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Use of Natural Resources by the Aborigines of South-Western Australia

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When Europeans first came to occupy parts of the south-west of Western Australia, the Aborigines whom they displaced, like those in other parts of Australia, were hunters and gatherers. Like them, they neither bred domestic animals nor tilled the soil to plant crops. However, as Hallam (1975) has emphasized, Aborigines were far from being merely wandering opportunists; contemporary records reveal that natural resources were husbanded and steps were taken by them to render the environment more suitable for the plants and animals cropped. The Aborigines understood well the complex natural resources that they harvested and were skilful in utilizing them according to seasonal dictates. They also built traps in both land and water.

Unlike the European who supplanted him, the Aboriginal was almost wholly dependent on resources derived from within a relatively narrowly defined area. Describing the territoriality of groups, families and even individuals, contemporary observers said:

> Every individual has his own territory for hunting, gathering gum and picking up yams, and the rights he has here are respected and sacred. . . . Consequently, each family regards one particular district as belonging exclusively to itself, though the use of it is freely shared by nearby friendly families. [Salvado 1977: 130-1.]

> Landed property does not belong to a tribe, or to several families, but to a single male; and the limits of his property are so accurately defined that every native knows those of his own land, and can point out the various objects which mark his boundary. [Grey 1841 Vol. 2: 232.]

> They are very jealous as to encroachments on their property, and the land is divided into districts, which is the property of families or individuals. [Nind 1831: 44.]

> . . . in the Swan River Country, as well as at King George's Sound, the Natives have their private property, clearly distinguished into hunting-grounds, the boundaries of which are definite, trees being often recognised by them as landmarks, and that the possession rests in the head of a family. [Backhouse 1834: 542.]

> . . . each tribe occupies its own separate division of territory. The district thus occupied is again subdivided into vaguely defined portions, every family or individual of the tribe

> having its or his recognised tract of country. This property descends in the family, from one to another, and is considered in every way private property, and the proprietors of such are boastful and proud of their hunting grounds in proportion to their extent and nature. [Browne 1856: 489.]

> . . . each tribe had its own hunting grounds, and no tribe trespassed on those of another without being specially invited. [Bradshaw 1857: 110.]

As Hallam (1975: 42) has pointed out, it is evident that territorial boundaries were not wholly exclusive and should probably be interpreted as representing an overlapping series of usage rights to particular parts of the resource by different levels within the community structure (individual, family, and wider group or 'tribe'). Thus, at any level, some boundaries were coincident with those of others, and others were exclusive. It is reasonable to assume that the boundaries of 'tribal' distributions in the area shown by Tindale (1974) comprise upper limits in the mosaic, within which members of a 'tribe' had access to a common resource and had a right to travel. However, there is evidence that trade in finished articles and raw materials other than food took place across 'tribal' boundaries.

The nature of the trade in materials and implements that took place between south-western 'tribes' may be visualized from Roth's description of the trade carried on by the Pindjarup people of the Bunbury area. He said (1903: 57):

> In trading with other tribes, all that they could barter in exchange were their spears, made from the local "spear-wood", which grew plentifully in the close neighbourhood of the coastal swamps. What they received in return included the following:
> (*a*) A sort of red ochre, wil-gi, which was used with fat for smearing over the body.
> (*b*) Fragments of crystalline quartz, bwor-ral, for sticking into their spears, which, with the advent of the whites, was subsequently replaced by glass. This quartz came from the Darling Ranges.
> (*c*) Stone-tomahawks (kod-ja); also from the ranges.
> (*d*) Wommeras (mi-ra); manufactured from the "raspberry jam" Acacia [*A. acuminata*], from beyond the ranges, in the Avon district.
> (*e*) Throwing-sticks (dau-ak); made of similar wood, and from the same district.
> (*f*) Cork-wood shields (hi-la-man); also from the Avon.
> There were no special individuals or actual traders for carrying on the exchanges, but they would proceed to their particular market whenever they considered the amount of food available there would be sufficient for the wants of all who might be present.

The existence of trade beyond the boundaries of the South-West has been reviewed by McCarthy (1939: 102), who considers that a 'major trunk route' extended from the South-West through the Murchison and Gascoyne districts as far north as the Kimberleys. As evidence of trade between the South-West area and the Gascoyne River, he cites remarks by Hammond (1933: 24), who believed that stone for *kodj* axes was obtained from 'as far north as the Murchison and Gascoyne', and that spears, boomerangs, blackboy-gum and feathers from the red-tailed cockatoo, which he (Hammond) saw on the Gascoyne in the 1870s, had come from the South-

West. A study by Meagher (1973) of the shields in the Western Australian Museum registered as having come from the South-West area showed that they were similar to others in the collection recorded as having come from as far north as the Ashburton.

