Bone tools have been produced by Australian Aborigines for at least 22 000 years. Bone points exist throughout the archaeological record on the Australian mainland and the island of Tasmania (Akerman 1995). In western Arnhem Land, single-pronged and multi-pronged spears tipped with bone points were used to hunt fish, tortoises and water snakes (Spencer 1914:357). They have also been recorded as being used as sorcery items and worn in nasal septums (Akerman 1995).

Bone points are commonly found in archaeological deposits in the northern portion of the Northern Territory. The floodplains in this region underwent dynamic environmental change from extensive mangrove swamps in the midto late-Holocene, through a transition phase of variable estuarine and freshwater mosaic environments, to the freshwater environment that exists today. In this paper, we review archaeological and ethnographic evidence for the uses of bone points. We draw on a case study from earth mounds on the Adelaide River to contend that bone points in these archaeological contexts are associated with fishing, especially in the transition phase of floodplain evolution.
The study area
The lower Adelaide River flows through the coastal plains of northern Australia, some 200 kilometres west of Arnhem Land and 60 kilometres southeast of Darwin in a subtropical savannah environment, twelve degrees south of the Equator (Figure 1). The climate is characterised by high temperatures and two major seasons, the dry season from May to November and the wet season from December to April.

Palaeo-environmental context
Following the Last Glacial Maximum, rising seas flooded down-cut river valleys on the coast of northern Australia. When the sea level stabilised, processes of sedimentation resulted in the rapid formation of vast mangrove swamps on the floodplains. This period is described as the 'Big Swamp Phase' and is dated from about 7000 to 4500 years BP on the South Alligator River in western Arnhem Land and from 6000 to 4000 years BP on the Adelaide River (Clark et al. 1992; Woodroffe et al. 1985; Woodroffe and Mulrennan 1993:266). This was followed by a ‘Transition Phase’ when further siltation and coastal progradation blocked the tidal influence and the mangroves retreated towards the coast and the edges of rivers and creeks. During this phase, the floodplains were a highly variable landscape made up of a mosaic of freshwater and estuarine ecosystems. Between 4000 and 1500 years BP, the slowing of coastal progradation and continued sedimentation led to

![Figure 1: Location map of northern Australia. 1 North Point; 2 Middle Point; 3 Kina; 4 Burial Cave, Anbangbang, 5 Nawamoyn, Paribari, Malangangerr, Ngarradj Warde Jobkeng.](image-url)
a final cut-off of the tidal influence. The ponding of freshwater behind the seaward chenier beach ridges resulted in the formation of vast freshwater wetlands that are a major feature of the northern floodplains today (Chappell 1988; Woodroffe and Mulrennan 1993). The archaeological evidence indicated that on the Adelaide River the freshwater influence was widely established by 2000 years BP (Brockwell 2001:55). In the contact period, Europeans first attempted to settle the northern portion of the Northern Territory in the 1820s and, by the 1880s, pastoral leases had been established over extensive areas. The impact on the coastal plains, especially the freshwater wetlands, was hugely detrimental with the introduction of feral animals, such as buffalo and pigs, and exotic weeds (Brockwell 2001:55–7).

Adelaide River archaeology

Surveys along the floodplain margins of the lower Adelaide River located a variety of open archaeological sites, the majority of which were earth mounds. Other site types included artefact scatters and quarried rock outcrops (Brockwell 1996; Smith 1981; White 1968).

The earth mounds were concentrated in two main areas on headlands jutting into the floodplains, Middle Point and North Point (Figure 1). Altogether 39 earth mounds were recorded, ranging from 30 m to 80 m in diameter and from 25 cm to 1.4 m high, and occurring mostly in clusters (Brockwell 1996; Smith 1981). Five earth mound sites were targeted for further investigation. Three mounds on Middle Point (MP2, MP5 and MP6) and two mounds on North Point (NP19 and NP20) were selected for excavation. A collection from a previously excavated earth mound (HD1 — White 1968) at Middle Point, held by the Museum and Art Gallery of the Northern Territory, was also analysed.

