Return to previous file: sr66.pdf

3.2 Movements and pairing of 1991 juveniles

3.2.1 K-8154 (radio-tagged): During February 1992 this juvenile was seen at several locations in the Tuku study area, including its natal home range, but in April it was fairly sedentary east of Taiko Camp (Fig. 2). In July it was in the lower Kawhaki Creek catchment, about three kilometres south of Taiko Camp, paired with an unjessed adult. It has been found in this area during each subsequent trip. From the timing of its stints on the nest (males incubate from mid-morning to late afternoon, females for the rest of the time), K-8154 is assumed to be a female.

Table 1 Number of adult parea during July-August 1992 in the Awatotara and Tuku study areas, southern Chatham Island.

Study area and territory names	Paired	Un-paired*
AWATOTARA		
Hadlee	2	
Siberians	2	
Eastenders	2	
Extras		2
Total	6	2
TUKU		
Lower Tuku		
Bumbag	2	
Lower Tuku	2	
Total	4	
Abyssinia		
Head Basin		1
Bike Park	2	
Punga	2	
Slip	2	?
Catch-22	2	
Pigeon Alley	2	
DSIR Plot		4
Upper Doubters	2	
Mid Doubters	2	
Total	14	5
Mid-Tuku		
Taiko Camp 2 ?		
Toyota Gully	2	1
Grunt	2	2
Snake Gully	2	
Greenpeace	2	
Waterfall	2	
Lower Doubters	2	
Total	14	3
TOTAL	**38**	**10**

