INTRODUCED BIRDS AND MAMMALS IN WESTERN AUSTRALIA

By J.L. Long

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Cover photo: Feral donkey in grassland near Nullagine (Babs and Bert Wells)

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INTRODUCTION

Reliable predictions of the consequences of liberating a species in a place where it has not lived previously are largely impossible. There are many examples throughout the world of introduced or feral mammals and birds becoming liabilities rather than the sporting, aesthetic or economic assets originally intended. Generally those that have become abundant in new areas, such as the rabbit, feral donkey and goat, have become pests.

Introduced species can cause damage to indigenous plant life, compete with native animals for food and shelter, assist in the spread of exotic infectious diseases as well as cause agricultural damage to crops and pastures.

The data presented in this book gives the history, spread and range of those species known to have been introduced or become feral in Western Australia. Maps showing distribution for some species have been included. Chronologies of the introduction for some species are also included.

BIRDS

At least fifty species of foreign birds have been introduced into the wild in this state. Many more may have been released, but the details of early introductions are not well documented. Fourteen species are now established, most of them being restricted in range, but many are still in the process of spreading.

Ogle (1839) in his book on Western Australia says "some emigrants have attempted, and in several instances with success, to carry out (from England) a few of our favourite warblers". However, the first documented introductions were acclimatizations from the Zoological Gardens. The kookaburra from eastern Australia and the two species of Asian doves were released in 1897-98. Most of the species released in the late 19th and early 20th century failed to become established, but some e.g. pheasant and peafowl, were successful when introduced again at a later date.

Some species have established themselves after escaping from captivity. It is thought that the goldfinch, red-browed waxbill, chestnut-breasted finch, sulphur-crested cockatoo and rainbow lorikeet became established in this manner. The pigeon has escaped from domestication. Other species which have escaped from captivity but have not become established include the canary, bullfinch and chaffinch.

The cattle egret, although it was introduced in the north of Western Australia, became established by expansion of its natural range, as it has done in most other countries of the world.

In recent years, house crows and sparrows have reached our shores with increasing frequency. Usually arriving by ship, these unwanted immigrants have so far been unable to establish themselves.

Legislation designed to prevent the establishment of pest species in Western Australia has been fairly successful. Although four species have become established in relatively recent times all are native Australian birds — the sulphur-crested cockatoo since 1935, the red-browed waxbill about 1958, the rainbow lorikeet in the 1960s, and the chestnut-breasted finch in 1973.

Many of the pest species which have been introduced in the eastern states of Australia and other places in the world, have not so far gained a foothold in our state. Constant vigilance will be needed to keep these species out in the future. The starling has been regularly invading Western Australia since 1970, but has been prevented from gaining a permanent foothold here by extensive control programmes.

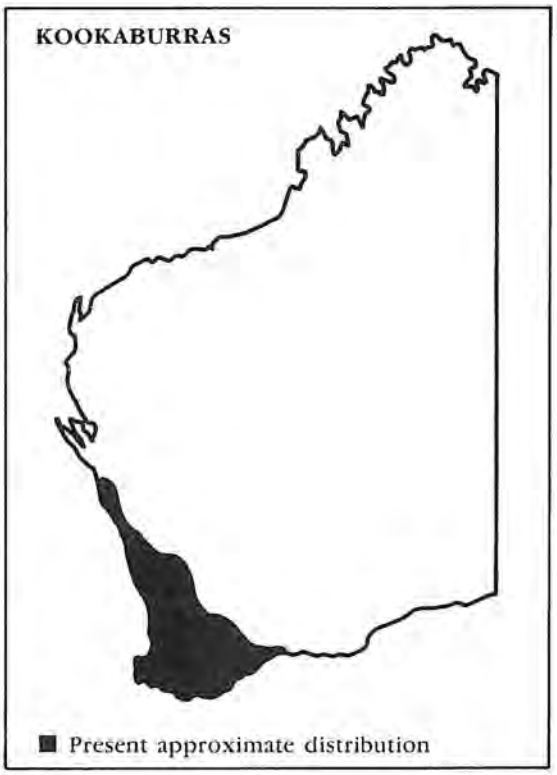
Species established in Western Australia

KOOKABURRA
Dacelo novaeguineae

Kookaburras were released from the Zoological Gardens from 1897 onwards. The species was released in Western Australia because it was said to be "a friend of the farmer, eating snakes and noxious insects" (A.R.A.C., 1898-99). Between 1897 and 1912 hundreds were imported by the Acclimatization Society, and "distributed in every direction" (Le Souef, 1912). Repeated liberations were made over the years at South Perth, Serpentine, on the Blackwood River, Guildford, Gingin, York, Canning and Pinjarra (Jenkins, 1977). The first releases were successfully made "to the Swan and Southern Districts" (A.R.A.C., 1896-97). One year after the first liberation they were breeding in at least one locality (A.R.A.C., 1898-99). A year later they were "increasing well where pairs were liberated" and it was planned to release "several score" (A.R.A.C., 1899-1900). In 1901 they were breeding regularly at Drakesbrook and a further 100 birds had been imported for release (A.R.A.C., 1901-02). By 1903 it was reported that in view of the value of the species to agriculture more would be released in 1904 (A.R.A.C., 1902-03).

Earlier independent introductions may have occurred; some Kookaburras were reported in the Mullewa area in 1896 (Jenkins, 1959). By 1920, the bird was becoming a familiar sight between the Darling Range and the ocean (Kingsmill, 1920). The Kookaburra may also have been independently introduced to the Mingenew and Irwin districts; it was noted at Arrino south of Dongara in 1962 (Serventy and Whittell, 1962). An implied gap (in litt.) in the range of the Kookaburra between Dongara and Jurien Bay did not exist as Ford (1965) noted them at Cockleshell Gully, at Stockyard Gully and at Arro Well in 1959-60. They are reported to have arrived at Stockyard Gully in 1908 (Chapman *et al.*, 1977).

In the 1960s the Kookaburra was firmly established in the south west forested country from Jurien Bay (200 km N. of Perth) to the Albany district (400 km S.E. of Perth). A colony was established on Bald Island (off the south coast). The Kookaburra however, had not spread eastwards as a permanent inhabitant beyond Moora, Bolgart and the Great Southern railway. Odd birds penetrated further inland but apparently never formed established colonies. Such temporary invasions were noted at Kellerberrin, Nangeenan, Dangin, Lake Grace, Lake King, Holt Rock, Gnowangerup and Borden. The species is now a permanent or semi permanent resident in many of these areas, but is however, generally confined to areas where there is permanent water.



FERAL PIGEON
Columba livia

Little is known about the introduction of pigeons to Western Australia. They were brought in by the early settlers and since this time have frequently escaped from captivity. Wollaston mentions the presence of pigeons in captivity in the colony in 1842 and 1843 (Burton and Henn, 1948). Feral birds were certainly established in the colony before 1890. At this time escaped birds which had built up flocks on Rottnest Island were destroyed because of pollution of the rainwater supply (Storr, 1965).

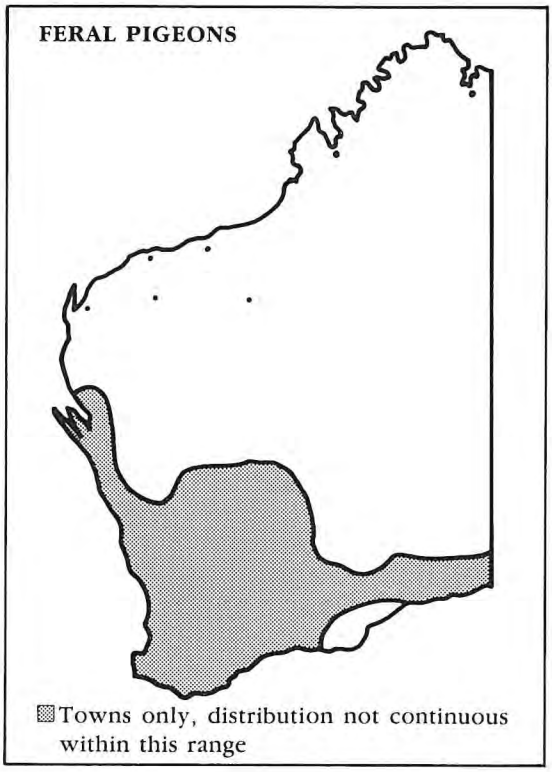
In 1951 pigeons were reported to be living free among city buildings at Perth and Fremantle (Serventy and Whittell, 1951), and were already feral in a number of country areas. In 1962 they were reported as feral on Garden Island and were present throughout the Perth metropolitan area, in a number of country towns and on some farms. They had been found nesting in native trees at Nangeenan, Moora, Trayning, and Yorkrakine Rock (Serventy and Whittell, 1962). In the 1960s and early 1970s pigeons were often reported living away from towns in bush areas (e.g. at north Baandee and east of Kununoppin).

Surveys in 1968-69 showed that Feral Pigeons were widely distributed in the metropolitan area and adjacent areas from Fremantle to Midland and Armadale and also in 77 country towns in Western Australia (Long, 1971). At this time the population in the metropolitan area was estimated (using transect counts) as 6000 birds and their density was calculated as 13/km^2. The following table indicates the distribution of Feral Pigeons in Western Australia in 1970.

Distribution of Feral Pigeons in Country Centres, 1968-69

Bencubbin	Kondinin
Bindoon	Koorda
Boddington	Kununoppin
Boulder	Lake Grace
Bridgetown	Mandurah
Bruce Rock	Margaret River
Bullabulling	Meckering
Buntine	Mingenew
Busselton	Minnivale
Carnamah	Morawa
Chidlows	Mukinbudin
Chittering	Narrogin
Collie	Northam
Coolgardie	Nungarin
Coorow	Perenjori
Corrigin	Picton
Cranbrook	Pingelly
Cuballing	Pinjarra
Cunderdin	Quairading
Dalwallinu	Tambellup
Dardanup	Tammin
Dongara	Trayning
Dowerin	Wagin
Dukin	Warrerin Hill
Dumbleyung	Wickepin
Fremantle	Widgiemooltha
Harvey	Wongan Hills
Hyden	Wyalkatchem
Kalannie	Yealering
Karlgarin	York

Pigeons were declared vermin in the Toodyay area of Western Australia in response to a request in 1950. They are not now declared anywhere under the Agriculture and Related Resources Protection Act. They are not often a pest of agriculture, but are a nuisance in cities where they foul buildings with excreta and become a health hazard to people. Occasionally they will settle in cultivated fields near built up areas and eat seeds and grains such as peas and oats.



SPOTTED TURTLEDOVE
Streptopelia chinensis
SENEGAL TURTLEDOVE
Streptopelia senegalensis

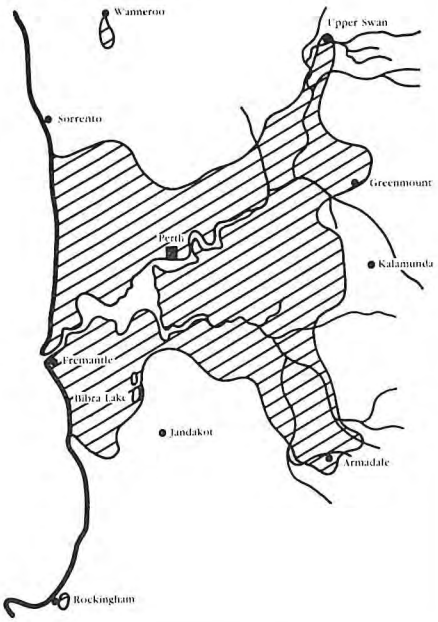
Both species of turtledove were first released from the Zoological Gardens in 1898 (Serventy and Whittell, 1951). Both species were imported from the Melbourne Zoological Gardens and released by E.A. Le Souef because he liked their calls (Sedgwick, 1958). Before 1912, they had become established in Perth and suburbs (Le Souef, 1912). Jenkins (1977) indicates that there were early liberations at Northam, Yatheroo and Dardanup. They are mentioned in 1920 as being continually despatched to applicants in various country districts, where they do well especially if pine trees are available for nesting (Kingsmill, 1920). In 1929 they were reported to have spread "far and wide" following the road lines (Colebatch, 1929). Apparently they did not spread far beyond the Perth metropolitan area but, since the mid 1920s have steadily increased their range (Sedgwick, 1958). The increase in range was apparently rapid between 1935 and 1942 (Jenkins, 1940-42).

S. chinensis reached Rottnest Island about 1937 (Storr, 1965) and in 1958 it was reported at various centres along the eastern railway to Wooroloo. Sporadic sightings were reported southwards as far as Quindalup, with isolated occurrences elsewhere such as at Dongara, Kalgoorlie and Katanning (Sedgwick, 1958; Serventy and Whittell, 1962).

S. senegalensis has extended its range further than *S. chinensis* (Sedgwick, 1958). It reached Rottnest Island about 1930 (Storr, 1965) and in 1958 was established at a number of centres in the wheatbelt between Geraldton and Tambellup and east of Beacon and Merredin. Isolated colonies existed at Kalgoorlie and Esperance (Sedgwick, 1958; Serventy and Whittell, 1962). This species is now established over most of the south-west in towns along the main roads and rail lines (Sedgwick, 1958, 1965, 1976). It is continuing to spread northwards towards the pastoral areas.

Damage by these two species of doves is occasionally reported in the metropolitan area, usually by market gardeners and nursery owners. The birds are accused of eating germinating seedlings. Neither species is protected under the Fauna Act, and they are not declared animals under the Agriculture and Related Resources Act. As they spread into the northern pastoral areas they may compete with the native dove species for food resources.

Distribution of the Goldfinch in the Perth area in the 1960s.



GOLDFINCH
Carduelis carduelis

It is known that the Goldfinch was liberated a number of times in Western Australia before 1912 as it is included on a list of liberations made by the Acclimatization Committee at the time (Le Souef, 1912). At least 200 were released about 1899 (Jenkins, 1977) and some were liberated at South Perth in 1902-03 (A.R.A.C., 1902-03). It was presumed that these did not survive, though goldfinches were reported at Graylands between 1927 and 1930 (Pepper, 1970). Free living birds were recorded in October, 1933, in Supreme Court Gardens, Perth (Jenkins, 1959). By 1948 they had spread into a number of suburbs but were not generally plentiful (Serventy, 1948).

The Goldfinch was still slowly spreading its range in the early 1960s (Serventy and Whittell, 1951 and 1962) and by 1967 they were widely distributed in the Perth metropolitan area and surrounds west of the Darling Scarp. They ranged from Wanneroo and Upper Swan in the north to a few kilometres south of Armadale, Forrestdale and Bibra Lake with a few birds as far south as Rockingham (Long, 1967). Thereafter and particularly in the early 1970s the population rapidly declined. The reasons for the decline are not precisely known, but it is thought that it was largely due to habitat destruction brought about by increased building construction, and possibly disease. Long (1967) found that 21% of the population suffered from encrustations of *Knemidocoptes* sp. mites on their legs and feet. These encrustations affected the ability of the species to feed efficiently on some of their main food plants such as thistles and sunflower.

Outside the metropolitan area, Goldfinches were found established at Albany (400 km S.E. of Perth) in 1955 (Jenkins, 1959) and, despite the vermin control authority's efforts to destroy them, they were noted again in 1957 (Sedgwick, 1957). Flocks of about 20 birds were noted in Albany in October, 1969 (Rowland, 1970) and in the same year one was reported just east of Mt. Barker (48 km N. of Albany).

Isolated reports of the presence of Goldfinches, before the 1970s, came from country centres such as Kalgoorlie (867 kms E. of Perth) and Collie (161 km S. of Perth), but these birds are thought to have been escapees from aviaries, as there have been no further records (Long, 1967).

At present the Goldfinch is probably still established at Albany and in Perth, but is uncommon in both

areas. In the metropolitan area it may still occur in some parks. The Goldfinch is not a declared animal under the Agriculture and Related Resources Protection Act in Western Australia.

RED-BROWED WAXBILL or SYDNEY WAXBILL
Estrilda temporalis

The Red-browed Waxbill was found to be well established in orchard clearings in Darling Range gullies east of Perth in 1958 (Dell, 1965). They were present near Bickley (Jungle Gully) in 1960 and breeding there in 1964 (Parton, 1965). Long (1969) suggests that they became established as a result of deliberate release or escape of cage birds in the 1950s.

In the late 1960s they inhabited a small area from Bickley, Hackett Gully, the Dell and to the edge of the scarp towards Helena Valley and Darlington (Dell, 1965; Long, 1969). A small flock of about 20 birds was noted in Hackett Gully in 1975. The Red-browed Waxbill is still established in the area (two pairs seen June 1986 and nests noted in *Leptospermum ellipticum* scrub). Some recent reports (c. 100 noted mid to late summer 1985 (C. Mayger pers. comm. 1986)) suggest that the population in the area has increased substantially.

WHITE SWAN or MUTE SWAN
Cygnus olor

Three pairs of White Swans arrived on the ss Devon in 1897 (Jenkins, 1977; Anon, 1979). Two pairs were allocated to the City of Perth and one pair to the Zoological Gardens. The Acclimatization Society bred and released White Swans from 1898 onwards (A.R.A.C., 1898-99; A.R.A.C., 1899-1900). Five which were reared in the Zoological Gardens were liberated on the "River" with black swans in 1901 (A.R.A.C., 1901-02). Some were released on "public waters" at two places in 1903 (A.R.A.C., 1902-03). By 1912 they were successfully acclimatized on ornamental waters around Perth. A number had already been distributed to many country towns (Le Souef, 1912), and were later reported to be breeding freely in the wild (Colebatch, 1929).

