Recovery of the Orange-bellied Parrot

Peter Bracken[1]

The Orange-bellied Parrot

The Orange-bellied Parrot, *Neophema chrysogaster*, has always been something of a mystery even though it was first described from a specimen taken at Bruny Island, south eastern Tasmania on one of Captain Cook's expeditions in the 1770's (Brown 1985). Since then, there have been reports of flocks of thousands, interspersed with long periods of no records. Unfortunately, the species has declined in numbers since late last century, to a current population of probably less than 200 birds.

The adult male Orange-bellied Parrot has bright grass-green upper parts, a blue frontal band edged with pale blue, a yellowish-green face, throat and breast and a yellow abdomen with a characteristic central orange patch extending to the vent. The adult female is similar to the male, but her general body colour is noticeably duller. The bill is dark grey in adults and yellowish in juveniles.

The Orange-bellied Parrot is one of seven similarly sized species in the genus *Neophema*, they are a little larger than a Budgerigar (*Melopsittacus undulatus*) and are all found in central and southern Australia. Three of these species are very similar to the Orange-bellied Parrot (the Rock Parrot (*Neophema petrophila*), Blue-winged Parrot (*Neophema chrysostoma*) and Elegant Parrot (*Neophema elegans*)) and their respective distributions overlap. They are generally olive-green and may have orange over their abdomens. None have the grass-green plumage, the distinctive buzzing alarm call and the bright orange patch of the Orange-bellied Parrot.

The life history and ecology of the Orange-bellied Parrot are similar to other members of the genus. Individuals mature and breed in their first year. Pairing is for life and adult pairs remain together as long as both birds survive. Nesting commences in late November, with females occupying hollows in eucalypts bordering extensive sedgeland plains. An egg is laid every second day to produce a clutch of up to six. The eggs are incubated solely by the female for three weeks. The male gathers food for himself and his mate during this period. By late December most eggs are hatched. Two weeks later the female begins to help her mate gather food for the chicks. Young remain in the nest for approximately five weeks before fledging. Chicks fledge by mid-February and leave their nests to form small groups prior to migration.

Distribution

The Orange-bellied Parrot population is less than 200 birds, making this species one of Australia's most endangered. Although always limited in distribution and only occasionally being abundant, the species has suffered a marked population decline and range contraction since the 1920's (Rounsevell 1997). Historical records indicate that in the late 1800's, Orange-bellied Parrots regularly occurred as far west as Adelaide and north to Sydney (Menkhorst *et al*. 1990). Between 1880 and 1907 many birds were recorded from the Sydney area (and may have bred there) but since then there have been no substantiated records from New South Wales (Brown 1985). Breeding was also recorded in central Tasmania more than 100km inland from the present known breeding areas (Brown and Wilson 1984).

The present breeding range is a narrow coastal strip of south-west Tasmania between Birchs Inlet, in Macquarie Harbour and Louisa Bay on the southern coast. Most pairs breed within 20 kilometres of Melaleuca Inlet, Bathurst Harbour and Port Davey, in what is considered as one breeding population (Rounsevell 1997). Here, the Orange-bellied Parrots breed in hollows in Eucalypts growing in sheltered foothill sites adjacent to extensive coastal sedgelands.

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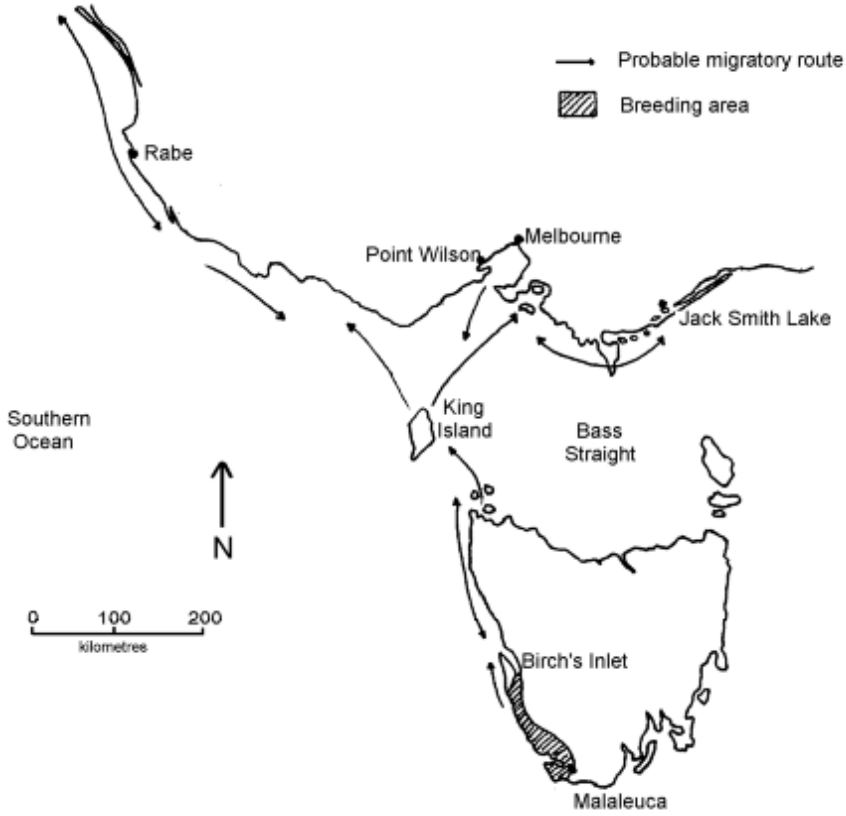
The winter distribution on the mainland occurs between South Gippsland, Victoria in the east and Lake Alexandrina, South Australia in the west.