* Minimum numbers

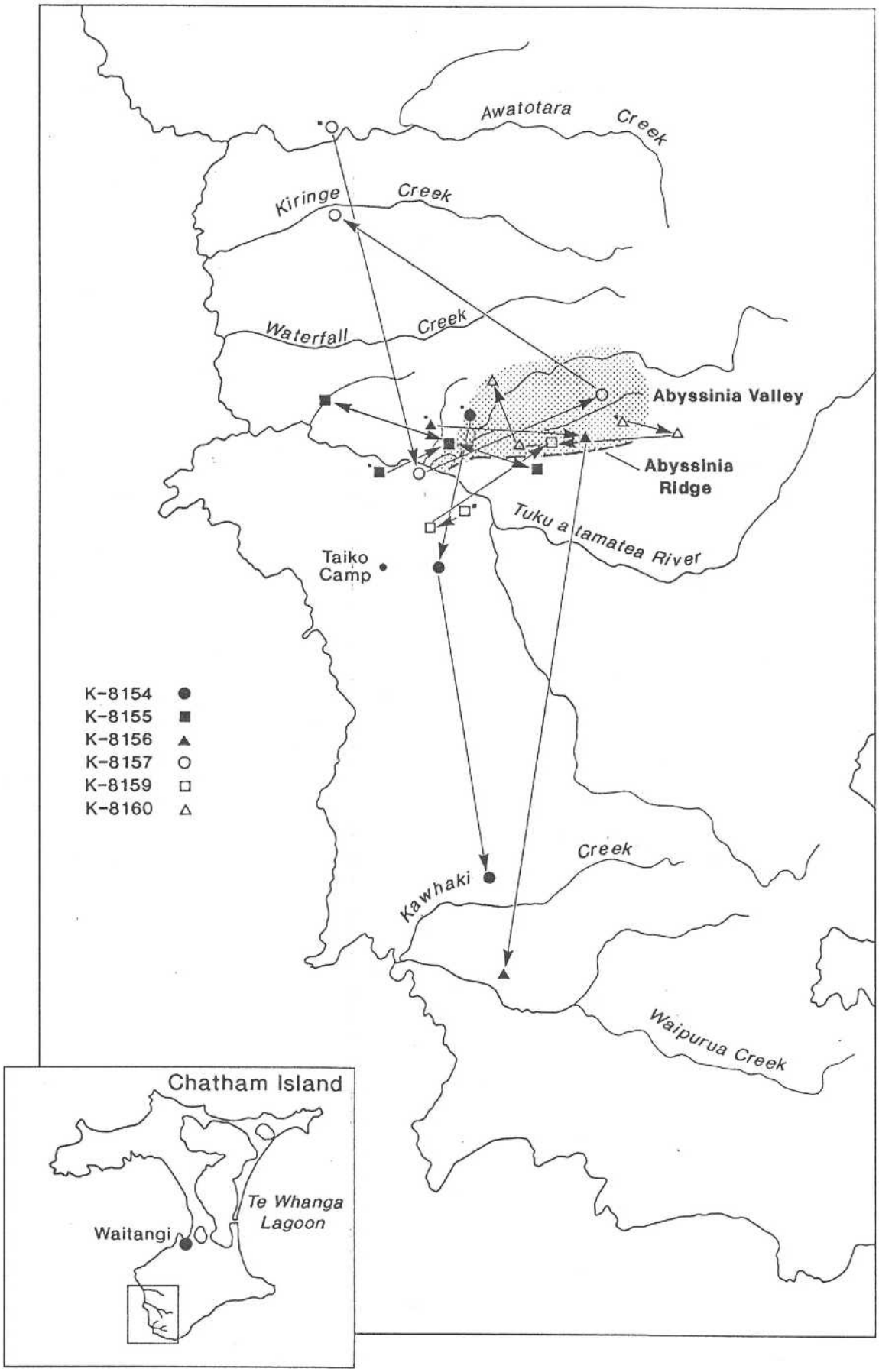

Figure 2 Nest sites (symbol with a dot beside) and subsequent general sightings of the six parea jessed and fledged in 1991.

3.2.2 K-8155 (radio-tagged): In February 1992 this bird moved between several sites in the Tuku catchment, and in April 1992 it was found mainly east of Abyssinia Ridge (Fig. 2). Initially during the July trip it remained in Macrocarpa Gully, but later fed mainly east of Abyssinia Ridge and roosted in southern Abyssinia Valley. Similarly, in September-October 1992 it fed east of Abyssinia Ridge and roosted in southern Abyssinia Valley, but also joined other birds to feed on clover in the lower Tuku Valley. In January 1993 it fed in Macrocarpa Gully and southern Abyssinia Valley, and was invariably found at the latter location in the early morning and evening. During April 1993, by which time its transmitter had fallen off, the bird was located once, in southern Abyssinia Valley. Although it associated with other parea, particularly in January 1993, it remained unpaired.

3.2.3 K-8156 (jessed): This bird was seen once in flight over Abyssinia Valley in February 1992, and was next seen in September 1992 in the Waipurua Valley (Fig. 2). The next sighting of it was during April 1993 in the same valley, in company with a juvenile raised in the lower Tuku Valley in 1992.

3.2.4 K-8157 (jessed): During February and late March 1992, K-8157 associated with its parents in the Awatotara Valley, but was not seen in April 1992. In July it was seen only twice at the southern end of Abyssinia Valley. The next sighting was in November near the head of Abyssinia Valley (Fig. 2). It was not seen in January 1993, but in April it was regularly found in a patch of forest beside Kiringe Creek opposite the Tuanui's home. Although still unpaired, a 1993 unjessed juvenile was often seen near K-8157 in Kiringe Bush.

3.2.5 K-8159 (jessed): In February and April 1992 this bird was seen in its natal home range near the Taiko Camp. During late July it was found nest building in mid Abyssinia Valley (Fig. 2) and has since remained there and bred successfully. The timing of its stints on the nest indicates that it is a female.

3.2.6 K-8160 (radio-tagged): During February, April and July 1992, K-8160 was located mainly in the northern portion of Abyssinia Valley (natal home range) and to the northeast (Fig. 2). Although its transmitter fell off in September, in October it was often seen along Abyssinia Ridge, and occasionally in the lower Tuku Valley feeding on clover with other parea. It seemed to be paired in October and was sometimes seen breaking off and carrying twigs, but it was not found nesting. The only subsequent sightings were in January 1993 when it was twice seen near the Bike Park feeding with other pigeons on pouteretere fruit (Fig. 2).

In summary, these birds became independent during December 1991 - April 1992. For the first few months after becoming independent they were fairly mobile and often returned to their respective natal home ranges. Two females (K-8154 & 8159) had paired by August 1992, one to four kilometres from their natal areas. The behaviour of K-8160 suggested it was also a female which may have paired, but subsequent sightings were too infrequent to confirm this. The three other birds were possibly males, but this can be confirmed only after they have paired and their mating or incubation behaviour observed.

3.3 Phenology

Research into the ecology of kereru has indicated that fruit availability is probably the main factor that induces and sustains breeding (Clout 1990, Langham 1991). Ripe fruit of all seven species were eaten by parea, plus green and half-ripe fruit of karamu and hoho. Therefore, phenology results are provided for ripe fruit availability of five food species, and a combined score for green, half-ripe and ripe fruit of karamu and hoho from April 1992 to April 1993 (Fig. 3).