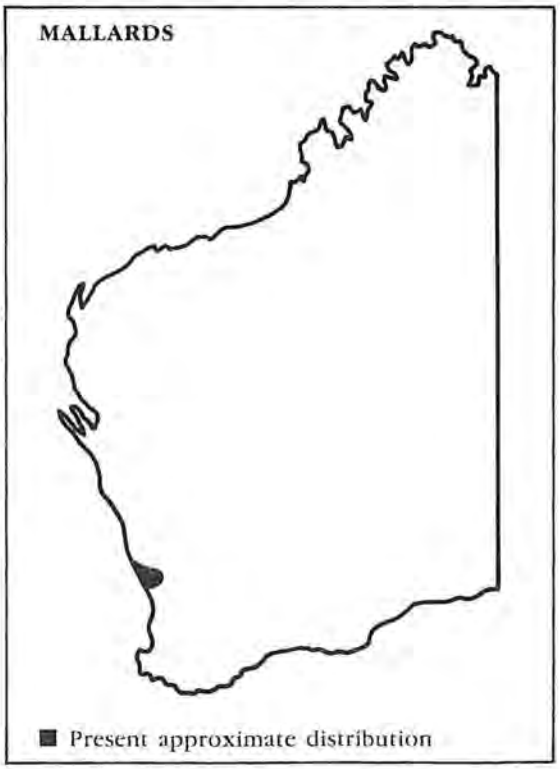
In the 1950s and 1960s the species was found on ornamental waters such as in Queens Gardens and Hyde Park and was established on the Avon River at Northam (80 km E. of Perth). Pairs have been liberated on some southern rivers, such as the Blackwood River at Bridgetown (242 km S. of Perth), but the species has shown no inclination to extend its range or increase markedly in numbers (Serventy and Whittell, 1951 and 1962).

In the 1970s odd individual birds were noted at Warnboro, Mandurah, Busselton and Walpole (Anon 1979).

The origin of the present colony at Northam on the Avon River is not known. A colony has probably been there since 1904 (Anon, 1981) or 1906 (Anon, 1980). Numbers of birds have increased slowly from as few as three in 1966 to 42 in 1976 (Anon, 1978) and to about 60 in 1981 (Anon, 1981). Responsibility for this colony belongs to the Northam Town Council and removal of the birds is prohibited and subject to a heavy fine (Anon, 1981). The numbers present are closely monitored by the Department of Conservation and Land Management who have prohibited re-introduction anywhere else in Western Australia and will not allow the population to increase substantially (Anon, 1979).

MALLARD
Anas platyrhynchos

Mallards were reported on a large number of ornamental waters around Perth by 1912 (Le Souef 1912). At this time they were said to be breeding well and spreading to new areas. In 1914 many were released from South Perth (Jenkins, 1977). In 1920, Mallards were living in the Zoological



Gardens and in some city parks (Kingsmill, 1920). In the 1960s they lived in a free state in some parks in the metropolitan area but did not appear to spread much or increase greatly in numbers (Serventy and Whittell, 1962). There appear to have been no recent changes in the distribution or status of the species in Western Australia.

OTHER FERAL DUCKS

From time to time domestic ducks such as muscovies and other varieties become feral in the metropolitan area of Perth. They join the wild flocks of ducks on ornamental waters in parks, gardens and other places. Many are removed by wildlife authorities, but a few remain. Some varieties will interbreed with the mallard and black duck and such hybridization is not welcomed. Feral ducks compete with the wild species for food and habitat in our diminishing wetlands.

RING-NECKED PHEASANT
Phasianus colchicus

Six "English" pheasants were imported by the Acclimatization Committee from Victoria in 1897-98 and kept in the Zoological Gardens where it was hoped to breed them and to distribute the progeny (A.R.A.C., 1897-98) for release in the wild. Some were released by the Acclimatization Committee after 1898. Releases in 1902-03 were said to be thriving (A.R.A.C., 1902-03). Fraser (1903) noted that at least two varieties of pheasants had been released in the south-west. Jenkins (1977) reports some were released at Pinjarra, Northam, Warren, Porongorups and elsewhere in 1905. In 1920 (Kingsmill, 1920) and 1929 (Colebatch, 1929), it was reported that introductions of pheasants had not met with much success.

Further introductions of pheasants by the Zoological Gardens to Rottnest Island in 1927 or 1928 were successful. Ring-necked Pheasants (one male and three females) were released by a Mr H.A. Pearse in January, 1928, on Rottnest (Jenkins, 1959; Storr, 1965). In three years they were common all over the island, being most numerous in the central and eastern portions (Saunders and de Rebeira, 1985). In 1948 they were reported as widespread (Jenkins, 1959) and in 1965 as a moderately common resident (Storr, 1965). In 1982-83 the species was common over the island (Saunders and de Rebeira, 1985) and has remained a moderately common resident.

In about 1980 a single male bird was reported (I. Rowley, pers. comm.) near Maida Vale. In 1983 a single bird was found in the Martagallup area, near Rocky Gully, and another north of Mt Barker (some 38 km west of Rocky Gully). The origin of these birds was never determined.

PEAFOWL
Pavo cristatus

Young Peafowl bred in the Zoological Gardens were released in various parts of the state before 1912 (Le Souef, 1912). Some were released at Gingin (100 km N. of Perth), Pinjarra (80 km S. of Perth) and in 1905 at Wanneroo (25 km N of Perth) and at Southern Districts (outer metro Perth) (Jenkins, 1977). Peafowl were also released near the Wanneroo Caves in 1902-03 (A.R.A.C., 1902-03).

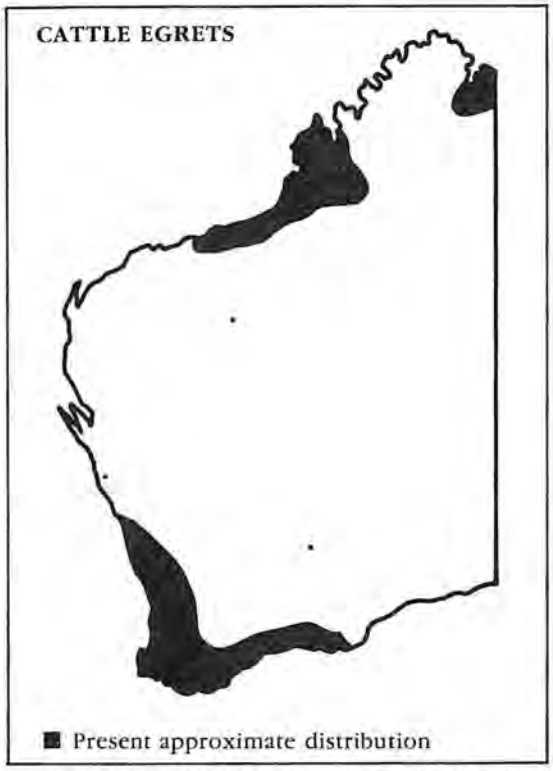
Peafowl were introduced on Rottnest Island in 1912 (Jenkins, 1959), between 1910 and 1915 or in 1917 (Storr, 1965). They were present on the Island in 1927 (Jenkins, 1977). In 1965, about 50 birds were established there (Storr, 1965). In 1982-83 a small isolated population was present (Saunders and de Rebeira, 1985) centred around the Kingston Barracks and the settlement where they obtained supplementary food. They appear to be more widespread since the departure of the army from Kingston Barracks in 1984, but the population remains at about 50. They sometimes cause problems for island residents by foraging in their vegetable gardens (Saunders and de Rebeira, 1985).

The early introductions on the mainland were unsuccessful, but occasionally Peafowl are allowed to wander and become temporarily semi-feral.

CATTLE EGRET
Bubulcus ibis

Before their attempted introduction into Western Australia, some publicity had been given to the value of Cattle Egrets in controlling cattle tick, blowfly and buffalo-fly. This prompted the Council for Scientific and Industrial Research to seek the advice of authorities in India on the matter (C.S.I.R., 1933). Their reply was that these birds were quite ineffective for such control, but no doubt consumed large numbers of the pests. However, 20 Cattle Egrets were imported from India (Serventy and Whittell, 1951; Hewitt, 1960) in 1933 following representations from the Pastoralist Association. Eighteen were subsequently liberated along the Lennard River at Kimberley Downs station (Jenkins, 1946 and 1959) in the north of the state.

Observers in the area state that the Cattle Egrets disappeared soon after their release; they had probably fallen prey to hawks (Jenkins, 1959). There



is no evidence that those now established in northern Australia owe their origin to the Kimberley birds (Tarr, 1950). They probably became established there as a result of expansion of their natural range (from Africa), as has happened in most countries of the world.

The first record of the Cattle Egret colonizing Western Australia was at Millstream station (S. of Roebourne in the N.W. of the state), on the Fortescue River in 1949, when a single bird was seen (Serventy and Whittell, 1962). In 1952 some were observed in the south-west at Three Springs (262 km N. of Perth) (Serventy and Whittell, 1962), 1952-53 at Norseman (547 km E. of Perth) (Jenkins and Ford, 1960; Serventy and Whittell, 1962), Bunbury (161 km S. of Perth) (Serventy and Whittell, 1962), Kellerberrin (180 km E. of Perth) and Bibra Lake (near Perth), in 1954 at Bremer Bay (419 km S.E. of Perth), Queens Park and Wanneroo and in 1958 at Middle Swan (Perth suburbs), Mt. Manypeaks and Ravensthorpe (on south coast) (Jenkins and Ford, 1960). By 1959 the invasion was widespread throughout the south-west of Western Australia (Jenkins and Ford, 1960).

Cattle Egrets are now present throughout much of the state except in waterless regions. They are migratory and are present in the southern areas mainly in autumn and winter.

SULPHUR-CRESTED COCKATOO
Cacatua galerita

Sulphur-crested Cockatoos occur naturally in north-western Australia including the Kimberley region. They are not a native species south of the latter region in Western Australia.

The first Sulphur-crested Cockatoos noted in the wild in the south of the state were recorded at Mandurah in 1935 (by A. Robinson). A flock at Pinjarra may have a more recent origin. A pair were observed in the latter area in 1956 (Anon., 1973) and by 1972 there were at least 24 present in one flock. In 1976, 25-35 were noted in one flock in the Pinjarra area (Long, 1977). Surveys carried out by the A.P.B. at this time suggested that there were 3-4 large flocks established in Western Australia. These ranged over an area from the metropolitan area south to Coolup and Harvey, and north to Bullsbrook (Long, 1977 and 1981). A small flock of up to 5 birds lived in the Middle Swan area in 1964 (Heron, 1970). Subsequently small groups have been found in country areas further afield. Most of the birds found in Western Australia appear to belong to the nominate race, *C. galerita galerita*.

The well established populations at Pinjarra and Guildford are known to have bred there in the 1970s. Total numbers were estimated to be at least 100 at the former place and 60 at the latter place in 1979 (Long, 1981). However, the combined populations in Western Australia in 1982 were estimated to be between 300-500 birds (Saunders, *et al.*, 1985).

Since 1979 nearly 300 Sulphur-crested Cockatoos have been destroyed in Western Australia by control programs involving shooting, trapping and poisoning. It is estimated that their numbers have now been reduced by about 60%. There appears to have been no breeding in the last two seasons by birds in the Pinjarra-Peel Inlet area (Milward, pers. comm. 1985). The eradication of the species is essential as they will compete with the endemic cockatoo species for nesting hollows, and they are potential pests of grain crops. In 1981 they were reported to be causing damage to pecan nuts in a small orchard at Helena Valley.

RAINBOW LORIKEET
Trichoglossus haematodus

Two Rainbow Lorikeets were sighted at Shenton Park in 1968 (Storr, 1973; Jenkins, 1977; Pash, 1977). Shortly after this time flocks of up to nine birds were noted in such areas as Daglish, Nedlands, Claremont and Floreat Park (Pash, 1977). Some

were noted 38 km (Safety Bay) south of Perth in 1978 (Smith, 1978).

Storr (1973) suggests that the Rainbow Lorikeets at present in Western Australia are the eastern states subspecies and not birds (Red-collared Lorikeet, *T. h. rubritorquis*) from northern Western Australia. He indicates that they arrived unaided from South Australia. Long (1981) however suggests that they were derived from escapees from a captive flock kept in or near the vicinity of the University of Western Australia.

Numbers of Rainbow Lorikeets appear to be slowly increasing. Thirty-nine were observed roosting in Supreme Court Gardens in September 1984 (Roberts, pers. comm. 1984). They are frequently heard when flying over Perth Modern School and a large flock was noted in the Hale School grounds at Woodlands in 1985.

A partial survey by A.P.B. officers in 1984 estimated their numbers as at least 54 birds in the metropolitan area. They are reported to breed at Reabold Hill (J. Roberts, pers. comm.) and have been observed feeding on the flowers of *Eucalyptus* spp., flame trees *(Brachychiton acerifolium)*, and the fruits of *Ficus* spp.

Rainbow Lorikeets are often noted in such areas as Supreme Court Gardens, Kings Park, University of Western Australia — Nedlands, Crawley, Karrakatta, Shenton Park, Woodlands, Herdsman, Perry Lakes, Wembley, Floreat Park, Claremont, and have been observed at South Perth and Alfred Cove. More recently small flocks have been reported at Mt Hawthorn (5 in May, 2 in June, 1986), Dianella — Tuart Hill (1 pair in April, 1986), Bicton (pairs October — January, 1985-6) and at Mt Pleasant (Bamford pers. comm., 1986).

Species introduced but not established

HOUSE SPARROW
Passer domesticus

In 1914, House Sparrows crossed the border between South Australia and Western Australia at Eucla. They reached Mundrabilla station (90 km W of S.A. border) (Jenkins, 1959) about 1918, but died out in the following summer (Serventy and Whittell, 1962).

In 1927 or 1928 the Chief Inspector of Rabbits of the Department of Agriculture, stated that "at intervals odd birds and nests have been found in trucks on the 'trans-line' and, about five years ago, one of my officers was sent to the South Australian border and cleared up a colony of about 10 birds which he found on this side of the border" (Serventy, 1928). Vigorous steps were taken to prevent sparrows entering the State, both by the coastal route and along the Trans Australian Railway (Jenkins 1959).

These measures were successful as, despite early invasions, the birds are not established west of the South Australian border. One of the contributory checks to the sparrows' western progress must undoubtedly have been the replacement of the horse by the motor vehicle as a means of transport (Jenkins, 1959). Presumably, sparrows could obtain grain from horse feeding troughs or from horse manure.

Besides the overland route as a means of invading the western section of the continent, sparrows still had an alternative i.e. by sea. Since the early invasion most, if not all, have probably entered the state by this means.

The first record of sparrows in the Perth metropolitan area was in December, 1897 (Lindley-Cohen, 1898(a)) when five specimens were shot near central Perth (Helms, 1898) (Jenkins, 1959, records this date as 1894). Further reference to this incident is made by the Chief Inspector of Rabbits (Mr C.J. Craig) who stated that two birds had been shot in 1898 in the Government Gardens (now Supreme Court Gardens) by Mr R. Helms (Serventy, 1928).

At that time, poisoned wheat was laid out in Government Gardens and a further report of sparrows in the Claremont (Perth suburb) area investigated (Lindley-Cohen, 1898(a)). The country between Perth and Fremantle was also searched in February, 1898, but no further sparrows were found (Lindley-Cohen, 1898(b)). They were reported again in 1911 or 1912 at Fremantle (Crawford, 1912), but no evidence was found of them (Crawford, 1913).

A sparrow was killed at Fremantle in 1927 after a pair had been released by a passenger from the liner Carinthia; the other eluded capture (Serventy, 1928). A single bird was destroyed in 1930, another in 1946, and two at Fremantle wharf in 1957 (Jenkins, 1959).

In 1963, a number of sightings were reported from the Fremantle area, but no sparrows were actually found until March, 1964 when nine were shot near the railway station by an employee of the Agriculture Protection Board (Long, 1964). Also in 1963, dead sparrows were presented to the shire council at Carnamah (250 km N. of Perth) as having been shot in this area. However, the report was found to be false and the birds were actually brought dead from South Australia. (See page 14 for a chronology of sparrows destroyed in Western Australia).

TREE SPARROW
Passer montanus

It has been assumed that all of the earlier records of "sparrows" in Western Australia have alluded to the House Sparrow and that the Tree Sparrow has only recently been recorded here.

In September, 1966, two birds shot on the Geraldton wharf (370 km N. of Perth) were sent to the Agriculture Protection Board and identified as Tree Sparrows. They were reported to have accompanied a ship whose last port of call had been somewhere in south-east Asia. In December, 1970, another Tree Sparrow was shot by an A.P.B. officer at Palmyra (Perth suburb). Since this time many Tree Sparrows have been recorded (see chronology table on page 14).

STARLING
Sturnus vulgaris

In 1895, the then Bureau of Agriculture placed the Starling on a list of birds prohibited from importation into Western Australia. In 1898 the Acclimatization Committee, formed the previous year, made strong recommendations to the Bureau for its release (Lindley-Cohen, 1898). Fortunately, the Bureau was well advised and the Starling was not imported.

A report on the professed usefulness of starlings to orchardists appeared in the same year (Helms, 1898(a)); it also pointed out the dangers associated with such an introduction. Although starlings were thought by many to be useful insect pest destroyers they could also be destructive, damaging both fruit and grain crops.

