Abert's Towhee

Pipilo aberti

Order PASSERIFORMES – Family EMBERIZIDAE

Issue No. 111

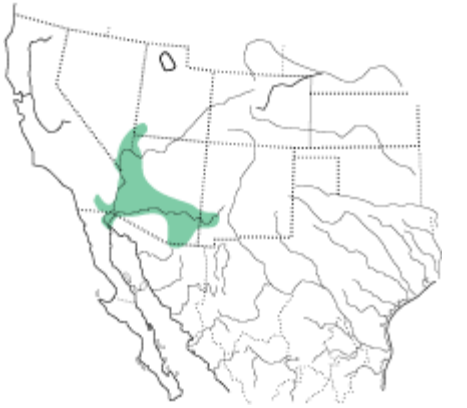
Authors: Tweit, R. C., and D. M. Finch

Introduction

Enlarge

Abert's Towhee, adult.

Abert's Towhee inhabits dense brush and woodlands along Sonoran Desert rivers and streams in Arizona and surrounding states. Spencer Baird described this species in 1852 (Am. Ornithol. Union 1983) and named it for Lt. James William Abert, U.S. Army (1820–1897), who obtained the specimen as a result of a survey of New Mexico at the end of the Mexican War. Abert, a West Point graduate, served in the Topographical Engineers and retired from the Army after the Civil War with the rank of Lt. Colonel (Mearns and Mearns 1992).



Enlarge

Fig. 1. Geographic range of Abert's Towhee.

Because this nonmigratory towhee spends most of its life on a permanent territory concealed by dense shrubs, it is thought to be secretive and is most often detected by its call notes. In interactions with other birds, however, it is bold and aggressive and where it finds suitable habitat in suburban environments it is often oblivious of humans.

Unlike the song of the Rufous-sided Towhee (*Pipilo erythrophthalmus*), the song of this towhee is rarely heard. The species' most characteristic vocalization is the squeal duet given simultaneously by both sexes upon reunion—a call used most often during the long breeding season to promote and maintain a close pair bond. This close and prolonged pair bond allows Abert's Towhee to initiate nesting rapidly in response to changes in weather or food supply, to minimize the nesting period, and to renest quickly after nest failure in an environment where rates of predation and parasitism are high.

Abert's Towhee has heavy legs typical of a ground forager, and it spends almost all of the

nonbreeding season scratching for insects and seeds or perching in low shrubs or tree branches. Its flights, which account for less than 5% of its daylight hours, are short and low, usually to perch sites, including wall tops in suburban habitats.

After an extended period of dry weather, rain during the breeding season can produce a peak in nesting activity within two weeks. The extended breeding season and tight pair bond enable some Abert's Towhees to produce two broods a year in an inhospitable environment, although as many as six nest attempts may be required. A female can lay the first egg of a new clutch one week after the loss of a nest. Cowbird parasitism reduces towhee reproductive success, but few young cowbirds are raised because some towhees abandon nests with cowbird eggs and because cowbird nestlings are generally much smaller then their towhee nestmates.

The preferred streamside habitat of Abert's Towhee—the brushy understory of cottonwood (*Populus fremonti*)-willow (*Salix goodingii*) gallery forests and mesquite (*Prosopis* spp.) bosques—has been cleared and otherwise altered by people, starting with Native Americans, primarily for agricultural fields and cattle grazing. Although this towhee has adapted to some urban and shrubland habitats created by people, including irrigation ditches, these do not equal the extent of habitat lost.

Distinguishing Characteristics ▸

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Distinguishing Characteristics

Large sparrow with gray-brown upperparts, little or no contrast between crown and back; breast, flanks, and belly pinkish brown; crissum dark rust; extensive black on lores, malar region, chin, and extreme anterior forehead surrounding very pale bill; male and female plumages identical (Zimmer 1988). Total length 21.2–23.1 cm (RCT); mass during breeding: male mean 47.1 g (40.0–54.1), female mean 44.8 g (39.5–51.0) (Dunning 1984).

Enlarge

Abert's Towhee, adult.

Range of this sedentary towhee overlaps that of Canyon Towhee (*Pipilo fuscus*), but they occur together only in sparse mesquite habitat (Marshall 1960, Tweit and Tweit 1991). Abert's is visually distinguished from other brown towhees by its black face and pale bill.

Introduction Distribution

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Distribution

The Americas

Permanent resident of brushy riparian habitat within the Lower Sonoran zone up to an elevation of about 1,300 m in Arizona and neighboring states (Phillips et al. 1964) (Fig. 1).

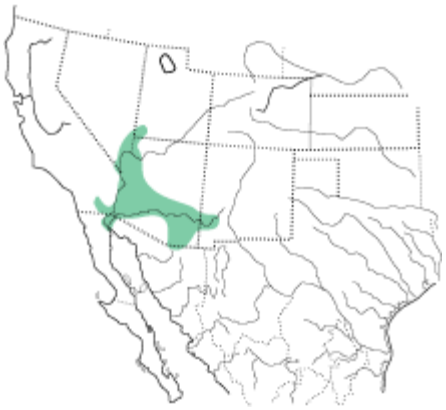

Fig. 1. Geographic range of Abert's Towhee.

Arizona

Where suitable habitat is present along the following rivers: (1) Colorado below the Virgin; (2) Virgin at Littlefield in nw. Arizona; (3) Bill Williams and Big Sandy Wash in w.-central Arizona; (4) Gila drainage basin. Suitable habitat is often scarce along streams and washes (Monson and Phillips 1981, Rosenberg et al. 1991, S. Hedges pers. comm.). Abert's Towhee is found throughout much of the suburban Phoenix area (Alcock 1993).

California

Along lower Colorado River plus Imperial and Coachella valleys in se. California (Davis 1951, Weathers 1983).

New Mexico

In the southwest along lower Gila River east to Cliff (Ligon 1961), and at San Simon Cienega (R. R. Johnson pers. comm.).

Nevada

Along Colorado River northeast to Virgin River; also along Virgin in se. Nevada, in Moapa Valley, and in suitable habitat around Las Vegas (Alcorn 1988, K. Voget pers. comm.).

Utah

In the southwest along Virgin River south of LaVerkin, Santa Clara Creek south of Gunlock Reservoir, and minor tributaries (S. Hedges pers. comm.).

Mexico

Colorado River delta (Wilbur 1987); San Pedro and Santa Cruz Rivers, just south of U.S. border (G. Monson and S. M. Russell pers. comms.).

Range Outside The Americas

No records known.

Historical Changes In Distribution

Range Expansions

In Arizona upper Santa Cruz to Nogales, up Sonoita Creek, up Oak Creek nearly to Sedona—all since mid-1970s (Christmas Bird Counts in *American Birds*, Davis 1951, D. Jones pers. comm.); upper San Pedro into Mexico (G. Monson pers. comm.); exotic shrubs along irrigation ditches in some agricultural and urban areas (Rosenberg et al. 1987); suburban backyards in the Phoenix, AZ, area (Alcock 1993).

Range Contraction

Beaver Dam Wash, UT, has lost all suitable habitat (S. Hedges pers. comm.). Along lower Colorado River and its tributaries, formerly continuous habitat is now fragmented, primarily cleared for agriculture. Lowered water tables from pumping groundwater have dried streams and killed streamside vegetation. Alcock (1993) estimates only 5–10% of Arizona's riparian vegetation remains. Many remaining habitat fragments have lost much of their native shrub component. Exotic salt cedar (*Tamarisk chinensis*), less than optimum habitat, now covers large stretches along streams and washes (Rosenberg et al. 1991).

