



An inventory of avian species in Aldesa Valley, Saudi Arabia

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Abstract

Conducting species inventories is important to provide baseline information essential for management and conservation. Aldesa Valley lies in the Tabuk Province of northwest Saudi Arabia and because of the presence of permanent water, is thought to contain high avian richness. We conducted an inventory of avian species in Aldesa Valley, using timed area-searches during May 10–August 10 in 2014 and 2015 to detect species occurrence. We detected 6860 birds belonging to 19 species. We also noted high human use of this area including agriculture and recreational activities. Maintaining species diversity is important in areas receiving anthropogenic pressures, and we encourage additional surveys to further identify species occurrence in Aldesa Valley.

Key words

Arabian Peninsula; bird inventory; desert fauna.

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Introduction

Global biodiversity is a consequence of evolutionary events that occur over time and space (Jetz et al. 2012). With current rates of biodiversity loss, understanding factors influencing species richness is critical (Sala et al. 2000, Pimm et al. 2014). Loss of biodiversity can directly and adversely alter ecosystem processes which in turn can affect the resilience of ecosystems to environmental changes (Chapin et al. 2000). For instance, modifications in biodiversity may affect species traits and community composition, for example by the introduction of exotic species (Vitousek et al. 1997). Species composition and interactions between species, as well as abiotic factors, are the fundamental elements in any ecosystem (Groombridge and Jenkins 2002), with losses in biodiversity threatening ecosystems and the species communities

living therein (Balvanera et al. 2006). Conservation of biodiversity is essential to ensure that ecosystems persist and function properly (Chapin et al. 2000). Biodiversity losses can be irreversible; therefore, biodiversity should be monitored and protected (Chapin et al. 2000, Brooks et al. 2006), and conducting species inventories are the most common approach to survey species richness (Hill et al. 2005).

Considerable variation in species richness exists, depending on ecological factors, with areas receiving higher rainfall having greater richness than dry areas, such as deserts (Gaston 2000). Deserts are defined as any ecosystem where limited water affects occurrence of species (Lawrence 2004), and desert ecosystems often contain the lowest species abundance and productivity (Waide et al. 1999). Hence, diversity and richness of terrestrial species in deserts are constrained by low rainfall,

