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SHORT-TAILED HAWKS NESTING IN THE SKY ISLANDS OF THE SOUTHWEST

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ABSTRACT: Credible sightings of the Short-tailed Hawk (*Buteo brachyurus*) in southern Arizona, Sonora, and southwestern Chihuahua commenced in the 1980s and since then have become increasingly numerous throughout the sky islands of Arizona, New Mexico, Sonora, and Chihuahua. In this report we summarize previously unpublished sightings and breeding records from this region and compare aspects of the species' breeding biology in Arizona and Florida. In 2007 we intensively monitored one successful nest in the Chiricahua Mountains of Arizona—the first fully confirmed nest in the western U.S.—and in 2009 we documented, but did not monitor, another active nest in the Sierra la Madera of Sonora—the first nest known in northwestern Mexico. Like other described nests of the species, both nests were placed near the tops of tall live trees, fully exposed to the sky. Both had broods of two nestlings, the maximum brood size known for the species. Both young fledged from the 2007 nest in the Chiricahuas, matching the productivity of three other probable nestings in the same locality that were documented by sightings of pairs of juveniles in 2003, 2006, and 2010. Together with sightings of single juveniles in 2001, 2004, 2005, 2008, and 2009, these records suggest a very high level of local breeding success. The diet at the 2007 nest was predominantly small birds (83% of 137 identified prey), similar to the diet of the species elsewhere. The majority of Short-tailed Hawks observed so far in the sky islands, including all individuals we have seen (with the exception of one bird in northwestern Chihuahua), have been of the light morph.

The sky islands of southeastern Arizona, southwestern New Mexico, and northern Chihuahua and Sonora are an array of towering isolated peaks rising from the desert and grasslands between the Mogollon Rim and the Sierra

Madre Occidental (Warshall 1995). The high elevations of these mountains are vegetated with oak woodlands and coniferous forests that support highly diverse communities of birds, including many species at the northern limits of their ranges (Phillips et al. 1964). One of the less familiar of these is the recently arrived Short-tailed Hawk (*Buteo brachyurus*). Before the 1940s, this species was recorded only from tropical and subtropical regions of South and Central America north to southeastern Mexico and Florida (Brown and Amadon 1968, Williams et al. 2007). The Short-tailed Hawk is an unusual *Buteo* in that it feeds primarily on small birds, but it resembles many other species of this genus in having both dark and light color morphs (Miller and Meyer 2002). Observations of the last decade indicate that this species now breeds regularly in the sky islands, though in small numbers, and in this paper we summarize aspects of its recent penetration of the region and its breeding biology under conditions that are ecologically quite different from those of the only other region where it has been closely studied, the Florida peninsula.

REVIEW OF RECENT SIGHTINGS AND EXPANSION OF KNOWN RANGE

In early years of the 20th century, the Mexican range of the Short-tailed Hawk was not known to extend north or west of southern coastal Tamaulipas (Williams et al. 2007). Since then, however, the boundary of the known range has progressed in both these directions, reaching Michoacán by 1941 (Blake and Hanson 1942) and Colima by 1958 (Schaldach 1963). By the mid 1960s, Alden (1969) found Short-tailed Hawks to be common in parts of Nayarit and Sinaloa.

By the time another 30 years had elapsed, Howell and Webb (1995) mapped southern Sonora and southwestern Chihuahua as part of the species' range. Howell (1999:322) noted the Short-tailed Hawk as occurring regularly in all regions of Mexico except Baja California, the region around Monterrey, and northern Sonora and Chihuahua. Erickson and Howell (2001) likewise did not include the species in the avifauna of Baja California. Williams et al. (2007) documented its occurrence yet farther north in Mexico and in Texas, New Mexico, and Arizona. Here we add to the published records for the northwestern region, which Howell (1999) excluded from the known range, and also expand the known records for Sinaloa.

Records in Sinaloa

Records of the Short-tailed Hawk in Sinaloa date from Crossin's observations of a pair in 1964 at Rancho Carrizo in pine–oak forest at an elevation of 1830 m (Hubbard and Crossin 1974) and Alden's sightings from the mid 1960s (Alden 1969). Additional records are plotted in Figure 1. A Short-tailed Hawk was observed by Alan Craig (pers. comm.), Pierre Devillers, Jean Devillers-Terschuren, and Xenia de Heering on 19 August 1968 north of Esquinapa, about 30 km from Mazatlán. In northern Sinaloa, Moore-Craig observed a light-morph adult at El Fuerte on 24 April 1998—a location outside the range given by Howell (1999).

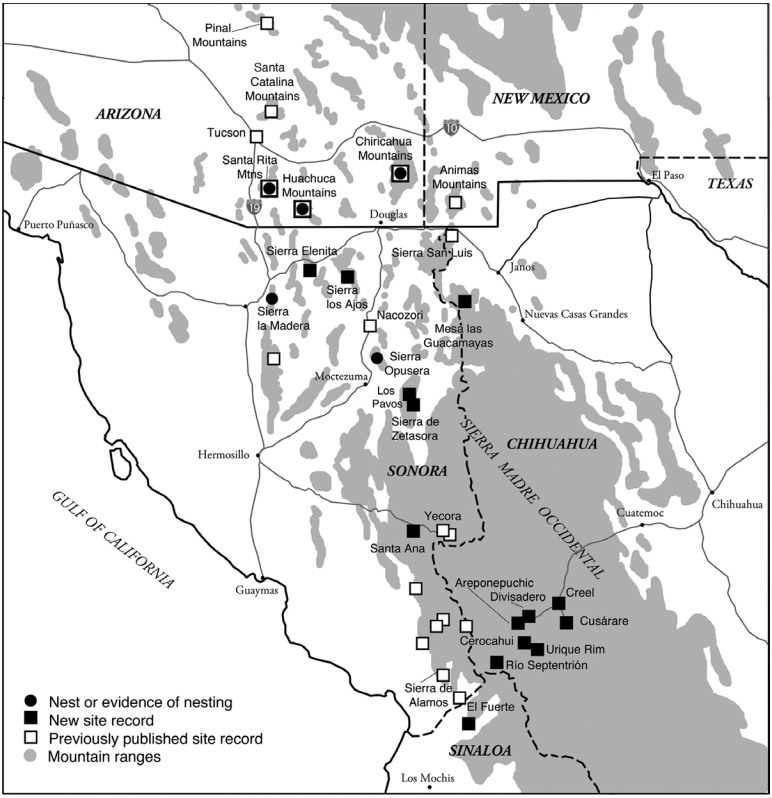

Figure 1. Locations of records of the Short-tailed Hawk in the southwestern United States and northwestern Mexico.

Status in Chihuahua

Williams et al. (2007) called attention to the dearth of published records of the Short-tailed Hawk in Chihuahua. There are credible unpublished records for Chihuahua, however, beginning in the mid 1980s, and since that time, researchers and guides of birding tours have reported (Table 1, Figure 1) that the Short-tailed Hawk is a rare but regular resident of the mountains of southwestern Chihuahua, especially in Barrancas del Cobre (Copper Canyon). In their landmark *Field Guide to the Birds of Mexico and Northern Central America*, Howell and Webb (1995) mapped the bird's presence in this region, on the basis of unspecified information that may have included some of these reports. Many of these sightings may have remained unpublished largely because they fell within the range mapped by Howell and Webb. Most of the Chihuahua sightings have involved light-morph birds.

Especially noteworthy in the context of range expansion are the 1997 sightings by N. F. R. Snyder, K. Concagh, and R. Otto of a single dark-morph

Table 1 Previously Unpublished Records of the Short-tailed Hawk in Chihuahua, Mexico

Date	Location	Sighting	Observers
30 May 1986	Urique Rim near Cerocahui	1 light-morph adult	R. Taylor
2 Apr 1987	Divisadero	1 dark-morph adult	R. Taylor
10 Oct 1989	Cerocahui	1 light-morph adult	R. Taylor
18 Apr 1990	Cerocahui	1 light-morph adult	R. Taylor
22 Apr 1991	Cusarare Falls near Creel	1 light-morph adult	R. Taylor
29 Mar 1995	Urique Rim near Cerocahui	1 light-morph adult	N. Moore-Craig, R. Taylor
27 Jun 1995	Urique Rim near Cerocahui	1 light-morph adult	R. Taylor
26–30 Jul 1997	Mesa las Guacamayas	1 dark-morph bird	N. Snyder, R. Otto, K. Concagh
25 Apr 1998	Cerocahui	1 light-morph adult	N. Moore-Craig
14 Mar 2001	Areponapuchic	1 light-morph adult	N. Moore-Craig
15 Aug 2004	Divisadero	2 light-morph adults	R. Taylor
14 Aug 2005	Rio Septentrion above reservoir, near Sinaloa	1 light-morph adult	R. Taylor
16 Aug 2007	Divisadero	1 light-morph adult	R. Taylor

individual near the top of Mesa las Guacamayas, a 2750-m, pine-forested location near the borders of both Sonora and New Mexico. Mesa las Guacamayas is the northernmost rim of the Sierra Madre Occidental. Visible from the Chiricahua Mountains in Arizona and the Animas Mountains of New Mexico, it is also the site of the northernmost known nesting colony of the Thick-billed Parrot (*Rhynchopsitta pachyrhyncha*). This locality is only about 50 km south of the Sierra San Luis, where J. P. DeLong observed a Short-tailed Hawk in 2005 (Williams et al. 2007; Figure 1). The two sites are connected by a corridor of hills and ridges.

