indicates that a cranium was present while an open circle indicates absence.

Site 16B. Grid ref. 481,780. The site is in the NW. portion of the same terrace area. Beneath yellow sand is a firm red sand which forms the surface at the NW. boundary of the area. Here 24 skeletons were excavated (Nos. 5-28) and their positions are shown in Fig. 2. The main group of skeletons was concentrated adjacent to our marker peg and were buried in the yellow sand. Those located well away from the marker peg to the NW. (Nos. 6, 14, 16, 19, 22) were buried in the underlying red sand.

To the SE. of the marker peg, and some 30 m from it, a well-defined midden of mussel shells (*Velesunio ambiguus*) was exposed on the surface. Approximately 6 x 12 m and 2-5 cm thick, the thickest portion formed a NS. ridge along the length of the midden. Near the S. end were pieces cemented by secondary carbonate. No artefacts were found in the midden. There were small scattered areas of shell and burnt clay in the area surrounding the site.

Site 17. Grid ref. 469,777. The site is a residual of a Pleistocene fluvatile terrace (named Rufus Formation by Gill, this *Memoir*) in dune-like form located in Brown's Paddock on Keera

Station. It is bordered on the N. by a thin belt of Black Box and surrounded by Sapphire and *Mesembryanthemum* flats. A loose red sand surface is underlain by a red hardpan. The skeletons excavated were buried in this hardpan, a red sand compacted by clay skins. The hardpan above the skeletons was exposed by wind and water erosion.

Three closely-grouped skeletons (Nos. 29-31) were excavated. Scattered bones indicated two burials nearby and the skeleton of a child was still discernible in partial section on the surface of the hardpan. The site plan is shown in Fig. 2.

Site 18. Grid Ref. 419,777. The site is at the extreme S. of Lake Wallawalla on the Lindsay River floodplain. Two skeletons only (Nos. 32-33) were excavated and portions of the cranium of a third were collected loose on the surface nearby. The skeletons were located in a fine grey clayey sand at the lunette rim of this dry lake. The soil was tightly bound and the bone surfaces were hardened by secondary carbonate. The larger scale of Site 18 in Fig. 2 allows the skeletons to be shown in outline.

Site 19A. Grid Ref. 404,792. The site is a small channel border dune associated with the Lindsay River system located at the W. end of Lindsay Island on Berribee Station. This dune, of loose red sand, is considerably wind-eroded. Three skeletons (Nos. 34-36), partly exposed and scattered by wind erosion, were excavated. Their relative positions are shown in Fig. 2.

Site 19B. Grid Ref. 404,791. The site is located on a channel border dune approximately 1,000 m long running N-S on Lindsay Island, Berribee Station. The dune is part of the Lindsay River system in the bend where that river runs N. to rejoin the Murray River near the S. Australian border, and is surrounded by Red Gum (*Eucalyptus camaldulensis*), Black Box and Tea-Tree. A high ridge runs the full length of the dune. The W. side of the ridge is grassed, but the E. side is a sand blow. The excavation site was approximately midway along the ridge immediately under the crest in the sand-blown area. Six closely spaced skeletons (Nos. 37-42) were excavated in loose yellow sand (Fig. 2).

Site 19C. Grid Ref. 404,790. The site is located S. of Site 19B on the S. end of the same dune. Sixteen skeletons (Nos. 43-58) were excavated in loose yellow sand. Two distinct levels of burial were noted and the skeletons were disposed in random fashion (Fig. 2).

New South Wales Site

Australian Army Survey (1:250,000) Ana-branch map SI-54-6, Ed. 1, Ser. R 502.

Site 8. Grid Ref. 431,607. The site lies on the E. border of the Lake Victoria lunette (Fig. 1) in the fine red sand of an exhumed paleosol. The paleosol surface itself has been subject to some wind and water erosion. The general level of the burial site was 30 m above the level of Lake Victoria.

Fourteen skeletons (Nos. 59-72) were excavated. Associated with the burials were concentrations of dispersed mussel shells of no significant thickness. A plan of the site is shown in Fig. 3.

Description of Excavated Skeletons

In the following descriptions the terms right and left refer always to the right hand and left hand sides of the skeletons. The terms superior and inferior, proximal and distal, medial and lateral are likewise used in the anatomical sense. The terms over and under, above and below refer to the positions of skeletal elements as they lay in the grave.

The dentition is indicated by the formula:

UR 87654321	12345678	UL
LR 87654321	12345678	LL

where UR means upper right; UL means upper left; LR means lower right and LL means lower left. The upper line refers to the upper teeth reading from the right side of the palate (UR) to the left side of the palate (UL). The lower line refers to the lower teeth from the right side of the mandible (LR) to the left side of the mandible (LL). The numbers refer to the following teeth:

1—medial incisor	5—posterior premolar
2—lateral incisor	6—first molar
3—canine	7—second molar
4—anterior premolar	8—third molar or wisdom tooth

The formula is used simply to indicate the presence of a *complete* tooth (when its corresponding number appears) or the absence of a *complete* tooth (when its corresponding number is replaced by a hyphen). Remarks on evulsion, tooth wear, the degree of eruption of third molars and other particular features of the teeth are additional to the dental formula.

The orientation of the skeleton was determined for each burial and is expressed as the *true* bearing of a line representing the general alignment of the body in the direction of the head. In extended burials this directional line generally coincides closely with a line connecting the feet with the centre of the cranium. In flexed burials it represents the approximate centreline of the trunk disregarding the position of the legs. The orientation line is given in all drawings.

The orientation line was marked over each skeleton by stretching a cord horizontally between pegs clear of all skeletal remains. Coordinates were measured along the cord from a zero reference point on it, horizontally at right angles to it and vertically below it for all points required to locate the skeletal elements. From these measurements, and from photographs of the skeletons, the drawings of Figs. 4-17 were made. The drawings are not intended to show anatomical detail but to show the attitude of the skeleton and the disposition of its bones.

In most cases a plan is adequate to show the attitude of burial. In three cases (Skeletons 4, 26, 44) both a plan and an elevation are necessary. In one case (Skeleton 2) no plan was necessary, side and front elevations being sufficient.

The skeletal elements of Figs. 4-17 are identified as follows: Sc—scapula; Cl—clavicle; P—pelvis; H—humerus; R—radius; U—ulna; F—femur; T—tibia. Right arm and leg bones have the prefix R. Left arm and leg bones have the prefix L.

All the skeletons excavated have been numbered consecutively in this paper for ease of reference. The skeletal material has been deposited in the National Museum of Victoria and the registered numbers are recorded with

the prefix NMV. In addition the number assigned to each skeleton in the Chowilla Project field notes is recorded with the prefix CHA.

SITE 16A, SKELETONS 1-4.

Skeleton 1. NMV X72799, CHA 14. Fig. 4

A supine extended burial, head lying on the right side, body straight, arms extended alongside the body with the hands inferior to the pelvis, feet together. The bones were generally in good condition. When found, the cranium was emerging from the surface and had been crushed on both temporal regions, probably by ambulating sheep. The feet had also been exposed and some of the distal bones had been dispersed. The balance of the skeletal material was covered by 5-15 cm of soil. The skeleton was 178 cm long measured from the estimated position of the underside of the heels to the top of the cranium.

The cranium was reasonably complete and has been largely reconstructed (Fig. 20). The mandible was separated from the maxillae by some 2-3 cm.

Dentition:

UR 87654321	12345678 UL
LR 87654321	12345678 LL

All teeth were fully erupted in both mandible and maxillae. Teeth large, wear moderate and even. Upper medial incisors 0.94 cm wide at the occlusal edge.

Rib cage substantially intact, with manubrium and sternbrae present but somewhat eroded and displaced. Both clavicles complete. Both scapulae substantially complete. Head of left humerus eroded. Hands complete. All vertebrae present except atlas and axis, well preserved.

The pelvis was nearly complete but fragmented, and has been reconstructed. Sacral vertebrae fused except S1 and S2. Sub-pubic angle 55°. Clearly male. Symphysis pubis with dorsal margin clearly defined and surface bevelled ventrally. Probable age 26-30.

Leg bones largely complete but with some erosion at the ends. Feet complete except for some distal bones. Orientation 160°.

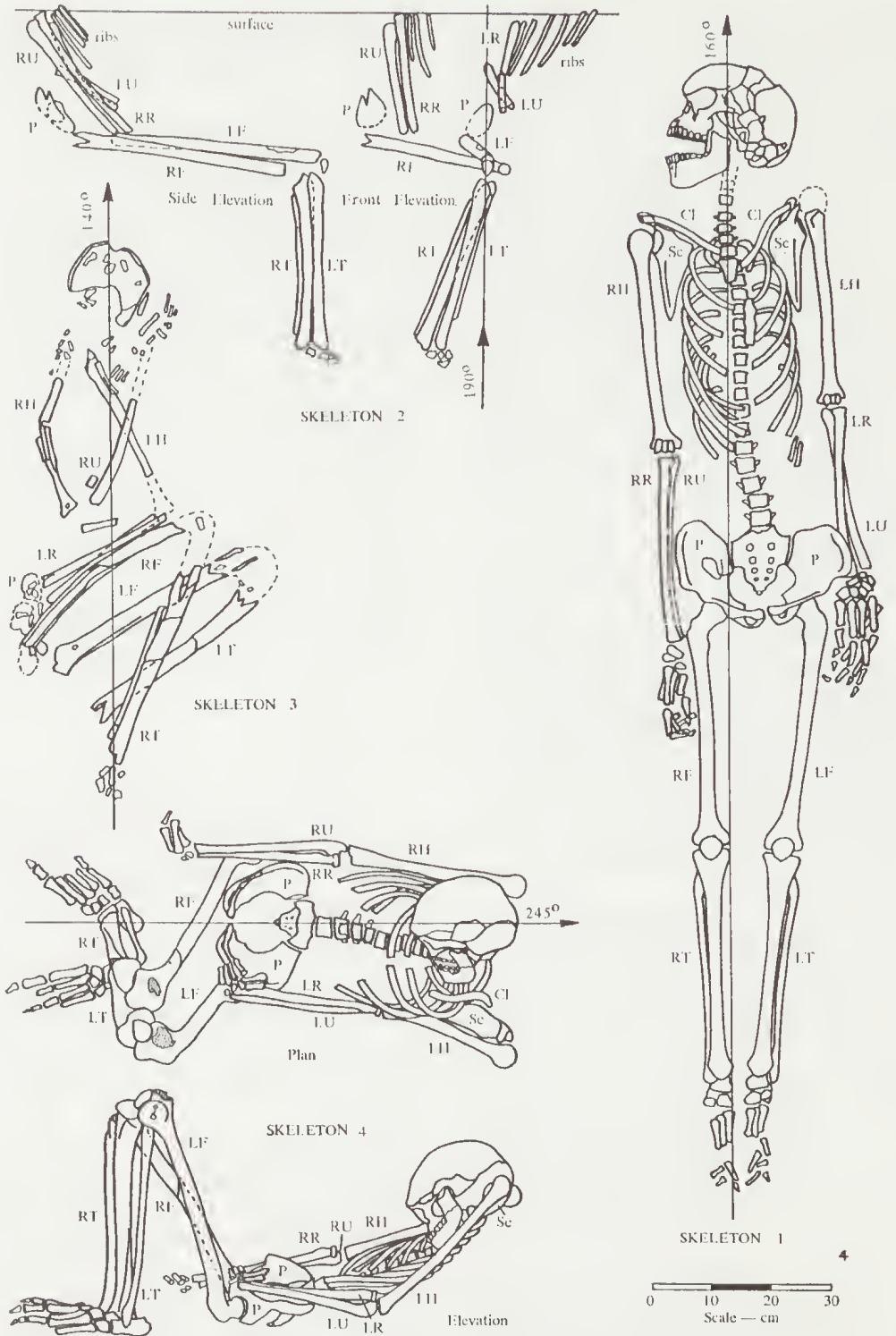


Fig. 4—Burial attitudes of Skeletons 1-4, Site 16A.

Skeleton 2. NMV X72800, CHA 31. Fig. 4.

A sitting burial of a most unusual kind. The body had been buried as if seated on a bench with the femora substantially horizontal, the tibiae and the thorax substantially vertical. Wind erosion had lowered the surface after burial exposing the cranium and shoulder bones, which had been dispersed and destroyed. When excavated, the ground level intersected the thorax some 23 cm above the hip joints at about the level of the elbows. The lower arm bones were in place together with a few pieces of rib and two vestigial iliac bones. The femora were contiguous at the knees, the left femur resting on the right, with the left tibia crossing over in front of the right tibia so that the right and left foot bones were in their correct lateral relationship. The leg bones were considerably eroded at the ends. The feet were buried at a depth of 61 cm below the existing ground surface. Orientation 190°.

The leg bones of this skeleton were used for radiocarbon dating and gave an age of 5,900 ± 550 years B.P. (GaK-1430).

Skeleton 3. NMV X72801, CHA 28. Fig. 4.

A flexed burial lying on the left side. The body was buried immediately below the existing surface. The cranium had emerged and been eroded away, leaving only fragments and a portion of the left temporal and parietal regions. These were sufficient to determine the position of the head at burial. The upper arm bones were incomplete, much eroded and broken, but clearly showing that the arms had been folded across the chest with the hands adjacent to the head. No thoracic bones or vertebrae present. Vestiges only of pelvis present. Leg bones much eroded, particularly at the ends. Knees drawn well up, superior to the pelvis, with the right leg bones resting on the left leg bones. Orientation 140°.

Skeleton 4. NMV X72802, CHA 103. Fig. 4.

A reclining supine burial with knees together and drawn up so that the femora and tibiae were almost vertical, inclining slightly to the left side. Feet extended and flat, as if placed on a horizontal surface at the same level as the

pelvis. The depth of burial from knees to heels was 43 cm. Right arm extended alongside the thorax with the hand inferior to the pelvis. Left arm extended alongside the thorax but flexed in the vertical plane with the hand resting on the pelvis. The bones were generally well-preserved.

Cranium slumped forward and inclined to the right with the mandible resting on the thorax. Maxillae crushed a little and the mandible broken on the right side due to lateral pressure.

Dentition:

UR 8765432-	-2345678 UL
LR 87654321	12345678 LL

The upper medial incisors have been evulsed. The teeth were moderately and evenly worn.

Rib cage largely complete but collapsed ventro-dorsally. Vertebral column complete. Pelvis and sacrum intact. Sub-pubic angle 55°. Definitely male. Feet and leg bones complete. Orientation 245°.

After excavation this skeleton was treated with 'Aquadhere' *in situ* by the method discussed below and was brought intact to the National Museum in Melbourne where it has been preserved complete for display.

SITE 16B, SKELETONS 5-28.

Skeleton 5. NMV X72803, CHA 74. Fig. 5.

A fully extended burial with the body in a straight line lying on the right side. The left tibia and a section of the roof of the skull were exposed on the surface before excavation. Surface erosion and scattering of exposed bones had removed the bulk of the left side of the cranium, the teeth, the left humerus and the left side of the rib cage. The right arm bones were eroded but fairly complete with some right hand bones inferior to the pelvis. Pelvis vestigial. The proximal half of the left femur was absent but the leg bones were otherwise fairly complete. The right knee was ventral to the left knee, but the right tibia crossed under the left tibia so that the right foot was dorsal to the left foot and was lying sole upwards. The estimated height was 170 cm. Bone con-

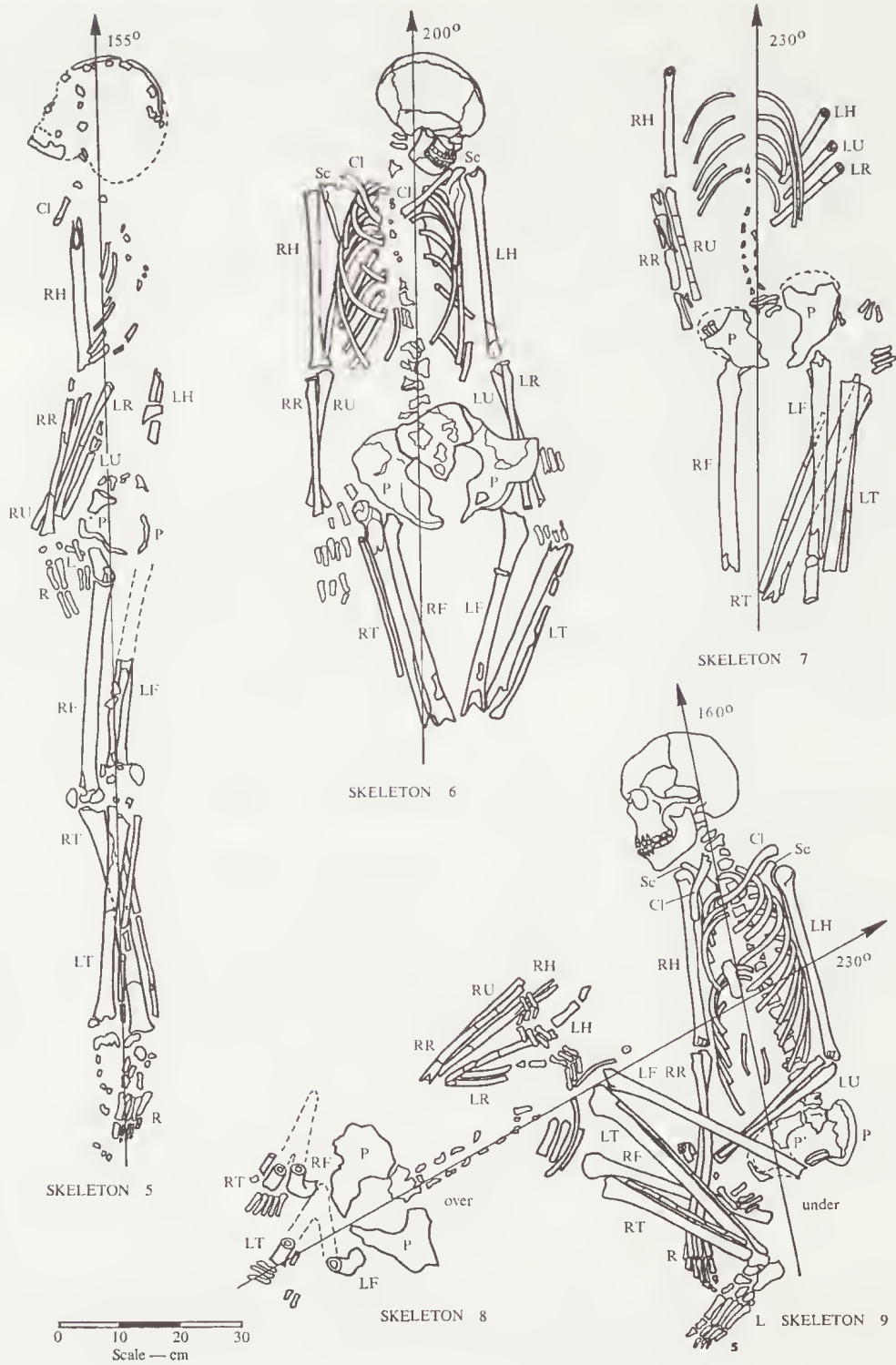


Fig. 5—Burial attitudes of Skeletons 5-9, Site 16B.

dition good. Skull bones up to 1.2 cm thick. Orientation 155°.

Skeleton 6. NMV X72804, CHA 69. Fig. 5.

A supine flexed burial with the head inclined to the left. Femora extended in the plane of the body with the knees contiguous. Tibiae flexed sharply back almost parallel with the femora, the feet being adjacent to the pelvis.

The cranium was substantially complete and lay on the left side with the chin resting on the left shoulder.

Dentition:

UR 87654321	12345678	UL
LR 8—54321	12345678	LL

The clavicles and scapulae were almost complete. Rib cage and vertebral column fragmentary. Arms extended alongside the body, the lower left arm passing beneath the pelvis, the hands inferior to the pelvis. The pelvis was eroded but nevertheless well-delineated.

Femora and tibiae considerably eroded at the ends. A few foot bones were located in the pelvic region. Orientation 200°.

This skeleton was buried in sand with sufficient clay content to make it set very hard around the bones. Excavation for removal of the bones would have been very difficult. A reinforced concrete slab was therefore cast in sections underneath the burial as described below. The undisturbed skeleton was removed complete and taken to the National Museum in Melbourne where it is on display.

It is difficult to conceive how the lower legs could be flexed back in such close contact with the thighs without some severance at the knee joints and without tying together. However, the movement of the bones during decomposition of the body and settling of the infill may have accentuated the closeness of the bones.

Skeleton 7. NMV X72805, CHA 79. Fig. 5.

A supine flexed burial with the femora extended in the plane of the body and the tibiae flexed back sharply under the femora towards the left side of the body with the feet adjacent to the pelvis.

The cranium and shoulder region had been exposed, eroded away and were not present. A

few rib portions *in situ* with fragmentary vertebrae and sufficient of the eroded iliac bones to define the position of the thorax. Right arm extended alongside the thorax with the hand under the pelvis. Left arm bone portions indicated that the lower left arm was flexed back towards the shoulder with the elbow under the thorax. Leg bones eroded at the ends. A few foot bones were present. Orientation 230°.

Skeleton 8. NMV X72806, CHA 70. Fig. 5.

A supine burial with the legs flexed so that the knees were raised above the plane of the body with femora and tibiae almost vertical. Feet on the same level as the pelvis.

This was a somewhat vestigial skeleton just below the existing surface of the ground. Clearly the original surface at the time of burial was at least 45 cm above that when excavated in order to cover the knees. Erosion appeared to have scattered and removed the cranial and thoracic bones and the major part of the femora and tibiae. The position of the body was defined by the position of the feet, the pelvis and the line of fragmentary vertebrae present. The proximal ends of the femora and the distal ends of the tibiae, although much eroded, clearly defined the vertically flexed position of the legs. Sufficient of the arm bones was present to show that the arms were folded over the chest and that the upper trunk inclined a little to the right. Orientation 230°.