In February, 1906, a letter in the *West Australian* newspaper indicated that a pair of starlings were

Sparrows Destroyed in Western Australia since 1897

Month and year		No.	Identification	Locality	Notes
Dec.-Jan.	1897-98	5	house(?) sparrows	central Perth	shot
	1903	some	sparrows	St. George's Terrace	none found
	1911-12	some	sparrows	Fremantle	none found
	1921-22	10	house sparrows	W.A.-S.A. border	shot
	1927	2	sparrows	Fremantle	1 shot, 1 escaped
	1930	1	sparrow	Fremantle(?)	shot
	1946	1	sparrow	Fremantle(?)	shot
	1957	2	house sparrows	Fremantle Wharf	shot
	1964	9	house sparrows	railway station, Fremantle	shot
Aug.	1965	1	house sparrow	Greenbushes	dead in imported machinery
Sep.	1966	2	tree sparrows	Geraldton	shot
May	1968	2	sparrows	Broome	shot
May	1969	1	house sparrow	Wray Ave, Bayswater	shot
		2	house sparrows	Fremantle Wharf	shot
Sep.		1	house sparrow	Kewdale rail yards	dead in crate
Dec.	1970	1	tree sparrow	Hammond St., Palmyra	shot
Sep.	1971	2	house sparrows	Kwinana Wharf	shot
Oct.	1971	1	house sparrow	Fremantle Hospital	shot
Jan.	1972	1	house sparrow	Ellen St., Fremantle	shot
May	1972	1	house sparrow	North Quay, Fremantle	shot
Mar.	1973	1	sparrow	Airport, Derby	shot
Apr.		1	house sparrow	Anzac Rd, Bayswater	shot
Jan.	1974	3	house sparrows	North Wharf, Fremantle	shot
Feb.		1	house sparrow	Esperance Jetty	shot
Jly		1	house sparrow	Kwinana Jetty	shot
Feb.	1975	1	house sparrow	Robbs Jetty	shot
Nov.		2	house sparrows	Albany Wharf	shot
Sep.	1976	1	house sparrow	Victoria Quay, Fremantle	shot
Nov.		4	sparrows	Eucla	shot
May	1977	1	house sparrow	Fremantle Wharf	shot
Dec.		1	sparrow	Geraldton Wharf	shot
Feb.	1978	1	sparrow	Geraldton Wharf	shot
Aug.		5	house sparrows	Border Village	shot
Feb.	1979	6	tree sparrows	North Wharf, Fremantle	5 shot, 1 escaped
Jne.		1	sparrow	Derby	escaped
Nov.		3-4	tree sparrows	B.P. Garage, Wyndham	3 shot
		1	tree sparrow	Union St., Subiaco	shot
		1	tree sparrow	North Wharf, Fremantle	shot
Nov.		1	sparrow	Tropic Star, Fremantle	body not recovered
Dec.	1979	8	sparrows	Kwinana Jetty	7 shot, 1 escaped
		1	house sparrow	Kinclaven Stn. Rawlinna	shot

Table continued ...

Month and year		No.	Identification	Locality	Notes
Jan.	1980	1	sparrow	CSPB, Kwinana	shot
		1	sparrow	Rawlinna	shot
Mar.		3	house sparrows	Fremantle Wharf	shot
Jly.		1	tree sparrow	Bunbury Wharf	shot
Dec.		1	sparrow	Bunbury	shot
Jan.	1981	1	sparrow	Geraldton Wharf	shot
		6	sparrows	Bunbury Wharf	shot
Jne		1	sparrow	Fremantle Wharf	shot
Dec.		2	sparrows	N.Quay, Fremantle	shot
Mar.	1982	3	tree sparrows	Geraldton Wharf	shot
Dec.		1	sparrow	Geraldton Wharf	shot
Apr.	1983	3	sparrows	Albany	shot
Jne		2	sparrows	Geraldton Wharf	shot
Oct.		1	sparrow	Bunbury Wharf	escaped
Mar.	1984	1	sparrow	N.Quay, Fremantle	shot
Nov.		1	sparrow	N.Quay, Fremantle	?
Dec.		1	sparrow	N.Quay, Fremantle	shot
		1	sparrow	Perth Airport	?
Jan.	1985	1	tree sparrow	Mobil Depot, N. Fremantle	shot
Jne		1	tree sparrow	North Rankin Gas Platform, off Karratha	shot
Oct.		1	tree sparrow	Scarborough	shot
Total		c.129-130			

seen at Guildford (Perth suburb) (Grasby, 1906), but later in the same year this was reported as an unfounded rumour and was possibly due to confusion with wattle birds (Despeissis, 1906).

Two other early records of the presence of Starlings in Western Australia have never been confirmed. They were reported to be present and possibly breeding in the Balingup area (201 km S. of Perth) in 1914-15 when two were said to have been shot and a nest found; and in 1917 Mr W.B. Alexander of the South Australian Ornithological Association stated that one had been sent from Albany to Perth for identification (Whittell, 1950). Until recently the Starling had been recorded few times in the wild in Western Australia. One was shot at Gingin in 1936 (Jenkins, 1959; Long, 1965) and in 1970 one was shot a few kilometres from Esperance (386 km E. of Albany).

In late 1971 two colonies of Starlings were found to be well established in the Condingup area (64 km east of Esperance). Following extensive searches c. 57 were destroyed. Since this time invasion of Western Australia by Starlings has occurred regularly. Other colonies have been found in areas just east of Esperance in 1976, 1980, 1982, 1983-84 and in February 1986. As a result of the 1982-84 invasion about 1000 Starlings were destroyed on this side of the border.

From 1976 onwards an eradication team has been based at Eucla to control any colonies which become established in Western Australia (Coyle, 1984). This unit destroys c. 1000 Starlings per year on both sides of the Western Australia/South Australian border and has so far been successful in preventing the species from becoming established in this State.

HOUSE CROW
Corvus splendens

The House Crow is not established in Western Australia but occasionally reaches our shores by accompanying ships from overseas countries (Jenkins, 1959; Long, 1967).

The earliest record of this species arriving by ship in this state was of three birds accompanying the s.s. "Naldera" from Colombo to Fremantle in 1926 (Hylton, 1927). One died near Fremantle and the other two flew ashore. One was observed in February 1928 (Jenkins, 1959).

Three House Crows were shot at Fremantle bet-

House Crows Destroyed Since 1950

Year	No. of birds	Place
1951	3	Fremantle
	1	Claremont
	1	Boyup Brook
1952	1	Bicton
	1	Claremont
1953	1	Moora
1954	2	Bicton
	1	Hilton Park
1956	1	Bunbury
1957	1? (reported)	Bunbury
1958	1	Kwinana
1959	1	South Perth
	1	Fremantle
1960	1	Yanchep
	1	Wembley
	1	Byford
	1	Attadale
	1	Fremantle
	1	North Fremantle
	1	Cottesloe
	1	? not known
1961	1	Cottesloe
1965	1	Rockingham
1966	2	North Wharf, Fremantle
1967	1	Kalbarri
1974	2	Fremantle
	1	Northampton
1975	1	Victoria Quay, Fremantle
1979	1	North Fremantle
	1	Rottnest Island
	1	? not known
1980	1	Avondale Research Station, Beverley
	1	Elvira St., Palmyra
1984	1	Heathridge
Total	c. 39-40	

Adapted from Jenkins (1959), Long (1967) and Long (1972)

ween 1937 and 1949 (Long, 1967), and six are known to have accompanied a ship from India and landed at Fremantle in 1942 (Ruddiman, 1952). In 1945 a suspected House Crow was reported at Coolup (80 km S. of Perth) (Robinson, 1950) but the bird was not captured.

The presence of House Crows in Western Australia was first reported to the Agriculture Protection Board in 1950 when two were shot at Fremantle and taken to the Museum for identification (Long, 1967). Since then, they have appeared fairly regularly and in 1967 it was estimated that about 16 birds had been shot between 1950 and 1961 (Long, 1967). More recent investigations indicate that the total since 1950 is considerably larger (see table of House Crows destroyed since 1950).

From 1950 to the end of 1985 some 40 House Crows were destroyed in Western Australia.

QUAIL and "AMERICAN" QUAIL

Colinus virginianus,
Lophortyx californica
Coturnix coturnix

Quail are mentioned in a list of liberations by the Acclimatization Committee before 1912 (Le Souef, 1912). Twenty-one California Quail *(L. californica)* were imported by the Acclimatization Committee and kept in the Zoological Gardens for breeding purposes prior to release (A.R.A.C., 1897-98). They were present in the Zoological Gardens for some time (A.R.A.C., 1899-1900), but most were reported to have been eaten by cats (A.R.A.C., 1899-1900). Large numbers of Egyptian Quail *(C. coturnix)* (A.R.A.C., 1902-03; Fraser, 1903) and some California Quail were released in several places in the south-west (Fraser, 1903) and appeared to be thriving (A.R.A.C., 1902-03). In 1912 it was reported to be too soon to say whether they had become permanently established. In 1929 Chinese Quail, (probably *Coturnix coturnix japonica*), liberated some time earlier, were reported to have "done well" (Colebatch, 1929). None of these species became permanently established in Western Australia.

American Quail (probably *L. californica* or *C. virginianus*) were apparently introduced to Rottnest Island by Governor Ord in 1876 (Storr, 1965), but they failed to become established.

HELMETED GUINEAFOWL

Numida meleagris

Hundreds of guineafowl were imported and distributed among farmers throughout Western Australia before 1912. Some are reported to have been released at Wanneroo, Capel, Pinjarra, Wonnerup, Wagin, and Coolup in 1905, six were liberated at the mouth of the Hill River in 1910, and six at the mouth of the Moore River in 1919 (Jenkins, 1977). Most of them were kept in captivity while the young were allowed to roam in the hope that they would become established (Le Souef, 1912). By the 1920s they were reported to be thriv-

ing in our coastal districts (Kingsmill, 1920; Colebatch, 1929) following the tuart belt which extends for over 320 km (80 km N. to 240 km S. of Perth) within a few kilometres of the ocean (Kingsmill, 1920). Although they were repeatedly released in this area, guineafowl did not become permanently established. In inland districts the birds did not breed well and attempts to establish them failed (Kingsmill, 1920).

Guineafowl were also introduced to Rottnest Island (Storr, 1965), but failed to become established.

RED-LEGGED PARTRIDGE
Alectoris rufa

PARTRIDGE
possibly *Perdix perdix*

MEXICAN PARTRIDGE
(species unknown)

Partridge were introduced into Western Australia by the Acclimatization Committee some time between 1897 and 1912 (Le Souef, 1912). Some partridges were released in 1905 (Jenkins, 1977) and some may have been released in the Porongorups with pheasants also in about 1905 (Glover, 1979).

Ten Mexican partridges were released on Rottnest Island in 1927 (Jenkins, 1977) or in 1928 (Storr, 1965) but they failed to become established (Glauert, 1956; Storr, 1965). The Acclimatization Committee released French Red-legged Partridges in the "bush" in the south-west in 1901-02 (A.R.A.C., 1902-03; Fraser, 1903).

In the 1920s it was reported (Colebatch, 1929) that partridges had failed to become established in Western Australia.

GEESE AND DUCKS
(Several species)

Several species of geese and ducks were liberated in Western Australia by the Acclimatization Committee before 1912 (Le Souef, 1912). In 1929 it was reported that large numbers of waterfowl had been hatched and released and in many cases were spreading widely (Colebatch, 1929). "Corea Tree Ducks" were bred by the Acclimatization Committee in 1898-99 and they were to be released in Perth about 1900 (A.R.A.C., 1898-99).

In 1917 "two black African Spur-winged Geese" (= Spur-winged Goose, *Plectropterus gambensis)* were released by the Acclimatization Society at Moora, two at Wagin some time later, and also some at Pinjarra and Coolup (Jenkins, 1977). Some were still being distributed for release in 1920, but it was reported to be "too early to pronounce a verdict on them" (Kingsmill, 1920).

Two Canada geese *(Branta canadensis)* were released at Northam in 1913, some at an unknown date at Gingin, and two on Rottnest Island in 1927 (Jenkins, 1977). Some were said to have been sent to one or more districts some time before 1920, but in the same year it was reported that it was too early to say whether they had been successfully established (Kingsmill, 1920). This species and the Spur-winged Goose were later reported to breed freely and it was thought that they might become valuable game birds (Colebatch, 1929). Neither species is now established in Western Australia.

Egyptian geese *(Alopochen aegyptiacus)* were liberated on Lake Sepping, near Albany, where it was reported that they will thrive as they have done in other parts of Australia (A.R.A.C., 1902-03). There are no further records of them. Some were apparently introduced to Rottnest Island, as mention is made in 1956 of their disappearance (Glauert, 1956).

The only species which have become established permanently in this State are the Mallard and White Swan mentioned earlier.

OSTRICH
Struthio camelus

The introduction of Ostriches into Western Australia for farming was discussed by a Select Committee as early as 1885. Four Ostriches purchased by the Acclimatization Committee from South Australia in 1897 were kept in the Zoological Gardens (A.R.A.C., 1897-98). These probably provided the stock which were later released and more than likely came from the stock of ostriches imported into South Australia in 1881 for farming at Gawler.

The Ostrich is mentioned in a list of liberations published in 1912 by the Acclimatization Committee (Le Souef, 1912). An article on Ostrich farming appeared in the W.A. Journal of Agriculture in 1909 (Anon, 1909). Some birds were kept in partial captivity at Gingin, and others were permitted to live under natural conditions. The latter group was apparently thriving in 1912 (Le Souef, 1912). The young of birds breeding in the Zoological Gardens were also liberated at Mount Morgan (E. of Leonora) in the Goldfields (Le Souef, 1912). The Ostrich, however, did not become established in Western Australia.

RED-BILLED LEIOTHRIX
(= Pekin Nightingale)
Leiothrix lutea

About 100 Pekin Nightingales (Jenkins, 1977) were released in 1898-99, but it was reported that few survived. The introduction was prompted by their "sweet song and insectivorous nature" (A.R.A.C., 1898-99). Apart from mention by Le Souef (1912) on a list of liberated species there are no further records of this species in Western Australia.

SKYLARK
Alauda arvensis

One hundred Skylarks were released about 1899 by the Acclimatization Committee (Jenkins, 1977). Le Souef (1912) mentions their introduction, but there are no further records.

MUSK LORIKEET
Glossopsitta concinna

At least one pair of Musk Lorikeets was present in the Alfred Cove — Attadale areas (Perth suburbs) for some years (Long, 1981). Corfe (1977) reported them there in 1975 and Griffin (1980) observed two at Troy Park in 1979. Two birds were later shot in the area. They were nesting in a hollow tree in Troy Park. Some were noted in the area in 1982 (Keeling 1982). No further birds appear to have been recorded.

DOVES
Geopelia humeralis,
Streptopelia decaocto
and other species

Indian cinnamon doves and two "kinds" of bar-shouldered dove, thirty-five in all, were released by the Acclimatization Committee from the Zoological Gardens, South Perth, in 1898-99 (A.R.A.C., 1898-99). In the following annual report of this committee it was reported that five dove species had been released (A.R.A.C., 1899-1900). Fraser (1903) noted that E.A. Le Souef (Director of the Zoo) had liberated six species of doves including the Bar-shouldered Dove *(Geopelia humeralis)* which was at this time a familiar form about South Perth. In 1902-03 the various "kinds" of doves released at South Perth were spreading well and efforts were to be made to release some at Kings Park (A.R.A.C., 1902-03). There are no further records of these species except for the spotted and Senegal turtledoves now established in Western Australia.

Barbary Doves *(S. decaocto)*, became established in the Forrestfield area in the 1960s (Long, 1981) when a colony of 16 birds, presumedly escapees or deliberate releases, were discovered. The colony was destroyed by Agriculture Protection Board officers.

Recently a single bird was noted in the Scarborough area (Gray, pers. comm., 1986).

SILVER PHEASANT
Lophura nycthemera

GOLDEN PHEASANT
Chrysolophus pictus

Both Silver and Golden Pheasants were obtained by the Acclimatization Committee for breeding purposes and the release of their progeny at later dates (A.R.A.C., 1898-99). There do not appear to be any records of releases.

Silver Pheasants were kept in semi-captivity by a tea gardens proprietor in the Porongorups area for many years (Long, 1981). When the tea gardens closed down (c. 1973) the birds (original flock c. 5) were allowed to wander off and some became established in one or two areas of the Porongorup Range. In 1976 there may have been 15-20 birds in two colonies (Anon., 1976) present in the range, which is a national park. The park authorities began removing the birds by trapping and shooting in the Bolganup Valley (6 km from the tea gardens on the opposite side of the range) in 1976. By June 1977 some 18 Silver Pheasants had been taken (Start, pers. comm., 1978). No further Silver Pheasants have been found in the park.

Other introductions

Feral bantams were apparently at Kavining Bay on Garden Island during the 2nd World War. Domestic turkeys were also believed to have been released on the island shortly after 1945 and the last of these was reported to have been shot in c. 1954 (P. Counsel, pers. comm., 1983).

A number of escapees from aviaries are occasionally seen in the metropolitan area. A chaffinch or greenfinch was noted in 1910 (Cleland, 1910) and the Bullfinch *(Pyrrhula pyrrhula)* and Chaffinch *(Fringilla coelebs)* were apparently found in the wild before 1937 (Serventy, 1937). Since the 1960s such species as the Canary *(Serinus canarius)*, Double-barred Finch *(Poephila bichenovii)*, Blackheart *(Peophila acuticauda)*, Adelaide Rosella and others have been regularly noted, but only the Double-bar and Chestnut-breasted *(Lonchura castaneothorax)* finches may have become permanently established. (For other exotic species found in the wild see the table below). Some like the Diamond Firetail *(Emblema guttata)* at times breed in the wild (at Helena Valley in 1986 — M. Brooker pers. comm.) and may eventually become permanent residents.

Other Aviary Escapees and Immigrant Species Found at Large in Western Australia Since 1910

Common name	Scientific name	Date and frequency
Green finch or chaffinch?	?	1910
Bullfinch	*Pyrrhula pyrrhula*	before 1937
Chaffinch	*Fringilla coelebs*	before 1937
Canary	*Serinus canarius*	occasionally
Adelaide Rosella	*Platycercus adelaidii*	once
Chattering Lory	*Lorius garrulus*	twice (1979, 1987)
Crimson Rosella	*Platycercus elegans*	5-6 times (1960, 1966-67, 1975, 1980, 1985-86)
Eastern Rosella	*Platycercus eximius*	3 times (1960s, 1985-86)
Namaqua Dove	*Oena capensis*	3 times (1960s, 1973, ?)
Peach-faced Lovebird	*Agapornis roseicollis*	c. 20 times (1965, 1973 and since)
Blackbird	*Turdus merula*	3 times (1979, ? 1984)
Indian Myna	*Acridotheres tristis*	once (1980)
Jungle Myna	*Acridotheres fuscus*	once (1980)
Japanese Quail	*Coturnix coturnix japonica*	once (1982)
King Quail	*Coturnix chinensis*	3-4 times (1970, 1976 and since)
Rose-ringed Parakeet	*Psittacula krameri*	3 times (c. 1982 and 1985-6)
Budgerygah	*Melopsittacus undulatus*	often
Red-collared Lorikeet	*Trichoglossus rubritorquis*	once (1984)
Alexandrine Parakeet	*Psittacula alexandri*	once (1984)
Hooded Parrot	*Psephotus dissimilis*	once (1985)
Monk Parakeet	*Myiopsitta monachus*	once (1985-86)
Diamond Dove	*Geopelia cuneata*	often
Star Finch	*Neochmia ruficauda*	occasionally
African Firetail Finch	*Lagonosticta senegala*	occasionally
Orange-breasted Finch	*Estrilda subflava*	once (1985-86)
Silver Pheasant	*Lophura nycthemera*	occasionally
Guineafowl	*Numida meleagris*	occasionally
Peafowl	*Pavo cristatus*	occasionally

Re-introduced and translocated native species

Two native species have been introduced to Rottnest Island with little success. Malleefowl *(Leipoa ocellata)* taken to the island in 1928 died before they could be released and magpies *(Gymnorhina dorsalis)* have been introduced from time to time. They were breeding there in 1958 (Storr, 1965), but their present status is as a vagrant (Saunders and de Rebeira, 1985).