Status in Sonora

Van Rossem (1945) and Marshall (1957) did not encounter the Short-tailed Hawk in Sonora. This result, together with sightings at 11 localities between 1982 and 1995 reported by Russell and Monson (1998), suggests that the Short-tailed Hawk's expansion into the state has been relatively recent, as was also suggested by Russell and Monson. Seven localities noted by Russell and Monson were in southeastern Sonora, two were near Yécora, and one was as far north as Nacozari de García. These sites are plotted in Figure 1 but are omitted from Table 2, which presents more recent Sonora records. Interestingly, 9 of the 13 birds reported by Russell and Monson were of the dark morph, whereas almost all other records for Sonora have involved light-morph birds. As most of the dark-morph birds were reported from different locations, they may not have included any individuals sighted repeatedly.

More recently, Flesch (2008a, b) has observed light-morph individuals in five mountain ranges in Sonora (Figure 1, Table 2): the Sierra Elenita, Sierra los Ajos, Sierra Opusera, Sierra Zetasora (north of Sahuaripa), and Sierra la Madera (east of Magdalena de Kino; site of the nest described below). His

Table 2 Recent Records, Mostly Unpublished, of the Short-tailed Hawk in Sonora, Mexico

Date	Location	Sighting	Observers
22 Dec 1998	Alamos	1 light-morph bird	D. Krueper, D. MacKay, Alamos CBC
20 Dec 1999	Yécora	2 birds	Yécora CBC
21 Dec 1999	Santa Ana, 25 km from Yécora	1 dark-morph bird	D. Krueper
21–23 Dec 2003	Sierra de Alamos	1 dark-morph bird	R. Taylor, Alamos CBC
31 Mar 2004	Los Pavos, Northern Jaguar Preserve	1 light-morph adult	N. Snyder
22 Dec 2004	Yécora	1 bird	Yécora CBC
28 Dec 2004	Alamos	1 bird	Alamos CBC
15 Mar 2006	Sierra de Alamos	1 light-morph adult	R. Wright
10 Jul 2006	Sierra Elenita (Cananea)	1 light-morph adult	A. Flesch
12 Jul 2006	Sierra los Ajos	1 light-morph adult	A. Flesch
10 Sep 2007	Sierra Opusera	2 light-morph adults, 1 juvenile	A. Flesch
11 Jul 2008	Sierra Zetasora, Northern Jaguar Preserve	1 light-morph adult	A. Flesch, M. Ali
19–21 Jun 2009	Sierra la Madera	1 light-morph adult, 2 nestlings	A. Flesch
8–9 Jul 2009	Sierra Opusera (same location as 10 Sep 2007)	2 light-morph adults	A. Flesch
11–12 Jul 2009	Sierra Opusera (>7 km from preceding sighting)	2 light-morph adults	A. Flesch

efforts and continuing surveys of the sky islands of northern Sonora (Flesch et al. 2009) indicate that Short-tailed Hawks occur at low densities in many of the ranges of northern Sonora that support pines (Figure 2).

Additionally, Short-tailed Hawks have been recorded on Christmas Bird Counts near Yécora (20 December 1999 and 22 December 2004) and Alamos (22 December 1998, 21 December 2003, and 28 December 2004; www.audubon.org/bird/cbc) and by other observers in these general locations (Table 2).

Status in New Mexico

Records for New Mexico are limited to a single light-morph bird seen on 24 May and 28 June 2005 high in the Animas Mountains (Williams et al. 2007). The scarcity of records in this state may be due mainly to a scarcity of high mountains in southwestern New Mexico and to limited access to the highest range in this region, the Animas Mountains. Surveys at high elevations in more northerly ranges that support pines, such as the Burro Mountains, the Black Range, and the Gila Wilderness, may provide additional records in the future.

Status in Arizona

The earliest accepted record of the Short-tailed Hawk in Arizona was of an adult seen by John Arvin near Barfoot Junction in the Chiricahua

Figure 2. Short-tailed Hawk breeding habitat in northern Sonora, like that in Arizona, appears to be limited to relatively high elevations with at least some pine forest.

Photo by A. D. Flesch

Mountains on 7 August 1985 (Rosenberg et al. 2007)—a location close to the nest of 2007 that we describe in this paper. The second Arizona record was of an adult in Sawmill Canyon of the Huachuca Mountains, found by Jon Dunn on 21 July 1988 (Rosenberg 2001). The first photographic documentation of the Short-tailed Hawk in Arizona was obtained by Rich Hoyer and Gary Rosenberg in Miller Canyon of the Huachuca Mountains in 1999 (Rosenberg 2001).

The Arizona Bird Committee (ABC) has reviewed 31 recent records of Short-tailed Hawks and accepted 25 (Rosenberg et al. 2007, G. Rosenberg pers. comm.): 12 from the Chiricahua Mountains, 7 from the Huachuca Mountains, 1 from the Pinal Mountains, 2 from Madera Canyon of the Santa Rita Mountains, 1 from Mt. Lemmon in the Santa Catalina Mountains, and 2 from the city of Tucson, where a bird wintered in 2008–2009 and 2009–2010 (Figure 1). Our summary of Arizona sightings excludes all reports not accepted by the ABC but includes some credible sightings that were never submitted to the committee (Appendix).

ABC records indicate "an almost annual presence in the Barfoot Park region of the Chiricahua Mountains since 1999" (Rosenberg et al. 2007). We found a successful nest of the species in this location in 2007, and birds have continued to be present there in spring and summer through 2010 (Appendix).

To date, only three of the many dozens of sightings in Arizona (representing an unknown total number of individuals) have involved the dark morph. Likewise in Chihuahua and Sonora, nearly all sightings other than those reported by Russell and Monson (1998) have involved the light morph. The

single individual seen in New Mexico by Williams et al. (2007) was also a light-morph bird. The recent preponderance of the light morph in the sky islands matches the recent situation in northeastern Mexico and Texas (see Williams et al. 2007, Lockwood 2001) but contrasts with the heavy and long-standing preponderance of the dark morph in Florida (see Miller and Meyer 2002, Meyer 2005).

EVIDENCE OF BREEDING IN ARIZONA AND SONORA

Evidence of breeding (Tables 3 and 4) is provided by (1) presence of paired birds during the breeding season, (2) summer sightings of juveniles (recognizable in the light morph by their buffy underparts; Figure 3), and (3) presence of active nests. Of these categories, the last two provide the strongest evidence of reproduction. No juvenal-plumaged birds have been well documented at high elevations of the sky islands prior to July, suggesting that July is the normal month for the start of fledging. Because the juvenal plumage of the Short-tailed Hawk is normally replaced by the bird's second summer (Ogden 1988, Miller and Meyer 2002, Wheeler 2003), and because the period of dependency of fledglings on adults in home territories is lengthy (sometimes exceeding 2 months), juveniles detected during summer are likely to have originated nearby. By fall, sightings of juveniles may more likely include some birds originating elsewhere.

From 19 to 21 June 2009, Flesch and Sky Jacobs observed a nest of Short-tailed Hawks at 1920 m in open pine–oak woodland in the Sierra la Madera of Sonora (east of Magdalena de Kino), the first reported nest for the state. The nest was situated at the very top of a Chihuahua Pine (*Pinus leiophylla*) and contained two chicks. Two years earlier, Flesch observed a pair together with a juvenile on 10 September in the Sierra Opusera, suggesting another nesting, and on 8 and 9 July 2009, he again found a pair behaving agitatedly at this latter location. Several days later he found another pair in the same mountain range but at least 7 km farther south, suggesting two occupied territories in 2009.

