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## UPDATE ON THE BREEDING DISTRIBUTION OF BELDING'S YELLOWTHROAT (*GEOTHYLPIS BELDINGI*)

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**ABSTRACT:** We update the list of locations occupied by Belding's Yellowthroat (*Geothlypis beldingi*), a species endemic to Baja California Sur, on the basis of surveys in June/July 2024, during which we visited most of the oases in the state. A total of 69 sites were surveyed: 25 in the north (San Ignacio to San Javier; *G. b. goldmani*), 30 in the south (La Paz to Cabo San Lucas; *G. b. beldingi*), and 14 in the central region. Of these, 13 oases lacked both suitable habitat and yellowthroats, while 14 had suitable habitat but no detection of the species. We documented both habitat and yellowthroats at 42 sites, grouped into 31 distinct locations. Among these, 17 had previous records, six had older records but no recent sightings, and eight had no previous records. Of the previously occupied locations where we found no yellowthroats in 2024, one was in the northern region, two were in the central region (the only central localities reported in the literature), and three were in the southern region. Of the newly identified locations, three were in the north, five were in the south, and none were in the central region. It is possible that other small oases, unmapped and difficult of access, were not included in this study. The lack of records in the central region suggests that the northern (*G. b. goldmani*) and southern (*G. b. beldingi*) populations remain isolated or were so in 2024.

**RESUMEN:** Para actualizar la lista de localidades con presencia de Mascarita peninsular (*Geothlypis beldingi*) en una misma temporada reproductiva, en junio/julio de 2024 realizamos un viaje a lo largo de Baja California Sur, visitando la may-

oría de los oasis. Visitamos 69 sitios, en el norte (*G. b. goldmani*) recorrimos 25; en la zona sur (*G. b. beldingi*), 30 y en la zona central 14. En 13 no encontramos hábitat ni aves, en 14 hubo hábitat, pero no detectamos la presencia de la especie. En total, documentamos tanto hábitat como Mascarita peninsular en 42 sitios. Estos sitios se integraron en 31 localidades, para 17 de las cuales existen registros previos. En contraste, en seis localidades existen registros, pero no se observaron ejemplares; además, se encontraron la mascarita en ocho localidades para las que no existen registros. De las localidades donde la especie fue erradicada, una está en la región norte, dos en la central (las únicas indicadas en la bibliografía) y tres en el sur. Referente a las localidades nuevas, tres se localizaron en la región norte, cinco en la sur y ninguna en la parte central. Innegablemente podrían existir otros oasis pequeños y de difícil acceso no considerados en el trabajo presente. La falta de registros en la región central implicó que las poblaciones norteñas (*G. b. goldmani*) y sureñas (*G. b. beldingi*) estuvieron aisladas, al menos en la temporada 2024.

Baja California Sur is Mexico's driest state, with an average annual rainfall that does not exceed 200 mm over most of its territory (Coria 1997). Consequently, the region is predominantly desert. Despite this, the state has freshwater oases, where denser vegetation supports greater species richness and abundance across various biological groups (Arriaga 1997). Because of the scarcity of water, wetlands are not only limited but also widely dispersed and distant from one another, hindering genetic exchange between populations of organisms dependent on them (Arriaga 1997). The surrounding desert serves as a natural barrier, promoting differentiation and speciation (Arriaga 1997). As a result, endemic species have evolved in these isolated habitats, such as the Baja California Killifish (*Fundulus lima*; Ruiz-Campos 2012) and Belding's Yellowthroat (*Geothlypis beldingi*; Rodríguez-Estrella et al. 1999), a member of the family Parulidae.

Belding's Yellowthroat is endemic to Baja California Sur (Howell and Webb 1995), with its northernmost breeding site at the San Ignacio oasis (27° 17' N) and its southernmost site at Estero Cascada near Cabo San Lucas (22° 53' N). The International Union for the Conservation of Nature (IUCN) currently classifies Belding's Yellowthroat as a vulnerable species (BirdLife International 2021), while the Mexican government, through NOM-059, lists it as endangered (SEMARNAT 2010).