Fossil History

The remains of California Towhee (*Pipilo crissalis*) have been found in Carpenteria and La Brea, CA, but there are no reports of Abert's Towhee (Davis 1951).

◂ Distinguishing Characteristics | Systematics ▸

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Systematics

Geographic Variation

Western populations (lower Colorado River and se. California) slightly paler, more cinnamon; eastern birds (Santa Cruz, San Pedro, and upper Gila Rivers) darker, more grayish brown (Davis 1951, Phillips et al. 1964). Zink and Dittman (1991) found no difference in mitochondrial DNA between California and Tucson, AZ, birds. The lack of geographic biochemical differences may reflect mixing of populations and gene flow associated with the cycles of climatic and vegetation changes that occurred in the Sonoran Desert region since the start of the current glacial era. Van Devender (1990) presents evidence that in the most recent (Wisconsin) glacial period, only elevations below 330 m contained vegetation typical of the present Sonoran Desert.

Subspecies; Related Species

The subspecific history of this species is confusing, complicated initially by a sketchy location description, “New Mexico,” for the type specimen. The AOU Check-list (1983) postulates Gila Bend, Maricopa Co., s.-central Arizona, as the location. Other factors complicating the designation of subspecies are the color changes of plumage that occur in live birds from sun-bleaching and abrasion after their last molt and color changes in study skins during storage (Davis 1951).

Ridgway (1901) did not specify subspecies. Van Rossem (1946) designated paler specimens from se. California as *P. a. dumeticolus* and assigned California, Colorado River, and Virgin River populations to this subspecies, specifically excluding the Bill Williams River and its tributaries in w. Arizona. By implication, the range not assigned to *P. a. dumeticolus* was assigned to the nominate subspecies. This designation was accepted by the American Ornithologists’ Union (1957).

Phillips et al. (1964) suggested different subspecies boundaries. Western subspecies coming as far east on the Gila River as Phoenix and on the Bill Williams to the Big Sandy Wash, whose population was said to be variable. Because of the newer definition of the site of the species’ type specimen (Am. Ornithol. Union 1983), Gila Bend west of Phoenix, the western population with its expanded range became the nominate subspecies, *P. a. aberti* Baird. An eastern subspecies, *P. a. vorhiesi* Phillips, was postulated for the upper Santa Cruz (Tucson and south) and east on the Gila and San Pedro Rivers above their

junction. Rea (1983) reports intermediate populations as variable in plumage. The lack of a clear dividing line between potential subspecies is consistent with the lack of geographic variation in mitochondrial DNA (Zink and Dittman 1991). Therefore, to avoid confusion, we define populations geographically rather than by formal subspecies names.

Mitochondrial DNA and allozyme studies by Zink (1988) and Zink and Dittman (1991) indicate that Abert's and California towhees are sister taxa as predicted by Davis (1951). The mitochondrial DNA studies produced a divergence *P* value of 2.5% for these 2 species. In contrast, Abert's and Canyon towhees differ by 4.7% and California and Canyon, once considered conspecific, differ by 4.3%. These values are comparable to values obtained with other pairs of species within the same genus. Assuming a divergence rate of 2% per million yr, Abert's and California towhees separated 1.2 million yr ago, whereas California and Canyon towhees separated more than 2 million yr ago. Allozyme data show a similar pattern.

The close biochemical relationship of Abert's and California towhees is consistent with behavioral and vocal similarities (Davis 1951, Marshall 1964). They are nearly allopatric (Weathers 1983) and have indistinguishable eggs (Harrison 1979), and both use exotic suburban habitats (Childs 1968, Alcock 1993), which the Canyon Towhee does not (Tweit and Tweit 1986).

The ranges of Abert's and Canyon Towhees partly co-incide in Arizona and New Mexico, although their habitats did not overlap historically (Marshall 1964, Rea 1983). In the few places where Canyon and Abert's towhees occur together in sparse mesquite woodland, territories overlap and few antagonistic interactions occur (Marshall 1960). This behavior is consistent with the extended period of species separation indicated by the biochemical data.

◂ Distribution Migration ▸

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Migration

Essentially sedentary.

◂ Systematics Habitat ▸

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Habitat

Historical habitat includes cottonwood-willow with a dense understory of shrubs (see Fig. 2) (Rosenberg et al. 1991) and mesquite woodland (Marshall 1960), e.g., along Colorado River and its perennial tributaries south from Virgin River, and also se. California. Most of this habitat has been altered (Rea 1983, Rosenberg et al. 1991), and Abert's Towhee is now found in remnants of riparian woods and shrubs, marshes, and exotic vegetation, including salt cedar in the lower Colorado River valley (Rosenberg et al. 1991) and in mixed exotic-native habitat in the Phoenix, AZ, area (Rosenberg et al. 1987). Within a well-developed cottonwood-willow or mesquite woods, Abert's prefers dense understory (Marshall 1960). It is also found in quailbush (*Atriplex lentiformis*) along agricultural fields. Populations disperse after the breeding season, then contract into preferred habitat following winter mortality (Rosenberg et al. 1991).

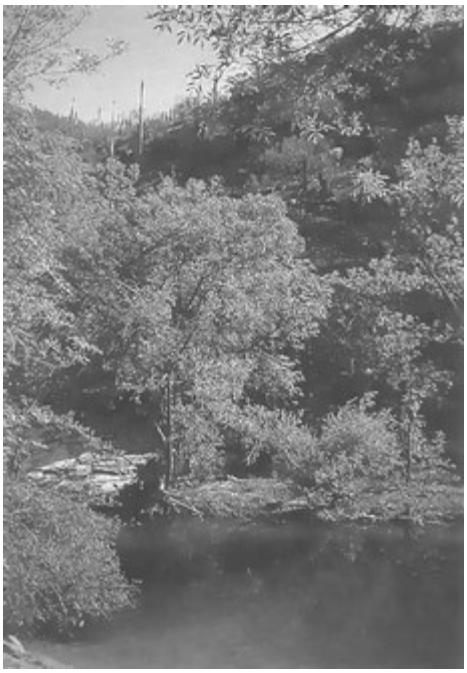

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Fig. 2. Streamside habitat of Abert's Towhee near Tucson, AZ.

Migration Food Habits

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Food Habits

Feeding

Main Foods Taken

Insects and seeds (Rosenberg et al. 1991).

Microhabitat For Foraging

Primarily a ground forager (Marshall 1960); of 747 observations of foraging birds, ≥ 70% on the ground (Rosenberg et al. 1991).

Food Capture And Consumption

Usually (50–67% of time) scratches on ground or in loose litter, often for a long time in one spot (Marshall 1960, Finch 1984a). Dunning (1986) observed captive birds using "double-scratch" technique, short hop forward followed by simultaneous backward kicks to uncover soil below the litter on top. Female forages 71.4% of daytime in prenesting season, male 66.2% (Finch 1984a). Foraging rates varied greatly among 4 captive birds: range 2–15 seeds/min. When amounts of available seed under litter varied, highest foraging rate occurred at below maximum seed levels (Dunning 1986). Marshall (1960) observed *P. aberti* finding insects in bark crevices 2.5 m above ground, and foraging like a nuthatch, head down with occasional scratching.

Diet

Of 108 towhee stomachs sampled from lower Colorado River, insects dominated diet in all seasons; 73% in winter to 96% in late summer. Beetles (20–30% of diet) and ants (5–10%) were consumed all year; caterpillars in fall, winter, and spring (15–25%); grasshoppers and cicadas in summer (up to 38%); seeds mostly from Chenopodiaceae. During all seasons, females consumed significantly larger items than males did, but both sexes ate the same prey species (Rosenberg et al. 1991).