Probable nesting in the Huachuca Mountains of Arizona can be inferred from the presence of a pair near Miller Peak in 1999, a pair and juvenile in Carr and Miller canyons from 18 August to 9 September 2001 (*N. Am. Birds* 56:84, 2002), and two territorial birds near Carr Peak on 20 August 2006 (W. Walraven pers. comm.), but no nest has yet been found in that

Table 3 Evidence of Breeding of the Short-tailed Hawk in Sonora, Mexico[a]

Date	Location	Elevation	Sighting
10 Sep 2007	Sierra Opusera	2000 m	2 adults with 1 juvenile
19–21 Jun 2009	Sierra la Madera	~2000 m	1 adult at nest with 2 nestlings
8–9 Jul 2009	Sierra Opusera	2000 m	agitated pair of adults
11–12 Jul 2009	Sierra Opusera (>7 km from preceding sighting)		pair of adults

[a]All observations by A. D. Flesch.

Table 4 Evidence of Breeding of the Short-tailed Hawk in Arizona

Date	Observation	Observers or reference
Huachuca Mountains, Cochise County (elevation 2000–2500 m)		
26 Jul–4 Sep 1999	pair in Miller Canyon	Rosenberg et al. 2007
5 Aug–3 Sep 2001	1 adult with 1 juvenile in Carr Canyon	Rosenberg et al. 2007
20 Aug 2006	2 territorial birds near Carr Peak	W. Walraven
Santa Rita Mountains, Santa Cruz County (elevation 2150 m)		
13 Sep 2008	1 "fresh" juvenile at Josephine Saddle	NAB 63:132, 2009; www.azfo.org
Barfoot Park area, Chiricahua Mountains, Cochise County (elevation 2400–2700 m)		
5 Aug–3 Sep 2001	1 adult with 1 juvenile	Rosenberg et al. 2007
31 Mar–Aug 2002	1 pair	Rosenberg et al. 2007
19 Jul 2003	1 adult with 1 recent fledgling	NAB 57:528, 2003
25 Jul 2003	2 adults with 1 begging juvenile	NAB 57:528, 2003
5 Aug 2003	1 adult with 2 juveniles	NAB 57:528, 2003
7–16 Aug 2003	2 adults with 2 juveniles	Rosenberg et al. 2007
1 May–3 Jul 2004	1 pair	Rosenberg et al. 2007
5 Sep 2004	1 adult feeding 1 juvenile	NAB 59:125–126, 2005
11 Aug 2005	1 juvenile	NAB 60:116, 2006
15 Aug 2005	1 juvenile	N. Moore-Craig, J. Ruth
Summer 2006	1 pair	NAB 60:562, 2006
7 Aug 2006	3 birds, at least 1 adult and 1 juvenile	R. E. Webster
9–18 Aug 2006	2 juveniles	G. Rosenberg
25 May–4 Jul 2007	2 adults, 2 nestlings at nest	This paper
8–11 Aug 2008	1 juvenile	NAB 63:132, 2009
25 Aug 2009	1 adult with 1 juvenile	N. Moore-Craig, N. Snyder
15–18 Jul 2010	2 adults with 2 juveniles	N. and H. Snyder, N. Moore-Craig

range. A 13 September 2008 sighting and photograph by Dave Stejskal of a fresh juvenile in Madera Canyon suggests that the species may also have begun breeding in the Santa Rita Mountains. However, this record is from sufficiently late in the summer that the juvenile involved might have fledged from some other location.

In the Chiricahuas, indications of nesting date back to 2001, when an adult and juvenile were observed at Barfoot Park from 21 to 25 August (*N. Am. Birds* 56:84, 2002). Additional sightings of juveniles, some giving begging vocalizations, suggested successful nestings at the same location each year from 2003 through 2010, whereas observations of an adult pair without any accompanying juveniles in 2002 may have represented an unsuccessful nesting attempt. An active nest we found and studied in an Arizona Pine (*Pinus arizonica*) in the Barfoot region in 2007 successfully fledged two young in early July (see below).

BREEDING BIOLOGY OF THE SHORT-TAILED HAWK IN ARIZONA

On 25 May 2007 H. A. and N. F. R. Snyder found an active Short-tailed Hawk nest at approximately 2600 m adjacent to the Barfoot Park region

Figure 3. Nestling Short-tailed Hawks showing developing feather tracts at a nest in the Chiricahua Mountains. After fledging, light-morph juveniles are most easily distinguished from adults by their largely buff ventral coloration.

Photo by Richard A. Wagner

of the Chiricahua Mountains. This nest was first suspected from repeated, distant sightings of adults dropping from the sky into what proved to be the nest canyon. The actual site was found by 6 days of progressively closer ground-tracking of aerial adults carrying prey and by homing in on their vocalizations. The site represents the first documented nest of the species for the western U.S. but was surely not the first nesting in the region. Chris Benesh (*fide* M. Stevenson) obtained distant photographs on 20 July 2002 of a Short-tailed Hawk perched atop what appears to be the nest tree of 2007, which together with sightings of nearby juveniles in 2001, 2003, 2004, 2005, and 2006, raises the possibility that the same nest had been active for at least 6 years prior to 2007. However, this nest was not active in 2008, 2009, or 2010 (although nesting evidently took place nearby in these years), and Meyer (2005) has reported that in Florida Short-tailed Hawks rarely reuse nests from year to year.

The 2007 nest was constructed of coarse twigs with a few green sprigs and rested about 30 m from the ground near the very top of an Arizona Pine on a steep northeast-facing slope (Figure 4). It contained two downy nestlings, estimated at about 1 week of age on the day of discovery. One adult, presumably the female, remained at the nest without flushing or giving alarm calls at the time of discovery.

The nest itself was partially visible from one location on the ground upslope from the nest tree and approximately level with the nest. We began

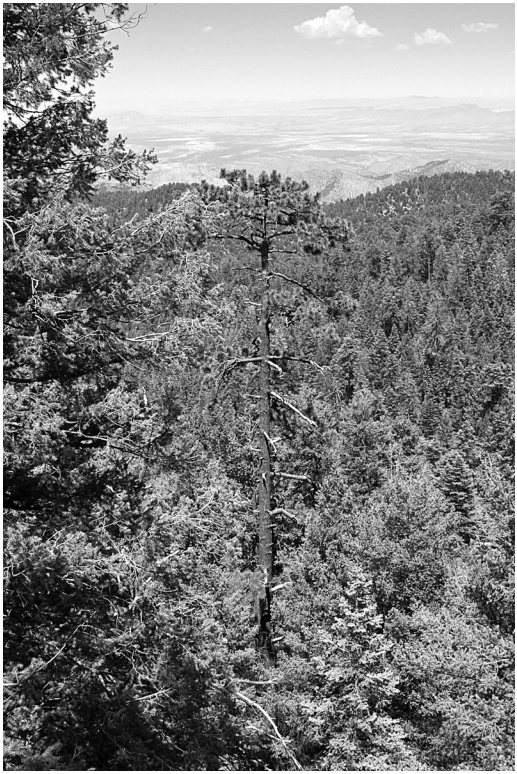

Figure 4. The first nest of the Short-tailed Hawk found in the western United States was at the top of this Arizona Pine (*Pinus arizonica*) at about 2600 m elevation in the Chiricahua Mountains, Cochise Co., Arizona, in 2007.

Photo by N. F. R. Snyder

observations of nesting activities from a blind at this site on 28 May. By 13 June, we had erected a tower blind that was higher and closer to the nest and was embedded in foliage of a live Douglas-fir (*Pseudotsuga menziesii*). This blind gave a better view of the nest from about 35 m, and after this date we observed mostly from this location.

The adults were not obviously disturbed by observers or the blinds and appeared to be behaving normally throughout the period of intensive observations, which ended when the chicks were flying with some competence. Altogether, we observed the nest from 4 to 12 hr per day on 29 days from 28 May to 4 July 2007. Observation periods were uninterrupted, exceeded 8 hr on all but 5 days, and averaged 8.8 hr per day. The observers were N. F. R. Snyder, Wagner, Rowlett, Moore-Craig, and H. A. Snyder. No attempt was made to climb the nest tree at any time, and no observation periods included periods of construction of the blinds.

The two adults at the nest were both of the light morph and were quite similar in appearance, but they could be reliably differentiated by an extensive gap from damage to the feathers in the outermost secondaries of the left wing of the presumed male (Figure 5). The presumed female lacked this conspicuous damage (Figure 6). Despite his disrupted wing, the male appeared highly proficient at capturing prey and accounted for most and perhaps all prey recorded during our observations.

We identified prey by direct observation through a scope and through photographs of prey in the bill or talons of adults landing at the nest. In most cases it was possible to determine if the prey was a lizard, mammal, or bird, and all identified prey fell into these categories, but we could not identify many of the birds to species because they arrived nearly fully plucked and headless. All prey not identifiable as lizards, mammals, or birds were items that were obscured from our view because the female dismembered them behind obstructions. We doubt these represented an atypical sample of prey.

