

Factors Influencing the Adoption of Indigenous Agriculture in Australia

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Human history is littered with examples of contact between peoples from divergent cultural traditions. Some of these interactions have been positive and productive for all concerned. Many others have been disastrous for one party or the other. We need look no further than the catastrophe experienced by Aboriginal peoples in Australia since the commencement of British colonisation in 1788 to see the truth in the latter statement. I do not intend, however, to dwell on this sad aspect of Australian history but instead consider two examples where seemingly productive interactions have taken place in the past between indigenous Australians and people of non-indigenous origin. By this means I hope to be able to elucidate some of the factors affecting cultural transfers, and inter-cultural relations, principally in the economic realm.

Extensive comment and considerable debate has taken place in Australia since the mid-nineteenth century regarding the supposed failure of any Aboriginal group to adopt or develop agriculture. While most of the specific arguments are beyond the scope of this paper they are all unfortunately predicated upon a false assumption because, as I will argue, at least one group, the *Nhanda*, and some of the adjacent groups of the Victoria District on the central west coast of Western Australia, were indeed practicing agriculture. Furthermore my current research indicates this may not have been a unique occurrence and that there was another region in eastern Australia which, as I will be arguing in a forthcoming publication, had all the hallmarks of an early agricultural society. Apart from this I have also identified in the course of this research at least 18 different species of plants that were possibly being planted in traditional contexts by at least 20 different identifiable Aboriginal groups.¹ Regarding the *Nhanda* the evidence, as we shall see, appears to indicate that cultivation was initiated in the seventeenth century as a consequence of short-term interactions between the Aboriginal peoples of that region and stranded or marooned Dutch sailors. In contrast, despite regular interactions between the inhabitants of coastal Arnhem Land and visiting Indo-Malay peoples, commencing in the late seventeenth century, the presence of cultivars in that region, and the introduction of additional cultivars, no agriculture or planting occurred there. This paper will examine some of the factors that could account for the different outcomes of these two examples of cultural interaction between Aboriginal populations and foreign groups.

Before deliberating on the possibility that indigenous agriculture was practised in Australia a digression is necessary in order to clarify what is meant by "agriculture". The characterization and definition of "agriculture", describing what is in effect a complex array of behaviours and relationships, is highly variable and at times quite confused.² Agriculture, according to Reed, is "the totality of the human practices involving those living energy traps which man plants, breeds, nurtures, grows, guards, preserves, harvests, and prepares for his own use".³ Rindos treats agriculture as a form of plant colonization of a well-defined area created by human disturbance,⁴ while Yarnell describes agriculture as "intentional husbandry practiced by humans".⁵ MacNeish sees it as the "planting of multipropagators (i.e. seeds) or cultivars in relatively large plots or fields,"⁶ but according to Meadows it is simply the "practice of growing crops ... Anyone who sows or harvests domesticated plants is involved in agriculture".⁷ While it would appear from this that there is little definitional consensus, in behavioural terms the

principal elements appear to be, after Redman⁸ and Harris⁹ - propagation (sowing or planting of plants), husbandry (soil preparation, maintenance of moisture and fertility, exclusion of competitors, protection from predators), harvesting and finally storage. The scale or extent of these activities would also appear to be a significant factor, though not always explicitly stated, as some of the preceding examples show. Clearly planting is absolutely essential to any consideration of agriculture. The requirement that the planted cultivar be "domesticated" is problematic, however.¹⁰ Certainly many plants appear to undergo morphological changes, some quite quickly,¹¹ once they are systematically planted and harvested. But domestication itself does not seem to be essential to agriculture,¹² simply being a strong indicator of systematic cultivation and entry into a fully commensal relationship, as well as a valuable means of detecting this in an archaeological context. It probably also results in an improvement in productivity.¹³ Perhaps the true significance of domestication is as one means of demonstrating an ongoing commitment to providing a proportion of food through systematic planting. Husbandry involves an array of behaviours, which the evidence appears to indicate are not developed or applied synchronously but are a series of refinements introduced over time, probably as adaptations aimed at improving the productivity of the crops being produced.¹⁴ Decree planting or broadcast seeding is often noted in early agricultural endeavours involving seed crops,¹⁵ with no clearing, or at most simply burning, and no deliberate tilling of the soil.¹⁶ Measures to protect the crop, such as weeding, are also later developments.¹⁷ In the European Neolithic measures to retain or enhance fertility were not initially practised in some areas and probably did not appear until the Bronze Age or later.¹⁸ Even the physical storage requirement is not considered essential in agricultural systems, it being a frequent practice with vegetatively reproduced staples, such as taro, sweet potatoes and yams, for the tubers to be left *in situ* and harvested as needed.¹⁹ In summary it would seem that the characterization of agriculture should include as a minimum: propagation and harvesting of plants on a systematic basis, and of sufficient extent to provide a significant proportion of the food supply for the people undertaking those activities. It should also involve a strategy to conserve the resultant output through storage or other means. Non-essential complementary features should include activities intended to maintain or enhance productivity (i.e. husbandry), and the expectation that the cultivar will have undergone some morphological change.

Now, on the 16 November 1629 two Dutch sailors, Jan Pelgrom de Bye and Wouter Loos, were deliberately marooned on the shores of the west coast of Australia, believed by almost all investigators to have been at the mouth of the Hutt River,²⁰ 450 kilometres north of Perth, Western Australia. These mariners (Loos was actually a soldier, de Bye a cabin-boy) were abandoned on the orders of Captain Francisco Pelsaert for their part in the bloody Batavia Mutiny. Five months earlier the Dutch ship *Batavia* had been wrecked on the Abrolhos Islands, 50 kilometres from the Western Australian coast. Whilst Captain Pelsaert and a number of others, in an epic voyage, sailed an open boat 2,400 kilometres back to Indonesia to effect a rescue, an horrific mutiny took place in which 125 men, women and children were murdered. The mutineers were captured by Pelsaert upon his return and 8 mutineers were sentenced to be hanged. At the last minute Pelsaert had a change of heart and reprieved 2 of the mutineers, Loos and de Bye, electing instead to maroon them on the Australian mainland.²¹ Pelsaert subsequently issued the castaways, the first Europeans known to inhabit Australia, with orders, which read (in part):

.... to put ashore there or here, to make themselves known to the folk of this land by tokens of friendship. Whereto are being given by the Commandeur [Pelsaert] some Nurembergen [cheap wooden toys and trifles], as well as knives, Beads, bells and small mirrors, of which shall give to the Blacks only a few until they have grown familiar with them. Having become known to them, if they then take you into their Villages to their chief men, have courage to go with them willingly. Man's luck is found in strange places;"²²

In order to assist the reluctant "pioneers" Pelsaert provided them not only with the aforementioned articles but also, on the day they were put ashore, "... a Champan [flat-bottomed boat] provided with everything..."²³

