

Agricultural Hunter-gatherers: Food-getting, Domestication and Farming in Pre-colonial Australia

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Introduction

Elkin (1974: 51) asserted, "We apparently agree with the Aborigines that Australia was in their time only suitable for a food-gathering and hunting economy... The food-gathering life is parasitical; the Aborigines are absolutely dependent on what nature produces without any practical assistance on their part." Statements such as these are highly subjective and unlikely to lead to any in-depth investigations of Aboriginal plant uses and management styles. This paper will show that his position was and is preposterous. It unfortunately led to many years of serious neglect of what actually happened in pre-colonial Australia both in anthropology and archaeology. The few who managed to get close to some of what really happened include Tindale (1974, 1977) and Lourandos (1980, 1983, 1985, 1997, 2008), among others.

Further, mainland Australian Aboriginal resource exploitation cannot be adequately described by the generalized hunter-gatherer archetype (Hayden, 1990). Although some Aboriginal economies may conform to this pattern, many others do not. Hayden characterizes generalized hunter-gatherer economies as relying heavily on scarce or unpredictable fluctuating resource bases, which in turn sustain low population densities (ca. 0.01–0.1 persons per km²). Such societies are highly mobile and egalitarian, utilizing opportunistic foraging strategies, relying on resources that may be easily overexploited. These resources have slow reproduction and maturation rates. This includes large sized mammals, in particular the marsupials, and many plant tubers, rhizomes, stalks and seeds.

It is this generalized hunter-gatherer model which is most commonly attributed to the Australian Aboriginal pattern of resource exploitation by the majority of authors (e.g. Horton, 1982; Kimber, 1976; Kirk, 1986; Thompson, 1939). We propose that Hayden's second category of complex hunter-gatherers is in fact more applicable in the Austral-

ian case. Typically, this category is seen as occurring in rich environments with a more reliable resource base, and it can sustain population densities greater than 0.1 people per km². Complex hunter-gatherers are generally semi-sedentary, using specialized foraging strategies directed at resources that have copious offspring with short maturation rates, such as grass seeds, nuts, fish and insects. Hence, it is believed that overexploitation is almost impossible. While this model may be readily accepted as the applicable strategy for hunter-gatherers in the richer coastal and riverine environments, this paper argues that it is also applicable to the Aboriginal economies of Central Australia in much poorer environments which in fact could support substantial stands of edible grasses or cereals, and higher human populations (cf. Tindale, 1974).

According to Hayden (1990) the transition from "generalized" to "complex" hunter-gatherer subsistence was based on the appearance of technological adaptations and innovations. These include an increase in basketry, netting, boiling, grinding-stones, mortars, fishhooks, leisters, harpoons, weirs, snares, leaching facilities and canoes. There is also an associated increase in the procurement of exotic foods for feasting, the accumulation of resources to denote status, and consequently changes in socio-economic inequalities, such as the appearance of private ownership. Instead, do Australian Aboriginal economies actually conform to complex hunter-gatherer modes of food production, in complete contrast to the implications of Elkin's (1974) original assertion?

Answering this question will involve investigating ethnohistorical and archaeological evidence relating to the Aboriginal food production strategies of four ethnographical and/or geographical zones of Australia: (1) Eastern coast of Cape York Peninsula; (2) South-western Victoria; (3) South-west Western Australia; and (4) Semi-arid Interior. Australia is a vast continent of some 7,682,300 km² with a considerable amount of climatic variation.

Approximately one third is tropical, one third temperate and the remainder – semi-arid desert.

This paper argues that Australian Aboriginal economies do conform to the “complex” hunter-gatherer archetype. Many Australian patterns of resource exploitation are much closer to what is often termed agricultural behavior or complex hunting-gathering than Hayden (1990) and others are inclined to believe. There is a great deal of evidence for a range of practices normally associated with both of the above categories in the ethnographic and ethnohistorical sources, and many of these practices occur outside the more complex environmental areas (i.e. the richer ecosystems of the rivers and coastlines) normally referred to by researchers such as Chase (1989), Chase and Sutton (1987), Hallam (1989), Harris (1977), Hayden (1990), Jones (1980) and Lourandos (1980, 1983, 2008).