Diet and Provisioning Rates

We observed 145 prey at the nest during the 29 days of observation. Of these, 137 (95%) were identified as vertebrates (bird, mammal, or reptile), and 8 were unidentified. Of the identified prey 114 (83%) were birds, 16 (12%) were mammals (mostly—perhaps all—Cliff Chipmunks, *Eutamias dorsalis*), and 7 (5%) were lizards (mostly—perhaps all—Yarrow's Spiny Lizard, *Sceloporus jarrovi*). Overall, there were 0.55 prey per hour of observation during 255.3 hr of study, but before 07:30 and after 18:00 MST observation periods were few. Rates of prey delivery varied greatly by time of day, peaked in the mid-morning (when the average rate approached 0.9 prey per hour), and declined steadily through the afternoon to just over 0.3 prey per hour in late afternoon (Figure 7). We recorded as many as 9 or 10 prey on some days, and young appeared to be well fed throughout, except on one rainy, foggy morning (11 June) when no prey was delivered. Average daily rates of provisioning showed an irregular peak during weeks 2–5 of observations (when young were approximately 3–6 weeks old), potentially paralleling the nestlings' need for food (Figure 8).

Avian prey ranged in size from the Mexican Chickadee (*Poecile sclateri*) to Steller's Jay (*Cyanocitta stelleri*) and American Kestrel (*Falco sparverius*), but most were the size of juncos or tanagers, and indeed often were Yellow-eyed Juncos (*Junco phaeonotus*) or Western Tanagers (*Piranga ludoviciana*). Prey diversity was much lower among the mammals and lizards, with only chipmunks and *Sceloporus* lizards clearly identified (see front cover).

We witnessed few attempts at capture of prey, but virtually all seen followed the usual pattern known for the species, of rapid dives from high in the sky to the surfaces of vegetation. Birds observed hunting hung consistently over slopes above 2000 m elevation, taking advantage of rising air masses, but they hunted over both forested and open habitats, and the variety of prey delivered to the nest suggested captures in both forested and open areas. Hunting adults commonly soared at an altitude above the ground that was three or more times higher than the altitude at which other species of *Buteo* and vultures were soaring. Only once did we seen an apparent attempt at

Figure 5. Male Short-tailed Hawk delivering a small bird to the nest in the Chiricahua Mountains in 2007. Damaged and displaced outer secondaries on the left wing allowed reliable identification of this individual. The wing damage was clearly more than just feathers missing from molt, and observations and photos as late as summer 2010 indicate that an adult bird with apparently the same pattern of wing damage still occupies the same territory.

Photo by N. F. R. Snyder

Figure 6. Female Short-tailed Hawk landing at nest to take over prey brought by her mate. Only the female ripped apart prey for the nestlings.

Photo by N. F. R. Snyder

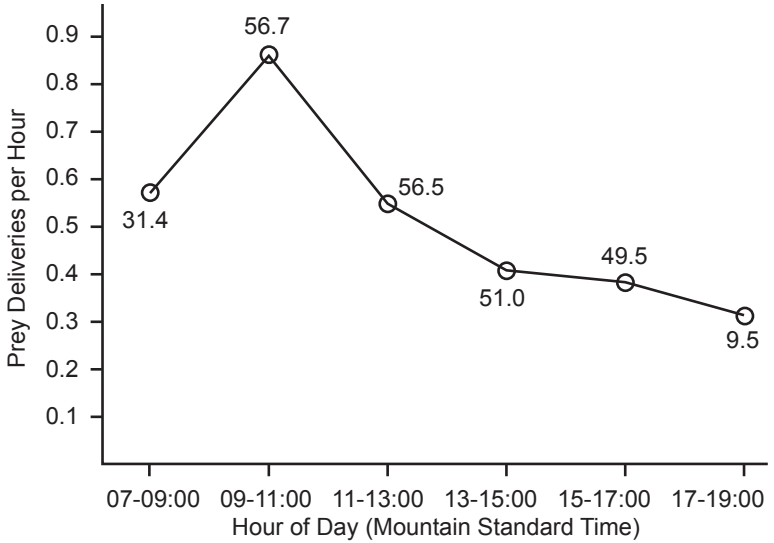

Figure 7. Rate of prey delivery by time of day during the nestling period, 28 May–4 July 2007, by the Short-tailed Hawk in the Chiricahua Mountains. Data points represent total prey delivered divided by total hours of observation during the hours of the day (MST) in question. Numbers next to data points give hours of observation.

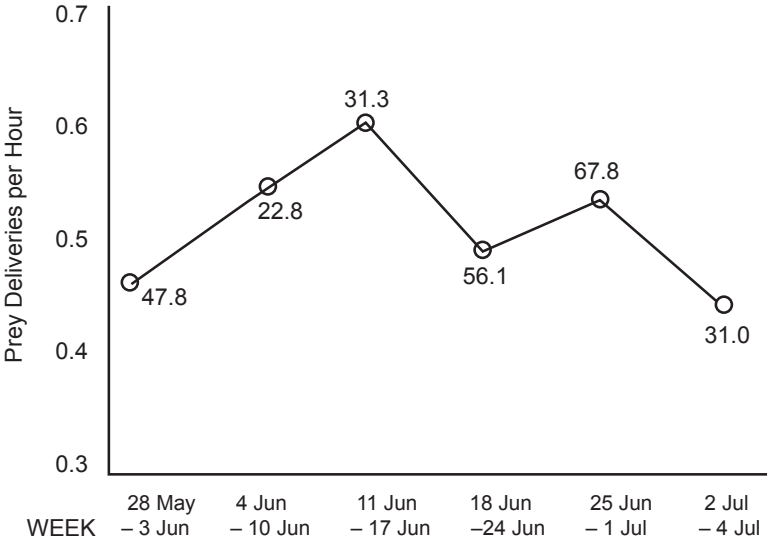

Figure 8. Rate of prey delivery by week during the nestling period, 28 May–4 July 2007, by the Short-tailed Hawk in the Chiricahua Mountains. Data points represent total prey deliveries divided by total hours of observation for the weeks in question. Numbers next to data points give hours of observation.

prey capture that was initiated from a perch, when an adult perched in the top of a live conifer on a cliff made a near-vertical dive and crashed into the top of another conifer lower on the cliff perhaps 100 m distant.

Roles of the Sexes at the Nest

The division of labor between adults resembled that of many other raptors during the early nestling period, with the female remaining in attendance at the nest or nearby, and with the male off out of sight, presumably foraging, for the great majority of the day (see Newton 1979). Transfers of prey from male to female sometimes took place away from the nest, sometimes in mid air, but the male also often brought prey directly to the nest, leaving it there without attempting to feed the chicks. If the female was already at the nest, she immediately took the prey delivered by the male and began ripping off pieces for the chicks (Figure 9). If the female was perched nearby at the time of the male's arrival, she usually followed him to the nest immediately (Figure 6) and began feeding chicks as the male departed the nest area.

In the latter stages of the nestling period, however, the division of labor between the sexes became rather different from that of many raptors, in that the female continued to remain at the nest or perched near the nest vicinity nearly throughout our observations, though she was often only detectable by her intermittent vocalizations, as she commonly perched on a snag uphill from the nest and out of sight from the blind. Her two primary roles at this stage appeared to be guarding the nest and continuing to rip apart prey for the nestlings.

Figure 9. Female Short-tailed Hawk presenting fragments of a *Sceloporus* lizard to her nestlings in the Chiricahua Mountains.

Photo by Richard A. Wagner

In many species of raptors, the female shifts to hunting nearly full time in the late stages of the nestling period when young no longer need brooding. But at the nest we studied, despite its relatively large brood, this shift clearly did not occur. While some of the prey deliveries to the nest were made by the female, only occasionally did such deliveries occur without evidence, vocal or visual, of a preceding exchange of prey from the male. Even in these cases, the prey may have been caught by the male and simply transferred to the female too far from the nest for us to detect it, or it may have been cached earlier by the female. At most the female captured very few prey for her nestlings during the nestling period and apparently sustained herself largely, if not completely, on portions of the prey brought in by the male.

Although prey were sometimes left temporarily uneaten in the nest throughout the nestling period, mostly when chicks appeared sated by food, only in the last week or so of observations did chicks begin to rip apart prey on their own. Initially, dismemberment of prey by nestlings was considerably slower and clumsier than that by the adult female, but the chicks improved rapidly, and by the time of fledging were consistently feeding themselves from prey left at the nest by the adults.

