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Arboreal Foraging and Food-caching by the Forest Raven *Corvus tasmanicus*

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Summary

Observations were made of arboreal foraging, use of arboreal cache-sites and retrieval of food from caches by Forest Ravens *Corvus tasmanicus*, in forest on the North Coast of New South Wales in spring 1996 and 1997. During the Ravens' breeding cycle, mostly while they had young nestlings, the adults hid food in three types of cache-site: stick structures (used as feeding platforms), cavities in dead branches, and behind loose bark on tree-trunks. While near the nest, apparently guarding, adult Ravens sometimes foraged in the tree canopy by gleaning foliage and probing dead wood.

Introduction

All five Australian species of crow and raven *Corvus* spp. have been observed to cache food in captivity, and most (except the Little Crow *C. bennetti*) also in the wild; cache-sites have been mostly terrestrial (reviewed by Ley 1995). Only the Australian Raven *C. coronoides* and Torresian Crow *C. orru* have been observed to retrieve cached food in the wild (Rudwick & Rudwick 1988; Ley 1995; Purchase & Purchase 1997).

There have been few records of the Forest Raven *C. tasmanicus* caching food (Leonard 1978), and none of retrieval of food from caches. This note describes arboreal foraging and habitual use of arboreal caches by the northern subspecies *C.t. boreus* in New South Wales, during the breeding cycle.

Observations

The following observations were made while studying a pair of Forest Ravens during the 1996 and 1997 breeding seasons (Secomb 2005). The nest area was on the edge of Nambucca State Forest overlooking the settling ponds of the Nambucca Heads sewage-treatment plant (30°38′S, 153°00′E) on the North Coast of New South Wales, approximately 1 km from the beach. The 1997 nest was built on the previous year's nest. The adult Ravens were sexed when possible according to their roles at the nest (male corvids the primary food-provider, females the primary carer of eggs or young: Rowley 1973a).

During these observations, most of the Ravens' foraging time was spent either at the beach or on the mown grassy area around the settling ponds. Occasionally they were observed foraging in the forested area around the nest, both on the ground and in the trees. Usually, one parent Raven was on or near the nest when the other was absent.

Caches

Cache 1: a stick structure in the top of a tall Blackbutt *Eucalyptus pilularis* with a bushy canopy, 100 m from the Ravens' nest.

21 August 1996, 1534 h: The male flew to this site with a well-foliaged branchlet, and left 4 minutes later without it. At this stage the pair had eggs.

8 September, 0754 h: The male flew to this cache-site; at 0803 h he was there again with the female.

26 September, 0550 h: Both birds visited this site. On each occasion their activity was not visible.

Cache 2: a platform of sticks in a Blackbutt in an open situation 50 m from the Ravens' nest.

5 September 1996, 1525 h: The male flew in with a large white object in his bill and landed on this structure. The female left the nest to meet him at this cache, then flew off with food in her bill. The male flew to the nest, but it was uncertain whether he fed the young. At this cache both adults tore off pieces of food and carried them nearby to eat. At 1553 h the male again landed on this cache-site with a large piece of food and commenced feeding. The female left the nest and flew to this cache to collect some of the food; she left the area but soon returned. Meanwhile the male had fed the young. At 1722 h the male flew to this cache with nothing visible in his bill; he ate some food at the cache, then flew to the nest.

8 September, 0558 h: A Raven flew to this cache with nothing in its bill, then ate some food from the cache. This activity was repeated at 0600 h (about 15 minutes before sunrise). At 0636 h both Ravens were at the nest; the male flew to this cache but did not feed, then departed from the area. At 0647 h he carried food to this cache, where he fed. He then went to the nest and fed the female or young, revisiting this cache at 0742 h to collect more food before returning to the nest to feed the occupants.

Cache 3: a cavity in a dead branch in a Blackbutt about 10 m above ground.

19 September 1996, 1648 h: A Raven landed at this site and fed before departing.

Cache 4: behind loose bark on the trunk of a Broad-leaved Paperbark *Melaleuca quinquenervia* (Figure 1).