Associated with Skeleton 8 were a single upward projecting right tibia and a fibula, both eroded at the distal end and with no foot. Further excavation revealed Skeleton 9 buried at a lower level than Skeleton 8 and the right tibia and fibula belonged to it. Skeleton 9 was buried subsequent to Skeleton 8 and perhaps the absence of a cranium and upper thorax of Skeleton 8 was due to disturbance of those bones while digging the grave for Skeleton 9. The excavation of the grave for Skeleton 9 must have cut through part of the region occupied by the upper trunk of Skeleton 8. A portion of the right side of a mandible with three teeth in place (lower right canine and premolars, well worn) was found buried with Skeleton 9 but not belonging to it. This was presumed to be a part of Skeleton 8.

Skeleton 9. NMV X72807, CHA 71. Fig. 5.

A flexed burial, the body inclining to the right with the cranium resting on the right side. Right arm extended along the right side of the thorax and passing between the legs. Left arm flexed across the pelvic region with the hand over the pubic area. Left leg flexed superior to the right leg, knees at a higher level than the pelvis and feet. The right foot and the distal end of the right tibia has been exposed at the surface and eroded away. The left foot was complete.

The cranium was almost complete and well-preserved. It was slightly compressed laterally resulting in some fracturing in both temporal regions and some peaking along the sagittal suture for some 5 cm immediately anterior to bregma. This distortion had undoubtedly occurred post mortem as disclosed by displacement along the coronal suture. This distortion tends to accentuate the unusually long and narrow facial aspect. Brows prominent. Wormian bone at lambda. (Fig. 21.)

Dentition:

UR 87654321	12345678 UL
LR 87654321	12345678 LL

The upper medial incisors were very wide, being 1.06 cm wide at the occlusal edge with loss of alveolar bone between their roots. Tooth wear was severe and of typical helicoidal character (Murphy 1964). A portion of the mandible was crushed and disintegrated on the right side. Lower jaw slightly prognathous, mandible deep in front (symphyseal height 4.20 cm).

Clavicles and scapulae well-preserved and almost complete. The majority of the rib cage was present but collapsed ventro-dorsally to a thickness of 5 cm with consequent inferior movement of the ventral surface. Vertebral column fragmentary. Pelvis severely eroded, the vestiges being insufficient to determine the sex although the cranial characteristics were clearly male (Table 4). The right arm bones complete, the right arm being extended along the right side of the thorax and passing between the flexed legs with the right hand complete *in situ* inferior to the legs. The left upper arm extended alongside the thorax with the

lower left arm bones flexed to the right over the pubic region. Only a few bones of the left hand remained. Leg bones eroded slightly at the ends. Right foot eroded away at the surface and scattered. Left foot complete and *in situ*. Orientation 160°.

This skeleton was well-preserved and it extended to a depth of 38 cm below the existing surface. The right hand and left foot were treated with 'Aquadhere' in accordance with the technique described below and were preserved intact as units.

Skeleton 10. NMV X72808, CHA 39. Fig. 6.

A fully extended supine burial. The cranium (except for a few fragments) together with the cervical vertebrae, scapulae and the proximal ends of the humeri had been exposed by erosion of the soil and scattered. A few vestiges of thoracic and lumbar vertebrae and some rib fragments were present. The arms were extended alongside the body with the hands resting over the pubic region. Pelvis fragmentary. Leg bones eroded at the ends. The distal ends of the tibiae were close together. The feet were completely scattered by exposure. There were a few small particles of charcoal associated with the skeleton. Orientation 0°.

Radiocarbon dating of the bones gave the age as 4,170 ± 200 years B.P. (GaK-1432).

Skeleton 11, immediately below Skeleton 10 and in contact with it, was revealed during excavation. The head lay beneath the distal portion of the left femur of Skeleton 10 with the body oriented 170°.

Skeleton 11. NMV X72809, CHA 45. Fig. 6.

A supine burial. No leg bones were present and it was not possible to determine whether the burial was extended or flexed.

The cranium was substantially complete, the supraorbital ridges smooth, the mandible complete. (Fig. 21).

Dentition:

UR -765432-	-2345-7- UL
LR 8-54321	12345-8 LL

Tooth wear was extreme. Lower right and left first and second molars were evidently lost at an early age since bone regrowth had almost

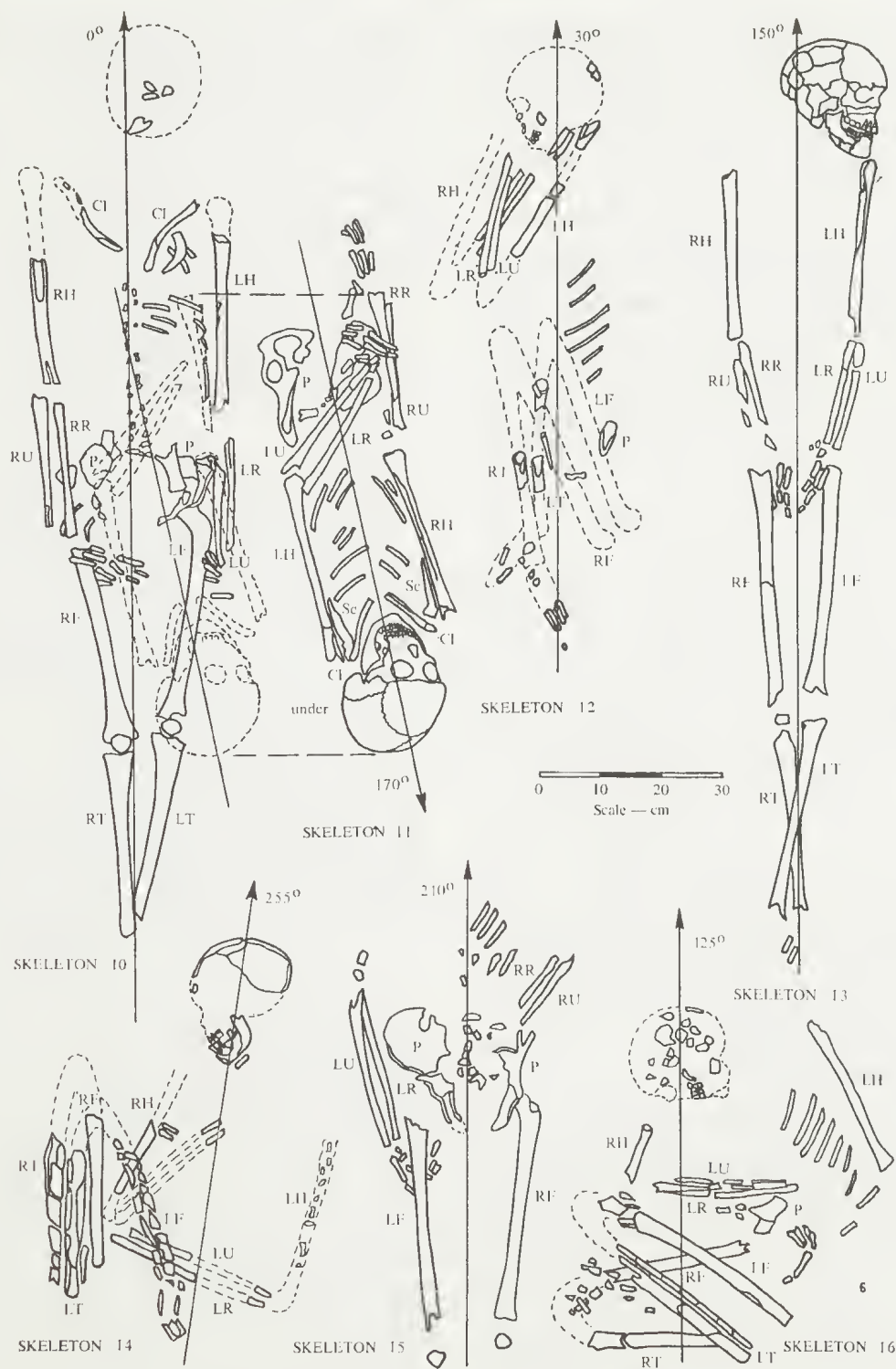


Fig. 6—Burial attitudes of Skeletons 10-16, Site 16B.

completely covered the corresponding root sockets. The remaining lower teeth showed marked helicoidal wear, which again suggests early loss of the molars coupled with fairly advanced age. There was marked cusped wear on the lower right third molar. The upper medial incisors had been evulsed.

Remnants of the scapulae, clavicles and rib cage were present. The right arm was extended alongside the thorax with some hand bones present inferior to the pelvis. The left humerus was extended alongside the thorax with the lower arm bones flexed across the pelvis with some left hand bones resting on the iliac bone. The pelvis was fragmentary but reasonably well-defined. There were no lower limb bones. Orientation 170°.

Radiocarbon dating of bones gave the age as 4,400 ± 220 years B.P. (GaK-1433).

The orientation of Skeleton 11 is so unrelated to that of Skeleton 10 that it appears unlikely that these two bodies were buried contemporaneously in the same grave. The complete absence of leg bones attached to Skeleton 11 suggests that they were removed during excavation of a grave for Skeleton 10. Close contact of the bones supports that view. The edges of the acetabular fossae of Skeleton 11 were sharply defined, implying mechanical removal and not chemical weathering. This skeleton may have been buried in an attitude approximating that of Skeleton 8, i.e. supine but with the knees raised and turned to the left. Finally the evidence of the radiocarbon dates suggests that Skeleton 10 was buried independent of and subsequent to Skeleton 11, although statistically the radiocarbon dates are not significantly different.

Skeleton 12. NMV X72810, CHA 78. Fig. 6.

A very fragmentary skeleton representative of an extreme flexed burial lying on the right side. Only a few fragments of the cranium remained in place, but those, together with three loose teeth in the sand matrix, were sufficient to indicate that the head lay on the right side and was compressed onto the thorax. The arms were folded back against the thorax with the hands adjacent to the head. A few pieces of rib, vestiges of pelvis and fragments

of leg bones and feet were just sufficient to indicate extreme flexure of the legs with the knees drawn up towards the head and brought close to the body. Orientation 30°.

Skeleton 13. NMV X72811, CHA 32. Fig. 6.

A fully extended supine burial with the head resting on the left side. The skeleton consisted of a cranium with moderately prominent brows, laterally compressed and somewhat broken in the temporal regions, together with arms and leg bones only. Upper and lower jaws compressed laterally, broken medially and shattered, but with teeth substantially in place.

Dentition:

UR 87654321	-2345678 UL
LR -7654321	12345678 LL

Very severe helicoidal wear to the pulp and almost to the roots on lower molars on the buccal side.

Arms extended alongside the thorax with both hands over the pubic area. The left tibia crossed over the right tibia at their midpoints. Two small foot bones were present. Estimated height 152 cm. Orientation 150°.

Skeleton 14. NMV X72812, CHA 65. Fig. 6.

A very fragmentary skeleton lying on the right side. Most of the cranium and the superior portion of the thorax had been exposed by soil erosion and dispersed. A few pieces of thin cranium bones (2.3 to 3.0 mm thick) were present and these, together with portions of the mandible with the lower left canine, incisors and third molar in place, and the upper left premolars and first molar embedded in the sand matrix, were sufficient only to delineate the position of the head. Fragmented traces of arm bones showed the right arm flexed back towards the head and the left arm flexed across the pubic region. Fragmented pieces of leg bone showed both legs drawn up sharply in front of the thorax with the left leg resting on the right leg. Clearly an adult with molars fully erupted. Orientation 255°

Skeleton 15. NMV X72813, CHA 52. Fig. 6.

A fragmentary prone burial. No cranium or upper thoracic bones were present except a

few rib fragments. The lower arm bones suggest that the left arm was extended alongside the thorax with the hand beneath the left femur, with the right arm flexed towards the pelvic region. The pelvis was defined broadly by several pieces, and fragments of lumbar vertebrae were present. The femora were extended and eroded at the ends. Both patellae were present. No tibiae or other lower leg or foot bones were present, these having been exposed by surface erosion and dispersed. Orientation 210°

Skeleton 16. NMV X72814, CHA 51. Fig. 6.

A fragmentary flexed burial lying on the right side. Fragments of bone and loose teeth in the sand matrix defined the position of the cranium. A few pieces of rib were present, but no other thoracic bones remained. Left arm flexed over the thorax. Small fragments of pelvis were present. Both legs sharply flexed with the knees drawn well up in front of the thorax. The left leg was above the right leg and the left knee was superior to the right knee. Orientation 125°.

Skeleton 17. NMV X72815, CHA 67. Fig. 7.

An extended burial lying slightly on the right side, with the cranium lying on its right side, the arms folded over the pelvis and the legs slightly flexed toward the right.

Cranium well-preserved, substantially complete, slightly compressed laterally. Supraorbital ridges smooth, mastoid processes small. Mandible complete (Fig. 21).

Dentition:

UR -765432-	-234567-	UL
LR -7654321	1234567-	LL

The upper third molars were just erupting. The lower third molars were unerupted. Wear slight. Lower incisors crowded (see Sandison, this *Memoir*). Upper medial incisors evulsed. Probable age 20-23 years.

Thorax substantially complete and vertebrae well-preserved. Collapse during decomposition had resulted in the ventral surface moving dorsally and to the right, giving a thickness of rib cage as excavated of 5 cm and a maximum width of 14 cm. Humeri alongside thorax with arms folded across the pelvic regions, hands on

iliac bones. Pelvis incomplete and insufficient to determine sex, but cranial characters are female. (Table 4).

Legs flexed a little to the right, with the left knee resting on the right knee. Feet approximately on the centreline of the thorax. Orientation 185°.

The thorax was treated with 'Aquadhere' using the technique described below and was removed as a unit. Along the line of the body and 5-7 cm above it was a seam of charcoal mixed with sand. The appearance suggested that a series of small branches or wooden stems had burned to charcoal in a narrow trench above the body extending over its full length. There was no evidence of burnt bone in the skeleton. The fire must have been lit subsequent to burial. The skeleton was buried between 22 and 35 cm below the existing surface.

Alongside Skeleton 17 at a level between the existing surface and 10 cm below it was Skeleton 18. The feet of Skeleton 17 lay close to the left lower arm bones of Skeleton 18 in plan, but at a lower level. Skeleton 17 was far better preserved and its position suggested that it was buried subsequent to Skeleton 18 without disturbing it, but there is no firm evidence to support this conjecture.

Skeleton 18. NMV X72816, CHA 66. Fig. 7.

An extended supine burial with the left femur resting on the right femur, the left leg being slightly flexed to the right. A skeleton preserved as traces only.

No cranium, vertebrae or pelvis present. A few pieces of rib only. Arm and leg bones severely eroded at the ends, with only a few foot bones present. Arms alongside thorax. The feet of Skeleton 17 were 8 cm below the left lower arm bones. Left knee flexed slightly and resting on the right knee. Orientation 50°.

Although closely adjacent to Skeleton 17, there did not appear to be any association between the two.

Skeleton 19. NMV X72817, CHA 68. Fig. 7.

A supine burial with legs flexed sharply back to the right.

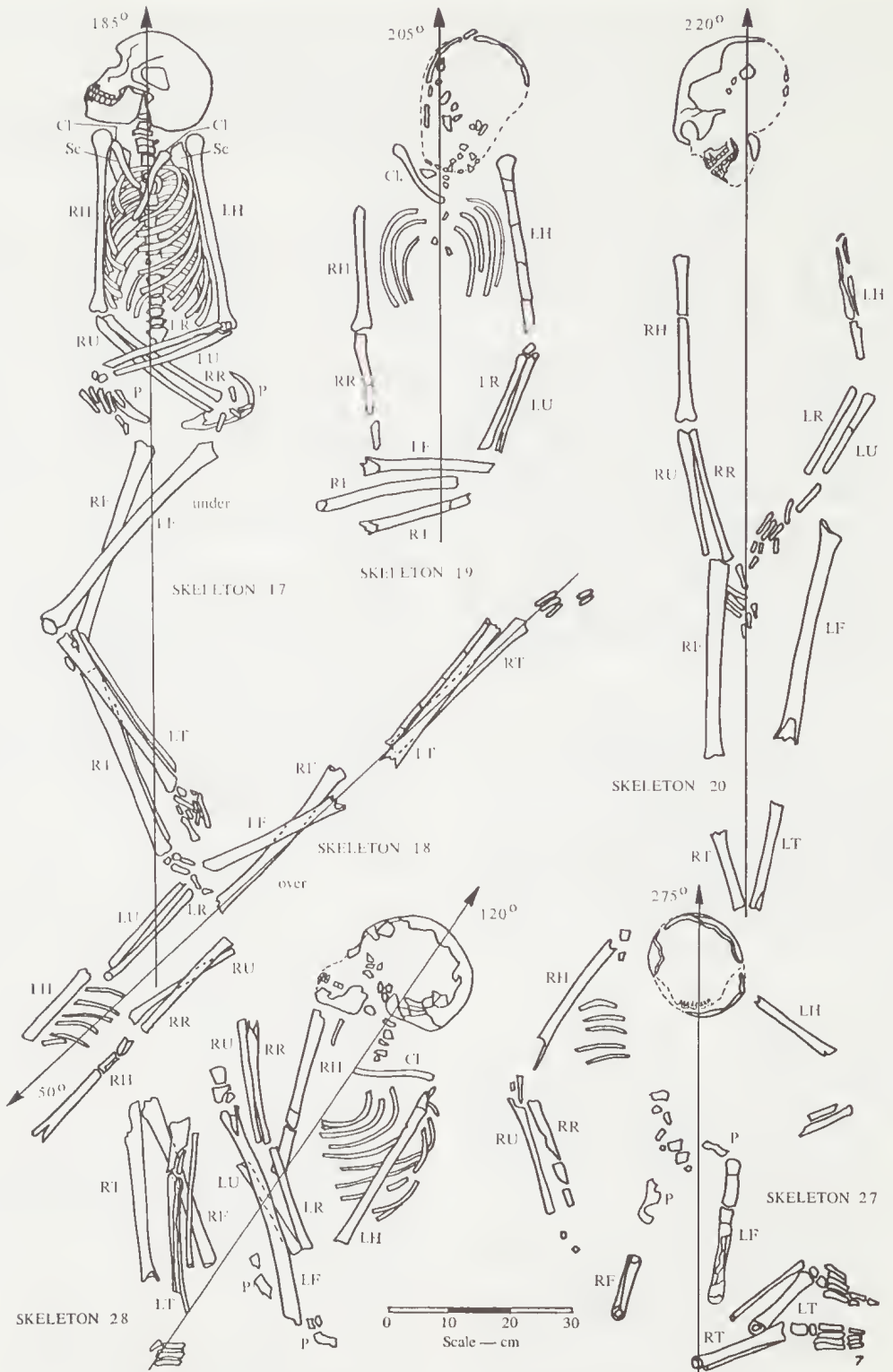


Fig. 7—Burial attitudes of Skeletons 17-20, 27-28, Site 16B.

This skeleton, which consisted of traces only, was located in hard clayey sand. The cranium was substantially eroded due to exposure, but there were sufficient fragments of the cranium to define the position of the head which was slightly on the right side. One clavicle and a few pieces of rib were present. No vertebrae were preserved and there was no pelvis. Both arms alongside the thorax. Femore flexed to the right and at right angles to the body. Only the right tibia was present, flexed sharply back inferior to the femur. No foot bones present. Orientation 205°.

Skeleton 20. NMV X72818, CHA 102. Fig. 7.

A fragmentary extended supine burial.

The cranium was present as fragments and sections only, including the frontal bone showing prominent brows. The mandible was fragmentary. The upper and lower left teeth were held in place by bone fragments and the sand matrix.

Dentition:

UR	————	12345678	UL
LR	————	12345678	LL

Two upper right molars and one lower right molar were present as loose teeth. All teeth were very severely worn to the pulp. The lower left premolars were worn at an angle of 15° and the lower left molars were worn to an angle of 30° from the plane of occlusion sloping downwards labially and leaving only 1 mm of enamel skirt on the molars.

There were no thoracic bones present and no pelvic bones. The arm and leg bones were severely eroded at the ends. The lower arm bones were flexed across the pelvic region with the hands over the pubic area. The tibiae were in contact at the distal ends as if bound together at burial. Orientation 220°.

Skeleton 21. NMV X72819, CHA 80. Fig. 8.

A very fragmentary flexed skeleton. There were no cranial or upper thoracic bones present, these having been dispersed by exposure. The thorax appears supine but the position of the arm bones suggests that the shoulders had been twisted to the left with the right shoulder much superior to the left, and the left arm pass-

ing below the legs. The legs were flexed to the left. The left tibia had been folded back close to the left femur and superior to it, with the left foot over the remnants of the pelvis. The right tibia was not present and the position of the few right foot bones suggests that it had been displaced. Orientation 150°.

Subsequent excavation from Skeleton 21 towards Skeleton 26 indicated that a former rabbit burrow entrance had been situated at the probable position of the cranium of Skeleton 21. This may have been responsible for the disturbance of the head bones. The burrow crossed the lap of Skeleton 26. An asymmetric basal portion of a large fish spine was found in the undisturbed sand immediately adjacent to the right femur of Skeleton 21.

Skeleton 22. NMV X72820, CHA 61. Fig. 8.

A fragmentary flexed skeleton. The body apparently lay on its right side with the lower arms folded back towards the shoulders. The legs were flexed substantially at right angles to the body, the tibiae being folded back in close proximity to the femora with the left leg bones resting on the right leg bones. All bones fragmentary and eroded. Orientation 180°.

Skeleton 23. NMV X72821, CHA 29. Fig. 8.

A very incomplete skeleton extending from the surface down to 15 cm below it. No trace of a cranium was found nor of any pelvic bones and lower limbs. It did not appear as if these elements had been exposed and scattered. It was therefore concluded that the burial represented the trunk only, laid supine with the left arm flexed back towards the shoulder and the right arm flexed across the lower thoracic region. A few small pieces of charcoal lay under the centre of the thorax. In this case the orientation of 22° probably has no real significance.

Skeleton 24. NMV X72822, CHA 73. Fig. 8.

