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First Record of Eurasian Jackdaw (*Corvus monedula*) Parasitism by the Great Spotted Cuckoo (*Clamator glandarius*) in Israel

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ABSTRACT.—Little is known about the biology of the Great Spotted Cuckoo (*Clamator glandarius*) in Israel. After erecting nest boxes intended for cavity-nesting raptors, however, we had opportunities to observe Great Spotted Cuckoos parasitizing Eurasian Jackdaws (*Corvus monedula*) that also nested in some of the boxes. During the 2003 breeding season, we monitored seven jackdaw nests, six of which were parasitized by cuckoos. In five of the jackdaw nests, one to four cuckoo eggs hatched, and one to three nestlings survived to fledge (four nests). This is the first documentation of Great Spotted Cuckoos parasitizing jackdaws in Israel. *Received 4 June 2004, accepted 18 February 2005.*

The Great Spotted Cuckoo (*Clamator glandarius*) is an obligate brood parasite. In Europe, the cuckoo's main host is the Common Magpie (*Pica pica*), and the Carrion Crow (*Corvus corone*) serves as a secondary host (Cramp 1985a). Cuckoos will parasitize other corvids, both in Europe (Cramp 1985a, Soler 1990) and in Africa (Jensen and Jensen 1969, Cramp 1985a), but their breeding success is generally greater when parasitizing magpies (Soler 1990). Parasitism of Eurasian Jackdaws (*Corvus monedula*) by Great Spotted Cuckoos has been observed in Spain, but at low frequencies (Soler 1990, 2002).

In Israel, the Great Spotted Cuckoo is a summer resident, arriving from mid-December to late March, and then leaving in June after the nesting season (Shirihai 1996). In Israel, Great Spotted Cuckoos mainly parasitize Carrion Crows (Yom-Tov 1975); to a lesser extent (isolated observations) they also parasitize Eurasian Jays (*Garrulus glandarius*; Shirihai 1996), Fan-tailed Ravens (*Corvus rhipidurus*; Shirihai 1996), and House Crows (*Corvus splendens*; Yosef 1997, 2002). Here, we report six instances of Great Spotted Cuckoos parasitizing jackdaw nests. We monitored hatching and fledging success of cuckoos in jackdaw nests to better understand the suitability of this species as a host for Great Spotted Cuckoos.

METHODS

The study site—an organic crop field and a date plantation (combined size = 32 ha) at Kibbutz Sde Eliyahu, Israel (32° 30′ N, 35° 30′ E)—was situated in the Jordan Rift Valley, 7 km from the city of Beit Shean and about 200 m below sea level. During the 2003 nesting season, we monitored five jackdaw pairs that nested in small nest boxes (50 cm wide × 30 cm long × 30 cm high; entrance 22 cm high × 15 cm wide) and two pairs that nested in large nest boxes (50 × 75 × 50 cm; entrance 25 × 15 cm). The small nest boxes, intended for Eurasian Kestrels (*Falco tinnunculus*), were erected in 1998 and attached to date palms (*Phoenix dactylifera*) at a height of 6 m above the ground; the large nest boxes, intended for Barn Owls (*Tyto alba*), were erected in 1993 in crop fields at a height of 3 m above the ground. Beginning the first week in March 2003, all nests were checked weekly using a hydraulic lift supplied by Kibbutz Sde Eliyahu. Because the jackdaw clutches were unusually large (mean clutch size in Israel is 4–5 eggs; Paz 1987), we suspected that inter- or intraspecific parasitism had taken place; but due to the similarity between jackdaw and cuckoo eggs, we were unable to identify parasites until 10 days after hatching (when feathers started showing). Although shape and color of the two species' eggs differ somewhat, we were unaware of those differences until we had confirmed that some of the nest-

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TABLE 1. Hatching and fledging success of six Eurasian Jackdaw nests parasitized by Great Spotted Cuckoos in Kibbutz Sde Eliyahu, Israel, during the 2003 breeding season.