At these oases, the yellowthroat nests exclusively in emergent vegetation, characterized primarily by three species: Common Reed (*Phragmites australis*), Cattail (*Typha domingensis*), and the exotic Giant Reed (*Arundo donax*; Marrón and Carmona 2024). Thus suitable habitat for Belding's Yellowthroat must meet two requirements: the presence of fresh water and emergent vegetation (Marrón and Carmona 2024).

Since the early 20th century, two subspecies have been recognized (Oberholser 1917): the paler, duller *G. b. goldmani*, which inhabits the northern region from San Ignacio to San Javier (27° 17' to 25° 52' N), and the brighter and more extensively yellow *G. b. beldingi*, found in the south from La Paz to Cabo San Lucas (24° 06' to 22° 52' N; Erickson et al. 2008). However, in the central region of the state, between San Javier and La Paz, the subspecific affinity of Belding's Yellowthroat remains undetermined.

The IUCN recently estimated the population of Belding's Yellowthroat at between 650 and 1670 mature individuals (BirdLife International 2021).

Such a small population size reflects the natural scarcity of suitable habitat. Furthermore, most of these oases face both natural pressures (e.g., cyclones, drought) and human pressures (e.g., fires, reed cutting, overgrazing, excessive water use, pollution, habitat reduction, and unregulated tourism, among others; Rodríguez-Estrella et al. 1999, Córdova-Rojas et al. 2024), all of which threaten the viability of these sites and, therefore, the survival of Belding's Yellowthroat.

Despite its status as an endemic species, studies of Belding's Yellowthroat remain limited. For instance, regarding its distribution, aside from the documentation of a few breeding sites (e.g., Brewster 1902, Grinnell 1928, Wilbur 1987, Rodríguez-Estrella et al. 1999, Córdova-Rojas et al. 2024), there is only one comprehensive study listing all the locations where this species has been found: Erickson et al. (2008). Drawing on a mix of literature, field work, and personal observations, those authors identified 34 sites with records of the species: 14 in the northern part of its range, 3 in the central region, and 17 in the south, along with three records of wandering individuals. In the 16 years that have passed since this compilation, given the natural and anthropogenic pressures, changes may have occurred.

Therefore, the goal of our study was to provide a detailed description, through field work, of sites where Belding's Yellowthroat is currently present and to compare this information with data from at least 16 years ago. This comparison aims to establish a baseline for future research, conservation, and management.

## METHODS

### Study Area

González-Abraham et al. (2010) categorized Baja California Sur as comprising two regions and eight ecoregions. In the north, the desert region encompasses five ecoregions, with annual rainfall nearing 180 mm (INEGI 2021). In contrast, the southern region, known as the Cabo tropical region, receives an average annual precipitation of approximately 350 mm. This makes the Cabo deciduous forest and the Sierra de La Laguna forest the only non-desert ecoregions in the state (González-Abraham et al. 2010). As a result of the more frequent and abundant rainfall in the south, the oases there are closer together and more extensive.

### Field Work

We surveyed a total of 69 sites (Table 1). In the northern region, in the range of *G. b. goldmani*, we visited 25 sites; in the southern region (*G. b. beldingi*), we examined 30 sites; and in the central region of uncertain subspecific affinity, we assessed an additional 14 sites. Most of these sites (24 out of 34) were already identified in the previous work by Erickson et al. (2008). Our field work from 9 June to 2 July 2024 comprised two survey teams: one focused on sites from La Paz southward, the other on sites between the San Ignacio oasis and San Javier in the north. Both teams also explored the central sites. Each team consisted of five observers.

Although many of these water bodies are physiographically distinct, they

often form part of a continuous riparian corridor, allowing birds to move between them. In this study, the term “site” refers to individual water bodies, while “locality” designates either interconnected sites linked by riparian corridors and isolated from other localities by desert zones, or isolated sites not connected to other localities, regardless of their size. For instance, the area that includes the towns of La Purísima, San Isidro, and Carambucho, although composed of five distinct water bodies (sites), is interconnected and contains patches of habitat suitable for the Belding's Yellowthroat; therefore, we group the five as a single locality (La Purísima). In contrast, a site like El Estribo, located 7 km southwest of San Ignacio, was classified as a separate locality because of its isolation from other sites, despite its small size (<0.5 ha of reed; for details, see Table 1).

