Department of Environment and Conservation
Our environment, our future

Pest notes

Preventing and controlling damage by pest animals in Western Australia

Corellas and other flocking cockatoos

Corellas, galahs and other cockatoos can be destructive because of their flocking nature and their habit of chewing for bill miantenance. The majority of corellas and galahs in the Perth area and regional towns of south-west Western Australia are introduced from the eastern states.

The key to minimising damage by corellas and other cockatoos is to understand their behaviour patterns. Damage can be minimised with good planning, monitoring and crop management in co-operation with neighbours. Effective damage control techniques include scaring, shooting, trapping, exclusion, minimising residual grain and possibly providing decoy foods.

Photo: © Tamra Chapman / DEC.

Identification and distribution – species native to Western Australia

Galah

The galah *(Cacatua roseicapill)a* is 24-40cm in length and 227-380g in weight (Higgins 1999). It is a small pink and grey cockatoo (Figure 1) and the sexes look alike, but the eyes of the male are dark brown, while those of the female are pinkish red.

Birds originating from the western parts of Australia, *C. r. assimilis*, are slightly larger with a darker pink crest, paler underparts, and pale grey or white eye-ring (Morcombe 2000). Birds originating from north / east of Australia, *C. r. roseicapilla*, have a light crown and crest, and a red eye-ring (Morcombe 2000).

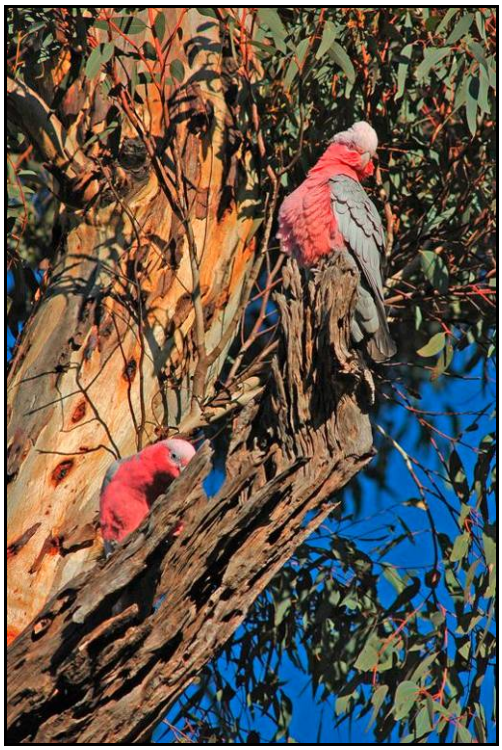


Figure 1 Comparison of galahs: Western *C. r. assimilis* (left) and North / East *C. r. roseicapilla* (right) subspecies (Photo Tony Kirkby WA Museum).

Immature birds are duller in colour, their breasts and crowns are a mixture of pink and grey feathers and their eyes are brown (Johnstone and Storr 1998). The juveniles beg for food from their parents using a continuous rasping cry (Morcombe 2000).

The clearing of the wheatbelt for pasture and cereal crops, and the establishment of permanent watering points, has allowed the western subspecies to expand its range throughout the south-west.

After the Second World War, intensive cropping resulted in the movement of the galah population into the south of the State. The Western Australian subspecies of Galah *C. r. assimilis* is now found as far south as Ongerup, Ravensthorpe and Albany (Figure 2). The eastern states subspecies also continues to spread south of Perth, where the keeping of horses and livestock (which are often fed grain), has provided the birds with a reliable source of food.

Galahs are now common in many Perth suburbs, due in part to the escape and release of aviary birds. The birds in the metropolitan area appear to be almost exclusively from eastern Australian origin.

These birds, of various subspecies from around the country, could pose a threat to the western subspecies through interbreeding.

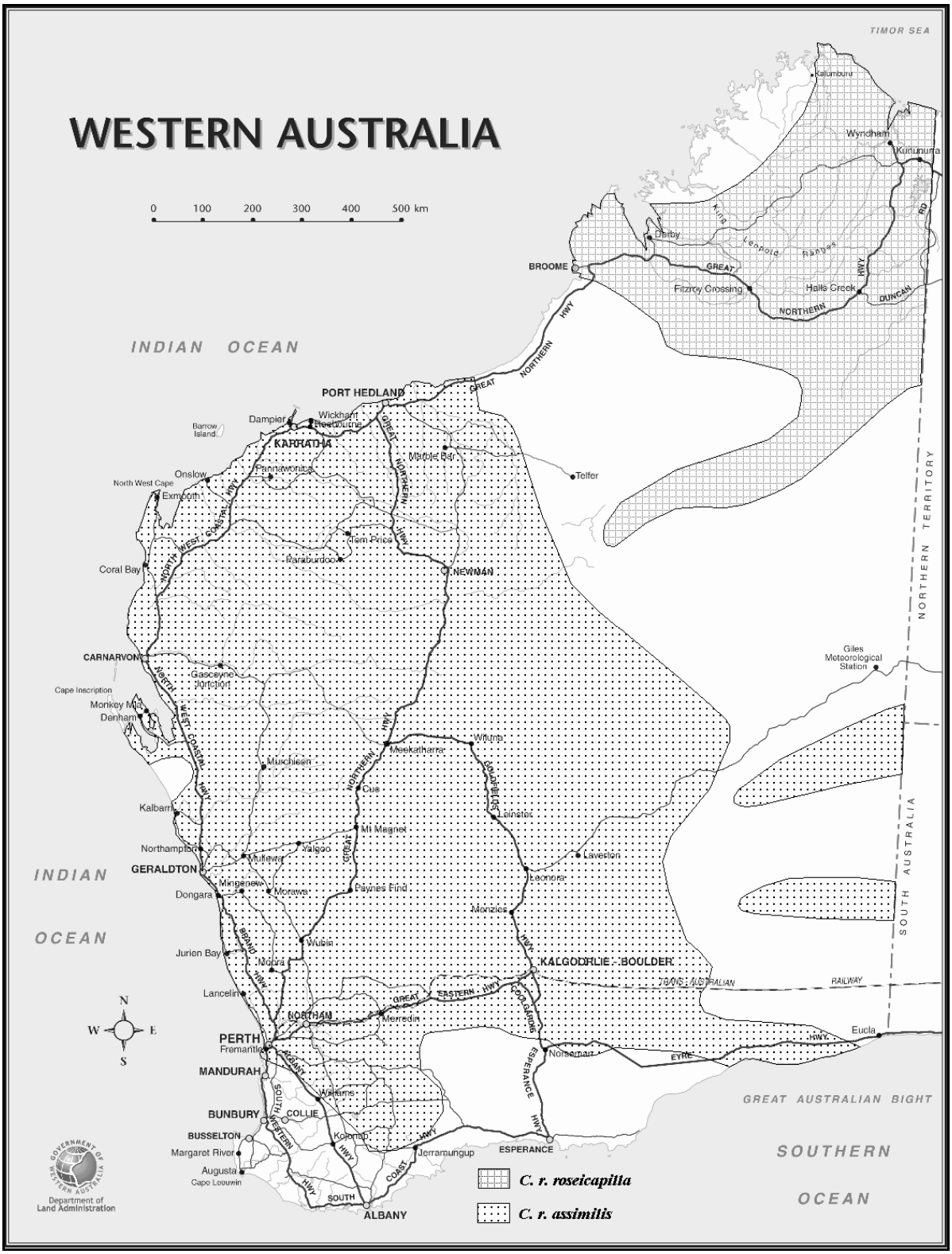


Figure 1 Distribution of the galah: northern subspecies *C. r. roseicapilla*; and southern subspecies *C. r. assimilis* in Western Australia (Adapted from Johnstone and Storr (1998)).