Cape York Peninsula

Much of tropical east coast of Cape York Peninsula is a coastal plain varying in width from 5 to 20 km, consisting of open and closed woodland, grasslands and scrubs. To the east there are offshore islands and the Great Barrier Reef. The southern extremity is bordered by the North Queensland highland and lowland rainforests. The Cape York Peninsula area receives some of the highest continental, annual rainfall of approximately 1,800 to 2,100 mm on average, falling primarily in rainforest areas (the southern fringe at Mt Bellenden Ker actually receives >8,000 mm per annum). There are two recognized seasons: the wet season (November to April) and the dry season (May to October). Cape York Peninsula may be classified as containing many environments rich in exploitable resources (Chase and Sutton, 1987; Hynes and Chase, 1982).

Hynes and Chase (1982) note that some of the Peninsula’s plant communities may have been not merely modified but created by Aboriginal cultural activities. It was found that in certain niches there is a high density of some 37 edible plant species, and it has been postulated that these niches are the result of a long and complex interaction between people and specific sites. Hynes and Chase (1982: 39) suggest that at such sites: “resident groups were relatively semi-sedentary moving only a few kilometres annually, as the seasons progressed, and that, all of the plant life in the area can be construed as belonging to the Aboriginal *Domus* or the home envi-

ronment and all plants played varying parts in what we call the local domiculture.”

The varying roles of the plant species may include: food trees, shade trees, medicinal plants and other trees used in daily living (e.g. to make canoes). Domicultural process can be compared to “dump-heap” strategies, described by Blumler and Byrne (1991), Harris (1989) and Yen (1989). This form of human-plant interaction is comparable to Rindos’ (1984) paradigm of “incidental domestication.” On the other hand, Hynes and Chase (1982) and Chase (1989) postulate that the present groves were created by Aboriginal selection of seeds and transplanting of seedlings. Therefore in ecological terms domicultural process, which takes “incidental domestication” a step further, is comparable to Rindos’ second paradigm of “specialized domestication.” Hence once the seeds germinate the ground around the seedlings is cleared and a protective barrier is established to prevent children and animals from uprooting and destroying the growing plants.

Hynes and Chase (1982) also describe a method of harvesting the yam (*Dioscorea savta* var. *elongata*) which aids in its regeneration and hence further increases its productivity. The tuber was removed leaving the top portion of the vine intact. It is understood that this form of harvesting enables *Dioscorea* to produce a multiple-ended tuber (this practice will be explained further, under the heading of South-west Western Australia). It is also believed that the yams were kept and maintained in designated gardens, which were further divided into sections, which were privately owned, to be used as the seasons progressed or for times of ceremony. Further, the Aborigines of Cape York Peninsula had social and cultural prohibitions relating to the collecting and use of the food resources. Chase (1989) suggests that *domus*-based activities included both “general and specific practical consciousness.” At the general level the actors at a *domus* have certain recourse to a background knowledge about the behavior of species and certain individuals were ascribed as persons “smart for plants, smart for wallaby” (Hynes and Chase, 1982; Yen, 1989). This knowledge extended to include the species’ potential usefulness, extractive technologies and their ecological relationships with other species. Furthermore, the *domus*-based activities also involved rational planning for the future in terms of both people and material resources.

Where the specific level of domicultural knowledge and processes may be considered interpretively specific within the landscape (Chase, 1989:

48–51), it should be noted that the abundance of food did not necessarily affect the amount of food harvested and distributed in a single season (Hynes and Chase, 1982). Hence it may be assumed that there was a heavy reliance on resources which have copious offspring. Therefore domiculture may be compared to Rindos' (1984) third paradigm of "specialized domestication."