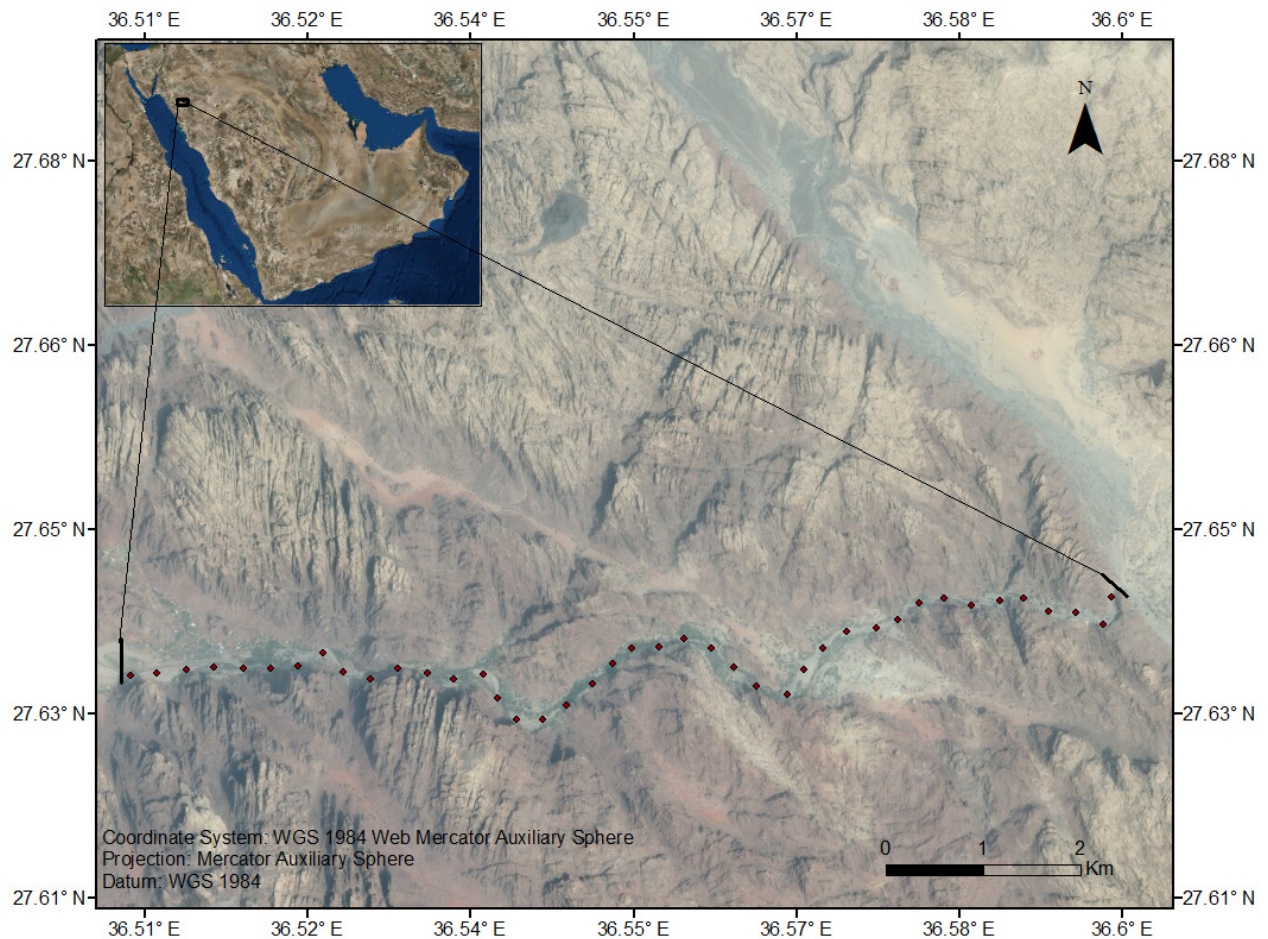


Figure 1. Aldesa Valley, Tabuk Region, Saudi Arabia shown above between the 2 black lines. Points in the valley represent the 40 segments locations.

but high temperature also has a strong effect on species occurrence in deserts (Tiger and Osborne 1999, Gillman and Wright 2014). Species richness is influenced by geographical composition (Brown et al. 2007), with valleys in deserts containing typically greater plant diversity, which in turn results in greater species richness of vertebrates (Qian 2007). Water may be more important to species where drought is continuous (AbuZinada et al. 2004). Access to water and related vegetation offered by desert valleys provide a higher quality habitat in terms of food and shelter for species (Slattery et al. 2003, Korine et al. 2015).

Conservation programs often tend to emphasize regions with greater species richness, with most national and international conservation efforts occurring in these areas (Fa and Funk 2007). In contrast, comparatively few efforts are conducted in areas of low species richness, such as deserts. Though deserts do not typically support high species diversity (Walker 1992, Lawrence 2004), documenting and maintaining biodiversity in ecosystems with low diversity is important because it provides important information about species existence and richness which can be used to ensure the long-term persistence of species assemblages in these extreme conditions (AbuZinada et al. 2004).

In 2001, the Kingdom of Saudi Arabia became sig-

natory to the Convention of Conservation on Biological Diversity that seeks to ensure the conservation of species and their habitats for all time (AbuZinada et al. 2004). In Saudi Arabia, 432 bird species belonging to 67 families have been recorded (AbuZinada et al. 2004). The Aldesa Valley is a unique ecosystem in Tabuk Province as the availability of water and the complex vegetation likely supports diverse bird species. Our objective was to inventory the avian species richness in the Aldesa Valley.

Methods

Study site. The Aldesa Valley is a narrow, 10 km long valley between 2 minor mountain ranges about 225 km southwest of Tabuk City, Saudi Arabia (Fig. 1). Aldesa Valley contains a permanent spring, known as the Blue or Eye Fountain. Temperatures during winter (December–February) typically range from 2 to 15 °C, but are occasionally below 0 °C. Temperatures during summer range from 19 to 42 °C in May and 24 to 48 °C in July. Annual rainfall is about 35 mm (Gosling et al. 2011).