Nest Building and Other Activities

Adults rarely perched anywhere but on the nest itself when at rest in the nest tree, and despite potential use of the nest over several years, the nest was not a notably large or thick structure. Only once did we see an adult transporting nesting material to the nest, a delivery by the female of a green sprig of Douglas-fir on 6 June. However, we also noted fresh green material in the nest's bottom on two other occasions, apparently delivered prior to the start of observations. The low observed frequency of nest-building trips by these Short-tailed Hawks contrasts with the frequent collection of nesting material, especially greenery, seen during the nestling phase in some other species of raptors (e.g., Snyder 1975, Newton 1979, Dykstra et al. 2009).

On several occasions the female adult was seen digging or "excavating" in the nest litter with thrusts of her bill, a behavior of unclear function also seen in many other accipitrids (Schnell 1958, Newton 1979). It may involve a reaction to nest-inhabiting arthropods.

The adults' activity levels appeared to be generally low in the early morning and late afternoon, very likely due at least in part to relatively calm conditions at these times of day. The Short-tailed Hawk's hunting behavior, involving long periods of kiting over ridges and other topographic features, appears to be most efficient when winds are moderately strong, and the daily fluctuations in prey-delivery rates may relate most importantly to wind conditions. The apparent restriction of the Short-tailed Hawk during the breeding season to very high elevations in the sky islands may likewise be largely a reflection of wind conditions.

Both the adult female and nestlings, once they were several weeks old, frequently gave begging calls as the adult male approached the nest with prey, but such vocalizations, especially by the nestlings, were not limited to arrivals of the male. Over a 2-day period (30 June–1 July) the young

gave seemingly endless begging calls whenever distant airplanes that were fighting a forest fire several kilometers to the southeast appeared above the horizon. The nestlings apparently were not differentiating distant planes from the male parent. Begging calls of the adult female and nestlings were often imitated by Steller's Jays resident near the nest, but the imitations were generally weak in volume and usually intermixed with other calls typical of the jays. The hawks showed no clear responses to the jays' imitations of their calls.

Fledging Behavior

As in many other accipitrids, fledging of the Short-tailed Hawks we studied was a gradual process, with youngsters first moving about branches surrounding the nest in short flapping hops from branch to branch. Feedings at this stage were still confined to the nest itself, and chicks were beginning to participate in the ripping apart of prey. One young made what appeared to be an accidental foray from the nest in the midafternoon of 27 June—a journey that entailed the bird desperately hanging upside down from a small branch and finally coming to rest on a thicker branch about 3 m under the nest, where it spent the night. The following day, while its sibling was fed several times at the nest by the female, the wayward chick worked cautiously on foot back up among branches under the nest, finally reaching the nest again at 09:48 where, evidently eager for food, it aggressively usurped prey from the adult female.

In the days following, chicks made progressively bolder short flights from branch to branch but still fed at the nest, increasingly without assistance from the adult female. Finally, on 4 July, a very windy day, we observed several uncertain flights of both nestlings up into the sky from the very top of the nest tree, returning back down to the treetop after a few seconds (Figures 10 and 11). Perhaps this day should be considered the day of true

Figure 10. Nestling Short-tailed Hawk in the Chiricahua Mountains about to launch into the unknown on 4 July 2007.

Photo by N. F. R. Snyder

Figure 11. A moment of panic, as a young Short-tailed Hawk fledges in the Chiricahua Mountains on 4 July 2007.

Photo by N. F. R. Snyder

fledging from this nest, although the young had not yet landed in any tree other than the nest tree.

Adults continued to provision the young after fledging, as observed in irregular checks of the nest area in succeeding weeks. On 8 July, the first day of observations after 4 July, Moore-Craig watched an adult fly with prey to a snag occupied by one of the young (perhaps 100 m from the nest tree) and leave the prey on a lower branch of the snag. The fledgling climbed down about 2 m to the prey and consumed it. Again on 17 July, H. A. Snyder observed both fledglings high in the sky over the nest area, followed by one of the two diving down to the nest. On 21 July Moore-Craig and N. F. R. Snyder observed both fledglings high in the sky near Barfoot Peak, where one of them subsequently landed. Then on 6 August, a rainy, foggy day, H. A. Snyder watched a begging fledgling pursuing the adult male, still with damaged left secondaries, high over the Onion Saddle Road more than 2 km from the nest. On 7 August 2006, Richard Webster (pers. comm.) observed a mid-air prey exchange between an adult and fledgling in the same general area.

The only instances we have observed of a fledgling foraging were on 30 July 2010, when H. A. Snyder saw a juvenile high over the Barfoot nesting territory twice making a short mid-air dive to capture and eat out of its talons what appeared to be a large flying insect, possibly a dragonfly. Sightings of adults feeding juveniles as late as early September (*N. Am. Birds* 59:125–126, 2005) suggest that dependency may sometimes last for 2 months or longer beyond fledging, a period of dependency comparable to that of other species of *Buteo* and bird-feeding raptors (see Snyder and

Wiley 1976, Newton 1979). However, the report of Salvador and Silva (2009) documenting a juvenile Short-tailed Hawk in Brazil still associated with parents in the vicinity of its nest of origin 7 months after fledging suggests that in this species dependency can sometimes last considerably longer, at least in the tropics.

DISCUSSION

Although to some extent the rapidly increasing number of records of the Short-tailed Hawk in the sky islands could reflect increasing numbers of observers and increasing familiarity of observers with the species, it seems doubtful that the species was present yet overlooked before the 1980s, especially in the U.S. No Short-tailed Hawks were observed by experienced ornithologists (e.g., Brandt 1951, Balda 1967, Snyder et al. 1973) working intensively at Arizona locations where the Short-tailed Hawk now occurs, even though several of these observers were closely familiar with the species from earlier work in Florida (e.g., Brandt 1924). Nor was the species reported by any of the numerous ornithologists working out of the Southwestern Research Station of the American Museum of Natural History in the Chiricahuas during the 1950s, 1960s, and 1970s.

Similarly, Short-tailed Hawks were never reported in northwestern Mexico prior to the 1980s, despite intensive field work by Lumholtz (1905), Nelson and Goldman (1926), van Rossem (1945), Goldman (1951), Marshall (1957), and Lanning and Shiflett (1983; J. Shiflett pers. comm.). Thus it likewise seems unlikely that the species occurred in Chihuahua or Sonora prior to the 1980s either.

Another strong argument that the Short-tailed Hawk was not present in low numbers in northwestern Mexico and Arizona prior to recent records comes from the steady geographic progression northward of first local sightings from Michoacán up the Sierra Madre Occidental to southern Arizona between the early 1940s and mid 1980s. As detailed by Williams et al. (2007), many of these sightings had been preceded by earlier ornithological investigations in the same locations that did not record the species.

The same general progression northward has been evident in Arizona, where the first two birds were detected in the 1980s in the southernmost sky islands of the U.S., the Chiricahua and Huachuca mountains. More recently, the Short-tailed Hawk has been sighted in other neighboring, and mostly more northerly, ranges: the Pinals in 2005, the Santa Ritas in 2008, and the Santa Catalinas in 2009.

Similarly in Texas, Lockwood and Freeman (2004) reviewed the first sighting in July 1989 in the lower Rio Grande valley (*Am. Birds* 43:1339), followed by records in neighboring Hidalgo County. By June 1995, Short-tailed Hawks had been found roughly 400 km farther north at Dripping Springs on the Edwards Plateau (Lockwood 2001).

The progression of first sightings in western Mexico, assuming it paralleled first actual occurrences of the species fairly closely, suggests a rapid range expansion, averaging roughly 30–40 km per year between Michoacán and southern Arizona. The rate may have been even more rapid in Texas, where sightings advanced north from the lower Rio Grande valley to the

Edwards Plateau at roughly 60–70 km per year following the first record in the state. Perhaps the rapidity of the northward advance in first sightings in both regions can be attributed both to good reproduction in newly occupied territories and to a necessity for the species to leapfrog extensive areas of unsuitable territory to find suitable new habitats to occupy.

In any event, until evidence to the contrary emerges, we believe the northward range expansion of the Short-tailed Hawk, as presented by Williams et al. (2007) and Lockwood and Freeman (2004), should be considered real and geographically extensive. However, we caution that the first actual occurrence in a location may sometimes precede the first sighting by a substantial period; calculations of rates of range expansion based on first sightings should be considered only preliminary.

Seasonally, sightings of Short-tailed Hawks at high elevations of the sky islands extend from 31 March to 24 October, but whether the birds are present or absent at high elevations in this part of the range in winter is uncertain because of a general lack of observers at high elevations during this season. Access to high elevations is usually difficult in winter because of snow and blocked roads. Nevertheless, we suspect the Short-tailed Hawks of this region may leave their high-elevation breeding grounds in winter because many of the small birds on which the hawk preys withdraw from high elevations at this season and most lizards and chipmunks become quiescent underground and under snow.