To meet his everyday wants, then, the Aboriginal was obliged to travel purposefully to different parts of his territory according to patterns of seasonal availability within them. For this, a high level of environmental knowledge was required. Grey (1841 Vol. 2: 262) noted:

> . . . in his own district a native . . . knows exactly what it produces, the proper time at which the several articles are in season, and the readiest means of procuring them. According to these circumstances he regulates his visits to the different portions of his hunting ground; and I can only state that I have always found the greatest abundance in their huts.

The environmental background. The following is a very brief outline of the environment in which the South-West Aborigines lived. For more detailed information see Mulcahy (1967, 1973), Riggert (1966), Ride *et al.* (1974), and Ride (1976).

The climate of the area is simple and fairly reliable. The average annual rainfall gradually diminishes away from the western and southern coasts and is reflected in the vegetation cover and, possibly, also in the landforms. The area has its wettest six-monthly period of the year between May and October, and January and February are the hottest months. In mid-winter there are frequent westerly gales in the coastal belt, and frosts occur from May through to September but are most frequent in July and August. Areas away from the coast and the influence of the sea have the more extreme temperatures. In order to withstand the extremes of climate, Aborigines wore skin cloaks, built huts of branches covered with thatch of blackboy (grass-tree) leaves or other leaves. And, of course, they used warming fires.

The seaward margin of much of the area is bounded by a coastal plain. Along the western coast, as far south as Cape Naturaliste, the undulating Swan Coastal Plain is bounded on the east by the Darling Plateau which, in the vicinity of the Swan River, forms a clearly defined escarpment. The Swan Coastal Plain is traversed by several major rivers and contains extensive lakes and swamps. Except in the Bunbury district, it contains no rocky outcrops other than relatively soft limestone unsuitable for tool-making. A narrow and steep, sand-covered coastal zone extends between Cape Naturaliste and Cape Leeuwin but, unlike the Swan Coastal Plain, it consists of dunes underlain by rocks of the continental shield that reach the coast at this point. As a result, rocky promontories separate sandy bays and shingle beaches. This part of the coastline is unprotected by offshore reefs and, even in summer, the surf is heavy. The dune systems contain extensive caves suitable for use as shelter (see Balme *et al.* 1978), and the underlying rocks, exposed along the coast, are suitable for tool-making. Around the southern coast is a wide coastal plain, comparable with the Swan Coastal Plain in its resources (see Dortch and Gardner 1976: 257-93), where numerous rivers form extensive landlocked inlets and barred

estuaries. There are also interdunal swamps and lakes, and many outcrops of shield rocks or, in some places, of basalt and silicious sedimentary rocks.

The Swan Coastal Plain is divisible into a number of discrete environmental units that differ in topographic character and yield different resources (McArthur and Bettenay 1974). A unit called the Pinjarra Plain, consisting of discontinuous alluvial deposits of rich earth, occurs along the foot of the Darling Scarp and its colluvial deposits. Similar alluvium borders the rivers where they cross the inland part of the coastal plain. Hallam (1975) has assembled evidence to show that these elements of the coastal plain were maintained by Aborigines as open forest and grassland through repeated and deliberate firing in order to provide grass pastures for kangaroos grazing and to facilitate movement.

To the seaward side of the areas of Pinjarra Plain lie three units of different ages derived from dunes of windblown sand. The oldest and most inland of these (the Bassendean Dune System) is of low relief. It becomes sodden in winter and has extensive shallow freshwater swamps and marshes. The Spearwood Dune System lies seaward of the Bassendean Dunes and is next oldest. It forms an undulating landscape with some steep slopes and outcropping aeolianite rock in an otherwise yellow sandy soil. In some places there are caves that were used by Aborigines (Hallam 1974, 1975). Within and along the margins of the system there are extensive saline estuaries and lakes which are mostly of permanent fresh water. The dune systems nearest the coast are often unstable or clothed with low coastal scrub.