Food Selection And Storage

No reports of food storage.

Nutrition And Energetics

Dunning (1986) estimated that captive birds needed about 7 g of seed/d (about 1000 milo

or millet seeds) to maintain weight.

Metabolism And Temperature Regulation

Ability to regulate temperature is acquired during the nestling stage, but female still broods and shades for 36–42% of day at end of nestling stage, owing to high summer temperatures (Finch 1984a).

Average obligatory energy (basal and thermostatic power consumption) during reproductive cycle decreases from 47.8 kJ/d to 28.4 (females) and from 47.9 to 30.9 (males) as day length and air temperatures increase (Finch 1984a). During hot months, Dawson (1954) did not see towhees in open areas between 1100 and 1530. Foraging and nesting activities continue in shade (Finch 1984a).

Exhibits diurnal temperature cycle. Birds held at 23°C and illuminated from 06:00 to 18:00 had daytime body temperatures of 42°C and nighttime body temperatures of 39°C. Body temperature changed abruptly at beginning and end of illumination, no matter what the length of photoperiod. At 5°C ambient temperature, daytime body temperature was slightly higher, and nighttime body temperature was more variable. At 39°C ambient temperature, daytime body temperature rose as high as 43°C with 41°C in the dark when birds were held 24 hours without water. Daytime body temperatures were about 1°C lower when water was provided. Mean lethal body temperature 46.9°C (range 46.4–47.7) (Dawson 1954).

Wingfield et al. (1992) studied corticosterone hormone levels in the blood plasma of Abert's Towhee in summer and winter. The baseline levels in 1989 were the same for males in winter and summer. Females in summer were similar, whereas the winter female level was about 50% higher. The summer of 1990 was unusually hot (maximum 50°C near study site), and males had a statistically significant 3-fold increase in plasma corticosterone levels, consistent with the stress of these high temperatures. Interestingly, females showed no significant increase.

Baseline levels also varied over the day, with males peaking about 08:00 at about 3 times midafternoon values. Females had a similar pattern with higher levels. Male Abert's Towhees showed a similar stress response to capture in winter and summer, whereas females showed a significantly lower responses to stress in summer. This decreased response was similar, but of smaller magnitude, than that shown by Cactus Wren (*Campylorhynchus brunneicapillus*), Curve-billed Thrasher (*Toxostoma curvirostre*), and Black-throated Sparrow (*Amphispiza bilineata*). Wingfield et al. (1992) suggest that Abert's Towhees with access to water are less stressed by summer temperatures than these 3 species.

Drinking, Pellet-Casting, And Defecation

Captive birds drink between foraging periods (Dunning 1986). Marshall (1960) observed towhees drinking at a well. Abert's drinks less than California Towhee at 39.°5C. At 45% relative humidity and 39.5°C ambient temperature, birds drink 17.0 cc per day (44.4% of body weight) when supplied with water and food (Dawson 1954).

No evidence of pellet-casting.

Habitat Sounds

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Sounds

Vocalizations

(From Marshall [1964] unless otherwise credited.)

Development

Juvenile song found in California and Canyon towhees, but not in Abert's.

Vocal Array

Relatively simple for a passerine. Most communication takes place via calls and duets. Squeal duet (Fig. 3a) is most conspicuous vocalization, heard often during day.

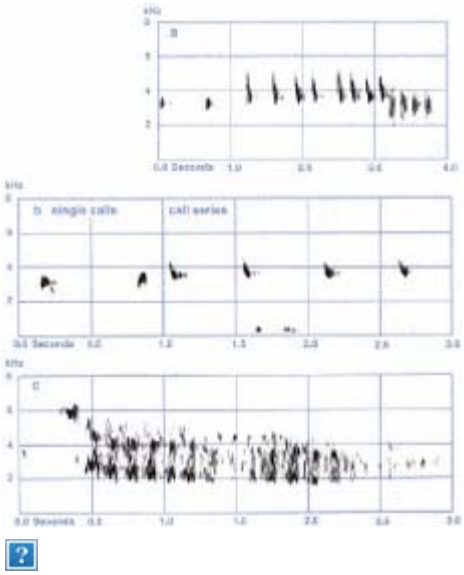

Fig. 3. Abert's Towhee vocalizations.

(Fig. 3c). Song used by territorial males to attract mates, is simple and similar to a series of call notes. Song made up of sharp *peep* sounds; used infrequently by mated males.

(Fig. 3b .) A high-pitched, sharp *peep* by mated males. Dawson (1968) quoted descriptions by others as *chirp*, *chuck*, or *huit* . The territorial call is similar in form and function to that of California Towhee.

A thin, high-pitched, and penetrating, quavering *seep* used by both sexes to keep in contact when hidden from each other. Abert's *seep* is lower, louder, and longer than that of California or Canyon towhees.

(Fig. 3a). A series of individual notes resembling *sleep*, *sleep*, *cha*, *cha*, *cha*, like locative calls followed by a harsh chatter. Broken more into individual notes than duets of California or Canyon towhees. The most conspicuous vocalization of Abert's Towhee, given dozens of times a day.

Song and calls are substantially the same over the range.

Phenology And Daily Pattern Of Vocalizing

Calls and squeal duets are used year-round by this sedentary species. Squeal duets

heard less frequently in fall and early winter (RCT). Locative call and squeal-duet calls used any time during day by either sex. During breeding season, mated male utters piercing, staccato *peep* while defending territory boundaries at dawn.

Song is used by male at onset of breeding season, which varies geographically and with rainfall patterns. Finch (1984a) reports mated males sing from before nest-building until incubation starts. Unmated males may sing all day, week after week, during breeding season until they disappear or find a mate. Male song heard from about 0.5 to 0.15 h before sunrise in May and early Jun (J. C. Tweit pers. comm.). Song may succeed staccato *peep* as a territory-marking display.

R. R. Johnson (pers. comm.) reports towhees also sing on into the morning. Pattern may vary between years and geographically. Canyon Towhees also sing before sunrise (S. Mills pers. comm.).

Places Of Vocalizing

Locative calls usually given on ground (foraging site), squeal duets from bushes or low tree branches at approximate level of nest. Females do not vocalize from nest during incubation unless threatened. Predawn song from within upper part of mesquite (RCT), also from upper part of citrus trees and lower limbs of cottonwoods (R. R. Johnson pers. comm.).

Repertoire And Delivery Of Songs

Song is a vigorous, accelerating series of call notes often ending in a very rapid succession of notes at a lower pitch (Fig. 3c). Little apparent variation in song between individuals. Song is similar in form to that of California Towhee; Canyon Towhee's song is an even succession of musical notes, often introduced by a single call. See Fig. 1a in Marshall (1964). Song interval about 6/min (RCT).

Social Context And Presumed Functions Of Vocalizations

Used by territorial male advertising for mate and defending territory.

Used for territorial marking by male, also locative when birds are apart; signifies alarm when more intense. At times of extreme alarm (e.g., predator present), Abert's voice cracks. A bell-like ventriloquial *peep*, given when an observer is near a nest with young, is a modification.

Locative call used by both sexes.

Reunion after foraging, reaffirms pair bond. Also used when birds engage in territorial disputes.

A high-pitched, piercing call, used for food begging by fledglings; increases in loudness and frequency as time elapses since the last feeding. Calls change with age of fledglings. Also uttered by independent juveniles capable of making adult calls, when near parents.