Exactly two centuries later (1829) the European colonization of Western Australia began in earnest when the British established a permanent settlement, the Swan River Colony, on the site of the present-day state capital, Perth. For a decade the colony was largely restricted to an area with a radius of 80 kilometres around Perth, during which time the indigenous tribes were pushed aside and then "pacified" when they began to resist. Tentative explorations beyond this area took place during this period but in 1839 an ambitious expedition was planned to examine the coastal lands between Perth and Shark Bay (880 kilometres north). Led by Lt. George Grey (later Sir George Grey) the expedition soon foundered when, at Shark Bay, they were caught in a terrible cyclone [hurricane] - the "eye" passing directly over them. Having lost most of their stores and equipment Grey decided to return immediately to Perth in the two remaining boats. Continuing south for some 300 kilometres, Grey attempted to put in at a place known as Gantheaume Bay, the embouchure of the Murchison River and Wittecarra Creek. Unfortunately a large and unexpected surf close to shore swamped the 2 boats there, leaving Grey and his party 500 kilometres from "civilization" with little food and no water. The party resolved at that point to walk overland back to Perth, experiencing great hardship, but accomplished this remarkable feat with the loss of only one life. In the course of his travails Grey kept a diary, later published in *A Journal of Two Expeditions In North-West and Western Australia, 1837-39*, in which he recorded at length the events that took place along the way. Several days after their mishap at Gantheaume Bay, as the ragged band of explorers approached the Hutt River, Grey began making some interesting observations. About 18 kilometres from the Hutt River valley, in a valley leading into it, Grey recorded in his journal:

*"April 4 1839 : we soon fell in with the native path we quitted yesterday, but now became quite wide, well beaten and differing altogether by its permanent character, from any I had seen in the southern portion of this continent ... And as we wound along the native path my wonder augmented, the path increased in breadth and its beaten appearance, whilst along the side of it we found frequent wells, some of which were ten and twelve feet [3-4 m] deep, and were altogether executed in a superior manner. We now crossed the dry bed of a stream, and from that emerged upon a tract of light fertile soil quite overrun with warran [original emphasis] plants [a species of yam plant - *Dioscorea hastifolia*], the root of which is a favourite article of food with the natives. This was the first time we had seen this plant on our journey, and now for three and a half consecutive miles [5.6 kms] traversed a piece of land, literally perforated with holes the natives made to dig this root, indeed we could with difficulty walk across it on*

that account whilst the tract extended east and west as far as we could see. It is now evident that we had entered the most thickly-populated district of Australia that I had yet observed, and ... more had been done to secure a provision from the ground by hard manual labour than I could believe it in the power of uncivilised man to accomplish. After crossing a low limestone range we came upon another equally fertile warran [original emphasis] ground.....

April 5 1839:..... The estuary [actually a salt marsh, Hutt Lagoon] became narrower here, and shortly after seeing these natives, we came upon a river running into it from the eastward [Hutt River]; its mouth was about forty yards [36 m] wide, the stream strong but the water brackish, and it flowed through a very deep ravine, having steep limestone hills on each side ... Being unable to ford the river here, we followed it in a SE direction for two miles [3.2 kms], and in this distance passed two native villages, or, as the men termed them, towns - the huts of which they were composed differed from those in the southern districts, in being built, and 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."²⁴

Over the next 130 kilometres, as Grey and his party traversed the Victoria District, they encountered a series of small fertile river valleys - the Bowes, Chapman, Greenough, Irwin and Arrowsmith Rivers - each conforming to the pattern observed at Hutt River in terms of the intensive utilization of the *warran* plant, known locally as *ijjecka* or *adjukoh*. Two further villages-like settlements were sighted, at the Bowes and Greenough Rivers. Grey estimated the latter "contained at least a hundred and fifty natives."²⁵ In the following 12 years, as exploration continued and British settlers began invading the Victoria District, all the elements of Grey's observations were borne out, by a variety of explorers, government officials and "pioneers".²⁶ Explorer Lt. Helpman in 1846, for example, provided a detailed description of the type of huts referred to by Grey:

"We here met with the first native hut, it was well plastered outside and the timber which formed it was about 6in. [15cm] thickness, about 6ft. [1.8 m] high inside and capable of holding ten persons easily."²⁷

Captain Stokes of the famous *Beagle* (Darwin was not on this voyage) even slept in one during a land reconnaissance in the area in December 1841

"We noticed their winter habitations substantially constructed and neatly plastered over with red clay ... Some neighbouring wigwams of superior structure gave us snug quarters for the night."²⁸

Perhaps of greater significance were other comments regarding usage of *Dioscorea hastifolia* made by some of the vanguard of the colonial invasion. William Burges, the first Government Resident in the district, reported in 1851 that:

"They [the Aboriginal people] seem very little addicted to hunting and very few of them are even expert at tracking a Kangaroo. This may result from the great variety of edible roots, particularly the A-jack-o or warang which grows here in great abundance."²⁹

a view echoed by Helpman in 1849:

*"They are fine race of men but seem to depend entirely [my emphasis] upon warran and gum, of which they have great abundance. Very few, even of the women, had kangaroo skins"*³⁰

Finally A.C. Gregory, a noted Australian explorer, provided a most telling observation regarding the *Nhanda* people of the Victoria District:

*"Agricultural science seemed to have made some progress, as they never dug a yam without planting the crown in the same hole so that no diminution of food supply should result."*³¹

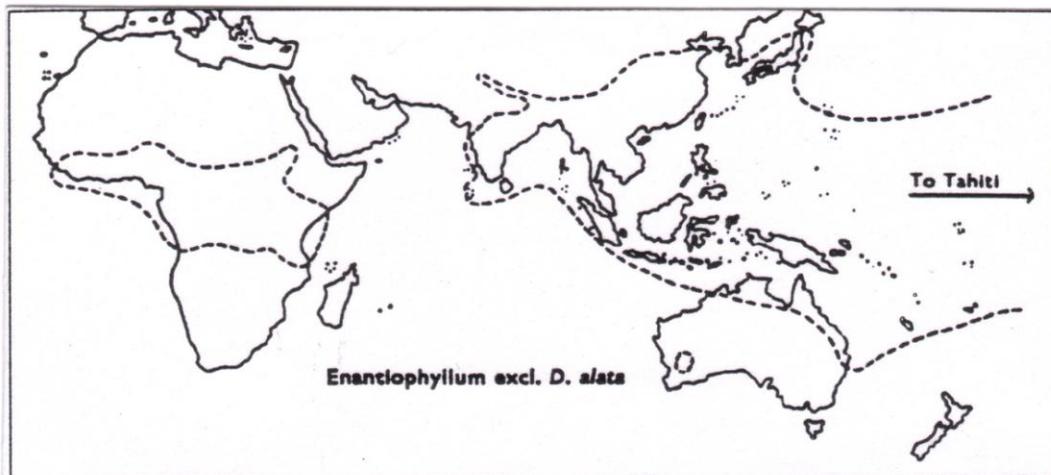
a conclusion supported in 1889 by J H Maiden in *Useful Native Plants of Australia*:

*"[Dioscorea hastifolia] ... is the only plant on which they [Aboriginal people] bestow any kind of cultivation, crude as it is."*³²

The significance of these passages lie in the references to the *warran*, the yam plants growing "as far as we could see", or, "tracts of land several square miles in extent",³³ calculated to cover an area of 15-16 sq. kms,³⁴ evidence of their propagation, the paths, the wells, the huts and the villages - all bespeak an agricultural society exhibiting a high degree of sedentism. Gregory's information is unequivocal and clearly indicates propagation was in evidence, while Grey elsewhere observed "these circumstances all combined to give the country an appearance of cultivation, and of being densely inhabited, such as I had never before seen".³⁵ Other comments, particularly Helpman's and Burges's, regarding the degree of dependence on the yams, if read in conjunction with Grey and others on the extent of the yam grounds, as well as the villages, strongly suggests that this propagation was carried out on a systematic basis, to an extent where it provided a major proportion of local subsistence. Pioneer Dr Robert Foley, in 1851, referring to the Chapman River valley, noted, "You can see for miles, and it being dug for warran or *agacs*, as they call it here, you can see the nature of the soil."³⁶ At nearby Wizard Peak, Bynoe, the surgeon from the *Beagle*, reported, "the native yam seemed to grow in great abundance."³⁷ Again Grey in describing the Arrowsmith River valley reported, "the whole of this valley is an extensive warran ground".³⁸ Grey's remark, that the ground at Hutt River was "literally perforated with holes the natives made to dig this root", was often repeated by other observers, pointing to intensive harvesting.³⁹ Unfortunately, apart from one minor unrelated study carried out in 1914,⁴⁰ no published archaeological investigations have ever been carried out in the Victoria District proper, necessitating a reliance on ethnographic sources. These limited sources do not contain any information on any husbandry that may have been undertaken by the *Nhanda* of the Victoria District. However it could be inferred that at least at Hutt River the plants may have been watered. Grey, it will be recalled stated that, "we found frequent wells, some of which were ten and twelve feet [3-4 m] deep, and were altogether executed in a superior manner". He described them in another account as being "of a depth and size quite unknown in the southern portions of the continent."⁴¹ The climate in this semi-arid region is of Mediterranean type, with hot, dry summers and cool, wet winters, and an annual rainfall of 463 mm [18.5 in]. Wells of the type described by Grey normally only appear singly in the arid zone

in Australia, an adaption to the “more marginal areas of the desert lowlands.”⁴² Following an exhaustive search of the ethnographic literature only three remotely comparable cases could be found. One was an account from northern Australia by explorer Ludwig Leichhardt of "some large [dry] wells, ten or twelve feet deep" near a *Zamia* grove,⁴³ while another explorer, Martin, reported encountering deep wells about every mile around Roebuck Bay in the Kimberley region of Western Australia in 1865.⁴⁴ The third report is from the Irwin River valley, again in the Victoria District, where Helpman reported "several wells of considerable size dug about 8 feet [2.4 m] deep."⁴⁵ Given that there are dozens of permanent springs in the Hutt region,⁴⁶ Grey actually commenting on passing springs "every few hundred yards" and a "chain of reedy fresh water swamps" on 3 and 4 April, 1839,⁴⁷ as well as the presence of various watercourses (Hutt River and a number of creeks), it is difficult to account for the wells he observed. The most likely explanation was that they were being used to water the yam fields and this contention is supported by their adjacency to the yam fields as well as by the similar occurrence of grouped wells in the Irwin River valley.

The yam plant referred to earlier, known as the *warran* or *ijjecka*, is a species of yam, *Dioscorea hastifolia*, that is in fact one member of the tropical genus *Enantiophyllum*, described as "... the most tropical yams".⁴⁸ Yet in Western Australia its distribution was almost exclusively encompassed by the South-West Botanical Province,⁴⁹ ranging from the wetter Mediterranean climate just south of Perth, to the prolific Victoria District, with isolated occurrences in the coastal desert region of southern Shark Bay, reportedly "abounding" on Salutation Island, where it grew to the thickness of a man's thigh.⁵⁰ The global distribution of the *Enantiophyllum* genus, excluding *Dioscorea alata*, an agricultural species, is illustrated below:



The Global Distribution of the *Enantiophyllum* Genus excl. *D. alata*
(Burkill 1958-61, p. 330, Fig. 5)

It can readily be seen that there are two main areas of distribution, in Africa and Asia/Oceania separated by the deserts of the Middle East. Australia, however, was completely isolated between 65 and 20 million years ago,⁵¹ the period in which the *Dioscoreaceae* were evolving.⁵² As Australia drifted north it entered the desert belt, now stretching across the middle of the continent, as it began to collide with the Asia/Pacific region. Unless *Dioscorea hastifolia* or an ancestral form was able to naturally diffuse along the island chains of south east Asia, enter Australia and then cross this desert belt in the last few million years, as some have speculated,⁵³ it is difficult to envisage the plant's migration to its isolated position in Western Australia, other than by human agency. The deserts of the Middle East acted as a barrier dividing the African and Asian distribution of *Enantiophyllum* for 15 million years until traders began transporting them around it in the last millennia or so.⁵⁴ Furthermore the archaeological, botanical and ethnographic evidence indicates that distribution of the genus east of Indonesia has in fact only arisen in the last two millennia, as the result of human agency,⁵⁵ explaining the presence of species such as *D. bulbifera* and *D. transversa* in the humid tropical and sub-tropical coastal regions of north and northeast Australia. It is therefore highly improbable that *D. hastifolia* could have reached its modern distribution by crossing the Australian desert and must have arrived by some other means.⁵⁶ It will be recalled that when Pelsaert marooned Loos and de Bye in the aftermath of the Batavia Mutiny they were given "... a Champan provided with everything."⁵⁷ Pelsaert, it should also be noted, had returned two months earlier on his rescue mission in the *Sardam*, having come directly from Java, where the ship had been requisitioned and provisioned before sailing. With numerous species of yam from the *Enantiophyllum* genus found in Java, and it being common practice to use yams in victualling ships in the 17th century,⁵⁸ it is quite probable that the two mutineers were put ashore with a supply of yams as food. The obvious inference from this is that they introduced the yam to the *Nhanda*, along with the knowledge of its means of propagation as well as perhaps some of the cultural innovations such as the huts mentioned earlier. From that point on, however, all further developments were essentially of indigenous provenance. This proposition is supported by detailed arguments that have been put forward contending that a significant foreign influence, resulting from the presence of the Mutineers and probably another group of Dutch castaways,⁵⁹ was discernible in the region at the time of British "settlement" there in 1849. It was evident in the physical appearance, the social organisation and mythology of the *Nhanda* and other peoples of the region.⁶⁰ It was also particularly apparent in the *Nhanda* language with a linguistic analysis of a 937 word/600 item vocabulary built up from early records of the *Nhanda* dialects indicating that 16% of the *Nhanda* language was of Dutch derivation.⁶¹ The critical point, however, is that this introduced yam was a domesticate. Presumably, once introduced, it either underwent further speciation through the "founder effect" or simply became a naturalized form of the original species. The exact genetic relationship between *D. hastifolia* and other species of *Enantiophyllum* yams has not as yet been determined. Once introduced it was carried to other localities, such as mentioned previously, presumably through trading, gifting and payments of yams, a common occurrence if early colonial accounts are a valid guide.⁶²