Twelve radiocarbon determinations were obtained from the earth mounds. They indicated that the western floodplain margins of the Adelaide River have been occupied for at least the last 4000 years BP until the recent past (Brockwell 2001:80–4; Brockwell 2006). The assemblages were assigned to environmental phases, based on the dates from the excavations, as follows: The ‘Big Swamp Phase’ (>3900 BP), the ‘Transition Phase’ (2000–3900 BP), the ‘Early’ (750–2000 BP) and ‘Late Freshwater Phases’ (180–750 BP), and the ‘Contact Phase’ (<180 BP) (Table 1). These divisions cannot be considered absolute, as the dating of each of the phases is not precise for the Adelaide River, but they are a convenient aid to the interpretation of cultural data within the environmental framework. The ‘Contact Phase’ at the end of the sequence is proposed because of the impacts on the environment as a result of the introduction of exotic species by the Europeans (Brockwell 2001:55–7).

The excavated mounds yielded large quantities of stone artefacts and well-preserved faunal remains, including macropods, birds, reptiles, fish and shellfish. The faunal analysis revealed that the assemblages were dominated by species from the floodplains (shellfish, fish and turtles), but also contained species from the open savanna woodlands (goannas, wallabies and possums). There was a marked variation in species between the top and bottom of the deposits (Figure 2).
Variation in the faunal species found in the mound sites can be explained in terms of the environmental changes that were occurring on the floodplains in the mid- to late-Holocene. There were large quantities of the mangrove shell
species in the lower layers of HD1, which has been dated to the ‘Big Swamp Phase’, when mangrove forests encompassed the floodplains, pre-3900 years BP on the Adelaide River. The shell assemblage was dominated by *Polymesoda* [*Geloina*] *coaxans*, a species that inhabits mangrove forests. The middle layers of the mounds contained increasing quantities of fish bone, while the amount of estuarine shell present in the assemblages declined with the retreat of the mangroves and the onset of the ‘Transition Phase’ from c. 3900 years BP. The most commonly identified fish species were barramundi (*Lates calcarifer*) and catfish (*Arius* sp.) These species tolerate both fresh- and saltwater conditions, but barramundi need estuaries to breed. From 2000 years BP, fish declined and freshwater turtle increased marking the beginning of the ‘Freshwater Phase’. The turtle remains were mainly from the carapace of the long-necked turtle (*Chelodina rugosa*). This is a freshwater species that typically inhabits swamps, billabongs and waterholes across northern Australia and today occurs commonly on the floodplains of the Adelaide River (Brockwell 2001:142–9).

**Adelaide River bone points**

Mounds MP2, MP6 and HD1 contained bone implements analysed subsequently by Kim Akerman (Table 2 and Appendix 1). There are 19 bone points from HD1, four of which are intact, seven show possible traces of resin and two have use-polish. There are six bone points from MP2, one of which is intact (34.1 x 4.3 x 2.9 mm) and three show possible resin residues. There were two bone points from MP6, both with burnt and broken tips, possibly made on macropod fibula (Appendix 1). The intact examples have dimensions of 22.3 to 29.4 mm in length, 3.5 to 5.4 mm in width, and 2.8 to 3.2 mm in thickness.

The Adelaide River specimens are mainly asymmetric small bone points, ground and polished into shape (Figure 3). They are rounded in cross-section and taper towards the pointed end. It is difficult to determine whether they are unipoints or bipoins as most were broken at either one or both ends. However, the intact examples are asymmetrical about the widest cross-section, which is nearer to one end

<table>
<thead>
<tr>
<th>Phase</th>
<th>Site</th>
<th>Spit</th>
<th>Date (yrs bp)</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late Freshwater</td>
<td>MP6</td>
<td>3</td>
<td>&lt;530</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>MP2</td>
<td>6</td>
<td>&lt;750</td>
<td>1</td>
</tr>
<tr>
<td>Early Freshwater</td>
<td>MP6</td>
<td>10</td>
<td>530–1420</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>MP2</td>
<td>12–13</td>
<td>460–2000</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>HD1</td>
<td>2</td>
<td>&lt;2000</td>
<td>1</td>
</tr>
<tr>
<td>Transition</td>
<td>MP2</td>
<td>14–16</td>
<td>&gt;2000</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>HD1</td>
<td>5–8</td>
<td>2000–3900</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>HD1</td>
<td>9–10</td>
<td>3900</td>
<td>4</td>
</tr>
<tr>
<td>Big Swamp</td>
<td>HD1</td>
<td>11</td>
<td>4100</td>
<td>2</td>
</tr>
</tbody>
</table>

*Table 2: Adelaide River sites. Distribution of bone points (summary)*
than the other. This suggests that the end of the bipoint with the longest taper was embedded into the wooden prong of the spear. The other, shorter section appears to be the actual tip of the prong. It may be that, initially, the point was symmetrical about a mid-point and that with wear and other attrition the exposed end was reduced, creating the asymmetry. Traces of resin found on some specimens suggest that they were hafted.