The oases were surveyed on foot and by kayak, depending on the terrain. At each site, we typically formed two teams, each conducting as many five-minute point counts as the site's size allowed. We then compared the presence or absence of Belding's Yellowthroat with previous records, most of which were compiled by Erickson et al. (2008).

## RESULTS

At 13 locations, we found neither suitable habitat nor Belding's Yellowthroats, while 14 sites had suitable habitat but no detections of the species. Overall, we documented both habitat and Belding's Yellowthroats at 42 sites (Figure 1).

At 20 sites, the observed abundance of the Belding's Yellowthroat ranged from 1 to 10 individuals (seven in the north and 13 in the south). At 15 sites, we recorded between 11 and 50 birds (eight in the north and seven in the south), while only seven sites had observations of 51 to 100 individuals (five in the north and two in the south; Table 1).

On the basis of the the previously outlined criteria, we grouped these 42 sites into 31 localities (Table 1). Seventeen of these localities have prior records of the species. We found no Belding's Yellowthroats at six historical localities from which we infer the species is extirpated, but we did find them at eight localities with no prior records in the literature (Table 1).

Regarding the new localities, we found three (37%) in the northern region, five (63%) in the south, and none in the central region. Of the localities where the species is extirpated, only one is in the north (17%), two (33%) are in the central region (the only ones documented in the literature), and three (50%) are in the south (Figure 1).

## DISCUSSION

The dates of this survey fell within the period of Belding's Yellowthroat's breeding (Marrón and Carmona 2024). Additionally, we observed juveniles at various sites (Table 1), confirming breeding for these sites in 2024. This study represents the first comprehensive census based entirely on field work during a single year; the previous compilation (Erickson et al. 2008) combined field data from various years with information from literature, some of which dates to the early 20th century.

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**TABLE 1** Status of Belding's Yellowthroat at Sites Surveyed in 2024

Region, locality, and site	Historical	2024 abundance range	Latitude	Longitude
North				
1 San Ignacio <sup>a</sup>	Yes <sup>b</sup>			
San Ignacio		51-100	27.2977	-112.8974
San Pablo		11-50	27.2863	-112.9045
Santa Rosa		11-50	27.2832	-112.9081
Poza larga		1-10	27.2720	-112.9161
2 El Estribo	No	1-10	27.2584	-112.9339
Corralitos 1		0	27.2452	-112.9583
Corralitos 2		0	27.2272	-112.9666
3 Las Casitas-San Sabas <sup>a</sup>	No			
San Sabas		1-10	27.2174	-112.9882
Las Casitas		1-10	27.2139	-112.9965
4 San Joaquín	Yes <sup>b</sup>	0	27.1806	-112.8622
5 Santa Águeda <sup>a</sup>	Yes <sup>b</sup>	11-50	27.2599	-112.3557
6 Ejido San Lucas	No	1-10	27.2180	-112.2213
San Joaquín		0	27.1806	-112.8622
San Zacarías		0	27.1377	-112.9046
7 San José de Magdalena <sup>a</sup>	Yes <sup>b</sup>	50-100	27.0628	-112.2346
8 Mulegé <sup>a</sup>	Yes <sup>b</sup>			
Mulegé río		50-100	26.8887	-111.9827
Mulegé presa		11-50	26.8868	-111.9868
9 La Purísima <sup>a</sup>	Yes <sup>b</sup>			
Presa Carambuche (arriba)		1-10	26.2392	-112.0024
Presa Carambuche (abajo)		11-50	26.2328	-112.0057
Poza Carambuche		11-50	26.2158	-112.0245
San Isidro		50-100	26.2013	-112.0531
Poza El Cantil		11-50	26.1967	-112.0621
Presa La Purísima		50-100	26.1910	-112.0752
10 Comondú <sup>a</sup>	Yes <sup>b</sup>	11-50	26.0370	-111.8327
Nopoló		0	25.9439	-111.3541
11 San Javier <sup>a</sup>	Yes <sup>b</sup>	1-10	25.8670	-111.5457
Center				
12 La Presa		0	24.8708	-111.0540
San Pedro de La Presa	Yes <sup>b</sup>	0	24.8487	-110.9905
El Cajón		0	24.8457	-111.0129
13 El Bosque	Yes <sup>b</sup>	0	24.8388	-110.7708
La Purificación		0	24.8325	-110.8068
El Chicural		0	24.8292	-111.0638
Tres Pozas		0	24.8224	-111.1243
La Soledad		0	24.8127	-110.8143
Corral de Piedra		0	24.7346	-110.9345
El Pilar		0	24.4733	-111.0051
Las Pilas		0	24.4732	-111.0267
Las Pocitas		0	24.4030	-111.1042
La Esperanza		0	24.3798	-111.1151
San Hilario		0	24.3736	-110.9787

