

SCIENCE AND RESEARCH INTERNAL REPORT NO.84

**PROGRESS REPORT
OF THE SUPPLEMENTARY FEEDING
OF KAKAPO ON LITTLE BARRIER ISLAND,
SEPTEMBER 1989 – APRIL 1990**

by

Ralph Powlesland and Brian Lloyd

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ABSTRACT

Identified in the Kakapo Recovery Plan, 1989-1994, (Powlesland 1989) was the need to develop techniques to provide supplementary foods to kakapo on Little Barrier Island. This report details the results of the first nine months of the supplementary feeding programme for kakapo on Little Barrier Island. Baits skewered on pieces of No. 8 wire were first spaced at intervals along tracks. Where feeding sign was evident, feeding stations were gradually assembled nearby. The stations comprised an aluminium pole, a tray 350 mm above ground and a cover about 150 mm above the tray. To prevent kiore taking food directly from the tray, there was a lid with a hinged flap that the kakapo pushed up to reach the food. Forty-one foods were presented, but only seven were regularly eaten in quantity - almond kernels, apple, brazil nut kernels, carrot, kumara, sunflower seed kernels and walnut kernels. As kiore ate most of the food left on the ground, no precise measure of the amount of food eaten by a kakapo at a station is possible.

A daily record is provided for each feeding station from the set-up date to 30 April 1990. While some birds fed from stations as soon as they were set up, it was several weeks before a few kakapo fed regularly from them. By the end of April, 10 feeding stations were in operation; at least nine kakapo, including four females and four males, fed regularly from them. This represents 53% of the estimated population. Therefore, the first phase of the supplementary feeding programme of getting free-living kakapo to regularly feed on unfamiliar foods from specially built feeding stations has been successful.

1. INTRODUCTION

Richard Henry's observations of kakapo (*Strigops habroptilus*) in Fiordland in the late nineteenth century (Henry 1903) and our recent observations on Stewart Island (Powlesland 1989) indicate that they do not breed annually but at three-to four-year intervals. They breed in years when above-average crops of fruit are available. For example, on Stewart Island breeding coincided with the periodic fruiting of podocarps such as rimu and pink pine, which produce an abundance of fruit in some years and little if any in others.

Nutrient analyses of Stewart Island plants show that podocarp fruit contain about twice as much nitrogen as most other foods eaten by kakapo (R.G. Powlesland, B.D. Lloyd and A. Grant unpubl. data). Nitrogen content provides index of a food's protein content,

important in egg formation and nestling growth. It seems that kakapo breed only when foods relatively rich in protein are readily available. Given the critical status of the species (Powlesland 1989) the Department of Conservation recognised the urgent need to boost the kakapo's productivity. This was particularly relevant to Little Barrier as kakapo were released on the island in 1982 but apparently had not bred during the subsequent seven years (Greene 1989). Therefore, it was suggested by Science and Research Division personnel that the Department of Conservation should test whether supplementary foods would induce and sustain kakapo breeding annually or biennially. This suggestion was accepted in July 1989 (Powlesland 1989). The supplementary feeding programme began in September 1989, when a team of Department of Conservation personnel went to Little Barrier Island to find as many kakapo as possible (Hodsell 1990).

2. METHODS & RESULTS

2.1 Baits on Wires

Baits were placed on pieces of No. 8 wire (Fig. 1) to detect that a kakapo was present along a section of track. The skewered bait was about 300 mm above the ground. The wires were spaced 50 to 100 m apart along tracks. A piece of carrot, kumara or apple was used as bait. These usually remained fresh for several days, but during warm, wet weather the kumara baits often needed replacing every second day.

When a kakapo fed on a bait it usually left distinctive signs on the remains. The birds did not eat kumara skin, and so beak marks were evident on it. Kakapo often left "chews" of apple flesh, presumably having taken just the juice. Similarly, they left fibrous chews of carrot and beak marks on uneaten portions. Although most kakapo rarely ate carrot, they still left distinctive beak marks, showing that they were present.

Towards the end of the eight-week effort to recapture kakapo kiore (*Rattus exulans*) ate many of the baits along some sections of track. When observing kiore at night with a zeniscope, we saw that they readily climbed the wires. Kiore preferred kumara, then apple, but they usually ignored carrot. Vaseline was smeared on the wires to deter kiore from climbing them. Although this was effective at first after a few nights the rats reached and ate the baits, and by morning no remained. It is likely that kiore ate the Vaseline as tests showed that kiore on Lady Alice Island, in the Hen and Chickens Group, ate petrogel paste (McFadden 1984).