Bone points were used throughout the history of the Adelaide River earth mound sites. However, as can be seen from Table 2 and Figure 4, they are not distributed evenly through the deposits. The radiocarbon results indicate that most of the bone points are concentrated in layers that have been assigned to the ‘Transition Phase’ from 3900 to 2000 years BP. While fish remains were present throughout the sites, fish remains dominated other floodplains fauna in the ‘Transition Phase’ (Figure 2).

Figure 3: Adelaide River bone points (Adelaide River Collection, Museum and Art Gallery of the Northern Territory; photograph by Darren Boyd).

Figure 4: Distribution of bone points by geomorphological phase, Adelaide River.
Bone points in other Arnhem Land archaeological contexts

Bone points have also been reported from several excavations in western Arnhem Land (Figure 1). At Arguluk Hill near Oenpelli on the East Alligator River, McCarthy and Setzler (1960) excavated bone implements from an undated shallow rock-shelter deposit. Their analysis placed the bone points into two classes according to appearance and size; bipoints and spatulate points. One intact bipoint they illustrated was 25 mm in length, similar to the Adelaide River specimens. They also described a complete bipoint as being made from a hard, well-preserved cylindrical piece of bone, rubbed all round the point” (1960:268, 270). They reported numerous marsupial, bird and fish remains from the deposit. Unfortunately, as the entire deposit was excavated as one unit, there is no stratigraphic information available that can be associated with the distribution of the faunal remains.

Schrire (1982: 60–3, 92–5, 126–8) reported numerous bone points from three rock-shelters in the northern Alligator Rivers region (Paribari, Malangangerr and Nawamoyn), which lie adjacent to the floodplains of Magela Creek (Figure 1). These include unipoints, bipoints and spatulate examples. The intact bipoints are similar in dimensions to the intact examples from the Adelaide River, ranging from 16 to 37 mm in length (1982:60, 94, 128).

There were two zones of deposit identified at Paribari: an older midden zone at the back of the rock-shelter and a non-midden zone in the front. The midden zone was about 3000 years old and was dominated by species of mangrove/mudflat shellfish (Table 3; Schrire 1982:51). The non-midden zone contained Velesunio angasi, a freshwater species of shellfish. The quantity of fish remains increased over time in Paribari. The number of all types of bone points also increased over time, but spatulate points were more common in the midden zone (1982:51). The distribution of the shellfish species and the dating suggest that midden zone was associated with the ‘Transition Phase’, while the non-midden zone was associated with the ‘Freshwater Phase’.

The lower midden layer at Malangangerr was dated to about 7000 years ago, while the lower midden layer at Nawamoyn was dated to about 8000 years (Table 3; Schrire 1982:85, 118). Schrire (1982:95) described the distribution of bone tools as being very similar both sites. Fish remains and bone points occurred throughout the shell midden deposit. Most of the bipoints and unipoints, however, occurred near the top of the midden layers, while spatulate points predominated in the lower midden layers (Schrire 1982: 52, 89, 95, 121, 128). The lower midden layers of the sites were dominated by Polymesoda [Geloina] coxans, and Telescopium telescopium, both mangrove species of shellfish, and the upper layers by Cerithidea anticipata, a shellfish that inhabits mudflats (1982:89–90; 121–23). This distribution suggests that the lower midden layers were associated with the ‘Big Swamp Phase’ and the upper layers with the ‘Transition Phase’.