In March, 1912 the Acclimatization Committee released some magpies in the north-west of Western Australia (Jenkins, 1977). White-backed Magpies were released by pastoralists in mid-western Australia and about the Hampton Escarpment (McColl, 1929; Serventy and Whittell, 1976). It is suggested that these have bred with the local magpies (Black and Ford, 1982).

Extensive efforts were made to "increase the numbers of Black Swans on the Swan for aesthetic purposes". Special exclosures and shelters were built and 30 birds *(Cygnus atratus)* were imported from Melbourne and released in 1900 (A.R.A.C., 1898-99; 1899-1900; 1901-02; 1902-03).

NOISY SCRUB-BIRD
Atrichornis clamosus

Noisy Scrub-birds were successfully translocated from Mt. Gardner to two sites at Mt. Manypeaks, near Albany, in 1983 (Smith, 1985) and 1985 (Burbidge *et al.*, 1986).

GALAH
Cacatua roseicapilla

Galahs have colonized the wheatbelt in Western Australia since the 1920s (Saunders *et al.*, 1985). Their spread along the Darling Scarp and in the metropolitan area has been assisted by the escape and release of caged birds (Long, 1981; Saunders *et al.*, 1985). Aviary escapees are also becoming established around other population centres (Blakers *et al.*, 1984) and may have assisted the southward spread of the species in some country areas.

Numerous Galahs of the eastern subspecies *(C.r. roseicapilla)* have been noted in the resident metropolitan population (Rowley, pers. comm., 1981; Saunders *et al.*, 1985). The coastal expansion of the species generally appears to have been helped by the popularity of acquiring "farmlets" for keeping horses: the galahs are capable of feeding on "left overs" including grain passed whole through the horses (Saunders *et al.*, 1985).

CORELLAS
Cacatua pastinator
C. tenuirostris

Individuals (and possibly pairs?) and some small flocks of both Little Corella *(C.p. gymnotis)* and Long-billed Corella *(C.p. pastinator)* exist in the Perth metropolitan area. A flock of corellas, probably derived from escapees, has frequented the Claremont-South Perth area since about 1967 (Jenkins, 1977). As many as 100 Little Corellas were sighted as early as 1974 (McMillan, 1976). They occasionally occur in flocks with the introduced sulphur-crested cockatoo (Saunders *et al.*, 1985). These flocks are the result of aviary escapes and releases.

Two Slender-billed Corellas *(C. tenuirostris)* from South Australia (with NPWS bands) were trapped with other corellas in the Perth area in recent years. A single bird was noted at Yerecoin (176 km N. of Perth) in 1977 (Saunders *et al.*, 1985), and more recently, 5 were observed in a flock of 45 corellas at West Swan (D. Wilson, pers. comm. 1986).

Little is known of their numbers and distribution and whether any of them breed in the metropolitan area or in nearby areas.

DOUBLE-BARRED FINCH
Poephila bichenovii

This small finch, which is native to northern Australia including the north of Western Australia, may now be established in the metropolitan area. In 1985-86 at least two flocks have been reported, the first a flock of 10 at Star Swamp and the second a flock of 12 at Herdsman Lake (P. Counsel pers. comm.).

CHESTNUT-BREASTED FINCH
Lonchura castaneothorax

Between 1973 and 1977 Chestnut-breasted Finches were sighted in small flocks (up to 40 birds) in Osborne Park — Herdsman Lake area (Perth suburbs) (Kolichis, 1978). They were presumed to be escapees from local aviaries as the species occurs wild only in the north of the state (Long, 1981).

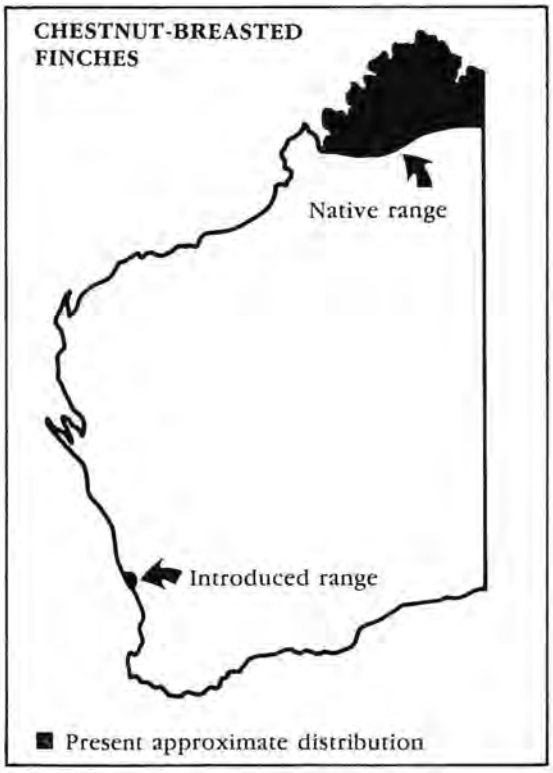
The species breeds in the Osborne Park area and has increased its range and numbers since the original sightings. They now occupy an extensive area of swamps, market gardens and lakesides in the Balcatta — Herdsman Lake area. Flocks of up to 50 have been observed a number of times. A survey in 1984 suggested that there were at least 300-400 of them in the area. Small flocks were noted intermittently

at Herdsman Lake throughout 1984-85 by Royal Australasian Ornithological Union observers.

A second metropolitan colony was discovered by R.A.O.U. observers at Bibra Lake in 1984. The observers counted between 120 and 150 Chestnut-breasted Finches at the locality. The origin of this colony is not known.

A third colony may still exist at Benger Swamp (near Harvey 138 km S. of Perth). An R.A.O.U. observer first noted a pair there in 1982 and counted as many as 16 in May 1984.

There may be other colonies established in the metro area or those that are established may wander widely. Twenty were noted at Bayswater in June 1986, and several have been sighted at Wungong Gorge between May 1985 and February 1986 (Bamford, pers. comm., 1986).



MAMMALS

The establishment of mammals in Western Australia appears to have been more successful than that of birds. Of 32 species which are known to have been introduced, 15 are established, two others may be established and the remainder have failed. Rabbits, foxes, cats, dingoes, rats and mice are widespread; feral animals such as goats, donkeys, camels, pigs, cattle and horses are restricted to certain areas; water buffalo are sometimes found in the Kimberley, and palm squirrels are limited to a small area within the city of Perth.

It was suggested in 1897 that the Mole *(Talpa europaea)*, the Hedgehog *(Erinaceus europaeus)* and Shrew *(Sorex vulgaris)* be introduced for the control of fruit fly (A.R.D.A., 1897-98). Fortunately the authorities at the time did not proceed with the suggestion.

Blackbuck and perhaps red deer may still be present in small numbers; ferrets, sheep and dogs occasionally become established in the wild.

Rusine deer, sambar deer, fallow deer, hog deer, eland, African buffalo, zebra, vicuna, llama, and hare have failed to become established. The release and establishment of exotic mammals in the wild is exceedingly dangerous as most of those established in Australia and other parts of the world have become pests of agriculture.

Species established in Western Australia

DINGO
Canis familiaris dingo

The origin of the Dingo is not reliably known but it has been suggested that the Wolf *(Canis lupis pallipes)* is the most likely ancestor (Marlow, 1962). Dingoes are thought to have been introduced to Australia by aborigines or adjacent native peoples along a northern sea route (Troughton, 1957). Evidence available indicates that they arrived at least 3000 years and perhaps 8000 years ago (MacIntosh, 1975). Gollan (1984) suggests that the founder population of domestic dogs, later to form the genetic base for the subsequent feral population of dingoes, were probably introduced about 4000 BP.

The Dingo is generally treated taxonomically as subspecifically distinct from Domestic Dogs *(Canis familiaris familiaris)*. There appear to be few differences in structure. Blood enzyme studies and the examination of skull characteristics (Newsome *et al.*, 1980) fail to clarify the relationship. The two hybridize readily in captivity and are suspected of doing so widely in the wild. In south-eastern Australia there may be a high proportion of hybrids, but few in central and northern Australia (Newsome and Corbett, 1985). Western Australia is thought to have a low number of hybrids. These are generally found close to settled districts.

Dingoes are distributed over the whole of Western Australia, although in some areas they have been restricted to more remote areas by settlement and their destruction in large numbers. In the 1950's the highest concentrations were in the Kimberley and north-west of the state (Tomlinson, 1955).

In the 1950's the Dingo was a pest of economic importance throughout the agricultural and pastoral areas of the State. The intensity of the problem was becoming less as settlement advanced, but was still acute in outback areas and sufficiently serious in many settled areas to cause concern (Tomlinson, 1955). Today the Dingo is mainly a pest in the pastoral areas.

RABBIT
Oryctolagus cuniculus

Rabbits were certainly established on at least one island in Western Australia in 1827 and may have been present on some others at even earlier dates. It was common practise for those engaged in whaling to leave rabbits as a food supply in case of shipwreck or for meat on future visits, on small islands within their whaling regions. Bay whaling commenced in Australia in 1806 (Dakin, 1934) and whalers were most likely patrolling the southern and western coasts shortly after this date.

The colonial botanist of the time, who visited Carnac Island (off Fremantle) reported in 1827 that the island produced an "abundance of hares" (Seddon, 1972). Ogle (1839) suggested that Western Australia was suitable for rabbits and certainly they were being kept (Anon, 1842; Burton and Henn, 1948) in the colony in early times.

Rabbits were reported from Houtman Abrolhos in 1878 (A.R.D.A., 1908) and were present there in 1890-92, 1893-94, 1895-96, and in 1897 (R.I.R., 1891-1897; A.R.B.A., 1895-96). They were present on Carnac Island in 1842, 1890-92, 1893-94, 1895-96 and in 1897 (Anon., 1842; R.I.R., 1891-1897). They disappeared from Carnac in the early part of this century only to be introduced again in 1934 (Dunlop and Storr, 1981).

Rabbits were also reported from islands off the southern coast as early as 1886-87 (Western Mail, 1886; Parliamentary Papers, 1887). They were reported from Bald Island in 1887 (Gillet, 1968), 1893-94 (R.I.R., 1894) and in 1895-96, and from Goose Island (Recherche Archipelago) in 1887 (Serventy 1953) and in 1894 (Rintoul, 1964). The first record of them from Eclipse Island was in 1912 when the Acclimatization Committee sent some there for release to provide food for shipwrecked mariners (Jenkins, 1977).

Early records and spread of the Rabbit in Western Australia are shown in the chronology table. There is strong evidence to suggest that rabbits were already established on mainland Western Australia when those from the eastern states reached Eucla in 1894. It appears that the Lynton-Murchison introductions (in 1882? or between 1887-1893) were spreading southwards (and perhaps northwards?) at the same time as the east-west spread.

The spread of the Rabbit from the eastern states largely followed the main roads and tracks used by people travelling to and from or within the Goldfields and the main centres. Rabbits began to spread widely at a time of rapid human expansion on the Goldfields (1895-1904) (Crowley, 1959). The spread coincided with the rapid expansion of agriculture itself:- areas under wheat trebled between 1905 and 1911 and again between 1911 and 1916. In 1900 about 2.8 million hectares of land had been opened up for agriculture and this had increased to 7.7 million in 1910-11 and to 11.5 million by 1924 (Handbook of W.A., 1925).

The transfer of rabbits in billycans and the help that rabbits received from miners and other travellers was noted by Wilson (1902) at the time and others at later dates (Fuller, 1970).

With the initial momentum of colonization after 1894, Rabbits spread far northwards and were

RABBITS

■ Present approximate distribution
▒ Scattered distribution

found over most of the pastoral regions as far north as Port Hedland. However, with unfavourable seasons, they died out but are still occasionally found in numbers at such places as Mundiwindi, east of Marble Bar and at the top of the Canning Stock Route. Penetration into the more heavily timbered southern portion of the State was at a much slower rate.

Despite the erection of barrier fence systems between 1901 and 1908 and their continued maintenance, by the early 1920s rabbits occupied most of Western Australia except the south-west corner.

The finding of the Rabbit near Manjimup in 1920-21 coincided with the commencement of a Government funded scheme to open up much of the forest country in that area for agriculture.

By the early 1930s the Rabbit had colonized all of the suitable areas in the state. They are now established as far north as the Kimberley region, but are not generally economically important agricultural pests further north than Shark Bay or in inland pastoral areas where their distribution is generally sparse. In the north-west coastal areas they are regarded as pests by pastoralists (King *et al.,* 1983), but rarely do populations reach a level where pastoral productivity is greatly affected.

Although rabbits were reported to have been introduced on a number of islands off the coast of Western Australia, in recent years they have only been reported from Goose Island in the Recherche Archipelago (Main, 1963; Fraser, 1963), Sandy Island, south of Pemberton (Fraser, 1963) (not present now), and Carnac Island (off Fremantle) until exterminated in 1969. Those present on the Green Islets (between Lancelin and Jurien Bay), Abrolhos group (Morley, Wooded and Leo), and Mistaken Island (Albany) were eradicated by poisoning in 1973-74, 1973, and 1977-80 respectively (Young, 1981).

Today, the Rabbit is present throughout the south of the state north to localities within the Great Victoria, Gibson and Great Sandy deserts, and also the southern edge of the East and West Kimberley districts (King, 1986). There are many areas within these boundaries where they do not occur e.g. in the Ashburton and Pilbara and elsewhere. The northern boundary remains fluid. It is found further north following successful breeding seasons and further south following unsuccessful breeding seasons. It is believed (King, 1986) that the rabbit's range in Western Australia is broadly related to the distribution of halophytic shrublands dominated by species of *Atriplex, Kochia* and *Arthrocnenum*.

Chronology of Rabbit Introductions and Invasion in Western Australia

Date	Locality/area/region	Remarks	Source
1806-1820s	islands off coast	probably on islands off south and west coasts, left by American, French and other whalers	
1827	Carnac Island	colonial botanist reports an abundance of hares	Seddon, 1972
1839	Western Australia	introduction of rabbits suggested	Ogle, 1839
1842	Carnac Island	warning in Perth Gazette against shooting or removing	Anon, 1842
	Busselton	Wollaston had rabbit pie at Bussel homestead	Burton and Henn, 1948
1843	Picton	Wollaston keeping rabbits in captivity	Burton and Henn, 1948
1859	Geelong, Victoria	release of rabbits (wild type) in eastern states	Ratcliffe, 1959
1878	Houtman Abrolhos	present	A.R.D.A., 1908
1882(?)	Lynton	possibly introduced at this time	Crawford, 1908
1886	Geraldton	reported at	Western Mail, 1886
	Geraldton-Greenough	one killed between these places	R.I.R., 1891
	Albany	reported at	Western Mail, 1886
1887	Bald Island Cheynes Beach	) reported on and reported at)	) Gillett, 1968;) Parliamentary Papers) 1887
1887-93	Lynton	probably introduced here from islands	Crawford, 1908
1889	Recherche Archipelago	possibly present on Goose Island	Serventy, 1953
1890-91	Carnac Island	present; cats introduced to control them	R.I.R., 1891; R.I.R., 1892
	Houtman Abrolhos	reported on Pelsart and Gun islands	R.I.R., 1891-92
1891	Northampton	4 destroyed (captives?)	R.I.R., 1891
1893-94	Carnac Island	reported few on island	R.I.R., 1894
	islands off coast (s.e. of Albany)	reported present	R.I.R., 1894
	Houtman Abrolhos	reported present	R.I.R., 1894
1894	Eucla	first noted	R.I.R., 1897
	Recherche Archipelago	colony black rabbits on Goose Isl. until 1960s	Rintoul, 1964
1895-96	Houtman Abrolhos	reported from Pelsart Isl.	A.R.B.A., 1895-96
	Carnac Island	still present, although 30 destroyed	R.I.R., 1896
	islands off coast (s.e. of Albany)	reported present	R.I.R., 1896
1896	Eucla	found at, 120 miles (192 km) west and 20 miles (32 km) north	Mason, 1896
	Eyre	reported as far west as	Anon, 1896
1897	Eyre's Patch	reported present	Inquirer, 1897; R.I.R., 1897
	Norseman	reported 8 miles (12.8 km) away from	R.I.R., 1897