Migration

The Orange-bellied Parrot and the Blue-winged Parrot are the only two species of migratory parrot in Australia.



Breeding areas and migration route of the Orange-bellied Parrot
(Menkhorst *et al*. 1990)

After breeding, most adults depart the breeding range in February in small groups, leaving juveniles to follow in March and April. During their northward migration they forage on beaches, coastal dunes, heathland and pasture until reaching the saltmarshes of western Bass Strait and King Island. The first birds arrive at King Island in mid-March but all have usually left by June. Migrating adults first reach Victoria in late March and disperse east as far as coastal South Gippsland and as far west as Lake Alexandrina in South Australia by April. Most of the population overwinters in saltmarsh habitat in coastal Victoria while the remainder moves west to the coast of South Australia. In September, the first adults leave the Australian mainland for Tasmania and the last birds are gone by November. The return migration is more rapid and direct than the northern migration (Rounsevell 1997).

A large proportion of the population concentrates in winter around fewer than five over-wintering sites and at

times 70% of the entire population congregate at 3 sites on western Port Phillip Bay and the Bellarine Peninsula (Menkhorst *et al*. 1990). These sites are the Murtcaim Wildlife Area, Lake Connewarre and Swan Bay, including Swan Island (Rounsevell 1997).

Habitat and Feeding

Saltmarshes, coastal dunes, pastures and shrublands, estuaries, islands, beaches and moorlands, usually within 10 kilometres of the coast, make up the range of habitats used by the Orange-bellied Parrots (Rounsevell 1997).

Wintering habitat has become highly fragmented and reduced in extent and quality over the last century. This is considered to be the main cause of the decline of the species and insufficient winter habitat is limiting its recovery.

Orange-bellied Parrots are specialists at feeding in coastal saltmarsh and adjacent plant communities, but these areas must contain a diverse range of plants to provide food throughout the winter period. The dry type of saltmarsh meets these criteria. The plant species favoured by the Orange-bellied Parrots in this saltmarsh habitat include : *Sarcocornia quinqueflora* (Beaded Glasswort), *Sclerostegia arbuscula* (Shrubby Glasswort), *Frankenia pauciflora* (Southern Sea-heath) and *Halosarcia halocnemoides* (Grey Glasswort) (Loyn *et al*. 1986). Unfortunately, this type of habitat and combination of plant species is rare in coastal Victoria.

Orange-bellied Parrots have adapted to some artificial environments in Victoria. These include golf courses, containing *Poa annua* (Winter Grass) and *Stellaria media* (Chickweed), and sewage grass-filtration paddocks, containing *Chenopodium glaucum* (Glaucous Goosefoot) (Loyn *et al.* 1986).

In western Victoria and South Australia, dry saltmarsh plants are less important and the birds prefer coastal dunes and beach fronts, where they feed on *Cakile maritima* (Sea Rocket) and *Acaena novaezelandiae* (Buzzies) (Brown *et al.* 1985).

In Tasmania, the breeding habitat is a mixture of eucalypt forest, rainforest and extensive moorland plains dominated by *Gymnoschoenus sphaerocephalus* (Buttongrass) (Brown and Wilson 1982, 1984; Stephenson 1991). Burning aids in producing a diversity in the range of species and ages of suitable habitat. Early in the breeding season they prefer areas burnt between 7 and 15 years ago, while in the mid-breeding season they seek out areas burnt between 2 and 5 years ago. In vegetation more than 15 years old, the density of shrubs reduces the flowering and seeding capacity of prefered food plants (Brown and Wilson 1984). Fire management is an important consideration for the management of breeding habitat.