Western corellas

Muir's corella

Muir's corella (*Cacatua pastinator pastinator)* is 43-48 cm in length and 560-815 g in weight (Johnstone and Storr 1998). A medium sized, stocky cockatoo, Muir's corella has broad rounded wings, a short tail and a crest that is usually flattened (Higgins 1999). It has a dark brown iris and bluish-grey bare skin around the eye (Johnstone and Storr 1998). This eye skin is larger below, than above, the eye (Higgins 1999). The bill is a dull greyish white and the upper mandible has a long tip. The legs are dark grey and the underparts are often stained or dirty as a result of feeding on the ground and digging (Johnstone and Storr 1998; Higgins 1999).

Adults are white with an orange-yellow wash on the lores and over the bill (Higgins 1999). The underparts of the tail and wings are sulphur yellow and the feathers of the head, neck and breast are orange on the base, but this is only visible when preening or when the feathers are ruffled by the wind (Johnstone and Storr 1998; Higgins 1999). No seasonal variation occurs in adults and the sexes are alike (Johnstone and Storr 1998; Higgins 1999).

Juveniles are distinguished from adults by a smooth (not flaky) bill and a faint yellow wash over the ear-coverts, upperbody and underbody (Higgins 1999). Under close view, the upper mandible is shorter and the eye skin is paler blue and flatter under the eye in juveniles than in adults (Higgins 1999).

When the Swan Coastal Plain was first settled by Europeans in 1829, one native species occurred in the area. Muir's corella was found in small widely separated colonies along the flood plain of the Swan, Helena and Avon Rivers (Johnstone and Storr 1998).

Shortly after agricultural crops were established to support the newly established colony, Muir's corella began to become a pest of crops. The corellas were subsequently shot and poisoned and were eliminated from the river systems of the Swan Coastal Plain.

Figure 3 Muir's corella (Cacatua pastinator pastinator) (Photo Tony Kirkby / WA Museum).

Muir's corella is now confined to a small region from Boyup Brook, McAlinden and Qualeup, south to Lake Muir and the lower Perup River, and east to Frankland and Rocky Gully (Figure 4; Massam and Long 1992; Johnstone and Storr 1998).

Butler's corella

Butler's corella (*Cacatua pastinator butleri)* is much like Muir's corella in plumage (Figure 3 and Figure 5), but is significantly smaller, lighter and the bill is slightly shorter (Figure 8). At present, the distributions of these two species do not overlap (Figure 4), but they may overlap in the future, because the distribution of Butler's corella is spreading south and that of Muir's corella is spreading east.

Butler's corella occurs in the northern wheatbelt of Western Australia (Figure 4; Johnstone and Storr 1998; Bomford and Sinclair 2002). It was previously confined to the area south of Dongara east to Mingenew and Morawa, south to the lower Hill River, Badgingarra, upper Moore River, Victoria Plains, Wongan Hills and Koorda (Johnstone and Storr 1998).

Figure 5 Butler's corella (Cacatua pastinator butleri) (Photo Tony Kirkby / WA Museum).

Over the past 150 years of cropping activities in the Perth and wheatbelt areas, Butler's corella has expanded its range considerably. Since about 1995, reports have been increasing in the central wheatbelt south to Northam and Yoting and around the fringes of the metropolitan area (Johnstone and Storr 1998). This southward spread has the potential to affect the genetic integrity of Muir's corella (a threatened species) through inter-breeding (DEC 2007).