Data collection. We conducted fieldwork from 10 May to 10 August in 2014 and 2015, having received permission from the Province of Tabuk and the University of Tabuk. We divided the valley, which is oriented east to west, into 40, 250 m long segments (Fig. 1). Each seg-

ment was surveyed perpendicular to the valley (i.e. north to south), twice in 2014 and 3 times in 2015. We used timed area searches (timed counts) to quantify bird species occurrence, conducting searches from 06:30–10:00 h and arriving at the first segment 15 min before sunrise (Hill et al. 2005, Shirley et al. 2013). We conducted surveys when winds were < 12 km/hr and there was no rain (Ralph et al. 1995). We used a handheld anemometer (EA-3010U Handheld Travel Anemometer) to record wind speed and temperature during surveys. We searched segments for 0.5–2.0 h, with time spend depending on segment size and the complexity of vegetation, and using a predetermined schedule. We surveyed 4 or 5 segments each day. We used 2 field guides to aid in the identification of birds (Porter and Aspinall 2010, Pope and Zogaris 2012). For each observation, we recorded the time and the number of individuals by species. We made additional opportunistic observations outside of our timed searches.

We used the IUCN Red List of Threatened Species (IUCN 2016) to determine the global conservation status for each species to provide an indication of the importance of the Aldesa Valley to vertebrate biodiversity within Saudi Arabia. We present the total number of times each species has been detected, as well as the number of segments in which each species was detected in each survey.

Results

We observed 2906 bird occurrences in 2014 and 3954 in 2015 belonging to 19 species, 15 families, and 5 orders (Fig. 2; Table 1). The most commonly detected bird species in Aldesa Valley were *Passer domesticus* (Linnaeus, 1758) representing 29.2% of all birds detected; *Onychognathus tristramii* (Sclater, 1858), 16.3% of detections; *Spilopelia senegalensis* (Linnaeus, 1766), 15.7% of detections; *Pycnonotus xanthopygos* (Hemprich & Ehrenberg, 1833); Figure 6), 8.6% of detections; *Carpodacus synoicus* Temminck, 1825), 6.6% of detections; and *Cinnyris osea* (Bonaparte, 1856), 6.5% of detections.

Family Passeridae

Passer domesticus (Linnaeus, 1758), House Sparrow Figure 3

Porter and Aspinall (2010): 324; Pope and Zogaris (2012): 366; ITIS (2016).

Material examined. Table 1; field observations and photographs.

Identification. This is a small common species ubiquitous to Aldesa Valley. The male has a gray crown, brown sides, a black bib, and white cheeks. The female is