At Ngarradj Warde Jobkeng, also in the northern Alligator Rivers region, Kamminga and Allen (1973:32) reported bone tools (unipoints and bipoints) associated with fish remains found mainly in the midden layers of the deposit dated to about 3500 years ago (Figure 1; Table 3). The dates and the fact that these layers were dominated by Cerithidea sp. suggest that they can also be assigned to the ‘Transition Phase’.
<table>
<thead>
<tr>
<th>Name of Site</th>
<th>Context</th>
<th>Spit/level</th>
<th>Depth below surface</th>
<th>Material</th>
<th>Laboratory number</th>
<th>Sources</th>
<th>Phase</th>
<th>Date</th>
<th>2σ (95.4 %) Cal Age Range/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paribari</td>
<td>midden, near base</td>
<td>III</td>
<td>N/A</td>
<td>charcoal</td>
<td>ANU-17</td>
<td>Schrire 1982</td>
<td>Transition</td>
<td>3120±100</td>
<td>3474–2961</td>
</tr>
<tr>
<td>Malangangerr</td>
<td>midden base</td>
<td>lb/6D/4</td>
<td>85–90cm</td>
<td>charcoal</td>
<td>GaK-627</td>
<td>Schrire 1982</td>
<td>Big Swamp</td>
<td>5980±140</td>
<td>7157–6442</td>
</tr>
<tr>
<td>Nawamoyn</td>
<td>midden base</td>
<td>lb/C82</td>
<td>42–48cm</td>
<td>charcoal</td>
<td>ANU-53</td>
<td>Schrire 1982</td>
<td>Big Swamp</td>
<td>7110±130</td>
<td>8163–7656</td>
</tr>
<tr>
<td>Ngarradj Warde Jobkeng</td>
<td>midden, middle</td>
<td>II/5</td>
<td>75cm</td>
<td>charcoal</td>
<td>SUA-164</td>
<td>Kamminga and Allen 1973; Allen and Barton 1989</td>
<td>Transition</td>
<td>3450±125</td>
<td>3971–3373</td>
</tr>
<tr>
<td>Anbangbang</td>
<td>layer 2, base</td>
<td>U17NW/13</td>
<td>53–59cm</td>
<td>charcoal</td>
<td>ANU-3207</td>
<td>Jones and Johnson 1985</td>
<td>Freshwater</td>
<td>790±80</td>
<td></td>
</tr>
<tr>
<td>Kina</td>
<td>midden layer, middle</td>
<td>SE/4</td>
<td>45–60</td>
<td>charcoal</td>
<td>ANU-3212</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Jones and Johnson 1985; Meehan et al 1985</td>
<td>Freshwater</td>
<td>280±140</td>
<td>445 –148</td>
</tr>
</tbody>
</table>

Note: sites (BS=Big Swamp; T=Transition; FW=Freshwater; N/A= Not available)
Further south, numerous bone tools were reported from the Anbangbang rock-shelter, which is located in the Nourlangie Rock outlier that lies on the plains midway between the South Alligator River and the Arnhem Land escarpment (Figure 1). Anbangbang lies adjacent to a large freshwater lagoon, fed by two ephemeral creeks that drain into Nourlangie Creek and ultimately into the South Alligator River. The formation of the freshwater Anbangbang Lagoon has been dated to about 3400 years ago (Hope et al. 1985:232–3). Bipoints and unipoints occurred in the upper layers of the excavation, dated from about 800 years ago (Table 4). They were associated with the remains of the freshwater mussel (*Velesunio angasi*) and freshwater fish (Foley 1985:1001–101; Jones and Johnson 1985:41, 60–2). At Burial Cave, on the other side of the lagoon, three bone points were found in the undated midden layer, which also contained fish remains (Figure 1; Kamminga and Allen 1973:66). A broken bone point was obtained from Kina, an earth mound site on the edge of the South Alligator River floodplains (Figure 1). The deposit also contained the remains of fish, freshwater turtle and the freshwater mussel *Velesunio angasi*. This site has been dated to c. 300 years BP (Table 3; Meehan et al. 1985:150–2).

Richard Fullagar (1988) prepared a report for Betty Meehan on use wear and residues for several of the bone points from Anbangbang. He concluded that one of the unipoints and three of the bipoints had been hafted as spear tips. One of the points had been fashioned with cut marks probably produced by a knife. Blood traces and other residues were detected but could not be further identified. A single-pronged wooden spear shaft was found in the upper layer of the deposit at Anbangbang. It was X-rayed to reveal a hafted tip, fixed with resin, that Fullagar concluded was probably a bone or stone point. The wooden shaft also shows impressions of fibre string probably used to bind the bone point into the spear tip, which had been hollowed out to accommodate the barb (Figure 5).