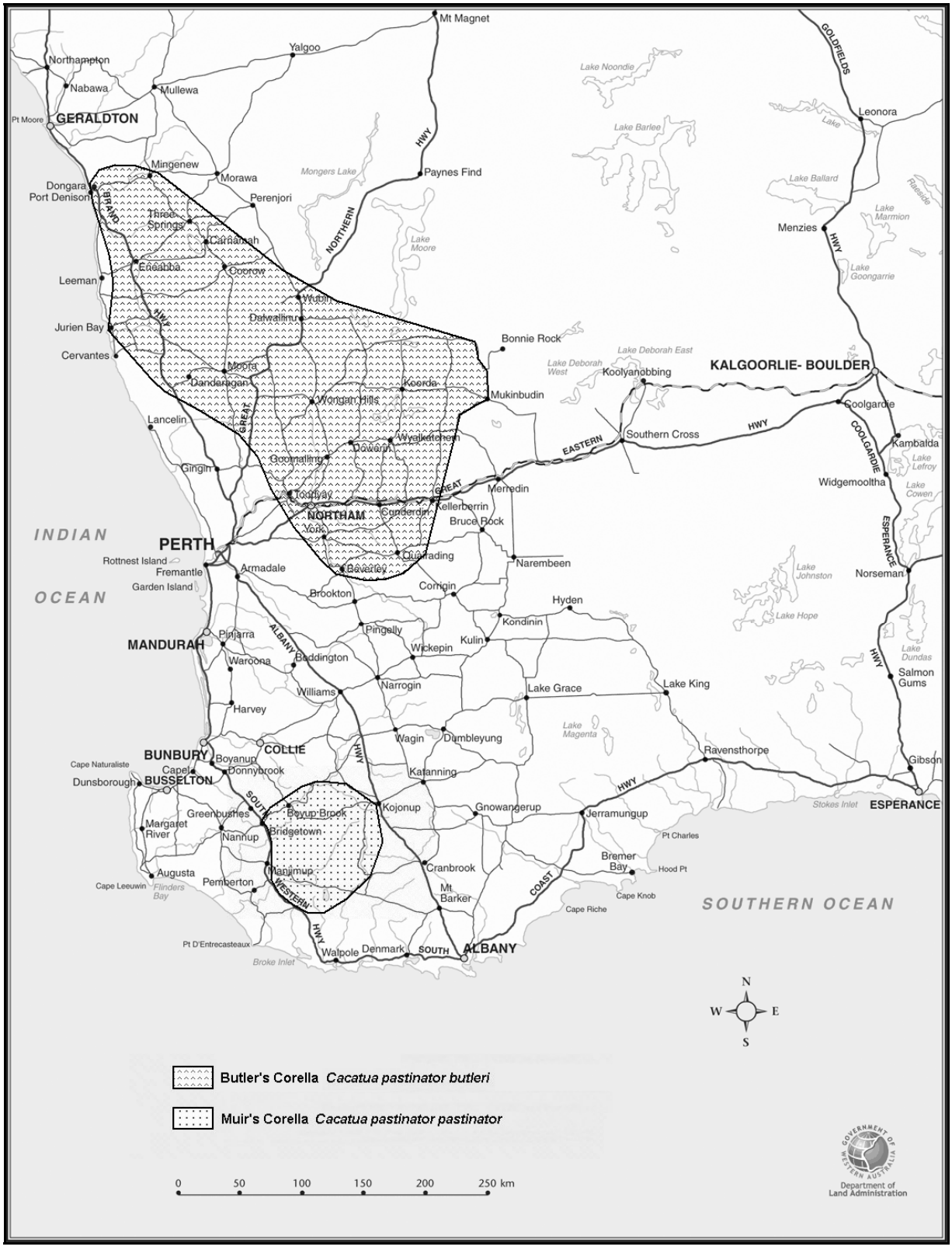


Figure 2 Distribution of Muir's corella (*Cacatua pastinator pastinator)* and Butler's corella (*Cacatua pastinator butleri)* based on information taken from Johnstone and Storr (1998)).

Identification and distribution – species introduced into Western Australia

The following species, which are native to Australia, but not native to Western Australia, have become established and expanded their range through parts of the Perth metropolitan area and regional towns in the past 20 years:

- Long-billed corella (*Cacatua tenuirostiris)*
- Little corella (*Cacatua sanguinea gymnopi)*
- Galah (*Cacatua roseicapilla roseicapilla)*
- Sulphur-crested cockatoo (*Cacatua galerita galerita)*

The eastern long-billed corella (*Cacatua tenuirostiris)* is characterised by a very long curved bill, short rounded crest and obvious crimson-pink feather bases that form a patchy throat bar (Figure 6, Figure 8). The Little Corella has a short bill, medium crest and no pink colouring on the throat (Figure 6 and Figure 8).

Muir's Corella may be confused with the little corella, but Muir's corella has a taller crest, its bill is longer and more curved and it has larger eye-skin (Figure 8). Muir's corella also has crimson-pink on the feather bases of the throat but these are semi-concealed, and thus not as obvious (Figure 8).

The Sulphur-crested cockatoo is very distinctive and is well known as a white cockatoo with a large forward curving deep yellow crest and black bill (Figure 7). The subspecies *cacatua galerita fitzroyi* is naturally occurring in the Kimberley, north of the Fitzroy River and on off-shore islands (Johnstone and Storr 1998).

Figure 6 Comparison of the little corella *Cacatua sanguinea gymnopis* (above) and eastern long-billed corella *Cacatua tenuirostiris* (below) (photo: ABC 720 Perth).

The southern subspecies of the Sulphur-crested cockatoo *Cacatua galerita galerita* originates from eastern Australia, including Tasmania. Feral populations occur in the eastern zone of the Swan Coastal Plain and in the northern Darling Range (Johnstone and Storr 1998). Populations of these species originated from aviary escapes or deliberate releases and have now established breeding populations.

Birds Australia WA, a community based conservation group, has conducted annual counts of corella populations in Perth since 1998 (Blyth 2004). A summary of the estimated number in the Perth area is shown in Table 1. In the six years between 1998 and 2004, the total population increased by 300 per cent from around 1,000 to around 3,000 (Table 1).

Figure 7 Sulphur-crested Cockatoo *Cacatua galerita galerita* (Photo: DA Trounson/Nature Focus © Australian Museum).

The little corella population in south-west Western Australia is beginning to increase exponentially (Table 1). The smaller populations of the eastern long-billed corella and sulphur-crested cockatoo do not appear to have expanded as rapidly. The numbers of eastern Australian galahs are also considerable and increasing, but of less immediate concern, as they do not have the same range of potential damage impacts as the corellas.

There are no population estimates for introduced galahs or ssulphur-crested cockatoos in south-west Western Australia at present. Anecdotal reports indicate that both the numbers and the range over which sightings occur are increasing.

Table 1 Summary of corella counts for Perth metropolitan area by Birds Australia WA.

Year	Little Corella	Long Billed Corella	Western Corella	Est. total
1998	~ 820	~ 140	-	960
1999	1,385-1,580	577-627	7	2,000
2000	939-1,451	250-374	-	1,400
2001	1,072-1,304	430-785	-	1,800
2002	1,740-2,395	781-902	5	2,700
2003	1,100-1,775	340-500	-	1,800
2004	2,270-2,445	530-800	~ 46	3,000

Biology and Habits

Corellas and other flocking cockatoos are opportunistic in terms of their use of food resources. For example, during spring they typically feed on grass seeds and bulbs in paddocks or other grassed areas (Johnstone and Storr 1998). During summer they congregate in large numbers to feed in paddocks where stubble remains following harvest. From late summer to autumn, they take grain from around stock feed troughs, animal dung and areas where stock is provided with hay.

All these cockatoo species nest in tree hollows lined with decayed woody fragments, although cavities in cliffs and termite mounds may also be used (Johnstone and Storr 1998). Two or three (occasionally four) eggs are laid from July to October and two clutches may be laid per year if conditions are favourable. The incubation period is 20 – 26 days, with the parents sharing the incubation duties and care of the young. Nestlings remain in the hollow for about 7 weeks. After fledging, the young birds and their parents join a large nomadic foraging flock (Johnstone and Storr 1998). Breeding birds are quiet in comparison to summer flocks and thus may go potentially undetected in the absence of intentional surveys.

Damage

Nuisance

The Department of Environment and Conservation (DEC) receives numerous and ongoing complaints from people objecting to the noise that flocks of introduced Corellas make when attracted to feeding sites. Similarly, large number of birds that congregate at day and night roost sites can cause a nuisance in the form of noise. These nuisance and inconvenience problems have accelerated in suburban and semi-rural areas in the past ten years, as introduced corella populations have grown.

Some of the nuisance problems caused by these cockatoos originate from people deliberately feeding the birds. DEC takes steps to discourage people from feeding the introduced birds, particularly in residential areas, but often there is no clear legal mechanism to prevent such an activity, unless local governments have specific by-laws in place.

While the nuisance complaints are often thought of as trivial in the broader community, people can suffer real and significant loss of the amenity of their homes and recreation areas as a result of the presence of introduced corellas and other cockatoos.

Fouling

Large flocks of corellas and other flocking cockatoos can foul trees, washing on the clothes line, business stock, recreational areas and vehicles with droppings (DEH 2007).