A fragmentary skeleton, apparently buried supine with the legs flexed upwards. Only fragments of cranium were present. There were no thoracic bones. Fragments of the pelvic bones lay adjacent to the proximal end pieces of both femora, the position of which suggested that

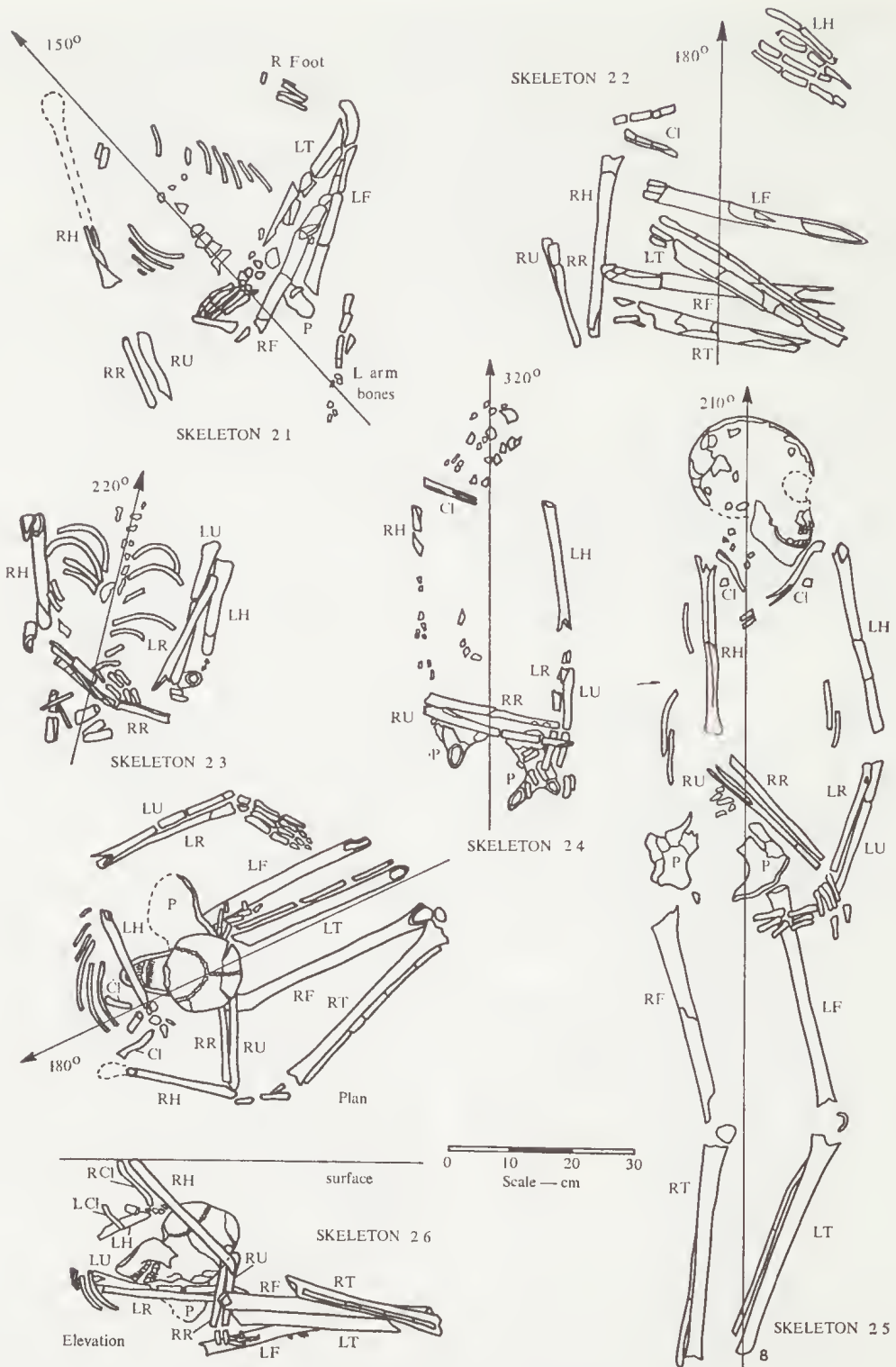


Fig. 8—Burial attitudes of Skeletons 21-26, Site 16B.

the legs were flexed upwards. The remainder of the leg bones had been exposed and scattered. Right arm alongside the thorax with the lower arm flexed across the pelvic area. Left arm alongside the thorax. All bones severely eroded and very fragmentary. Orientation 320°.

Skeleton 25. NMV X72823, CHA 75. Fig. 8.

A fully extended supine burial, head on the left side, legs flexed slightly to the left, hands to the left side of the body. Erosion had exposed the right side of the cranium, which had disintegrated and scattered. The remaining pieces, including substantial portions of the mandible, clearly indicated the position of the head. Four upper incisors were in place as were three lower incisors and one canine. A total of eight molars and eight premolars were found loose. The wear of the teeth was severe. Pieces of clavicle and a few rib fragments defined the position of the rib cage. Left arm alongside the thorax with the left hand resting on the proximal end of the left femur. Right arm slightly over the thorax with the lower arm bones flexed across the body superior to the pelvis, the right hand resting on the left wrist. Pieces of the iliac bones defined the pelvis position. Femora flexed slightly to the left side with the distal ends of the tibiae remaining on the centreline of the body. Feet exposed and scattered. Arm and leg bones fragmented and severely eroded at the ends. Orientation 210°.

The left tibia had a small bone growth 1.5 cm long standing 2.5 mm proud on the anterior border midway between the ends, apparently a periostitic growth consequent upon a blow.

Skeleton 26. NMV X72824, CHA 76. Fig. 8.

A squatting burial with legs flexed, compressed from above.

The body had apparently been buried in a sitting position, as defined by pieces of rib, the clavicles and the position of the proximal ends of the humeri. The arms had been placed more or less alongside the thorax, with the left lower arm and hand alongside the pelvis and left femur, and the right lower arm flexed across the pelvis with the right hand lying over the proxi-

mal end of the left femur. Pelvis fragmentary. Leg bones much eroded at the ends, encrusted with a substantial calcareous layer, but otherwise in good condition. Both femora were placed in a horizontal position extending forward from the trunk, with the tibiae flexed back sharply, so that the feet were in the pelvic region. The leg bones were very closely in one horizontal plane as seen in the elevation drawing (Fig. 8) and this was no doubt due to settlement during decomposition. Evidence of the remarkable degree of vertical compression was the fact that the lowest element of the skeleton was within 32 cm of the surface.

An interesting feature was the position of the cranium. Whatever its original position at burial, it is clear that as the thorax decomposed the cranium sank downwards onto the chest. With continuing decomposition and settlement the chin penetrated the chest cavity and swung downwards and backwards, so that the head finally came to equilibrium with the face in a horizontal plane facing downwards, with the chin to the posterior side of the body and the parietal bones in the anterior position. The cranium was substantially complete except for the supramaxillary region. The elements of the cranium had parted at the sutures and distortion due to their relative movement was considerable, the cranium having been compressed somewhat antero-posteriorly. There was considerable evidence of permanent distortion of some of the cranial elements.

Dentition:

UR 8765432-	-2345678 UL
LR 8765432-	-2345678 LL

The upper medial incisors had been evulsed. The lower medial incisors, although missing from the mandible as teeth, had been broken off post mortem, leaving the roots in the bone. Wear generally moderate, but there was no apparent wear on the two upper third molars. The occlusal surface of the upper left third molar was 3 mm superior to the occlusal surface of the second molar, whose occlusal surface was in turn 3 mm superior to that of the first molar, giving a stepped appearance. The occlusal surfaces of the second and third upper

right molars were at the same level, but were 4 mm superior to the occlusal surface of the upper right first molar. Both the lower third molars stood proud of the first and second molars by 1.5 mm. With this unusual variation in the height of the occlusal surfaces, it is apparent that occlusion between the second and third molars could not occur. The rear molars had fully erupted, but apparently so recently as not to be subject to perceptible wear. Probably age 25 years. Orientation 180°.

Excavation revealed an unoccupied rabbit burrow extending from an entrance at the head position of Skeleton 21 and passing across the lap of Skeleton 26. The burrow passed just beneath the skull. Of interest is the fact that all bones below the burrow position were encrusted with a calcareous layer approximately 1 mm thick. This is apparently of recent origin, possibly derived from the reaction of uric acid and/or other fluids introduced while rabbits were in occupation.

Skeleton 27. NMV X72825, CHA 77. Fig. 7.

A supine flexed burial with the head forced forwards onto the thorax.

In its final equilibrium position the cranium was clearly vertical. The erosion of the ground caused the superior half of the cranium to be worn away and scattered, so that when located, a horizontal section of the skull just above the brow level appeared at the surface. The cranium had been crushed a little vertically. The mandible, located underneath it, was substantially complete, although the inferior part of the cranium had largely been eroded away.

Dentition:

UR -765432-	-2345678	UL
LR -7654321	1-45678	LL

The upper medial incisors had been evulsed. The lower left teeth had been displaced upwards and medial to the upper left teeth as a result of vertical compression. Wear moderate.

A few rib portions with fragmentary vertebrae and pelvic bones were present, just sufficient to delineate the trunk. Arm bones very eroded and fragmented, but clearly alongside the thorax. Femora extended more or less in

line with the body but slightly to the right. Tibiae flexed sharply back to the left with the feet on the left hand side and lying superior to the position of the knees. Leg bones fragmentary, broken and eroded. Orientation 275°.

Although classed as a supine flexed burial, it is possible that the body was placed in the grave in a slightly reclining position which resulted in the forward collapse of the cranium during decomposition.

Skeleton 28. NMV X72826, CHA 35. Fig. 7.

A flexed burial lying on the right side.

Erosion had exposed the left side of the cranium and worn it away so that fragments present were merely sufficient to delineate its position—on the right side and facing right. Small pieces of the right mandible were present with the lower right second and third molars in place in the bone. These two teeth were considerably worn into the pulp, with the roots exposed for 6 mm above the bone. Slight lateral calculus present on the lower edge of the crowns both lingually and labially.

Traces of cervical vertebrae were present, and a few pieces of rib delineated the thorax. Upper arms alongside the thorax with the lower arms folded upwards in front of the thorax. Pelvis extremely fragmented. Femora flexed well up in front of the thorax with the tibiae flexed sharply back against the femora. A few foot bones present. All bones fragmented and severely eroded. Orientation 120°.

Radiocarbon dating of the bones gave an age of 5,350 ± 290 years B.P. (GaK-1431).

SITE 17, SKELETONS 29-31.

Skeleton 29. NMV X72827, CHA 17. Fig. 9.

A flexed burial lying on the right side.

A very much eroded and comminuted skeleton buried in hard red clayey sand. The cranium lay on its right side and had been severely compressed laterally to a thickness of 8 cm, with an overlap at the sagittal suture of 2.5 cm. It had been severely comminuted. The right side of the cranium had been flattened by soil pressure. Mandible substantially complete, but broken at the front and laterally compressed against the right humerus lying immediately

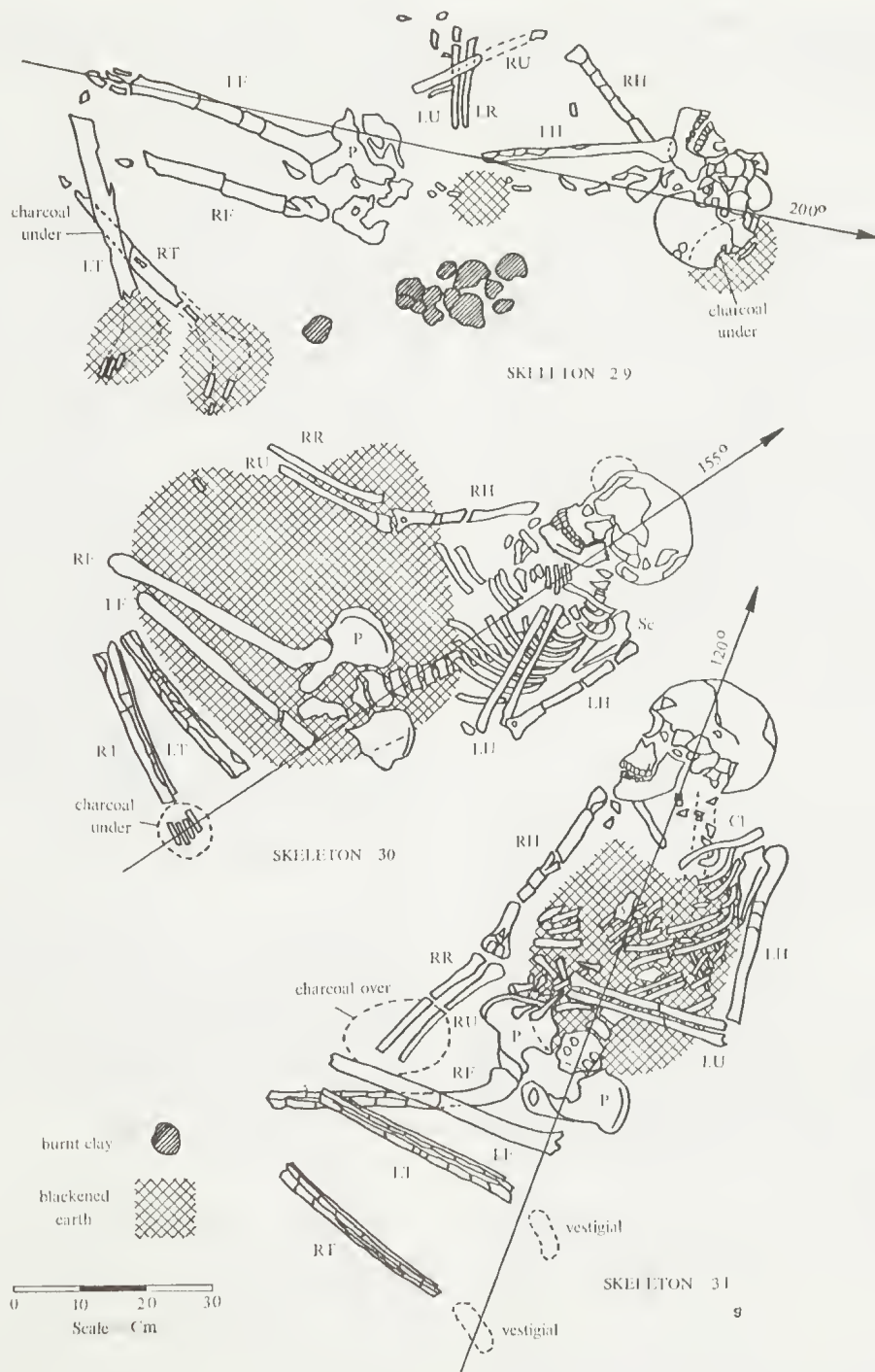


Fig. 9—Burial attitudes of Skeletons 29-31, Site 17. The three skeletons are shown in their correct relative positions as they lay in the grave.

below it, so that the right lower teeth were forced medial to the right upper teeth. The cervical vertebrae had been forced upwards under the mandible.

Dentition:

UR -76543— —45678 UL
LR invisible 1234-678 LL

The teeth showed little wear and were preserved *in situ* with the cranium. The soil held the fragments of the cranium together when treated with 'Aquadhere'.

The arms were folded across the thorax anteriorly, the degree of lateral compression during decomposition being such that the upper ends of the humeri were only 5 cm apart. No thoracic bones were present.

Only remnants of the pelvis and sacrum were present. The femora extended in line with the trunk and the tibiae were flexed backwards with the feet superior to the knees. A few isolated foot bones were present. All limb bones were much comminuted and eroded. Orientation 200°.

Dark areas of soil were present around both feet, in the lumbar region, and under the cranium. Charcoal was present in quantity under the cranium and under the tibiae. A small concentration of 13 calcined clay hearthstones was located adjacent to the lumbar region but these were not associated with charcoal.

A sample of the dark soil was found to consist of 93.8 per cent of coarse silica sand, 5.0 per cent of silt-size iron-stained quartz particles with some humic organic matter, and 1.2 per cent of organic volatiles. The organic volatiles were responsible for the dark colouration of the soil.

The charcoal associated with the skeleton was radiocarbon dated at 5,840 ± 90 years B.P. (GaK-1409).

Skeleton 30. NMV X72828, CHA 333. Fig. 9.

A flexed burial with the body lying on the right side.

Cranium somewhat fractured and with the left temporal region flattened. Mandible broken at the symphysis due to lateral compression, the

right and left portions overlapping. Sutures normal, brows not prominent, mastoid processes large.

Dentition:

UR 8765432- -234567- UL
LR 87654321 12345678 LL

Upper medial incisors evulsed.

Substantial elements of the rib cage were present together with a largely complete but much eroded vertebral column. Thorax on the right side. Right arm extended and somewhat anterior to the thorax. The left humerus alongside the thorax, with the left lower arm bones flexed upwards across the thorax towards the shoulder region. Pelvis partially present with eroded sacrum. The sacrum and pelvic girdle appeared male. Femora flexed to the right and the tibiae flexed back inferior to the femora. A few foot bones present, located on the centre-line of the trunk. Some charcoal was found lying under the foot bones. Orientation 155°.

A large area of dark soil underlay the right arm and extended under the pelvic area and the femora. Analysis showed the dark colouration to be due to the presence of humic organic material and not to charcoal.

Skeleton 31. NMV X72829, CHA 334. Fig. 9.

A flexed burial lying on the right side.

Cranium lying on the right side, fairly complete, comminuted in the temporal regions and with the right side flattened by lateral pressure. Brows not prominent. Mandible much comminuted on the right side which was crushed in under the palate, although the teeth remained substantially *in situ*.

Dentition:

UR 87654321 12345678 UL
LR invisible 1234567- LL

Upper medial incisors wide, 1.14 cm at the occlusal edge. Both upper third molars were just emerged from the bone with the occlusal surfaces still some 8 mm superior to those of the upper second molars. Probable age 20-23 years.

The clavicles, left scapula, rib pieces and traces of vertebrae defined the position of the

thorax lying partially on the right side. Right arm fully extended, anterior to the thorax, with the hand under the left knee. Left humerus alongside the thorax, with the lower left arm bones flexed across the lower thoracic region, the hand resting on the right iliac bone. The pelvis was well-defined in position but was insufficient to determine the sex. Leg bones very much eroded, flattened by soil pressure and fragmented. Femora drawn up approximately at right angles to the body and to the right, left knee superior to right knee. Left tibia flexed backwards close alongside the left femur. Right tibia flexed backwards to a lesser degree. Both feet present as faint traces only. Orientation 120°.

A small calcined clay hearthstone was lodged underneath the left scapula. Some charcoal was present over the lower right arm bones.

In Fig. 9 the three skeletons (Nos. 29-31) excavated at Site 17 are shown correctly oriented and spaced relative to one another. It is tempting to think of them as a group burial surrounding a small fire, since all were buried at the same level, all have areas of soil associated with them which have been discoloured by organic matter, and they are associated with a number of calcined clay hearthstones mainly concentrated between Skeletons 29 and 30. Skeleton 29 was dated $5,840 \pm 90$ years B.P. from charcoal associated with it, but funds did not permit of dating Skeletons 30 and 31. Although buried in the same soil horizon, Skeletons 30 and 31 were so much better preserved than Skeleton 29 that they were probably interred at a much later date. Only dating of these bones can provide a firm answer.

SITE 18, SKELETONS 32-33.

Skeleton 32. NMV X72830, CHA 215. Fig. 10.

A prone extended burial with the head lying on its left side and facing to the left. Bones hard and somewhat mineralized on the surface due to carbonate deposition.

Cranium fairly complete but crushed laterally, flattened and broken on the left temporal region in particular. Coronal suture no longer visible. Sagittal suture just visible. Mandible complete. A mussel shell was wedged between

the mandible and the zygomatic arch on the right side. Another mussel shell lay medially within the mandible.

Dentition:

UR 8765432-	-2345678 UL
LR 87654321	12345678 LL

Wear moderate and helicoidal. Incisors worn flat and to the pulp. Upper medial incisors evulsed.

Scapulae, clavicles, rib pieces and eroded but clearly defined vertebrae delineate the thorax. There were fragments of mussel shell among the bones near the centre of the spinal column. The pelvis was much broken and eroded and was insufficient to determine the sex. Arms extended alongside the thorax, left hand bones missing, right hand bones inferior to the pelvis. Deltoid tuberosity strongly developed on each humerus. Leg bones somewhat fragmented and eroded at the ends. Femora extended in the line of the thorax with the left tibia crossing over the right tibia just superior to the distal ends. No foot bones present, these having been exposed and scattered. Orientation 200°.

Numerous pieces of yellow ochre were in place around the leg bones, with one piece of red ochre below the right knee and several more embedded in the soil above the level of the skeleton 60 cm away from the body at the level of the right hand.

The placing of mussel shells on various parts of the body at burial appears to have been done deliberately as a part of burial ceremonials in some cases (e.g. in burials examined by Graeme Pretty at Roonka Station, Lower Murray Valley, S. Australia—personal communication). The shell lodged in the right mandible of Skeleton 32 could have been placed there deliberately, but the shell found lodged medially within the mandible could not have migrated there from a similar position in the left mandible and could hardly have been placed in position post mortem. Likewise the shell found in the central thorax area could not have been placed there post mortem. It seems probable in this case that the shell has been lodged fortuitously and has been derived from the grave infill.

Skeleton 33. NMV X72831, CHA 214. Fig. 10.

An extended supine burial.

Bones hard and mineralized on the surface by carbonate deposition. Skeleton disturbed, fractured and scattered by a combination of surface erosion and the penetration of a shallow root from a nearby tree. This had passed through the cranium and along the centreline of the body to the pelvic and upper leg regions. Its position is indicated in the drawing (Fig. 10). As a result, only portions of the left side and occipital regions of the cranium were present, together with fragments of the mandible. Two loose molars were found, both well-worn. The bones were exceedingly fragmentary but showed the arms to have been fully extended alongside the thorax and below the pelvis. Pelvis very fragmentary and scattered. The left femur was absent. The right femur, broken and eroded, was extended in the line of the body. Pieces of both tibiae were present, but somewhat displaced. No foot bones were present. Orientation 170°.

SITE 19A, SKELETONS 34-36.

Skeleton 34. NMV X72832, CHA 95. Fig. 10.

A supine flexed burial with the legs flexed to the left and the arms folded back on the chest with the hands towards the head. The bones had become somewhat scattered by exposure. A few fragments only of the cranium were present with shattered remnants of four teeth, well worn down. A skull fragment shows the suture to be of an intricate interlocking character.