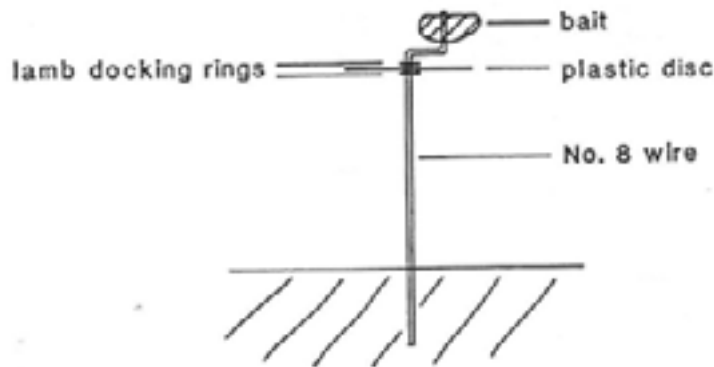
Flexible discs of plastic prevented most kiore from getting to baits on wires. The discs were 0.5 mm thick plastic (recycled polystyrene) and 180 mm in diameter and held in position with lamb docking rings above and below (Fig. 1). A rat cannot climb or reach around a disc, and if it jumps onto the disc the material tips under its weight. Furthermore, the disc's smooth surface prevents a kiore from gripping it.

2.2 Kakapo Capture

When a kakapo was regularly feeding on bait, it was recaptured. Its metal serial band was replaced with one that had been painted (Dulux autocolour) with an individual colour combination. This enabled staff to identify the bird without having to handle it. Painted metal bands (size 'O') were put on females. Suitable bands (modified 'R') were not readily available for males, but a new band size was eventually produced for males

(size 'KA'). Most recaptured kakapo, particularly females, were found in the same general area as they had been during a radio-telemetry study in 1982-84 (Moorhouse 1985) and the 1986 recapture programme (Veitch 1986).

Figure 1. Bait station



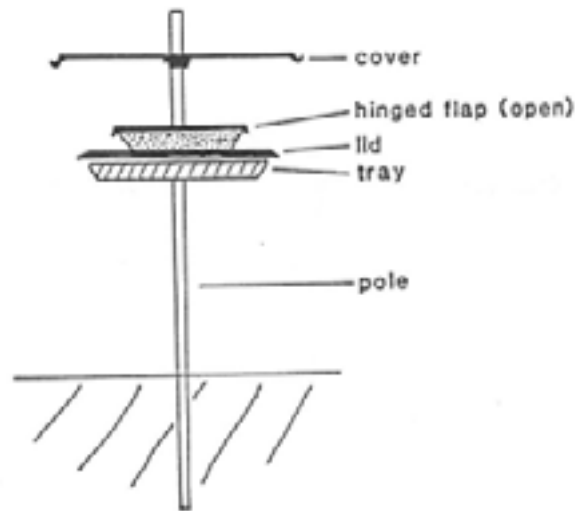
2.3 Feeding Stations

It was necessary to present a variety of foods to each kakapo on a structure sheltered from rain and inaccessible to kiore. Trials suggested that a bird-table or feeding station with a tray 350 mm above the ground would be inaccessible to most kiore (Fig. 2). Before the feeding station was put in place, baited wires were gradually moved closer together on a reasonably flat area of track. To kill as many rats as possible two or three Ezeset rat traps in aluminium tunnels were also placed two to three metres from the eventual feeding-station site. Once the bird was feeding regularly from a few closely-spaced wires, the first phase of feeding-station construction was started.

The pole (25 mm diameter aluminium tube) and tray (Teflon-coated frying pan minus the handle) were positioned with the tray on the ground; both were completely covered with vegetation to disguise them from kakapo. Four small holes were drilled in the tray to allow water to drain out, and shiny surfaces were painted dull green. Food was placed on the camouflage vegetation and on the wires. Once the bird fed on this food several times the vegetation was gradually removed over several days, and the tray was raised a few centimetres. If the bird continued to feed from the tray the wires were removed and the tray was gradually raised to 350 mm (Fig. 2).

Subsequently a cover was added to shelter the food from rain (Fig. 2). So that the new object did not frighten the bird, it was first placed at the top of the pole with some vegetation tied beneath it. If the bird continued to feed nightly, the vegetation was removed and the cover lowered over several nights to within about 150 mm of the tray. Although the cover did prevent rain falling directly on to the food, frequent misty and windy conditions at the higher altitude stations often made the food damp. In such conditions some seeds and nuts became moist and slimy and began to sprout, while other foods soon went mouldy. During wet, warm weather any uneaten foods had to be replaced at one-or two-day intervals.