When breeding, Orange-bellied Parrots eat the seeds and fruits of Moorland plants, nest in eucalypt hollows and roost in tea trees (Rounsevell 1997).

Population Decline

The Orange-bellied Parrot has steadily declined in abundance and its range has contracted markedly since the 1920s (Rounsevell 1997). Reasons for the population decline are not clear, but the destruction or degradation of significant areas of winter habitat was probably the most critical. This winter habitat, the dry type of saltmarsh, is now something of a rarity with large tracts, especially in the Port Phillip Bay, having been lost to industrial and urban development, agricultural practices and recreation. Other factors which may have contributed to the decline are trapping for aviculture, increased predation from foxes (*Vulpes vulpes*) and cats (*Felix catus*), competition from feral animals, such as rabbits (*Oryctolagus cunniculus*), European Goldfinches (*Carduelis carduelis*) and the House Sparrow (*Passer domesticus*) and disease (Menkhorst *et al.* 1990).

The small population is particularly sensitive to disease, loss of genetic variation and catastrophes such as storms during migration.

The wild population of Orange-bellied Parrots is currently less than 200 mature birds. Annual counts of birds in the wintering areas show that the population has been stable since the 1980s. Monitoring of nests and flocks of juveniles suggests that recruitment is adequate, yet the population is not increasing. It is believed that a lack of high quality winter habitat is the most important factor in inhibiting a population increase.

Conservation Measures

Until 1978, the Orange-bellied Parrot remained an enigmatic species, known only to a small group of dedicated bird watchers and aviculturists. At this time, Imperial Chemical Industries (ICI) announced plans to construct a petrochemical plant at Point Wilson, Port Phillip Bay, Victoria, close to the major over-wintering site. There was concern raised about the potential threat of this development to the Orange-bellied Parrot and it highlighted the lack of knowledge about the biology and ecology of the species as well as its vulnerability to extinction.

ICI generously funded research into the use of this habitat by the Orange-bellied Parrot. The plans for the petrochemical plant were eventually shelved indefinitely but the research into the Orange-bellied Parrot has continued.

In 1979, a three-year study was initiated by the Tasmanian National Parks and Wildlife Service with funding from World Wildlife Fund Australia into the status and ecology of the Orange-bellied Parrot throughout its range. Its status was described as critical with a total population estimate of between 100 and 200 birds. Since this time, regular counts have been carried out in South Australia and Victoria during winter.

In 1983, the Orange-bellied Parrot Recovery Team was formed. It included representatives of the federal and three state wildlife authorities and nature conservation groups. It was established to implement a recovery plan for the species.

In 1984 the first Orange-bellied Parrot recovery plan was written (Brown and Wilson 1984) and implemented. The second recovery plan was written in 1990 (Stephenson 1991). These plans formed the foundation of the future conservation efforts to save the Orange-bellied Parrot. The plans included detailed recommendations directed at the wildlife and land management agencies of each state. The most important components of these recovery plans were :

- conservation and management of critical habitat
- the implementation of a captive breeding program

Habitat Conservation

The over-wintering habitat of the Orange-bellied Parrot has been identified as the most critical factor causing the decline and impeding the recovery of this species. For this reason the conservation and management of these areas plays a primary role in the protection of the Orange-bellied Parrot.

Almost all areas used by the species are reserved for nature conservation, or are the subject of co-operative conservation agreements between landholders. Four areas of over-wintering habitat are currently listed as wetlands of international significance, these include Corner Inlet, Western Port Bay and western Port Phillip Bay, Victoria and The Coorong in South Australia (Rounsevell 1997).

In Victoria the management and protection of crucial winter habitat for the species has been a very complex and difficult feature of conservation efforts. The reason is that many different organisations and private landowners are involved in managing land where the Orange-bellied Parrot occurs.

In 1990 the Orange-bellied Parrot Victorian Working Group was formed to focus the conservation efforts in Victoria. Consequently, over 50% of the saltmarsh communities of Port Phillip Bay are now fenced as protection from degradation, the Spit Nature Reserve and the French Island State Park have been enlarged to include habitat for the Orange-bellied Parrot and management plans have been drawn up for managing habitat in reserves at Swan Bay (Edgar 1991), Jack Smith Lake and Lake Connewarre State Game Reserves (DCE 1991; DCNR 1993), all of which are critical over-wintering sites.