Health and public amenity

Flocking cockatoos habitually dig for corms, bulbs and roots resulting in damage grassed public playing surfaces. This may leave sizable holes in the surface, which may be hazardous to users of the sports fields, thereby posing a public liability insurance risk to the managers of the playing fields (in most cases Local Government Authorities). Similarly, damage to putting greens on golf courses can render them unplayable.

In rural Western Australia, the native species of Western corella have also been reported to damage artificial playing surfaces (bitumen and synthetic rubber) resulting in expensive repair costs. At present, damage to surfaces in public spaces has not been reported widely from the Perth metropolitan area, but this may be due to the relatively large area of grass playing surfaces available to the birds.

When roosting during the hotter parts of the day and at night, corellas and other flocking cockatoos trim small branchlets and leaves from their roost trees (Figure 9).

Figure 9 The first signs of peripheral damage to the centre branches of a tree by corellas on the Rockingham foreshaw (Photo Tamra Chapman/DEC).

This kind of damage has been recorded in heritage listed street trees and in recreation parks. If this trimming behaviour is repeated in the same trees over time, it can affect the health of the trees, leaving them vulnerable to attack by fungal pathogens and invertebrates. Continuous damage to trees can lead to the death of major limbs and even the entire tree. This results in maintenance cost such as park maintenance, street sweeping and tree removal.

If roost trees are situated in public open space, the managing authority must evaluate and manage the risk of falling limbs or trees by trimming. This can be costly because professional tree loppers or surgeons may have to be engaged to undertake the work.

Reports of damage to trees in south-west Western Australia have been increasing in recent years and Local Governments have raised concern about both with the damage to trees and the associated impacts of the birds on the amenity values of public places.

GANG-GANG, CORELLAS, COCKATIEL

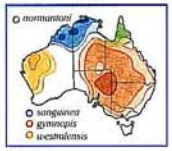
Gang-gang Cockatoo *Callocephalon fimbriatum* 33–36 cm

Distinctive dark grey cockatoo with wispy, fine-plumed crest. Bulky head and shoulders taper to short tail. Once settled in a tree and feeding on seeds, nuts and berries, Gang-gangs can be hard to see: when feeding or resting in dense foliage, they remain silent except for soft growling sounds. Sometimes reveal their presence by dropping debris as they rip seed capsules apart, but remarkably placid and tolerant of close approach. Its long wings and deep powerful wingbeats make the Gang-gang a strong flier; often travels tree to tree by swooping low then rising steeply to land. **Voice:** as contact call an incredibly drawn out, creaky rasp, 'gr-raer-iriek!'; beginning as a rough croak, ending with a squeak like a rusty hinge. Makes soft growling sound while feeding. **Hab.:** dense, tall, wet forests of mountains and gullies, alpine woodlands. **Status:** common in prime habitat of S NSW and NE Vic., but becoming rare where habitat is degraded. **Br.:** 374

Long-billed Corella *Cacatua tenuirostris* 38–41 cm

A white cockatoo with crimson or salmon-pink splashed about the face and neck; crest often folded and not noticeable. Usually in pairs or alone in the spring breeding season; at other times in small to large flocks. **Voice:** the usual contact call in flight is a wavering, nasal, falsetto, triple-noted 'ar-aer-ek, ar-aer-aerk', which, from a flock, becomes a raucous din. When disturbed makes very loud, harsh screeches. The long bill is used to dig up roots, bulbs and corms, the plumage becoming stained with red dust. **Hab.:** savannah woodland, open forest, grassland with scattered or watercourse trees, roadside and paddock trees; close to water. **Status:** now generally uncommon; aviary escapee colonies near Sydney, Brisbane, Adelaide, Perth, Hobart. **Br.:** 375

Little Corella *Cacatua sanguinea* 36–39 cm



White with pink patch at lores small or absent; feeds in flocks on ground; congregates on trees to strip the leaves. Flight swift with glides. **Variation:** *sanguinea*, Kimberley and Top End NT; race *gymnopis*, E interior; race *westralensis*, NW of WA; *normantoni*, NE Qld. **Voice:** very noisy in flight and perched. Call varies in length—a harsh, resonant, nasal, brassy 'air-er-ek' that also varies from sharp to guttural—'aier-ek, aier-rr-k, aer-rk, errk, urrk, aiirk'; also loud screeches. Flocks of thousands create a crescendo of screeches and hollow croaks. In breeding season flocks are smaller, pairs keep closer to their nest sites. **Hab.:** tree-lined watercourses and adjacent plains; savannah woodland, mulga, mallee. **Status:** generally abundant. **Br.:** 375

Western Corella *Cacatua pastinator* 36–39 cm

Similar to Long-billed Corella, with red or deep pink to lores and throat; differs in having an often erect crest, long rounded wings, longer tail. The Western Corella uses its long bill to dig for roots and corms. The plumage often becomes reddish, stained by soil. **Variation:** two subspecies. Opinions differ on naming of N population, whether *butleri* or *derbyi*. Prior to settlement there was a wide gap between this N race and the S race *pastinator*. With clearing of wheatbelt woodlands and forests, the N race has extended further S while the S race has contracted southwards to the more heavily forested SW corner. **Voice:** like that of Little Corella. **Similar:** Little Corella, but lacks pink on throat, weaker pink at lores; Long-billed Corella, but separated by Nullarbor. **Hab.:** open forest, woodlands, farmlands with abundant trees in shelter belts, road reserves, paddocks; SW of WA. **Status:** S race constricted, locally quite common, vulnerable; N race common. **Br.:** 375

Cockatiel *Nymphicus hollandicus* 31–33 cm

A graceful small cockatoo with slender silhouette. Flight swift on slender, flickering, backswept wings, long tail trailing; travels direct and without the undulations typical of parrots; small flocks keep together with precision formation flying. The Cockatiel's classification is still uncertain, it being the sole member of its genus. Until quite recently, it was placed in the parrot family. Evidence now suggests it is a cockatoo, and it is placed in that family, to which it has anatomical similarities and behavioural links in breeding rituals and the begging calls of the young. Biochemical comparisons support this classification. **Voice:** a distinctive, loud, clear, flight call, a slightly husky, mellow, rolling yet sharply penetrating 'whee-it, wheeit' or 'querr-eel', which gives the name 'Quarrion'. **Hab.:** most open country, woodlands, scrub or grasslands with scattered trees that is near water. **Status:** common, abundant in some northern inland regions; highly nomadic—follows rain into drier regions or moves towards coast during inland droughts. **Br.:** 375