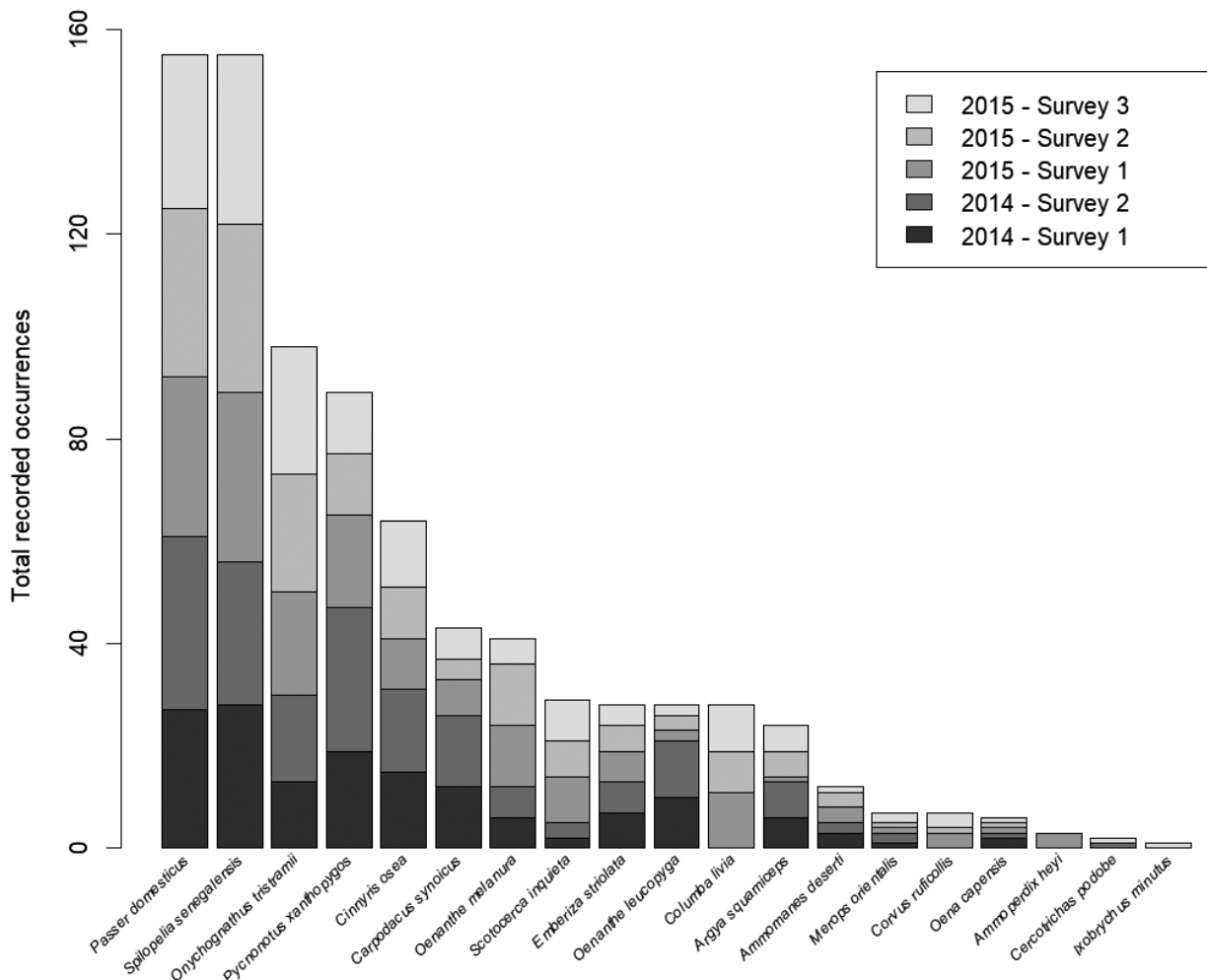


Figure 2. Total number of occurrences, and detail per survey, for bird species that were detected in the Aldesa Valley from 10 May to 10 August in 2014 and 2015.

Table 1. Avian species observed in Aldesa Valley, Saudi Arabia from 10 May to 10 August in 2014 and 2015.

Taxon	IUCN status ¹	No. of detections		Total
		2014	2015	
Aves				
Passeriformes				
Passeridae				
<i>Passer domesticus</i> (Linnaeus, 1758)	LC	843	1163	2006
Pycnonotidae				
<i>Pycnonotus xanthopygos</i> (Hemprich & Ehrenberg, 1833)	LC	223	365	588
Sturnidae				
<i>Onychognathus tristramii</i> (Sclater, 1858)	LC	439	682	1121
Nectariniidae				
<i>Cinnyris osea</i> (Bonaparte, 1856)	LC	116	330	446
Muscicapidae				
<i>Oenanthe melanura</i> (Temminck, 1824)	LC	89	76	165
<i>Oenanthe leucopyga</i> (Brehm, 1855)	LC	18	56	74
<i>Cercotrichas podobe</i> (Müller, 1776)	LC	0	4	4
Scotocercidae				
<i>Scotocerca inquieta</i> (Cretzschmar, 1827)	LC	239	154	393
Corvidae				
<i>Corvus ruficollis</i> Lesson, 1830	LC	22	19	41
Fringillidae				
<i>Carpodacus synoicus</i> (Temminck, 1825)	LC	322	131	453
Leiotrichidae				
<i>Argya squamiceps</i> (Cretzschmar, 1827)	LC	57	60	117
Alaudidae				
<i>Ammomanes deserti</i> (Lichtenstein, 1823)	LC	0	90	90
Emberizidae				
<i>Emberiza striolata</i> (Lichtenstein, 1823)	LC	66	36	102
Columbiformes				
Columbidae				
<i>Spilopelia senegalensis</i> (Linnaeus, 1766)	LC	419	657	1076
<i>Oena capensis</i> (Linnaeus, 1766)	LC	8	5	13
<i>Columba livia</i> Gmelin, 1789	LC	15	78	93
Pelecaniformes				
Ardeidae				
<i>Ixobrychus minutus</i> (Linnaeus, 1766)	LC	1	2	3
Coraciiformes				
Meropidae				
<i>Merops orientalis</i> Latham, 1801	LC	20	13	33
Galliformes				
Phasianidae				
<i>Ammoperdix heyi</i> (Temminck, 1825)	LC	9	33	42

¹ LC = Least Concern

brown-gray on the upper-parts and buff-brown on the rest of the body. The female lacks the black bib seen in males.