Date	Locality/area/region	Remarks	Source
	Israelite Bay	reported between Ponton's Station and	R.I.R., 1897
	Carnac Island	present on	R.I.R., 1897
	Houtman Abrolhos	present on Long Island	R.I.R., 1897
1898	Eucla	abundant at; carried by miners	Fuller, 1970
	Israelite Bay-Eyre	scattered along coast between	Gillet, 1968
1899	Eyre's Patch	2 killed by cats	Inquirer, 1899
1900	Norseman	2 caught	Kalgoorlie Miner, 1900
	Southern Cross	1 shot	West. Aust., 1900
1901	Southern Cross	definite evidence of; 1 shot	S. Cross Miner, 1901
	Lake Lefroy	1 found	S. Cross Miner, 1901
	Esperance	tracks and traces 80 miles (128 km) east of	Inquirer, 1901
	Kalgoorlie	thousands reported at	Inquirer, 1901
	Musgrave Ranges	said to have passed them	West. Aust., 1902
	Leonora	reported as far north as	Canning, 1902
1901-02	Edjudina	) Note: at this time	)
	Mulgabbie	) reported established	)
	Coolgardie	) from Coolgardie	)
	Bulong	) to coast a little west	)
	Penny's Lake	) of Esperance. Spread	) Wilson, 1902
	Kanowna	) assisted by people	)
	Southern Cross	) transporting them	)
	Esperance	) in billycans	)
	Nannine	)	)
	Ravensthorpe (Emu Rocks)	possibly seen at	Wilson, 1902
	Parkerville	reported at, but none found	Wilson, 1902
	Rockingham	reported at, but none found	Wilson, 1902
1902	Perth	reported within 25 miles (40 km)	West. Aust., 1902
	Bibra Lake	reported at	A.R.D.A., 1902-03
	Boulder	3 caught	West. Aust., 1902; Kalg. Miner, 1902
	Burracoppin	1 sighted	West. Aust., 1902
1902-03	Guildford (Smith's Well)	1 found	A.R.D.A., 1902-03
	Moora	reported at, but none found	A.R.D.A., 1902-03
	Mingenew	reported at, but none found	A.R.D.A., 1902-03
	Yatheroo	reported at, but none found	A.R.D.A., 1902-03
1903	Dalyup	1 caught on farm near	West. Aust., 1903
	Coolgardie (Mt. Robinson and Mt. Poisson)	reported many	Kalg. Miner, 1903
1904	Menzies	1 found timber yard, obtained with ferrets	Kalg. Miner, 1904
	Boulder	1 killed by tram	Kalg. Miner, 1904
	Dalyup	found in town of	Kalg. Miner, 1904
	Ravensthorpe	found at state smelter	P.R.T., 1904
	Coolgardie	cause serious trouble at	Kalg. Miner, 1904
	Norseman	have "fair hold" at	Kalg. Miner, 1904
	Geraldton	100 miles (160 km) north of	Kalg. Miner, 1904

Date	Locality/area/region	Remarks	Source
	west of Rabbit Proof Fence	reported more on west than east side	Smith, 1966
1904-05	between nos. 1 and 2 R.P.F.	found in many places	A.R.D.A., 1904-05
1905	Burtville	numerous 50 miles (80 km) east of	Kalg. Miner, 1905; West. Aust., 1905
	Balladonia	present in thousands	Kalg. Miner, 1905
	Perth	1 killed in load wood near	Kalg. Miner, 1905
	Israelite Bay	numbers increasing	Kalg. Miner, 1905
	Esperance	numbers increasing	West. Aust., 1905
	Bruce Rock district	signs of them at Kwolyin	Ewers, 1959
1905-06	south coast-Nannine	extend from south coast north to, but some areas still not infested	A.R.D.A., 1905-06
	Cunderdin	found 45 miles (72 km) north (Cowcowing Lakes)	A.R.D.A., 1905-06
	Hyden	control of colonies at Lakes Carmody, Hurleston and Varley	A.R.D.A., 1905-06
1906	Yuin	reported west of	West. Aust., 1906
1906-07	Coorow	found at	A.R.D.A., 1906-07
	Mullewa	found at	A.R.D.A., 1906-07
	Northampton	found at	A.R.D.A., 1906-07
	Mt. Cecilia (70 miles (112 km) south Kimberley border)	reported at	A.R.D.A., 1906-07
1907	Geraldton	reported west of town	West. Aust., 1907
	Nannine	reported numerous at	Kalg. Miner, 1907
	No. 2 R.P. Fence	reported west of	Kalg. Miner, 1907
	Oakover River	traces reported at	Anon, 1907
1907-08	Mullewa	reported numerous inside No. 2 R.P. Fence	A.R.D.A., 1907-08
	Lynton	found along coast to No.3 R.P.F. and 40 miles (64 km) north where known for 20 years	A.R.D.A., 1907-08
	Coorow	found at	West. Aust., 1908
	Cunderdin	found north of	West. Aust., 1908
1908	Hamelin Pool	1 live seen	West. Aust., 1908
	Leonora	plentiful at	West. Aust., 1908
	Lynton-Murchison	established within 6-7 miles (9.6-11.2 km) of coast for 80 miles (128 km)	Crawford, 1908
1909	Geraldton	2 caught at showgrounds	West. Aust., 1909
	No. 2 R.P. Fence	found west of	West. Aust., 1909
	Nos. 1 and 2 R.P. Fences	plentiful between	West. Aust., 1909
	York	found at	West. Aust., 1909
1909-10	Nyabing	probably at	Beecham, 1975
1910	Kellerberrin	1 killed 9 miles (14.6 km) south of	Ewers, 1959
	Kellerberrin	6 found in burrow near	Eastern Recorder, 1910
	Cunderdin	1 seen at	Ewers, 1959

Date	Locality/area/region	Remarks	Source
	Bruce Rock district	6 caught by C.A. Malcolm of Kurrenkutten	Ewers, 1959
1911	Bruce Rock	1 seen on Kumminin Station	Ewers, 1959
1911-12	Mingenew	spread south from Geraldton to	A.R.D.A., 1911-12
	Wallal	2 killed at	A.R.D.A., 1911-12
	Northampton	spread from here eastwards	A.R.D.A., 1911-12
1912	Eclipse Island	released on island as food for shipwrecked mariners	Jenkins, 1977
	Nyabing	numerous at	Beecham, 1975
	Pingrup	numerous at	Beecham, 1975
1912-13	Moora	1 killed at; spread down coast to	A.R.D.A., 1912-13
	Fitzroy Crossing	reported 1 killed at	A.R.D.A., 1912-13
	Nyabing-Lake Pingrup	badly infested with	A.R.D.A, 1912-13
	Dowerin	some east of	A.R.D.A., 1912-13
	Yalgoo	some at	A.R.D.A., 1912-13
	Greenough-Mingenew	numerous in area	A.R.D.A., 1912-13
1913	Kent Shire	widespread in	Beecham, 1975
1913-14	Bremer Bay	present at	A.R.D.A, 1913-14
	Fremantle	reached area 40 miles (64 km) north of	A.R.D.A, 1913-14
	Murchison River	spread north to mouth of	A.R.D.A., 1913-14
	Dandaragan	present here and other areas in vicinity	A.R.D.A., 1913-14
	Three Springs	present here and other areas in vicinity	A.R.D.A., 1913-14
	Coorow	present here and other areas in vicinity	A.R.D.A., 1913-14
1915	Bolgart	1 caught at	Toodyay Herald, 1915
	Westonia	specimen in museum from	Kitchener and Vicker, 1981
1915-16	Northam	found 10 miles (16 km) east of	A.R.D.A., 1915-16
	York	found 10 miles (16 km) south-east of	A.R.D.A., 1915-16
	Beverley	found 17 miles (27.2 km) west of	A.R.D.A., 1915-16
	North Fremantle	found at	A.R.D.A., 1915-16
1918	Calingiri	first appeared at	Toodyay Herald, 1918
	Nos. 1 and 2 R.P. Fences	well established between	Smith, 1918
	Moora	found south of in number of localities	Smith, 1918
	Darling Range	not in, but in country to west	Smith, 1918
	Dowerin	badly infested	Smith, 1918
	Mt. Marshall	badly infested	Smith, 1918
	Trayning	badly infested	Smith, 1918
	Wyalkatchem	badly infested	Smith, 1918
	Cunderdin	badly infested	Smith, 1918
	Kulin Hill	specimen in Museum from	Kitchener and Vicker. 1981

▲ 1. The chestnut-breasted Finch, a recent escapee from captivity established in Perth.
(Photo: Babs and Bert Wells)

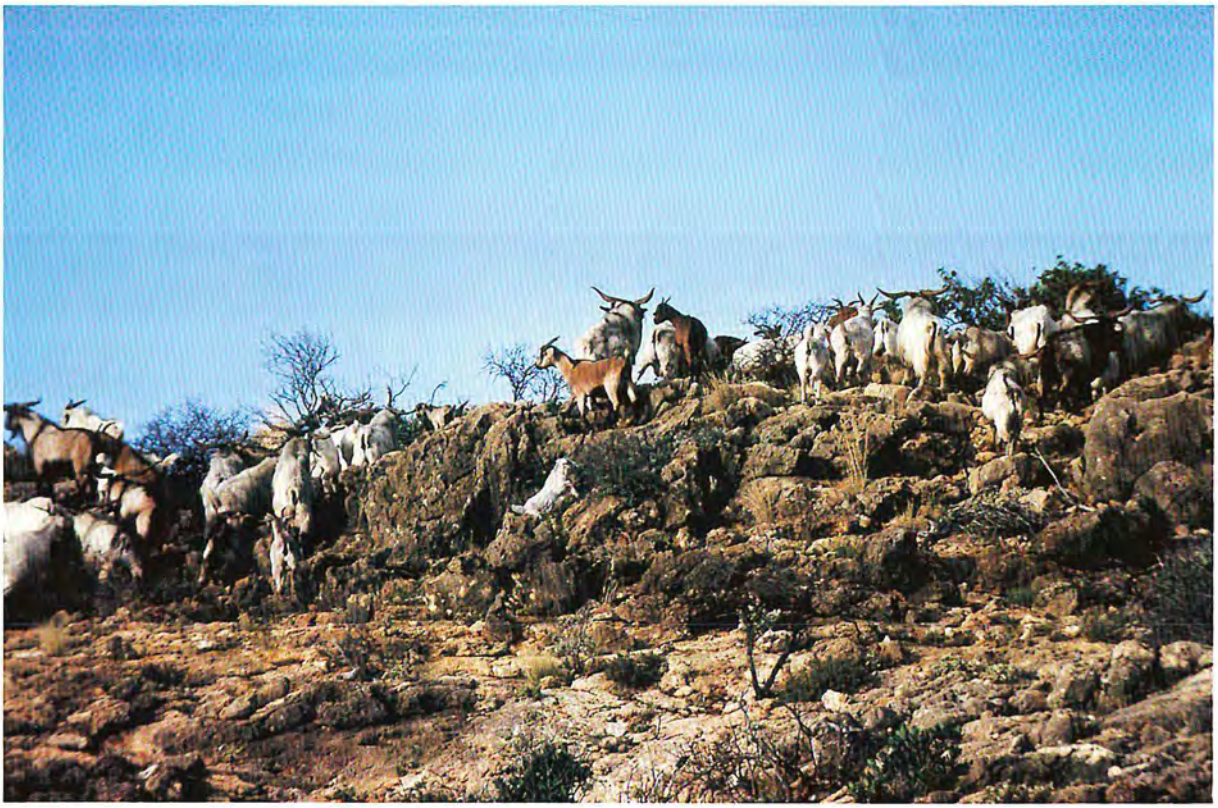
◄ 2. The introduced Goldfinch, formerly more widespread, now rare — found in metropolitan parks and gardens.
(Photo: Babs and Bert Wells)

▲ 3. A Black Rat caught near Bullsbrook. *(Photo: Babs and Bert Wells)*

▶ 4. A Feral Camel in arid country near Lake Disappointment. *(Photo: Babs and Bert Wells)*

◄ 5. Indian Palm Squirrels at South Perth. *(Photo: Babs And Bert Wells)*

▼ 6. A Feral Donkey in grassland near Nullagine. *(Photo: Babs and Bert Wells)*



▲ 7. Feral Goats in breakaway country at Cape Range (NW Cape). *(Photo: Babs and Bert Wells)*

▶ 8. A Feral Pig on Beverley Springs Station, Kimberleys. *(Photo: Babs and Bert Wells)*

Date	Locality/area/region	Remarks	Source
1918-19	Kelmscott	some at	A.R.D.A., 1918-19
	Jandakot	traces found at	A.R.D.A., 1918-19
	Rockingham	present along coast at	A.R.D.A., 1918-19
	Gascoyne Junction	as far north as	A.R.D.A., 1918-19
	Exmouth Gulf	few noted at	A.R.D.A., 1918-19
	Upper Gascoyne	reported from	A.R.D.A., 1918-19
	Shark's Bay	present at	A.R.D.A., 1918-19
	Nannine	) present in these areas	) A.R.D.A., 1918-19
	Cue-Day Dawn	) and throughout	)
	Mt. Magnet	) Murchison and	)
	Yalgoo	) south	)
1919	Nyabing	reported present in thousands	Beecham, 1975
1919-20	Gascoyne Junction	spread north to Gascoyne River and Gascoyne Junction	A.R.D.A., 1919-20
1920s	Koorda district	nuisance, 300/400 per night caught	Antonio-Crake, 1974
1920-21	Manjimup	4 killed near	A.R.D.A., 1920-21
1921-22	S.W. Division	reported to be throughout	A.R.D.A., 1921-22
1923	Kings Park	recorded at	Kitchener and Vicker, 1981
1923-24	S.W. Division	numerous and increasing	A.R.D.A., 1923-24
1924-27	Kent Shire	numerous in	Beecham, 1975
1924-25	S.W. Division	throughout, but absent from southern part along No. 1 Fence	A.R.D.A., 1924-25
1925	Islands off coast	present on islands off south and west coasts	Craig, 1925
	Nukarni	specimen in Museum from	Kitchener and Vicker, 1981
1926	Plantagenet Shire	appeared in area c. 1926	Glover, 1979
1928	Badjebup	specimen in Museum from	Kitchener and Vicker, 1981
1930s	Victoria Plains Shire	reported numerous in	Erickson, 1971
1931	Nalya	specimen in Museum from	Kitchener and Vicker, 1981
1934	Carnac Island	reintroduced on	Dunlop and Storr, 1981
	Kent Shire	numerous in	Beecham, 1975
1935	Houtman Abrolhos	introduced North Island from Geraldton	Storr, 1960
	Broomehill	specimen in Museum from	Kitchener and Vicker, 1981
1937	Tambellup	specimen in Museum from	Kitchener and Vicker, 1981

RED FOX
Vulpes vulpes

Foxes were first reported in Western Australia by A. Crawford (Chief Rabbit Inspector) at a location west of Eucla in 1911-12 (A.R.D.A., 1911-12) and 160 km west of the South Australian border in 1915 (A.R.D.A., 1914-1915). One was reported at Esperance in 1916 and one was shot at Sandstone in the same year (A.R.D.A., 1915-1916).

These animals are thought to have spread into this state from Victoria where they were released a number of times from 1845 to the 1880s (Terry, 1963; Troughton, 1957). The Fox appeared to follow approximately the same path of invasion as the rabbit though several years later. Within 26 years they had occupied most of Western Australia with the exception of the Kimberley region.

The chronology table shows the rapid spread of the Fox through the state. There is some evidence to suggest that they colonized the last of the forested areas of the lower south-west at the same time as the rabbit.

By 1934, all areas in the south-west corner of the state had paid bonuses for fox scalps (Gooding 1955).

Foxes are now spread almost throughout the state. They are common in the south-west and adjacent north-east interior, and the upper west and lower north-west coasts; very common in the south-east, uncommon in the midwest interior; rare in the Great Victoria, Gibson and Great Sandy deserts and the Pilbara highlands, upper north-west coast and south and east Kimberley; absent from the Kimberley north and west of the King Leopold Range (King and Smith, 1985).

There are a number of records of Foxes from islands off the coast of Western Australia including Depuch, Legendre, Harry Rock, Dolphin, Gidley, Keast, Hauy, Angel and Dirk Hartog (Burbidge and Prince, 1972; King and Smith, 1985). However, the Fox does not appear to be established permanently on any of them except Depuch Island where they have existed (Kinnear *et al.*, 1984) for more than 20 years and on Dolphin Island (K. Morris pers. comm. 1986).

Chronology of the Invasion and Spread of the Red Fox in Western Australia

Date	Locality or area	Remarks	Source
1845-1880s	Victoria	fox introduced to Australia	Troughton, 1957; Frith, 1973
1911-12	Eucla	reported west of and near	A.R.D.A., 1911-12
1912-13	Eucla	reported on W.A./S.A. border over 12 months ago and again this year	A.R.D.A., 1912-13
1915	Eucla and west of	reported 100 miles (160 km) west of S.A. border	A.R.D.A., 1914-15
	?	reported first fox in W.A.	Craig, 1926
1915-16	Esperance	one reported at, and one reported west of	A.R.D.A., 1915-16
	Sandstone	one shot at (reported by Erickson (1971) to have been shot in 1913)	A.R.D.A., 1915-16

Date	Locality or area	Remarks	Source
1918-19	? W.A.	Three reports from eastern portion	A.R.D.A., 1918-19
1919-20	Wagin	one killed at, and one seen further east	A.R.D.A., 1919-20
1922-23	Victoria district	said to be numerous in	A.R.D.A., 1922-23
1923-24	? W.A.	spreading to new centres, greatest numbers in northern parts of south-west division	A.R.D.A., 1923-24
1924-25	Northampton-Moora	most numerous in this area	A.R.D.A., 1924-25
	Gascoyne	a scalp from this area	
1925	Mingenew Geraldton Northampton	) distributed around coastline) as far north as Geraldton. Most) numerous between these areas	Le Souef and Le Souef, 1925
1925-26	Northampton-Moora	reported throughout state, but only numerous these areas	A.R.D.A., 1925-26
1926	Plantagenet Shire	reported came with rabbit at this date	Glover, 1979
	State	reported fox not numerous in W.A.	Craig, 1926
1926-27	Northampton-Albany	present in every part of state from here to Mt Barker and Albany	Craig 1927; A.R.D.A., 1926-1927
1927	State	bonus paid on 222 scalps	A.R.D.A., 1927-28
	Perth	several killed within a few miles (kilometres)	Craig, 1927
1927-28	State	bonus paid on 1,403 scalps	A.R.D.A., 1927-28
1928-29	State	scalps sent in from 28 new districts	A.R.D.A., 1928-29
1929	Augusta-Margaret River	paid bonus on fox scalps for first time: no further scalps until 1933	A.R.D.A., 1929-30
1929-30	State	scalps sent in from 31 new districts, no foxes in s.w. corner	A.R.D.A., 1929-30
early 1930s	Manjimup	reported present	Gooding, 1956
early 1930s	Bruce Rock	reported present	Ewers, 1959
1931	Nullagine, Roebourne-Tablelands and Broome	) paid bonus on scalps for) first time)	A.P.B. records
1932	Marble Bar	paid bonus on scalps for first time	A.P.B. records
1933	Kent Shire	numerous and a nuisance in district	Beecham, 1975
1934	West Kimberley	paid bonus on scalps for first time	A.P.B. records
1934-36	Victoria Plains	increasing Piawaning area and farmer claimed killed 100 on 2 sq mile (10 km^2) area in 1 year	Glover, 1979
1937	s.w. corner W.A.	reported exterminating rock wallabies and killing black swans	Troughton, 1941

Date	Locality or area	Remarks	Source
1938-43	Stirlings-Wagenellup	52 killed by trapper/poisoner employed by dingo club in Plantagenet Shire	Glover, 1979
1943	Halls Creek and Wyndham	paid bonus on scalps for first time	A.P.B. records
1949	Port Hedland and beyond	now firmly established and penetrated inland	A.R.D.A., 1949
1958	Fitzroy Crossing	one seen this area	Long, 1972
1959	State	from 1929 to 1959, 893,000 scalps presented for bonus	Crawford and Veitch, 1959
1968	East Kimberley	one caught Lissadell Station	Long, 1972

BLACK RAT
Rattus rattus

NORWAY RAT
Rattus norvegicus

HOUSE MOUSE
Mus musculus

It is not known when these pests became established in Western Australia. They were probably first introduced via early Dutch ships along the west coast after c. 1616 (Archer 1984; Hand 1984). This suggestion is reinforced by the finding of rat skeletons in cannons raised from the reefs upon which some of the ships were wrecked along the Western Australian coast. However, they may not have become permanently established until the arrival of European settlement in 1826. They were certainly well established in Perth in 1898-99 (W.A. Year Book, 1898-99) and in the south-west in 1900 (Fraser, 1903). It is unlikely that they pre-dated European colonization as they have not been recorded from any subfossil deposits (Baynes 1979; Chapman, 1981).