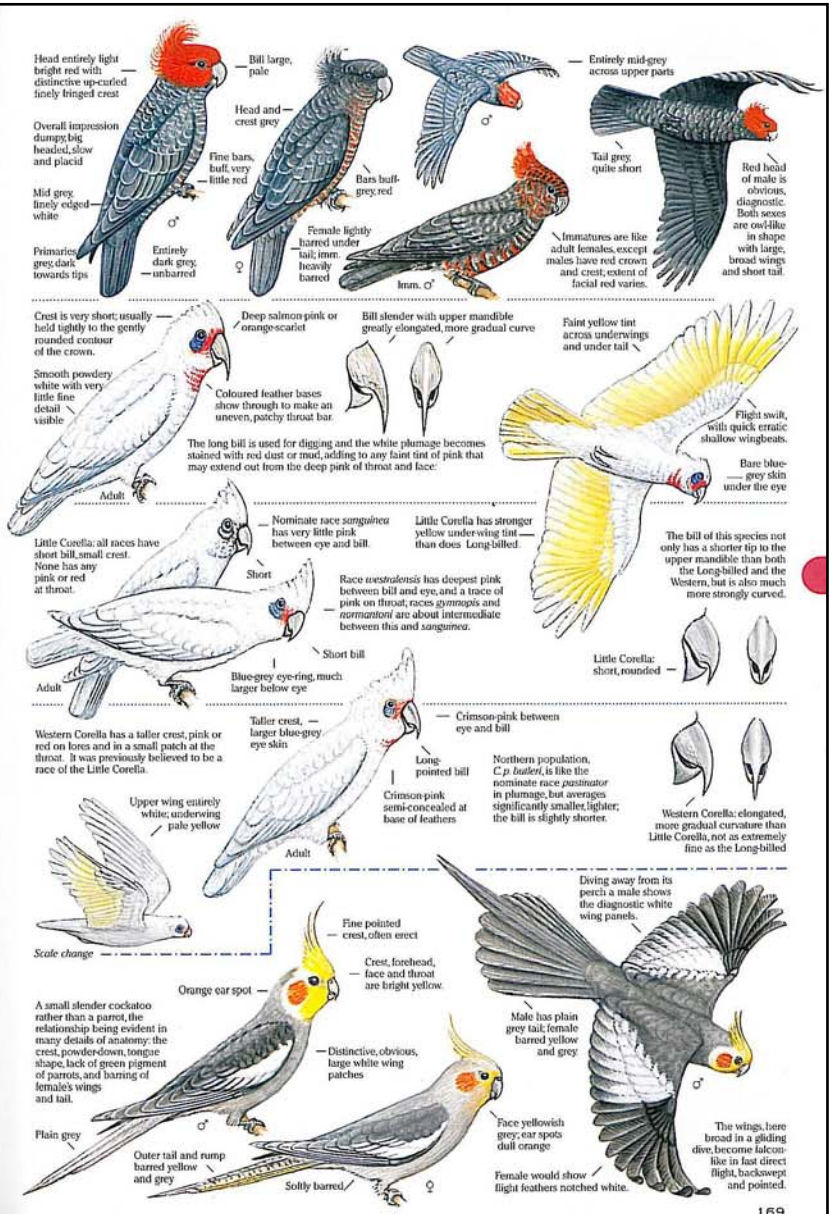


Figure 8 Distinguishing features of corellas (From Morcombe 2000).

Corellas and other cockatoos also use artificial structures, such as telecommunication towers, as temporary roost sites. This can result in damage to the cabling that links the structures to the peripheral communication equipment. Damaged cabling must be repaired by trained technicians and riggers, imposing additional costs on communications operators and ultimately the customers using those services.

Biodiversity

The environmental impact of corellas and other flocking cockatoos in south-west Western Australia is difficult to quantify. The damage they cause to potential nest trees via their habit of damaging trees poses a long-term risk. This risk will increase as the number of mature trees remaining declines due to clearing for agriculture, housing and industrial development.

Little recruitment of replacement trees occurs and older trees are being lost to old age and disease. Even if steps were taken to provide replacement trees, they would not be likely to reach a size and condition suitable for nesting for 70-120 years.

Regardless of the impact that corellas might have on nest tree health, they represent immediate and significant competitors for native obligate hollow nesters (parrots, cockatoos, owls, raptors and some duck species). If the introduced populations of corellas are allowed to increase and expand their range, they will compete with native populations of western corella, including the Endangered Muir's corella.

The three species of black cockatoo that occur in south-west Western Australia are under threat from possible nesting competition with introduced Corellas and other cockatoos. These are Carnaby's cockatoo *Calyptorynchus latirostris*, Baudin's cockatoo *Calyptorhynchus baudinii* and the forest red-tailed black cockatoo *Calyptorhynchus banksii naso.* These are all threatened species and nest competition a key threatening process in the draft recovery plans for these species.

Corella species have been recorded hybridising in the wild (little corella x eastern long-billed corella, eastern long-billed corella x galah and little corella x sulphur-crested cockatoo). The loss of genetic purity in threatened species is also considered to be a threatening process to native corellas. A similar risk occurs with genetic impurities into the Western Australian forms of galahs from ongoing survival of aviary escapes of eastern Australian subspecies.

Primary production

Corellas and other flocking cockatoos mainly feed on the ground, on seeds, roots, corms and bulbs. They dig up newly planted seeds of wheat and oats and also feed on grain supplied for stock during summer and autumn periods. They have been recorded pulling up or cutting down the seedlings of blue gums, lettuce, cabbage and other root vegetables. They can damage reticulation systems established to support intensive horticulture by either cutting through piping or removing fittings, causing leaks in the system.

At present, none of the introduced corella populations are reported to be causing significant economic damage to agricultural enterprises in south-west Western Australia. This is probably due to distribution of the birds relative to the location of market gardens and other primary producing enterprises.

However, if the populations continue to grow and expand in range, it seems likely that they could move into the upper Swan valley and the Shires of Swan, Chittering and Gingin, where they could cause significant economic damage to viticulture and intensive horticulture enterprises.

Environmental law

Commonwealth

Muir's corella is a threatened species, listed as Vulnerable, under the *Environment Protection and Biodiversity Act 1999*.

State

The species native to Western Australia, Muir's Corella, Butler's Corella, Little Corella and Galahs are listed as a Declared Pest of Agriculture (Category A7 of the *Agriculture and Related Resources Protection Act 1976*, administered by the Western Australian Department of Agriculture and Food). In selected Shires they may be shot when causing damage to agriculture in accordance with an open season notice without the need to obtain a damage licence. For relevant Shires, refer to the Fauna Notes on DEC's website.

Outside the open season areas, a damage licence must be obtained from the Department of Environment and Conservation prior to shooting.

Destruction should be viewed as a last resort after all other control options have been attempted. For other management options see below. A strategy comprising a number of techniques will probably be needed to reduce damage caused by corellas and other cockatoos.

Damage prevention and control

The key to minimising damage by corellas and cockatoos is to understand their behaviour patterns. These birds flock, fly and roost together. When they see other birds feeding below, the flock will join those birds until a large flock congregates (Temby and Marshall 2003). Wherever cockatoos land, they chew while feeding or maintaining their bills and damage results.