**Rock-art**

In the rock-art of western Arnhem Land there are numerous examples of single and multi-pronged spears, with and without barbs. It is difficult, however, to tell

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**Table 4**: Bone tools from Anbangbang, Alligator Rivers region

<table>
<thead>
<tr>
<th>Sq/spit</th>
<th>Layer</th>
<th>Bipoint</th>
<th>Unipoint</th>
<th>Section</th>
<th>Awls</th>
<th>Incisor</th>
<th>Date</th>
<th>ANU no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R/surf-3</td>
<td>surface</td>
<td>1</td>
<td>4</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S/surf-2</td>
<td>surface</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td></td>
<td>Modern</td>
<td>3771</td>
<td>3208</td>
</tr>
<tr>
<td>T/5</td>
<td>layer 1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;420±60</td>
<td>3208</td>
</tr>
<tr>
<td>T/9</td>
<td>layer 1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&gt;420±60</td>
<td>3208</td>
</tr>
<tr>
<td>U/2–13</td>
<td>layer 1</td>
<td>4</td>
<td>8</td>
<td>1</td>
<td>1</td>
<td></td>
<td>&lt;790±80</td>
<td>3207</td>
</tr>
</tbody>
</table>

Total 8 10 1 5 1

Note: After Jones and Johnson 1985:60–2.
Bone points from the Adelaide River

Brockwell & Akerman

whether bone points were used as tips, because generally spears in rock-art are depicted with little detail of the point (P. Taçon pers. comm. 2006).

Chaloupka (1993:146, 148, 150–1) reported that, in the rock-art of Arnhem Land, the four-pronged spear appeared for the first time during the estuarine period (‘Big Swamp Phase’), dated from 7000 years BP, and is depicted being used to spear fish (Figure 6).

Taçon (pers. comm. 2006) said that the three-pronged spear appeared in the rock-art with along with other objects about 4000 to 6000 years ago. It is associated with ‘Yam Figures’, ‘Simple Figures’, ‘Rainbow Serpents’ and life-size ‘humans’. It is found in the backs of ‘macropods’ and sometimes ‘fish’, and with ‘human’ figures, and is often portrayed as a standard part of a three-piece tool-kit consisting of a single-pronged ‘spear’, a three-pronged ‘spear’ and a hooked-stick (presumably a spear-thrower). From about 3000 to 4000 years until recent times, this pronged ‘spear’ is exclusively associated with depictions of ‘fish’, which increase steadily in frequency (P. Taçon pers. comm. 2006). No information is available about whether the four-pronged and three-pronged spears differed from each other in form and function.

In Lewis’ analysis of the rock-art of western Arnhem Land, depictions of multi-pronged ‘spears’ first appeared in the art of his ‘Broad Spearthrower Period’ (early X-ray style), which he dated from c. 6000 years BP coinciding with the ‘Big Swamp Phase’. It also occurred in his ‘Long Spearthrower Period’ (recent or fully-developed X-ray style), dated from c. 2000 years BP and associated with the ‘Freshwater Phase’ (Lewis 1988:50–5, 95–105, figs 176–7). During this ‘Long Spearthrower Period’, there were at least six multi-pronged ‘spear’ types depicted, including barbed and un-barbed varieties (1988:399, fig. 257), all of which were used in Arnhem Land until recent times.

Ethnographic examples of bone point use in the Northern Territory

Three main types of bone points have been recorded in the ethnographic literature of the Northern Territory. These were unipoints (pointed at one end), bipo...
Bone points from the Adelaide River

Brockwell & Akerman

Bone points from the Adelaide River (pointed at both ends) and spatulate points (wide, with a rounded end), all of which also occurred in archaeological contexts (see above). There was no specific information about the ethnographic use of bone implements on the Adelaide River. However, Hodgson (1995:96–7), who surveyed museum collections from localities including the Alligator Rivers, Coburg Peninsula and Katherine, reported that sources from coastal areas in the Northern Territory and Arnhem Land have described bone as being used variously as tips for fishing spears, awls, scrapers, knives and personal adornment.