The willingness to protect the Orange-bellied Parrot and its habitat in Victoria has also been demonstrated by effective community actions and co-operation throughout its range. For example, in western Port Phillip Bay proposals for an airfield on Swan Island and a marina proposal within Swan Bay were abandoned. Coastal developments at Queenscliffe were modified. The extraction of shellgrit at Point Wilson was abandoned to prevent loss of habitat. The Queenscliffe Golf Club was awarded a national environmental award for managing

the course as habitat for the Orange-bellied Parrot (AGCSA 1996).

In the past, conservation efforts in Victoria have focussed on obtaining and protecting over-wintering sites from both developmental and grazing pressures. For example, large areas of saltmarsh at Murtcaim and Point Wilson have been fenced to exclude grazing stock. This resulted in excellent regeneration of saltmarsh on bare areas and increased use by the parrots the following year (Loyn *et al*. 1986). Subsequently, the use of this site has declined (Jessop and Reid 1986; Starks 1988). Constant heavy grazing obviously reduces the food supply, but it is possible that light or intermittent grazing may be needed to provide optimal conditions in the long term (Menkhorst *et al*. 1990). Further research is required to substantiate this hypothesis.

In the future plans have been made to identify suitable areas and create new winter habitats. These new plans will be implemented using the information attained from appropriate research carried out in recent and future years. There is great scope for making further supplementary feeding areas for use in mid-winter (Loyn 1982; Brown and Wilson 1984), though there is also a risk that newly created habitat will not be used, but this is less serious than the risk of unknowingly ruining a traditional area by misguided attempts to improve it.

Surveys of saltmarsh in coastal Victoria and South Australia using airborne multispectral imagery will be used to investigate the distribution and extent of saltmarsh communities for the Orange-bellied Parrot (Rounsevell 1997). Accurate knowledge of the distribution, quality and area of winter habitat will allow planning for the habitat management, identification of potential release sites (for progeny of the captive breeding program) and assist in winter population censusing and locating areas to search for wintering birds outside the currently known sites.

Using this technology and the information gained from it, the Victorian Working Group will select up to 10 locations in Victoria where sufficient new habitat may be created with a food supply for at least 100 additional Orange-bellied Parrots by the year 2000 (Rounsevell 1997). Sites will be chosen where support is available from landowners, volunteers and the local community and where winter resources (shelter, water and food) can be provided in a secure environment that is not currently used by the species. Instead of simply fencing the area and removing grazing stock, the water, soil and plants will be manipulated to create a landscaped habitat with features attractive to Orange-bellied Parrots. These new sites can be tested by using them as release sites for captive bred birds.

Another important aspect of habitat management in Victoria is predator and pest control. The ongoing control of introduced predators (primarily foxes and feral cats) and rabbits is required at Point Wilson, Murtcaim, Lake Connewarre, Swan Bay and Swan Island to increase the probability of survival of Orange-bellied Parrots wintering in these areas (Rounsevell 1997). These control programs are being carried out by volunteers, local councils and state wildlife authorities.

Conservation efforts in South Australia and Tasmania have not required the intensity and aggression of the Victorian effort, nevertheless appropriate action has been taken to secure and protect the habitat of the Orange-bellied Parrot.

In South Australia 10 of the 15 important areas of habitat for the Orange-bellied Parrot are protected through a combination of reservation, heritage agreements or planning regulations. Management plans have been prepared for the Canunda National Park (NPWS 1986), the Coorong National Park and Coorong Game Reserve (NPWS 1989), Beachport Conservation Park (Sutherland 1990) and the Carpenter Rocks Site (Owers 1994).

In recent times the Carpenter Rocks Site has been the most popular over-wintering site in South Australia (Gibbons 1984). Experimental manipulation of the strandline and sowing seeds has successfully augmented the local supply of *Cakile maritima* (Sea Rocket) in recent years (Rounsevell 1997). This work will be continued as necessary and hopefully will make this site a suitable place for releasing captive bred birds in the future.

In contrast to the over-wintering habitat, the breeding habitat is secure and minimal changes have occurred since European settlement began. The most significant change which has occurred is the altered fire regime. In the past (pre-European settlement) Aboriginal tribes would periodically burn the plains to provide grazing for the wombats and wallabies, as well as to enable people to move around and visit each other (Watts 1987). Regular burning is required to maintain the floristic diversity essential for the habitat of the Orange-bellied Parrot.