Rapid succession of guttural notes, *cut*, *cut*, *cut* uttered when fighting another towhee; described by Davis (1957) as "snarling, throaty notes."

A shriek or explosive cry used when handled, pursued by hawk, or otherwise frightened.

Nonvocal Sounds

Wing flutter (rarely heard) when taking off (Marshall 1964).

Food Habits Behavior

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Behavior

Locomotion

Walking, Hopping

Hops, runs, also scratches with both feet simultaneously (Marshall 1960, Finch 1984b).

Flight

Female spends less than 2% of day in flight, male up to 3.5% (Finch 1984a); flies from ground to shrub or low tree branch, rarely higher (Marshall 1960).

Self-Maintenance

Preening

Captive birds preen between periods of foraging (Dunning 1986). Species dustbathes in open (Dawson 1968).

Sleeping, Roosting, Sunbathing

Brown (1903) saw “large numbers” sunning together in early winter.

Daily Time Budget

Prenesting period, males spend 66.2% of 14-h day foraging and 32.1% perching; females: 71.4% and 26.9%; see Table 1 (Finch 1984a). In hottest weather, individuals take shelter in densest part of habitat from 11:00 to 15:30; very few birds trapped between 0900 and 1630 (Dawson 1954).

Agonistic Behavior

Physical Interactions

Frequent fights with other pairs or individuals at territory boundaries, over water, or at supplementary food (Marshall 1960).

Communicative Interactions

Threat displays, body feathers ruffed out, head retracted, scapulars raised off wings, tail spread (Marshall 1960). Observed standing parallel to each other on top of a wall, uttering the squeal duet call in an apparent territorial dispute in late winter (RCT).

Spacing

Individual Distance

Marshall (1960) observed an immature male feed a few inches from a pair of Canyon Towhees, with Abert's Towhees on a wall (above) equally nearby (RCT).

Territoriality

Mated pairs maintain permanent territories about 1.5 to 2 ha in optimum habitat (Marshall 1960, Rosenberg et al. 1991). Mean territory size in lower Colorado River valley 1.22 ha (*n* = 7) (Finch 1984b), perhaps as small as 0.8 ha on San Pedro River, AZ (D. Kreuper pers. comm.).

Male marks boundaries with "territorial calls" daily (Marshall 1964); many territorial squeal-duets and fights (Marshall 1960; see Sounds: vocalizations). Males visibly aggressive in defending snags and areas around them. Aerial chases most frequent in early morning. Females participate in ground chases. Aggressive territorial defense declines over breeding season (Finch 1981a).

In sparse mesquite habitat in Tucson, AZ, area, territories of Abert's and Canyon towhees overlap extensively with little sign of conflict (Marshall 1960).

In fall and winter, Abert's Towhees use a larger territory and tolerate floaters, birds of the year, and neighboring pairs in their territory (Marshall 1960). Unmated individuals and/or birds of the year may congregate during nonbreeding season. Brown (1903) saw "large numbers" scratching and sunning together in early winter. Marshall (1960) reports flocks of up to 12 individuals.

Mated pairs do not tolerate floaters on their territory during breeding season (Marshall 1960).

Sexual Behavior

Mating System And Sex Ratio

Monogamous. Marshall (1960) reported a shortage of females during a drought period.

Pair Bond

Form a multi-year bond on year-round territory. Most pairs mate for life (Marshall 1960); mates who die or disappear are readily replaced (DMF). Only on the unusual occasion when the female/male ratio is much less than 1 are males heard singing to attract mates, all day long, week after week (Marshall 1960). Thus pairs are formed and on territory in Jan in the lower Colorado River valley awaiting favorable conditions for breeding (Finch 1981a). At this time pairs accompany each other in all activities, make simultaneous flights, and perform face-to-face squeal duets (Marshall 1960). Because at least some males have cloacal protuberances at this time (RCT analysis of Tanque Verde Banding Group [TVBG] and S. M. Russell [SMR] banding data), indicating breeding readiness, this behavior may be considered mate-guarding, but it may also merely be maintenance of a close pair bond.

Extra-Pair Copulations

No observations.

Social And Interspecific Behavior

Degree Of Sociality

Pairs defend territories aggressively against other pairs of the same species early in breeding season. Aggressive behavior abates as season progresses, and territory owners tolerate floaters and neighbors in winter (Marshall 1960).

Play

Not reported.

Interactions

Attacks Northern Cardinal (*Cardinalis cardinalis*), Pyrrhuloxia (*C. sinuatus*), Green-tailed Towhee (*Pipilo chlorurus*), and White-crowned Sparrow (*Zonotrichia leucophrys*) at food source to displace them. Aggressive interactions with Canyon Towhees are rare (Marshall 1960).

Predation

Predators on eggs and young include Cactus Wren, Crissal Thrasher (*Toxostoma crissale*), snakes such as Arizona coachwhip (*Masticophus flagellum*), and Greater Roadrunner (*Geococcyx californianus*) (Finch 1981b). Marshall (1964) suggests adults may be attacked by hawks. See also Causes of Mortality.

Coachwhips can take 1 nestling per visit over several days; roadrunner can remove 3 nestlings (but not an egg) at 1 visit (Finch 1981b). Adults respond to predators with loud calls or harsh, rattling noises (Finch 1981b).

◂ Sounds Breeding ▸

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Abert's Towhee

Pipilo aberti

Order PASSERIFORMES – Family EMBERIZIDAE

Issue No. 111

Authors: Tweit, R. C., and D. M. Finch

Breeding

Phenology

Pair Formation

Because territories are occupied year-round by permanent pairs, most birds entering the breeding population do so at random times as replacements for a deceased pair member. Finch (1981a) found territories already occupied by mated pairs at the start of her study season in Jan. Species seems to have little need for an established time and behavior pattern for formation of new pairs.

Nest Building

Constructed by female in about 1 wk (Finch 1984b).

First Brood

See Figure 4 . In Tucson, AZ, males captured 28 Jan and 23 Feb had 6-mm cloacal protuberances; numbers of males with enlarged cloacal protuberance increase greatly in Mar and peak in Apr (RCT analysis of TVBG and SMR banding data). Earliest nest reported, in a pyracantha bush in Phoenix, had 4 eggs 5 Feb and 3 young 15 Feb 1965 (S. Demaree/Cornell Nest Record Card). On Gila River, AZ, first nest found by Gilman (manuscript quoted by Rea 1983) was 28 Feb, last 4 Sep; of 125 nests found, 22% were found in Apr, 18% n May, 30% in Jun, and 19% in Jul. Late winter, spring, or summer rains may produce a nesting peak in about 10–15 d; over 4 yr, onset of nesting varied by as much as 1 mo (Marshall 1963).

Second Brood

Enlarge

Abert's Towhee clutch, Arizona.

Enlarge

Abert's Towhee nest.

Started about 9 wk after start of successful nest (Finch 1984b). Bendire (1890) reported a fresh egg set on 10 Sep in Tucson area. Some males captured in Sep and Oct in Tucson had cloacal protuberances ≥ 5 mm (RCT analysis of TVBG and SMR banding data). May renest as little as 1 wk after a nest failure (Finch 1984b); interval decreases as nesting season progresses, and may be ≤1 wk when an old nest is reused (Finch 1981a).