Figure 2. Feeding station



2.4 Foods Provided

Appendix 1 lists the foods put on feeding-station trays for kakapo. Of the 41 foods listed only two apparently went untouched, and 20 were tasted but afterwards were usually left untouched. The remaining 19 were eaten regularly; these were mainly root vegetables, seed and nut kernels, and fleshy fruit. Individual kakapo had varied food preferences, particularly with regard to the nut and seed kernels. Their preferences also occasionally changed during the study. For example, frozen corn-on-the-cob was presented skewered on wires in October and November, with most birds eating all the kernels of an 80 mm piece. However, over a couple of months they gradually ate less and then ignored it. When fresh corn-on-the-cob was provided in January the birds tasted it but subsequent pieces of corn were left untouched.

Of the foods eaten, seven were provided nightly because they were eaten in reasonable quantities by kakapo, were readily available, could be stored for the duration of a field trip (two weeks), could be carried to the stations without deteriorating and contained reasonable levels of protein and/or fat. These were almond kernels, apples, brazil nut kernels, carrots, kumara, sunflower seed kernels and walnut kernels. Kakapo apparently ate these foods by chewing them and spitting out the residue, presumably having ingested mainly the moisture and soluble components. How much of each food was ingested directly is unknown. The skins of most foods including those of almond kernels, were not eaten.

2.5 Hides

Hides were set up within five metres of three stations and were set up gradually over a fortnight so as not to frighten the kakapo. A zeniscope and infra-red light were used to monitor activities. Kakapo were readily able to reach up 350 mm to the tray to take food. Small items such as sunflower seed were eaten directly from the tray, and occasionally chews were dropped into the tray. Large items such as pieces of kumara and apple were usually put on the ground and bites taken from them. Brazil nuts were eaten the same way or held in a foot in typical parrot fashion.

2.6 Kiore

Kakapo are messy feeders, leaving scraps of food at the stations. The scraps included partly eaten items, skins of some foods, and chews. As with apples and carrots, nuts and seeds were chewed and then the fibrous residue was spat out. A bird on first reaching a station at night was seen to throw several pieces of kumara and apple onto the ground before eating some nut kernels. The items thrown included 60 g bits of kumara.

Kiore quickly found and ate most scraps. Large items were carried or dragged to a sheltered retreat to be eaten, but chews and other small items were eaten on site. Apple and carrot chews were apparently unappetizing to rats. An occasional kiore jumped up to the tray to feed. Others were seen climbing nearby vegetation and the pole under the tray, but they did not reach the food.

Although the rat(s) took a small proportion of food from the tray, it was a concern that other rats could learn this behaviour. To prevent this happening we placed a lid directly over the tray. The lid had a hinged section or flap to allow kakapo to reach the food. After a few weeks of our tying the flaps up and gradually lowering them, birds learnt to raise the flaps. As well as making it more difficult for kiore to reach the food, the flap system should reduce rain falling onto the food.

It is impossible to stop kiore from feeding on the uneaten food and chews left on the ground. Snap traps were moderately successful in controlling kiore numbers at the stations, but was little inducement for kiore that fed on the left-overs to venture into traps. Similarly, they rarely fed on poison in silos. The crushed poison baits (Talon, Storm, Waxy Pack) usually remained untouched for weeks and went mouldy.

Because kiore ate the kakapo left-overs on the ground, no precise measure of the amount of food eaten by kakapo at a feeding station was possible. However, we were usually able to determine whether a kakapo fed or not at a station on a particular night. Therefore, we ensured that there was ample favoured food available each night. The objective of supplementary feeding is to stimulate the birds to breed annually or biennially, and even if we do not know precisely what the birds ingest, we will be able to determine whether this objective is being met.

2.7 Frequency of Visits to Feeding Stations

Appendices 2 to 8 show in detail the use by kakapo of each feeding station from 6 October to 30 April 1990. Since females seemed to have more difficulty than males attaining breeding condition, our first objective was to get females eating supplementary foods. As soon as a female was recaptured or was regularly eating baits we began setting up a feeding station in the general area. Feeding stations were set up for males subsequently.

2.7.1 Bella-Rose

This bird proved very difficult to encourage to feed regularly from a station (# 1). Although she fed on baits readily in late September, it was not until early November that she fed from a station (Appendices 2, 3), and even then her visits were irregular. She may have been made shy of man-made structures since she was recaptured by hand at night while feeding on a bait and was afterwards disturbed by people walking along the track at night. Although we kept providing baits for her, she rarely fed on them. It was not until early February when baits were put out along a different section of track that Bella-rose began feeding on them regularly (Appendix 6). She was recaptured on 19 February and did not have a brood-patch. On 23 February a feeding station was set up

for her with food jammed the rim of the tray. From 1 April she began taking food regularly from this station.