It is unknown whether the Short-tailed Hawks of the sky islands move south in winter, as has been demonstrated for the Florida population (Ogden 1974, Miller and Meyer 2002, Meyer 2005). The only winter sightings in the sky-islands region so far have been in the city of Tucson: an odd-plumaged bird seen from 11 February to 13 April 2008, from 20 November 2008 to 4 April 2009, and from 3 December 2009 through 12 March 2010. These sightings support a view that the birds move seasonally, but since Tucson, in addition to being at a relatively low elevation of 780 m, lies near the northern edge of the known range, it also appears possible that the species' seasonal movements may be as much altitudinal as latitudinal.

The nests of Short-tailed Hawks studied in Arizona in 2007 and in Sonora in 2009 appeared to be typical of the species, in that they were located near the very tops of the tallest trees in their surroundings and were quite fully exposed to the sky, allowing birds to land directly from above and also providing the birds with a commanding view of their surroundings (Figure 12; see Miller and Meyer 2002, Snyder and Snyder 2006). But, like the highly exposed nests of the Osprey (*Pandion haliaetus*) and Bald Eagle (*Haliaeetus leucocephalus*), Short-tailed Hawk nests tend to be in full view of other raptors and potentially vulnerable to their depredations. Perhaps this vulnerability was a primary factor leading to the Barfoot female's nearly constant guarding of her nest through the nestling period of 2007. In part, nest guarding was achieved from the nest itself, but more often, once the young were several weeks old, the female exercised her vigilance from an exposed snag uphill from the nest.

The importance of nest guarding was reflected in the frequency of battles of the hawks with natural enemies. Throughout our observations we saw repeated instances of nest defense in which an adult, usually the female,

Figure 12. Like other nests of the Short-tailed Hawk, the nest of 2007 in the Chiricahua Mountains was reached from above by adults and was fully visible to other raptors in the sky. The female adult guarded the nest almost constantly through the nestling period, while her mate hunted for the entire family.

Photo by N. F. R. Snyder

aggressively chased off Common Ravens (*Corvus corax*), Turkey Vultures (*Cathartes aura*), Red-tailed Hawks (*Buteo jamaicensis*), and Zone-tailed Hawks (*B. albonotatus*). In one instance the female adult repeatedly struck an Apache Fox Squirrel (*Sciurus nayaritensis chiricahuae*) climbing the nest tree until the squirrel retreated down the tree (Figure 13). We have also witnessed instances of Short-tailed Hawk nest defense in other regions. In Florida H. A. Snyder once observed a nesting female successfully driving off a Yellow Rat Snake (*Elaphe obsoleta quadravittata*) from the nest rim, and in Sonora Flesch observed a nesting Short-tailed Hawk successfully driving off a Golden Eagle (*Aquila chrysaetos*). Other observers have reported nesting Short-tailed Hawks chasing off Bald Eagles, Red-shouldered Hawks (*B. lineatus*), and Broad-winged Hawks (*B. platypterus*) (Miller and Meyer 2002).

Vulnerability of the nest may be one of the most important factors leading to a low clutch and brood size in the species, to the extent that it reduces the potential for females to forage for their broods by demanding their continuous presence near their nests. Throughout the Short-tailed Hawk's range, clutch size has uniformly been reported as only one or, more commonly, two eggs (Miller and Meyer 2002). Five of six Florida nests reported by Ogden (1988) had only single nestlings, including a nest H. A. and N. F. R. Snyder studied in 1979. However, Meyer (2005) has noted that nests with two young predominate in the most heavily forested nesting areas of Florida.

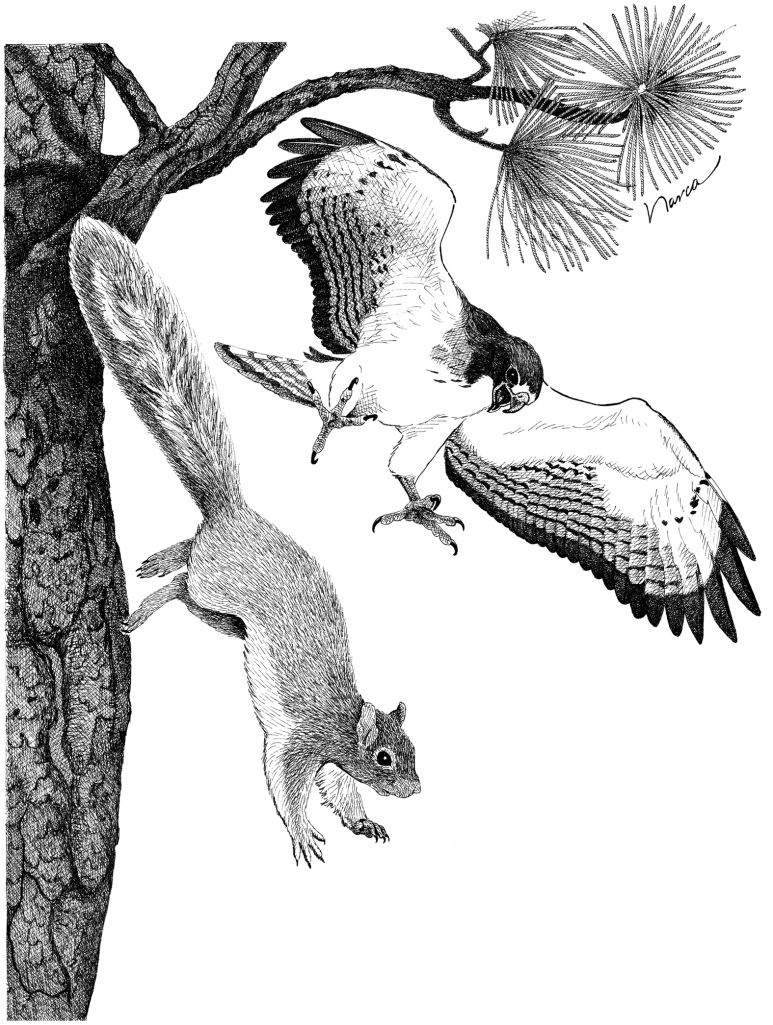

Figure 13. Female Short-tailed Hawk driving an Apache Fox Squirrel from the nest tree in the Chiricahua Mountains on 17 June 2007. Other enemies driven from the vicinity of the nest included Common Ravens, Zone-tailed Hawks, and Red-tailed Hawks.

Pen-and-ink drawing by N. Moore-Craig

By comparison, clutches and broods are characteristically much larger in the Cooper's Hawk (*Accipiter cooperii*), another Arizona raptor often found at high elevations that is very similar in body weight and prey to the Short-tailed Hawk but which does not normally nest in exposed locations and in which females hunt extensively late in the nestling stage. In fact, in 1971,

H. A. and N. F. R. Snyder studied the nest of one pair of Cooper's Hawks that was located at nearly the same elevation as the Short-tailed Hawk pair of 2007 and only a few hundred meters distant. The diet at this nest was very similar to that at the Short-tailed Hawk nest (i.e., 70% birds and 30% lizards and chipmunks), and the range of prey sizes was also very similar. The usual clutch size of Cooper's Hawks we have studied in Arizona, however, was 4 eggs (range 3–5), and pairs commonly fledged 3 or 4 nestlings. Potentially, the differences in clutch and brood sizes are in part related to the differing roles that females of these two species have in foraging for their broods, resulting from differences in the vulnerability of their nests to other predators. It appears the Short-tailed Hawk may be making an evolutionary tradeoff between maximizing brood size and ensuring nest safety. Potentially supporting this idea, nesting female Ospreys also do very little hunting prior to fledging young (Poole et al. 2002), possibly reflecting a similar crucial need to guard nests that are highly exposed and vulnerable (especially to Bald Eagles and Raccoons, *Procyon lotor*). However, whether support for such relationships might also be found in an examination of nest-site vulnerability, female attentiveness, and clutch size across all diurnal raptors is yet to be studied and lies beyond the scope of this paper.

An obvious question remains: if tree-top nesting entails a penalty for the Short-tailed Hawk's clutch size, why has the species evolved this trait, while other similar-sized and partially sympatric species of *Buteo*, such as the Red-shouldered and Broad-winged Hawks, nest in more concealed locations within the canopy? Clutch size generally runs 2–3 eggs for the Broad-winged Hawk and 3–4 eggs for the Red-shouldered Hawk (Goodrich et al. 1996, Crocoll 1994), seemingly consistent with the possibility that concealed nesting may allow greater clutch size in at least some close relatives. But could there be advantages for the Short-tailed Hawk in tree-top nesting that compensate for its relatively low clutch size?