Nest Site

Selection Process And Microhabitat

Preferred nest sites along Gila River, e. Arizona, mesquite and the shrubs *Baccharis* and *Lycium* (Gilman manuscript quoted by Rea 1983). In lower Colorado River valley, early nests in small shrubs or mistletoe (*Phoradendron californicum*) clumps, later nests substitute mesquite for small shrubs (Finch 1985). Towhees apparently prefer trees to shrubs as nest sites when both have leaves, but avoid bare trees. Throughout breeding season, 40–60% of all nests built in mistletoe clumps (Finch 1985). Bendire (1890) reported many nests in Tucson area on recently cut willow stumps, surrounded by sprouts. Mexican elderberry (*Sambucus mexicanus*) is another favored nest site. R. R. Johnson (pers. comm.) found nests on thick cottonwood branches in Camp Verde area of central Arizona.

Site Characteristics

Nest height early 155.8 cm (29.58 SE); late 224.0 cm (17.10 SE). Nest height and nest plant species vary in conjunction with mesquite leafing phenology along lower Colorado River (Finch 1985).

Nest

Construction

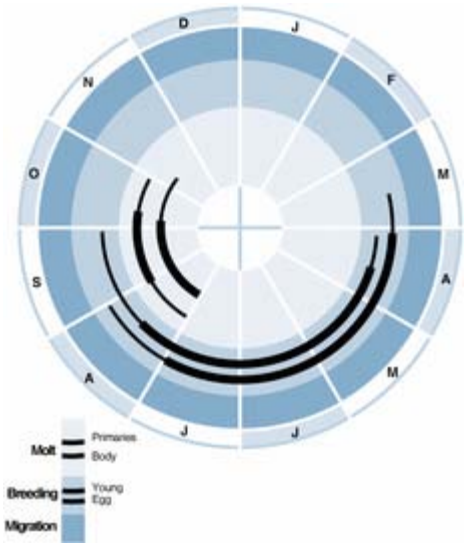
Female only, requires more than 1 wk early in breeding season, less than 1 wk by end of breeding season (Finch 1981a, 1984b).

Structure And Composition

Bulky cup nest of fresh mesquite leaves and bark, salt cedar, saltbush (*Atriplex canescens*), inkweed (*Suaeda torreyana*), and/or arrowweed (*Tessaria sericia*) leaves, grasses, and even newspaper (Finch 1983a). See Fig. 5 . Bendire (1890) found

Enlarge

Abert's Towhee adult and young at nest; Arizona.



Enlarge

Fig. 4. Annual cycle of Abert's Towhee.

many nests built of soft inner bark of cottonwood. Brown (1903) reported inner bark of willow.

Fig. 6. Abert's Towhee nest with cowbird eggs.

Dimensions
Western populations: outside diameter 13.7 cm (range 10–17.5, *n* = 18), outside height 10.9 cm (10–12.5, 4), inside diameter 7.8 cm (5–10, 18), inside depth 4.8 cm (3.1–6.9, 18) (RCT from Western Foundation of Vertebrate Zoology [WFVZ] data). Average nest: outside diameter 15 cm, inside 7.5 cm; outside depth 10 cm, inside 6.25 cm (Brown 1903). Only nest reported from an eastern population had similar dimensions (Bendire 1890).

Microclimate
Early nests face predominantly southeast toward early morning sun; late nests randomly oriented (Finch 1983a).

Maintenance And Reuse
Reuse of own nest not common but does occur (DMF); Finch (1982b) found 4 clutches in old Crissal Thrasher nests with fresh linings of grasses and green leaves woven into the stick structure. Marked pairs renest after losing previous clutches.

Nonbreeding Nests
None reported.

Eggs
Size
Lower Colorado River valley and California: length 25.08 mm (range 23.60–26.42, *n* = 62), breadth 17.86 mm (16.92–18.92, 62), empty shell weight 0.258 g (0.216–0.290, 62) (WFVZ); length 24.65 mm (0.228 SD, *n* = 98), breadth 18.30 mm (0.113, 98) (Finch, 1982a). Eastern populations: length 24.11 mm (22.39–25.86, 71), breadth 18.15 mm (16.79–19.48, 71), empty shell weight 0.260 g (0.233–0.294, 71) (WFVZ); length 23.8 mm (20.8–27.4, 83), breadth 17.8 mm (83) (Dawson 1968)

Mass
4.45 g (0.076 SD, *n* = 98), 9.5% of adult weight, lower Colorado River valley (Finch 1981a, 1982a).

Color
Pale clay blue, dark brown markings sparse but well defined, heaviest at the large end (Dawson 1968). Indistinguishable from eggs of California Towhee (Harrison 1979).

Eggshell Thickness
Unknown.

Egg-Laying
In early morning (Finch 1981a), at about 1-d intervals. On day of laying first egg, female spends 33.1% of time at nest, incubating or perching on rim, 55.5% foraging, and 10.3% perched elsewhere (1 time budget, 240 min); male accompanies her while foraging but does not visit nest (Finch 1984a).

No evidence for intraspecific egg dumping. Eggs removed by cowbirds are not replaced (Finch 1983b).

Incubation

Onset

After laying first egg (Finch 1984a).

Incubation Patch

Female only (Davis 1974).

Incubation Period

14 d (Finch 1984b).

Parental Behavior

Female spends 59.4% (2.6 SE, *n* = 10) of day at nest and 32.9% (2.6 SE, 10) foraging; incubates at night. Male does not incubate; spends 40.3% (2.2 SE, 3) of time foraging and 56.8% (2.6 SE, 3) perching. Male not observed feeding female at nest (Finch 1984a).

Hardiness Of Eggs Against Temperature Stress

Monthly averages in lower Colorado River valley during breeding season range from 8.3°C in Mar to 42.9°C in Jul (Finch 1984b). All-time max temperature at Yuma, sw. Arizona: 50°C; min -5°C.

Hatching

Preliminary Events

Egg develops star-fracture on hatching day (Finch 1984b).

Shell Breaking And Emergence

Asynchronous, up to 1 d apart (Finch 1984b).

Parental Assistance And Disposal Of Shell

At hatching period, female spends 42.2% (6.5 SE, *n* = 3) of daytime at nest, 44.9% (8.6 SE, 3) foraging, and 11.2% (2.2 SE, 3) perched elsewhere. Male spends 54.8% of daytime perching and 41.5% foraging (Finch 1984a).

Young Birds

Condition At Hatching

Hatching weight 3.63 g (0.075 SE, *n* = 13 from 8 clutches), 7.8% of adult weight (Finch 1984c); wing chord 7.73 mm (9% of adult); tarsus length 7.75 mm (25% of adult) (Finch 1981a).

Growth And Development

Growth rate (K) 0.476, fastest growth (weight) between days 4 and 7; fledgling weight 32.8 g, 70% of adult weight (Finch 1984c). Most rapid wing growth between days 4 and 8, tarsus days 3 and 8 (Finch 1981a).

Locomotion

Young can walk at 10 d (Finch 1981b).

Parental Care

Brooding

Female spends 49.1% (4.1 SE, *n* = 15) of daytime at nest and 10.4% (2.4 SE, 15) perched elsewhere. Male not observed to brood (Finch 1984a). Brooding declines as

nestlings age (Finch 1981a).

Feeding

In lower Colorado River valley, only female feeds young the first day or so after hatching, then both parents bring insects. Male brings food to nest; female attends young (Finch 1981a). During nestling stage, female spends 39% of day foraging and 49% at the nest while male spends 50% foraging, 4% at nest, and 43% perched away from nest (Finch 1984a). Daytime visits by female increased from 27/d at start of nestling stage to 73/d by fledging, while male visits increased from 5 to 83/d (Finch 1981a).

Nest Sanitation

No data.

Parental Carrying Of Young

Not reported.

Cooperative Breeding

No reports.