2.7.2 Heather

Heather's home range incorporates feeding stations 2, 3 and 7. She was recaptured on 27 September near station 2 and in October began feeding from this station (Appendix 2). She was seen through a zeniscope feeding at this station. Station 3 was only about 200 m away so presumably she fed from it too. However, because two kakapo were seen at station 2 on 10 November and because on some nights more food was eaten from both stations combined than when only one station was being visited per night, it cannot be determined how often Heather fed from these stations. Kakapo fed irregularly from the two stations in October (Appendix 2) and nightly in November (Appendix 3). During November a kakapo often fed from station 7 on the same nights that a bird fed from one or both of stations 2 and 3 (Appendix 3). However, from 3 December to 31 March (except for 7 January) only one of stations 2 and 7 was used each night. During this time, particularly after mid-January, male(s) that had fed from these stations were at track-and-bowl systems some distance away, so Heather had sole access to the feeding stations. From 4 December to 24 January Heather seemed to alternate her feeding visits between the two stations, spending 2-10 consecutive nights feeding at each station. From 25 January until 8 March, however, she fed only from station 7.

On 19 February Heather was found nesting about 200 m from station 7. When the nest was again inspected on 21 March it had been abandoned and contained a decomposing chick. It was estimated that the chick died at about 6 days old and had been dead a week when found. Thus the chick hatched about 9 March. Allowing 10 days for the period from copulation to the laying of the first egg and 25 days for incubation, Heather would have mated in late January or early February. Mating probably occurred soon after 25 January when she began visiting feeding station 7 exclusively. During incubation (February to early March) Heather fed at station 7, usually every second or third night. In April both stations 2 and 7 were being fed at on some nights. This increased activity probably reflects the cessation of booming and the return of males to their booming season home ranges.

2.7.3 Maggie

Since 1986 Maggie has been captured in the area where subsequently feeding station 4 was established, no other kakapo have been captured or detected nearby. On 10 October she recaptured near station 4, and soon after that she began feeding regularly from it (Appendix 2). During November and December she continued to feed from the station almost nightly (Appendices 3, 4), but in January her visits became erratic (Appendix 5). Maggie did not feed from the station during the last 10 nights of January (Appendix 5), when she probably left her home range to mate. In February and until mid-March she fed at the station every second or third night (Appendices 6, 7), as Heather did from station 7 when incubating. Maggie was found nesting on 12 March about 400 m from the feeding station. One egg was partially visible beneath her during a brief check into her nest hole. When her nest was checked again on 28 March she had abandoned it, leaving a single unhatched egg. During most nights from 17 March to late April Maggie fed from the station.

2.7.4 Johngirl

It was not until December 1989 that Johngirl fed nightly from feeding station 8 (Appendices 3, 4). There was no evidence of two birds living along this track, so presumably only Johngirl fed there.

During January she fed irregularly from the station (Appendix 5), and only twice fed from it in February (Appendix 6). It was mid-March before she began feeding at the station on successive although these were interspersed with periods of absence (Appendix 7). Since occasionally there was kakapo sign found on the track 100 m or more above the feeding station, station 11 was set up about 200 m further up the track from station 8. For most of April Johngirl fed each from one of these (Appendix 8). There was no evidence of a brood patch when she was recaptured on 3 April, so it was assumed that she did not breed this year.

2.7.5 Males

Feeding stations were established within 50 m of three track-and-bowl systems; # 5 on 15 October, # 9 on 15 November and # 10 on 14 January (Appendices 2-5). From early January, when males were at their systems and began to boom, they fed from the feeding stations on most nights (Appendices 5). These nightly visits took place throughout the booming season (January-March) and continued during April, when the males stopped calling regularly from track-and-bowl systems.

2.7.6 April Results

By the end of April 10 stations were available to kakapo. These feeding stations were visited daily to determine what foods had been taken the previous night and to re-stock. At least nine birds were feeding regularly from the stations. Evidence suggested that on some nights two birds fed from both stations 2 and 10, so by April probably 11 birds had fed from the stations. In April 1990, four of the six females recaptured in 1986 regularly fed from stations.

3. DISCUSSION

3.1 Results to Date

From the activity at track-and-bowl systems it seemed that at the height of the booming season at least 11 males occurred on the island (Lloyd & Powlesland 1990) and probably at least six females existed. Thus, the nine birds regularly feeding at the stations represent 53% of the estimated population. Except for kiore eating kakapo food scraps, the initial phase of the programme of getting free-living kakapo to feed regularly on provided foods at unnatural structures has been a success. The birds have been willing to taste unfamiliar foods, and individuals regularly ate kumara, apple and nut kernels. Also, they have learnt to get at food by lifting flaps at the feeding stations.