In conclusion it can be seen that, by the minimum criteria established, earlier, agriculture was being practiced in the Victoria District, with evidence of propagation, and harvesting on a systematic basis and of sufficient extent to provide a major component of the *Nhanda*'s subsistence. Furthermore there is some evidence of possible husbandry (i.e. watering) as well as

utilization of a what appears to be a domesticate in cultivation, with *in situ* storage being employed. By extension the features of the *Nhanda* economy are consistent with most of the definitions of agriculture discussed earlier. Other lines of indirect evidence, such as indications of higher population density, the division of labour, concepts of land tenure and specific artworks, support this conclusion.⁶³ I will return later to the Victoria District to re-examine developments there in terms of the cultural transfer that took place, but now turn to consider cultural interactions in Arnhem Land.

As stated earlier the Macassan peoples began regularly visiting the north and north west coasts of Australia from about 1700, perhaps earlier.⁶⁴ The most intensive and extensive contacts between indigenous populations and the Macassans seems to have occurred in one area in particular, Arnhem Land.⁶⁵ The Macassans arrived in fleets of up to 100 praus each year, carried there by the summer monsoon, principally to obtain trepang, returning to Sulawesi at the end of the monsoon season.⁶⁶ Relations developed between the Macassans and the *Yolngu*, and other Arnhem Land groups, based on trade, exchange and tribute. This interaction had significant impacts on the indigenous cultures of this region in terms of their material culture, language, customs and the regional economy. Direct transfers of items of material culture included dugout canoes with sails and stone anchors, bronze fish hooks, harpoons with detachable heads, iron, iron knives and axes, glass, pipes, tobacco, cloth in the form of calico and wool, belts, beads, string, alcohol and some foods.⁶⁷ These were provided to the Arnhem Landers in exchange for labour, tortoise-shell, pearls, pearl-shell, sexual services and the right to fish in their waters.⁶⁸ A significant linguistic influence also manifested itself in the borrowing of many Macassan words, directly, or in modified form in accordance with Aboriginal phonology.⁶⁹ Macassan wind direction terms were adopted, for example, because of their role in sailing dugouts.⁷⁰ Certain place names arose, in modified form, from the names the Macassans applied.⁷¹ A form of pidgin Macassan in fact became the *lingua franca* between different groups all along the Arnhem Land coast.⁷² Cultural influences included the adoption of the "Van Dyke" beard and square gin bottles, in wooden form, as totem objects.⁷³ Economically, it has been argued trade with the Macassans stimulated the traditional transaction network, known as the ceremonial exchange cycle, hundreds of kilometres inland.⁷⁴

In regard to plant foods, the Macassans introduced the tamarind fruit and rice to the *Yolngu* and their neighbours through trade and tribute.⁷⁵ They also frequently planted the tamarind (*Tamarindus indica*), it consequently becoming a distinctive marker of Macassan sites, and possibly grew rice (*Oryza sativa*).⁷⁶ Furthermore small numbers of people from Arnhem Land travelled back with the Macassan fleets to Sulawesi and beyond, living there for 6 months or more before returning.⁷⁷ It can be surmised from this that the Arnhem Landers had ample opportunity to observe the Macassans planting and undertaking agricultural activities. As well as the introduced tamarind a variety of species occur in the Arnhem Land region that were cultivated in New Guinea, parts of south east Asia and the Pacific Islands. These included "wild rice" (*Oryza saliva*, *Oryza fatua*, *Oryza meridionalis*), coconuts (*Cocos nuciferas*), taro (*Colocasia esculenta*), yams (*Dioscorea buibifera* var., *D. alata*) and the salad vegetable *Ipomoea aquatica*.⁷⁸ Yet despite utilisation of most of these plants, as far as is known no deliberative planting of any species has ever been reported in the area of Arnhem Land subject to direct Macassan influence.

So how does one explain why, with only episodic contact, planting and agriculture commenced in western Australia whereas it did not do so in Arnhem Land, despite extensive and regular contact with people who practised agriculture to some degree. In providing an answer it is necessary in the first instance to dispose of the common preconception that traditional Aboriginal societies in Australia were inherently conservative. Superficially this might appear so, with appeals to tradition and the "Dreamtime" to support and justify any number of cultural practices and social features. However the reality was a little different, and a plethora of examples can be cited showing dynamic responses by traditional Aboriginal societies, followed in many instances by the adaptation of myths and traditional justifications to maintain congruency with their "world view". Obvious examples include the adoption by the Arnhem Landers of the innovations arising as a result of their interaction with the Macassans, the dugouts with sails and anchors, fish hooks, harpoons, iron, wooden totem bottles and so forth, with attendant adjustments in myths and legends, and the development of new ceremonies.⁷⁹ Another illuminating example can be found in Tasmania. The Tasmanians had never ever seen a dog, because dingoes never reached there, or any animal resembling a dog, Tasmanian tigers being the antithesis of dogs in behavioural terms. Yet within a few years of first contact with Europeans they had adopted and fully integrated dogs into their hunting strategies, and provided them a place in their mythology and ceremonies.⁸⁰ But as a final illustration of the rapidity with which Aboriginal people could respond to novel circumstances I refer to an anecdote provided by Alfred Giles, a member of the Overland Telegraph survey party in inland Australia in 1870. Giles gave this account of an encounter between members of the survey party and an old Aboriginal man:

*"Mr Ross made the old man a present of a brand-new and bright tomahawk, which he examined very carefully, feeling the bright steel edge, wondering what sort of stone it could be. After he examined it, he returned it to Mr Ross, seemingly unaware of its use. Mr Ross told me to go and lop off a small limb of a tree near by, which I did with one blow, to the astonishment of the old savage, who examined the limb and eagerly took back the tomahawk."*⁸¹