Ribs displaced, but the arm bones clearly show the humeri parallel to the thorax with the lower arm bones flexed back parallel to the thorax with the hand positions adjacent to the cranium. Pelvic bones fragmentary, but the sub-pubic angle which approximates 100° suggests a female. Femora flexed to the left side at right angles to the centreline of the thorax, right over left, with the tibiae flexed back sharply inferior to and closely associated with the femora. Remnants only of vertebrae, hand and foot bones present. Orientation 220°

Skeleton 35. NMV X72833, CHA 96. Fig. 10.

An extended supine burial with the arms alongside the thorax and the legs inclined slightly to the left.

Because of soil erosion the cranium was present only as scattered pieces of bleached bone. Mastoid processes small, supraorbital ridges not prominent. A piece of the left maxilla was present with the upper left premolars in place. Right half of the mandible present with the premolars and the third molar in place, and the sockets of the remaining teeth present. Four upper molars, three lower molars and four premolars found loose in the sand. Wear on all teeth severe, helicoidal and angular to as much as 40° from the occlusal plane. Wear on the lower right third molar was severe and concave with the anterior edge upstanding.

Rib cage substantial with ten fragmentary vertebrae present including the axis. Pelvic bones substantial. Sub-pubic angle of 100° indicates a female. Arms extended alongside the thorax, hands inferior to the pelvis, with the lower arm posterior to the pelvis. Legs fully extended but inclined towards the left relative to the body axis. A few finger bones lay between the tibiae. Foot bones substantial, with the right foot almost complete. Orientation 220°.

Skeleton 36. NMV X72834, CHA 97. Fig. 10.

An extended supine burial.

Cranium fully exposed by soil erosion and scattered, leaving a few small remnants only. Thorax partially exposed and scattered, but well defined by rib portions and pieces of scapulae. Right arm flexed slightly to the right with the hand over the pelvis. Ten fragmentary vertebrae present. Iliac bones well-preserved. The sub-pubic angle of 65° indicates a male. Leg bones fully extended in line with the thorax with the feet well apart. A majority of the feet bones were present. Orientation 230°.

SITE 19B, SKELETONS 37-42.

Skeleton 37. NMV X72835, CHA 98. Fig. 11.

An extended supine burial in association with Skeletons 38 and 39.

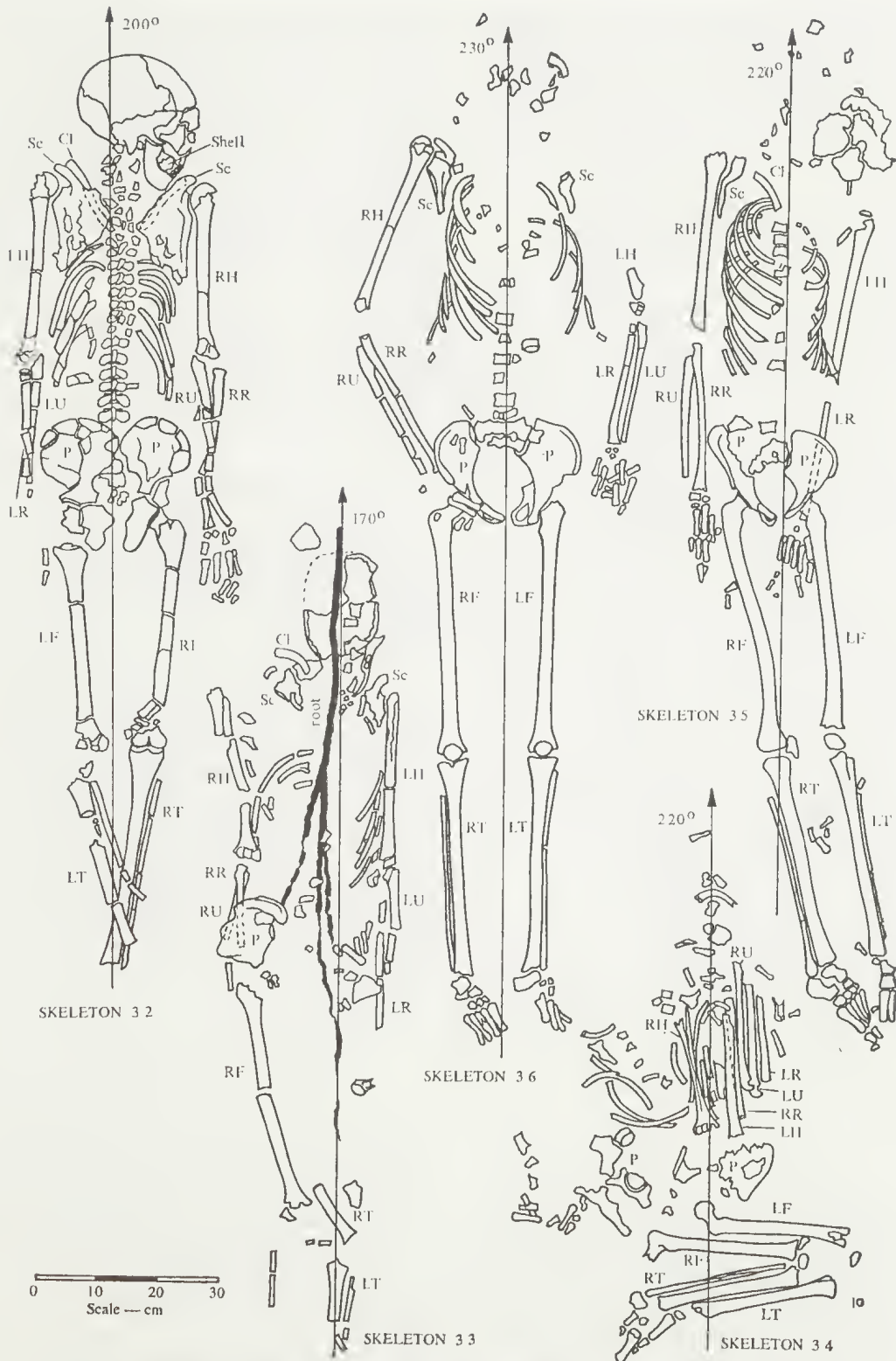


Fig. 10—Burial attitudes of Skeletons 32-33, Site 18, and Skeletons 34-36, Site 19A.

Cranium fairly complete with the face fallen forward onto the thorax so that the mandible had been forced upward under the palate. Some vertical compression had caused the atlas and axis to be forced into the foramen magnum and to become comminuted. (Fig. 20).

Dentition:

UR 8765432-	-2345678	UL
LR —5432-	12345—	LL

Wear helicoidal and severe, up to 30° from the occlusal plane. Upper third molars fully erupted and well worn. Upper molars worn close to the roots. Medial upper incisors evulsed. Lower right medial incisor broken off post mortem due to movement of the mandible. Bone regrowth had been complete over the sockets of all lower molars indicating their early loss. Probable age over 35 years.

Clavicles and portions of the scapulae present, but no other thoracic bones remained. Pelvic bones fragmentary. Arms alongside the thorax with the hands inferior to the pelvis. Leg bones eroded at the ends but otherwise substantial. A few foot bones were present. Orientation 230°.

Below the right elbow, portions of a mandible (3, Fig. 11) were found and above the level of Skeleton 37 and to the left of its pelvis, the frontal bone and attached maxillae of Skeleton 39 (3, Fig. 11) were located.

Skeleton 38. NMV X72836, CHA 99. Fig. 11.

A fully extended supine burial in association with Skeletons 37 and 39.

Cranium lying on the right side, fairly complete but with the right temporal region somewhat crushed, and the right ramus of the mandible broken due to soil pressure.

Dentition:

UR 8765432-	—345678	UL
LR —4321	1234—	LL

Teeth well-worn, helicoidal, with wear up to 30° from the horizontal occlusal plane. The bone was broken away at the position of the upper medial incisors and it was impossible to determine whether or not these teeth had been grown over the sockets of the lower left second premolar and molars, and the lower right

second and third molars indicating early loss. This was substantiated by the presence of a helicoidal wear pattern on the remaining lower teeth. Age probably in excess of 35 years.

Cervical vertebrae present, together with the clavicles, the greater part of the scapulae and a few rib portions. Arms extended alongside the thorax. No lumbar or thoracic vertebrae or pelvis present. The legs extended below the thorax and femora of Skeleton 37. Orientation 220°.

The parietal and occipital bones of another cranium (Skeleton 39) were found located over the thorax of Skeleton 38 lying between its cranium and that of Skeleton 37 (3, in Fig. 11).

Skeleton 39. NMV X72837, CHA 100 and 101. Fig. 11.

The skeleton consisted of cranial portions only, associated with Skeletons 37 and 38. The locations of these portions have been described above.

The frontal bone, together with its associated maxillae and upper teeth, which were found located to the left hand side of Skeleton 37, fitted together with the parietal and occipital bones located between the crania of Skeletons 37 and 38, and were clearly elements of one cranium (Skeleton 39). The portions of mandible recovered below Skeleton 37 were reassembled into a substantially complete mandible, the teeth of which occluded well with the upper teeth of this cranium and clearly formed a part of it.

Dentition:

UR -765432-	-2—67-	UL
LR 87654321	12345678	LL

The teeth showed very little wear. Both lower third molars had just erupted through the bone and their occlusal surfaces were 6 mm below those of the lower second molars. The upper third molars were unerupted. Medial upper incisors evulsed. A young person, probable age about 20 years.

Skeletons 37-39 are shown in the drawing (Fig. 11) in their correct positions relative to one another. The elements of Skeleton 37 bear the suffix 2, the elements of Skeleton 38 bear

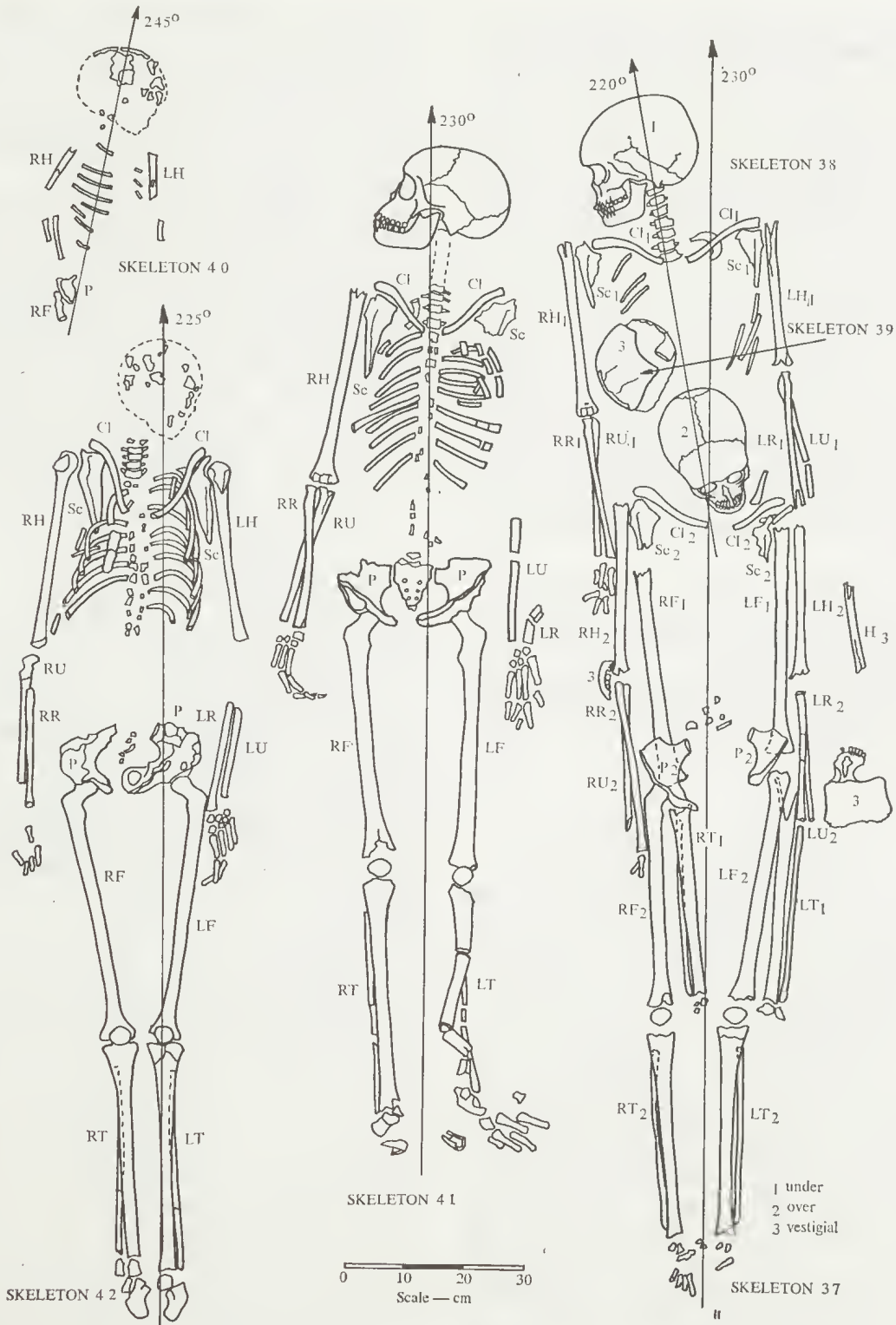


Fig. 11—Burial attitudes of Skeletons 37-42, Site 19B.

the suffix 1, and the elements of Skeleton 39 bear the number 3. It seems from the position of the three skeletons that 39 was buried subsequent to 38 and above it, and that 39 was then disturbed and scattered when the grave was dug to bury 37, the only evidence of 39 being the cranial elements recovered. It seems probable also that the lower thoracic and pelvic regions of 38 were removed and lost during the burial of 37.

Skeleton 40. NMV X72838, CHA 357. Fig. 11.

A supine burial, apparently extended, with the head turned to the left. Remains extremely fragmentary but sufficient to indicate the position of the cranium, the thorax (with the arms extended alongside it) and the pelvis. A small portion of the right femur suggested the extended position. Clearly a young child. Orientation 245°.

Skeleton 41. NMV X72839, CHA 162. Fig. 11.

A fully extended supine burial with the head turned to the right.

Cranium almost complete, supraorbital ridges not prominent, all sutures well-defined. Palate small. (Fig. 21).

Dentition:

UR 87654321	12345678	UL
LR 87654—21	12345678	LL

Teeth with very slight helicoidal wear. The rear molars were fully occluded but unworn. The medial incisors were 1.14 cm wide at the occlusal edge. Age probably about 25 years.

The atlas and axis were present under the cranium, separated by 7 cm from the lower four cervical vertebrae, indicating some post mortem displacement. Balance of the vertebral column fragmentary. The clavicles, portions of the scapulae and pieces of rib cage defined the thorax well. Arms extended alongside the thorax, hands inferior to the pelvis and well clear of it on each side (Pl. 12, fig. 3). The left humerus was completely absent, again suggesting some post mortem disturbance. The pelvis and sacrum were fairly complete. Leg bones eroded at the ends. Left tibia and fibula broken in several places. Some foot bones were

present and the feet were well separated. Orientation 230°.

A small burnt clay hearthstone was found alongside the neck.

Skeleton 42. NMV X72840, CHA 163. Fig. 11.

A fully extended supine burial.

A few fragments only of the cranium were present and were not sufficient to define the attitude. Four cervical vertebrae and vestiges of thoracic vertebrae were present which, together with the clavicles, scapulae and portions of the rib cage, clearly defined the thorax. Arms extended alongside the thorax with the hands inferior to the pelvis. Pelvis somewhat fragmented. Legs fully extended with the knees and feet close together. The calcaneum and talus of each foot were present, but there were no other foot bones. Orientation 225°.

SITE 19C, SKELETONS 43-58.

Skeleton 43. NMV X72841, CHA 166. Fig. 12.

A flexed burial lying on the right side with the legs flexed to the right.

The cranium was lying on its right side. The left side and the occipital region were fairly complete. The supramaxillary region was somewhat comminuted. The right side comminuted and largely absent. The saggital and lamboidal sutures were fused and invisible. The maxillae and the mandible were present but had been laterally compressed and broken medially.

Dentition:

UR 876543—	12345678	UL
LR 87654321	12345678	LL

Moderate helicoidal wear to 15° from the horizontal occlusal plane. Probable age 35-40 years.

The thorax was well defined by rib portions, the scapulae and remnants of vertebrae. The skeleton lies on the right side with the left shoulder anterior to the right shoulder. Left arm folded back close to the chest with the hand bones immediately anterior to the face. The right humerus lay below the rib cage with the right lower arm bones flexed upwards towards the face and lying directly below the left lower arm bones in the grave. The pelvic bones

were fragmentary and insufficient to define the sex, Femora flexed at right angles to the centre-line of the trunk, with the lower leg bones closely inferior to them and the feet immediately inferior to the pelvis. The right leg lay underneath the left leg. Orientation 100°.

Skeleton 44. NMV X72842, CHA 167. Fig. 12.

A flexed squatting burial, vertically and severely compressed.

Cranium largely complete, lying partly on the right side with the right temporal region severely crushed inwards. Maxillae substantially intact with the upper teeth in place. Mandible dislodged to the left and separated from the cranium. Brows not prominent. Wormian bone present at lambda.

Dentition:

UR 8765432-	-2345678 UL
LR ————21	12345678 LL

Upper medial incisors evulsed. Wear moderately severe, helicoidal. Upper premolars and canines worn to the pulp. Upper molars moderately worn with the occlusal surface of the second molars 2.5 mm superior to that of the first molars and the occlusal surface of the third molars 2.5 mm superior to that of the second molars, giving a stepped appearance.

The left shoulder region had been superior to the cranium but had been exposed at the surface and abraded away. The left scapula and clavicle had been displaced. The right shoulder was 10 cm inferior to the top of the cranium. Both lower arms were folded forward and rested on the legs. Femora approximately horizontal with the tibiae folded back immediately below them with the feet under the pelvis. Pelvis fragmentary. There was heavy termite damage to the surfaces of the left arm bones. Orientation 150°.

The drawing (Fig. 12) is presented both in plan and elevation in order to show the attitude of this skeleton and to illustrate the extraordinary degree of vertical compression which it had undergone. The whole skeleton occupied a vertical space of only 33 cm. This skeleton lay immediately over the mass of skeletons comprising Nos. 51-55 inclusive and was in close

contact with skeleton 50 on its dorsal side. The juxtaposition of these skeletons is discussed below.

Skeleton 45. NMV X72843, CHA 168. Fig. 12.

A flexed burial lying on the right side.

A few fragments only of cranium were present with three molars, one premolar and one canine of the upper left teeth *in situ* in the sand matrix. This was sufficient only to delineate the position of the head on the right side. No thoracic bones were present. Small fragments of the left lower arm bones and pelvis were evident. Femora flexed to the right with the tibiae flexed back inferior to them. The foot position was inferior to the pelvic region, but no foot bones were actually present. Right femur extensively channeled on the surface by termite attack. Orientation 245°.

Skeleton 46. NMV X72844, CHA 169. Fig. 12.

A small portion of a skeleton consisting of pieces of pelvis only, with broken pieces of the shaft of the left femur and a few fragments of hand bones. The position of the femur and the location of the hand bones suggest an extended burial with an orientation of 260°.

Skeleton 47. NMV X72845, CHA 170. Fig. 12.

A flexed burial lying on the right side.

Cranium fragmentary, but clearly showing the position of the head on the right side. The left maxilla and the left side of the mandible were *in situ* and substantially complete.

Dentition:

UR -7654—	-2345678 UL
LR 876—	-2345678 LL

Wear moderately severe, helicoidal. Third molars fully erupted and well-worn. Slight calculus on the lower buccal margin of the crowns of the upper left second molar and the lower left first molar. Probable age at least 30 years.

Vestiges of vertebrae delineated the position of the thorax. There were a few fragments only of pelvic bones. Both arms extended alongside the thorax with the lower right arm passing beneath the leg bones and the lower left arm posterior to the pelvis. Both hands lay inferior

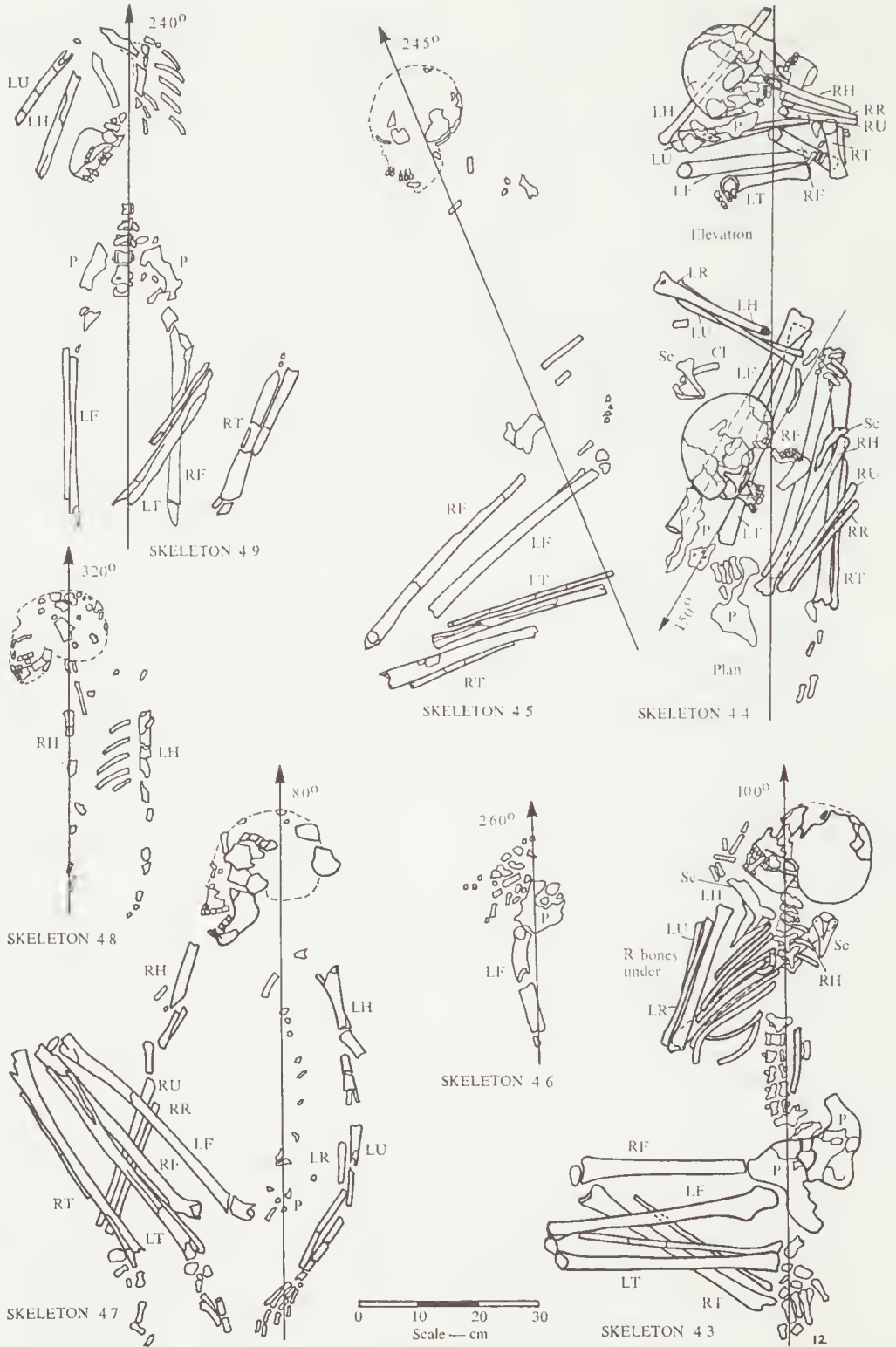


Fig. 12—Burial attitudes of Skeletons 43-49, Site 19C.

to the pelvis. Femora drawn well up towards the thorax with the tibiae flexed back immediately inferior to them, the right leg bones lying beneath the left leg bones. A few foot bones lay immediately inferior to the pelvis. Orientation 80°.