Flocks use regular flight paths and repeatedly return to favourable feeding sites. Day roosts are used between feeding bouts and may be used repeatedly for casual or short-term resting places (Temby 2003a).

During hot, dry weather the cockatoos feed early in the morning and late in the afternoon, but in winter they may feed throughout the day (Temby and Marshall 2003).

Corellas and cockatoos favour specific foods. They are attracted to germinating cereal crops and ripening sunflower and safflower. Their preferred food is a weed species; onion grass. Damage to crops is seasonal and has most impact when cereal crops germinate in autumn. In summer, food shortages threaten the survival of young birds (Temby and Marshall 2003).

Effective damage control programs are: well planned; based on an understanding the behaviour of the birds; varied frequently; integrated with a number of different methods; and persistent (Temby 2003a).

The most effective damage control methods involve limiting access to food, scaring and population control by shooting and trapping. Ideally, one or more control measures should be undertaken before a flock becomes established in an area. This should reduce the overall cost of control and, if other control methods are required, may result in fewer birds having to be deterred, trapped and/or destroyed (DEH 2007).

Methods of damage control that are considered ineffective, impractical or inhumane for these birds include fertility control, alpha-chloralose, lethal poisons and carbon monoxide necrosis.

The use of poisons or anaesthetics is not suitable for use to control corellas and other flocking cockatoos. It's effectiveness is limited and these agents are not target specific and thus, can present a significant risk to non-target animals. In addition, they are usually expensive and there is no chemical approved for use in the control of Corellas in Western Australia at present.

Field trials conducted by DEH (South Australia) in 1990 demonstrated that experimental culls using alpha-chloralose was successful in reducing roost size in the short-term. However, the reduction in bird numbers was more likely to be attributable to a disruption in flocking behaviour and the subsequent movement of flocks to new roosting sites. Therefore, alpha-chloralose had limited application in the broad-scale reduction of little corella numbers in situations where large flocks were causing problems (DEH 2007).

Poisons such as strychnine are not acceptable, as the effective dose for a bird is about thirteen times that of a carnivorous mammal, so the potential for non-target killing (either due to primary or secondary poisoning) is high. There is also a significant lag time between consumption of the poison and unconsciousness, increasing the probability of consuming a large quantity and then being eaten by a predator, which could subsequently be poisoned. Most organophosphates are unsuitable to kill birds, due to highly variable individual susceptibility and high resistance (DEH 2007).

Trees and seedlings

It should be kept in mind that damage to trees can be caused by a range of factors, including invertebrates, soil nutrient imbalance, altered hydrology, soil compaction, fungi, possums, stock and machinery (Temby 2003a). Tree pruning by cockatoos may not always result in long-term damage or death (Temby 2003a).

Roost tree damage is more common at day, than night roosting sites and is best reduced by limiting the amount of time the cockatoos spend in them (Temby 2003a). It is easier to deter birds from a new roost site than a well established site.

The most effective methods for deterring birds from roosts is a combination of Bird Frite cartridges and taped alarm calls. This should be re-enforced by shooting as the birds return to the roost. It may take a week or more for this control program to move the flock to another roost (Temby 2003a). If the birds must be repelled from a night roost, Bird Frite , combined with spotlights may be effective (Temby 2003a), but this would require public notification and careful management in rural towns and urban areas.

Newly planted seedlings can be protected via visual screens, including rows of native vegetation and tall grass. Screens should be 0.6 – 1m high and fences lined with hessian or shade cloth may be effective for small areas (Temby 2003a). The effectiveness of these screens can be enhanced by scaring and shooting patrols (Temby 2003a). Direct seeding and natural revegetation may reduce the risk of the plants being uprooted by the birds.

Buildings and fixtures

Damage to buildings and fixtures most often occurs in areas where residents are providing food for the birds, thereby attracting them to the area. It is important that all feeding be stopped as this may be all that is needed to move the birds on.

A scaring strategy using alarm calls and loud noises may be useful, but these may be difficult to deploy in populated areas where the noises may disturb residents (Temby 2003a). A licenced trapper may be employed to trap and remove the birds, but this is likely to be time consuming and expensive.

Timber can be protected by covering with metal or hanging shade cloth. If the timber requires replacing, hardwood or metal fixings should be used. Running powerlines underground can prevent damage to insulation and loose roofing nails should be replaced by roofing screws (Temby 2003a).

Light fittings, aerials and rooves can be protected with the use of wires and rotating perches. Commercial wires and spikes are difficult for birds to perch on and can be installed on buildings to prevent perching. Encasing light fixings and aerials with 50mm poly pipe will prevent perching because it rotates as the birds attempt to land.

In areas prone to damage by cockatoos prudent design, material selection and placing of fixings can prevent damage.

Playing fields

By careful observation, it is possible to determine what is attracting Corellas to a playing field and reduce the damage. For example, it may be that a nearby roost site is attractive and this where the birds can be targeted via scaring (Temby 2003a). Moving the birds away from a nearby roost can prevent damage to playing fields. Cockatoos are commonly attracted to onion grass and if so, the onion grass should be removed from the site if at all possible.

For small sites, such as bowling greens, a removable screen lined with shade cloth or hessian 2-2.5m high may be effective in preventing the birds from landing (Temby 2003a). For larger areas such as golf courses, bird hides can be used to scare and shoot the birds. The hides must be moved frequently and can be used to fire Bird Frite and live ammunition, combined with playing of taped alarm calls (Temby 2003a).

Fodder, silage and feedlots

Corellas and other cockatoos are attracted to feed trails and stubble after the harvest. They consume grain intended for livestock, and their presence may inhibit feeding by young lambs (Temby 2003b). It is important to limit access to grain as fewer young birds will survive, leading to a decrease in the overall population (Temby 2003b).

Setting harvesters to minimise the amount of grain left in stubble after harvest and collecting chaff and grain for stock feed can reduce the availability of grain (Temby 2003b). Locating crops away from watering points and roosting trees may also reduce the impacts of the birds.

Feed trails for stock should be placed out late in the day when cockatoos are going to their roosts, allowing stock to feed through

the night undisturbed. The aim should be to release just enough grain so that little residue remains in the morning (Temby 2003b).

Feeding small amounts more frequently, or keeping birds away until the stock have finished feeding, not only saves grain but limits access to grain by the cockatoos (Temby 2003b).

In feedlots, cockatoos may be attracted to the undigested grain in cattle droppings. Young cockatoos that have just left the nest use this grain as a food source at a time when little else is available and thus, it helps enhance the survival rates of cockatoos and assists in increasing their numbers (Temby 2003b). Regularly clearing up droppings may limit the survival of young and subsequent population growth.

Covering feed troughs with hoods or screening with shade cloth may reduce cockatoo feeding because the birds like to have a clear view around them when feeding (Temby 2003b). Fitting modifications to stock water troughs to exclude corellas can limit roost size and location, particularly if the modifications are installed before the birds establish roosts (DEH 2007).