The House Mouse was reported to outnumber the native rodents and to be widespread in c. 1904-07 (Shortridge, 1936). Shortridge obtained specimens from Bernier Island, Kalgoorlie, Margaret River, King River and Duraladine (E. of Brookton).

All three species are now well established in Western Australia, particularly the House Mouse, which is also found in remote desert areas far from settlement. The range of both rats is not well known. The Black Rat appears to be established in most towns throughout Western Australia and is far more widespread than the Norway species. The Norway Rat appears to be confined to coastal ports and townships along the larger watercourses. Before 1960 they were often seen along the banks of the Swan River in the metropolitan area (Gooding and Long, 1960).

The House Mouse is widespread throughout the state in all habitats. Their numbers have sometimes reached plague proportions in central Australia and such occurrences have been recorded in the South West Division in 1974-75 (Chapman, 1981) and on the western Nullarbor Plain (Broker, 1977).

Rats and mice occur on a number of off-shore islands. Black Rats were present on Double Island (off Barrow Island) in 1918 and were still present there in 1965 (Main and Yadav, 1971). They were probably introduced to Woody Island (Recherche Archipelago) c. 1920 (Abbott and Black, 1978) and are still common there (Goodsell *et al.*, 1976; Abbott, 1981). There are also records of Black Rats from Trimouille Island (where they may have been present since 1894) in 1914 (Montague, 1914), in 1955 (Hill, 1955) and 1970, (Burbidge, 1971), South East Island in 1952 (Hill, 1955), most of the Monte Bello Islands in 1970 (Burbidge, 1971), Lacepede Islands (in 1962), Pigeon Island (in 1965), Middle and West islands in the Lacepede group (in 1973), Barrow Island (in 1976), Double Island (in 1976) (Kitchener and Vicker, 1981) and on West Islet in the Ashmore Islands (Johnstone pers. comm., 1986).

Black Rats were poisoned on Mistaken Island during rabbit eradication trials in the late 1970s (Young, 1981). Black Rats may have been present on Pelsart Island (Houtman Abrolhos) since 1840 (Fuller *et al.*, 1981). Eradication programmes carried out by wildlife authority personnel on Boomerang, Double and Pascoe Islands (off Barrow Island) in 1983-84 appear to have successfully exterminated those Black Rats present on them. It is planned to exterminate them on Middle and Boodie islands in the near future.

Mice are present on Rottnest Island and have been recorded from Christmas Island (in 1957 and 1961),

Garden Island (in 1968), Browse Island (in 1972), Dirk Hartog Island (in 1972-74) and from Dixon Island (in 1977) (Kitchener and Vicker, 1981). Some House Mice were collected on Bernier Island (Shortridge, 1936) in 1906, but there were apparently none there in 1912, 1959 (Fraser, 1962), or in 1976 (Robinson *et al.*, 1976). Mice are also established on Sir Graham Moore Island in the Kimberley (Burbidge and McKenzie, 1978) and on Boullanger Island (off Jurien Bay) (Christensen, 1986).

INDIAN PALM SQUIRREL
Funambulus pennanti

Palm Squirrels were introduced to the Zoological Gardens, South Perth in 1898 (Sedgwick, 1968). They remained confined to the gardens for many years, but in the last twenty-five years have invaded or been taken to a number of other suburbs. A population has existed at Wesley College since 1964 and breeds there, but does not increase much. Colonies have existed at Royal Perth Golfclub, South Perth Civic Centre, Comer Reserve, Como Primary School, Bentley Pine Plantation, McCallum Park, and Raphael Park. In 1981 some were found at Midvale (Zekulich, 1981) and at Kelmscott. At about this time three were caught at Pingelly, having been transported in the roof of a transportable home. In 1984 a single squirrel was trapped at Osborne Park. The present distribution is probably limited by the presence of exotic trees, a high mortality rate, and a limited food supply (Wright, 1972).

FERAL CAT
Felis catus

Since the first settlement in Western Australia, cats have escaped from domestication and established themselves in the wild. There appear to have been at least several early deliberate liberations. The Colonial Secretary had 200 cats from Adelaide released between Eyre Patch and Mt. Ragged (on the south coast) in 1899 to control the advance of rabbits (Gillett, 1968; Fuller, 1970).

During a commission of inquiry into rabbits in 1901 the Chief Inspector of Stock indicated that 160 cats at fifteen shillings ($1.50) a head had been released in rabbit infested country. Twenty full grown (many in kitten) cats were released on Carnac Island in 1890-91 by W.C. Lawrence (Inspector of Rabbits) for rabbit control. It was planned to release another 30 in the following year (E.R.I.R., 1891), however, in 1892 it was reported that they appeared to have destroyed the rabbits (E.R.I.R., 1892).

In 1900, Feral Cats were reported as far east as the South Australian border and, in certain parts of Western Australia, were common enough to be frequently used as food by the aborigines (Aytoun, 1900; Finlayson, 1961). Fraser (1903) records that cats had run wild and were "becoming as great a plague as the dingo". In 1908 there were large numbers in the Murchison district (Rolls, 1969). It is probable that the liberation of cats for the control of rabbits was widely advocated as the rabbit invasion advanced into this state. However, the widespread distribution of Feral Cats before the arrival of the rabbit is indicated by the records of them at Lake Prinsep between 1890 and 1896, at Lake Darlot (120 km N Leonora) in 1894, and in the Winnecke Hills (on the W.A./N.T. border east of Lake Disappointment) in 1897.

Feral Cats are able to breed and survive successfully in the wild, and their numbers are constantly being supplemented near settled areas by stray and abandoned pets. Consequently, they often exist in various stages of semi-domestication.

Feral cats are now present throughout Western Australia including desert country remote from settlement. They were sufficiently abundant in the state by 1921 to be declared vermin although at present they are not a declared animal under the Agriculture and Related Resources Protection Act.

FERAL CATS

■ Present approximate distribution

Cats have been recorded on a number of offshore islands. They were recorded on islands in the Monte Bello group in 1912 (Montague 1914), 1950 (Sheard, 1950), 1952 (Hill, 1955) and in 1970 (Burbidge, 1971). They were established on Dirk Hartog Island in 1917 (Burbidge and George, 1978) and attempts were made to remove them in 1976 to aid the re-establishment of the banded hare wallaby *(Lagostrophus fasciatus)* (Prince, 1977). Some were present on Bernier Island in 1906-07, but were absent in 1959 (Fraser, 1962) and 1976 (Robinson *et al.*, 1976). Two cats were found on North Island (Houtman Abrolhos) in 1960 and were thought to have been introduced after 1945 when the island was inhabited by humans (Storr, 1960). They were first noted on Pelsart Island in 1913 (Alexander, 1922) whilst the island was occupied for the mining of guano (Fuller, *et al.*, 1981). They have also been introduced to Rottnest Island and to Garden Island (Baynes, 1979; Kitchener *et al.*, 1980).

FERAL DONKEY
Equus asinus

The introduction of the "Ass of Spain" into Western Australia was recommended in 1839 (Ogle, 1839). However, donkeys were first imported in any number into Australia in 1866 (Terry, 1963) by Sir Thomas Elder. They were first used in this state in the development of the Victoria River district and the East Kimberley late in the 19th. century (Letts, 1964). At that time they were used as pack or draught animals and large trains carried goods from Carnarvon to the Kimberley (Letts, 1964). In 1894 there were some 131 donkeys and mules in Western Australia (Fraser, 1905).

The Western Australian Government imported donkeys in 1904 from Sumatra and Mauritius (Terry, 1963) but it was reported in 1911 (Despeissis, 1911) that most of the donkeys used in our north were the progeny of those imported earlier by Elder. In 1919-20 the Stock Branch of The Department of Agriculture gave some attention to the breeding of mules and to a lesser extent donkeys. These animals were found to be serviceable in the goldfields and Kimberley because of their hardiness and freedom from disease (A.R.D.A., 1919-20).

Terry (1963) recorded that donkeys first became feral in the Kimberley in the 1930s. On some properties up to 100 donkeys (mares) were kept as breeders to provide replacements for teams. Those animals which had given good service were turned out and allowed to roam the country (McDonald, 1959).

As the donkey was superceded by the motor vehicle as a means of transport in the north of the state, many were released to roam as they liked. They built up into such large herds in some areas that they were declared vermin at Nullagine and Halls Creek in 1949. Other districts later added Feral Donkeys to their list of declared animals. These included Port Hedland, Coolgardie and Dundas in 1953; West Kimberley in 1954; Marble Bar in 1957; and Wyndham and Meekatharra in 1958.

Feral Donkeys were widely distributed in the Kimberley, Pilbara, north west and Goldfields districts of Western Australia in the 1950s and 1960s (Long, 1968). In the Kimberley they ranged from the Northern Territory border to Derby. The greatest concentrations were said to be in the East Kimberley, extending into the Northern Territory. Total numbers are not easy to assess, but in 1957, the population was estimated by field officers of the A.P.B. at 100,000 and in 1960 at 80,000 to 90,000 donkeys. From 1957 to 1972, some 90 — 100,000 were destroyed in shooting drives in this region. Some stations estimated that they had more than 10,000 donkeys within their boundaries and some claimed to have more Feral Donkeys than cattle.

Mobs of up to 500 animals were reported. Distribution in the Pilbara and north west extended from the De Grey River west almost to Onslow and south through the Upper Gascoyne area. It was estimated by A.P.B. officers in 1957 that there were 20,000 donkeys on Bulloo Downs and Prairie Downs; and in 1960 that there were 2,000 on Maroonah station and 2,000 around Mundiwindi. In 1957, 545 were destroyed on Warrawagine station and in 1960, 462 were destroyed in the Port Hedland-Roebourne area. In 1958, some 4,000 were estimated to be in the Savory Creek area east of Mundiwindi.

In the Goldfields, Feral Donkeys were widely distributed in the 1960s from Lake Wells in the north, to Norseman in the south, and west through Bullfinch to Boodarockin. They were reported in the Meekatharra area and on Boolardy station in the Murchison. Generally numbers were small in this region and mobs were widely scattered. In 1960, the Meekatharra Vermin Board reported approximately 3,000 donkeys in the area, and Boolardy station reported a few hundred.

The range of the Feral Donkey in Western Australia appears to have changed little in the last fifteen years. McKnight (1976) estimated the population as 40,000-70,000 donkeys. However, current estimates vary from 75,000 to 1 million. Aerial surveys in the East Kimberley in 1980 showed there was approximately one Feral Donkey for every three cattle along flight transects (Gowland, 1980). Between 1978 and 1981 some 70,000 donkeys were shot by pastoralists and their staff in the East Kimberley. From 1978 on over 150,000 have been destroyed during control programs involving the use of helicopters in the East Kimberley and over 90,000 in the West Kimberley.

The effect of shooting in the Victoria River district has been to reduce the average age of the population rather than to reduce numbers (McCool *et al.*, 1981). Evaluation of the control program involving helicopters indicates that numbers in the shooting areas in the East Kimberley have decreased (Wheeler, 1983) by up to 70% (Wheeler, pers comm., 1985).

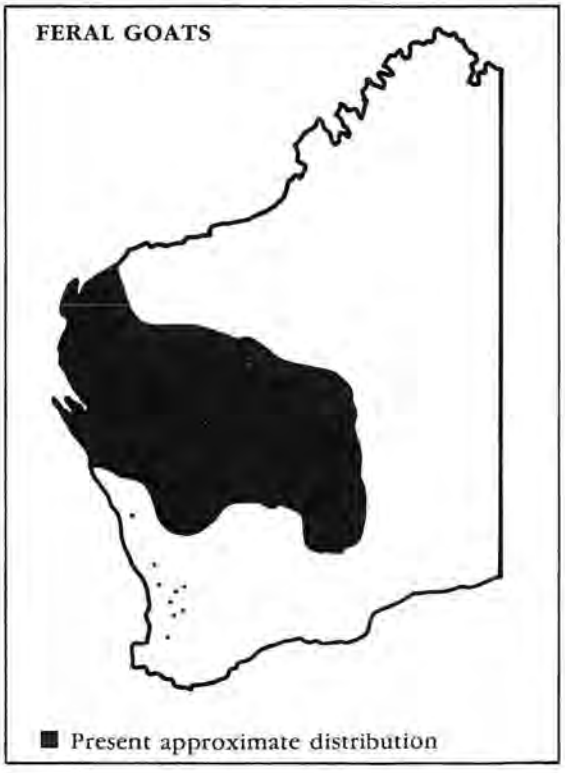
The variation in the colour patterns of the present feral populations of donkeys suggests that the Australian population is made up of a number of breeds (McCool *et al.*, 1981).

FERAL GOAT
Capra hircus

Goats may have been left by whalers and or sealers on some islands off the southern coast long before the first settlement by Europeans at Perth and Albany. In 1841 Eyre describes his meeting with French whalers at Rossiter Bay (east of Esperance) and records he visited an island where the captain kept his livestock including "strange fat-tailed sheep which looked like goats". Goats were present on Mistaken Island in King George Sound, Albany in 1841 (Abbott, 1978 quoting W.N. Clark, "Journal of an Expedition to Nornalup, or the Deep River of the Sealers, in the months of March and April 1841". The *Inquirer* No. 56, 25 Aug.).

Domestic goats were brought to Australia in the early colonial era in the hope of establishing a mohair industry, and to provide milk, butter and meat. They were also used for light haulage work and goat racing (Mallett, 1953). The Victorian Acclimatization Society sold 50 to Arthur Blackwood of Shark Bay about 1870 (Rolls, 1969). In 1834 there were 492 domestic goats in the colony and by 1894 some 4,500 (Battye, 1924).

The Acclimatization Society of Western Australian obtained Angora goats in 1898-99 and these were reported to be breeding in the Zoological Gardens a year later (A.R.A.C., 1898-99; A.R.A.C., 1899-1900), but there are no records of any releases in the wild. Angora goats from South Africa were taken to Faure Island in Shark Bay in the early 1900's and a feral herd existed on that island (Clarke, 1976) until they were recently removed.



In the period 1902-4 Feral Goats were reported to be established throughout the inhabited portion of the state in small numbers (Fraser, 1905). Large flocks were grazed on stations and were eventually dispersed when the mohair industry did not achieve importance (Mallett, 1953). In 1908 many escaped at the Granites (north-east of Wiluna) from Canning's party while they were putting down bores for the stock route.

By 1911 (Despeissis, 1911) flocks of goats were seen in every township in Western Australia north of Port Hedland, at telegraph stations and around most homesteads in the area. Colonies were noted at the De Grey River, Carnot Bay, Beagle Bay and Derby.

Breeding groups escaped or became semi-feral on many stations and were declared vermin in the Upper Gascoyne district in 1928; at Marble Bar and Port Hedland in 1929; Mullewa and Meekatharra in 1954; Bernier and Dorre islands in 1958; and on the Recherche Archipelago in 1959.

Feral Goats were found in the 1960s in the Kimberley, north west, Pilbara and Murchison areas and occasionally in the south west of the state (Long, 1968). They are present on Bernier Island (Ride and Tyndale-Biscoe, 1962; Fraser, 1962) where they have been feral since about 1899 (Burbidge and George, 1978). Between 1959 and 1972 some 450 goats were shot on this island (Anon, 1971) however, five were observed (Robinson *et al.*, 1976) there in 1975. From 1972 to 1974 over 800 were destroyed by the Department of Fisheries and Fauna on Dirk Hartog Island (Burbidge and George, 1978). Efforts being made to eradicate the remaining goats from Bernier Island (Morris, 1984) have been successful and there are now none on that island (Morris pers. comm., 1986).

Goats were reported to be on most stations in the West Kimberley and in some areas of the East Kimberley in the 1950s and 1960s. The population in the Kimberley was estimated by A.P.B. officers at around 10,000 animals and flocks of up to 300 had been sighted near Fitzroy Crossing in 1960. Many were reported to be existing in a semi-feral state particularly in the East Kimberley. There now appear to be few Feral Goats in the Kimberley region.

Distribution in the Pilbara, north-west and Murchison areas was widespread in country with suitable rocky outcrops. Their range extended from the De Grey River in the north through Meekatharra and Wiluna to Menzies in the Eastern Goldfields, throughout the Gascoyne and Murchison areas and to at least Geraldton and Lake Moore in the south.