If one accepts then that Aboriginal people in traditional contexts in fact responded to new or altered circumstances in much the same way as other peoples of the world, that Indigenous Australians were not, and are not, unique in this respect, then the way is open to consider other alternatives. But to explain the divergent responses documented above it is now necessary to consider the nature of Aboriginal economies. These economies were, traditionally speaking, principally subsistence economies, as distinct from production economies which aim to meet not only subsistence and other needs but generate surpluses as well. Gaughwin and Fullagar recently proposed a schema characterising traditional Aboriginal subsistence activities in terms of coastal and marine economies.⁸² As an extension of this I would propose a more global schema categorising subsistence economies in terms of the particular ecozones or groups of ecozones that are exploited. These include terrestrial, aquatic, coastal, marine and pelagic economies. In broad terms a terrestrial economy involves exploitation of land-based food resources, usually plants and animals. An aquatic economy is one focussed on the exploitation of major rivers, lakes, estuaries or wetlands while a coastal economy is predominantly terrestrial, with a seasonal component involving utilisation of near-shore and inter-tidal

resources. A marine economy entails regular utilisation of inter-tidal, sub-tidal and offshore resources and, finally, a pelagic economy is based around exclusive exploitation of offshore and island-based food resources, often revolving around fishing and the hunting of marine mammals such as dugong and turtles. Of course particular groups did not fit neatly into these categories, the Australian evidence suggesting that most exploited more than one ecozone in traditional circumstances, although one type of economy usually predominated. Associated with each type of economy was a particular suite of weapons, tools, implements, equipment, and techniques necessary to effectively exploit some of the available food resources, along with the knowledge of the distribution, availability and distinctive characteristics of those resources.

Within this schema coastal groups in Arnhem Land typically followed a maritime economy with terrestrial, aquatic and pelagic components. In other words they gained most subsistence from the sea, some from estuaries and at certain times of the year a proportion from inland wetlands and woodlands.⁸³ The *Anbarra Gidjingali* of north east Arnhem Land, situated on the coast and Blyth River estuary, for example, derived 62.0% of their calorific intake, chiefly in the form of fish and shellfish, from marine and estuarine sources.⁸⁴ They saw themselves as "beach people" in contrast to inland groups such as the *Matai and Gunadba Gidjingali* who were "forest people" relying largely on terrestrial resources.⁸⁵ On the islands off the Arnhem Land coast the maritime and pelagic components were of prime importance.⁸⁶

The *Nhanda* have never been studied in such detail. Their traditional culture was effectively destroyed in the second half of the nineteenth century, with only a handful of individuals nowadays able to claim descent. As little archaeological work has been carried out in the region reconstruction of their traditional subsistence economy must, therefore, rely upon historical ethnographic sources.⁸⁷ These sources, as exemplified by some of the earlier statements, indicate that the economy was overwhelmingly terrestrial. There are only scattered references to non-terrestrial economic components, such as spear fishing in the estuary of the Murchison River⁸⁸ and on the beach just north of Geraldton,⁸⁹ and fishing with small nets in rock pools on the Murchison River.⁹⁰ This view is supported by the lack of any reported use of water craft, fish hooks or substantial nets in the Victoria District, along with a specific prohibition on the consumption of rock oysters.⁹¹

Given this characterisation of the subsistence economies in Arnhem Land and the central west coast of Australia I would now contend, firstly, that in circumstances where contact occurs between different cultures and transfers take place, that those transfers will in all likelihood include technologies, items of material culture and new technical expertise. Secondly, where transfers of this nature take place they are most likely to be congruent with and integrable within a major component, usually the primary component, of the subsistence economy of the recipient group. And thirdly such transfers may have a significant impact on the economies of the recipients and even shift their overall economic orientation. In understanding this aspect of the dynamics of cultural transfers the adoption of dugouts with sails by the Arnhem Landers, along with the expertise to handle such craft, is a striking example. Dugouts were readily adopted principally because they provided a steadier platform for spearing dugong, turtles and sharks than the bark canoes previously used.⁹² This advantage was complemented by the adoption of harpoons with detachable heads, reducing the loss of fishing spears, and bronze fish

hooks. Similarly iron, incorporated into tools and weapons, iron axes and knives, and glass, used in spear heads, had value in all components of the indigenous economy of the Arnhem Land coast.⁹³ Other examples, such as those cited earlier, the Tasmanians and dogs, the old man and the metal axe, also fit within this paradigm. By extension, although we have no idea exactly what took place in the days and weeks following the marooning of the two Dutch Mutineers in 1629 the adoption of the yam is an innovation perfectly consistent with what appears to have been the original primary economic orientation of the *Nhanda*. Conversely, the boat they were marooned in may have been another potential innovation, one which I would suggest was not taken up because the maritime and aquatic components were such a minor part of the *Nhanda* economy.

Another factor I believe has a vital role in transfers of an economic nature is what I term the "point of articulation". This concerns the dynamics of inter-group interactions at the point of transfer which makes such transfers possible. It necessitates a level of acceptance on the part of both parties. Such acceptance may be based on common interest, potential gain or simple curiosity and may lead to a level of integration. Trade is a classic example of articulation, where discrete economic systems achieve a level of integration based on common interest, usually through frequent or sustained contact. This was certainly the case with the Macassans and the Arnhem Landers. In the fleeting situation of the old man and the axe the colonists were interested in meeting local people to learn more about them in order to ascertain what threat they might have posed to their activities.⁹⁴ One presumes the old man may have had similar concerns, but gained a "new, improved" axe as a consequence of the uneasy encounter. One can only guess at what took place in the days and weeks at Hutt River following the marooning of the two mutineers. Their only hope of salvation lay with establishing friendly relations with the *Nhanda*, and as Aboriginal people in the western part of Australia had never come into direct contact with Europeans up to that point the mutineers would certainly have had high curiosity value.⁹⁵ One can only presume friendly relations were established and the Mutineers in this unique situation were able to integrate change from within *Nhanda* society.

And so, to return to the original issue regarding the development of indigenous agriculture in Australia, particularly in situations where that may potentially have arisen as the result of interaction with "foreign" peoples. Several specific reasons that have been advanced as to why the people of Arnhem Land did not take up agricultural activities. One, the "original affluence" hypothesis, or variants of it, has been put proposed by number of eminent researchers,⁹⁶ in spite of the evidence that traditionally there was seasonal scarcity and people actually worked very hard trying to meet their obligations under the ceremonial exchange cycle.⁹⁷ Macknight alternatively argued that the absence of "strong economic or ideological competition between the two cultures" was the reason the Macassans failed to transform the north coastal economy.⁹⁸ More specifically he speculated that the lack of autochthonous vessels suitable for the cooking of rice may also have been a contributing factor.⁹⁹ However there are many examples in other parts of the world of agriculture being adopted as a result of diffusion without the necessity for economic or ideological competition. One can point to an Australian example, the *Kaurareg* people of Muralag or Prince of Wales Island, just off the tip of Cape York. They began planting a yam garden, known as a *garricoop*, for the first time in October 1849, this being witnessed by Barbara Thompson, a young shipwreck survivor who lived with the *Kaurareg* for 5 years. In