We have no compelling answer to this question, but perhaps, lacking the especially short wings and a long tail typical of many raptors adapted to cluttered aerial environments, the Short-tailed Hawk is simply not well adapted to maneuvering among branches within the canopy of trees, and perhaps it nests in tree tops mainly to minimize risks of damage to its wings and flight feathers. In its daily activities, the species does concentrate on relatively open air spaces. However, its wings and tail do not differ greatly in length from the wings and tails of forest-adapted *Buteo*s such as the Broad-winged and Red-shouldered Hawks (see Goodrich et al. 1996, Crocoll 1994). As noted by Miller and Meyer (2002), the Short-tailed Hawk, despite its name, has, for its genus, an average tail length relative to body size. Although its wings are relatively long for the bird's weight, they are somewhat shorter than the wings of the Red-shouldered Hawk. Conceivably the main advantages of tree-top nesting to the Short-tailed Hawk may come after fledging, with so much of the activity of fledglings and adults taking place above the canopy and the nest still serving as an easily accessible platform for prey deliveries and feedings.

In 40 hours of observation at three successful Florida Short-tailed Hawk nests with single nestlings, Ogden (1988) found an average feeding rate of 0.30 prey per hour—a rate about one half the overall rate we observed at

the Arizona nest of 2007 (0.55 prey per hour), in reasonable consistency with the difference in brood size. But such comparisons should be viewed as only rough and suggestive, especially because the times of day and times in the nestling cycle when observations were made in Florida were not specified and may have differed substantially from the times of day and times in the nesting cycle represented in our study—factors with potentially substantial influences on provisioning rates (see Figures 6 and 7).

Also, comparisons of feeding rates in terms of prey per hour can be misleading if the average size of prey in Florida and Arizona differed. Unfortunately, comprehensive data on average prey sizes are not available for either Florida or Arizona. We suspect from Ogden's (1974) description of the range of prey taken that average sizes of prey in the two regions may have been reasonably similar.

Ogden reported only two or three prey deliveries per day at nests with a single young, while at the Arizona nest with two nestlings, deliveries averaged at least 5.2 prey per day for the 19 days that included at least 9 consecutive hours of observation covering the portion of the day with peak deliveries of prey. This comparison, like that of prey per hour, could be taken as some indication that foraging conditions in Arizona compare favorably with those in Florida. Unfortunately, in addition to other difficulties already mentioned with such comparisons, the extent to which the overall prey-delivery rates in Florida and Arizona may have reflected the maximum potential of males to provide food for their broods is not known. If they came close to reflecting the full potential in each region, there may be little advantage in pairs ever attempting broods larger than two young.

The Short-tailed Hawk's rapid occupancy of high elevations of southern Arizona and New Mexico and northern Chihuahua and Sonora in recent decades implies that this region currently offers good habitat for the species. The relatively large brood in the nest we studied in 2007, the apparent fledging of broods of two young in the Chiricahuas in 2003, 2006, and 2010, and the quite consistent presence of at least one fledgling at this location in nearly all recent years likewise suggest that local conditions may be generally good for the species. Average nesting success for the pair/locality in question from 2001 to 2010 was evidently at least 90%, and average productivity was at least 1.3 fledglings per year. By comparison, the species' overall nesting success in Florida has averaged only about 40–45%, with frequent nest failures during the egg stage and an average production of only 0.64 fledglings per nesting attempt (Miller and Meyer 2002, Meyer 2005). Nevertheless, it is unknown how typical of Arizona habitats the Barfoot territory may be in its suitability for the species.

Have there been any fundamental recent changes in the sky islands that might have favored colonization by the Short-tailed Hawk? The most obvious habitat change in the region in recent decades is that extensive stand-replacing fires have substantially increased the extent of open areas at high elevations in both the Huachucas and Chiricahuas (as well as on other nearby sky islands). But it is not clear that this change has been beneficial to this species, as it hunts both forested and open habitats. Indeed, telemetry studies in Florida suggest the birds prefer forested habitats for both nesting and winter foraging (Meyer 2005). As documented in detail by Williams et al.

(2007), the recent expansion of the species into Arizona and New Mexico appears to be just part of a much broader expansion throughout northern Mexico that has been taking place since the early 20th century. The species' arrival in the sky islands may not be related to changes in local conditions but to a steady population expansion farther south.

The influx of the Short-tailed Hawk into the various sky islands parallels a recent northward expansion of the Gray Hawk (*B. nitidus*) in the same region (Williams and Krueper 2008), while Phillips et al. (1964) and a variety of contemporary studies (e.g., Crick 2004, Inkley et al. 2004, Parmesan 2006) similarly indicate that the distributions of many other western birds have been shifting substantially northward in recent decades, correlated with increases in mean temperatures. However, provided that the progression of first records from Michoacán northward comes close to portraying the range expansion of the Short-tailed Hawk accurately, this species' northward movement has been of much greater magnitude than that seen in many others, raising the question of whether it is due to similar causes.

In contrast, no concurrent range expansion of the Florida population of the Short-tailed Hawk has been documented (Miller and Meyer 2002). We suspect that the difference between western and eastern populations may prove to be related to better reproduction and/or survival in the West than in Florida, but demographic data are currently too few for this possibility to be tested conclusively.

Despite only modest nest success, the Short-tailed Hawk population of Florida has been considered potentially stable and self-sustaining during recent decades, although it is very small, probably under 200 pairs (Miller and Meyer 2002, Meyer 2005). Whether the sky islands will provide adequate habitat for the Short-tailed Hawk in the long term, and may even serve as a source region for further range expansion of the species, remains to be seen. The history of animal invasions of new territories includes examples of some species doing very well initially, followed by population crashes and extirpations as natural communities adjust to their presence. Despite what appears to be a truly impressive recent record of expansion of the Short-tailed Hawk into northern Mexico and the southwestern U.S., we offer no firm predictions for the future.

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APPENDIX. Arizona records of Short-tailed Hawk by area and year. Records not accepted by the Arizona Bird Committee have been excluded. Where additional important details, such as color morph, were included in messages circulated through the listserve for Arizona–New Mexico birding, BIRDWG-05, it is cited as a reference. (Nearly all eBird reports fall within the ranges of dates available from other sources.)

Chiricahua Mountains, Cochise County

1985: 7 Aug, Barfoot Junction, 1 light adult; J. Arvin, Rosenberg et al. 2007, AB 40:150, 1986

1999: 5 Apr, Onion Saddle, 1 light bird; M. Lanzone, Rosenberg et al. 2007
22 Aug, Onion Saddle, 1 light bird; C. Benesh, NAB 54:83, 2000, Rosenberg et al. 2007

2001 (sightings represent at least 3 individuals, a probable pair and 1 fledgling): 5 Aug–3 Sep, Barfoot Park, 1 light adult, 1 light juvenile; F. Gallo, J. Havlena, C. Benesh, N. Moore-Craig, et al., NAB 56:84, 2002
27 Aug, Barfoot Park, 1 light adult with prey, H. Snyder

2002 (sightings represent at least 2 individuals): 31 Mar–Aug, Barfoot Park, 2 light adults; C. McIntyre, J. Burns (photo), Rosenberg et al. 2007, NAB 56:338, 465, 2002
2 Jul, Barfoot Park, 1 light adult; C. Benesh (photo) et al., fide M. Stevenson through 6 Sep, Barfoot Park, 2 light adults, J. Smith et al., NAB 57:99, 2003

2003 (sightings represent at least 4 individuals): 23 May, Barfoot Park, 1 bird; B. Chapman et al., NAB 57:387, 2003
28 Jun, Barfoot Park, 1 light adult; R. Hoyer, Rosenberg et al. 2007
19 Jul, Barfoot Park, 1 light adult, 1 light fledgling; J. Dunn, NAB 57:528, 2003
25 Jul, Barfoot Park, 2 light adults, 1 light juvenile begging; R. Taylor et al., NAB 57:528, 2003
2 Aug, Barfoot Park, 2 light adults, 1 light juvenile; M. Pollock et al., BIRDWG 05
5 Aug, Barfoot Park, 1 light adult, 2 light juveniles; R. Webster, NAB 57:528, 2003
7–16 Aug, Barfoot Park, 1 adult, 2 juveniles; R. Hoyer (photo), Rosenberg et al. 2007
22 Aug, Barfoot Park, 1 light adult, 2 juveniles; R. Webster
18 Sep, Barfoot Park, 1 adult; B. Chapman, NAB 58:122, 2004