Ripe matipo fruit was scarce during the 13-month period; just the remnants of an abundant crop were available during November 1991 to March 1992. Similarly, few ripe mahoe fruit were present. Most mahoe fruit ripened during January to April. It is highly sought after by parea and several species of introduced passerines, and was eaten almost as soon as it ripened. Supplejack and hokataka fruit ripened during late summer-autumn (Tisdall 1992), and was most abundant in autumn and winter 1992 (Fig. 3). Small amounts of green karamu fruit were available year round; no ripe fruit was seen. Hoho fruit reaches full size in autumn and ripens gradually in winter and spring (Tisdall 1992). In July 1992 several marked trees were laden with fruit (scores = 5). The availability of hoho fruit in April 1993 was much less than in April 1992 (Fig. 3). Ripe pouteretere fruit has been evident during each trip, but was most abundant in January 1993. This fruit crop gradually ripens during winter to summer.

3.4 Diet

During each three-week field trip much of the parea's diet consisted of two or three food-types from five or fewer species (Table 2). When parea ate pasture species we were often unable to determine the species. Pasture species eaten in October 1992 seemed to be mainly white clover (*Trifolium repens*) and some ryegrass (*Lolium* sp.) from what had recently been sheep pasture. However, during April 1993, as well as foraging at such sites, parea often fed on the ground under open kopi forest, feeding on clover, pennywort (*Hydrocotyle heteromeria*) and chickweed (*Stellaria decipiens*).

The diet of parea, as presented in Table 2, is considered, from more general observations, to be a good approximation of what the birds were eating during each field-trip, except in October 1992. During October only one parea in the Awatotara and Tuku study areas had a functional transmitter. All birds proved difficult to follow because most flew some distance from their home ranges to feed. They flew to the tarahinau (*Dracophyllum arboreum*) forest to feed mainly on hoho fruit, and to sheep pasture to feed on clover. While we readily located parea feeding on pasture, only the radio-tagged bird could be regularly found when parea sought food in tarahinau forest. From a casual analysis of at least 50 droppings, we are confident that in October the birds fed almost entirely on hoho fruit and pasture species. However, the proportion of feeding observations attributed to the eating of hoho fruit (22%) probably underestimates the importance of this food.

A feature of the parea diet during 1992-93 was the change from a largely fruit and pasture diet in April, July and October 1992, to one of mainly leaves in 1993 (Table 2). This difference is most evident when the April 1992 diet is compared with that of April 1993 (Fig. 4). In 1993, other than the pasture component, much of the rest was

Parea nesting season extended from June 1992 - February 1993.
Figures in brackets are sample sizes.