South-western Victoria

South-western Victoria is a fertile plain which extends from the Great Dividing Range in the east to the South Australian wetlands in the west. The annual rainfall ranges between 760 and 1,400 mm. The vegetation is open sclerophyll forests in the higher rainfall areas, and grasslands and savannah in the drier zones (Lourandos, 1980, 1983; Coutts et al., 1978). Unlike Cape York Peninsula, it was found that the landscape of south-western Victoria was dotted with large scale, permanent, human socio-economic re-organization of the natural environment. Archaeological and ethnographic evidence shows that the Aboriginal food procurement strategies were based on the hydrological cycle. Therefore the *domus*-based exploitation strategies were centered around lacustrine and marsh environments. The strategies employed by the Aborigines included extensive remodeling of the landscape with the construction and maintenance of artificial weirs; drainage/irrigation ditches; free-standing rock walls; stone-walled channels; fish traps; and what appears to be semi-circular stone-walled houses, elevated above the surrounding area by mounds. Coutts et al. (1978) and Lourandos (1980) have also suggested that these structures were used as inland fisheries and for flood mitigation purposes.

Recent research into this wetland management system has shown an intensive exploitation and management model of the short-fin eel (*Anguilla australis*) that can be described as aquaculture, and that did not end with the immediate consumption of the product. The surplus was treated for long-term storage (Builth, 2002). This type of landscape modification and infrastructure management of the hydrological complex would override the natural limits of seasonality (Builth, 2002). Taken further, it can be argued that the system can offset climatic changes, being viable during lengthy dry and wet periods (Bird and Frankel, 1991; Kershaw et al., 2004). In terms of population growth this system would allow a long-term sustainable food source

and surplus, which supports population rise promoted by cultural change, rather than the assertion of cultural change promoted by population pressure (Beaton, 1983).

As there is heavy rainfall during the winter months in many parts of western Victoria, the land would have been inundated for lengthy periods. Therefore the artificial water channels would have been employed to dispel large back-ups of water. One such channel at Toolondo extends for some 3 km and serves to drain marshlands between two natural wetlands. Lourandos (1980) suggests that the drainage system operated on a threefold principle:

- 1) a form of wetland management;
- 2) a system for handling excess water; and
- 3) retention of water during times of drought.

Whereas the structures located at Lake Condah consist of four major fish trap systems (Coutts et al., 1978: 24): "Each of which comprises several stone races, canals, traps and walls which are all articulated. ... the route of each stone race and canal has been carefully chosen to take full advantage of natural topography, generally following drainage lines."

Further, the Lake Condah systems have "V" shaped traps located at different heights so that, "fish were certain to be trapped regardless of the water level, fish could be caught both as the lake rose and fell" (Coutts et al., 1978: 25). Construction of these permanent structural features would have involved an initial high input of labor, but once established the system would have produced an efficient mode of food procurement that required low maintenance, that is, it would have become "automatic" (Campbell, 1982). The presence of stone house sites and their association with particular traps indicates that the traps were privately owned and operated by specific groups. They were used in accordance with a seasonal schedule focusing on a staple food, e.g. eels. There were comparatively bigger intra-group socio-economic ties. With emphasis placed on strong social ties with other groups in adjacent areas, it is consequently probable that during lean seasons, people could broaden their ranges and share food sources belonging to neighbors (Robinson, 1839–1849; Lourandos, 1997).

South-west Western Australia

The environmental and climatic conditions of south-west Western Australia are not unlike those found in south-western Victoria. Of all the sites and cultural areas described in this paper, this part

of Australia has some of the clearest ethnohistorical records concerning Aboriginal subsistence strategy that predate European colonization. There are records of land under extensive cultivation and indigenous urbanization in the Hill River area made by Dutch seafarers 200 years prior to those made by Grey. The latter (Grey, 1841: 4 April) describes the area as having: "light fertile soil, quite overrun with warran plants [a species of *Dioscorea*], ... the root of which is a favorite article of food with the natives. This was the first time we had yet seen this plant on our journey, and now for three and a half consecutive miles [6 km] we traversed a fertile piece of land literally perforated with the holes the natives had made to dig this root."