Family Sturnidae

Onychognathus tristramii (Sclater, 1858), Tristram's

Starling

Figure 4

Porter and Aspinall (2010): 290; ITIS (2016).

Material examined. Table 1; field observations and photographs.

Identification. The male has glossy, specular black plumage, and the female has a gray-brown sooty head. A conspicuous orange color on the wing can be seen during flight and when perched.

Family Columbidae

Spilopelia senegalensis (Linnaeus, 1766), Laughing

Dove

Figure 5

Porter and Aspinall (2010): 180; Pope and Zogaris (2012): 233; ITIS (2016).

Material examined. Table 1; field observations and photographs.

Identification. This species is common throughout Aldesa Valley. The head, breast, and neck are pink-mauve with black spots on the breast and white-gray plumage on belly and lower body. The upper body is deep red-brown with a black bill. Females look similar to males.



Figures 3–17. Birds detected during a terrestrial vertebrate inventory in Aldesa Valley, Saudi Arabia, May–August 2014–2015. **3.** *Passer domesticus*, House Sparrows. **4.** *Onychognathus tristramii*, Tristram’s Starling. **5.** *Spilopelia senegalensis*, Laughing Doves. **6.** *Pycnonotus xanthopygos*, White-spectacled Bulbul. **7.** *Carpodacus synoicus*, Sinai Rosefinch. **8.** *Cinnyris osea*, Palenstine Sunbird. **9.** *Ammomanes deserti*, Desert Lark. **10.** *Ammoperdix heyi*, Sand Partridge. **11.** *Scotocerca inquieta*, Streaked Scrub-Warbler. **12.** *Oena capensis*, Namaqua Dove. **13.** *Columba livia*, Rock Dove. **14.** *Corvus ruficollis*, Brown-necked Raven. **15.** *Ixobrychus minutus*, Little Bittern. **16.** *Emberiza striolata*, House Bunting. **17.** *Merops orientalis*, Green Bee-eater. Photographs by Abdulaziz Alatawi.



Figures 18–21. Birds detected during a terrestrial vertebrate inventory in Aldesa Valley, Saudi Arabia, May–August 2014–2015. **18.** *Argya squamiceps*, Arabian Babbler. **19.** *Oenanthe leucopyga*, White-crowned Wheatear. **20.** *Oenanthe melanura*, Blackstart. **21.** *Cercotrichas podobe*, Black Scrub-robin. Photographs by Abdulaziz Alatawi.

Family Pycnonotidae

***Pycnonotus xanthopygos* (Hemprich & Ehrenberg, 1833)**, White-spectacled Bulbul

Figure 6

Porter and Aspinall (2010): 232; ITIS (2016).

Material examined. Table 1; field observations and photographs.

Identification. *Pycnonotus xanthopygos* is easy to identify with distinctive yellow plumage on the under-part of the body. The belly and breast are dull gray with a sooty black head. It has a black bill and is dark gray-brown on upper parts.

Family Fringillidae

***Carpodacus synoicus* Temminck, 1825**, Sinai Rose-finch

Figure 7

Porter and Aspinall (2010): 354; ITIS (2016).

Material examined. Table 1, field observations and photographs.

Identification. The male of this species is very distinguishable and easy to identify. The body of the male

is pink-rose in color with a sandy-brown tail. It has a conical-billed and the wings are pale-brown. The female is sandy-brown with sandy-pale buff underparts, faintly streaked on crown and mantle.

Family Nectariniidae

***Cinnnyris osea* (Bonaparte, 1856)**, Palestine Sunbird

Figure 8

Porter and Aspinall (2010): 322; ITIS (2016).

Material examined. Table 1; field observations and photographs.

Identification. This species has a long curved bill. Male has glossy blue-plumage on breast and dark black plumage on the rest of the body. Female has pale-gray on under-parts and brown-gray on the upper-parts. The bill of females is slightly longer than in males.