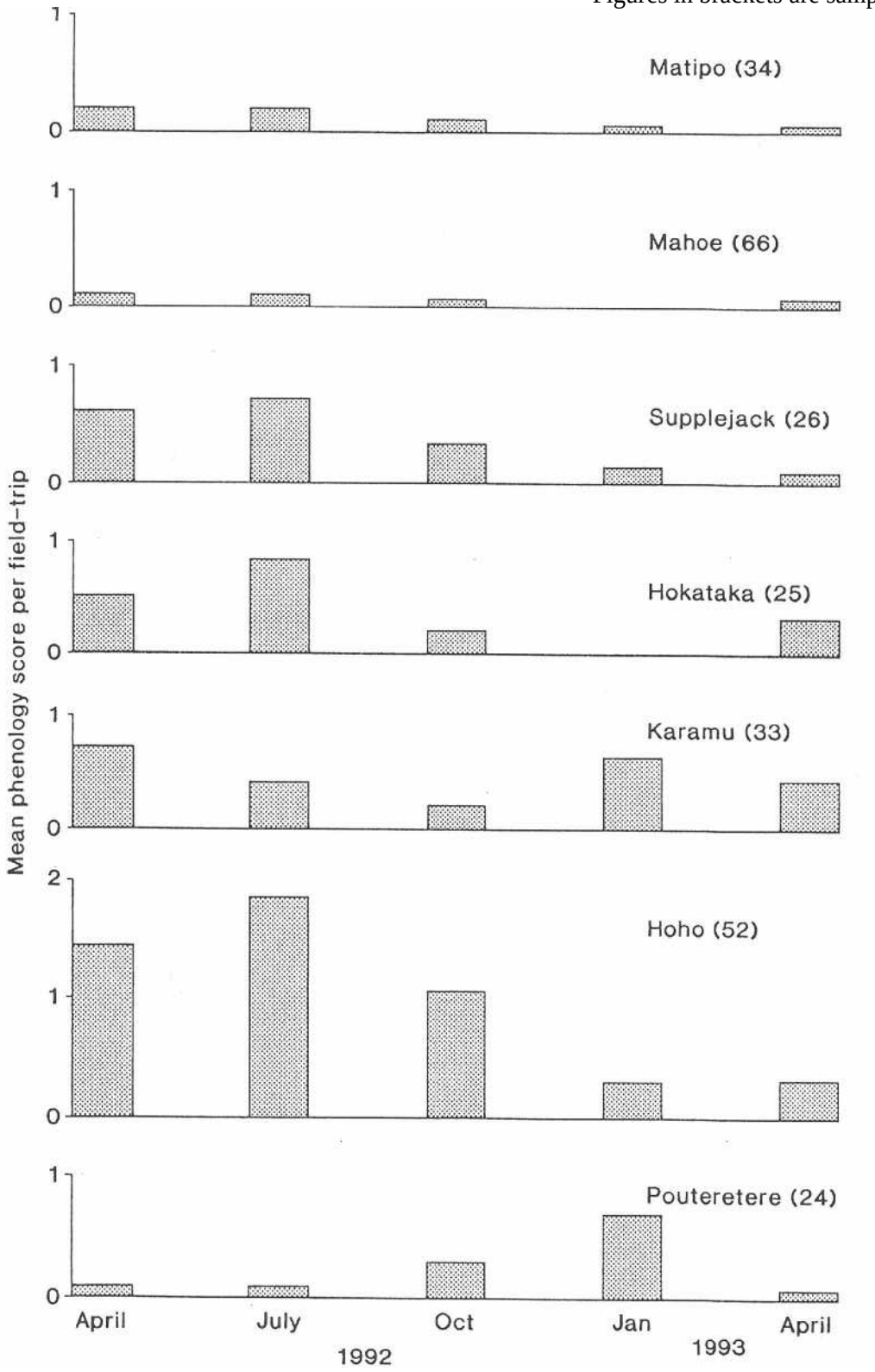

Figure 3 Phenology scores (max. of 5) for fruit availability on 7 parea food species, southern Chatham Island.

coarse, mature leaves that appeared little digested in the droppings. As well as these mature leaves, parea regularly ate the terminal 3-5 cm of mahoe (*Melicytus chathamicus*) and karamu twigs. Although only a minor component of the diet in April 1993 (2% of 419 feeding observations), parea were seen feeding on galls on the twigs of karamu. These galls were formed by gallmidges and each probably contained a 0.5 mm long maggot (J. Dugdale pers. comm.). A juvenile parea that ate a caterpillar from a mahoe is the first instance of a parea seen deliberately eating an invertebrate.

3.5 Foraging movements

Parea flew long distances over unsuitable habitat (extensive pasture-bracken, *Pteridium aquilinum*) to reach forest and shrub habitats, as was noted in 1991-92 (Powlesland *et al.* 1992). No doubt a small proportion of flights were made by wandering juveniles and unpaired adults, but the majority were by birds flying to food sources not available in their home ranges. Such foraging flights were particularly evident in October and January. By October very little hoho fruit remained in the home ranges of nesting pairs in the Awatotara and Tuku Valleys. Birds from Abyssinia and Awatotara Valleys (Fig. 1) flew up to about two kilometres east to reach hoho trees laden with ripening fruit in tarahinau forest. Most birds returned to their home ranges within an hour, but a radio-tagged unpaired bird often remained in the tarahinau forest for 3-4 hours at a time. It seems that the tarahinau tableland forest was not inhabited by territorial pairs.

Flights west from Abyssinia Valley and down the Tuku Valley in October were generally of birds flying for about half a kilometre to feed on pasture. Such sites were usually at the forest edge or where a small isolated forest patch was surrounded by pasture. Some sites were visited more than once each day by several individuals, and it was usual to find a parea feeding on the ground or roosting nearby at any time. On one occasion at least 14 birds were seen at such a site; this flock included breeding and non-breeding adults, as well as juveniles raised earlier in the season.

Table 2 Percentage of feeding observations (>5%) parea fed on a variety of food-types in southern Chatham Island.