24 October 1996, 1700 h: A Raven landed in a favourite Paperbark in a small dam next to the settling ponds, with a large piece of food in its bill. It flew to the trunk of a Paperbark; while holding the food with its foot, it tore off a piece of bark and placed it over the food, which was behind a large fold of partly detached bark. The Raven then flew off without the food. By this stage the Raven young had recently fledged.

Cache 5: a hollow in the side of a fork 20 m above the ground, in a 30-m Blackbutt 30 m from the Ravens' nest.

7 September 1997, 1536 h: The male flew from this cache to the nest and fed the young. He returned to the cache and collected more food, which he fed to the young while the female was at the nest. At 1600 h the male landed at this cache with a large piece of food in his bill and deposited it in the hollow. The female flew from the nest to the cache, while the male flew to the nest and fed the young. After eating some food at this cache, the female also fed the young. At 1649 h the male landed at the cache with no visible food. After a few seconds he flew to the nest and gave food to the female, which fed it to the young. At 1719 h the male flew to this cache, deposited food (not seen in his bill) and wiped his bill. The female left the nest and fed at the cache while the male went to the nest and fed the young.

18 September 1997, 1638 h: The male flew to this cache. The female left the nest and flew to the tree; the male walked up the branch, away from the cache, and the female then flew to the cache and ate.

Cache 6: a small stick structure in the nest-tree (a Blackbutt).

28 September 1997, 0621 h: A Raven flew to this cache, moved some sticks and collected some food. It was seen 2 minutes later near the cache, holding food with its feet and tearing off pieces.

Cache 7: a notch in a dead branch in a Blackbutt 15 m above ground.

28 September 1997, 0830 h: A Raven landed just above this cache, reached down and picked up a piece of red meat 1 cm in diameter, which it carried away.

2 October 1997, 1534 h: A Raven flew to this cache where it ate some food, wiped its bill, then departed.

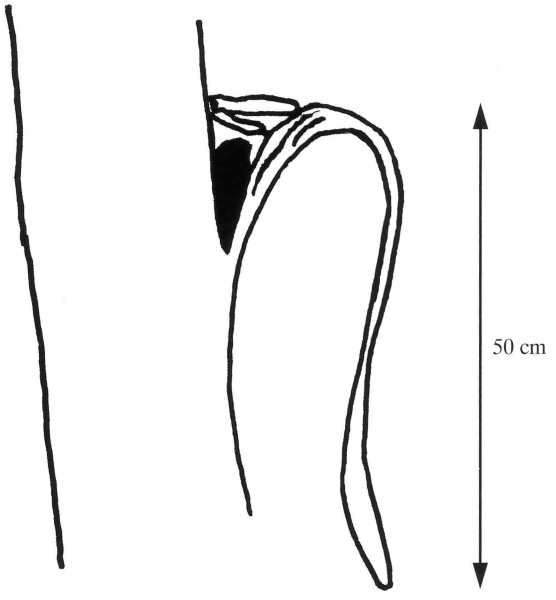

Figure 1. Cache 4. Sketch showing food (dark, covered by piece of bark) hidden behind a long fold of bark of a Broad-leaved Paperbark.

The Ravens concealed small items of food in the bill when flying to the nest, but carried large visible food items to the caches near the nest. All caches observed were in trees within 200 m of the Ravens' nest. The cache-sites were shallow stick structures approximately 30–40 cm in diameter, shallow cavities of dead limbs, or behind large flakes of bark on tree-trunks. The stick structures were in atypical sites for, and did not appear to be, old Raven nests. Most observations of the use of caches coincided with the first two weeks of the nestling period, when the adults were feeding young. Some caches were used for several days; one may have been used over a month. Two separate caches (6 and 7) were used on one morning.

Robbery of a cache

A cache was apparently robbed by Torresian Crows on the morning of 28 September 1997 (cf. caches 6 and 7, above). At 0545 h three Crows flew low over the Ravens' nest while the parents were absent. After much calling and chasing, one Crow left with a large piece of food that resembled an item which the Ravens typically concealed in a cache. Five minutes later two Crows returned and investigated the Ravens' nest, which contained a large nestling, but quickly dispersed when they heard the returning Raven.