(continued)

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Region, locality, and site	Historical	2024 abundance range	Latitude	Longitude
<b>South</b>				
14	Yes <sup>b</sup>	1–10	24.1097	–110.3457
15	Yes <sup>b</sup>			
		0	23.7492	–110.0952
		0	23.7425	–110.1110
16	Yes <sup>b</sup>	11–50	23.7378	–109.8392
17	No	1–10	23.6391	–109.7723
		0	23.6189	–109.6106
		0	23.5963	–109.5664
18	No	1–10	23.5984	–110.0390
19	Yes <sup>b</sup>	50–100	23.4852	–109.7180
20	Yes <sup>b</sup>			
		11–50	23.4615	–110.2235
		1–10	23.4522	–110.2273
		11–50	23.4413	–110.2388
		1–10	23.42932	–110.2247
21	Yes <sup>b</sup>	0	23.4395	–109.8085
22	Yes <sup>b</sup>	11–50	23.3907	–110.2112
23	No	1–10	23.3910	–109.8252
24	Yes <sup>b</sup>			
		1–10	23.3666	–109.7745
		1–10	23.3652	–109.7533
25	Yes <sup>b</sup>			
		1–10	23.3688	–110.1630
		1–10	23.3678	–110.2018
		1–10	23.3644	–110.1708
		0	23.3425	–109.5607
26	Yes <sup>b</sup>	0	23.3347	–109.7771
		0	23.2535	–109.8264
27	Yes <sup>b</sup>	1–10	23.2109	–110.1414
28	No	11–50	23.1306	–109.8126
29	No	1–10	23.0731	–110.0293
30	Yes <sup>b</sup>			
		11–50	23.0618	–109.6916
		11–50	23.0554	–109.6807
		50–100	23.0544	–109.6882
31	Yes <sup>b</sup>	1–10	22.8927	–109.8995

<sup>a</sup>Locations where breeding was confirmed through the presence of juveniles.

<sup>b</sup>Localities included in the compilation by Erickson et al. (2008).

<sup>c</sup>Site referred to as El Triunfo by Erickson et al. (2008).

<sup>d</sup>Site visited in November 2020.

<sup>e</sup>Site referred to as Cabo San Lucas by Erickson et al. (2008).