In its collections from the Northern Territory, the Australian Museum in Sydney holds bone implements whose uses have been recorded ethnographically (S Florek pers. comm. (15 June 2006). There are seven pointed bone implements from Yirrkala (E47898–E47905), mostly described as knives. Two bone points from Arnhem Land (E67888) have been described as shellfish picks. One bone point (E80937) from the Blyth River was described as being used to make a hole through the nasal septum. Three bone points (E80884–6) from Yirrkala were recorded as knives to cut through the skin of native cashew fruit to extract the nut. Richard

Figure 6: Rock-art depiction of hunter with four-pronged spear and barramundi, Inyaluk, near Oenpelli, western Arnhem Land (photograph by Paul Taçon).
Fullagar (1988), who examined these specimens for use-wear and residue, found that two of the latter had plant fibres consistent with piercing a plant.

On the Blyth River in central Arnhem Land, Jones and Johnson (1985:60) reported that within historical memory bone bipoints served as barbs in multi-pronged fishing spears. Today such multi-pronged spears are armed with wire prongs. ‘Stout awls’, as Jones and Johnson described them, were made from wallaby fibula and shaped with pumice from the beach. They were used for such diverse functions as piercing animal hides and bark fibre prior to binding together canoes, manufacturing water carriers from palm leaves, decorating pierced nasal septums and extracting the flesh of shellfish (Jones and Johnson 1985:60; Meehan 1982:102) (Figures 7–8). On the basis of these descriptions, Schrire (1982:63) proposed that the spatulate bone points, found in the lower midden layers of Malangangerr, Nawamoyyn and Paribari in western Arnhem Land (see above), were used to winkle out shellfish meat as described ethnographically for the examples from the Blyth River.
During his visit to the Alligator Rivers region in 1912, Spencer (1914:331; 1928:797–99) reported that bone points were used to pierce nasal septums and hafted onto multi-pronged spears, and used for fishing (Figure 9). He noted that wooden and bone-tipped prongs of fish spears were being replaced with prongs made from fencing wire by the time of his visit (Spencer 1928:797).

There were two bone-tipped spears that Spencer described as being unusual in form and made exclusively by the Alligator Rivers region tribes. The first was a single-pronged hardwood shaft 2.9 metres long called a jiboru (Figure 9; Spencer 1914:358):

Figure 9: Spears from the Alligator Rivers region: Jiboru (second from right) and kujoro (third from right) (Spencer Collection, Museum of Victoria).
Its total length is nine feet eight inches [290cm], the greater part of which consists of a thin shaft of hard wood only, at most, three-quarters of an inch [19mm] in diameter. At the handle end there is a short length of reed or bamboo measuring twelve inches [30cm] and made so that the point of the spear thrower can be fitted into it. At the opposite end there is single sharpened bone, which projects for an inch and a quarter [31mm] from a small mass of hard kapei, that is, the resin derived from the root of the ironwood tree.

Spencer did not describe the use of the jiboru. However, it is similar in form to the archaeological specimen found at Anbangbang in the Alligator Rivers region, on which evidence of hafting was identified by Richard Fullagar (see above; Figure 5). Chaloupka (1993:146) described another a long slender straight spear made from a single piece of hardwood but with no bamboo handle. It was sharpened to a single point that was hardened by firing, with a bone tip inserted at one end. It was called a garrarr, and was made and used by the Mayali people of western Arnhem Land in historic times.

The other spear (Figure 9) that Spencer (1914:357–9, 1928:799–800) described in detail was called kujorjo or kumbata and was used for fishing and hunting freshwater file snakes in the dry season:

The total length is only five feet three inches [157.5cm]. It consists, essentially, of four prongs of hard wood, and a short length of bamboo, into which they are inserted. The prongs are free for just three feet. From this point downwards towards the handle they are arranged around a central stick, immediately above which a pad of paper bark is inserted between the prongs, which are then bound tightly round outside for four inches [10cm], first with banyan bark string and then with split cane...The result is that, as shown in the figure [9], the prongs are divergent at their free ends. Beyond the split cane the four prongs and the central stick are uncovered, then comes a length of bamboo measuring twelve inches [30cm], into which they are inserted fitting tightly. For some six inches [15cm] the upper part of the bamboo is wound round with banyan string, evidently to prevent it from splitting as the pressure is considerable. Each prong end in a sharp pointed bone, an inch long [25mm], projecting from a rounded mass of kapei resin.