The position of this skeleton suggested that it might possibly have originally been buried nearly supine with the head to the right and the knees drawn up vertically, and that the legs moved to the right and subsided over the right arm during decomposition and settlement.

Skeleton 48. NMV X72846, CHA 171. Fig. 12.

A fragmentary burial of a small adult, apparently on the right side.

Fragments of cranium and teeth *in situ* in the sand matrix delineate the size of the head and its position as lying on the right side. The head was small, but eleven loose molar crowns were present in the sand and therefore it was that of an adult. A few rib fragments and pieces of the right and left arm bones outlined the thorax with the arm extended alongside it. No other bones were present. Orientation 320°.

Skeleton 49. NMV X72847, CHA 172. Fig. 12.

A flexed prone burial.

No cranial bones were present, but a mandible, the left side of which was fairly complete, was located in the centre of the thorax area and had been displaced post mortem. Five lower molars, two lower premolars and two incisors were present showing moderately severe wear.

Left humerus alongside the thorax with the lower arm flexed back towards the head. The left clavicle, sternum and rib portions delineated the upper thorax. Four lower lumbar vertebrae were present and confirmed the prone position. Only vestiges of the pelvis remained. Femora in line with the thorax. Tibiac flexed back and directed to the right side of the body. The position of the feet was superior to that of the knees but no foot bones were present. Orientation 240°.

Skeleton 50. NMV X72848, CHA 173. Fig. 13.

A flexed burial lying on the left side.

Cranium substantially complete but commi-

nuted in the left temporal region and flattened on the left side by soil pressure. Brows prominent. Mandible displaced to the left and crushed by lateral pressure. Teeth held in place by portions of bone and the sand matrix.

Dentition:

UR 8765432-	—5678 UL
LR 8765432-	—5678 LL

The ten teeth not in place were recovered loose in the sand, showing that all teeth were present at death. The molars were fully erupted and wear was slight. Age probably about 30 years.

The cervical vertebrae were reasonably preserved, but the balance of the vertebral column was largely eroded away or otherwise absent. The thorax was well-defined by rib portions, the right clavicle and the sternum. Upper arms alongside the thorax with the lower arms folded across the pelvic region with the hand bones above the pelvis. Pelvis substantial. The subpubic angle of 55° indicates a male. Femora flexed to the left with the tibiatic flexed back inferior to the femora. Both feet substantially complete. The left leg lay beneath the right leg. The leg and arm bones were eroded at the ends but were otherwise well-preserved. Orientation 320°.

The juxtaposition of this skeleton with Skeletons 44 and 51-52 is discussed below.

Skeletons 51-55. NMV X72849-X72853, CHA 174-178. Fig. 13.

These skeletons were all flexed squatting burials subject to considerable vertical compression and subsidence after burial and during decomposition. They must be treated as a group because, as reference to Fig. 13 will show, they have been buried in such a manner as to become inextricably mixed by overlapping and interpenetration. This clearly required simultaneous burial and decomposition. Further, the skeletons were all buried at approximately the same level, and extended from 33 cm to 51 cm below the existing surface level. This extremely restricted vertical dimension confirms the very considerable vertical settlement during decomposition. The essentially

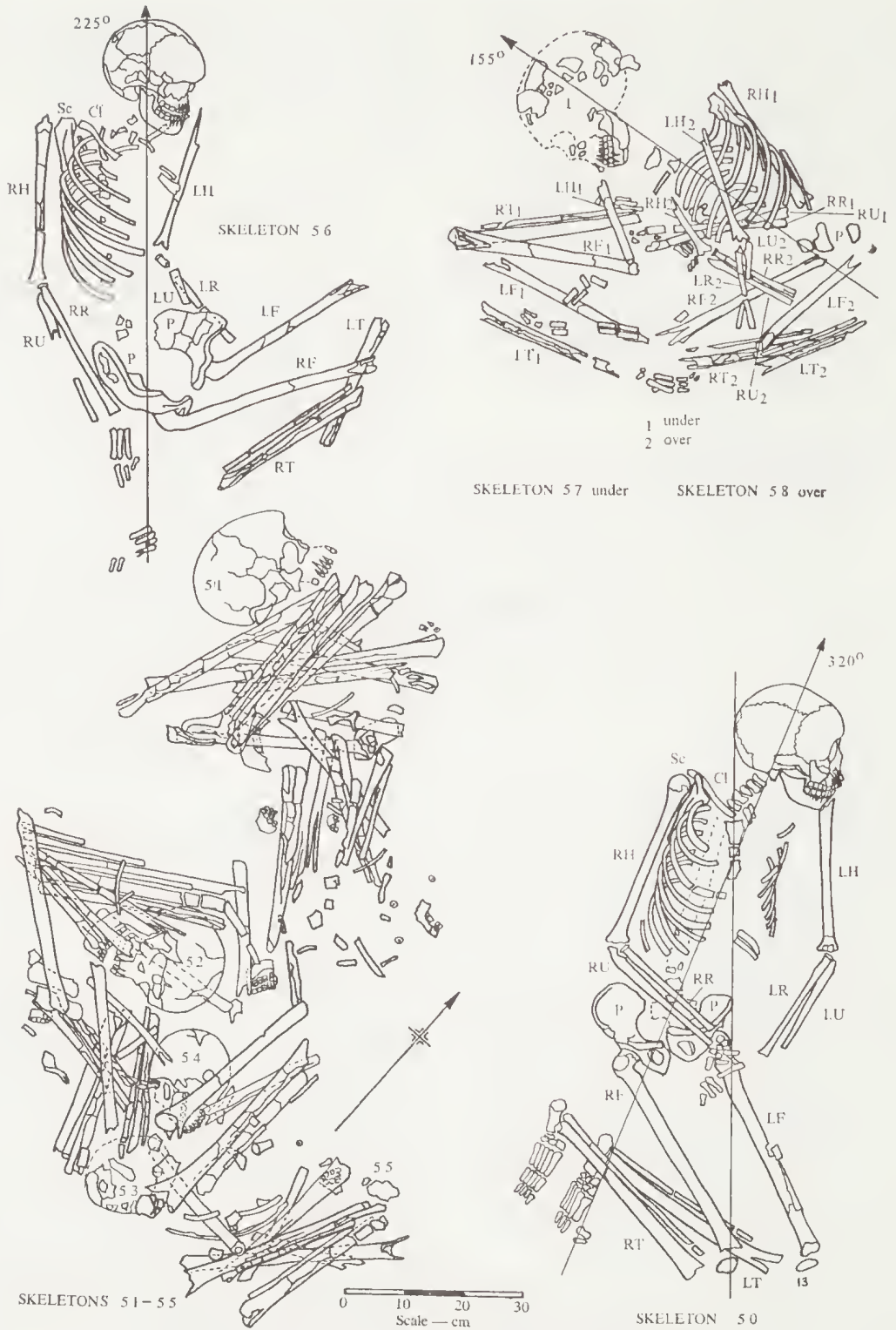


Fig. 13—Burial attitudes of Skeletons 50-58, Site 19C.

horizontal position of the leg bones also confirms this, and indicates a very severe degree of flexure at the time of burial as well.

The bones generally were very considerably eroded and fragmented. Many of them were extremely friable and some remained only as traces. Many of them had been subject to severe attack by termites. Their condition suggested a much greater age than those of Skeletons 44 and 50, which had been buried subsequently and immediately on top of the mass of skeletons 51-55.

Skeleton 44, also a flexed squatting burial, was buried with the skull 5 cm from the skull of Skeleton 52 and to the N.W. of it. Skeleton 50 was buried immediately over the skulls of Skeletons 52, 53 and 54 with its head above the skull of Skeleton 51. The relationship may be seen in Fig. 2 which illustrates the location of skeletons at Site 19C. The relative positions of Skeletons 44 and 50 showed that 44 was buried subsequently to 50.

Skeleton 44 was excavated first, since the upper portion of its left humerus appeared at the ground surface. This resulted in the exposure of Skeleton 50. Excavation of Skeleton 50 and its removal together with Skeleton 44 revealed the mass of skeletal material below. Preliminary excavation of this mass of material seemed to indicate that there were five cranial remnants and these were designated Skeletons 51-55. Complete excavation, however, made it clear that there were six skeletons involved, there being 12 femora and 11 tibiae identifiable. It was not possible to assign skull fragments, although many were present, to a sixth cranium. On complete excavation also, the cranium initially assigned to Skeleton 55 was found to consist only of extremely decomposed pieces.

As excavation proceeded it became clear that it was not possible to assign particular post-cranial remains to particular crania with any certainty. For this reason, while the cranial remains initially designated as Skeletons 51-55 have been preserved individually, the post-cranial bones have been preserved *en masse*.

Reference to the drawing of these skeletons *in situ* (Fig. 13) will also make it clear that there were six skeletons present as judged by

the groupings of the severely-flexed leg bones. The general relationship of groups of bones is such that the bodies must have been buried prior to decomposition and are not re-buried skeletal remains (Pl. 13, fig 4).

The following additional notes are relevant:

Skeleton 51. Cranium somewhat eroded but defines the position of the head on the left side. Maxillae not present, but three upper molars, four upper premolars and two upper incisors were present in the sand matrix. There was no mandible.

Skeleton 52. Cranium lying on the left side with the left temporal region severely crushed and broken. Left humerus underneath the cranium. Supraorbital ridges not prominent. Maxillae attached and the mandible in position but both crushed laterally.

Dentition:

UR 8765432-	-234567-	UL
LR 8765432-	-234567-	LL

Teeth well worn helicoidally. Upper right third molar not fully occluded. An adult, probably about 24 years of age.

Skeleton 53. Pieces of cranium only, very severely eroded. The left maxilla was in place with the upper left molars and premolars and lateral incisor well-worn, but flat on the occlusal surfaces. Loose crowns of the upper right second and third molars were present. The third molars appeared to be fully occluded. Age probably about 30 years.

Skeleton 54. Cranium severely crushed laterally to a width of 7.5 cm, the comminuted bone being held in place by the sand matrix. The left maxilla attached, the right maxilla loose. Small fragments only of the mandible were present.

Dentition:

UR 8765432-	-2345678	UL
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Medial upper incisors evulsed. Wear severe but flat. Upper third molars fully erupted but very little worn. Occlusal surface of both upper canines superior to the occlusal surface of the upper premolars and a little worn on the anterior edge of the occlusal surface only.

Occlusal surface of the upper lateral incisors superior to that of the upper canines with no apparent wear on the occlusal edge, suggesting that the upper incisors did not occlude with the lower incisors. Age probably about 25 years.

Skeleton 55. Small cranial fragments only, with a separated portion of the maxilla. Five upper molars, four upper premolars, one canine and two incisors were present in the sand matrix. There was no possibility of determining the attitude or orientation of the cranium.

The dentition of these skeletons suggests that all five were adult. No evidence was present to suggest a possible cause of death. A selected mass of bone representative of the group of burials was radiocarbon dated at $3,580 \pm 370$ years B.P. (ANU-420D).

Skeleton 56. NMV X72854, CHA 345. Fig. 13.

A flexed burial lying on the left side.

The cranium was largely complete but considerably broken and lay on its left side. It was comminuted and crushed on the left temporal region due to soil pressure and the left side was pressed inwards and was concave. Supraorbital ridges not prominent. Left maxilla crushed. Mandible displaced slightly to the right, the left side crushed and broken.

Dentition:

UR 8765432-	—————8 UL
LR 87654321	-2345— LL

The teeth not in place were present loose and as crowns. Teeth worn slightly and helioidally. Very little wear on the rear molars. Age probably 25-28 years.

The thorax, delineated by portions of the right ribs and vestigial vertebrae, appeared to lie slightly on the left side. The lumbar region was flexed slightly to the left with the arms alongside the thorax, the lower arms being flexed slightly to the left. Right hand bones inferior to the pelvis. Pelvic bones somewhat fragmented and eroded. Femora flexed to the left approximately at right angles to the body with the tibiae flexed back inferior to them. A few foot bones lay inferior to the pelvic region. Orientation 225° .

Skeleton 57. NMV X72855, CHA 346A. Fig. 13.

A severely flexed burial lying on the right side, semi-prone.

The cranium, compressed laterally, was very fragmentary, the bone being very thin and consisting mainly of the outer cortex. The maximum thickness of the occipital bone was only 3.8 mm. The upper teeth were in place in portions of the maxillae and in the sand matrix. Mandible, broken at the symphysis, present in position.

Dentition:

UR 8765432-	—————45678 UL
LR 87654321	-2345— LL

The rear molars were fully occluded but unworn. Age about 25 years.

The rib cage, well defined by rib portions, lay on the right side but with the left arm anterior to the right arm, indicating a semi-prone position of the thorax. The right upper arm lay alongside the rib cage with the lower right arm flexed upwards and passing below the rib cage as the skeleton lay in the grave. The left upper arm lay approximately parallel to the rib cage, the left lower arm being flexed over the left leg bones and broken into numerous short sections of paired bones during decomposition and settlement. No pelvic bones were present. Femora flexed strongly upwards to the right with the tibiae flexed sharply back, the right tibia lying superior to the right femur, the left tibia lying inferior to the left femur. A few foot bones were present. Orientation 155° .

Skeleton 57 was buried in association with Skeleton 58 (see discussion below).

Skeleton 58. NMV X72856, CHA 346B. Fig. 13.

A severely flexed burial lying on the right side.

Only two very small fragments of cranium were present. The cranium of this skeleton apparently lay slightly inferior to the cranium of Skeleton 57 and on top of the upper thorax of Skeleton 57 as buried in the grave. The remains of an unoccupied rabbit burrow were

found in the apparent position of the cranium of Skeleton 58 and rabbit activity was evidently responsible for its fragmentation and removal. No rib cage was present, but the arm bones located in the grave above the rib cage of Skeleton 57 indicated the position of the thorax. The left lower arm bones crossed over the right lower arm bones, both lying in the grave above the leg bones. Small vestiges of the pelvis were present. Femora flexed sharply upwards to the right with the tibiae flexed sharply back inferior to them. The left leg lay above the right leg. No foot bones were present. Orientation 155°.

Skeleton 58 was clearly the skeleton of a young child as judged by the length and diameter of the limb bones. It had been buried above Skeleton 57 in the grave. The intimate contact of the bones of Skeleton 58 with those of Skeleton 57 indicated that they were buried together and that decomposition and settlement were contemporaneous. There is no factual evidence, but conjecture suggests the burial of a mother and young child together.

In the drawing of these skeletons in Fig. 13, they are shown in their correct relationship one to the other. The elements of Skeleton 57 bear the suffix 1 and the elements of Skeleton 58 bear the suffix 2.

SITE 8. SKELETONS 59-72

Skeleton 59. NMV X72857, CHA 274. Fig. 14.

An extended supine burial.

The cranium, substantially complete, lay on its left side, facing left. The right temporal region was comminuted. The mandible was forced to the right approximately 2 cm and was broken at the symphysis. Skull base asymmetric (see Sandison, this *Memoir*). The atlas, axis and three cervical vertebrae were forced up under the mandible. (Fig. 20).

Dentition:

UR 87654321 12345678 UL
LR 876543— —345678 LL

Teeth worn moderately, helicoidally.

The rib cage was clearly defined by rib portions, two clavicles and two scapulae. The left shoulder had been forced up under the head.

The vertical column and sacrum were largely complete. Pelvis complete. The sub-pubic angle of 45° indicates a male. Femora extended in line with the thorax. This skeleton was buried with the head 20 cm below the present surface and the feet above it. As a result, the tibiae were broken and the distal ends had been exposed and scattered. Orientation 340°.

Skeleton 60. NMV X72858, CHA 271. Fig. 14.

An extended supine burial.

The cranium had been exposed by surface erosion and consisted of scattered pieces only. The mandible was broken at the symphysis and the ascending rami were absent.

Dentition:

LR 87— —678 LL

The teeth present showed extreme helicoidal wear to 40° from the horizontal occlusal plane, being worn down to the roots on the buccal side.

Rib cage well defined by rib portions and parts of the clavicles and scapulae. Vertebral column substantially complete. The two lowest thoracic vertebrae were fused together. Upper arms extended alongside the thorax with the lower arms flexed medially, the right hand being over the pubic area and the left hand under the pelvis. The sacrum and pelvis were eroded and incomplete. Leg bones eroded and extended in line with the thorax with the feet together. No foot bones were present. The right fibula was broken and displaced. Orientation 240°.

A fragment of a maxilla was found lodged between the femora.

Skeleton 61. NMV X72859, CHA 273. Fig. 15.

Apparently an extended supine burial, but very much broken up and scattered by erosion. Scattered and bleached pieces of cranium included the frontal bone, the parietal bones, the occipital bone and the right mastoid process. Supraorbital ridges prominent. The mandible was broken into three pieces. Portions of both maxillae were present but unattached.

Dentition:

LR 8765432— —56—8 LL

In the mandible, all sockets without teeth

contained root stumps. The portion of the left maxilla present contained the roots of the lateral incisor, the canine and both premolars. The portion of the right maxilla present contained the roots of the posterior premolar and the first and second molars. There was a supernumerary incisor fully embedded in the bone of the right palate adjacent to the palatine torus (see Sandison, this *Memoir*).

The right elements of the thorax were much scattered, particularly the scapula and humerus.

An almost complete vertebral column was present, which with the left half of the rib cage, the left clavicle, scapula and arm bones, defined the position of the thorax and showed it to rest supine. Left arm alongside the thorax. A somewhat eroded sacrum and right pelvic bones together with the head and broken proximal portion of the right femur in place, confirmed an extended burial. The proximal half of the left femur was present but had clearly been displaced and reversed in aspect. No lower leg

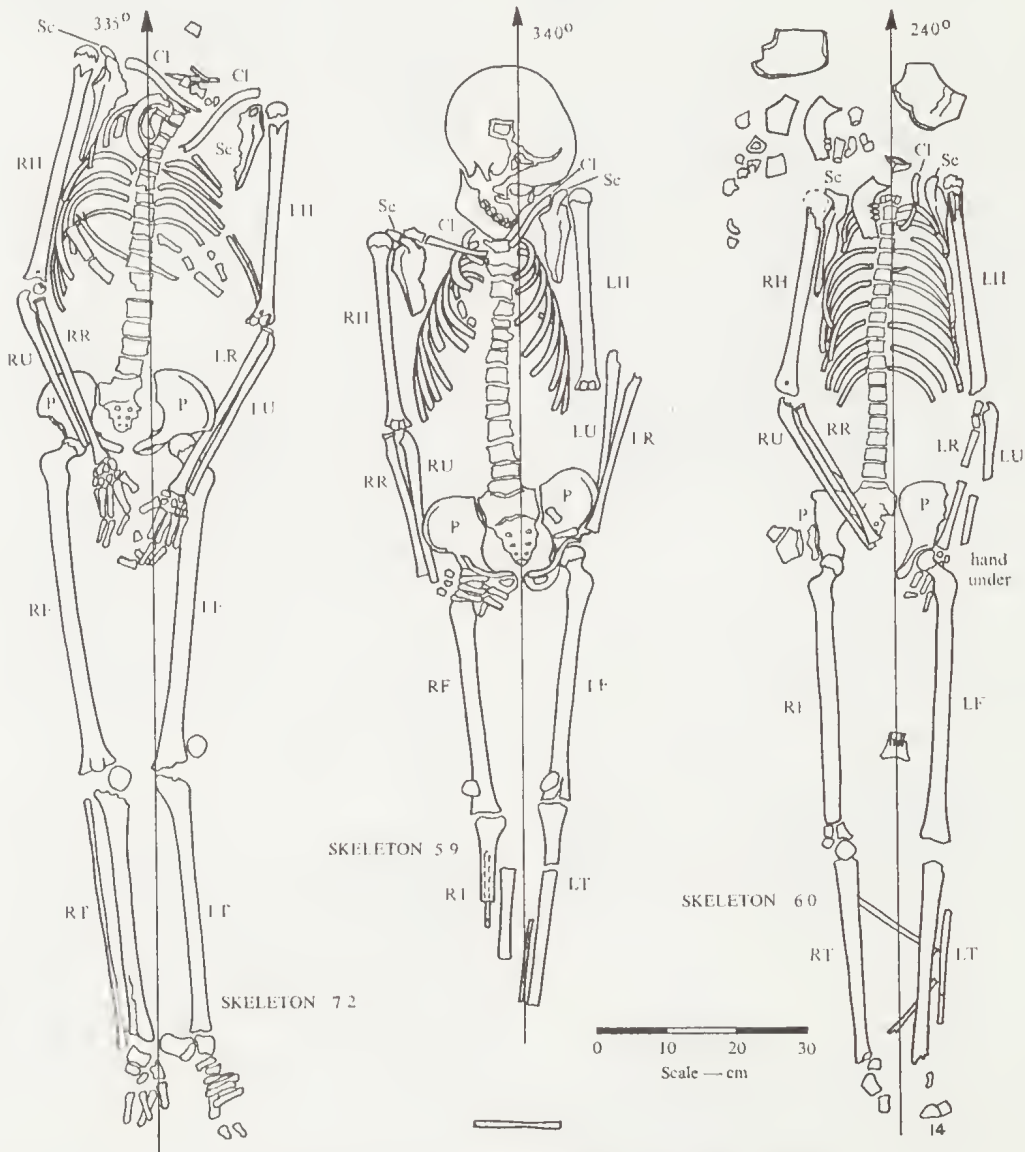


Fig. 14—Burial attitudes of Skeletons 59-60, 72, Site 8.

bones or foot bones were present. Some hand bones in the pelvic region suggested the position of the hands was over the pubic area. Orientation 35° .