The Swan Coastal Plain harboured in its wetlands one of the most seasonally stable populations of waterfowl in Western Australia. For instance, recent surveys of the Vasse estuary at the end of the breeding season have shown the presence of as many as 20 000 swans and 25 000 ducks. Thus, the coastal plains provided Aborigines with a wide range of reliable resources. Fresh water was plentiful at all seasons. Mostly the estuaries provided access to abundant marine life, easily accessible to a people who were not seafarers, and the lakes and estuaries provided a habitat for large numbers of aquatic birds. Large nesting colonies of black swans and pelicans formed in the winter; and at the end of summer, when inland waters had dried up, the waters of the coastal plains became drought refuges, and hence attracted concentrations of enormous numbers of waterfowl. The swamps also provided abundant freshwater tortoises, crustaceans and frogs. Zamia palms and *Haemadorum* roots were prolific on the stable dunes, rushes in the swamps and *Dioscorea* (yams) in the alluvial soils. The fire-maintained grasslands of the alluvial flats also provided better grazing for kangaroos along the edge of the forests in which they sheltered. There is evidence to suggest (Hallam 1975: 107-10) that the coastal plains were the most densely populated area of the South-West. There is no direct evidence of preferential use by Aborigines of different parts of the plain in different seasons, but this may be inferred from the nature of the wetlands and their seasonal use by waterfowl.

The Darling Plateau provides a marked environmental contrast to the coastal plains. It is a region of densely-forested high and broken country east of the Swan Coastal Plain and north of that part of the southern coastal plain lying to the west of

King George Sound. (The term 'Darling Plateau' is equivalent to Mulcahy's 'zone of detrital laterites'; see Mulcahy 1967.) In its northern and western parts it is deeply incised by numerous narrow, steep-sided valleys, in many of which are swamps which feed short, freshwater streams; they also contain dense thickets. In places on the uplands of the plateau are shallow broad valleys, many of them swampy and thickly vegetated. Elsewhere, the plateau is mantled with ironstone gravels, and granite rocks protrude from the surface. In the north, the Darling Plateau is clothed with an open forest of jarrah and marri, with wandoo, sheoaks, banksias, and paperbarks in places; the understorey seems to have been kept open by burning to facilitate travel. In the south, where rainfall is highest, the relief is more subdued and there are extensive forests of karri and marri trees. It would seem that the eastern margins of the jarrah forests and the northern plateau area were maintained as open forest by firing, but the dense karri forests of the far south and a triangle of jarrah forest from Harvey southward were not kept open, and were little used by Aborigines, except where the forest was penetrated by major rivers such as the Blackwood (Hallam 1975: 110).

Aboriginal use of natural resources within the Darling Plateau has not been documented because the European settlers avoided poor soils and difficult terrain. However, it is known that such small, gregarious marsupials as the quokka inhabited the thickets of the narrow valleys (Ride 1971: 50), especially along the western scarp, and there was ample hard stone. Both would have been important and easily available resources to a people who frequented the adjacent plain. Inland from the Darling Plateau lies a more hospitable region of broad valleys tending northward and southward and containing the headwaters of the major rivers which lead to the Swan Coastal Plain, as well as those that open into the Southern Ocean to the west of King George Sound, and to others. The valleys of these major rivers are filled with alluvial deposits, and Mulcahy (1967), who calls it the Region of Younger Laterites, has noted that these soils are most extensive in the valleys of the Avon, Moore, Brockman, and Blackwood rivers. There is ample evidence (Hallam 1975) that, like the Pinjarra Plain, these valley floors were kept open through deliberate burning by Aborigines. The region was well watered by rivers and streams that in the dry season contracted to chains of pools; soaks and swamps also occurred in sandy deposits adjacent to the uplands. These, with extensive chains of lakes that occur in places, constitute important waterfowl areas in the inland South-West. Today the Lake Muir area, for instance, serves one of the largest black swan concentrations on record—over 50 000 birds having been counted on one occasion; and many other species of waterbirds are abundant. Concentrations of up to 20 000 black swans and many ducks have been recorded on Wandering Lake, near Woodanilling.