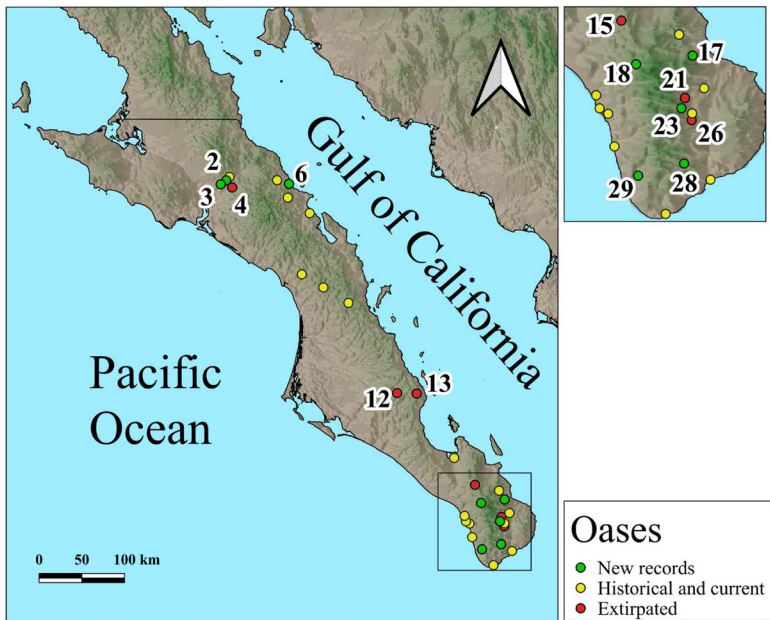


FIGURE 1. Localities surveyed for Belding's Yellowthroat in 2024. Yellow circles, sites with both previous and current records; green circles, sites without prior records but with sightings in 2024; red circles, sites with previous records but lacking yellowthroats in 2024. Sites of discoveries in 2024 and extirpations are identified by the corresponding numbers listed in Table 1.

Although Córdova-Rojas et al. (2024) published recently on the species' distribution (among other aspects), that study relied entirely on records from various online databases and included only nine localities, all of which we visited in 2024 and had been previously noted by Erickson et al. (2008). Thus the last compilation took place 16 years ago, since which time several anthropogenic and natural events, including fires, cyclones, and unregulated tourism (Córdova-Rojas et al. 2024), have altered the species' distribution. The southern oases face greater pressures due to unregulated tourism, as Los Cabos holds most of the state's yellowthroats, has the highest rate of human population growth (4% per year; INEGI 2023), and the most developed mass-tourism industry. Consequently, the southern subspecies faces more significant conservation challenges than the northern one.

We did not visit ten sites identified by Erickson et al. (2008). Five of these we excluded from consideration because of the lack of suitable habitat, as the records from these sites likely represent vagrant individuals rather than resident or breeding populations. For the remaining sites (El Mezquital and Cadejé in the north, and Las Cuevas and Santa Anita in the south), their numerical significance appears to be minimal, as Erickson et al. (2008) reported only one male in 2000, a pair in 2001, no more than three individuals between 2004 and 2007, and one male in 2006, respectively. In the case of El Sauzal, in

addition to the February 2004 record (Erickson et al. 2008), there is a more recent observation in June 2016 (Carmona pers. obs.).

In addition to the sites reported by Erickson et al. (2008), observations of the Belding's Yellowthroat have been documented at other locations (e.g., Loreto, El Centenario, La Ribera, etc.; <https://eBird.org>). Some of these sites were surveyed without success by us, while others we excluded because of the absence of suitable habitat. Like the five sites reported by Erickson et al. (2008), the numerical significance of these additional locations is minimal, as few individuals have been recorded, recent sightings are uncommon, and many lack the conditions necessary to support the establishment of breeding populations.

A recurring issue in studies of this nature, which involve sampling across different years and incorporate historical data, is the lack of uniformity in place names. For example, some of the discrepancies identified between Erickson et al. (2008) and our work include Playa Cerritos, Punta San Pedro, and Cabo San Lucas, which we refer to as Pescadero, San Pedro del Palmar, and Estero Cascada, respectively. Another problematic site is El Triunfo, which Erickson et al. (2008) hypothesized may have been misnamed and actually referred to as El Oro. In our study, we included El Oro as part of El Rosario (Table 1). The names we selected, evaluated individually, we believe to be more accurate.