Spencer described another similar spear, about three metres in length tipped with five prongs, each 15cm long, being used to spear large barramundi from a dug-out canoe. This form of multi-pronged spear is similar to the ones depicted in the rock art of western Arnhem Land also being used to spear fish (Figure 6). A similar bone-tipped multi-pronged spear collected by Spencer in Oenpelli on his 1912 expedition was X-rayed for Carmel Schrire and revealed four bipoints inserted half-way into splits at the ends of the wooden prongs, which were fixed with resin (Figure 10; Mulvaney 1975:102, 105; Schrire 1982:37). Schrire (1982:62–3) pointed out that the X-rayed points were similar in form to the unipoints and bipoints found associated with fish remains in the upper layers of the western Arnhem...
Land sites (see above). On this basis, she suggested that the archaeological examples were hafted as the tips of fishing spears. Kamminga and Allen (1973:32, 66) came to the same conclusion, speculating that, as bone points were associated with fish remains in the western Arnhem Land sites of Ngarradj Warde Jobkeng and Burial Cave, they may have come from fishing spears. The Adelaide River archaeological specimens illustrated in Figure 3 are also similar to the bone points from the *kujoro* (or *kumbata*) spears collected by Spencer (Figures 9 and 10).

**Discussion**

The analysis of faunal remains from the Adelaide River earth mound sites demonstrates that fishing was undertaken as a subsistence strategy throughout their history. The analysis also indicated that there was a particular emphasis on fishing during the ‘Transition Phase’ between 3900 and 2000 years BP (Figure 2). During this phase, there existed a mosaic of freshwater and estuarine environments when the mangroves had retreated seawards and towards the margins of the river, and freshwater conditions were beginning to be established. A diverse range of freshwater and estuarine fishes were available during this time. Prior to this period, during the ‘Big Swamp Phase’, exploitation was focused on estuarine resources, especially shellfish. After 2000 years BP when freshwater floodplains were widely established, exploitation of freshwater resources dominated.

In nearby western Arnhem Land, dates from floodplain sites in the northern Alligator Rivers region suggested that bone points were in use from c. 7000 years BP, coincident with the ‘Big Swamp Phase’. Images of multi-pronged ‘spears’ also first appeared in western Arnhem Land rock-art c. 7000 years BP. Allen and

![Figure 10: X-ray photograph of four-pronged fish spear inset with bone points, Alligator Rivers region (Spencer Collection, Museum of Victoria; photograph courtesy of John Mulvaney).](image-url)
Barton (1989:104) commented that bone points (spatulate, unipoints and bipoints) occurred in every mangrove/mudflat midden dating between 7000 and 3000 years BP. Schrire (1982:51–4, 60–3, 87–95, 120–8) argued that their distribution in the deposits showed that spatulate points were dominant in older midden layers where estuarine shellfish dominated the faunal remains ['Big Swamp Phase'], while unipoints and bipoints were more common in the upper layers where fish remains increased in the deposits ['Transition Phase']. Between 4000 and 3000 years ago in western Arnhem Land, three-pronged spears depicted in the rock art are associated exclusively with images of 'fish' and the emergence of modern X-ray paintings.

Further south at Anbangbang, Burial Cave and Kina, bone unipoints and bipoints also appeared in the upper layers of the sites dated from c. 800 years BP, associated with the remains of fish, and freshwater turtle and mussel. Anbangbang also contained a single-pronged wooden spear with a hafted tip of bone or stone.

Ethnographically, bone points, similar in appearance to the ones excavated from the Adelaide River earth mound sites, were recorded as being hafted as tips in multi-pronged fishing spears and single-pronged hardwood shafts, like the one from Anbangbang.

Conclusion
The majority of bone points that were recovered from the Adelaide River earth mounds have been attributed to the ‘Transition Phase’ dated from c. 3900 to 2000 years BP, where there is also the highest density of fish bone in the sites. The archaeological results from Adelaide River and elsewhere suggest that there is a strong association between fish remains and the presence of bone points. Images of multi-pronged spears associated with fish are illustrated in the rock-art of western Arnhem Land. These images are dated to a similar period as the archaeological specimens and also show similarities to the bone-tipped spears recorded ethnographically by Spencer and others. The rock-art indicates that there is considerable antiquity in the manufacture and use of such spears. Archaeological evidence, supported by the ethnographic data, strongly suggests that the bone bipoints found in the Adelaide River mound sites were components of fish spears.

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