Additional species

Other species of birds observed were *Ammomanes deserti* (Lichtenstein, 1823 (Alaudidae, Desert Lark; Fig. 9), *Ammoperdix heyi* (Temminck, 1825) (Phasianidae; Sand Partridge; Fig. 10), *Scotocerca inquieta* (Cretzschmar, 1827) (Scotocercidae, Streaked scrub-Warbler; Fig. 11),

Oena capensis (Linnaeus, 1766) (Columbidae, Namaqua Dove; Fig. 12), *Columba livia* Gmelin, 1789 (Columbidae, Rock Dove; Fig. 13), *Corvus ruficollis* Lesson, 1830 (Corvidae, Brown-necked Raven; Fig. 14), *Ixobrychus minutus* (Linnaeus, 1766) (Ardeidae, Little Bittern; Fig. 15), *Emberiza striolata* Lichtenstein, 1823 (Emberizidae, house bunting; Fig. 16), *Merops orientalis* Latham, 1801 (Meropidae, Green Bee-eater; Fig. 17), *Argya squamiceps* (Cretzschmar, 1827) (Leiotrichidae: Arabian Babbler; Fig. 18), *Oenanthe leucopyga* (Brehm, 1855) (Muscicapidae; White-crowned Wheatear; Figure 19), *Oenanthe melanura* (Temminck, 1824) (Muscicapidae, Blackstart; Fig. 20), *Cercotrichas podobe* (Müller, 1776) (Muscicapidae, Black Scrub-robin; Fig. 21).

The IUCN threat category for all species of birds observed is Least Concern (IUCN 2016).

Discussion

We detected 19 species of birds belonging to 15 families in the Aldesa Valley. Limited knowledge about species abundance and composition makes comparisons of species detected in Aldesa Valley difficult. Habitat heterogeneity typically provides diverse food resources; thus, higher species richness is expected in areas with such characteristics (Tews et al. 2004). The lower annual rainfall in deserts results in extreme drought most of the year and lower biodiversity (e.g. Arabian Peninsula; AbuZinada et al. 2004). Water, vegetation, and topography are key factors for species persistence in the extreme environmental conditions experienced in hot deserts (Tews et al. 2004, Korine et al. 2015). Perennial streams are rare in extreme desert environments, including Saudi Arabia (AbuZinada et al. 2004), which makes the Aldesa Valley unique. We suggest the habitat diversity in Aldesa Valley created by topography, vegetation, and especially permanent water is largely responsible for high avian species richness observed. Overall, there is a positive and fundamental relationship between habitat heterogeneity and species richness (Tews et al. 2004, Qian 2007).

We observed what we consider high avian species richness in Aldesa Valley, documenting 15 different families that accentuate the importance of this valley in the region. Such unique areas will likely benefit long term from increased official attention to help ensure species persistence and ecosystem function.

The Ministry of Tourism classified Aldesa Valley as a place for tourism in the Tabuk region (Saudi Commission for Tourism and Antiquities 2015). However, such a designation carries with it potential adverse consequences for the environment and biodiversity. Through this fieldwork and observations, we observed that tourism is causing negative effects on this ecosystem, as elsewhere in the world (Christ et al. 2003).

We observed numerous human activities in Aldesa valley that may adversely affect wildlife, including deposition of trash from tourists, occurrence of farms, and burning of trees. These human activities can influence

ecological processes and landscape conditions which can adversely affect species richness and endemism (Vitousek et al. 1997, Hunter and Gibbs 2007). There is potential for adversely affecting biodiversity if these disturbances continue.

Because of the uniqueness of the Aldesa Valley, we suggest that avian biodiversity conservation of this area should be a priority. We encourage authorities to consider monitoring human activities in this unique valley (Al-Moutiri 2004) to ensure long-term persistence of avian assemblages. We encourage additional inventories, including more detailed studies (e.g. night counts focusing on nocturnal species) on avian and other vertebrate groups, and ecological studies to further our understanding of the vertebrate community structure, dynamics, and species interactions in the Aldesa Valley.

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Authors' contributions

ASA, FB, and JLB designed the survey. ASA conducted the survey, collected the data, and identified the specimens. ASA, FB, and JLB wrote the text.

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