that instance planting, it would appear, was simply undertaken as a risk-management strategy, in case the wild yams failed,¹⁰⁰ this representing the end point of a proximal cline of agricultural intensification running across Torres Strait.¹⁰¹ Macknight's contention that a lack of suitable cooking vessels was an obstacle to the adoption of agricultural practices can also easily be dismissed, wild rice, where it was consumed, was simply ground and made into damper like other seed foods.¹⁰² In my view the answer lies in the economic orientation of the recipient group, whether there is a point of articulation and the nature of that articulation. As stated earlier I contend transfers of an economic nature will take place when what the donor group has to offer is congruent with one or more of the major economic components of the recipient group. The adoption of the yam by the *Nhanda* fits with this, as does the adoption of a range of technologies and innovations centred on fishing and marine mammal hunting by Arnhem Land coastal groups. Conversely these same Arnhem Land groups "rejected" agricultural innovations, as the terrestrial component was only a minor part of their economy, the exploitation of seeds such as wild rice being almost non-existent, basically one of their "fallback foods".¹⁰³ Furthermore, Yesner has argued previously that fishing as an economic activity, because it produces higher protein yields, is a major impediment to the adoption of agriculture.¹⁰⁴ There are certainly examples in prehistory of prolonged "resistance" to agriculture, for periods of a thousand years or more, by cultures with a maritime economic orientation, the Ertebolle of Denmark and the East Jomon of Japan being examples.¹⁰⁵ In such circumstances agriculture may only enjoy a marginal comparative advantage, if at all.¹⁰⁶

Undoubtedly there was a point of articulation between the Arnhem Landers and the Macassans but the character of the articulation was probably unfavourable to agricultural type transfers. That articulation was manifested through trade and exchange relationships carried on by men, so that all the technological transfers involved things that were in the male domain in the sexual division of labour.¹⁰⁷ Secondly the Macassans arrived at a time of year when local Aboriginal groups were based on the coast and the terrestrial component of the economy was negligible. It was only during the dry season, when the Macassans had gone, that there was a movement inland and the terrestrial component increased in significance.¹⁰⁸ Finally utilisation of seed foods was quite uncommon in the coastally based Arnhem Land groups, making it less likely that they would have taken up the only seed food they obtained from the Macassans, rice.¹⁰⁹ As for the Mutineers and the *Nhanda*, there is little specific information. The fact that the Mutineers were men was not necessarily an obstacle to the transfer of the yams, normally something that would be part of the women's domain. Often such transfers involve associated cultural attributes, such as the sexual assignment of the activity, along with the actual material transfer.¹¹⁰ Although only speculation I would suggest that their uniqueness at that particular point in time probably was the critical factor. There are many historical examples of Aboriginal people at first contact exhibiting great curiosity about Europeans and their strange ways, as long as they did not consider them to be an immediate threat and managed to overcome their initial shock. The man and the axe is a fairly typical instance. More to the point the transformation began by those events in 1629 lead to the situation where, by 1839, *Nhanda* men were engaged in harvesting yams.¹¹¹ The significance of this cannot be underestimated. In Australia and globally in traditional hunter-gatherer societies the gathering of vegetal foods is almost exclusively women's work.¹¹² When an "agricultural revolution" takes place the sexual division of labour is, through local dynamics, fundamentally redefined and men begin to become

involved in the planting, harvesting and processing of plants. That, in my view, is exactly what had taken place when British colonists barged into the Victoria District in the mid-nineteenth century. Such is the profound but unexpected legacy of a delinquent cabin-boy and a villainous soldier of the early seventeenth century.

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²⁰ R. Gerritsen, *And Their Ghosts May Be Heard*, (South Fremantle: Fremantle Art Centre Press, 1994), pp. 271-287.

²¹ At the time the continent was *Terra Incognita* to Europeans, only "discovered" in 1606, and completely and utterly unknown apart from the shadowy outlines of parts of the north, south and west coasts. No definitive account of the mutiny has been written though the interested reader can refer to :

H. Drake-Brockman, *Voyage to Disaster*, (London: Angus & Robertson, 1982)

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P. Goddard, *The First and Last Voyage of the Batavia*, (Perth: Abrolhos Publishing, 1993), pp. 130-43,164-87.

²² F. Pelsaert, 'The journals of Fransisco Pelsaert', in *Voyage to Disaster*, comp. by H. Drake-Brockman (London: Angus & Robertson, 1982) pp. 122-254 (p. 230).

²³ Pelsaert, p. 237.

²⁴ G. Grey, *A Journal of Two Expeditions in North-West and Western Australia 1837-9*, 2 vols. (London: T & W Boone, 1841a), 2:12,19.

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²⁵ Grey 1841a, 2:38.

²⁶ Including Lt. Helpman (Explorer), A. C. and F. T. Gregory (Surveyors, Explorers), James Drummond (Government Botanist, Pioneer), Mrs Brown (Pioneer), Phillip Chauncy (Surveyor), John Septimus Roe (Surveyor-General), William Burges (Government Resident), Edward Cornally (Shepherd) and Dr Robert J. Foley (Pioneer).

²⁷ Lt. Helpman, 'Champion Bay to the coal on Irwin River', in *Exploration Diaries*, 6 vols (Perth: Western Australian State Archives, PR 5441), 4:6-19 (p. 9) [9 December 1846].

²⁸ J. L. Stokes, 'Visit to the country adjacent to Champion Harbour reported to be Port Grey, and examination of the coast line to the northward', *Perth Gazette*, 25 December 1841, 2-3 (pp. 2-3). How Stokes came to the conclusion these dwellings were only inhabited in winter is a moot point as he was only in the area for about one and a half days. [See J. L. Stokes *Discoveries in Australia*, 2 vols (London: T. and W. Boone, 1846), 2:385-93]

He probably just assumed this was when they were usually occupied because of their substantial construction. However winters here are quite mild (minimums never fall below zero, av. maximum 18 deg. C) compared to further south where far less substantial or protective shelters were constructed.

²⁹ 'W. Burges to Acting Colonial Secretary', 9 June 1851 [WASA, Colonial Secretary's Records, 218/291-3], (p. 6)

³⁰ 'Letter from Lt. Helpman to Government Gazette', *Government Gazette*, 18 December 1849, p. 3.

³¹ A. C. Gregory, 'Inaugural address', *Royal Geographical Society of Australasia, Queensland Branch*, 1 (1885), 18-25 (p.23).

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"The natives on the West Coast of Australia are in the habit amongst other things of digging up yams as a portion of their means of subsistence; the yams are called 'ajuca' in the north and 'wirang' in the south. In digging up these yams they invariably re-insert the head of the yams so as to be sure of a future crop, but beyond this they do absolutely nothing which may be regarded as tentative in the direction of cultivating plants for their use."

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³² J. H. Maiden, *The Useful Native Plants of Australia*, (Sydney: Turner and Henderson, 1889), p. 22.

³³ Grey 1841a, 2:292.

³⁴ See Gerritsen 1994, p. 298n19.

³⁵ G. Grey, 'Notes upon that portion of Western Australia that lies between Gantheaume Bay and the Arrowsmith River', in *The New Settlement of Australind*, comp. by H. S. Chapman (London: Harvey and Darton, 1841b), pp. 41-54 (p. 44).