Placing shade cloth or hessian on three sides of haystacks will reduce the area of damage to the bales by the cockatoos when they feed on seed heads (Temby 2003b). Removable panels can be used, so that access to other sides of the stack is still possible, but all four sides may have to be covered if damage is severe (Temby 2003b). Damage to round bales in paddocks can be reduced by the erection of temporary walls or by covering the bales.

These cockatoos have powerful bills which can perforate the covers on silage pits, letting in air and reducing the quality of the silage (Temby 2003b). Silage covers can be protected by erecting shade cloth or hessian walls around them and these should be 2-2.5m high (Temby 2003b).

Damage to grain covers generally occurs when birds are attracted to spilt grain on, or around, the covers (Temby 2003b). Any spillage should be removed immediately. If damage continues, a combination of screens of shade cloth, Bird Frite® cartridges, taped alarm calls and gas guns, may be effective, and may enhance the effect of the visual barriers (Temby 2003b).

Grain crops

Corellas and cockatoos can severely damage crops, but it should not be assumed that crops have been damaged just because the birds are present. Crops should be checked for visible signs of damage. Crops in the entire region should be monitored closely and growers should be prepared for peak periods of activity. Damage can be minimised with good planning, monitoring, crop management and use of damage control techniques (Temby and Marshall 2003).

Shooting and scaring are the most commonly advocated techniques for dealing with large flocks of damaging birds. The crop protection program should start with shooting to establish a link between the danger of shooting and other scaring devices (Temby 2003b). Shooting is generally neither suitable nor legal in residential areas, and requires police approval and skilled shooters to carry out.

Deterring birds from a feeding area (e.g. paddock ploughed to plant a crop or grain bunker) should be undertaken when the “scout” birds arrive at the site and before flocks of birds arrive and establish a pattern of feeding (DEH 2007).

Shoot from hides or near vehicles adjacent to the main approach route and switch to other sites regularly. Once the birds associate the hides with danger, try to get as close as possible before shooting. At this time, bright clothing should be worn so the birds associate the colour with danger. The same colour should be worn when shooting and applied to scarecrows that are moved regularly (Temby 2003b).

At this point in time, scaring devices should be introduced. There are numerous, commercially available bird scaring devices which can include a visual stimulus, averse sounds or a combination of these. A commonly used device is the gas gun. The gas guns should be set to operate at long intervals, only when the birds are feeding on the crop early and late in the day. They are most effective if hidden by hides and should be moved every two or three days. They should also be put out of sight when not in use.

Shooting alone rarely achieves the goal of reducing bird impacts and must be integrated into a scaring program to achieve an improvement in effectiveness of scaring (DEH 2007). Corellas and cockatoos are scared by birds of prey, so kites that simulate birds of prey may be effective for small paddocks. However, the birds may also become used to them, so they should be shifted often and combined with other methods, to be effective (Temby and Marshall 2003).

Some potential exists to lure abundant birds away from high value crops by supplying abundant food in an alternative location (DEH 2007). Oats and rice hulls for example, should be placed at least 500m away from the crop so that scaring does not disturb the birds at the decoy site (Temby 2003b). Some farmers plough an area to expose onion grass corms to lure the birds to an alternative site while sowing (Temby and Marshall 2003).

Effective decoy sites are those in flight paths and near trees that can be used for perching or roosting (Temby 2003b). No shooting or scaring should be carried out at the decoy site, but continue to shoot and scare at the crop.

Manual scaring techniques (e.g. Bird Frite®) are often expensive and time consuming, requiring two to three hours in the early morning and late afternoon if the birds have become established in a location. Farmers growing a rotation of summer and winter crops may have to devote 4-6 hours a day for 6-8 weeks to protect crops in some locations (DEH 2007).

Effective scaring and decoy campaigns often move the problem onto a neighbour who has not been as diligent in addressing the impact of the birds. In such cases, broad community-wide control programs within the region are the only realistic option for addressing the problem and preventing an escalation of the problem over time.

It is important for all farmers in the area to sow at the recommended rate, cover all grain and clean up spills, minimise residual grain in stubble, direct drill and sow at the same time as neighbours (Temby and Marshall 2003).

Horticultural crops

Corellas and other cockatoos can cause damage to commercial fruit and nut trees, grape vines and commercial flower crops (Temby 2003c). Most of the damage control methods for these crops are similar to those employed to protect grain crops. This involves preventing the birds from developing a habitat of feeding at the crop and scaring and shooting persistently until the birds leave the site. Additional techniques include visual screening for high value crops

and decoy crops to lure the birds away from the produce (Temby 2003c).

Population control

Shooting

Shooting the birds at their night roosts, and possibly also at their midday roosts during hot weather, is an accepted humane and efficient option for control. However, it may also draw criticism from people opposed to the killing of birds. Thus, sites and times of operation must be carefully selected and operations conducted outside of normal public use patterns of those areas.

DEC has consulted senior staff in the Police Firearms Branch on the use of firearms to control introduced Corellas in the Perth metropolitan area. The Police had no objections to the method as it is regularly used by licensed pest control operators to control pigeons and other problem birds.

Local Police in the relevant suburbs should be informed in advance and the most suitable and lowest powered licensed firearms must be used. High performance air rifles (.177 calibre) have proven to be successful.

Trapping

A successful trapping program relies on understanding the daily and seasonal movements of the flocks. This includes knowledge of feeding habits, flock structure (including the presence of non-target species), number of flocks, roosting locations and flight paths. Such information must be gained prior to undertaking a trapping program.

Trapping can be an effective means of removing over-abundant birds and breaking up large flocks habitually feeding in an area (DEH 2007). Feeding prior to netting is needed to entice the birds to feed confidently in an area before releasing the net. Once the birds have been netted at a site, the others in the flock are likely to leave the area and not return.

Most of the introduced Corella species in Perth feed in the open, and for the most part public places. Thus, trapping using walk-in cage traps will have limited potential for use. In addition, interference from vandals and others might also be difficult to manage in such areas. For these reasons, trapping would best be applied in a controlled site that does not have public access.

Substantial numbers of birds can be trapped using a single pull net (Figure 10) or single or double clap net (Figure 11). Cannon netting could have some application, but it would most probably also be restricted to specific sites and times when public exposure was minimal. Cannon netting must only be carried out by experienced personnel who hold a Shot-Firer's Licence.

Trapping must be conducted under the conditions of a Licence obtained from the Nature Protection Branch of the Department of Environment and Conservation, Western Australia. The trapping procedure should also follow the national guidelines for Trapping of Pest Birds (Sharp and Saunders 2004). Once in the net any non-target birds trapped must be released unharmed as soon as possible.