Skeleton 62. NMV X72860, CHA 270. Fig. 15.

An extended supine burial with the head and feet exposed and scattered by surface erosion.

Many scattered pieces of cranium were present, including two occipital bones, one of which did not belong to this skeleton. The main portion of the cranium was reconstructed. It showed prominent parietal lobes and slight lateral compression with a raised sagittal suture. Supraorbital ridges not prominent. The smooth occipital crest area and small mastoid processes

suggested a female. No maxillae, mandible or teeth were present.

Thorax area somewhat displaced generally, but well-defined by rib portions and remnants of the scapulae and vertebrae. The attitude of the lower lumbar vertebrae confirmed the supine position. Sacrum and pelvic bones much eroded. Arms somewhat displaced but clearly extended alongside the thorax. The femora, eroded and split by exposure, extended in line with the thorax. Only the proximal portion of the right tibia was present and there were no foot bones. Orientation 175° .

Skeleton 63. NMV X72861, CHA 264. Fig. 16.

An extended supine burial with the lower

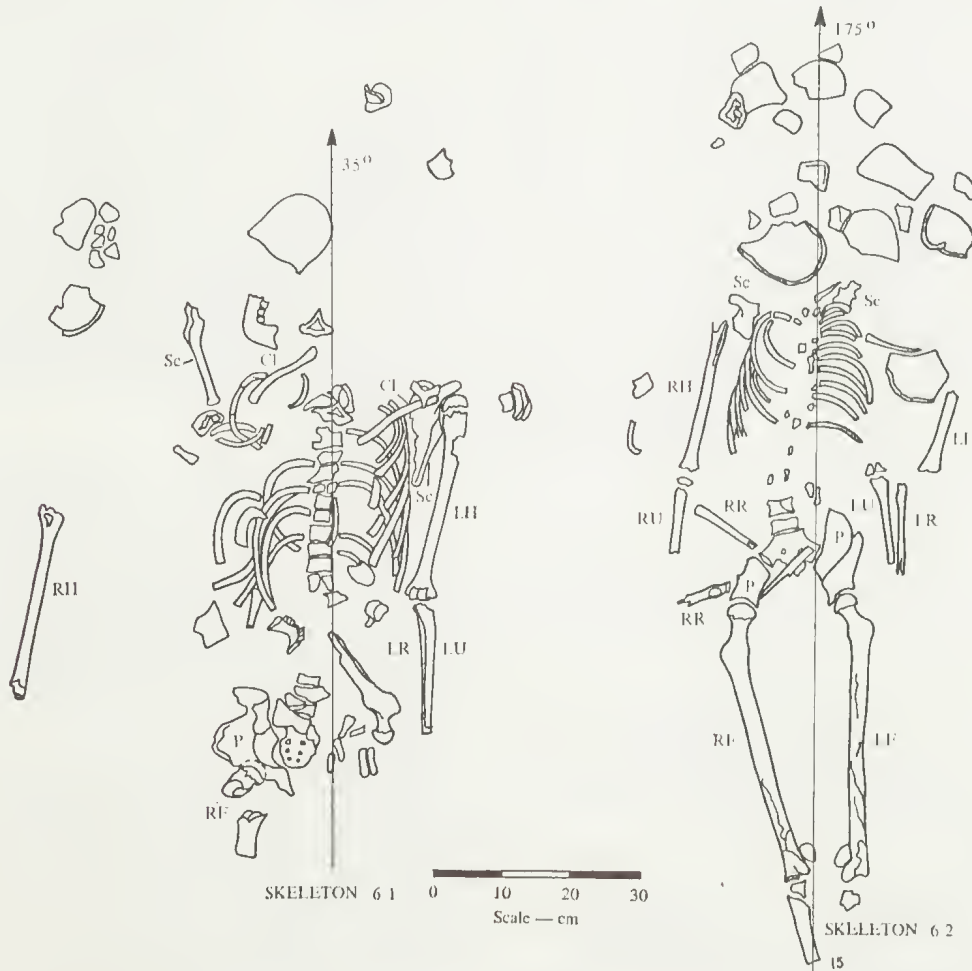


Fig. 15—Burial attitudes of Skeletons 61-62, Site 8.

legs, left arm and cranium exposed and scattered by erosion.

Only greatly displaced portions of cranium bone were present. Supraorbital ridges not prominent. Occipital crest area smooth. Maxilla and the right side only of the mandible were present.

Dentition:

UR	—65432—	—23456—	UL
LR	87654—		LL

The teeth were worn very severely and helicoidally, well into the pulp. Upper medial incisors evulsed, with a gap of 8 mm between their sockets.

The thorax was slightly sinuous as defined by rib portions, clavicles, scapulae and a complete but eroded vertebral column. The left scapula was exposed and sun-bleached. The left upper arm had been exposed and scattered. The left lower arm was flexed across the pelvic region. Right arm extended alongside the thorax with the hand over the pubic region. The sacrum complete with all sections fused, was typically female. The pelvis was largely present and was much eroded, but the sub-pubic angle approximated 90°, confirming a female. Femora inclined slightly to the right. The right femur was deeply channelled by termite attack. The lower leg bones were much fragmented and scattered, but confirmed the extended position. No foot bones present. Age probably over 35 years. Orientation 255°.

Skeleton 64. NMV X72862, CHA 269. Fig. 16.

An extended supine burial with the feet and cranium exposed, broken up and scattered by surface erosion.

The cranium was present only as substantial bleached and scattered portions lying loose on the surface. Supraorbital ridges not prominent. The maxillae and broken portions of the mandible were present.

Dentition:

UR	87654—	—45678	UL
LR	876543—	—345678	LL

Teeth worn severely and helicoidally. The rear molars were well-worn, indicating an age of

at least 30 years. All roots of the upper third molars extended into the maxillary sinus.

Thorax well defined by the clavicles, scapulae, rib portions and substantially complete vertebral column. The two lowest thoracic vertebrae were fused together. The sacrum was complete and typically male, with all joints fused together, confirming the age of at least 30 years. Pelvis substantially complete with a sub-pubic angle of 40°, indicating a male. Arms extended alongside the thorax with the lower left arm flexed over the pelvis and both hands lying over the pubic area. Left radius distinctly bowed (see Sandison, this *Memoir*). Femora complete and extended. The right tibia was broken and displaced, but the left tibia was extended and confirmed the burial position. Orientation 200°.

Skeleton 65. NMV X72863, CHA 275. Fig. 16.

A flexed supine burial in association with Skeleton 66.

The cranium lay face upwards and was substantially complete, the supraorbital ridges and the glabella both being prominent. Maxillae present. Mandible present, but broken and forced outwards on each side by pressure from the atlas, axis and four cervical vertebrae which were forced into it by settlement of the cranium.

Dentition:

UR	87654321	12345678	UL
LR	87654321	12345678	LL

Teeth worn very severely and helicoidally, to 40° from the original occlusal plane. All incisors were worn well into the pulp. An abscess had erupted through the bone on the left side of the mandible on the lateral surface at the position of the root of the lower left first molar (Pl. 12, fig. 5).

Thorax position defined by the right clavicle and scapula together with rib portions and a complete vertebral column. The superior section of the thorax had been displaced to the left post mortem. The left humerus and the left ulna were absent and had probably been disturbed during the burial of Skeleton 66. The left radius was present with the left hand over the pubic area. Right arm alongside the thorax

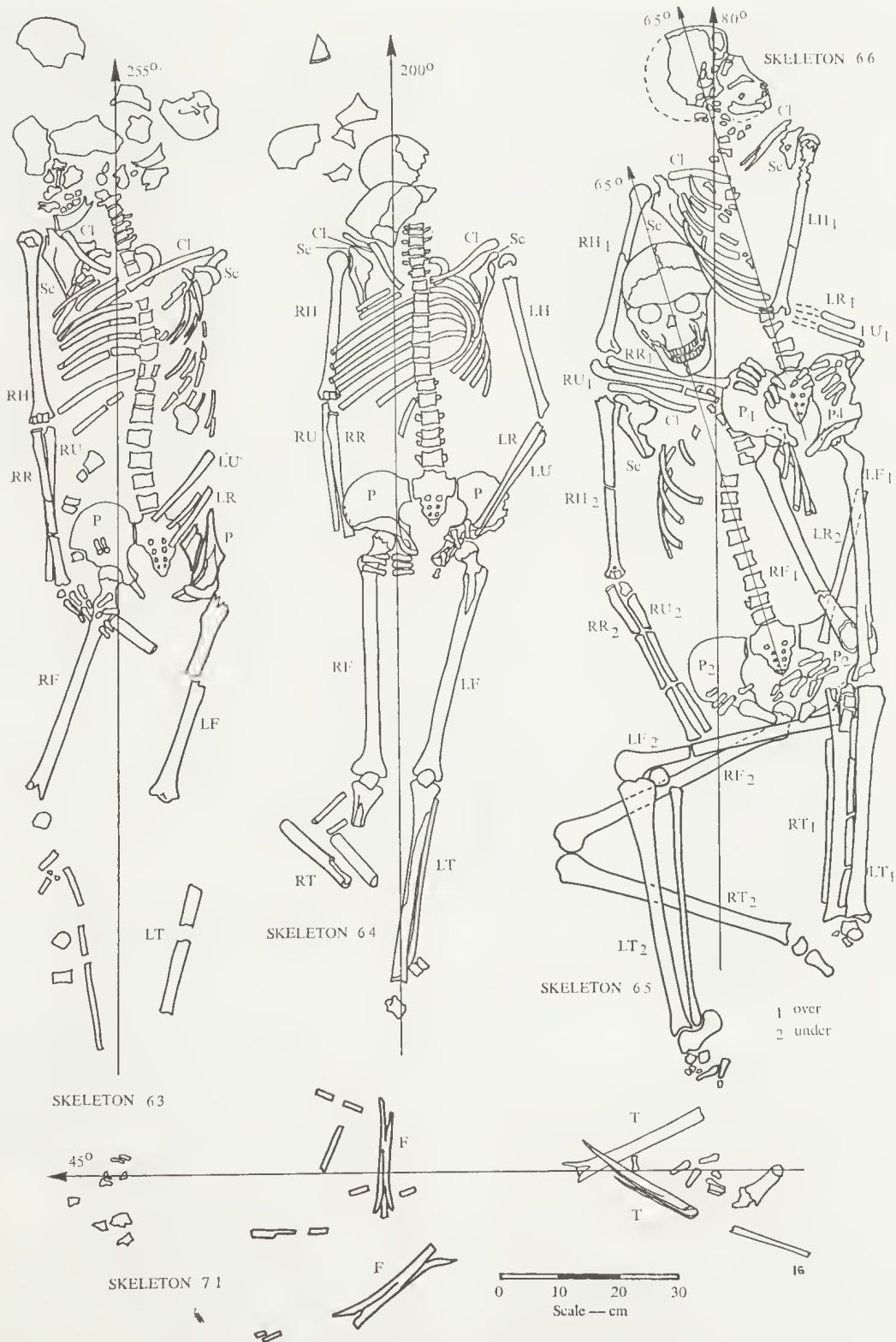


Fig. 16—Burial attitudes of Skeletons 63-65, 71, Site 8.

with the right hand over the pubic area. The sacrum was characteristically male with all joints fused, indicating a probable age of 35 years or more. The sub-pubic angle of the pelvis of 60° indicated a male. Femora flexed to the right at right angles to the body. Right tibia flexed back inferior to the right femur with some foot bones lying inferior to the pelvis. Left tibia flexed back approximately parallel with the centreline of the thorax. Some left foot bones were present. The left leg lay on the right leg in the grave. Orientation 65°.

Skeleton 66. NMV X72864, CHA 263. Fig. 16.

An extended supine burial in association with Skeleton 65.

The cranium was exposed and scattered by surface erosion and was very fragmentary, mainly consisting of the left parietal and temporal regions with some portions of the maxillae and mandible. It lay on the left side.

Dentition:

UR	—3456—8	UL
LR	—432—	—2345—8 LL

Teeth worn severely and helicoidally, to 30° from the original occlusal plane. Bone regrowth had completely covered the sockets of the lower right posterior premolar and the first and second molars and had almost covered that of the lower right third molar. Bone regrowth had also covered the sockets of the lower left first and second molars, the third molar being present as a tooth. The evidence suggested that these teeth were lost at an early age. Anodontia seems unlikely. Age probably over 30 years.

The thorax was defined by the clavicles, substantial portions of the scapulae, the right side of the rib cage and a few remnants of vertebrae. Both elbows were flexed to the right hand side, the lower arms being flexed back to the left with the hands over the pelvic area. Skeleton 66 lay above Skeleton 65 in the grave and its right arm embraced the cranium of Skeleton 65. The sacrum and pelvis were somewhat eroded, but clearly lay above the thorax of Skeleton 65 in the grave. The femora, eroded at the ends, extended in line with the thorax,

knees together. The tibiae were close together, somewhat eroded, but clearly lay above the thorax of Skeleton 65 in the grave. The femora, eroded at the ends, extended in line with the thorax, knees together. The tibiae were close together, somewhat eroded and flexed slightly to the right. The foot bones were present as remnants only. The legs clearly lay above the pelvis and legs of Skeleton 65 in the grave. Orientation 65°.

Skeleton 66 had been buried subsequently to Skeleton 65. Its right arm hooked around the cranium of Skeleton 65 suggests a contemporaneous burial, but the absence of the left upper arm bone and shoulder of Skeleton 65 indicates that they had been disturbed and removed in digging the grave for Skeleton 66. The right hand side of the rib cage of Skeleton 66 lies partly over the cranium of Skeleton 65. The difference in attitude of the two skeletons seems inconsistent with simultaneous burial. In the absence of radiocarbon dating of these skeletons, it is in our opinion that Skeleton 66 was buried some time after Skeleton 65, certainly subsequent to the decomposition and consolidation of the latter skeleton.

In the drawing of Fig. 16 Skeletons 65 and 66 are shown in their correct position relative to one another. The elements of Skeleton 65 bear the suffix 2 and the elements of Skeleton 66 bear the suffix 1.

Skeleton 67. NMV X72865, CHA 261. Fig. 17.

An extended supine burial with the head and legs exposed, broken and scattered by erosion.

Only fragmentary pieces of cranium were present, including the left maxilla with all teeth in place except the third molar and the medial incisor. Teeth worn severely to the pulp, helicoidally, to as much as 30° from the original occlusal plane. The roots of all teeth were completely exposed externally by resorption of alveolar bone.

The rib cage was well-defined. Vertebral column fairly complete, but eroded. A substantial portion of the sternum was present. The right clavicle and scapula were present. Right arm alongside the thorax with the hand over the pubic area. Left scapula and arm bones

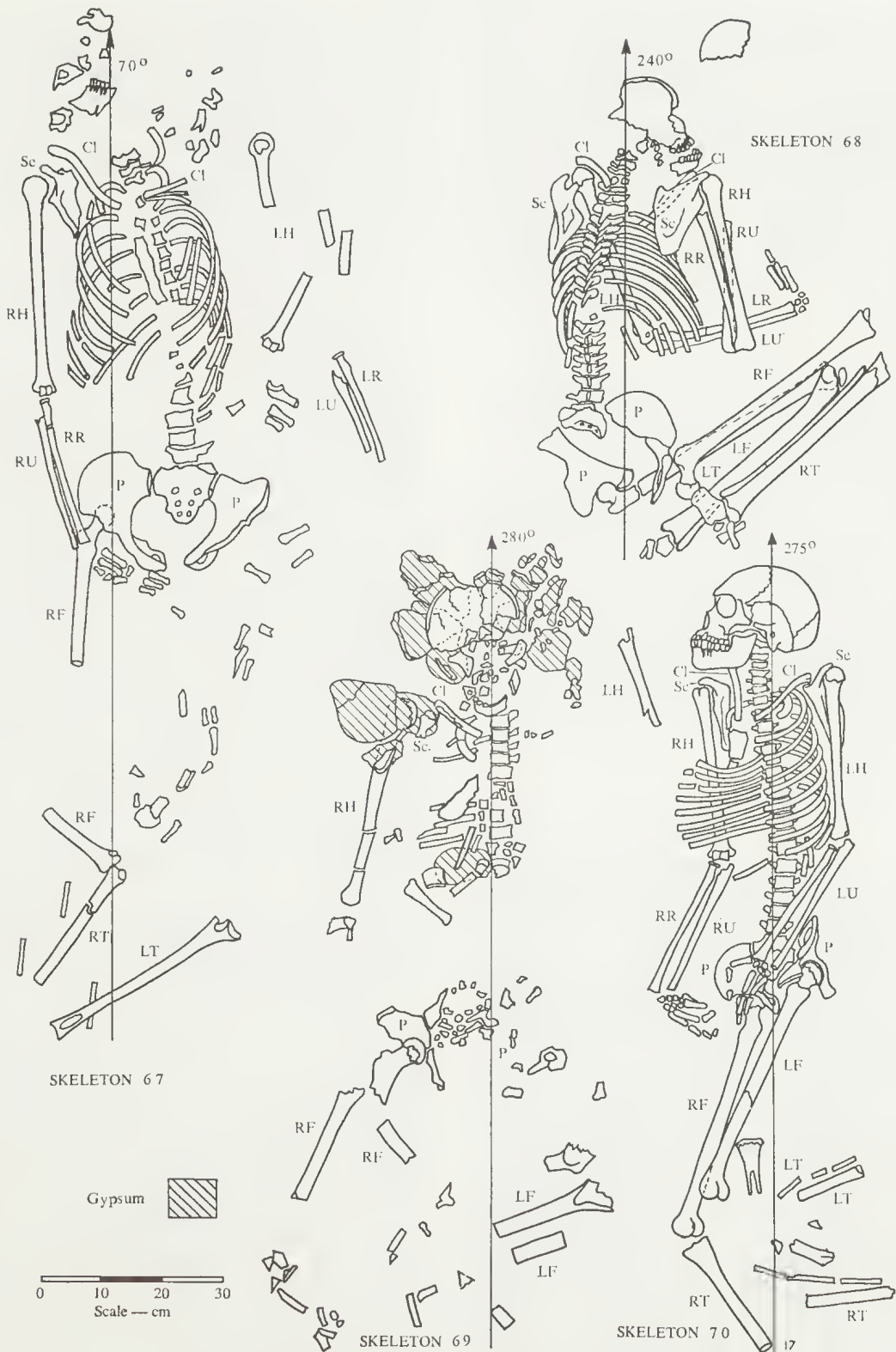


Fig. 17—Burial attitudes of Skeletons 67-70, Site 8.

broken and scattered by surface exposure. The sacrum was largely complete with all joints fused, indicating an age of about 30 years. Pelvis largely complete. The sub-pubic angle of 80° suggests a female. The right femur with the head in place in the pelvis confirms the extended burial even though its distal half, together with both the tibiae have been displaced and disturbed. No left femur was present and the left hand bones had been disturbed and scattered inferior to the pelvis. Orientation 70° .

Skeleton 68. NMV X72866, CHA 265. Fig. 17.

A severely flexed burial lying on the left side with the thorax semi-prone.

A well-preserved skeleton except for the cranium which lay on its left side, but which had been exposed, broken on the right side and occipital region and scattered by surface erosion. However, the frontal bone and both temporal regions were present in place together with the maxillae. The mandible was present except for the frontal section and ascending rami. Supraorbital ridges not prominent.

Dentition:

UR —654321	1234567—	UL
LR 8—65432—	—45678	LL

Both the lower third molars were fully erupted but were substantially unworn. Remainder of the teeth well worn to the pulp, helicoidally. Age probably about 25 years.

Both scapulae were complete and both clavicles were present. The scapulae situated above the clavicles, as well as the attitude of the vertebrae, clearly confirmed the prone position at the shoulders, and its gradual development from the pelvic area. The pelvis lay on the left side but tended towards the prone position. Rib cage fairly complete. Sternum complete. The vertebral column was complete and very well-preserved. Left humerus under the thorax with the left lower arm bones flexed to the right and with some left hand bones present. Right humerus extended alongside the thorax with the right lower arm bones flexed immediately back towards the shoulder, contiguous with the

humerus, and with the hand position underneath the right scapula. The right hand bones, however, had been exposed and scattered. Femora flexed sharply upwards and to the right. Tibiae flexed back immediately inferior to the femora with a few foot bones inferior to the pelvis. The right leg bones lay on the left leg bones. Orientation 240° .

Skeleton 69. NMV X72867, CHA 268. Fig. 17.

An extended supine burial with a widow's cap in place on the cranium.

The drawing shows the scattered nature of this skeleton which had become almost completely exposed by erosion. The cranial remains clearly showed that the head had been buried face upwards. The front portion of the mandible was *in situ* but without teeth. Although the supramaxillary region and frontal bone of the cranium had been comminuted and scattered, the rear portion of the cranium was essentially in place although fractured into several pieces. The cranium was surrounded by scattered pieces of a widow's cap, but that portion which had covered the temporal and occipital regions, although fractured into a number of pieces, was essentially in place. Since it extended beneath the cranium as buried in the grave, it was clearly in place on the head at the time of burial (Pl. 13, fig. 1). Reconstruction of the cranial elements confirmed that the remains of the widow's cap matched the spherical curvature of the cranium when separated from the cranial surface by some 6 mm.