³⁶ 'Letter from Dr. Foley to E. R. Parker', in *Perth Gazette*, 31 January 1851.

³⁷ Quoted in Stokes 1846, 2:389.

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⁴² P. M. Veth, 'Islands in the interior: A model for the colonization of Australia's arid zone', *Archaeology in Oceania*, 24 (1989), 81-92 (p. 83); P. M. Veth, *Islands of the Interior: The Dynamics of Prehistoric Adaptions Within the Arid Zone of Australia*, (Ann Arbor: International Monographs in Prehistory, 1993), p. 106.

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⁴⁵ Helpman 1846, p. 13-14.

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⁵⁴ Burkill, p. 334; Coursey, pp. 16-17,33.

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⁵⁶ The climate in northwest Australia improved marginally between 10-12,000 years ago, with current regime coming into effect about 7,000 years ago. The "barrier dunefields" of the Great Sandy Desert have acted as a biogeographic barrier for 35,000 years at least and have only been occupied in the last 5,000 years. *D. hastifolia* would have had to come either directly across the Australian desert or along the coast through "one of the largest arid coastal zones in the world" [P. Veth, 'Aridity and settlement in north west Australia', *Antiquity*, 69(265) (1995), 733-46.] unaided at a time when the climate was not as dry, or across the desert by human agency in more recent times, transported to its isolated position on the central west coast and nowhere else. See K. H. Wyrwoll et al., 'The Great Sandy Desert of Northwestern Australia: The last 7000 years', *Search*, 17(7-9) (1986), 208-10; Veth 1993, pp. 8-9,103-14.

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⁵⁹ It is conjectured that surviving members of a group of 68 sailors stranded on the coast following the wreck of the *Vergulde Draeck* in 1656 also made their way into the region (Gerritsen 1994, pp. 232-46).

⁶⁰ Gerritsen 1994, pp. 66,71,145-50,160-1,169,171.

⁶¹ Gerritsen 1994, pp. 113-30.

Five historical sources (1840-1908) were employed, being temporally closest to the original language. The decline of the *Nhanda* was such that now only a few individuals remain who can claim descent from the original population. Paralleling this has been a catastrophic loss of cultural and linguistic information.

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⁶³ Gerritsen 1994, pp. 86-7,139-43,185.

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⁷⁵ Macknight 1972, p. 306; Macknight 1976, pp. 31, 59, 84, 87.

⁷⁶ Berndt and Berndt, pp. 3, 34-7; Macknight 1976, p. 59.

Warner (p. 457) and J. P. White, ['New Guinea and Australian prehistory: The Neolithic problem', in *Aboriginal Man and the Environment*, ed. by D. J. Mulvaney and J. Golson (Canberra: ANU Press, 1971), pp. 182-95] p. 188 also suggests that the Macassans may have introduced the "large bamboo". The presence of *Dioscorea alata*, an important yam in agriculture, on Groote Eylandt may also be the result of Macassan influence.

⁷⁷ Berndt and Berndt, pp. 17, 50-4; Warner, pp. 458, 468; J. P. White, p. 188; Macknight 1976, pp. 85-6.

It would appear one man may have even travelled as far as Singapore. See Macknight 1976, pp. 85-6.

⁷⁸ M. Holtze, 'Introduced plants in the Northern Territory', *Transactions of the Royal Society of South Australia*, 15(1) (1892), 1-4 (p. 3); P. Worsley, 'The utilization of natural food sources by an Australian Aboriginal tribe', *Acta Ethnographica*, 10(1-2) (1961), 153-90 (pp. 165-6); R. Jones and B. Meehan, 'Plant foods of the Gidjingali: Ethnographic and archaeological perspectives from northern Australia on tuber and seed exploitation', in *Foraging and Farming: The Evolution of Plant Exploitation*, ed. by D. R. Harris and G. C. Hillman (London: Unwin, Hyman, 1989), pp. 120-35 (pp. 122, 126-30); D. E. Yen, 'The domestication of the environment', in *Foraging and Farming: The Evolution of Plant Exploitation*, ed. by D. R. Harris and G. C. Hillman (London: Unwin, Hyman, 1989), pp. 55-75 (p. 59).

Some of these may have been introduced in the more distant past as Holtze specifically claims in relation to *I. aquatica*.

⁷⁹ Thomson, p. 52; Berndt and Berndt, pp. 16-7; Warner, p. 466; Macknight 1972, pp. 314-5.

⁸⁰ R. Jones, 'Tasmanians and their dogs', *Mankind*, 7 (1970), 256-71. See also W. Rolland, *The Tasmanian Tiger: The Elusive Thylacine*, (Kenthurst: Kangaroo Press, 1997) pp. 6-8.

⁸¹ A. Giles, *Exploring in the Seventies and the Construction of the Overland Telegraph Line*, (Adelaide: W. K. Thomas, 1926) p. 29. This encounter took place on Giles Creek, 90 km east of Alice Springs.

⁸² D. Gaughwin and R. Fullagar, 'Victorian offshore islands in a mainland coastal economy', *Australian Archaeology*, 40 (1995), 38-50 (p. 39).

⁸³ Worsley, p. 156; B. Meehan, 'Man does not live by calories alone: The role of shellfish in a coastal cuisine', in *Sunda and Sahul: Prehistoric Studies in Southeast Asia, Melanesia and Australia*, ed. by J. Allen, J. Golson and R. Jones (New York: Academic Press, 1977) pp. 493-531; Jones 1990, pp. 41-2.

⁸⁴ Meehan 1977, pp. 502-5.

⁸⁵ Berndt and Berndt, p. 7; Worsley, p. 156; Meehan 1977, p. 523; Jones and Meehan, pp. 120-9.

⁸⁶ N. B. Tindale, 'Some population changes among the Kaiadilt people of Bentinck Island, Queensland', *Records of the South Australian Museum*, 14 (1962), 297-336; N. B. Tindale, 'Further report on the Kaiadilt people of Bentinck Island, Queensland', in *Sunda and Sahul: Prehistoric Studies in Southeast Asia, Melanesia and Australia*, ed. by J. Allen, J. Golson and R. Jones (New York: Academic Press, 1977) pp. 247-73; H. Lourandos, *Continent of Hunter-Gatherers: New Perspectives in Australian Prehistory*, (Cambridge: Cambridge University Press, 1997) p. 77.

⁸⁷ The only archaeological studies of which I am aware are : Campbell 1914; R. H. Pearce, 'Archaeological survey at Oakajee River', (Unpublished Report, 1982) [Untraceable]; P. M. Veth and G. Quartermaine, 'Report on the survey for Aboriginal archaeological sites on the Geradton lateral gas pipeline route', (Unpublished Report, 1984); K. Morse, 'An archaeological survey of midden sites near the 'Zuytdorp' wreck, Western Australia', *Bulletin of the Australian Institute of Maritime Archaeology*, 12(1) (1988), 37-40.

⁸⁸ Oldfield, p. 273.