Where the western margin of the Region rises to the Darling Plateau there are extensive open forests of wandoo trees. These were the environment of the most diverse mammal fauna of the South-West: in all, 44 species of mammals were known to inhabit the area and kangaroos and wallabies were particularly abundant. The wandoo tree also provided nesting sites for birds and homes for the brush possum. Trees were climbed by cutting toe-holds with an axe (see Tindale 1950:

257-73); hollow limbs were also chopped into. In parts of the country where waters dried up in the summer, hollow wandoos were also a source of stored water (Moore 1884*b*: 72). As in the case of the coastal plains, swamps and the alluvial centres of the valleys provided abundant plant foods in season associated with sources of permanent fresh water; but unlike the marine fish of coastal rivers, the freshwater fish of the south-western inland are small and not numerous. Frogs and long-necked tortoises are abundant. Hallam (1975: 110) considers that the Aboriginal population of this region was smaller than that of the coastal plain but higher than that of the Darling Plateau.

To the east and north of this area, and separated from it by defined physiographic boundaries, lies the Region of Salt Lakes and Sand Plains. By comparison with the other regions mentioned here, it has a harsher environment characterized by low rainfall, sparse vegetation, poor soils and saline waters. Standing fresh water is scarce, except where exposed granite rocks provide catchments and sheltered reservoirs in the form of soaks or rock-holes. This much less hospitable Region forms a broad natural boundary to the area with which we are concerned. In a sense, it was also a cultural boundary, containing the western limit of the distribution of circumcision (Forrest, in Nicolay 1880: 91; Tindale 1940, 1974). The 'line' that can be drawn to represent this limit corresponds more or less with the boundary defined by Gardner and Bennetts (1956: 206) of the South-Western Vegetation Province (Ride 1958: 163). Tindale (1940: 149) has remarked that a correlation often exists between 'tribal' limits and ecological and geographical boundaries, but the nature of the data in south-western Australia does not permit precise point-by-point comparison. However, there is little doubt that the people inhabiting the milder environments of the South-West circumscribed by the zone of harsher arid environments formed an overall cultural bloc, distinguished from their neighbours not only by the relatively plentiful natural resources available to them, but also by their use of implements of distinctive character (Davidson and McCarthy 1957: 390-458; Meagher 1973, Mulvaney 1969). Within that cultural bloc there were different social entities, which varied dialectally and in terms of social organization. (See Chapters 6 and 7.)

Resources and their utilization. Information on the main sources of food available to Aborigines of the South-West, and how these were utilized, is set out in Meagher (1974). Mammals, birds and their eggs, many reptiles and frogs, fish (especially marine species from the lower reaches of rivers, and from estuaries and inlets) and some invertebrates (especially the larvae of some beetles and moths) were eaten. So was a wide range of roots, seeds and fruits. (See Meagher 1974 for lists of food items and their scientific equivalents.) In some cases, sophisticated techniques were developed for removing poisonous or distasteful elements (for example, in the cases of zamia nuts and frogs).

Few contemporary European observers remarked on a division of labour between the sexes in hunting and gathering activities. It may be inferred that men hunted larger animals, in particular kangaroos and emus, and women and children dug for roots, collected fruits and seeds, and caught small creatures: however, men too

engaged in some of these pursuits, particularly the last. A further inference as to division of labour can be drawn from information about the implements members of each sex used. Spears, axes, throwing-sticks or clubs, and boomerangs belonged to and were used by men, while women's main implements were the digging-stick, the bark carrying-'dish', the skin cape and the skin bag. Men and women usually went about their hunting and gathering independently. However, both shared in some activities, such as fishing, or driving animals.

Grey kangaroos were taken by spearing, or by catching them in snares and traps (Meagher 1979). In the winter the kangaroo was usually hunted by single persons or by small groups of men who took advantage of the wind and rain to conceal their approach from their quarry. They stalked it until they were close enough to spear it or to stun it with a stone axe. Moore (1884*b*: 18) described the use of a portable leafy screen by the stalker. In the summer, when a relatively large number of people were gathered together, kangaroo hunting was a group activity in which dogs also took part. In this case, the ground in which kangaroos were sheltering was surrounded and the animals driven out either by the hunters' shouts, or by fires, and were speared or stunned as they emerged. In addition to their use as food, kangaroos provided articles such as cloaks and bags made from the skin; nose-bones and awls from the bones; sinews from the tail for sewing cloaks and bags, and for binding implements; and scrapers made from the teeth (see Dortch and Merrilees 1971: 109 for archaeological evidence of this). These articles are described in Meagher (1973).