It would also appear that the Aborigines of the area were semi-sedentary, as they constructed what Grey describes as two "native villages" or "towns," consisting of large "superior" huts; "very nicely plastered over the outside with clay, and clods of turf so that, although now uninhabited they were evidently intended for fixed places of residence." Grey (1841: 5 April) goes on further to suggest that, "these villages would have serviced at least 150 natives." Other examples of the Aboriginal built environment recorded by Grey (1841: 5 April) include well marked roads, deeply sunk wells and extensive yam grounds: "all spoke of a large and comparatively-speaking resident population, and the cause of this undoubtedly must have been the great facilities for procuring food in so rich a soil."

Archaeological investigations by Hallam (1989) confirm that there is a long history of large groups focusing on the resources of wetlands, lakes, alluvial flood plains and terraces as early as 8,000 years ago at Walyunga. It was also found that intensive use of the area occurred in the upper stratigraphical levels, ranging between 4,000 and 200 years ago. Hallam's (1989) excavations revealed that the stratigraphy is penetrated by pits which are thought to be the product of digging for yams.

Furthermore, these indigenous villages were adjacent to water sources as well as other exploitable resources, such as zamias, reed rhizomes, wetlands, lakes and lagoons, with fish, fowl, frogs, turtles and crustaceans, and also frequented by larger game. The idea of villages (i.e. built environments) entails fixed socio-economic facilities associated with and used for food procurement and processing being concentrated in the vicinity of these resource foci. Therefore the immediate environs adjacent to the cultural activity areas may, like both Cape York and Victoria, be interpreted along the lines of domicul-

ture. Hallam (1989: 147) describes this domicultural process by stating that: "everywhere harvesting and husbanding of plant resources (both tubers for direct subsistence and pasture to encourage game) implied substantial labor investments and concomitant propriety and usage rights. Husbandry and management practices, including firing, encouraged the maintenance, improvement, and extension of tuber and pasture resources."

To what extent have these domicultural processes affected the plant communities of the area? As mentioned for Cape York Peninsula, the husbanding and harvesting practices for *Dioscorea* sp. increase its production of tubers. It should be stated that harvesting of any kind improves the growth of root staples, whether they are reed rhizomes or yam tubers. These practices also lead to the plants' proliferation and spread. Gott (1983) noted that digging loosens and aerates the soil, and separates new tubers from old growth. Furthering the process is the fact that loose soil and plant litter fill the resulting hole, hence providing a well aerated substrate for further growth (Gregory, 1887; Hallam, 1989; Tindale, 1974, 1977).

Hallam (1989) stated that similar harvesting and cultivation techniques can be found in known horticultural systems. Studies have shown that yams (*Dioscorea* spp.) were widely spread throughout the tropical regions of the world. These yams require nutrient-rich, well-aerated soils. Generally, they are planted in mounds or ridges, but they may also be planted in flat areas where there are deep soft soils (e.g. river alluvia). By following this procedure yams may be harvested twice a year, so long as the tuber-head is left intact (Coursey, 1967).

Semi-arid interior

The arid areas of Australia include savannah grasslands and deserts like the Simpson, Gibson, Great Sandy and Great Victoria. They are not "as rainless as some of the other deserts of the world and therefore they always have a plant covering" (Kimber, 1984: 13). There are approximately 785 plant species. The driest Australian desert, the Simpson, receives an average annual rainfall ranging between 100 and 200 mm.