Heather and Maggie, the two females who fed on nut kernels from stations regularly from late October, laid clutches in late January-early February 1990. This was the first evidence of kakapo breeding on Little Barrier. Bella-rose, who fed irregularly on baits (kumara, carrot and apple only), did not lay a clutch. We are unable to be sure whether or not Johngirl laid a clutch. This meagre evidence is not sufficient to indicate whether the supplementary foods induced Heather and Maggie to lay clutches or not. Unless the kakapo breed next summer, we must continue the supplementary feeding programme until March 1992 to test whether the provision of supplementary foods will induce kakapo breeding.

3.2 Future Modifications

We intend to fix flap-lids to all stations to prevent the occasional kiore jumping up to the food trays and taking food. These lids also help to keep the food dry during rain.

To reduce the present requirement for daily visits to each feeding station, and therefore the need for two people to service the stations, we hope to develop a hopper system at each station. The hopper would hold enough food, particularly nuts, to meet the requirements of a kakapo for two to three nights.

In collaboration with nutritionists, we need to investigate the nutritional quality of the supplementary foods eaten by kakapo. It may be necessary to introduce new foods to ensure a balanced diet.

It is almost impossible to distinguish individual kakapo at the stations through the zeniscope. Although it is possible to distinguish painted bands from unpainted ones, the colours of the painted metal bands cannot be distinguished. We propose to replace the coloured bands on kakapo with bands painted with distinctive black and white patterns which can be recognised through a zeniscope. In addition, we propose to fix a transponder to each bird's metal band. Each transponder has an individual frequency, and so with appropriate equipment, a bird can be identified without being handled. The identity of a bird and the date and time of each of its visits could be recorded automatically by a data logger.

It would be useful to have regular weights of kakapo. We hope to obtain this information using a weighing device as a platform which the birds step onto to give them access to food at each station. Ultimately, the device would be linked to the data logger, so that each time a bird stands on the platform its identity and weight, as well as the date and time, are recorded.

4. ACKNOWLEDGEMENTS

We thank Terry Greene and Ian McFadden for leading some trips and helping on others during the supplementary feeding programme. We also extend our appreciation to the many Department of Conservation staff and volunteers who have generously provided their time and energy to assist with the programme, to Dobbie and Mike Dobbins for so many forms of assistance, and to the kakapo themselves for regularly visiting the feeding stations and eating some of the many types of foods provided.

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Appendix1: List of foods presented to kakapo at feeding stations on Little Barrier Island, and the birds' response to each food. Unless stated otherwise, the foods were presented raw and fresh.

Foods	Untouched	Tasted, but not eaten	Eaten
Almond kernel			+
Apple - green			+
- red			+
Apricot - dried		+	
Asparagus		+	
Avocado		+	
Banana - raw		+	
- dried		+	
Brazil nut kernel			+
Bread		+	
Carrot			+
Cashew nut kernel		+	
Celery		+	
Chick pea - cooked		+	
Conditioner food ¹		+	
Corn on cob - raw		+	
- frozen			+
Cucumber			+
Date - dried		+	
Fig - dried	+		
Flax pod			+
Hazelnut kernel			+
Kiwifruit			+
Kumara			+
Macadamia nut kernel			+
Mung bean - sprouted		+	
Orange		+	
Parsley leaves	+		
Parsnip		+	
Peanut butter and Roudybush mix ²		+	
Pear			+
Porridge mix ³			+
Potato		+	
Pumpkin - cooked		+	
- seed kernel			+
Roudybush pellets ⁴		+	
Sultana		+	
Sunflower seed kernel			+
Swede			+
Walnut kernel			+
Yam			+

¹ Juffers Condition and Rearing soft food. High protein meal product available from pet-shops; mixed with water to a mash.

² Roudybush pellets were crushed to a meal and mixed with peanut butter.

³ Cooked mixture of rolled oats, Roudybush pellets, soya grits and sunflower seed.

⁴ A balanced diet formulated for caged parrots and supplied by North Brighton Aviaries, 155 Beach Road, Christchurch 9.