Smaller species of the kangaroo family (*Macropodiae*) were also an important food item. Species that occur in concentrations seem to have been particularly important as a regular source of food. For that reason, most descriptions of how wallabies were caught refer to those that lived in thickets. Aborigines surrounded such areas and broke down the cover by trampling. In some areas fences or snares were constructed at the end of runs. The brush possum was taken and eaten. That the ringtail possum was taken can only be inferred from a statement by Nind (1831: 32) that it was fatter than the brush possum, and that the fur of both species was easily detached from the skin. Possum fur was spun into long strands for use as belts and bands. Various other mammals such as bandicoots, small marsupials, rats and mice were also eaten. So was the dingo. Puppies were regarded as a delicacy, although these were sometimes reared for hunting. Bracelets were made from the tails, and tail fur made into an ornament worn across the forehead.

Moore (1884*b*) listed a number of birds, but, apart from the emu and the swan, he does not indicate which of these were hunted and eaten. However, this may be because most of them were. Grey (1841 Vol. 2: 281) noted that birds 'formed a very considerable article of food for the natives, . . . their modes of killing them are so various that it would be impossible to enumerate them all.' Emu was available throughout the whole area. It was stalked and speared (a particularly useful description is given by Salvado 1977: 157). Nind (1831: 30) noted that they were speared mainly in the winter, when nesting. The feathers were used as decorations. The black swan is abundant in the South-West, and particularly common in coastal waters such as the estuaries and in inland lakes. It was easily caught when moulting, and

large numbers of both young and old birds, as well as eggs, were also taken during the nesting season. References to the taking of flocking birds were given by Grey (1841 Vol.2: 281-2), Roth (1903: 47) and Salvado (1977: 157-8). Of these, the most complete descriptions (of taking cockatoos and parrots) are given by Grey and Salvado, who mention boomerangs being used for this purpose. Wounded birds were also used as decoys. Pigeons were eaten, but there are no references in the literature to suggest that Aborigines took special precautions to avoid poisoning from eating bronze-wing pigeons, although it is possible that the custom of drawing birds as described by Grey (1841 Vol. 2: 285) is in part related to this need. Birds' eggs were collected and eaten. Nind (1831: 31), for instance, says that: 'At the spring time of the year, they live principally upon the eggs and young of birds, chiefly of the parrot tribe, but also of hawks, ducks, swans, pigeons, etc.'

Reptiles are also extremely numerous in the South-West, and for women and children would probably have provided a very reliable, and most easily obtained, source of animal protein. Except in cold weather, snakes and lizards are active during the day and can be easily caught by such procedures as digging, rolling stones or logs, searching through leaf litter, and lifting bark. Freshwater tortoises (long-necked, and the rarer short-necked) were abundant in swamps, lakes and rivers. Grey (1841 Vol. 2: 279-80) says that they were particularly numerous in the summer when the waters were least extensive. They were caught by hand; but Breton (1833: 28) mentions that pits, regarded by him as kangaroo traps, were also thought to be for catching tortoises. Certainly, during the spring the long-necked tortoise emerges from the water to lay its eggs on shore and could be caught in pits at that time: their eggs were eaten too.

Edible insect larvae were obtained from a number of trees, including *Xanthorrhoea, Acacia, Eucalyptus,* and *Banksia* (Meagher 1974: 24). As the larvae of the 'bardi' *(Barbistus cibarius)* were found in decayed or rotting trees, Aborigines killed blackboy trees *(Xanthorrhoea)* to ensure a supply. Individual persons regarded such trees, or more specifically the larvae that resulted from this cultivation, as personal property, and jealously guarded them (Grey 1841 Vol. 2: 289; Nind 1831: 34).

Frogs were abundant, but some species (for example, *Helioporus*) are poisonous, or at least distasteful, and one would have expected to find rather specialized treatment of them by Aborigines. Moore (1884*a*: 281) said: 'It appears that the natives do not consider every frog fit for eating, for some of a greenish colour were under the stack, but they would not eat them, and said they lived above the waters, but the good ones lived in the ground.' Frogs were collected from the swamps and shallow lakes throughout the year but, as in the case of freshwater tortoises, the greatest number were taken in the summer. They were also dug out of the ground with digging sticks. Crustaceans (marron, jilgies, coonac) in the freshwater rivers and swamps were caught in traps, or by hand. Freshwater mussels were thought to be poisonous and were not eaten (Meagher 1973).