Now that Aboriginals no longer inhabit the area, controlled burning is an important tool for the management of the Orange-bellied Parrot population. Without some periodic burning of button grass, food for the parrot would become scarce and possibly inhibit the stimulus for breeding. Other habitat in south west Tasmania, such as rainforest and melaleuca scrub, are all required for roosting and nesting of the Orange-bellied Parrot but burning should be avoided in these areas (Watts 1987).

It is very fortunate that the entire breeding range of the Orange-bellied Parrot is now within the Western Tasmania Wilderness World Heritage Area except for a small area of land leased for tin mining at Melaleuca in the South West Conservation Area (Rounsevell 1997). The management plan for this area places a high value on the species and the management of its habitat.

Improvement of the breeding habitat has included the installation of artificial nest boxes at Melaleuca, Birchs Inlet and Towterer Creek. The use of these artificial nests has proved successful. At Melaleuca pairs of breeding Orange-bellied Parrots have used over half of the 23 nesting boxes provided and those that did fledged over 30 chicks (Rounsevell 1997). It is planned to install and service up to 100 nesting boxes at Melaleuca and 30 nesting boxes at both Birchs Inlet and Towterer Creek over the next 5 years (Rounsevell 1997).

Captive Breeding and Release

One component of the recovery plan for the Orange-bellied Parrot was the establishment of a captive breeding program.

In 1981 ten aviaries were constructed at Green Point Nature Reserve near Hobart to conduct preliminary captive breeding trials (Brown *et al*. 1995) . The preliminary trials were commenced using wild caught Rock Parrots and Blue-winged Parrots. These were considered appropriate species to use as they had shown some of the same captive management problems, primarily obesity, as the Orange-bellied Parrot (Brown 1988) which had proved difficult to breed in captivity, with few successes recorded (Lewitzka 1974).

The aviaries comprised to opposing banks of five aviaries with a central administration room in between. Each aviary measured 7m by 4m by 2.7m high with a moveable partition between them to enable the width to be altered as required.

Breeding trials using the other two *Neophema* species commenced in 1982. Both species settled well into captivity. The trials proved to be an outstanding success. Within three years sufficient young had been reared to reintroduce both species back into their natural habitat. In 1985, 30 Rock Parrots and 24 Blue-winged Parrots were released in South Australia and Tasmania. The released birds of both species adjoined wild flocks (Brown *et al*. 1995).

The Tasmanian aviaries had proven suitable for breeding these two species (particularly when birds were housed in colonies), the establishment of wild birds in captivity had been accomplished smoothly, long term problems with obesity had not been encountered in maintaining either species and the release program was a success.

In 1985, the Recovery Team recommended that a captive breeding program for Orange-bellied Parrots begin. In March 1986, ten wild juveniles were captured at Melaleuca in south-west Tasmania prior to their northward migration (Brown *et al*. 1995). Juveniles were taken in preference to adults for two reasons : they are generally better able to be established in captivity, and removal of adult birds would have certainly reduced the stock of experienced breeders (Menkhorst *et al*. 1990).

The birds settled in well but two months later it was noted that, following a moult, several birds had developed a number of yellow feathers which later fell out and were replaced by dystrophic feathers. Affected birds were diagnosed as having Psittacine Circoviral Disease (formerly known as Psittacine Beak and Feather Disease). Seven out of the ten birds died from the disease during the first winter (Brown *et al*. 1995).

The remaining three birds (one male and two females) showed no visible signs of the disease and appeared to be in good health. They were housed together in a double sized aviary for the 1986 breeding season. The male mated with both females. A total of four chicks were reared. In April 1987 all four youngsters began to show yellow feathering in their plumage and were diagnosed as having Psittacine Circoviral Disease (PCD). Two subsequently died and one was accidentally killed, while the remaining chick lost the yellow feathers, moulted

normally and maintained excellent health.

In March 1987, a further six wild juveniles were caught at Melaleuca to supplement the existing captive population (Brown *et al*. 1995). These birds settled in well and showed no signs of PCD in the following winter. Eight young were reared in the 1987 season, seven from two of the newly captured pairs and one from the original stock. An attempt to foster six Orange-bellied Parrot eggs in two Rock Parrot nests during the 1988 breeding season ended in failure, although 22 young Orange-bellied Parrots were reared that year (Sindell and Gill 1992).

In 1989 the captive breeding facility was moved to a less exposed location in Hobart to avoid cold winter winds which were affecting the birds at the original site. The relocation took longer than expected and resulted in the birds being placed in their breeding aviaries too late in the season. Nevertheless, three young were reared in 1989. A second group of aviaries was added to the complex, providing three additional compartments for breeding birds.