Brood Parasitism

Identity Of The Parasitic Species

Brown-headed Cowbird (*Molothrus ater*) (Marshall 1963, Friedman et al. 1977, Finch 1982a). During 19th century, Bendire (1890) found no cowbird eggs in 80 nests examined near Tucson, AZ. Brown (1903), however, found cowbird eggs in towhee nests near lower Colorado and Gila Rivers. Of 145 egg sets in WFVZ collection from before 1936, only 1 contains a cowbird egg, whereas 4 of 47 later sets were parasitized. This trend is consistent with the statement of Phillips et al. (1964) that cowbirds have “become much more common in recent years in Arizona.”

Captive female cowbirds prefer to lay in host nests that contain eggs smaller than their own (King 1979). Because Abert’s Towhee eggs are larger than cowbird eggs (Fig. 6), Abert’s is probably not an ideal host for this parasite. Finch (1983b) suggests that moderately high rates of Abert’s Towhee parasitization are due to a shortage of suitably sized hosts and a relative abundance of towhee nests. Parasitization of closely related California Towhee has not been reported (L. Kiff pers. comm.).

Frequency And Timing Of Occurrence

In lower Colorado River valley, none of 18 nests started before 9 Apr were parasitized. Of 52 later nests, 44% had cowbird eggs. Of these, 64% had 1 cowbird egg, 23% had 2, and 14% had 3. Rates of parasitization increased from 45% in May to 67% in Jun (Finch 1983b). Nests were more frequently parasitized in interior honey mesquite (50%) than along agricultural-riparian edge (20%) (Conine 1982). In Tucson area, Marshall (1963) found late summer nests were not parasitized. Friedman et al. (1977) reported 20.6% of nests from Maricopa Co., AZ, were parasitized.

Response

Seventeen of 22 nests with cowbird eggs were incubated, 5 were abandoned; in most abandoned nests, towhee eggs had been removed (Finch 1983b). Towhees chase and attack adult cowbirds (Finch 1981a).

Effect On Host

From Finch (1982a, 1983b). Parasitized towhee nests lost 32% of eggs, due almost entirely to cowbird ejection. In addition, a number of nests were abandoned and some were lost to predators during incubation. From 53 towhee eggs in 22 parasitized nests, 9 eggs hatched (17%). In 47 unparasitized nests, 67 birds hatched from 130 eggs (52%); 1.67 (1.23 SD) towhee hatchlings per parasitized nests (excluding those abandoned or predated during incubation) versus 2.77 (0.86 SD) in nonparasitized. Total productivity of successful parasitized nests 0.046; in nonparasitized nests 0.278 before Apr 29, 0.307 after. Daily survival rate of towhees in parasitized nest: incubation 0.963/egg, 0.911/clutch; nestling 0.984/nestling, 0.938/brood.

Success Of Parasite

Of 32 cowbird eggs in 22 nests, 6 hatched. Four of these nestlings (67%) disappeared, 1 was lost to predation, and 1 fledged (at a nest where all towhee eggs had been ejected by adult cowbirds) (Finch 1983b). Cowbirds lost 9% of eggs from towhee nests that remained active (Finch 1981a). Finch (1983b) suggests starvation as the cause of disappearance of cowbird nestlings, citing the weight contrast (25.7 g vs. 4.4 g) of a 5-d-old towhee vs. a 3-d-old cowbird sharing a nest.

Fledgling Stage

Departure From Nest

Occurs before growth to adult size is complete, which may reduce losses to predation (Finch 1981a).

Period

12–13 d from hatching to departure from nest (Finch 1984b).

Condition Of Development

Fledgling weight: 32.8 g, 70% of adult weight; tarsus length: 28.7 mm (93% of adult); wing chord: 50.47 (59% of adult) (Finch 1981a).

Manner Of Departure

On foot (Finch 1984c).

Growth

Wing chord probably close to adult size by 1 wk after nest departure since young can fly then (Finch 1984c).

Association With Parents

Fledglings attended by both parents 4–5 wk before attaining independence (Finch 1984b).

Ability To Travel

Young run at 10 d after hatching but do not fly until as much as 1 wk after fledging (Finch 1984c).

Immature Stage

Apparently a period of high mortality. Of a sample of 190 birds banded as juveniles, 47% were not recaptured; 23% were recaptured only in the first month; and 10% were last recaptured after 1 mo but before the end of the calendar year. The remainder were recaptured during successive breeding seasons. Recapture rates for Abert's Towhee are high at the Tanque Verde banding site (near Tucson, AZ) described by Walters et al. (1984), so absence from the recaptured population is most likely due to mortality. Weights

and wing lengths at first capture were mostly at the lower end of adult range (see Appendix), suggesting that these birds were late in the fledgling stage, if not independent of parents (data analysis by RCT).

This trend is consistent with findings of Sullivan (1989) that 42% of Yellow-eyed Juncos (*Junco phaeonotus*), another ground forager, disappeared during their first 2 wk of independence, and 14% of the survivors were lost during the next 4 wk.

Skull pneumatization complete 1 Sep through Feb (Pyle 1987).

Behavior | Demography and Populations

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Pipilo aberti

Order PASSERIFORMES – Family EMBERIZIDAE

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Demography and Populations

Measures Of Breeding Activity

Age At First Breeding

Can breed in the calendar year after hatching: a hatching-year bird banded 10 Nov 1977 was recaptured with a 6-mm cloacal protuberance 26 Jan 1978. From a sample of 190 birds banded in their hatching year, 21 were last recaptured in the succeeding year. Of these, 6 were females with brood patches and 6 males with cloacal protuberances (TVBG and SMR banding data analyzed by RCT). Marshall (1960) found 6 birds that bred in their second year in his study area. Finch (1981a) banded immature females in 1979 that bred in 1980.

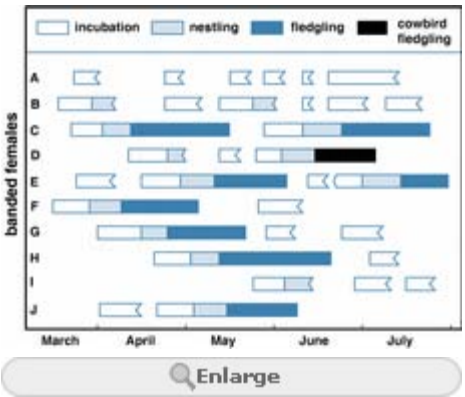

Fig. 7. Nesting histories of female Abert's Towhees.

Intervals Between Breeding

Established pairs attempt breeding at least once a year and as often as 6 times depending on nest success (Finch 1984b) (Fig. 7).

Clutch

Mean clutch size 2.85 eggs (0.35 SE, *n* = 65) range 1–4, mode = 3; number of clutches laid per year 2–6 (*n* = 10) in lower Colorado River valley (Finch 1984b). One-egg clutches laid only during first half of breeding season; frequency of 2-egg clutches increases with time. Modal clutch size (3) was most productive, about 3 times over other clutch sizes; 54% of nests produced 78% of fledglings (Finch 1981a).

Annual And Lifetime Reproductive Success

Average annual fecundity 14.05 eggs/female. Annual productivity in 1980, 2.8 fledglings/pair; 67 nestlings resulted from 130 eggs in 47 unparasitized nests in lower Colorado River valley (Finch 1984b). Only 5 of 63 eggs lost were part of a successful clutch, remainder from total clutch failures (Finch 1983b). No data on lifetime success.