Concentrations of fish in the lower reaches of rivers and estuaries were a major food resource, and caught throughout the year. The local Aborigines were not a seafaring people, and had no form of water transport. Accordingly, they confined

their fishing activities to the sheltered waters provided by rivers and estuaries. Fish were speared, caught by hand or trapped. Aborigines in this area did not make nets or lines for fishing, and did not use poisonous or narcotic plants for this purpose either. In fishing at night, grass-tree torches were used to attract fish. When large numbers of people gathered together, usually in the summer months, fish-traps were built across rivers and in estuaries (Dix and Meagher 1976). By this means, quantities of fish were caught. If the catch was more than was required for immediate use, it might be preserved by either being buried or being cooked and wrapped in bark. Hallam (1975: 69) has questioned whether the recorded proximity of extensive fires to fishing operations implied smoke-drying, but there is no positive evidence of preserving by smoke-drying, sun-drying or salting. Berndt and Berndt (1977: 114) have noted that techniques of preserving food were known in other parts of Australia, and it is unlikely that absence of information on storage of animal foods indicates either improvidence or lack of technical ability on the part of Aborigines. Rather, it may indicate abundance and reliability of resources (see below for evidence of storage of plant food). Oil from the mullet was used by the Aborigines for greasing their heads and bodies (Neill 1845: 426). Some fish, although easily caught, were not eaten. Bunbury (1930: 133) reported that Aborigines would not eat longtom (*Belone*) or garfish (*Hyporhamphus*), for they believed that green-boned fish were poisonous, and Neill (1845) noted they would not eat beaked-salmon *(Gonorhynchus greyi)*, boxfish *(Aracana ornata)* or fiddler rays *(Trygonorhina fasciata* or *Aptychotrema vincentiana)*. Sharks, sting-rays and maiden-rays were sometimes caught, but it seems that this was done mainly for sport, for they were not eaten either.

Whales and seals are common in coastal waters. Some species of whale such as sperm and the false killer commonly strand in schools (45 have been recorded in a single stranding). The Doubtful Island Bay and Bremer Bay areas on the south coast are more prone to strandings than other parts, and few years pass without some whales coming ashore during spring gales. Aborigines took advantage of this and gorged themselves on the meat, and greased their bodies with the blubber. Similarly, seals which were stranded or came into shallow waters were speared or clubbed. It is tempting to speculate that the absence of seal colonies from the south-western mainland coast today, and their presence on the offshore islands (for example, on the Recherche Archipelago and Carnac), is indicative of former predation by Aborigines.

It is not known why Aborigines made no use of marine molluscs for food as did those living in the coastal areas of northern and eastern Australia, where, as a result, extensive shell middens are common. Certainly, oysters were believed to be poisonous.

Roots, bulbs and tubers appear to have been the main sources of vegetable food. Those collected and eaten included species of *Caesia, Dioscorea, Haemodorum, Platysace, Prasophyllum* and *Typha*. Seeds, nuts, fruit and fungi were also eaten. In addition, nectar was obtained from the flowers of *Banksia, Dryandra* and *Eucalyptus,* and gum from *Acacia*. Sandalwood seeds were eaten, but were collected mainly

for the oil, which they used for rubbing on their bodies. Some vegetable foods seem to have been available throughout the year, but many were seasonal (for example, those specified by Grey 1841, Vol. 2: 292; see Meagher 1974 for general information on seasonal distribution). It is known that some plant foods were stored. Acacia seeds, when they ripened, were collected by women and stored until required; they were then ground up and made into cakes. In the summer, acacia gum was collected and made into cakes, which were kept and eaten as the need arose.

The seasonal distribution of localized assets is reflected in the territorial structure, thus:

> . . . there are even some tracts of land which abound in gum . . . which numerous families appear to have an acknowledged right to visit at the period of the year when this article is in season, although they are not allowed to come there at any other time. [Grey 1841 Vol. 2: 298.]

As already mentioned, special techniques were developed for dealing with noxious substances in plant foods. In the case of *Haemodorum* roots, that were believed to cause dysentery when eaten by themselves (they were also said to have a hot taste when eaten raw), they were roasted and then pounded up with a quantity of earth or 'mould' which women carried in their bags for this purpose. The highly carcinogenic and poisonous nuts of the zamia palm were an abundant staple item of diet. They were well known to be dangerous. Toward the end of March, when the fruit ripened, it was collected, soaked in water for a period, and then buried until safe to be eaten raw or roasted (see Meagher 1974).