Field-trip	N[1]	Food species and types										
		Matipo	Mahoe		Pasture[2]	Pouteretere	Hokataka	Hoho			Karamu	Other
		FRU[3]	FRU	LEA	LEA	FRU	FRU	FRU	LEA	FLB	LEA	
1992												
April	754	32.2	34.0	-	9.8	-	8.1	-	-	-	-	15.9
July	543	-	-	-	-	-	-	84.7	-	-	-	15.3
October	495	-	-	-	59.0	-	-	22.0	-	-	-	19.0
1993												
January	185	-	-	10.3	16.2	13.5	-	11.9	17.3	9.2	9.2	12.4
April	419	-	-	12.4	23.2	-	-	-	18.6	-	24.8	21.0

[1] N = number of feeding observations.
[2] Pasture foods were mainly white clover, grasses, pennywort and chickweed.
[3] FRU = fruit; LEA = leaf; FLB = flower bud.

In January 1993, as in 1992, parea were seen flying from the valleys to eat hoho fruit and flower buds, and clover. Often the birds spent several hours at isolated forest patches, such as Macrocarpa Gully and Blackberry Creek forest (Fig. 1), feeding and roosting before returning to the main valleys. Parea flew two to three kilometres to reach sources of ripe pouteretere fruit during January, particularly in the Tuku study area. Flights to and from pouteretere scrub were most evident in the early morning and late evening. Flocks of up to seven parea were seen roosting together in isolated tarahinau trees in the semi-open pouteretere scrub, but generally the birds dispersed to feed on the fruit.

3.6 Breeding

3.6.1 Timing of breeding season During the 1992-93 breeding season, the nesting of 16 pairs of parea was monitored in detail; three pairs in the Awatotara Valley, 12 in the Tuku Valley and one in the Kawhaki Valley (Fig. 1). Because observers were not available every day to determine the breeding status of each pair and five nesting attempts failed early in incubation, a few nesting attempts may have gone undetected. When not known from direct observation, the egg laying date at a nest was estimated from chick age and/or fledging date. The earliest pair to nest began incubating in early

Figures above the colums are the number of feeding observations.

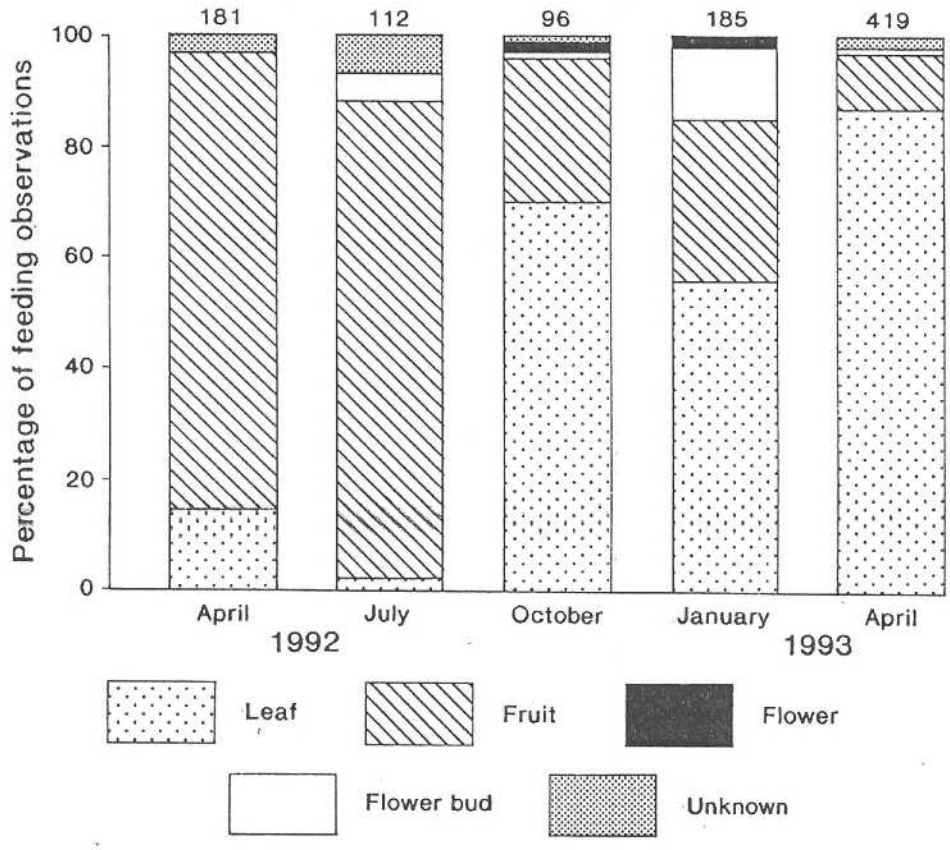

Figure 4 Feeding observations of parea during 5 field-trips in 1992-93, expressed as percentages, identifying the 4 food-types (plus unknown) on which the birds were feeding.

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