Regarding localities where the birds have been extirpated, at San Joaquín, nesting was recorded in 1928 (Bancroft 1930), and a male was observed in 2020 (Carmona pers. obs.). Rodríguez-Estrella et al. (1999) reported a sighting at San Pedro de la Presa in 1995, and two birds were observed at Segundo Bosque in 2006 (Erickson et al. 2008). At El Triunfo (i.e., El Rosario), three pairs were recorded in 1902 (Erickson et al. 2008), with the most recent observation in August 2010 (<https://eBird.org/checklist/S66321242>). Agua Caliente had a pair observed in 1902 and a male sighted in 2006. Lastly, at least three birds were at Caduaño during the period from 2003 to 2007 (Erickson et al. 2008). Although Belding's Yellowthroats had been recorded there regularly up until March 2024, the number of individuals has never exceeded three (<https://eBird.org>).

The absence of the species in the central region is particularly striking, as we did not detect any Belding's Yellowthroats at the two sites where their presence had been recorded previously: Segundo Bosque and San Pedro de La Presa (Erickson et al. 2008). In the case of Segundo Bosque, we found no suitable habitat, while at San Pedro de La Presa, the habitat was very limited, measuring only 0.02 hectares. Additionally, we surveyed 12 more sites in this region. Out of the 14 sites assessed, seven had suitable habitat but no records of the species, while the remaining seven lacked habitat entirely. A common theme was the absence or scarcity of cattail and reeds; residents noted that this vegetation had been swept away by flooding caused by the cyclones in 2023. Thus it is reasonable to hypothesize that habitat availability in this region may fluctuate significantly over time, and habitat may reappear, potentially affecting the connectivity between the southern and northern populations of Belding's Yellowthroat.

Regarding the eight sites where we recorded Belding's Yellowthroat for the first time, it is important to emphasize that these are not necessarily newly

colonized areas. The lack of prior records is likely more related to the difficult access to these locations. This is particularly evident for El Estribo (Figure 2) and Las Casitas–San Sabas (Figure 3) in the north, and for Pozas Azules and El Coro in the south. Figure 4 shows La Candelaria, another newly revealed site in the south.

We recorded a total of 50 individuals at the eight new sites, with Boca de la Sierra having the lowest abundance at just one bird, while the San Lázaro dam had the highest count with 17 individuals. Both these sites are in the south. Although 50 Belding's Yellowthroats represent a considerable number—approximately 3% to 7.6% of the population estimated by BirdLife International (2021)—another important aspect of these sites is their role as part of corridors connecting different population groups. A notable example of this is Pozas Azules, a small site (less than 0.1 ha of habitat) located in the channel of a stream in the Sierra de La Laguna, situated between well-established populations at Santiago, La Poza in Todos Santos, and San Pedro del Palmar.

It is important to note that there may be other small, hard-to-access wetlands not included in this study. While these sites might serve as connectors between populations, they are unlikely to be numerically significant.

To the historically most significant localities (San Ignacio, Mulegé, and La Purísima in the north, and Santiago, Todos Santos, and Estero de San José in the south; Rodríguez-Estrella et al. 1999, BirdLife International 2021, Córdova-Rojas et al. 2024), we also include Santa Águeda and San José de Magdalena in the north, as well as San Bartolo and San Lázaro in the south.

In summary, most known localities for the Belding's Yellowthroat have remained stable, with 17 locations discussed by Erickson et al. (2008) still supporting the species. However, six locations of limited numerical signifi-



FIGURE 2. El Estribo, 7 km southwest of San Ignacio, Baja California Sur, first verified as a site for Belding's Yellowthroat in 2024.

*Photo by Roberto Carmona*

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FIGURE 3. Las Casitas, 12 km southwest of San Ignacio, Baja California Sur, first verified as a site for Belding's Yellowthroat in 2024.

*Photo by Roberto Carmona*



FIGURE 4. La Candelaria, 25 km northwest of Cabo San Lucas, Baja California Sur, first verified as a site for Belding's Yellowthroat in 2024.

*Photo by Gerardo Marrón*

cance have seen the species extirpated, while eight previously undocumented localities were discovered. No birds were found in the central region, resulting in the northern (*G. b. goldmani*) and southern (*G. b. beldingi*) populations being isolated, at least during the 2024 season.

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