Appendix 2: Kakapo visits to feeding stations (Little Barrier Island, October 1989)

October 1989	Feeding station ¹						T20 Top	T20 Bottom
	T1-T2	T19 Apex	T19 West	T17	Woodpile			
6		Set-up	Set-up					
7								
8	Set-up			Set-up				
9								
10								
11	N	Y	N	Y				
12	N	Y	Y	N				
13	N	Y	Y	Y				
14	N	N	N	N				
15	N	-	-	-	Set-up			
16	N	N	N	Y	Y			
17	N	Y	Y	Y	-			
18	N	Y	?	Y	Y			
19	-	-	-	-	-			
20	N	-	-	-	Y			
21	-	Y	N	N	N			
22	N	N	?	Y	N			
23	N	N	N	N	-			
24	N	N	Y	N	N			
25	-	-	Y	-	-			
26	N	Y	Y	Y	N			
27	N	Y	Y	N	N			
28	N	N	N	Y	N			
29	N	Y	Y	Y	?			
30	N	Y	Y	Y	?	Set-up		
31	N	Y	Y	Y	Y	Y	Set-up	

¹Y = kakapo fed from tray, N = did not feed from tray, ? = may have feed from tray, - = station not checked

Appendix 3: Kakapo visits to feeding stations (Little Barrier Island, November 1989)

November 1989	Feeding stations ¹								
	1	2	3	4	5	6	7	8	9
1	N	Y	Y	Y	Y	Y	N		
2	Y	Y	Y	Y	Y	Y	N		
3	N	Y	Y	N	?	N	Y		
4	N	Y	Y	Y	N	N	Y		
5	Y	Y	Y	N	N	Y	N		
6	W	Y	Y	Y	N	N	N		
7	Y	Y	Y	Y	N	?	Y		
8	W	Y	Y	Y	N	N	Y		
9	W	Y	Y	Y	N	N	N	Set-up	
10	Y	Y	Y	Y	?	Y	N	Y	
11	W	Y	Y	Y	N	Y	N	Y	
12	Y	Y	Y	?	N	?	Y	N	
13	Y	Y	Y	Y	Y	Y	Y	N	
14	-	Y	Y	Y	-	-	-	N	
15	Y	Y	Y	Y	W	N	N	N	Set-up
16	-	Y	Y	Y	-	Y	N	N	-
17	N	Y	Y	Y	?	Y	Y	N	W
18	Y	Y	Y	Y	Y	Y	Y	N	Y
19	-	-	-	-	-	-	-	-	-
20	-	-	-	-	-	-	-	-	-
21	N	N	Y	Y	Y	Y	N	-	N
22	?	Y	Y	Y	Y	Y	Y	Y	Y
23	N	Y	Y	Y	?	N	Y	W	Y
24	N	Y	Y	Y	N	N	Y	Y	Y
25	W	Y	Y	Y	Y	Y	Y	Y	Y
26	N	Y	Y	Y	Y	Y	Y	Y	N
27	N	Y	Y	Y	Y	Y	Y	-	N
28	W	Y	Y	Y	Y	Y	Y	Y	N
29	N	Y	Y	Y	Y	Y	Y	W	N
30	N	Y	Y	Y	Y	Y	N	W	Y

¹Y = kakapo fed from tray, N = did not feed from tray, ? = may have fed from tray, W = fed from wires only, - = station not checked.

Appendix 4: Kakapo visits to feeding stations (Little Barrier Island, December 1989)

December 1989	Feeding stations ¹								
	1	2	3	4	5	6	7	8	9
1	N	Y	Y	Y	Y	Y	Y	Y	N
2	N	Y	Y	Y	Y	Y	Y	Y	N
3	N	Y	Y	Y	Y	Y	Y	Y	N
4	N	Y	Y	?	Y	Y	N	Y	N
5	N	Y	N	Y	Y	Y	N	Y	N
6	N	Y	Y	Y	N	Y	N	-	N
7	N	Y	N	Y	Y	Y	N	Y	N
8	N	Y	Y	Y	Y	Y	N	Y	Y
9	N	N	N	Y	N	Y	Y	Y	Y
10	N	N	N	Y	N	Y	Y	Y	N
11	N	N	N	Y	N	Y	Y	Y	N
12	N	Y	Y	Y	Y	Y	N	Y	N
13	N	Y	Y	Y	N	N	N	Y	N
14	N	N	N	Y	Y	Y	Y	Y	N
15	N	N	N	Y	N	Y	Y	Y	Y
16	N	N	N	Y	N	Y	Y	-	Y
17	N	N	N	Y	N	Y	Y	Y	Y
18	N	N	N	Y	Y	Y	Y	Y	N
19	N	N	N	N	N	Y	Y	Y	Y
20	dismantled	N	N	?	Y	N	Y	Y	N
21		N	N	Y	N	Y	Y	Y	N
22		N	N	Y	Y	N	Y	Y	Y
23		N	N	Y	N	Y	Y	Y	Y
24		Y	Y	Y	N	Y	N	Y	Y
25		Y	N	Y	N	Y	N	Y	Y
26		Y	Y	Y	N	Y	N	?	Y
27		?	N	Y	N	Y	N	Y	Y
28		Y	N	Y	N	Y	N	Y	Y
29		N	Y	Y	N	Y	N	Y	Y
30		Y	Y	Y	-	Y	N	Y	Y
31		N	dismantled	Y	dismantled	Y	N	?	N

¹Y = kakapo fed from tray, N = did not feed from tray, ? = may have fed from tray, W = fed from wires only, - = station not checked.