The majority of Feral Goats appeared to be in the north west and Murchison areas and flocks of several hundred were common. In 1967, 2,200 were slaughtered on Murchison House station within a period of six months. Goats slaughtered for export in 1965 numbered 39,200. This increased to 44,000 in 1966, most from the lower Murchison, fell in 1965-66 to 23,000 from the Mullewa and Yalgoo areas and rose again to 40,000 in 1967. These were exported from Murchison and other areas to south-east Asian countries. In 1968, goats were reported as still numerous in the Murchison district.

Feral Goats have been widespread in the Goldfields for many years. At present about 24,000 are mustered and sent for slaughter from the central Goldfields each year.

In the mid-1970s the Feral Goat population in Western Australia was estimated at 100,000 to 200,000 animals (McKnight, 1976). However, present estimates vary from 300,000 to 700,000 (Henzel, 1981; Johnson, 1985). Since 1972 over 1.5 million goats have been harvested with little noticeable change in their distribution or numbers.

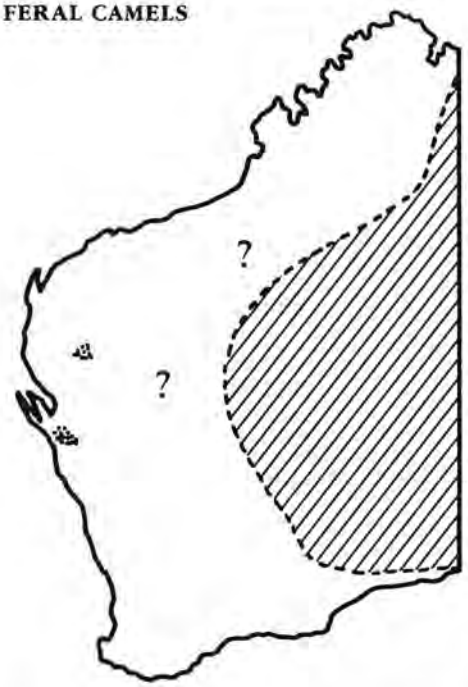
In the south-west, small flocks were recorded near Jarrahdale (17 in catchment area) and Donnybrook (50 at Preston) and on the Recherche Archipelago (40 to 50) in the early 1960s. In 1969, seven goats were seen in the John Forrest National Park near Perth. In 1978 several flocks ranged between the Donnelly and Tone rivers and a flock of 23 existed south of Manjimup.

It has been suggested (Johnson, 1985) that at least 30% of the present Feral Goats in Western Australia could produce reasonable quantities of cashmere. This is not surprising as many of their ancestors were imported for mohair or cashmere. Although such an industry appears to be economically viable at present (Kelly, 1985) will it always be so? The present feral herds are largely the result of an uneconomic industry early this century.

FERAL CAMEL
Camelus dromedarius

The introduction of camels to Western Australia was advocated as early as 1839 (Ogle, 1839). A reward was offered by the Government of Western Australia to any person who would import them in the 1840s (McKnight, 1969). In 1892 there were many camel teams in the Yilgarn and between 1893 and 1896 more than 4,500 camels were introduced for use in the goldfields in Central Australia and Western Australia (Letts, 1964). By 1900, there were 5,000 in use in Western Australia. (*Aust. Encyc.* 1956; Fuller, 1970). Official statistics (Stat. Recs. of W.A. 1890-1930) indicate that the maximum number of 6,500 domestic camels in Western Australia was reached in the early 1920s.

FERAL CAMELS



▨ Probable present range — exact boundaries not known

The first Feral Camels in Western Australia were those which escaped from explorers, or were stolen by natives and later became feral. The Warburton expedition in 1872-3 lost and also abandoned some camels. In 1896 the explorer Mason had three camels stolen from him by natives on the Nullabor Plain.

Camels escaped from an exploring party on the Oakover River in 1896-97 and some escaped from the illfated Wells and Jones when they were too ill to pursue them. In 1894, H.S. Trotman caught a stray camel at Siberia Soak in the Goldfields. There were wild camels on Wilsons Creek at Cutmores Well (N. of Menzies) in 1896.

Deliberate releases of camels occurred in the late 1920s and early 1930s when more modern transport in outlying areas began to take their place. Forty or fifty camels were abandoned by Afghan camel drivers in 1927 in the north west of Western Australia when they could no longer find work for the animals (Barker, 1964). Barker, himself a camel driver, freed 25 in open country near Barramine Station (160 km NE of Marble Bar on the edge of the Great Sandy Desert) in 1929 because they were "unsaleable".

Wandering camels were recorded as damaging the rabbit proof fences in 1908 and at this time were reported to be straying from breeding herds used to provide animals for use on the fence system (A.R.D.A., 1907-08). Also at this time it was suggested that a camel breeding industry in Australia could develop into an important export trade to Asia. By 1911, camels were a feature of Western Australia's north-west landscape (Despeissis, 1911).

Camels were introduced to Australia to assist with exploration and development in arid areas (Letts, 1964) and their value was largely as beasts of burden. Uses included carting supplies (Fuller, 1970), wood carting (Terry, 1936), pulling ploughs (Marten, 1938), the surveying, construction and maintenance of the vermin proof fence system (Despeissis, 1911), water carting in remote areas and the construction of the east-west railway (Fuller, 1970). The Department of Agriculture maintained a camel and horse breeding station at Jigalong, at least until 1930. In 1907 the Public Works Department had 400 camels in teams employed on the rabbit proof fence system (Anon, 1907). Feral Camels are now established in remote areas of the Kimberley, Pilbara, Eastern Goldfields, and in the Wiluna and Meekatharra areas (Long, 1968).

In the Kimberley they are reported only from a strip of country near the Northern Territory border. However, their range extends from there through the Great Sandy Desert to the Pilbara. They were found to be present in all sectors and habitats of the desert in 1977-79 (Burbidge and McKenzie, 1983). Thirty Feral Camels were shot in the East Kimberley in 1965 and some were reported there in 1985.

They are reported in the Pilbara from time to time on outlying stations. On the edge of the pastoral areas, east of Port Hedland, Marble Bar, Nullagine and Mundiwindi they were particularly numerous in 1959-60. In 1960 they were reported at Warralong station and on the Shaw River. During a donkey control program in 1986 at least 120 were destroyed in the Marble Bar — Nullagine area.

Their range extends through the desert country east of these centres to Meekatharra and Wiluna. East of Meekatharra and Wiluna and north of Sandstone, a number of stations have reported camels. In 1960, it was estimated that there were 300 in the Meekatharra area. In the Wiluna area in the same year, a large number of stations reported their presence; numbers varying from a few to hundreds. Distribution is thought to extend to the Eastern Goldfields.

Feral Camels have been reported east of Leonora, Laverton, and Norseman and at Balladonia and Cocklebiddy on the Nullarbor Plain. In 1960 it was estimated that there were 200 animals in herds bet-

ween Balladonia and Zanthus. They were fairly common along the central western and the northern edges of the Nullarbor Plain between 1967 and 1976 (Brooker, 1977). They are still present in many areas of the Goldfields where mobs of 15-20 are reported as common in 1985-86. The highest concentrations occur in areas between Windidda and Lake Wells where mobs of 40-100 have been sighted recently (J. Stevens, pers. comm., 1986).

Feral Camels were declared vermin in the Nullagine and Halls Creek areas in 1949 and in the Laverton and Port Hedland areas in 1959.

About 30 Feral Camels are reported to exist in the country between Tamala and Nerren Nerren stations in the Murchison. About 50-60 are reported from the area around Mt. Phillip in the Gascoyne (L. Ward, pers. comm., 1986).

FERAL PIG
Sus scrofa

Pigs arrived in Australia with the First Fleet and in 1788 there were 49 animals in the colony *(Aust. Encyc.*, 1956). There is no evidence to suggest that pigs existed in Australia before occupation by the white man. Feral animals have originated from escaped domestic stock kept under semi-feral conditions *(Aust. Encyc.*, 1956) or from abandoned animals.

Groups of Feral Pigs have been reported (Pullar, 1950) in Western Australia since 1870. Some were reported from the Darling Range in 1870, Hill station near Broome in 1894-95, the Ord River Valley (exterminated about 1925), Greenough, Gingin and the Avon River (near Beverley). In 1911 (Despeissis, 1911) wild pigs were found on the De Grey River and the Fitzroy River and, in a number of areas such as the Gascoyne River and Beagle Bay, pigs were allowed to roam about without restraint.

The Acclimatization Committee of Western Australia sent "wild boars" for release on M. Smith's property at Cookernup in 1915 (Jenkins, 1977). There may have been other similar events in the same era which have been lost through poor documentation. For instance, it has been suggested that some wild pigs were present as early as 1912 at Mumballup.

Pigs were introduced to Barrow Island at the beginning of the century, but were not present there in the 1960s (Main and Yadav, 1971). Some were recorded on Sir Graham Moore Island in 1978 (Burbidge and McKenzie, 1978) where they are believed to have been first introduced by American servicemen during the Second World War. They later died out, but the island was restocked with pigs by staff from the Kalumburu Mission.

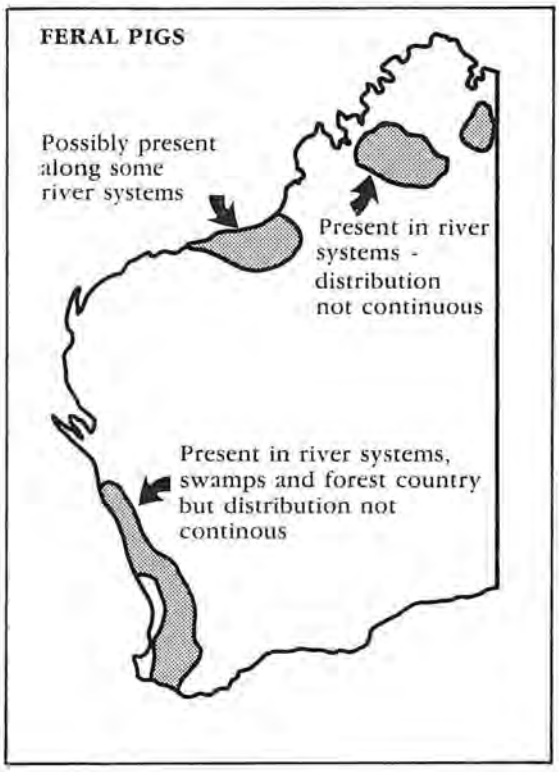
A number of domestic pigs are claimed to have been released by a local butcher in the Lake Preston area in the 1930s because they were returned from the markets unsold. Feral pigs were present in this area until development removed their habitat in the 1950s and 1960s. Masters (1979) suggests that some of the early colonies in the south-west of the state were the results of gradual transition from free-roaming domestic pigs. However, in the light of early deliberate releases, and in more recent times the deliberate release of pigs for shooting, it is suggested that the establishment of many colonies may have been due to deliberate efforts by individuals or groups of people.

Feral Pigs were established in many areas of the Kimberley, Pilbara and north-west, lower Murchison and Geraldton areas and in the south-west of the state in the 1960s (Long, 1968). They inhabited several river systems in the Kimberley between Wyndham and Derby. In 1950 (Pullar, 1950), pigs existed on the Forrest River, Isdell River and Fitzroy River (escaped 1932). These were still present in the 1960s when those along the Fitzroy were said to be increasing in numbers. Pigs were numerous on the Isdell River in 1962 and groups were reported on the Forrest, Drysdale, Charnley, Robinson, Lennard, Fitzroy and Margaret rivers. Generally numbers were small in the Kimberley, but fluctuated locally from scarce to abundant.

In the Pilbara and north-west, small numbers of wild pigs were reported for many years on the De Grey, Shaw and Fortescue rivers. At least 35 were killed along the Ridley River in the East Pilbarra in 1983-84.

Pigs have been recorded along the Murchison River and Bowes River (near Northampton) (Pullar, 1950). In 1960, 30 to 40 animals were reported along the Hutt River and a small herd was sighted in the Nanson area. In 1966, feral pigs were causing damage in the Northampton area but a survey in 1967 failed to locate any large concentrations in this region. However, in 1985-86 all of the river systems west of the North West Coastal Highway were found to have resident Feral Pig populations. Nanson and the whole of the Chapman Valley appear to support small populations at present. A few small isolated populations are present at Mullewa.

In 1950, some existed in the south-west of the State (Pullar, 1950) at Wooroloo Brook, along the Darling Range, in the vicinity of the Serpentine, Brunswick, Harris, Williams and Hotham rivers, and along the south west coast between Mandurah and Bunbury. Since then, reports of damage caused by pigs have come from Waroona, Harvey, Collie, Drakesbrook, Serpentine/Jarrahdale and Dwellingup. In these areas, pigs inhabit the hilly and



swampy country, usually appear only in small numbers and are reported to have increased little in the past 20 years.

Many colonies of Feral Pigs have existed in the Mundaring water catchment area since pre-World War II days. Some lived near Mundaring in 1939 and a number were reported from the Watershed Road area in 1957-58. A colony also existed in the Mornington area before World War II.

In 1965, wild pigs were reported from the foothills of the Darling Scarp in the Swan district but the report was not substantiated. In 1968, a herd of about 20 animals were seen at Swan View and, in 1969, some were present in the John Forrest National Park.

By 1979 pigs had virtually disappeared from the coastal plains in the south-west and there had been some extension in range southwards beyond Collie towards Donnybrook, Bridgetown and Boyup Brook (Masters, 1979). At this time Masters estimated the Feral Pig population in the south-west to be c. 10,000 head. He recorded a density of 2-4 pigs/km^2 at South Dandalup dam and estimated that over their range from Armadale south the density was 1/km^2. The highest concentrations are associated with the major river systems (Anon, 1981).

In the 1960s Albany Highway and Serpentine were regarded by some people as the northern limit of Feral Pig range. However, the early records from the Mundaring area suggest a recent recolonization rather than further spread. They were again present in this area in 1980 and there is no reason why they could not spread both further south and west of the present limits of their range in Western Australia (King, 1985). At present they have been recorded on 191 properties in 20 shires in the south-west. Their present range extends, but is patchy and discontinuous from at least Margaret River, Nannup and Northcliffe north to Northampton.

Feral Pigs still exist in the East and West Kimberley (Bell, pers. comm., 1985) in much the same river systems as in the 1960s. In the East Kimberley they currently occur on the Forest River (Old Ord River) Brook River, Bow River (Turkey Creek), the Bow River — Lake Argyle area, and at Lissadell on the Ord River. Few recent reports come from areas in the north-west and Pilbara. Present estimates of Feral Pig numbers in Western Australian range from 15,000-40,000 (McKnight, 1976), to 500,000 (Tisdell, 1982). Based on information currently on file and Masters (1979) estimates, a figure of between 25,000 and 30,000 head seems reasonable.

FERAL CATTLE
Bos taurus

The first livestock return for the Albany area in 1829 (Stephens, 1962) listed twenty sheep, one goat, but no cattle — they had escaped and were found two years later thriving on the grassy plains of the Hay and Kalgan rivers which were unknown in 1829 (Glover, 1979). In the 1830s many cattle escaped into the bush because of the lack of fences and also because of floods; some died and some became wild (Battye, 1924).

There are many more records of Feral Cattle during the following 150 years. Some were feral on the south coast in 1839 (Ogle, 1839), at Picton in 1842 (Burton and Henn, 1948), at Albany in 1842, at Forest Hill in 1871 (Glover, 1979), and north of Coolgardie in 1894 (Smith, 1966).

Following settlement of the north of the state in the 1860s and 1870s cattle were taken to the East Kimberley by the Duracks in 1883-85 (Despeissis, 1911). Feral Cattle began to appear shortly after this time. Many were left to roam on the Canning Stock Route in 1909 when Shoesmith and Thompson were speared by aborigines whilst bringing the first cattle down the route.

Feral Cattle have been found in the Kimberley, Pilbara, Meekathara, Wiluna and Goldfields areas and in the south-west (Long, 1968).

Herds of up to 30 Feral Cattle were sighted on two sheep stations along the Fitzroy River in the Kimberley in 1956. Cattle were also reported from four stations in the Pilbara in 1960-64 where large mobs apparently existed in 1959. Approximately 500 were estimated to be in the Meekatharra area in 1960, and many were reported to be in the Carnegie area east of Wiluna. Some cattle were also reported to be in areas north of Kalgoorlie in 1960.

In the south-west, cattle have been reported around Oldfield-Munglinup (113 km west of Esperance), at Heinsman Rock (100 km north of Mount Arid, Esperance area), and in coastal areas near Walpole in 1960. North of Perth they were reported in coastal areas near Moora, between Hill River and Green Islet and north of Mullewa. Generally numbers are few, but occasionally 40 or more cattle are seen in a herd.

There are few recent records of Feral Cattle in Western Australia. The most recent records are that of some noted at Wulumara Hill on the upper Roe River (in northern Western Australia) (Miles and Burbidge, 1975) and a few which may be present (1986) in Kalbarri National Park (Ward, pers. comm.).

FERAL HORSE
Equus caballus

References to wild horses date back to the first settlements by Europeans in Western Australia. There have been suggestions that they may pre-date the early settlers. According to a popular early tradition (Anon, 1906) the brumby or feral bush pony in Western Australia is descended from a few horses which were cast ashore from a vessel which was wrecked when rounding Cape Leeuwin : "they stood about 13-15 hands and were frequently used by miners, bushmen, and prospectors".

Early records of feral or wild horses include:- Wollaston mentions horses running wild at Port Leschenault (Picton area) in 1841 and in the Collie (river) area in 1843 (Burton and Henn, 1948); at Albany in 1848 (Henn, 1955), at Victoria Plains in 1846 and in 1876-77 (Erickson, 1971), and in the Plantagenet Shire in 1871 (Glover, 1979). John Forrest left horses in the Musgrave Range, in the Mann Ranges, and at other places further east on his exploratory trip from Chapman Bay to Oodnadatta in 1874. In 1905 Feral Horses were present 48 km north of Perth in the Wanneroo Caves area (W.A. Year Book, 1905). Between 1908 and 1914 large mobs were in the Bolgart and New Norcia areas — these disappeared as the land was fenced and the country cleared (Erickson, 1971).