⁸⁹ Grey 1841a, 2:34-5.

⁹⁰ Oldfield, p. 274. Grey (1841a,2:19) also refers to men fishing in Hutt Lagoon but does not specify by what method.

⁹¹ Oldfield, p. 276.

The evidence of a predominantly terrestrial economy does not appear to be an artifact of observation as similar materials clearly show that, in contrast, northward from Shark Bay and along the Gascoyne coast there are indications of a marked maritime economic orientation [See R. Gerritsen, 'Aboriginal fish hooks in southern Australia: Evidence arguments and implications', *Australian Archaeology*, 52 (2001), 18-28 (p. 25)].

⁹² Warner, p. 460.

⁹³ Warner, p. 464; Macknight 1972, pp. 304-5; Macknight 1976, p. 91.

⁹⁴ Giles account of his activities in this period is replete with examples of their concern with attacks by local Aboriginal populations. This concern almost amounted to paranoia, virtually every action by Aboriginal groups in their vicinity being interpreted in terms of a potential threat.

⁹⁵ Prior to the marooning of the two mutineers only one, possibly two encounters took place between the Dutch and Aboriginal people in the western part of Australia, as far as is known. A brief reference in Tasman's 'Instructions' in 1644 mentions the temporary grounding of the *Vianen* in 1628 on the north west coast at 21⁰. A comment in the 'Instructions' indicates the region was inhabited by "exceedingly savage black, barbarian inhabitants" but as translations differ, it is unclear whether contact was actually made, and the comment may simply be a summary of Dutch knowledge of Australia up to that time. See 'Instructions for Tasman 1644', in J. E. Heeres, *The Part Borne By the Dutch in the Discovery of Australia 1606-1765*, (London: Luzac and Co., 1899) p. 54; 'Instruction for Tasman', in *Journal of Abel Jansz Tasman 1642 With Documentation Relating to His Exploration in 1644*, ed. by G. H. Kenihan (Adelaide: Heritage Press, 1964) p. 109; 'Letter of the Governor-General to the Managers of the E.I.C. dated January 3, 1624, in Heeres, p. 22. On the other occasion, 16 June 1629, Pelsaert and crew, on their way back to Indonesia to get help following the wreck of the *Batavia*, saw 8 men who ran away, just south of Yardie Creek on North West Cape (Pelsaert, p. 130).

⁹⁶ e.g. Berndt and Berndt, p. 38; M. Sahlins, *Stone Age Economics*, (Chicago: Aldine, Atherton, 1972) pp. 14-21.

⁹⁷ Thomson, pp. 34-36; Worsley, pp. 172-3; Meehan 1977, pp. 510-3; J. C. Altman, *Hunter-Gatherers Today: An Aboriginal Economy in North Australia*, (Canberra: Australian Institute of Aboriginal Studies, 1987) p. 94.

⁹⁸ Macknight 1972, pp. 317-8.

⁹⁹ Macknight 1972, p. 307.

¹⁰⁰ O. W. Brierly, 'Journals, Manuscripts, 1848-50', in *Islanders and Aborigines at Cape York*, comp. by D. R. Moore (Canberra: Australian Institute of Aboriginal Studies, 1979) pp. 25 - 233 (pp. 148,178-9,184).

¹⁰¹ Yen 1989, p. 57; D. R. Harris, 'Early agriculture in New Guinea and the Torres Strait divide', *Antiquity*, 69(265) (1995), 848-54 (pp. 852-3); J. Flood, *Archaeology of the Dreamtime*, (Sydney: Angus & Robertson, 1995) p. 254.

¹⁰² W. E. Roth, *Ethnological Studies Among the North-West-Central Queensland Aborigines*, Brisbane: Government Printer, 1897) p. 92.

¹⁰³ M. M. McArthur, 'Food consumption and dietary levels of groups of Aborigines living on naturally occurring foods', in *Records of the American-Australian Scientific Expedition to Arnhem Land*, ed. by C. P. Mountford, 4 vols (Melbourne: Melbourne University Press, 1960) 2:90-135 (2:108); Jones and Meehan, pp. 126-8; Yen 1995, p. 841.

¹⁰⁴ D. R. Yesner, 'Maritime hunter-gatherers: Ecology and prehistory', *Current Anthropology*, 21(6) (1980), 727-50 (p. 733).

¹⁰⁵ Bailey, p. 11; T. Akazawa, 'Maritime adaption of prehistoric hunter-gatherers and their transition to agriculture in Japan', in *Affluent Foragers*, ed. by S. Koyama and D. H. Thomas (Osaka: National Museum of Ethnology, 1981) pp. 213 -58 (pp. 249-51).

¹⁰⁶ Bailey, p. 11.

¹⁰⁷ Thomson, p. 33; Warner, pp. 129-30,140.

¹⁰⁸ Meehan 1977, pp. 495-8,510-17; Jones 1990, pp. 41-2.

¹⁰⁹ Worsley; Jones and Meehan, pp. 122-8; Jones 1990, pp. 41-2.

¹¹⁰ e.g. Men using fish hooks in north east Australia is seen as result of diffusion from Melanesia where men did the fishing, whereas on the coast of New South Wales women did the line fishing, seen as the result of independent invention. See S. Bowdler, 'Hook, line and dilly bag: An interpretation of an Australian coastal shell midden, *Mankind*, 10(4) (1976), 248-58 (pp. 250-55); I. Walters, 'Fish hooks: Evidence for dual social systems in southeastern Australia', *Australian Archaeology*, 27 (1988), 98-114 (p. 106); Gerritsen 2001, pp.24-5.

¹¹¹ P. Chauncy, 'Notes and anecdotes of the Aborigines of Australia', in *The Aborigines of Victoria*, comp. by R. B. Smyth, 2 vols (Melbourne: Govt. Printer, 1878), 2:221-84 (2:246); Grey 1841a, 2:54; Mrs Brown, 'Narrative of a journey from York to Champion Bay in the Colony of Western Australia during the Months of May and June 1851', *Inquirer*, 10 September 1851, p 4. Burges, p. 6.

¹¹² B. Hiatt, 'Woman the gatherer', in *Woman's Role in Aboriginal Society*, ed. by F. Gale (Canberra: Australian Institute of Aboriginal Studies, 1974), pp. 4-15; C.H. Berndt, 'Digging sticks and spears, or, the two sex model', in *Woman's Role in Aboriginal Society*, ed. by F. Gale (Canberra: Australian Institute of Aboriginal Studies, 1974), pp. 64-84; M. Ehrenberg, *Women in Prehistory*, (London: British Museum Publications, 1989) p. 83.; P.J. Watson and M.C. Kennedy, 'The development of horticulture in the Eastern Woodlands of North America: Women's Role', in *Engendering Archaeology: Women and Prehistory*, ed. by M. W. Conkey and J. M. Gero (Oxford: Blackwell, 1991) pp. 255-75 (pp. 256-7).