Birds must not be excessively distressed or injured in the process of trapping. Any suffering must be alleviated as quickly as possible. Frightened cockatoos will injure themselves and other birds and thus, must be killed as quickly and humanely as possible.

The targeted birds should be euthanized as soon as possible using carbon dioxide administered from a pressurised cylinder. The gas is administered via a close fitting plastic mask placed over the head of the bird. If this technique is correctly employed, the birds take an average of 20 seconds to expire. After it has been euthanized, the bird may then be removed from the net.

It may be difficult to manage the efficient, humane and safe disposal of the birds captured under the net, so this must be controlled through specific and clear operating protocols and management. In addition, the procedure is not aesthetic, and could easily upset some members of the public, so should only be considered for use at a controlled site.

Health risks may be associated with the handling of birds during trapping. Psittacosis (DEH 2005) and Chlamydia diseases are common in parrots and can be passed on to handlers through bites, scratches, contact with faeces and by inhalation of feather dust. Suitable personal protective equipment must be used by staff at all times.

Import restrictions

Sulphur-crested Cockatoos may only be imported into Western Australia under permit and strict conditions. Importation is prohibited except where the bird is a family pet that has been owned for two years and the owner is permanently moving to the State. The owner must demonstrate that these criteria have been met via a statutory declaration. The bird may not be sold or given away and strict keeping conditions apply under a permit.

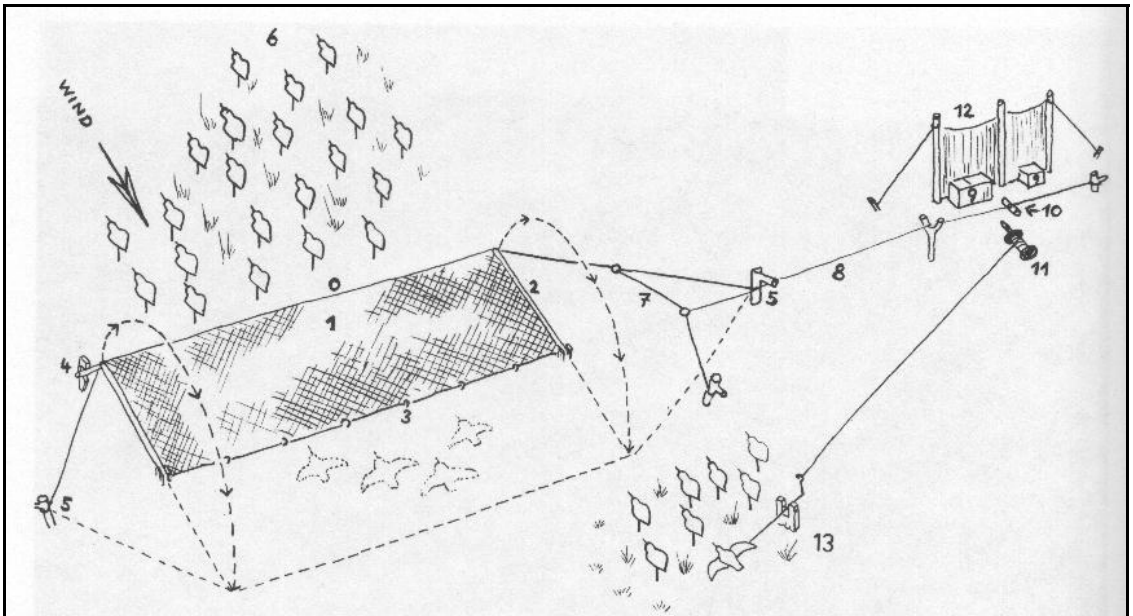


Fig. 425. Pull net for catching Lapwings and Golden Plovers. (1) net; (2) net poles; (3) net sides staked to the ground; (4) small stick which holds the net to the ground, pulling on the pull string releases the net; (5) end post for tieing the net string; (6) wooden decoys in front of and behind the net. In the foreground a bird on a seesaw perch; (7) a cross string; (8) pull string; (9) boxes for wooden decoys; (10) locking handle for pulling the pull string; (11) device attached to the string of the seesaw perch; (12) wall for protection and camouflage; (13) the seesaw perch with decoy which has been fastened to a rubber plate here; (14) lure calls (see Fig. 427). After EENSHUISTRA, 1956.

Figure 3 Diagram of a pull net which may be suitable for trapping corellas and other cockatoos (from Bub (1991, pg 284)).

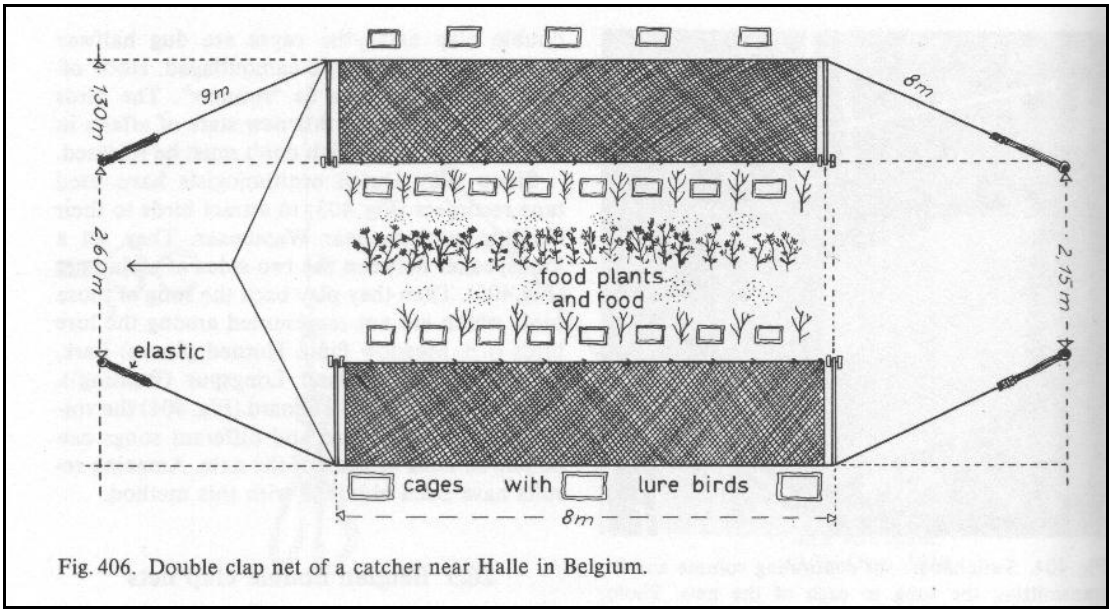


Fig. 406. Double clap net of a catcher near Halle in Belgium.

Figure 4 Diagram of a clap net which may be suitable for trapping corellas and other cockatoos (from Bub (1991, pg 272))

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Further Information

Contact your local office of the Department of Environment and Conservation.

See the Department's website for the latest information: www.dec.wa.gov.au.

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