Appendix 5: Kakapo visits to feeding stations (Little Barrier Island, January 1990)

January 1990	Feeding stations ¹									
	1	2	4	5	6	7	8	9	10	
1		N	?		N	Y	N	Y		
2		N	?		Y	Y	Y	Y		
3		N	?		Y	Y	Y	Y		
4	wires	N	?		N	N	Y	Y		
5	only	N	N		N	N	Y	Y		
6	W	N	N		?	Y	Y	Y		
7	W	Y	?		?	Y	N	Y	W	
8	N	Y	N		N	N	N	Y	N	
9	W	Y	Y		?	N	?	Y	N	
10	W	Y	N		N	N	?	Y	W	
11	N	Y	Y		N	N	N	Y	W	
12	N	Y	N		Y	N	N	Y	W	
13	?	Y	Y	W	Y	N	Y	Y	W	
14	?	?	N	W	N	N	N	Y	Set-up	
15	N	N	Y	W	N	Y	N	Y	Y	
16	N	N	N	W	Y	Y	Y	N	Y	
17	N	N	Y	W	Y	Y	Y	Y	Y	
18	N	N	?	W	N	Y	?	Y	Y	
19	N	N	N	W	Y	Y	N	Y	Y	
20	N	N	N	Set-up	Y	Y	Y	N	Y	
21	N	N	Y	Y	Y	Y	N	Y	Y	
22	N	N	N	Y	N	Y	Y	Y	Y	
23	W	Y	N	Y	Y	N	?	Y	Y	
24	W	Y	N	Y	N	N	?	Y	Y	
25	-	N	N	Y	N	N	N	N	Y	
26	-	N	N	Y	N	N	?	Y	Y	
27	W	N	N	Y	N	Y	Y	Y	Y	
28	-	N	N	Y	N	Y	Y	Y	Y	
29	-	N	N	Y	N	Y	Y	?	Y	
30	W	N	N	Y	N	N	N	Y	Y	
31	W	N	N	Y	N	?	N	Y	Y	

¹Y = kakapo fed from tray, N = did not feed from tray, ? = may have fed from tray, W = fed from wires only, - = station not checked.

Appendix 6: Kakapo visits to feeding stations (Little Barrier Island, February, 1990)

February 1990	Feeding stations ¹									
	1	2	4	5	6	7	8	9	10	
1	-	N	N	Y	N	Y	N	Y	Y	
2	W	N	N	Y	N	N	N	Y	Y	
3	N	N	?	Y	N	?	Y	Y	Y	
4	W	N	N	Y	N	?	N	Y	Y	
5	W	N	N	Y	N	N	N	Y	Y	
6	N	N	Y	Y	N	N	N	Y	Y	
7	N	N	N	Y	N	Y	N*	Y	Y	
8	?	N	Y	Y	N	N	N	Y	Y	
9	W	N	N	Y	N	N	N	Y	Y	
10	W	N	N	Y	N	N	N	N	Y	
11	W	N	?	Y	N	N	N	N	Y	
12	W	N	Y	Y	N	N	N	Y	Y	
13	N	N	N	Y	N	Y	N	Y	Y	
14	W	N	Y	Y	N	Y	N	Y	Y	
15	W	N	N	Y	N	N	N	Y	Y	
16	W	N	N	Y	N	N	N	Y	Y	
17	N	N	Y	Y	N	Y	N	Y	Y	
18	W	N	N	Y	N	N	N	Y	Y	
19	W	N	N	Y	N	Y	N	N	Y	
20	W	N	Y	Y	N	N	N	Y	Y	
21	W	N	N	Y	N	N	N	Y	Y	
22	W	N	Y	Y	N	Y	Y	Y	Y	
23	Set-up	N	N	Y	N	N	N	Y	Y	
24	W	N	N	Y	N	Y	N	N	Y	
25	W	N	Y	Y	N	N	N	Y	Y	
26	W	N	N	Y	N	N	N	Y	Y	
27	?	N	Y	Y	N	Y	N	Y	Y	
28	N	N	N	Y	N	Y	N	Y	Y	

* The bird, which was observed from a hide, went to tray, looked in twice without taking anything and then moved off. It did not return in the subsequent 75 minutes.

¹Y = kakapo fed from tray, N = did not feed from tray, ? = may have fed from tray, W = fed from wires only, - = station not checked.