Foraging in trees

29 August 1996, 1342 h: After both adult Ravens chased away a White-bellied Sea-Eagle *Haliaeetus leucogaster*, the male (?) was in a Blackbutt 100 m from the nest when he found prey in the foliage and ate it, holding it on the branch with his foot. At 1347 h he moved through the trees, keeping to the medium-to-large branches as he searched for prey. He probed intensely at the end of a

dead branch, at times tearing off splinters or flakes of wood. During this time the female was off the nest, at one stage heard some distance away. At 1507 h the female left the nest and started to search for prey in the foliage for 2 minutes without success. At 1529 h the male started to search in the foliage, where he found a large green insect. As he fed, the female left the nest and begged for the prey; he departed, leaving the female to feed on the remains.

18 September 1997, 1529 h: The male was foraging mostly around dead limbs and trunks within 70 m of the nest for 5 minutes. At 1618 h the female found a large insect in a tree near the nest; she held the prey with her foot as she tore it apart.

4 January 1998, about 2 km south-west of the above nest-site, two adult Ravens and one juvenile: One or possibly both adults foraged in the foliage mostly of large Blackbutt saplings, by peering upwards before moving up to the next branch. Twice a large insect (suspected to be cicadas *Psaltoda* sp. which were abundant) was caught and held against the tree-trunk with the foot as the prey was eaten. None was offered to the young nor did the young beg for food.

When foraging in trees, the Ravens restricted themselves to the larger branches and any associated foliage or dead branches where most prey was gleaned or, in one instance, probed. They did not venture to the outer foliage where branches could not support their weight. However, on an earlier occasion a foraging Raven did land in the outer foliage. On 1 January 1992 about 500 m from the pair's nest-site, an adult and a juvenile were seen in an area where many cicadas were calling. The adult was feeding in the treetop by jumping between branches. Once it flopped into the foliage in the manner of a Pacific Baza *Aviceda subcristata.*

Discussion

These observations confirm that Forest Ravens commonly use arboreal food-caches near the nest during the breeding cycle, and particularly during the nestling phase. Some of these cache-sites (i.e. the stick structures) were used as feeding platforms, in which the stored food was hidden among the sticks or apparently by placing leaves over the food.

The origin of the stick structures remains uncertain. Their size suggested an old Raven or raptor nest, but the structures did not appear to be old. Instead, they appeared to have been freshly built by the Ravens. Cache-site 1 was observed being constructed while the Ravens had an active nest that subsequently fledged young. The exposed location of cache-site 2 was uncharacteristic of the nests of any local bird species, and was not present on previous observation visits to the Ravens' active nest.

The long, partly detached bark folds on Paperbark trunks also appeared to have been created by the Ravens. In the vicinity of cache-site 4 were several other fresh bark folds hanging from the trunks of Paperbarks.

These observations are consistent with previous records of caching by Australian corvids (Ley 1995; Purchase & Purchase 1997), and suggest that corvids habitually retrieve food from caches to feed their young. Caches might act as a buffer against fluctuations in food supply or foraging conditions, and thus enable a constant supply of food, at a time of peak food demand while the male must supply himself, his mate and his brood. However, unlike the other Australian corvids, caches used by the Forest Raven (at least in forest habitat during the breeding cycle) are mainly arboreal. This finding, along with arboreal foraging, is consistent with the Forest Raven's stronger association with forest and greater willingness to forage beneath a closed canopy (Rowley 1970, 1973b).

Use of the tree stratum appeared advantageous during the incubation and nestling periods. The Ravens were able to survey their territory from a height

while still being able to forage. For instance, the male was able to guard the nest and forage (perhaps opportunistically) while the female was feeding elsewhere. Arboreal caches may prevent robbery by ground scavengers. However, arboreal cache-sites that resembled nests were not immune to investigation and robbery by Crows.

It remains to be determined how frequently Forest Ravens forage and cache arboreally during other stages of their annual cycle. Such behaviour may confer some ecological flexibility, enabling the Forest Raven to utilise forest niches less available to competing corvids. Observations on the preparation of cache-sites, such as stick platforms and bark crevices, are also required.

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