It is not known whether Aborigines specifically cultivated land for the crops they harvested: there is no information on this question for Aboriginal Australia. However, it is certain that where concentrations of edible plants grew, the soil was repeatedly dug over, sometimes to a considerable depth and over wide areas ('several square miles in extent', notes Grey 1841, vol. 2: 292). Firing was employed to improve the crop of *Typha* roots (Hallam 1975: 52) and grass pastures. Warran (*Dioscorea*) grounds, on alluvial flats, would also have been kept open through firing, and abundance ensured through reduction of plant competition; but there is no evidence of deliberate intention in this case as is apparent in regard to grass and *Typha*.

Plants were conserved, too. For instance, Grey (1841 Vol. 2: 292) said that it was

> a law that no plant bearing seeds is to be dug up after it has flowered; they then call them (for example) the mother of Bohn, the mother of Mud-ja &c.; and so strict are they in their observance of this rule, that I have never seen a native violate it, unless requested by an European, and even then they betray a great dislike to do so.

But there is no evidence of the gathering and deliberate planting of seeds in the South-West comparable with behaviour recorded by Dix and Lofgren (1974: 73-4) at Kurumi in the Western Desert of Western Australia, which is outside the area of this discussion.

Trees provided the principal material for making implements, from spears to spinning spindles. Most spears (that is, those used in daily tasks) were made solely of wood; only the fighting-spear was stone-barbed. The typical hunting-spear was a slender, straight pole, between two and two-and-a-half metres long, sharpened to a point at one end, while a different kind, used for both hunting and fishing, was similar but was barbed with wood. Contemporary European observers reported that trees growing in the swamps or in marshy ground were preferred. The wood of acacia (wattle), mallee, and mongup trees was used (see Meagher 1973). Hardwood (including jarrah and acacia) was used for spear-throwers, handles for axes and knives, digging and throwing-sticks, and boomerangs. For boomerangs, the natural curve of a crooked limb was followed (some, like Salvado 1977, say that only acacia was used for this purpose). Hammond (1933: 36) also recorded that some boomerangs 'were made of soft wood and employed for practice to save the better class'. Lighter woods, such as 'the soft wood of the *Nuytsia floribunda*' (Chauncy 1876: 251), or 'corkwood' (Roth 1903: 58), seem to have been the most favoured for making shields. Salvado (1977: 148) specified that the wood used was very light, and was fairly rare throughout the area around New Norcia. Hassell (1936: 691), alone of the contemporary European observers, claimed that hardwood was used for shields.

Salvado also mentioned (1977: 149; in describing the contents of a woman's bag) that drinking-vessels were fashioned from wood. Bark seems to have been the usual material for this, and for carrying water. Bark had other uses too. Large sheets of it formed weatherproof huts or shelters. Fish were wrapped in it before being cooked or, after cooking, to preserve them. Shredded bark served as tinder for kindling fire; so did dried fungi.

Gum from blackboy trees was an adhesive in tool-making: plastic when heated, and hard when cool, it supplied a firm junction between stone and wood in implements such as the axe *(kodj)* and the knife *(taap)*. Following manufacture, balls of it were carried for later use, and it was traded.

Stone was the other major constituent required by Aborigines for making implements. Its sharp edges, when produced by skilful fracture, provided cutting-tools; its hardness and weight, hammer and axe (often combined in one, as in the *kodj*); and its abrasiveness, a grindstone. Despite the commonness of stone tools and flakes at former campsites in the South-West, and the potential they afford for analysis, little is known about the way in which different kinds of stone were selected or the origin of stones used in different areas. Certainly, some stone was transported over great distances. Both Grey (1841 Vol. 2: 266) and Salvado (1977: 149) list stone among the items carried in women's bags for subsequent use in fabrication. In considering assemblages of stone flakes found at Aboriginal sites on the Swan Coastal Plain, Glover and Cockbain (1971: 545-6) considered that the nearest-known source of some of the stone was about 65 km away. In most places, other than on the dune systems of the Swan Coastal Plain, heavy and hard-stone was freely available; and it seems likely that for many purposes (such as making *kodj* and grindstones) the local Aborigines drew on material to hand, but preferred medium-coarse rocks such as

granite, gneiss and dolerite (McCall in Meagher 1973). Quartz, chert, silcrete and feldspar seem to have been favoured for making the small flakes set in gum that formed the cutting edges of wooden-handled knives and the barbs of fighting spears.