Number Of Broods Normally Reared Per Season

Maximum 2 broods in lower Colorado River valley, average number of nest attempts 3.79

(Finch 1984b); in Tucson, 1.57 over 4 dry years (Marshall 1963).

Proportion Of Total Females That Rear At Least One Brood To Independence Per Season

Of breeding females, 60% (*n* = 10) reared 1 brood; 20% reared 2 broods (Finch 1984b).

Daily Nest Survivorship

Incubation period: 0.995/egg, 0.955/clutch; nestling: 0.994/nestling, 0.969/brood (Finch 1982a).

Life Span And Survivorship

Maximum age record for banded bird: about 8 yr, 7 mo (Klimkiewicz and Futcher 1987).

Disease And Body Parasites

Two helminth parasites recorded: *Anonchotaenia longiovata* (Voge and Davis 1953) and an unidentified nematode crop worm (Dawson 1968).

Causes Of Mortality

See Breeding: predation; also immature stage. Nestling starvation most common in early part of breeding season when insect biomass lowest and 1-egg clutches most common (Finch 1981a).

Exposure

Rosenberg et al. (1991) state that winter is time of highest mortality.

Predation

Egg/nestling predation by mice (*Peromyscus* sp.) (Marshall 1963), Arizona coachwhip (Finch 1981b), and blacksnake (Gilman 1915). Snakes probably account for most nest predation, but rodent pellets in empty nests suggest possible predation by roundtail ground squirrels (*Spermophillus tereticaudus*) and white-throated woodrats (*Neotoma albigula*). Nests with larger clutches may attract more predators because of more visits and louder begging (Finch 1981a).

Human/Research Related

Egg and specimen collection have probably never had an appreciable impact.

Range

Initial Dispersal From Natal Site

Probably occurs after dependence on parents ends 4–5 wk after fledging; see below, Dispersal from breeding site. Local, seasonal movements in marginal habitat near edge of range (Weathers 1983) probably represent initial dispersal, as does presence of towhees in autumn in tributaries of Verde River, central Arizona, where they do not breed (DMF). Larger flocks, such as those seen in the open after breeding season by Brown (1903), may also be immatures. This dispersal of immature birds may be the mechanism for range expansions.

Fidelity To Breeding Site

Inhabits permanent territories (Marshall 1960).

Dispersal From Breeding Site

All 322 encounters from 1,805 banded birds occurred at original location (D. Bystrak pers. comm.).

Home Range

After breeding season, territorial defense becomes less aggressive and birds tolerate floaters and wanderers (Marshall 1960).

Population Status

Numbers

Spring (Mar–Apr) densities in structurally well-developed cottonwood-willow habitat on San Pedro River increased to 107.2 birds/40 ha in 1991 (D. Kreuper pers. comm.). Rosenberg et al. (1991) reported 55 birds/40 ha in similar habitat along lower Colorado River and up to 30 birds/40 ha in salt cedar-honey mesquite. Density in a remnant mesquite woodland on Rillito Creek in Tucson is similar to the latter figure (J. C. Tweit pers. comm.). Rosenberg et al. (1987) found a late spring density of 49 birds/40 ha in mixed exotic-native suburban habitat in Phoenix area. Abert's Towhee and Hooded Oriole (*Icterus cucullatus*) are the only obligate riparian species with densities as high in this exotic habitat as in cottonwood-willow.

Trends: Geographic And Temporal

On San Pedro River, densities (birds/40 ha, 6-yr average) peaked in summer at: 104.9 early, 103.9 late, and declined to 86.0 fall, 84.6 winter, and 80.2 in Mar and Apr (D. Kreuper pers. comm.). Population in lower Colorado River valley peaks in Jun–Aug, with the low around end of year. Numbers increased from 1975–1979 (Meents et al. 1981), years of increasing precipitation. Marshall (1960), by contrast, found increasing territory sizes and unmated territorial males in drought years.

Breeding Bird Survey data (B. Peterjohn unpubl. data) do not show statistically significant trends because of insufficient sample sizes. Only 7 routes run more than once in 1986–1992 had annual means > 1. Annual variability was high (RCT).

Population Regulation

High rate of nest failure appears to be a major selective pressure determining many of the breeding adaptations of Abert's Towhee. Adaptive responses to predation are: (1) rapid replacement of nests after failure; (2) rapid growth rates, short nesting periods, and ability to fledge at less than adult weight; (3) fledgling mobility on ground highly developed compared to many sparrows; (4) cryptic coloration of both adults and offspring. Early breeding and a long season are also advantageous in coping with high nesting mortality, but the factors determining these characteristics are more complex. Prolonged monogamy and permanent defense of territories favor early breeding and a long breeding cycle.

Availability of food resources undoubtedly determines ability to remain on a permanent territory, but this needs study. Food supply may also determine clutch size and seasonal variation of clutch size (Finch 1981a).

Sedentary habits favor a prolonged pair bond. The long period between fledging and independence demands a greater degree of pair cooperation than in some other passerines. Pair bond is also important in synchronizing cycles for early breeding and rapidly replacing clutches after failure. Pair bond appears to be the key to reproductive success of Abert's Towhee. Maintenance of pair bond is aided by frequent use of squeal duet (Marshall 1964). In an environment where rates of nest predation and parasitism are

high, a prolonged pair bond allows quick response to seasonal changes, nestling mortality, weather, and food supply (Finch 1981a).

A long breeding season also permits adaptation to geographical and temporal variation in rainfall patterns and cowbird parasitism (Marshall 1963, Finch 1983b).

Breeding | Conservation and Management

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Conservation and Management

Effects Of Human Activity

Sensitivity To Disturbance At Nest And Roost Sites

Wingfield et al. (1992) report an increase in plasma corticosterone levels, a measure of stress, of about 6-fold in the first hour after capture.

Shooting And Trapping

Trapped for food or captured by torch-hunting at night along Gila River by Native Americans in past (Rea 1983).

Pesticides And Other Contaminants

No studies reported.

Degradation Of Habitat

Habitat changes in Colorado River delta since 1922, when Leopold (1949) explored the area, are illustrative of changes in much of this species' range. Leopold found an enormous wilderness of lagoons, marshes, and cottonwood-willow and mesquite woodlands now converted to agricultural fields and barren salt flats. The Colorado River now flows into the Gulf of California only in flood years. Kelly (1993) reports Abert's Towhee is "not easy to find" in Colorado River delta. See also Rosenberg et al. 1991 and Finch 1983a .

Rea (1983) describes changes on Gila River, Arizona, where extensive loss of cottonwood-willow and brushy mesquite habitat has reduced population density of Abert's Towhee from that described by Gilman (manuscript quoted by Rea) as "very abundant resident." Gilman found 125 nests and wrote "it was about as much sport finding them as going to gather eggs in a hen house."

S. Hedges (pers. comm.) estimates Utah population has declined by 50% in the last 20 yr because of habitat loss from housing and golf-course development.

Exotic habitats such as *Tamarisk* sp. along streams (Rosenberg et al. 1991) and horticultural plantings in the Phoenix area (Rosenberg et al. 1987) have not adequately replaced habitat lost, and the population decline over the last 150 yr has probably been extensive though poorly documented.

Management

After removal of cows from the San Pedro Riparian National Conservation Area in se. Arizona, spring densities of Abert's Towhees in cottonwood-willow habitat increased from 56.5 to 107.2 birds/40 ha over 5 yr (D. Kreuper pers. comm.). Attempted restoration of cottonwood-willow habitat along lower Colorado River has not been completely successful (Rosenberg et al. 1991). Habitat protection for endangered southwestern Willow Flycatcher (*Empidonax traillii*) at elevations below 1,300 m in Arizona will benefit Abert's Towhee.