	Number of eggs			Number of nestlings[a]			Number of young fledged		
Box no.	Cuckoo	Jackdaw	Both	Cuckoo	Jackdaw	Both	Cuckoo	Jackdaw	Both
1	2	5	7	1	2	3	1	0	1
2	—	—	5	1	1	2	1	0	1
4[b]	—	—	9	4	4	8	—	—	—
5[c]	—	—	9	2	3	5	2	—	2
8	—	—	9	4	0	4	3	0	3
37[d]	—	—	—	—	—	—	—	—	—
n	—	—	39	12	10	22	7	0	7
Mean	—	—	7.8	2.4	2.0	4.4	1.8	0	1.8
SD	—	—	1.8	1.5	1.6	2.3	1.0	0	1.0

[a] Brood size is a minimum estimate due to eggs/nestlings disappearing from some nests before identification.
[b] Nest box was accidentally knocked down by date plantation workers on 22 April. Four live cuckoos, three starved dead jackdaws, and one starving jackdaw were in the box. All were approximately 5 days old.
[c] One healthy and one starving jackdaw nestling were removed for another study.
[d] Clutch and brood size unknown: one cuckoo and one jackdaw egg were found in this abandoned jackdaw nest (discovered on 9 May). Fate of nest unknown.

lings were cuckoos; thus, the exact number of parasite and host eggs was unknown except in box number 1. In addition, the exact time and order of parasitism (before, after, or during jackdaw laying) was unknown. We identified starving nestlings as those that were substantially smaller and weaker (i.e., could not hold head up) than other nestlings, and starving or starved (dead) nestlings as those that had empty crops. Because corvids are known to remove dead nestlings from nests (Yom-Tov 1975), and because our nest checks took place only weekly, the fate (starved, diseased, depredated, etc.) of nestlings that disappeared between visits was unknown.

RESULTS

Jackdaws started building their nests during the first 2 weeks in March, and began egg laying about 4 weeks later; both species completed egg laying between 3 and 21 April. Cuckoo eggs were sub-elliptical with blunt ends, light bluish-green, and heavily marked with light brown spots. The eggs were similar in color and shape to the middle Great Spotted Cuckoo egg depicted in Cramp (1985a:plate 95). Jackdaw eggs were more elliptical, bluish-green, and lightly to thickly marked with dark brown spots; they were similar in color to both the left and middle jackdaw eggs depicted in Cramp (1985b:plate 76), but their shape more closely matched that of the left egg.

Cuckoos parasitized six of seven jackdaw nests (85.7%); a mean of 1.8 cuckoos fledged per parasitized nest ($n = 4$; Table 1). The one unparasitized jackdaw nest had a clutch of five eggs, all of which hatched, and three of which fledged. Eggs were found missing between nest checks in nest boxes 2 and 8. In box 8, there had been nine eggs, but there were just four cuckoo nestlings on the next nest check (8 days later). In box 2, three jackdaw eggs were missing after a cuckoo and a jackdaw had hatched. We were unable to determine the fate of the missing eggs or nestlings.

DISCUSSION

The parasitism rate and reproductive success of cuckoos we report suggests that jackdaws are suitable hosts for Great Spotted Cuckoos. Moreover, the impact of parasitism on reproductive success of jackdaws appears to be severe. The nesting success of parasitized jackdaw pairs (no jackdaws fledged at four nests) was less than that of the unparasitized pair (three jackdaws fledged). However, in Spain only 6 of 290 jackdaw nests were parasitized (2.1%; Soler 1990) and only 1 of 9 parasitized nests fledged cuckoos (11.1%; Soler 2002).

Habitat characteristics may be responsible for differences in the jackdaw-cuckoo relationship in Israel versus Spain. The high rate of parasitism we observed could have been due to a lack of alternative hosts or a cuckoo

preference for jackdaw hosts. Carrion Crows nest on the kibbutz about 1 km away from our study site (they do not nest in the date plantation or crop fields themselves) and have been parasitized for the past 10 years (SA pers. obs.), but they start nesting earlier than jackdaws (late February to early March; Paz 1987). In addition, many pairs of Eurasian Jays (>20 pairs) nested in the date plantation, but we have never recorded cuckoos parasitizing the jays.

In Israel, jackdaw populations declined drastically in the 1950s due to poisoning; in 1987 they were still considered rare, nesting in just a few isolated colonies (Paz 1987). In the early 1990s, jackdaw populations started to increase, and in 1999 they began nesting in our study area (SA pers. obs.). Recent sympatry may explain the cuckoo's success in Israel, as magpies living in recent sympatry with Great Spotted Cuckoos reject fewer eggs than those living in ancient sympatry (Soler 1990, Soler and Møller 1990, Soler et al. 1999).