McKinlay's (1861) expedition observed that the Aborigines of the Simpson Desert practiced a form of animal domestication, in addition to the domesticated dog. It was noted that the Aborigines would muster young pelicans into holding yards. The pelicans would then be slaughtered once they were

large enough to fly. It has been suggested by Kimber (1984) and Flood (1995) that similar processes may have been carried out with other wild fowl such as geese and Australian bush fowl. It has also been noted that not only did the Aborigines muster fowl, but they also had strategies allowing for the storage of both plant and animal foods. Some of these food reserves included native cereals (Mitchell or *Astrela* sp. and millet or *Panicum* sp.), mulga seeds, dried yams, *ngardu* (*Marsila quadrifolia*), caterpillar flour, dried fish and fowl. Tonkinson (1978) describes this process as comprised of wrapping the foods in grass and then applying a coating of mud, which allowed storage for up to 18 months. Evidence of these storage caches was located and recorded by Lewis in the 1880s at Altunga near Alice Springs in the Northern Territory; other storehouses were also found near the Alligator River in the Northern Territory (Kimber, 1976, 1984). Carnegie (1898) found similar evidence for large-scale cereal storage near Kunanarra in Western Australia.

Ethnographically, through an Aboriginal informant, Walter Smith (Kimber, 1984), it was found that the Aborigines of the Simpson Desert practiced the conscious and deliberate propagation and cultivation of *ngardu* (*Marsila quadrifolia*). He said that there was a large trading network for *ngardu*. He also describes domicultural processes with intent to extend the areas of propagation, in that seed was dispersed in favorable areas near campsites and then covered with soil so that after the next rains the seeds would germinate. Hence there would be new *ngardu* for the next harvest. Finally, Kimber (1984) suggests that *ngardu* was not exploited in the better season but as a predictable “fall back” food for use in the drier season. In fact, it has been suggested by Tonkinson (1978) that post-rain growth transformed the deserts into what resembled wheat fields.

According to Mitchell's (1839) direct observations from semi-arid northern New South Wales and southern Queensland it is clear that not only did the arid areas resemble wheat fields, but they were in fact fields of domesticated and cultivated native Australian cereal crops. He also describes areas of ground “where the clods had been very extensively turned up by the natives ... These clods were so very large and hard ... The whole resembled ground broken up by the hoe... There might be about two acres in the patch we crossed, and we perceived at a distance, other portions of the ground in a similar state” (Mitchell, 1848: 247). In other areas Mitchell (1839: 237–238) describes the landscape which if it had been in Europe, would have been a description

of wheat fields at the time of harvest when the hay was being gathered into ricks: “we found the ricks, or haycocks, extending for miles.”

According to Tindale (1977: 345) an important aspect of “the long lasting Aboriginal hunting cultures of Australia has been the intensive use, as food, of grass seed, after processing it by a special technique of wet grinding, followed by baking in hot ashes as a form of unleavened bread or cake [i.e. damper]... One consequence of this development in the principal grassland areas of Australia seems to have been an increase in the number of people who have been able to link themselves together as a tribe, namely from a mean of around 450 to perhaps double that number.” Further, “Examination of activities associated with other foods such as wild rice, water chestnuts (*Eleocharis*), and *Dioscorea* yams encourage a suggestion that many of the activities of northern Australian people were already akin to those associated with the earliest gardening cultures” (Tindale, 1977: 345).

Australian tool kits and food production

Both mainstream Australian and European-trained archaeologists have long had problems with trying to classify and understand Aboriginal stone tool development and variation. By at least 20,000 years ago grinding technology (seed-grinding stones, edge-ground or polished axes, etc.) had been developed in central and northern Australia (Schrire, 1982; Smith, 1989). In other words, during the Last Glacial Maximum or earlier the indigenous peoples of Australia had begun developing what would be seen elsewhere in the world as Neolithic technologies some 10,000 years or more before the classic regions for early agriculture. Further, although some Australian archaeologists have split this continent's stone tool traditions into an “Australian Core Tool and Scraper Tradition” for the Late Pleistocene and Early Holocene, and an “Australian Small Tool Tradition” for the Middle and Late Holocene, many elements of the so-called small tool tradition are already evident by at least 13,000 years ago (Campbell, 1984; Campbell and Mardaga-Campbell, 1990, 1993; see also Jones, 1975).

Discussion

In this paper we have dealt with Aboriginal manipulation of their food resources to increase yield.