Contemporary records of trade reveal that certain kinds of stone (for example, quartz, Moore 1884*b*: 49) were probably traded across 'tribal' boundaries within the South-West, but the geology of the area is such that the origins of the kinds of stone identified in South-Western Aboriginal implements (for example by Tindale 1950: 257-73; Ride 1958: 162-79; Glover and Cockbain 1971: 545-6; McCall in Meagher 1973; and Dortch and Gardner 1976: 257-93) can be attributed to its confines. Accordingly, it is unlikely that there was any need to trade in stone, as such, from outside. However, this is not to say that objects of stone already fabricated would not have entered the area. Some objects may have possessed special significance in themselves and may have been traded on that account even if raw material of equivalent utility were present. Some such reason may explain the presence in the South-West of numbers of complete edge-ground axe-heads (Ride 1958: 162-79) which, if they had been transported into the South-West by Aborigines, would not have been employed as axes by people who used only the 'half heads' of the *kodj* set in gum.

Clay and ochres were, in addition to stone, minerals of very great importance for cosmetic, ceremonial and ritual uses. Ochres appear to have been mined in restricted localities and under special circumstances. The main sources in the South-West are not well known, but local supplies were certainly available (Bunbury 1930: 81-2; Bignell 1971: 12). It is also certain that ochres were traded great distances, possibly from well outside the area and from as far away as Wilgie Mia in the Murchison district (Woodward 1914: 85; Davidson 1952: 84).

The dependence of the Aboriginal of south-western Australia on the land and its resources was absolute. Although a few things came to him from beyond his individual range of travel, his subsistence was derived from a land through which he himself moved and within which he had defined rights both of movement and of property. Within these limits, his economy was secure. Despite the inadequacy of contemporary records, and contradictory interpretation resulting from lack of communication, misunderstanding, conflicting interest, and prejudice, a clear image emerges of an industrious people, wise in the application of local knowledge, and behaving with foresight toward their renewable natural resources.

But, for all their knowledge and adaptive social structure, one should not pretend that life was at all times easy for them. Some seasons were harsh, the climate could be unpredictable, and there were fluctuations in the populations of plants and animals upon which they depended. Grey, that most acute of observers, said (1841 Vol. 2: 261-3):

> Generally speaking, the natives live well; in some districts there may at particular seasons of the year be a deficiency of food, but if such is the case, these tracts are, at those times, deserted. It is, however, utterly impossible for a traveller or even for a strange native to judge whether a district affords an abundance of food, or the contrary . . .

> But in his own district a native is very differently situated; he knows exactly what it produces, the proper time at which the several articles are in season, and the readiest means of procuring them . . .
>
> There are, however, two periods of the year when they are, at times, subjected to the pangs of hunger; these are, in the hottest time of summer, and in the height of the rainy season . . .
>
> In all ordinary seasons, however, they can obtain, in two or three hours, a sufficient supply of food for the day. . .

Somehow, in that passage of time since early settlement, today's Australian has let that image slip and has replaced it with another; with one of a dirty, wandering, improvident people who avoided labour and who lived a hand-to-mouth and make-shift existence, without property in either land or the resources of that land.

It should not be thought from this discussion that the south-western population was unique in Aboriginal Australia in these respects. The pattern revealed here was but part of a mosaic of similar patterns repeated across the continent with variations dictated by climate, land and resources. Thus John Dunmore Lang, writing from Liverpool in New South Wales in 1840, revealed the same essence (in Grey Vol. 2: 233-5).

> It is well known that these Aborigines in no instance cultivate the soil, but subsist entirely by hunting and fishing, and on the wild roots they find in certain localities (especially the common fern), with occasionally a little wild honey; indigenous fruits being exceedingly rare. The whole race is divided into tribes, more or less numerous, according to circumstances, and designated from the localities they inhabit; for although universally a wandering race, with respect to places of habitation, their wanderings are circumscribed by certain well-defined limits, beyond which they seldom pass, except for purposes of war or festivity. In short, every tribe has its own district, the boundaries of which are well known to the natives generally; and within that district all the wild animals are considered as much the property of the tribe inhabiting, or rather ranging on, its whole extent, as the flocks of sheep and herds of cattle, that have been introduced into the country by adventurous Europeans, are held by European law and usage the property of their respective owners.
>
> But particular districts are not merely the property of particular tribes; particular sections or portions of these districts are universally recognised by the natives as the property of individual members of these tribes . . . the wild animals on the ground being all considered the property of the owner of the land.
>
> . . . indeed this idea of property in the soil, *for hunting purposes,* is universal among the Aborigines.

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