The 1990 breeding season proved more productive with 14 chicks fledging, all of which survived their juvenile moult. Results improved consistently thereafter.

In 1994 a second captive breeding program was established at Healesville Sanctuary with breeding stock from the colony at Hobart (Rounsevell 1997).

The greatest cause of death among captive Orange-bellied Parrots from the beginning of the program in 1986 until 1991 was PCD (Brown 1988). The virus multiplies in the liver (Raidal *et al*. 1993), is shed in the faeces and affects developing feather follicles, distorting the new feathers and causing them to be shed. The lost feathers and lack of thermal insulation causes birds to die from secondary infections such as pneumonia. Since 1990 mortality due to PCD has almost been eliminated in captive bred stock because of the relocation of the breeding facility to a warmer more sheltered site (Rounsevell 1997). However, the virus remains a risk for the captive population. Other deaths have been caused by accidents, stress during courtship, renal failure and aspergillosis (Rounsevell 1997).

Another potential problem for the captive (and wild) population is inbreeding depression. Methods have been developed to measure genetic diversity in individual birds. The method detects specific alleles in the genotypes of individual birds from which, estimates of genetic diversity in the captive (and wild) population can be made. The information gained can be used to avoid matings of closely related individuals and maintain the level of genetic diversity in the captive population.

Despite these problems the Orange-bellied Parrot captive breeding program has been a great success with a total of 183 young being reared to independence from 1986 to 1996 (Rounsevell 1997).

The Recovery Team delayed releasing birds because of fears of introducing PCD into the wild population. In 1991 a very poorly feathered wild bird was collected at Swan Island in Victoria and tested positive for PCD, confirming its occurrence in the wild population (Brown *et al*. 1995). Later that year the Recovery Team approved the release of captive bred birds at Melaleuca where the original stock was captured and the breeding population is most easily observed. It was agreed that spring was the best time for release, as the birds would have the full summer to become established prior to the migration. A release at this time would also provide the best opportunity to observe their progress and monitor their establishment in the wild.

A year before the first release, a substantial observatory was built on the sedgeland plains at Melaleuca. The release aviary, which was easily erected and dismantled, was built within clear view of the observatory.

The birds chosen for release were fed a basic proprietary seed mix and a variety of local seeding sedges to introduce them to a natural diet. Each bird was banded with a unique combination of coloured bands for identification in the field. The birds are placed into the release aviary for up to a month prior to being released (Brown *et al*. 1995). The first birds (11 individuals) were released in October 1991. In 1992, 14 captive bred birds were released at the same time and place as in 1991. Since the first release, 38 captive bred birds have been successfully introduced into the wild at Melaleuca (Rounsevell 1997). The captive bred birds remained in the release area and most of them paired with other released birds, or wild birds, and many successfully raised young at Melaleuca before migrating (Brown *et al*. 1995).

By breeding so readily upon being released they quickly add progeny to the population, ensuring that the release program has been immediately effective. As a group captive bred birds tend to migrate later than wild bred adults and a small number have been seen in Victoria during winter and/or Tasmania in up to three successive breeding seasons, confirming that captive bred birds can migrate successfully and breed for years after their release (Brown *et al*. 1995). Some were not seen again, either in the wintering or breeding range.

In 1994 15 birds were released at Birchs Inlet to try and establish a second breeding population (Rounsevell 1997). In 1995 no birds were released, instead, birds were transferred to boost the breeding stock at Healesville Sanctuary. In 1996 14 birds were released at Birchs Inlet and for the first time birds were released in the wintering range at Point Wilson (Rounsevell 1997). The aim is to determine whether birds can survive at the wintering site, migrate to Tasmania to breed and then return to the mainland the following winter.

The success of the captive breeding program has allowed 73 birds to be released thus far (Rounsevell 1997).

Conclusion

In the past century the Orange-bellied Parrot has suffered a large decline in numbers and the area of suitable habitat has been markedly reduced by many factors. In the early 1980s it was recognised that the Orange-bellied Parrot was in danger of becoming extinct. Since that time every effort has been made by government agencies, industry, research consultants, ornithologists, botanists, hydrologists, ornithological organisations, bird observers and the lay public to ensure the survival of the Orange-bellied Parrot. Habitat conservation and management and the captive breeding program have been essential components of this recovery effort. With continued research and refined management techniques the Orange-bellied Parrot can be assured a long term future.

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