It has been found that the Australian Aboriginals were not only hunter-gatherers but that they also practiced what appears to have been classified as agriculture or horticulture elsewhere in the world. As a result of this study, we suggest that Australian food strategy is better described as “agricultural hunter-gatherers.” The complexities of human-plant-animal relationships described here include many aspects which have in the past been attributed to the “agricultural” and other “complex systems” described by Blumler and Byrne (1991), Harris (1977, 1989), Horton (1982), Kimber (1976), Kirk (1986) and Rindos (1984). Further, varieties of socio-economic phenomena have been described by Hallam (1989: 137), Hynes and Chase (1982), Chase and Sutton (1987), Chase (1989), Coutts et al. (1978) and Lourandos (1980, 1983), which have commonly been associated with the so-called agricultural systems, though we have seen that they are also found in the “Australian agricultural hunter-gatherer” systems, as they include:

- 1) intensive use of clearly defined areas where plants with subterranean storage organs were harvested, such as *Dioscorea* spp. in Cape York Peninsula and south-west Western Australia;
- 2) well defined usage rights of resources;
- 3) seasonal scheduling of both plant and animal exploitation;
- 4) harvesting and husbanding practices which encourage maintenance and proliferation, such as the *Dioscorea* gardens in Cape York Peninsula and south-west Western Australia;
- 5) investment of labor in resource improvement and management, such as the fish traps and drainage ditches of western Victoria;
- 6) burning to open up access to localized resource patches;
- 7) associated fixed facilities (path networks, wells and irrigation to crops);
- 8) semi-sedentism to the extent of construction of permanent villages and stone houses;
- 9) evidence of ancient, large-scale geomorphic effects due to socio-economic activities (extensive remodeling of the natural landscape).

It is also apparent that domicultural processes as described by Chase and Sutton (1987) were present in all parts of Australia at the time of contact in 1788 (i.e. foundation of Sydney by the British “First Fleet”). The evidence shows that Aboriginal subsistence strategies in Cape York Peninsula, the semi-arid interior, south-western Victoria and south-west Western Australia used the landscape and knowl-

edge of plants and animals to their full advantage. It was found that these strategies supersede Rindos’ (1984) paradigms of “dump-heap and incidental domestication,” and that seeds and plants were consciously selected and cultivated with exploitation in mind. The construction of gardens and groves were established in both Cape York Peninsula and south-west Western Australia to localize resources and to reduce travel time for their procurement. Aboriginal people of south-western Victoria built and maintained irrigation and large scale inland fishing industries through intentionally diverting water to artificial catchments and creating habitats for fish and eels. Further, these systems were used to drain inundated and waterlogged country. The Aboriginals of the semi-arid interior practiced storage of foods for use in the bad seasons.

With these traits attributed to the Australian “hunter-gatherer” it is understandable why we suggest that Aboriginal economies were “agricultural hunter-gatherers,” even though the traditional archetype states that they were as Hayden (1990) describes “generalized hunter-gatherers” who were highly mobile egalitarian societies, utilizing an “opportunistic foraging strategy.” This paper challenges this traditional view and maintains that the “agricultural hunter-gatherers” of Australia conform in part to Hayden’s (1990) second category of “specialized hunter-gatherers,” but with a knowledge of a tendency for an agrarian subsistence which was supplemented by hunting and gathering. Further, the Australian “agricultural hunter-gatherers,” through the manipulation of the landscape and forward planning with an in-depth knowledge of plant husbandry, such as propagation, cultivation and harvesting techniques coupled with plant and animal ecology, managed and maintained potentially over-exploited resources in an optimal growing condition which enabled some resources to increase yields and stabilize growing seasons, in particular the root rhizomes and cereal grasses.

Corresponding human population changes were not a result of the whims of the environment as argued by Beaton (1983) but were consequences of “agricultural hunter-gatherer” decisions and developments, in general much more in the fashion Lourandos (1980, 1983, 1985, 1997, 2008) has argued, as in the case of south-western Victoria. Our position is that Lourandos and Tindale in particular have been on the right track, but we have argued that they have not gone far. We open this for wider discussion and debate.

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