The supine position of the thorax was shown by the attitude of the five thoracic vertebrae still in place. These, together with several fragmentary vertebrae inferior to them, plus the remains of the sternum and a few rib portions, defined the thorax itself. The right humerus was extended alongside the thorax although a little displaced. Portions of the widow's cap were found below the right shoulder bones. This can only be explained as being due to the displacement of the right humerus and scapula during decomposition and settlement following collapse and displacement of the widow's cap. Portion of the left humerus had clearly been displaced by exposure, all the left side of the

thorax being completely absent. Pieces of pelvis remaining in place with many hand bones scattered over the pelvic area suggest that the hands were placed over the pelvic region at burial, as is common among the skeletons of Site 8. The head of the right femur still in position in the pelvis, together with a proximal portion of the shaft, indicates an original extended burial even though the remainder of the right femur and portions of the left femur were considerably displaced. Portions of both femora present were reassembled to confirm their connection with the other skeletal remains and were then used for radiocarbon dating. An age of 750 ± 170 yr B.P. was obtained (ANU-421). Orientation 280° .

The widow's cap itself varied in thickness from 1.2 cm to 2.5 cm. It was composed of gypsum with some flakes of mussel shell incorporated in the matrix on the concave surface. The pieces of the cap clearly showed the impression on the concave surface of the net on which it was formed. Plastic casts were made of these net impressions so that the form of the woven netting was reproduced (Pl. 12, fig. 7). In the absence of fibre remains it was not possible to determine the nature of the fibres used to produce the yarn.

Skeleton 70. NMV X75432, CHA 267. Fig. 17.

An extended burial lying on the right side, but semi-supine.

Cranium substantially complete. Supraorbital ridges moderately prominent. Mandible broken at the mental symphysis, but complete. (Fig. 20).

Dentition:

UR 8765432-	12345678 UL
LR 8765432-	12345678 LL

Wear was even and moderate. Upper canine roots extensively exposed by recession of the alveolar bone. All third molars were little worn. Age probably about 28 years.

Both clavicles and scapulae were present. The thorax was well defined by a complete vertebral column and rib cage. Right ribs displaced over the right humerus during settling and decomposition, no doubt due to the semi-

supine position of the body combined with vertical earth pressure (Pl. 13, fig. 5). Both arms extended alongside the thorax with the hands over the pubic region. Sacrum typically male with all joints fused. The pelvis was complete and sub-pubic angle of 55° indicated a male. Femora slightly flexed to the right. Tibiae broken and somewhat scattered by surface exposure, but clearly flexed slightly to the left. Orientation 275° .

Skeleton 71. NMV X75435, CHA 272. Fig. 16.

An extremely fragmentary skeleton, all the bones being fully exposed on the surface.

A few small fragments of the cranium were present including a fragment of the right mandible with the lower right third molar and the sockets of the lower right first and second molars present. Therefore it was the skeleton of an adult, aged about 25 years.

There were only a few fragments of arm bones. Pieces of the shafts of both femora lay on the surface, sun-bleached, distorted and split by exposure. Similar portions of both tibiae were present with the remnants of some foot bones. The general distribution of the bones suggested an extended burial. Orientation 45° .

Skeleton 72. NMV X75434, CHA 266. Fig. 14.

An extended supine burial.

The cranium had been almost completely dispersed by erosion. Only small fragments, including the right and left mastoid processes, were present together with a small fragment of mandible showing bone regrowth over the sockets of the lower left molars.

Shoulders well defined by the clavicles and a scapula. These, together with rib portions and an almost complete vertebral column, defined the thorax. Both arms extended alongside the thorax with the lower arms flexed towards the centreline with the hands over the pubic region (Pl. 12, fig. 1). Sacrum characteristically male, with all joints fused. Age probably at least 35 years. Pelvis in good condition with the left iliac bone complete. The sub-pubic angle of 60° indicated a male. Femora and tibiae extended in line with the thorax. Most bones of both feet present. Orientation 335° .

TABLE 1
NUMBER OF BURIALS AT ALL SITES RELATED TO THE ATTITUDE
OF BURIAL

Attitude of Burial	Burial Site								Total Number
	16A	16B	17	18	19A	19B	19C	8	
Extended supine	1	7		1	2	5		11	27
Extended prone				1					1
Extended on side		1						1	2
Flexed supine	1	7			1			1	10
Flexed prone							1		1
Flexed on right		6	3				5		14
Flexed on left	1						2	1	4
Squatting	1	1					6		8
Total	4	22	3	2	3	5	14	14	67

Attitude of Burial

An analysis of the attitude of burial of the 67 burials examined in which the attitude of the skeleton could be firmly established is presented in Table 1. This table shows the attitudes represented at each burial site in addition to those of the whole sample.

Of the 67 burials examined, 45% were extended, 43% were flexed and 12% were squatting. Of the eight squatting skeletons only one (Skeleton 2) had been buried with care. The remainder (Skeletons 26, 51-55) had apparently been interred with scant circumspection in the smallest possible space. It would appear, therefore, that in some 90% of burials as represented by the subjects of this paper, some care was taken in laying the body in the grave. However, in only half of these instances was burial undertaken with apparent formality, the body being laid out extended and almost exclusively supine.

While the above statement is applicable to the burials examined as a whole, it is clear that practice varied as between burial sites. A broad comparison of the relative frequencies of extended, flexed and squatting burials at each burial site with those in the overall sample is shown in Table 2. Here the attitudes of burial are expressed as percentages of the sample at each site, and of the total sample.

At only three sites were the numbers excavated sufficient to draw conclusions of any significance, but at each of these sites (16B,

19C and 8) the pattern of the attitude of burial differed markedly. At Site 16B where 22 attitudes were clearly defined, 36% were extended, 59% flexed and 5% squatting. At Site 19C where 14 attitudes were clearly defined, none were extended, 57% were flexed and 43% were squatting. At Site 8 where 14 attitudes were defined, 86% were extended, 14% were flexed and none were squatting. At Site 19B only five attitudes of burial were defined, but it is interesting to note that all were extended supine burials, closely spaced and similarly oriented. The contrast between the attitudes at this site and the attitudes at Site 19C, clearly seen in the site plans in Fig. 2, is most marked.

As an overall average it can be said that apparently formal burial practice is evenly divided as between flexed and extended atti-

TABLE 2
ATTITUDES OF BURIAL AT EACH SITE
—PERCENT

Site	Attitude of Burial—Percent		
	Extended	Flexed	Squatting
16A	25	50	25
16B	36	59	5
17	0	100	0
18	100	0	0
19A	67	33	0
19B	100	0	0
19C	0	57	43
8	86	14	0
Total Sample	45	43	12

tudes. However, the departures from the overall average at Sites 16B, 19C, and 8 are very significant, indicating a wide variation in practice in different localized areas.

In the extended supine burials examined, the arms are generally extended alongside the thorax with the hands either inferior to the pelvis and placed lateral to the legs (Pl. 12, fig. 3), or the lower arms are flexed medially with the hands placed over the pubic area (Pl. 12, fig. 1). Skeleton 1 (Fig. 4) is a typical example of the former and Skeleton 72 (Fig. 14) of the latter. Skeletons with the hands located over the pubic area were found only at Sites 16B and 8. This mode of laying out the body was found in 21% of the total burials, in 18% of the burials at Site 16B and in 71% of the burials at Site 8. Examination of the drawings of the skeletons excaavated at Site 8 (Skeletons 59-72, Figs. 14-17) shows that 10 of the 14 skeletons were placed in the grave with the hands resting over the pubic area. This proportion is very significantly different from the proportion in the total sample and shows that placement of the hands in this position was evidently a customary attitude of burial practised by the Aborigines using Site 8.

In only 13 cases could the sex of the skeleton be determined with certainty. Nine of these cases (or 70%) were males and four (or

30%) were females. Six males were buried extended and three were buried flexed. All four females were buried extended. Nothing significant can be deduced from these figures as regards any relationship between attitude of burial and sex.

Orientation in Burial

The orientation of the skeleton expressed as a true bearing was determined for each burial. In order to determine whether any definite pattern of orientation existed either within individual burial sites or among the skeletons sampled as a whole, the frequency of occurrence was recorded for orientations falling within 30° intervals. Thus the number of skeletons with orientations lying between bearings of 0° to 30°, 30° to 60°, 60° to 90° and so on were recorded for each burial site examined, and for the sampling as a whole. Table 3 sets out the results for 64 skeletons for which orientations were determinable.

As has been noted in the discussion on attitudes of burial it is clear that only at Sites 16B, 19C and 8 were the skeletons excaavated sufficient in number to give any significant indication of general orientation. The frequencies of occurrence for the intervals of orientation selected are plotted graphically in Fig. 18 for burials at Sites 16B, 19C and 8 and for the total

TABLE 3
FREQUENCY OF ORIENTATION OF SKELETONS

Interval of Orientation	Number of Burials at Site								Total	Extended Supine Burials Only
	16A	16B	17	18	19A	19B	19C	8		
0° to 30°		1							1	1
30° to 60°		2						2	4	3
60° to 90°							1	3	4	2
90° to 120°							1		1	
120° to 150°	1	2	1						4	
150° to 180°	1	5	1	1			3	1	12	5
180° to 210°	1	5	1	1				1	9	3
210° to 240°		5			3	4	1		13	9
240° to 270°	1	1				1	2	3	8	3
270° to 300°		1						2	3	2
300° to 330°		1					2		3	
330° to 360°								2	2	2
Total	4	23	3	2	3	5	10	14	64	30

sampling. No predominant direction or orientation exists among burials at Sites 8 and 19C. At Site 16B there is a tendency to orient the body with the head towards the south, although it is not habitual. A similar tendency is evident in the orientation of the skeletons representing the total sample, but again it is by no means universal.

The overall pattern of orientation is considerably influenced by the pattern of Site 16B burials and the few skeletons excavated at Sites 16A, 17 and 18, all of which happened to have a general southerly orientation.

An examination was also made of the frequency of orientation, using the same intervals of bearing, of the 30 extended supine burials for which orientations could be determined, to see whether a more definite pattern of orien-

tation existed when considering only those so buried. The results are recorded in Table 3 under the column for extended burials only, and are plotted in Fig. 18. The same trend towards a southerly orientation exists as for the sampling as a whole and is not significantly different.

The general orientation differs from the orientations reported by Sunderland and Ray (1959) for the Chowilla and Lake Victoria areas. They reported the majority of skeletons lying N-S. but with the heads to the N. In the present series only one third lay within 30° either way of N-S. irrespective of the direction of the head and the general trend was for the head to be directed S.

In considering the attitude and orientation of burial it has not been possible in the absence of dating all skeletons, to consider any changes in practice with time.

Tooth Evulsion

The practice of tooth evulsion was evident at all burial sites. It was confined to the two upper medial incisors. There was evidence of evulsion by impact and fracture, but in the majority of cases the roots were absent. Whether this indicates evulsion by loosening and complete extraction or loss of the roots subsequent to impact evulsion cannot be determined.

There were 26 skulls in which evulsion was clearly either present or absent. In 11 of these (42%) evulsion was present. In 15 of these (58%) evulsion was absent. Of these 26 skulls, 24 could be correlated with the attitude of burial with certainty. Nine of these (38%) showed evulsion and 15 (62%) lacked evulsion. Extended burials were represented by 11 skeletons within this group and in four cases (36%) evulsion was present and in seven cases (64%) evulsion was absent. Flexed burials were represented by 13 skeletons within the group and in five cases (38%) evulsion was present and in eight cases (62%) it was absent. Thus evulsion is not associated in any way with attitude when the burials are considered as a whole. The number of samples at each site was too small to reveal any significant differences.

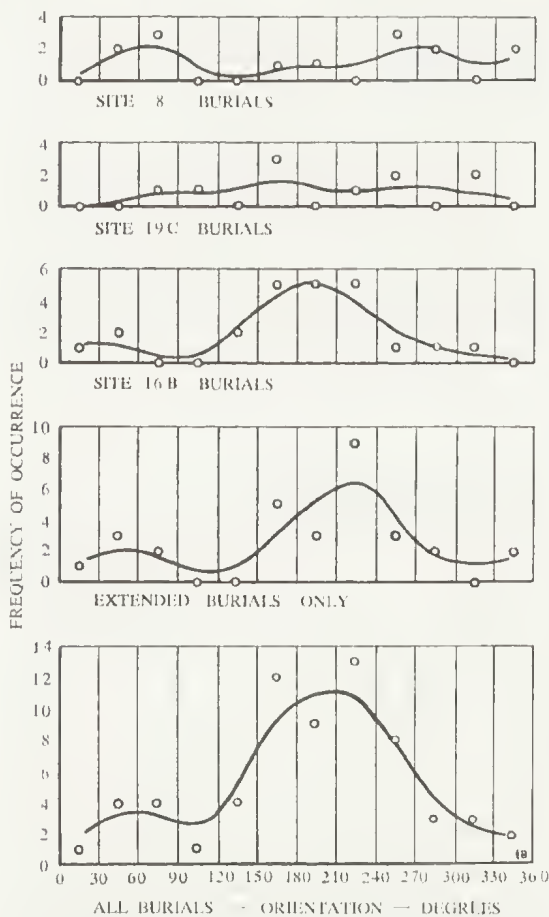


Fig. 18—Frequency of orientation of skeletons in the graves.

Only seven skulls showing clear evidence of the presence or absence of evulsion could be associated with skeletons whose sex could be determined with certainty. One male and one female showed evulsion, but in five males evulsion was absent. These figures cannot be regarded as significant except to suggest that evulsion in males was infrequently practised amongst the Aborigines represented by the present series of burials.

Artefacts and Abnormalities

No artefacts or personal possessions were found buried with the skeletons. No burnt bone was found. Small amounts of charcoal were found associated with some remains, notably Skeletons 17, 23, 29-31.

Calcined clay hearthstones were associated with Skeletons 29 and 30 lying between them and at the same level. That these stones were a closely-packed group suggested that they lay *in situ* as originally assembled to form a cooking hearth, although if this was so it is difficult to imagine how they came to be buried at the level of two bodies lying in an excavated grave. No charcoal was associated with these stones and their association as a group was probably fortuitous.

Skeleton 69 was buried with a widow's cap on the head and this unique occurrence is discussed below.

Mussel shell was lodged in the cranium of Skeleton 32 but had probably become intimately associated with it subsequent to decomposition and settlement of the grave infill. Particles of both red and yellow ochre were also found associated with Skeleton 32.

In several cases (Skeletons 44, 45, 63) severe termite damage was present on some of the bones. This takes the form of heavy surface channelling and is illustrated in P. 12, fig. 2. No bones were found which had been fractured during life and only three bone abnormalities were seen. Skeleton 25 had a periostitic growth on the anterior border of the left tibia, evidently caused by a blow. Skeletons 60 and 64 each had two thoracic vertebrae fused together.

Skeleton 59 showed asymmetry of the base of the skull, and the left radius of Skeleton 64 was distinctly bowed. These pathological symptoms are discussed by Sandison, this *Memoir*.

Removal of Skeletons *in Situ*

On excavation, Skeleton 6 was exposed in a firm matrix from which it would have been difficult to remove the fragile bones intact. It was decided to remove it as a complete burial and to transport it intact to the National Museum in Melbourne.

A rectangular trench some 30 cm deep was excavated around the skeleton and three tunnels (A, Fig. 19) approximately 10 cm high and

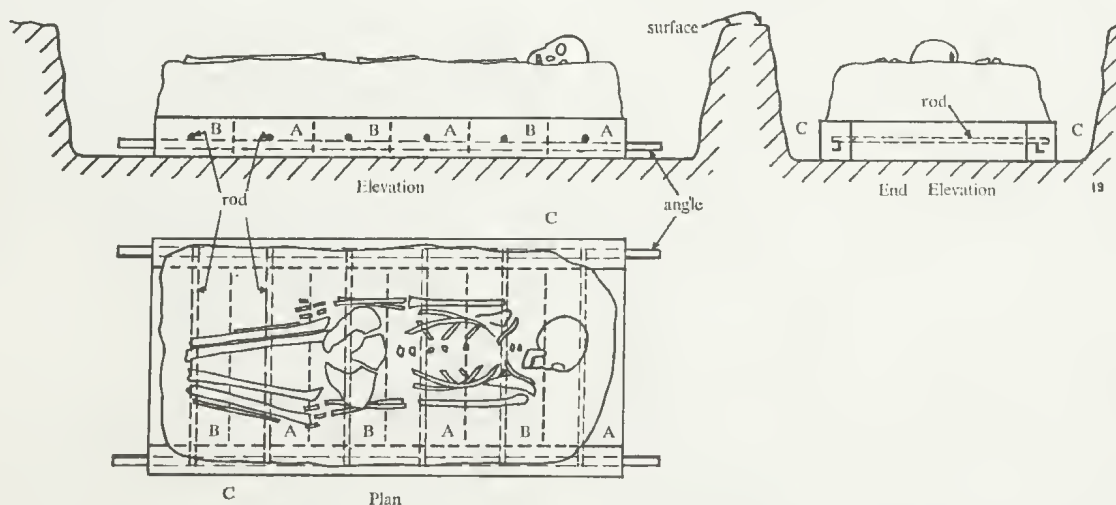


Fig. 19—System of construction of a concrete slab underneath Skeleton 6 to permit removal of the burial intact. Concrete sections, A, B and C were placed in that order.

30 cm wide were excavated transversely below it. These tunnels were filled with cement mortar with a steel rod inserted centrally in each so as to protrude some 10 cm at each end. After hardening, intermediate tunnels (B, Fig. 19) were excavated. These were grouted and reinforced similarly and allowed to harden. Light angle iron reinforcement was placed longitudinally on each side of the skeletal platform, passing beneath the protruding ends of the lateral reinforcing bars and tied to them. Formwork allowed pouring of longitudinal members (C, Fig. 19) to complete the concrete slab under the skeleton (Pl. 13, fig. 3), which was allowed to harden for some two months. The slab, supporting the undisturbed skeleton, was then lifted by the protruding ends of the longitudinal reinforcement. It was placed on an airbed on the floor of a truck and transported to the National Museum where it is on display.

While this method was quite successful, the technique was slow and laborious. A quicker and better method of preserving an intact burial was desirable.

During the excavation work many fragile and friable bones were strengthened before removal by the application of 'Aquadhere' (PVA glue) diluted with twice its volume of water. This almost invisible coating soaks into the surface layer and when dry hardens sufficiently to allow delicate bones to be handled safely. Combined with the sand between adjacent bones, this solution forms a membrane some 3-4 mm thick which holds them firmly together in their correct relative positions.

First experiments were made on a hand of Skeleton 9, which was so treated (Pl. 12, fig. 8). After hardening, the loose sand underneath was brushed away leaving the bones united by a thin web. A complete foot was also removed from Skeleton 9 and preserved in the same way. The technique was then applied to a larger section when a complete rib cage and thorax were removed from Skeleton 17. Finally, a complete skeleton (Skeleton 4) was removed and brought to the National Museum in Melbourne as an entity and is now on display. Skeleton 4 (Fig. 4) was a supine reclining body with the knees raised, the femora and tibiae

being substantially vertical, with the feet close to the pelvic region. The cranium was slumped forwards on to the thorax. The area occupied by this skeleton in plan was therefore quite small and it was well suited to the experiment. After treatment with diluted 'Aquadhere' a baseboard was inserted underneath the skeleton by following a wooden cutting blade (Pl. 13, fig. 2).

Where the matrix is friable this technique provides a very satisfactory method of removing an excavated skeleton in its *in situ* condition. Many marsupial skeletons were also removed by this method during the course of the palaeontological work associated with the Chowilla Project.

Tooth Abnormalities and Wear

Those skeletons with teeth present showed a complete absence of dental caries. In only two cases (Skeletons 27, 47) was there slight evidence of calculus on the lingual and buccal margins of molar crowns. Exposure of the roots on the surface by thinning and resorption of the alveolar bone was frequently present to some degree, and was occasionally severe (Skeletons 28, 67, 70). An abscess below the root of the lower left first molar of Skeleton 65 had erupted through the lateral surface of the mandible (see Pl. 12, fig 5). The lower right first molar of the same skeleton showed loss of bone around the roots on the buccal side caused by pyorrhoea. Two examples of stepped occlusal surfaces of the molars were seen (Skeletons 26, 44) and Skeleton 54 showed a similar stepped condition on the upper canines and incisors. Skeleton 61 had a supernumerary incisor fully embedded in the right palate adjacent to the palatine torus. All roots of the upper molars of Skeleton 64 extended through to the maxillary sinus. Skeleton 17 showed crowding of the lower incisors.

Where wear was slight the teeth appeared flat and uniformly abraded. Teeth with moderate wear uncovering the dentine generally showed the development of the usual helicoidal occlusal plane (Murphy, 1964). In those skeletons showing severe wear well into the pulp, the helicoidal occlusal plane was developed to the

extreme. In such cases the worn occlusal surfaces of the first and second molars were at angles of as much as 40° from the plane of the original unworn occlusal surface, the worn surface on both upper and lower molars sloping downwards laterally so that the lingual margin is superior to the buccal margin. In some cases wear was so severe that the lower molars were worn down into the roots on the buccal side (Skeletons 60, 65). Pl. 12, fig. 5 shows the mandibular teeth of Skeleton 65 which have been subject to extreme helicoidal wear.

In several cases (Skeletons 11, 37, 38, 66, 72) lower molars had apparently been lost pre-mortem at an early age, the sockets having closed and healed by bone regrowth and loss of the supporting alveolar bone. Subsequent wear in Skeletons 11 and 38 had resulted in the development of a helicoidal pattern of wear on the remaining canines and premolars.

Isolated lower third molars in Skeletons 11 and 35 were very severely worn to the pulp, the resulting occlusal surfaces being concave. In Skeleton 35 the lower right third molar was worn by incomplete coverage of its surface by the corresponding upper third molar, leaving a sharp point of hard enamel on the linguomesial margin rising some 2 mm above the general level of the worn occlusal surface (Pl. 12, fig. 6).