Wild horses were numerous on stations in the East Kimberley adjacent to the Northern Territory border in 1959. In the 1960s in the pastoral areas they were reported on many stations from Nullagine in the north to Esperance in the south. The largest area of distribution appeared to be from Juna Downs and Mt. Vernon in the west, to the Canning Stock Route. There were an estimated 4,000-5,000 wild horses in this area in 1960. Also in 1960, the following estimates of wild horse numbers were given by Shire Councils:- Meekatharra 500, Leonora a few, Shark Bay 150-200, Upper Gascoyne a few, Sandstone a few, Norseman 200-300 and the Wiluna area various reports from a few at Granite Peak to 500 near Carnegie. Many Feral Horses were recently removed from Hammersley Range National Park.

In the south-west, Feral Horses were reported in 1960 from coastal areas near Esperance including Cape Le Grande, Pink Lake and Fleming Grove.

In 1960, 100 horses were estimated to be in coastal areas between the Moore River, Cockleshell Gully, Green Head, and Eneabba. At Eneabba (300 km N of Perth) it was claimed there were 300 in c. 1962 (Gill, 1977). Gill reported that they were the progeny of horses let loose on the Carnarvon-Perth stock route in earlier times. In 1977 residents rounded up five of the remaining 8 to keep in captivity during a drought. They were to be released again later.

In the lower south-west horses have been reported from the western portions of the Brookton and Pingelly shires, north of Wandering, in the Boddington shire, north-east of Collie, at Tone River south-east of Boyup Brook and between the Donnelly River and Yornup. Numbers are small and up to six at a time have been sighted at Collie. In 1969 some were seen in the coastal area south of Jerramungup.

Species which may be established or become feral occasionally

BLACKBUCK
Antilope cervicapra

The date of the first liberation of Indian Blackbuck or antelope in Western Australia is not reliably known. Bentley (1967) suggests late last century, Allison (1969) about 1900, and Jenkins (1977) as late as 1912. Acclimatization Committee records suggest that a Mr Grant had started a herd of deer (presumably blackbuck, but not specifically mentioned) at Newmarracarra by 1902-03 (A.R.A.C., 1902-03). Blackbuck were selected for introduction to dry country "to which they quickly become adapted" (Le Souef, 1912).

Jenkins (1977) records that in 1912 a pair were sent to Dinninup and 3 pairs to Newmarracarra. More were apparently sent to Geraldton in 1913 and others to Roelands and Wiluna. They were reported to be thriving at Wiluna in 1915 (Jenkins, 1977).

In 1920 (Kingsmill, 1920), Blackbuck were reported to have established themselves in Murchison country, and a small but steadily increasing herd was frequently seen near Wiluna. In 1929, it was reported (Colebatch, 1929) that blackbuck released 480 km north of Perth had become so well established that they required thinning out to prevent them from becoming agricultural pests. They were still present on Newmarracarra after the second World War (Bentley, 1967) when a population of 100-150 animals was reported (Allison, 1969 and 1970).

Blackbuck were kept at Newmarracarra and Coolyala stations about 1960 (Tomlinson, 1965) and protected by the managers of these properties. This population was strictly confined and many were said to have been killed by poisoned oats used for rabbit control. They were decreasing in numbers and were in danger of being wiped out. In 1970 a population of 30 was reported at Kojarena (J. Roberts, pers. comm., 1970).

In 1976, 12-15 Blackbuck were noted by an APB district officer (D. Chant) at Scabby Station Gully at Kojarena. An unconfirmed report from a pilot engaged in aerial mustering of stock in the area suggested that there were about 100 head. P. Martin sighted 7 in 1982 and a single animal in 1983, and in the same year an "abandoned" fawn was kept by R. Maslin on his property until it later died (Melville, pers. comm., 1986). Since this time few Blackbuck have been seen or reliably reported. It is thought that drought conditions and unauthorised shooting in the last three years have severely reduced their numbers, so much so, that it is doubtful if many remain in the area.

FERRET
Mustela putorius furo

Ferrets were introduced into Australia to help reduce rabbit populations. They were widely introduced in Western Australia for rabbit control and were often used in the early 1920s and 1930s (Craig, 1925; Anon, 1967) by rabbit shooters.

Some occasionally escaped from rabbiters and from time to time are found living in the wild. One was reported in the Cunderdin area (130 km E. of Perth) in the late 1950s, and, in the late 1960s, a small colony was found established near commercial poultry yards at Wanneroo (Perth suburb).

A ferret skull was found at Black Rock in the Yarloop area in 1967. Single animals were found at Claremont and Harvey in 1977 (A. Chapman, pers. comm.), a single animal just south of Dunsborough in early 1979 (C.E. Hadley, pers. comm.) and a single ferret was captured at Wanneroo in 1981 (A. Burbidge, pers. comm). It is not usually known how long these ferrets have been living in the wild and there appears to be no record of them breeding in the wild in Western Australia.

FERAL DOG
Canis familiaris familiaris

It has been suggested that "there is always a steady drift of domestic dogs going wild to swell the ranks of dingoes in W.A." (Tomlinson, 1955). The extent to which the two cross breed in nature in Western Australia is not reliably known, but they will mate and produce fertile hybrids in captivity.

Feral Dogs have been reported as preying on domestic stock particularly sheep in Western Australia at least since 1916 (A.R.D.A., 1915-16). They frequently cause concern in areas north and south of Perth and in the outer metropolitan area and at many country centres. In the late 1950s a number were reported killing sheep in the Wattle Grove-Forrestfield area and in 1969 were reported to be killing sheep in the Kelmscott area.

Feral Dogs have continued in the last 15 years to cause problems for sheep farmers in Western Australia. The problem is generally worse adjacent to the larger cities and towns where abandoned or wandering dogs form roving bands. Some of the more recent examples include those at Coolgardie, where as many as 40 sheep were killed by such a band, at Busselton, and in the outer metropolitan area.

WATER BUFFALO
Bubalus bubalis

Water Buffalo were brought to Australia between 1824 and 1886 (Letts, 1964; Tulloch, 1969). When the settlement at Port Essington in the Northern Territory was abandoned in 1849 buffalo were apparently left behind. Progeny from these animals are now spread over the sub-coastal plains and adjacent areas of the Northern Territory (Tulloch, 1969). Some occasionally cross the border into Western Australia. They have been reported in the north-east Kimberley north of latitude 16 deg. S. Odd bulls have been recorded as far west as Broome (Letts *et al.*, 1979).

In 1958, one was sighted near Fossil Downs station and in March, 1970 two were reported from Meda station in the West Kimberley. In 1982, 10 were sighted in the West Kimberley and Broome shires. Three were sighted, of which two were shot, in the West Kimberley area in 1986. Sightings are rare and the animal has not become permanently established in the area.

FERAL SHEEP
Ovis aries

Sheep occasionally become feral near pastoral leases. They do not usually survive in the wild for any length of time. There have been a few reports of self-maintaining flocks of Feral Sheep in Western Australia including a record quoted by McKnight (1976). He quotes a report ("Flock of Wild Sheep for Research" The *Bulletin* 86:73, 1964) that a small flock of wild sheep had existed in the East Kimberley for nearly four decades. These were thought to be the remnants of a flock of 300 which were released in the 1920s. However, there are some doubts as to whether these animals were present continuously for the period stated. They no longer appear to exist.

Feral Sheep are thought to be present in the Kalbarri National Park, where there may be as many as 50-60 head. At White Cliffs in the Northampton Shire Feral Sheep (originally escaped from local farms) have possibly been present for more than forty years. Their numbers appeared to be maintained by breeding in the wild, but most were removed from the area several years ago.

Species which have failed to become established

BROWN HARE
Lepus capensis

The Government was urged in 1898 by farmers attending the 6th Annual Conference of Producers to "again be impressed with the dangers attendant upon the introduction of hares" (Lindley-Cohen, 1898(c)). Seven Brown Hares were sent to Western Australia in c. 1874 (Proc. Zool. Acclim. Soc., Vic., 1874 : 35), but there are no further records of them. Four were imported by the Western Australian Acclimatization Committee in 1896, but were not released due to protests by the Bureau of Agriculture and Commerce (A.R.A.C., 1897).

The importation of twenty hares was approved in 1902, but it is not known whether this project proceeded. Some hares may have been released unsuccessfully on Rottnest Island in c. 1900 (Jenkins, 1977). Brown Hares are not established in this state although they are widely established in the eastern states of Australia where they were released in Victoria in 1862.

In 1984 a number of hares were confiscated after their discovery in captivity near Toodyay. Another two were destroyed at Muchea. Both groups had been given to their owners and it is possible that others exist in captivity in Western Australia (An. Rep. A.P.B., 1985).

RED DEER
Cervus elaphus

Efforts to obtain Red Deer for release in Western Australia were made in 1897-98 (A.R.A.C., 1897-98). Some were presented to the Acclimatization Society by Queen Victoria shortly after this date and arrangements to release them in the south-west were being made in 1898-99 (A.R.A.C., 1898-99).

Two Red Deer were released at Cape Leeuwin in 1899 and were reported a year later to be thriving (A.R.A.C., 1899-1900). They were occasionally observed by the lighthouse keepers at the Cape (A.R.A.C., 1900-1901) and were later said to be breeding there (Le Souef, 1912). It is likely, although evidence is lacking, that a small herd built up in this area. Bentley (1967) suggests that the Red Deer were declining at Cape Leeuwin between 1924 and 1930 although Kingsmill (1920) indicates that they had failed before 1920.

Other introductions of Red Deer also occurred in this state. It was noted that E.A. Le Souef on behalf of the Acclimatization Committee had introduced them into forests of the south-west (Fraser, 1903) by 1900-1901. In 1902-03 it was reported that private herds had been established by E. Edgar at Gingin and that A.E. Morgan had the nucleus of a herd on a property in the Porongorups (A.R.A.C., 1902-03). As well as at Cape Leeuwin, releases of red deer may also have occurred near Albany, and in an unoccupied tract of land between Pinjarra and Rockingham (Kingsmill, 1920). In 1903-06 several varieties of deer were transported to the Porongorups (Bentley, 1967). According to Allison (1969) Newmarracarra (near Geraldton) ran Red Deer and other species in the early 1900s. Those released at Albany failed before 1920 (Kingsmill, 1920), but introductions at Pinjarra were successful for many years.

Red Deer from Werribee Park in Victoria were released at Pinjarra on the property (Creaton) of Mr. D. Paterson who initially cared for three fawns belonging to the Western Australian Acclimatization Committee. The exact date of the first introduction is not known, but appears to have been about 1900. Others were later released, probably in the same area, in 1908 (Kingsmill, 1920) and in 1915 (Bentley, 1967). Four were released there in 1903 and the population numbered some 30 head by 1912 (Le Souef, 1912). In 1905 a Mr. Maxwell complained to the Lands Department that deer had damaged his potato crop (Jenkins, 1977).

Details of the Pinjarra herd or herds are sparse. The deer are said to have ranged over an area between the Dandalup and the Murray rivers : some were shot on the properties of Messrs, McLarty and Paterson in 1912 and 1916 (Bentley, 1967; Jenkins, 1977). There may have been 150 head present in the area c. 1920 (Kingsmill, 1920; Allison, 1969). In the early 1920s there were said to be 50 or 60 deer in the Yangedi Swamp area, south of Serpentine (Roberts, 1980). After 1916 the deer in the Pinjarra area are said to have declined although Colebatch (1929) reports it was "necessary to destroy many as they came into cultivated land". However, he more than likely was referring to the shooting in 1912-16. The reasons for the decline in numbers is not known, but certainly some Red Deer persisted in the area until the late 1950s. The last definite record of one in the area was that of a stag shot at North Dandalup in 1959. Red Deer are still reported occasionally, but are doubtfully present in the area.

FALLOW DEER
Cervus dama

Fallow Deer were presented to the State at the same time as red deer. They were kept in the Zoological Gardens, South Perth, and their progeny, a pair, were liberated (Le Souef, 1912) in the Cape Leeuwin area in 1899 (A.R.A.C., 1898-99; A.R.A.C., 1899-1900). Apparently three or four liberations may have occurred at Cape Leeuwin (Bentley, 1957)

and in 1914-18 they were said to be still thriving in the area. Fallow Deer were also liberated at Gingin but died out (Allison, 1969).

There appear to be no further records of these deer except for reports in 1929 (Colebatch, 1929) and in 1956 (Glauert, 1956) that they had met with little success.

HOG DEER
Cervus porcinus

The Western Australian Acclimatization Committee received several Hog Deer of unknown origin in c. 1895. These were apparently released into swampy country in which they thrive (Allison, 1969; Le Souef, 1912). The annual report of the society (A.R.A.C., 1902-03) records the release and Fraser (1903) indicates that they had been released by 1900-1901. Bentley (1967) records that a pair were liberated at Cape Leeuwin with other deer species in 1899. Hog deer may have been included amongst several varieties transported to and released in the Porongorups at a later date. Before World War II they were reported to be established in the Mundaring water catchment area off Watershed Road. In 1956 Hog Deer were reported to have been unsuccessful in establishing themselves in Western Australia (Glauert, 1956).

SAMBAR DEER
Cervus unicolor

Sambar Deer are reported (Bentley, 1957) to have been released in Western Australia, but there appear to be few records of where or when. None are now established in the wild.

Rusa Deer *(C.u. timoriensis)* were liberated by the Acclimatization Society (A.R.A.C., 1902-03) but apparently had little success (Glauert, 1956). A pair were liberated at Cape Leeuwin in 1899 (Bentley, 1967), possibly thrived for a while but then died.

DEER
(unspecified species)

Deer of several species are known to have been released in the Porongorup Range about 1900. According to Glover (1979) the last of these was shot in the Porongorups area in 1911 when it became "aggressive".

An unspecified pair of deer were imported on the "Grace Darling" which operated in the 1890s between Singapore and Esperance (Rintoul, 1964). They were taken and released on one of the islands in the Recherche Archipelago. There are no further records of them.

ELAND
Taurotragus spp.

A pair of Eland were presented to the Acclimatization Committee at the instance of His Excellency the Governor, Sir G. Strickland, by the Duke of Bedford (Le Souef, 1912). These were kept in the Zoological Gardens, South Perth, and the young were to be used for acclimatization.

Some were apparently released as, in 1929, Elands were said to have failed because of native poison plants (Colebatch, 1929). In 1956 (Glauert, 1956) those released in earlier years were again reported to have met with little success.

AFRICAN BUFFALO
Syncerus caffer

African Buffalo were possibly introduced to Western Australia (Allison, 1969 & 1970) apparently about 1900 but died out.

ZEBRA
Equus sp.

Zebra are reported to have been introduced into Western Australia in about 1900, but died out (Allison, 1969 & 1970). A single animal is reported to have escaped from a circus truck which had broken down on the Nullarbor Plains in c. 1932. No Zebras have ever been found or noted wild in this state.

VICUNA
Vicugna vicugna

LLAMA
Llama peruana

GUANACO
Llama guanaco

The introduction of llamas into Western Australia was recommended as early as 1839 (Ogle, 1839). The Acclimatization Committee obtained a single male in 1898-99 and it was said at the time that the introduction of such an animal would be useful in arid areas as a source of food and wool.

A female Guanaco also obtained by the Acclimatization Committee was held at the Zoological Gardens in 1898-99. It seems doubtful from the records available that any of these species were released in the wild in this state.

COUGAR
Felis concolor

It has been reported (in press) that Cougars were introduced into Western Australia and became established in the south-west of the state.

The most persistent theory is that United States sailors (or servicemen) brought four Cougar kittens to Western Australia during the 1939-45 war (Pash, 1979). I. Flugge saw one at an American military camp in Perth in 1945 (Anon., 1981). The animals, it is reported, grew too big for captivity and so two were released at Fremantle and two at Bunbury (Pash, 1979). However, there is no evidence to support the theory.

Animals said to resemble Cougars were reported from the Duranillin area in the late 1970s (McGeough, 1979). In two years they are said to have killed over 1,000 sheep in this area. Here the Cougars are reported to have escaped from a circus involved in an accident between Bridgetown and Nannup in c. 1961.

In 1981 a twenty thousand dollar reward was offered for the capture dead or alive of a Cougar (Anon., 1981). During two years of investigations Agriculture Protection Board officers failed to find any evidence to support the allegation that they had been introduced or that Cougars were present in the south-west of Western Australia (Zekulich, 1979).

PLATYPUS
Ornithorhynchus anatinus

The Platypus was introduced to Western Australia in 1940 when a male and a female were released (Grant and Fanning, 1984) at an unknown location.

Two reports of Platypus sightings, at West Pingelly and West Dale, occurred about 1967, but neither sighting was confirmed (Anon, 1967).

Grant and Fanning (1984) indicate that those released in Western Australia failed to survive.

Reintroduction of native mammals

BANDED HARE WALLABY
Lagostrophus fasciatus

Banded Hare Wallabies captured on Dorre Island in 1974 were transferred to enclosures on Dirk Hartog Island as the first stage in an attempt to re-establish them on the island. By 1976 this population (4 males and 7 females) had increased to 35 individuals. In 1977, six were released into a four hectare experimental enclosure near the south end of the island which was opened in 1978 and the animals allowed out (Burbidge and George, 1978; Anon, 1979).

TAMMAR
Macropus eugenii

Tammar Wallabies were released on North Island, Houtman Abrohlos between 1913 and 1945, but failed to become permanently established (Storr, 1960).

GREY KANGAROO
Macropus fuliginosus

Grey Kangaroos were probably recently introduced to Woody Island in the Recherche Archipelago where a pair were sighted in 1976 (Goodsell *et al.*, 1976) and where at least one adult and one joey were noted in 1978 (Abbott and Black, 1978).

WOYLIE
Bettongia penicillata

Fifty two Woylies were released in the north of the Perup Forestry Protection Area in October 1977, but after several months they had all disappeared (Christensen, 1980). Twenty woylies from Manjimup were released in 1982 in a reserve near Collie to re-establish the species in that area. They were established and breeding in this locality in 1984.

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