There were differences in nest sites and nest type used by jackdaws in Spain versus those in Israel. In Spain, jackdaws nested in colonies (2–10 individuals; Soler and Soler 1996) on clay cliffs in which there were many crevices and holes. In Israel, jackdaws nested in nest boxes located on date palms ($n = 5$) and in crop fields ($n = 2$). Soler and Soler (1996) found that nests with larger entrances are depredated more frequently (by Common Ravens, *Corvus corax*) and that Great Spotted Cuckoos prefer hosts that nest in trees (Soler 1990). In Israel, the large entrances of our nest boxes and the location of jackdaw nest boxes in trees may have made it difficult for the jackdaws to defend their nests.

Great Spotted Cuckoo nestlings are known to outcompete host young for food, causing the latter to starve to death (Cramp 1985a, Soler 1990, Soler and Soler 1991). In Israel, at four of five nests with data on brood size, jackdaw nestlings were found both starved and starving due to such competition. None of the cuckoo young starved. However, our findings contrast with those of Soler (2002), who found that, for the most part, Great Spotted Cuckoo nestlings, and not jackdaws, are the ones that starved in jackdaw nests.

Brood parasites may prefer certain hosts over others. One would expect hosts that successfully raise parasitic young to be preferred over hosts that do not. In our study area, both the high rate of cuckoo parasitism of jackdaws and the cuckoo's high level of breeding success indicate that, under certain environmental conditions, jackdaws can be successful foster parents for Great Spotted Cuckoos.

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House Wren Preys on Introduced Gecko in Costa Rica

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ABSTRACT.—On 25 May 2002, we observed a House Wren (*Troglodytes aedon*) eating a juvenile house gecko (*Hemidactylus frenatus*) in Golfito, Costa Rica. Just a few studies report insect-eating birds taking vertebrate prey, and we found no prior publications for this species. The recently introduced house gecko may be a new potential food resource for other native species in Costa Rica and elsewhere. *Received 16 August 2004, accepted 17 March 2005.*

Members of the Troglodytidae are known for their almost completely insectivorous habits. Twenty-two species of this family have been reported for Costa Rica (Barrantes et al. 2002) and they are described as incessant searchers of insects, larvae, spiders, and other invertebrates. They seek their food in forests, thickets, open groves, grasslands, and marshes. In Costa Rica, the House Wren (*Troglodytes aedon*) is commonly found around human habitations and in man-made habitats. It is a conspicuous resident species occurring from lowlands to 2,750 m, and is rarely found in extensively forested areas or dry lowlands (Stiles and Skutch 1989).

On 25 May 2002, in Golfito, Puntarenas Province, Costa Rica (08° 39′ N, 83° 09′ W), we observed a House Wren holding a juvenile house gecko (*Hemidactylus frenatus*) in its bill. At the onset of our observation (11:06 CST), the bird held the gecko by the neck and was perched in the upper part of a bush (Rosaceae), 1.5 m above the ground in a garden on the campus of the Universidad de Costa Rica. The gecko was a characteristic uniform grayish-brown on the dorsum, and we estimate its size was approximately 3 cm (snout-vent length). While perched in the bush, the House Wren pounded the prey repeatedly against a branch, giving it strong shakes. Five min later, the bird flew to its nest in a nearby building with the gecko. The nest was placed about 2 m high on a beam of the open ceiling in one of the buildings' porches; the nest contained three nestlings approximately 9 to 12 days old. Finally, the House Wren fed the gecko to one of its chicks. We examined the nest but did not find a discarded gecko, suggesting that a chick ate the prey and swallowed it completely.

Cases of vertebrate predation by birds considered to be insectivorous are scarce. For example, vertebrate predation has been observed in only 4 of 50 species of wood warblers (Parulidae; Brown and Dickson 1994, Eaton 1995, Robinson 1995). Whereas there are limited reports of atypical vertebrate prey having been taken by tanagers (Aborn and Froehlich 1995, Pérez-Rivera 1997), woodcreepers, and leaftossers (Poulin et al. 2001), there are no such reports for wrens in Costa Rica (Stiles and Skutch 1989) or elsewhere (Guinan and Sealy 1987, Van Horne and Bader 1990, Johnson 1998). Our observation is the first report of vertebrate predation by a House Wren.

The house gecko, native to southern India, Sri Lanka, and Southeast Asia, is an invasive species that has widely extended its geographic range, and is now established in Australia, China, East Africa, and North and Central

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