It seems probable that helicoidal wear develops because the lateral distance between both lingual and labial surfaces of the upper molars is greater than the distance between the corresponding surfaces of the lower molars. Thus wear is more concentrated on the labial side of the lower molars and the lingual side of the upper molars, and where wear is rapid due to the mastication of abrasive food, the helicoidal pattern is soon developed. In Skeleton 65, for instance, the overhang of the upper molars over the lower molars approximates 1 mm. It can be clearly seen in Pl. 12, fig. 4, which shows the occluded teeth on the left side. This figure also shows the severe thinning and resorption of the alveolar bone exposing the roots of the upper left canines, premolars and first molar in particular.

Extreme helicoidal wear, particularly when

combined with pre-mortem loss of lower molars with subsequent healing of the sockets, is in itself a sign of advanced age at the time of death. The descriptive notes on individual burials provide confirmatory evidence of this in many cases by reference to other skeletal features. Skeletons exhibiting extreme helicoidal tooth wear were found at Sites 16B, 19A, 19B, 19C and 8, but the number of skeletons excavated whose teeth were sufficiently preserved to determine the degree and pattern of wear was significant only at Sites 16B and 8. Severe helicoidal wear was present in 40 per cent of such skeletons at Site 16B, and in 70 per cent of such skeletons at Site 8.

At and in the vicinity of the burial sites examined there was no real evidence of the dietary habits of the populations concerned, except that at Sites 16B and 8 small middens of mussel were present. No mammal bones were found, and only one small fishbone was associated with Skeleton 20 at Site 16B. There was no evidence, therefore, that the higher incidence of severe tooth wear at Site 8 could be attributed to diet. The greater age at death was the predominant factor, wear in general being rapid due to the abrasive nature of all food consumed in a dry, sandy environment.

Antiquity of Skeletons

Radiocarbon dates were determined for six skeletons individually (Nos. 2, 10, 11, 28, 29, 69) and for the mass of skeletal material representing Skeletons 51-55. In all cases except Skeleton 29 the determinations were made on the organic content of the bone. Skeleton 29 was dated using charcoal intimately associated with it in the grave. For the first time, some idea of the range of age of burials in the area between Mildura and the S. Australian border has been obtained.

Skeleton 29 at Site 17 on Keera Station, dated by charcoal, gave an age of $5,840 \pm 90$ years B.P. A comparable age of $5,900 \pm 550$ years B.P. was obtained for Skeleton 2 at Site 16A, also on Keera Station. Skeletons 10, 11 and 28, all at Site 16B, very close to Site 16A, gave ages of $4,170 \pm 200$, $4,400 \pm 200$ and $5,350 \pm 290$ years B.P. respectively. It can

therefore be said that the skeletons in the area examined on Keera Station were buried from some 4,000 to 6,000 years ago.

The alkaline soils of this low rainfall area favour the preservation of skeletal material. It is now clear that the very large number of burials known in the region is not the short-term result of a high population density, but is the result of burial over a long period by a relatively small population. In the restricted area of Site 16B alone, interment must have been practised over a period of more than 1,000 years, yet only 24 skeletons were recovered there.

Radiocarbon dates were determined for Skeletons 10 and 11 because they were buried in close proximity, Skeleton 10 lying above Skeleton 11. As has been discussed above, the archaeological evidence in the grave was that Skeleton 10 had been buried subsequently to Skeleton 11. Dating confirms this and suggests a possible difference between the burials of some 200 years, although statistically the radiocarbon date determinations considered in isolation reveal no significant difference.

The skeletons of Site 8 at Lake Victoria were buried in a red paleosol thought to be some 16,000 years old as dated elsewhere in the lunette (Gill, this *Memoir*). Most skeletons here had been exposed to some extent and the bones had become bleached and scattered. The condition of the unexposed bones, however, did not suggest great antiquity. This was confirmed by a radiocarbon date based on the organic content of bones of Skeleton 69. The age was 750 ± 170 years B.P. It seems reasonable to assume that this would be representative of all burials at this site, which were intrusive into the paleosol.

Unique Widow's Cap Burial

The Aboriginal custom of wearing funerary skull caps as a sign of mourning for a near relative is well known. Worn predominantly by widows, and made of gypsum in the shape of a helmet formed over a net base placed on the head, these widows' caps were commonly placed on the grave after removal at the conclusion of the mourning period. Dummy caps

of gypsum are also known to have been used as grave markers. There are many references in the literature to widows' caps found placed on graves, and Davidson (1948), in what is the best summary of the subject to date, notes the occurrence of this custom in the lower Darling area of N.S.W.

The evidence in the grave after excavation of Skeleton 69 at Site 8 in the E. border of the Lake Victoria lunette, as set out in the detailed description of Skeleton 69 above, shows that it was buried with a widow's cap actually in place on the head (Pl. 13, fig. 1). The authors are unaware of any reference in the literature to a body having been buried with a widow's cap in place on the head, and believe Skeleton 69 is unique in this regard.

The skeletal remains were insufficient to determine the sex, but in view of the preponderance of reference in the literature to the wearing of mourning caps by widows, it seems likely that the burial represents the body of a widow who died during the mourning period. There is, however, no direct evidence in support.

The cap itself was composed of gypsum with some flakes of mussel shell incorporated in the matrix on the concave surface. The flakes were oriented parallel to that surface, confirming construction in successive layers. The thickness varied from 1.2 cm to 2.5 cm. It had been constructed over a net base. The concave surface of the cap showed impressions of the net. Plastic casts were made of these impressions to reproduce the form of the net (Pl. 12, fig. 7). The mesh varied from 6 x 10 mm to 10 x 13 mm. The cord from which it was formed was from 2.0 to 2.3 mm in diameter, two ply, right hand twist. The net was apparently made by knotting and cutting off at almost every mesh intersection (Pl. 12, fig. 7). No fibre remains were present.

The pieces of leg bones associated with Skeleton 69 were radiocarbon dated. Dating was based on the organic content of the bone. The burial occurred 750 ± 170 years B.P. The assay was on "collagen" obtained by acid hydrolysis (Longin method) (ANU-421). It is clear that the burial is comparatively

recent. In the absence of further supporting evidence the burial cannot be regarded as representing ancestral burial practice, and it must be regarded for the present as a fortuitous occurrence of death and burial of an individual during the period of mourning.

Cranial Types

The skulls of only eight skeletons (Nos. 1, 9, 11, 37, 41, 59, 70) were sufficiently complete to permit of cranial measurement. These skulls were all to some slight extent distorted

and had undergone some degree of reconstruction. Nevertheless, it is believed that they give a reasonably good impression of the general cranial features, and it is for this purpose that they are reproduced here in Figs. 20-21 in *norma lateralis*, *norma frontalis* and *norma verticalis*. The skulls have been drawn from the right or left according to which side was the more complete. With the three projections of the cranium placed in their correct relationship in each case, a clear impression of the shape and form of the head becomes apparent.

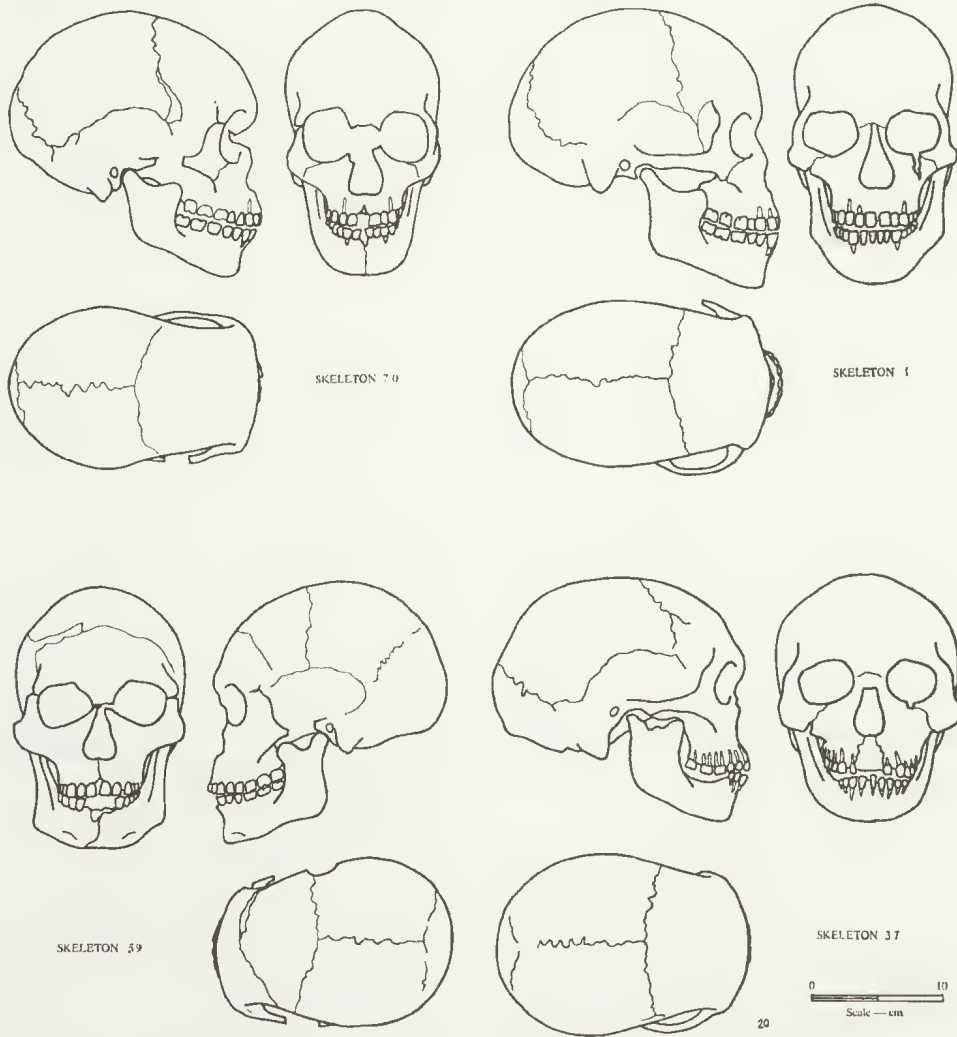


Fig. 20—Skulls of Skeletons 1, 37, 59, 70 as seen in *norma lateralis*, *norma frontalis* and *norma verticalis*.

The cranial measurements of these skulls insofar as they could reasonably be made are set out in Table 4. Measurements are given to the nearest millimetre, greater accuracy being unwarranted. The measurements recorded are those described by Brothwell (1965).

Sex determinations were made on these skulls using the method of Larnach and Freedman (1964). Determination by pelvic characteristics confirmed the sex of Skeletons 1, 59 and 70. There were six males and two females.

The cephalic index has been calculated for

each skull. The skull of Skeleton 11 with an index of 76 would be classed as mesocephalic, but taken as a whole the group is typically dolichocephalic.

The cranial form in *norma verticalis* is predominantly birsoid, although that of Skeleton 9 is ovoid and that of Skeleton 17 is ellipsoid. The cranial form has been determined according to the classification of Sergi (Martin and Saller, 1957).

In spite of the considerable variety of form exhibited by the skulls individually, which can

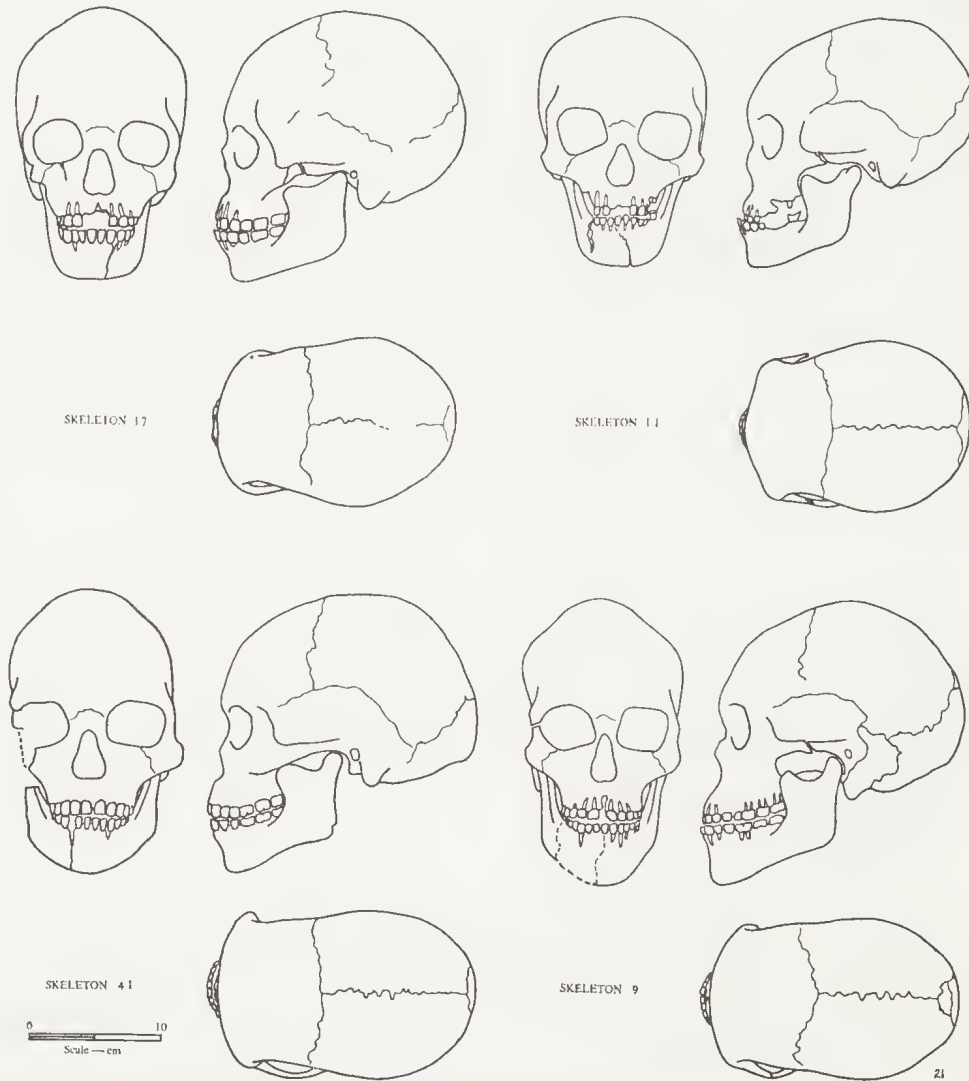


Fig. 21—Skulls of Skeletons 9, 11, 17, 41 as seen in *norma lateralis*, *norma frontalis* and *norma verticalis*.

TABLE 4
CRANIAL MEASUREMENTS OF SELECTED SKULLS—cm

Skeleton No.	1	9	11	17	37	41	59	70
Maximum cranial length	19.8	18.6	17.1	18.0	19.5	19.2	18.9	18.8
Maximum breadth	12.3	12.0	13.0	12.5	14.0	12.4	12.8	12.0
Basi-bregmatic height	—	—	—	—	—	13.4	12.6	13.2
Basi-nasal length	—	—	—	—	—	10.2	10.0	11.4
Basi-alveolar length	—	—	—	—	—	10.8	10.0	10.3
Upper facial height	7.3	7.2	6.5	6.2	6.9	7.1	7.1	7.2
Bi-maxillary breadth	9.4	9.4	8.7	—	9.5	—	9.4	8.9
Bizygomatic breadth	—	11.9	12.0	—	13.4	—	—	—
Nasal height	5.1	5.2	—	4.8	4.8	5.1	5.2	5.6
Nasal breadth	3.0	2.3	2.5	2.6	2.6	2.8	3.0	2.8
Orbital breadth—Right	4.0	4.2	3.9	3.8	3.9	—	4.0	—
—Left	4.0	4.0	3.9	3.5	4.0	4.0	3.8	—
Orbital height —Right	3.3	3.3	3.3	3.0	3.4	3.2	3.0	3.9
—Left	3.2	3.5	3.5	3.4	3.2	3.1	3.0	3.9
Palatal breadth	4.1	3.9	—	3.1	3.6	3.4	4.1	3.7
Mid frontal breadth	9.4	9.6	9.8	9.4	10.0	10.2	8.9	9.0
Frontal arc	14.0	12.9	11.1	12.0	13.0	13.0	12.4	12.5
Parietal arc	13.0	11.1	10.7	12.0	13.2	14.5	10.1	12.0
Occipital arc	10.6	12.4	11.0	—	—	11.5	13.0	10.1
Bimastoideal diameter	12.6	—	12.9	11.4	12.1	—	12.4	11.9
Symphysial height	4.1	4.2	3.4	3.2	3.3	3.9	3.5	3.1
Maximum projective mandibular length	11.4	12.1	10.4	10.2	—	11.4	9.9	—
Coronoid height—Right	5.6	5.5	4.9	5.9	—	—	5.7	—
—Left	5.6	5.5	—	5.9	—	5.5	6.1	—
Mandibular angle	130°	123°	128°	109°	—	119°	105°	119°
Minimum ramus breadth								
—Right	3.7	3.6	3.2	3.8	3.3	—	3.1	3.2
—Left	3.5	3.7	3.1	3.7	—	3.9	2.9	3.1
Bigonial breadth	10.4	9.1	7.2	7.0	—	—	10.4	7.3
Foramen mentalia breadth	4.9	4.8	4.2	4.6	4.7	4.8	4.6	4.3
Cranial form in norma verticalis	birsoïd	ovoid	birsoïd	ellipsoid	birsoïd	birsoïd	birsoïd	birsoïd
Sex determination	M	M	F	F	M	M	M	M
Cephalic index	62	64	76	70	72	65	68	64

be clearly seen in Figs. 20-21, there are two characters common to all, which are typical of the Australian Aboriginal.

All skulls seen in norma frontalis show the presence to some extent at least, and sometimes markedly so, of a paramedian flattening or even concavity, on either side of an elevated, rounded sagittal ridge of the parietal. In Skeletons 9, 17 and 70 this is combined with prominent parietal eminences, more typical of the Tasmanian Aboriginal skull. In Skeletons 9 and 17 the elevation of the sagittal ridge was slightly emphasized by lateral compression in the grave, but was nevertheless pronounced.

The cranial outline of all skulls as seen in norma lateralis is extraordinarily uniform in character. Fenner (1963) has described the typical outlines for Aboriginal skulls from the N. Territory, N. Queensland and SE. Australia.

The cranial outlines in norma lateralis of the skulls figured here are compared in Fig. 22 with the typical outline of Fenner for Aboriginal skulls of SE. Australia, which has been drawn in each case with the same maximum cranial length as the individual skull with which it is compared. The correspondence is remarkably close.

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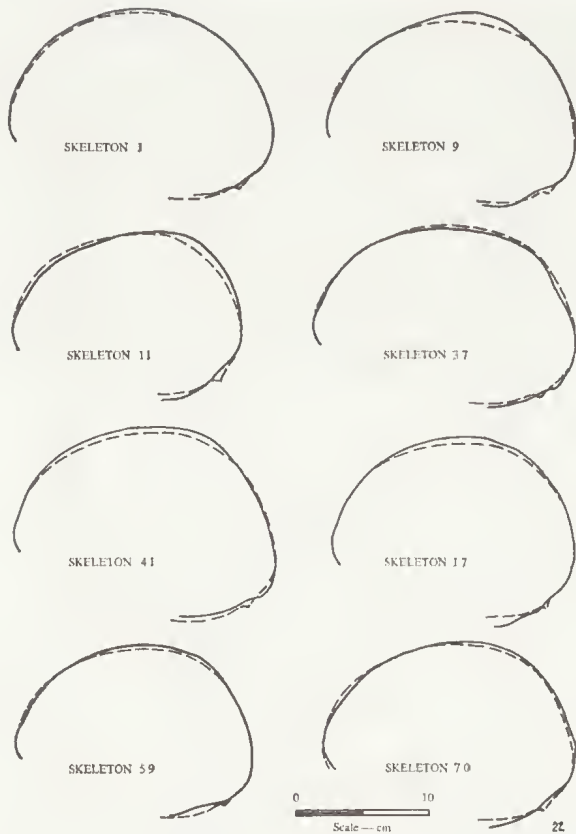


Fig. 22—Profiles in norma lateralis of the crania of Skeletons 1, 9, 11, 17, 37, 41, 59, 70 (full line), compared with the outline (broken line) of the typical Aboriginal cranium of SE. Australia as described by Fenner (1939).

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Explanation of Plates

PLATE 12

- Fig. 1—Typical position of hands over the pubic area in extended burials—Skeleton 72.
- Fig. 2—Examples of bones subject to termite attack post mortem.
- Fig. 3—Typical position of hands alongside the body in extended burials—Skeleton 41.
- Fig. 4—Occluded teeth of Skeleton 65 showing overhang of the upper molars over the lower molars and exposure of roots of the upper teeth by resorption of the alveolar bone.
- Fig. 5—Mandible of Skeleton 65 showing eruption of an abscess through the lateral surface below the first molar and extreme helicoidal wear to the roots of the first and second molars.
- Fig. 6—Lower right third molar of Skeleton 35 showing severe concave wear of the occlusal surface leaving a sharp, upstanding point on the linguo-mesial margin.
- Fig. 7—Plastic cast taken from the concave surface of the mourning cap of Skeleton 69 which reproduces the detail of the net on which the cap was formed.
- Fig. 8—Complete hand of Skeleton 9 removed as a unit by treating the bones and sand matrix with diluted 'Aquadhere'.

PLATE 13

- Fig. 1—Remains of the cranium of Skeleton 69 with the remnants of a mourning cap still in place. The photograph was taken from a position superior to the head.
- Fig. 2—Skeleton 4 completely excavated and prepared with diluted 'Aquadhere' for removal as a unit. The wooden 'saw' was used to cut through the base while inserting a board support on which the skeleton was transported to the National Museum of Victoria for display.
- Fig. 3—Skeleton 6 as it lay *in situ* after construction of a concrete platform beneath it. The skeleton was removed on this platform for display in the National Museum of Victoria.
- Fig. 4—Mass of Skeletons 51-55 during excavation after removal of Skeletons 44 and 50.
- Fig. 5—Skeleton 70 fully excavated showing collapse and distortion of the rib cage during settlement in the grave.
- Fig. 6—Cache of mussel shells as exposed by wind erosion at the summit of the lunette on the E. side of Lake Victoria, N.S. Wales.