Appendix 7: Kakapo visits to feeding stations (Little Barrier Island, March 1990)

March 1990	Feeding stations ¹									
	1	2	4	5	6	7	8	9	10	
1	N	N	N	Y	N	N	W	Y	Y	
2	N	N	?	Y	N	Y	?	Y	Y	
3	N	N	N	Y	Y	Y	?	Y	Y	
4	N	N	Y	Y	Y	N	N	Y	Y	
5	N	N	N	Y	Y	Y	?	Y	Y	
6	N	N	N	Y	Y	Y	N	Y	Y	
7	N	N	Y	Y	N	Y	N	Y	Y	
8	N	N	N	Y	Y	Y	N	Y	Y	
9	N	Y	N	Y	Y	N	N	Y	Y	
10	N	N	Y	Y	Y	Y	N	Y	Y	
11	N	N	N	Y	Y	Y	N	Y	Y	
12	N	N	Y	Y	Y	Y	N	Y	N	
13	N	N	N	Y	Y	Y	N	Y	Y	
14	-	N	Y	N	Y	Y	Y	Y	N	
15	-	N	Y	N	Y	Y	Y	?	Y	
16	N	N	N	N	Y	Y	Y	Y	Y	
17	N	Y	Y	N	Y	N	Y	Y	Y	
18	N	?	Y	N	-	N	Y	Y	Y	
19	-	Y	Y	Y	Y	N	Y	Y	Y	
20	W	Y	Y	Y	N	N	N	Y	Y	
21	-	Y	Y	Y	N	N	N	Y	Y	
22	N	Y	Y	Y	N	N	N	Y	Y	
23	W	Y	Y	Y	N	N	Y	Y	Y	
24	W	Y	Y	Y	Y	N	N	N	Y	
25	W	Y	Y	Y	Y	N	Y	Y	Y	
26	W	Y	Y	Y	Y	N	Y	Y	Y	
27	W	Y	Y	N	Y	N	Y	Y	?	
28	N	?	Y	N	Y	Y	N	?	Y	
29	Y	N	Y	N	Y	N	N	N	Y	
30	N	N	Y	N	Y	Y	N	Y	Y	
31	W	Y	?	Y	Y	Y	N	Y	Y	

¹Y = kakapo fed from tray, N = did not feed from tray, ? = may have fed from tray, W = fed from wires only, - = station not checked.

Appendix 8: Kakapo visits to feeding stations (Little Barrier Island, April 1990)

April 1990	Feeding stations ¹									
	1	2	4	5	6	7	8	9	10	11
1	Y	Y	N	Y	Y	Y	N	Y	Y	
2	Y	Y	?	Y	Y	Y	N	Y	Y	
3	Y	Y	N	Y	N	Y	N	Y	Y	Set-
4	Y	Y	N	Y	?	Y	N	Y	Y	up
5	Y	Y	N	Y	N	Y	N	Y	Y	N
6	Y	Y	Y	Y	N	Y	Y	N	Y	N
7	Y	Y	Y	Y	Y	N	Y	Y	Y	N
8	Y	Y	Y	Y	Y	N	Y	Y	Y	N
9	Y	Y	Y	Y	Y	N	Y	Y	Y	N
10	Y	Y	Y	Y	Y	N	Y	Y	Y	N
11	Y	Y	Y	Y	Y	N	Y	Y	Y	N
12	Y	Y	Y	Y	Y	N	Y	Y	Y	N
13	Y	Y	Y	Y	Y	N	Y	Y	Y	N
14	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
15	Y	Y	Y	Y	N	Y	Y	Y	Y	N
16	?	Y	Y	Y	Y	N	Y	Y	Y	N
17	Y	Y	Y	Y	Y	N	Y	Y	Y	N
18	Y	Y	Y	Y	Y	N	?	Y	Y	N
19	Y	Y	Y	Y	N	Y	Y	Y	Y	N
20	Y	Y	Y	Y	N	Y	Y	Y	Y	N
21	Y	Y	Y	Y	Y	N	?	Y	Y	Y
22	Y	Y	Y	Y	Y	N	N	Y	Y	Y
23	N	N	Y	Y	N	Y	N	Y	Y	Y
24	N	N	N	Y	Y	Y	N	Y	Y	Y
25	N	N	Y	Y	Y	Y	N	Y	Y	Y
26	Y	N	Y	Y	Y	N	Y	Y	Y	N
27	Y	N	?	Y	N	Y	N	Y	Y	Y
28	Y	N	Y	Y	N	Y	N	Y	Y	Y
29	Y	N	Y	Y	N	Y	N	Y	Y	Y
30	Y	N	Y	Y	Y	N	N	Y	Y	Y

¹Y = kakapo fed from tray, N = did not feed from tray, ? = may have fed from tray, W = fed from wires only, - = station not checked.