◂ Demography and Populations

Appearance ▸

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Appearance

Molts And Plumages

No formal studies of molt in this species. More work needed; detailed study of data available from banded birds would be helpful. Sexes alike in all plumages.

Hatchlings

No information.

Juvenal Plumage

No information on Prejuvenal molt. Sexes alike. Forehead, crown, sides of head, nape, and back light drab brown. Rump and uppertail coverts similar, tinged with rusty. Remiges drab brown, lighter than rectrices. Primaries and S1–S6 narrowly edged with light gray; tertials (S7–S9) edged rusty. Greater coverts tipped with rufous forming narrow wing bar. Rectrices also narrowly tipped rufous. Chin, throat, chest, sides, and belly light buffy brown. Dusky mustache marks on sides of chin. A band of coarse but obscure black spots extend across breast giving it a faintly streaked appearance. Flanks, lower belly, leg feathers, and crissum uniformly rich rusty. Plumage soft and lacy (Brewster 1882, Chapman 1912, Davis 1951, 1974, Graber 1955, Parkes, 1957).

Basic I Plumage

Prebasic I molt occurs Jun–Oct (Colorado River and se. California) Jul–Nov in Tucson, AZ. Molt incomplete; includes all body plumage and often some to all rectrices (Davis 1951) In Tucson, 20% were molting rectrices 1, 2, or 3 when captured (RCT analysis of banding data from Tanque Verde Banding Group [TVBG] and S. M. Russell [SMR]). Literature disagrees on remige replacement in the Prebasic molt. Davis (1951, 1974) indicates that remiges are retained while Chapman (1912) writes that the Prebasic molt includes “inner wing feathers.” Of 87 hatching year birds captured between Jul 31 and Oct 31 by TVBG and SMR, 10 (11%) were replacing primaries and 5 of these were also molting secondaries. Of the entire sample, 32% had body feathers in sheaths (RCT analysis), suggesting that some birds replace some or all remiges in the Prebasic molt.

Tucson, AZ, Jul: Colors from Smithe (1975–1981). Sexes alike. Head and back, mars brown (234a); extensive black on lores and malar region; unstreaked breast, cinnamon drab (219c); undertail coverts, flesh ocher (132d); primaries and rectrices, van dyke brown (121a) (RCT).

Definitive Basic Plumage

Definitive Prebasic molt complete; after breeding in adults. Jun–Oct in Colorado River valley and se. California (Davis 1974), Aug–Nov in Tucson. Heavy ventral and dorsal molt often coincides with primary, secondary or rectrix replacement. Body feather and primary molt starts first, more often with inner primaries. Secondary molt starts early Sep, rectrix replacement is scattered from Aug–Oct. Patterns obscured by nonsynchronized start of molt (RCT analysis of Tanque Verde Banding Group and S. M. Russell data). Marshall (1963) found unmolted adults with fledged young in Oct.

Tucson, Jul: Sexes alike. Same as Basic I except black chin and extreme anterior forehead; primaries, hair brown (119a); rectrices, sepia (219) (RCT). (Lower Colorado River valley and se. California, Nov–Jan). Colors from Maerz and Paul (1930): Head and back, brownish (near 14–E–6, but slightly darker); chin black, throat cinnamon (nearest 13–D–9) streaked with black; underparts brownish suffused with cinnamon (between 13–E–7 and 13–E–8); undertail coverts dull cinnamon (13–I–9 to 13–I–10); primaries dark grayish brown; rectrices blackish brown (Davis 1951).

Bare Parts

Colors refer to Smithe (1975–1981). Tucson, Jul (RCT).

Bill

Lower mandible pearl gray (81) with a pink tone; upper mandible same on sides; top, pale neutral gray (86).

Iris

Mahogany red (132b).

Bare Skin

Pale neutral gray (86).

Legs And Feet

Glaucous (79).

◂ Conservation and Management Measurements ▸

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Measurements

Linear

See Appendix .

Mass

Tucson, male (Mar–Aug) 47.54 g (2.91 SD, *n* = 69) range 40.0–55.6; (Oct–Feb) 49.44 g (3.07, 42) 42.5–54.9. Female (Mar–Aug) 44.73 g (2.83, 44) 38.9–51.0; (Oct–Feb) 46.62 g (1.66, 13) 45.2–50.6 (RCT analysis of banding data from TVBG and SMR). Weights of western populations (Davis 1951, 1974) are similar, but sample sizes are small. Dunning's values (1984) are well within 1 SD of the Mar–Aug weights above (see Distinguishing Characteristics).

Length of cloacal protuberance: range 5–9 mm (shorter cps not considered reliable sexing criteria), mean 7.6 mm, median 8 mm, mode 9 mm (RCT analysis of TVBG and SMR data).

◂ Appearance Priorities for Future Research ▸

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Priorities for Future Research

Greatest need may be an assessment of the effects of climatic change due to global warming on this species and its habitat. An increase in summer temperatures or change in rainfall pattern or amount could have severe impacts.

Research is needed on mortality of this species, both at different ages and seasons. Banding data are available for a survivorship analysis. More data on causes of death, especially predation, are needed.

Additional behavior studies are also needed. These may be most easily conducted in suburban habitats. Self-maintenance, sleeping and roosting, pair formation, and pellet-casting and defecation information is needed. Little is known about metabolism.

Reproductive success and survivorship in exotic habitats as well as specific habitat requirements in urban areas would aid urban wildlife management. Radio-tagging newly independent young birds would provide valuable data about dispersal and mortality in this poorly documented period.

Collection of Nest Record Card data from all parts of the species' range would provide a broader picture of breeding activity than is now available (current data base is 3 cards).

◂ Measurements Acknowledgments ▸

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◂ Priorities for Future Research About the Author(s) ▸

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About the Author(s)

Robert C. Tweit is an independent ornithological researcher. He received an S.B. (Chemistry) from the Massachusetts Institute of Technology (1950) and a Ph.D. (Organic Chemistry) from the University of California (Berkeley) in 1953. For 23 years he was a senior research investigator in the pharmaceutical industry and was co-inventor of his company's leading product. He changed fields in 1978 to pursue interests in urban birds and relationships between southwestern birds and plants jointly with his spouse, Joan. He has banded birds for 20 years, is a past president of Western Bird Banding Association, and is currently their editor for North American Bird Bander. He is author of some 30 papers and holds 20 U.S. patents. Address: R & J Associates, 3116 N. Willow Creek Drive, Tucson, AZ 85712-1382.

Deborah M. Finch is a Project Leader and Research Wildlife Biologist in Albuquerque, NM, for an aridlands research unit of the U.S. Forest Service's Rocky Mountain Forest and Range Research Station. Deborah graduated in 1978 with a B.S. in Wildlife Management from Humboldt State University. She has an M.S. in Zoology from Arizona State University (1981) and a Ph.D. in Zoology and Physiology from the University of Wyoming (1987). Deborah has studied community and reproductive ecology of birds and small mammals in riparian, forested, and subalpine habitats. From 1991 to 1993, Deborah coordinated the Forest Service's role in the Neotropical migratory bird conservation program Partners in Flight. Currently she leads an interdisciplinary team of scientists who conduct ecosystem research in the Rio Grande Basin. Deborah has published more than 50 articles in journals and books and actively participates in meetings and committees of the Cooper Ornithological Society, American Ornithologists' Union, and The Wildlife Society. Address: Forestry Sciences Laboratory, 2205 Columbia SE, Albuquerque, NM 87106.

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