2004 (sightings represent at least 3 individuals): from 9 May, Barfoot Park, 2 light adults; D. Stejskal, NAB 58:414, 520, 2004
1 May–3 Jul, Barfoot Park, 2 light adults; B. Sullivan (photo), D. Stejskal et al., NAB 58:414, 520, 2004, Rosenberg et al. 2007, www.azfo.org
23 Aug, Rustler Park, 1 light adult; R. Webster
30 Aug, Barfoot Park, 1 light bird, probably juvenile; R. Webster
5 Sep, Barfoot Park, 1 adult feeding 1 juvenile; M. Kehl, NAB 59:125–126, 2005
17 Oct, up to 3 birds; many observers, NAB 59:125–126, 2005

2005 (sightings represent at least 3 individuals, a probable pair and 1 fledgling): 11 Apr, 1 adult; many obs., NAB 59:477, 2005
all summer, Barfoot Park, 1 light adult; J. Dunn et al., NAB 59:638, 2005, BIRDWG 05
11 Aug, 1 juvenile; C. Benesh, NAB 60:116, 2006
15 Aug, Rustler Park, 1 light juvenile; N. Moore-Craig, J. Ruth

30 Aug, Long Park Road, 1 dark bird; R. & L. Taylor, NAB 60:116, 2006, BIRDWG 05

2006 (sightings represent at least 4 individuals): 13–20 Apr, South Fork, Cave Creek, 1 bird; A. Grenon, S. Kennedy, NAB 60:417, 2006

22 Apr, Barfoot Junction, 1 adult; A. Grenon, G. Rosenberg pers. comm.

17 May–1 Sep, Barfoot Junction, 1 light pair; D. Jasper et al., NAB 60:417, 562, 2006, O. Niehuis (photo), www.azfo.org, G. Rosenberg pers. comm.

7 Aug, Onion Saddle, 3 light birds (1 adult, 1 juvenile, 1 unknown), food transfer; R. Webster

9–18 Aug, Barfoot Park, 2 juveniles; J. Pike, G. Wolbek, G. Rosenberg pers. comm.

from 7 Aug, 2 light adults, 2 light juveniles; R. Webster et al., NAB 61:119, 2007

1 Sep, Onion Saddle, 1 light juvenile; R. Webster

2007 (sightings represent at least 4 individuals): 28 Apr, Barfoot Park, 1 bird; J. Arnett, eBird

9 May, Barfoot Park, 1 light adult; R. Webster

25 May–4 Jul, Barfoot Park, 2 light adults, 2 light nestlings; this paper, NAB 61:492, 625, 2007

through 25 Sep, Barfoot Park, 2 birds; many obs., NAB 62:121, 2008

2008 (sightings represent at least 3 individuals, a probable pair and 1 fledgling): 14 Apr, 1 light adult, H. Snyder, NAB 62:458, 2008

7 May, Barfoot area, 1 light adult; P. Lehman, N. Moore-Craig, B. Carlson, G. McCaskie

19 May, Barfoot Park, 1 adult; D. Stejskal, BIRDWG 05

17 Jun, 1 bird, R. A. Rowlett

8–11 Aug, Barfoot Park, 1 light juvenile; C. Benesh, G. Smith (photos), NAB 63:132, 2009, www.azfo.org, G. Rosenberg pers. comm.

2009 (sightings represent at least 3 individuals, a probable pair and 1 fledgling): 14 Apr, Barfoot Park, 1 light adult; N. Moore-Craig, NAB 63:478, 2009

24 May, Portal, 1 light adult; R. Webster, R. A. Rowlett

26 May, Rustler Park, 1 adult; R. A. Rowlett, R. Webster

8 Aug, Barfoot Park, 1 light adult; M. Henscell (photo), G. Rosenberg pers comm., www.azfo.org

12 Aug, Barfoot Park, 1 light juvenile; S. Whittle, G. Rosenberg pers comm.

25 Aug, Barfoot Junction, 1 light adult, 1 light juvenile; N. Moore-Craig, N. Snyder

24 Oct, Barfoot Road, 1 light adult; N. Moore-Craig, J. Fletcher

2010 (sightings represent at least 4 individuals, a probable pair and 2 fledglings): 8 May, Barfoot Park, 1 light adult; N. Snyder, J. Miller

15–18 Jul, Barfoot Park, 2 light adults, 2 light juveniles; N. and H. Snyder, N. Moore-Craig, C. Rustay, C. Sandell

Huachuca Mountains, Cochise County

1988: 21 Jul, Sawmill Canyon, 1 light adult; J. Dunn., Rosenberg et al. 2007

1999 (sightings represent at least 2 individuals): 26 Jul–4 Sep, Miller Canyon, 1 light bird; R. Hoyer, NAB 53:416, 1999, 54:83, 2000, Rosenberg 2001

31 Jul–4 Sep, Miller Canyon, 1 dark bird; R. Hoyer (photo), G. Rosenberg (photo), many obs., Rosenberg 2001, NAB 53:416, 1999, 54:83, 2000

2001 (sightings represent at least 3 individuals, a probable pair and 1 juvenile): 5 Aug–9 Sep, Miller and Carr canyons, 1 light bird, 1 light juvenile; F. Gallo, C. Benesh, many obs., Rosenberg et al. 2007, NAB 56:84, 2002, BIRDWG 05

2004: from 9 May, Miller and Carr canyons, 1 adult, B. Feltner et al., NAB 58:580, 2004
8 Aug, Miller Canyon. 1 adult; NAB 59:125–126, 2005
2005 (sightings represent at least 2 individuals): 23 Jul–4 Aug, Carr Canyon, single birds; many obs., NAB 59:638, 2005, 60:116, 2006
13 Aug, Miller Canyon, 2 light birds; T. Beatty, E. Wade, BIRDWG 05
2006 (sightings represent at least 2 individuals): 13–31 Aug, up to 3 birds (at least 1 light, 1 dark); NAB 61:119, 2007, BIRDWG 05
13 Aug, Carr Canyon, 1 light bird; C. Runk, BIRDWG 05
20 Aug, Carr Peak, 1 light adult, 1 dark adult, territorial behavior; W. Walraven, BIRDWG 05
2007: 26 Jun, Miller and Carr canyons, 1 light bird; M. Ali, S. Healy, NAB 61:624, 2007, BIRDWG 05
9 Aug, Sawmill Canyon, 1 or 2 light birds; L. Hoy et al., BIRDWG 05
9 Aug–8 Sep, Miller Peak, 1 or 2 birds; R. Hoyer, P. Kline, NAB 62:121, 2008, G. Rosenberg pers. comm.
2008 (sightings represent 1 or 2 individuals): 1 Aug, Carr Canyon, 1 light "adult or near-adult"; J. P. Smith (photo), NAB 63:132, 2009, www.azfo.org
2 Aug, Hereford Road, 1 bird; B. Fisher, NAB 63:132, 2009, G. Rosenberg pers. comm.

Pinal Mountains, Gila County

2005: 17 Jun, Upper Pinal Picnic Area, 1 light adult; D. Pearson, J. Alcock, NAB 59:638, 2006, Rosenberg pers. comm., BIRDWG 05

Tucson, Pima County

Apparently the same bird has returned for three winters to the same roost but atypically has retained mostly juvenal plumage for all three winters (see Wheeler 2003). We accept the Arizona Bird Committee's decision on its identification while recognizing that the plumage is inexplicable.

2008; 11 Feb–13 Apr, 1 light juvenile (?); D. Stejskal, J Hecimovich, NAB 283, 458, 2008, G. Rosenberg pers. comm.
2008–2009: 20 Nov–4 Apr, 1 light juvenile (?), D. Stejskal, many obs., NAB 63:132, 304, 2009, BIRDWG 05, G. Rosenberg pers. comm.
2009–2010: 3 Dec–7 Mar, 1 light juvenile (?); J. Hecimovich, many obs., BIRDWG 05; photos at www.azfo.org

Santa Rita Mountains, Santa Cruz County

2008: 13 Sep, Josephine Saddle, 1 light juvenile; D. Stejskal (photo), NAB 63:132, 2009; BIRDWG 05, www.azfo.org, G. Rosenberg pers. comm.
2009: 14 May, Madera Canyon, 1 adult; C. Cathers, NAB 63:478, 2009

Santa Catalina Mountains, Pima County

2009: 3 Sep, Mt. Lemmon, 1 light adult; J. Lebowitz, J. Edison (photo), et al.; G. Rosenberg pers. comm.
2010: 24 Apr, Summerhaven, 1 light adult; J. Yerger; record circulating through Arizona Bird Committee