

Supplemental information for:

‘Unscrambling’ the drivers of egg production in Agassiz’s desert tortoise: climate and individual attributes predict reproductive output

Text S1. Study Site Details

The **Area 31, Redcliffs, and Sandstone Mountain** sites were located in the Red Cliffs Reserve in Washington County, Utah. These sites fell within the Upper Virgin River Recovery Unit. Elevation at these sites ranged from 840 to 1220 meters and vegetation was characterized as Mojave Desert scrub. Data were collected at the Area 31 site from 1998-2000 for 26 females, at the Redcliffs site for one year in 1998 for a total of 10 females, and at the Sandstone Mountain site for four females from 1999-2000. MCL of the study animals for these three sites varied between 180 and 264 mm (Esque unpublished data, Nussear et al. 2012). The monitored tortoises at the Sandstone Mountain site were translocated to the site as part of a study on the effects of translocation (for details see Nussear et al. 2012).

The **Barrow** site was located on National Park Service lands within the Pinto Basin area of Joshua Tree National Park. This site was characterized as Sonoran Desert scrub and had relatively uniform topography with elevations ranging from 654 to 718 meters. The Barrow site fell within the Colorado Desert Recovery Unit and data were collected at this site from 1997-1999 for seven female tortoises ranging between 229 and 265 mm MCL (Lovich et al. 1999).

The **Bird Spring Valley** site was located on Bureau of Land Management (BLM) lands within the Eastern Mojave Recovery Unit approximately 21 km southwest of Las Vegas, NV. This site covered an extensive bajada with elevations ranging from 900 to 1300 meters and was characterized as Mojave Desert scrub. Data were collected at this site from 1997-2002 for a total of 71 female tortoises (both resident and translocated) ranging between 195 and 289 mm MCL (Medica unpublished data, Nussear et al. 2012).

The **Cima** site was located in the Mojave National Preserve and is located at the southeastern edge of the Eastern Mojave Recovery Unit. This site was characterized as mixed Mojave Desert scrub and elevation was approximately 1068 meters. Data were collected at this site from 1997-2000 for a total of 28 female tortoises. MCL for the study animals at this site varied between 199 and 283 mm (Lovich et al. 1999, Medica unpublished data).

The **Cottonwood** site was located on National Park Service lands within the vicinity of Shavers Wash in Joshua Tree National Park. Vegetation at this site was characterized as Sonoran Desert scrub and topography consisted of sloping bajadas, arroyos, and the steep slopes of the Cottonwood Mountains. Tortoises were located at elevations ranging from 534 to 780 m. The Cottonwood site fell within the Colorado Desert Recovery Unit and data were collected at this site from 2015-2016 for seven female tortoises ranging between 212 and 250 mm MCL (Lovich et al. 2018).

The **Lake Mead** site was located on National Park Service Lands on a peninsula extending into the northern end of the Lake Mead National Recreation Area near the town of Overton, Nevada. Vegetation at this site was Mojave Desert scrub. This site fell within the Northeastern Mojave

Recovery Unit and elevation ranged from approximately 200 to 600 meters. Data were collected at the Lake Mead site from 1998-1999 for a total of 20 female tortoises (both resident and translocated) ranging from 198 and 267 mm MCL (Nussear et al. 2012).

The **Mesa** site was located at a wind energy generation facility in the southeastern foothills of the San Bernardino Mountains approximately 21 km from Palm Springs, California and fell within the Colorado Desert Recovery Unit. This site, sitting at the intersection of several ecosystems including Sonoran and Mojave Desert, montane, chaparral, and coastal sage scrub, was located on the western edge of Agassiz's desert tortoise range. Tortoises were located at elevations from 660 to 880 meters. Data were collected at the Mesa site from 1997-2000 for 18 female tortoises ranging between 216 and 271 mm MCL (Lovich et al. 1999, 2012, 2015).

The **Orocopia** site was located on BLM lands to the south of Interstate 10 and Joshua Tree National Park. This site was located in the Colorado Desert Recovery Unit. Vegetation at the site was generally characterized as Sonoran Desert scrub with topography dominated by sloping bajadas and arroyos. Tortoises were located at elevations ranging between 480 to 620 m. Data were collected at the Orocopia site from 2017-2018 for a total of four female tortoises ranging between 218 and 250 mm MCL (Lovich et al. 2019).

The **Pahcoon Flats** site was located on BLM lands to the west of St. George, Utah and was located in the Upper Virgin River Recovery Unit. This site was characterized as Great Basin conifer woodland and elevations ranged from 1350 to 2000 meters. Data were collected at this site from 1998-2000 for a total of six female translocated tortoises ranging between 213 and 271 mm MCL (Nussear et al. 2012).

The **Piute Valley** site was located on BLM land within the Colorado Desert Recovery Unit and was approximately 90 km from Las Vegas, Nevada. This site was characterized as Mojave Desert scrub and elevation was approximately 926 meters. Data were collected at the Piute Valley site from 1998-2002 for a total of 37 female tortoises ranging between 190 and 245 mm MCL (Medica unpublished data).

Additional Tables and Figures

Table S1. Additional studies and corresponding locations used to calculate mean female midline carapace length (MCL) used in creating predictive maps.

Site	Location (County, State)	Source
Hidden Valley	Clark, NV	Drake et al. (2015)
Mesquite Valley	San Bernardino, CA	Dutcher et al. (2020)
Stateline Pass	San Bernardino, CA	
ISEGS North	San Bernardino, CA	
ISEGS South	San Bernardino, CA	
Southpah	San Bernardino, CA	
Nipton	San Bernardino, CA	
Silver State	Clark, NV	
Sheep	Clark, NV	
McCullough Pass	Clark, NV	
Eldorado Valley	Clark, NV	
Piute Valley	Clark, NV	
Fort Irwin National Training Center	San Bernardino, CA	Esque et al. (2010)
Bird Spring Valley	Clark, NV	Sah et al. (2016)
Coyote Springs	Clark, NV	
Fort Irwin	San Bernardino, CA	
Halfway	Lincoln, NV	
Lake Mead	Clark, NV	
McCullough Pass	Clark, NV	
Piute Valley	Clark, NV	
St. George	Washington, UT	
Stateline Pass	Clark, NV	



Fig. S1. Upper panel: Example X-radiograph images of female Agassiz's desert tortoises (*Gopherus agassizii*) with three eggs (upper left panel) and five eggs (upper right panel). Note VHF radio-transmitter placement on the front right and front left of shell in the upper left and upper right panels, respectively. Lower panel: Phil Medica X-raying a desert tortoise at the Bird Spring Valley site in 1997

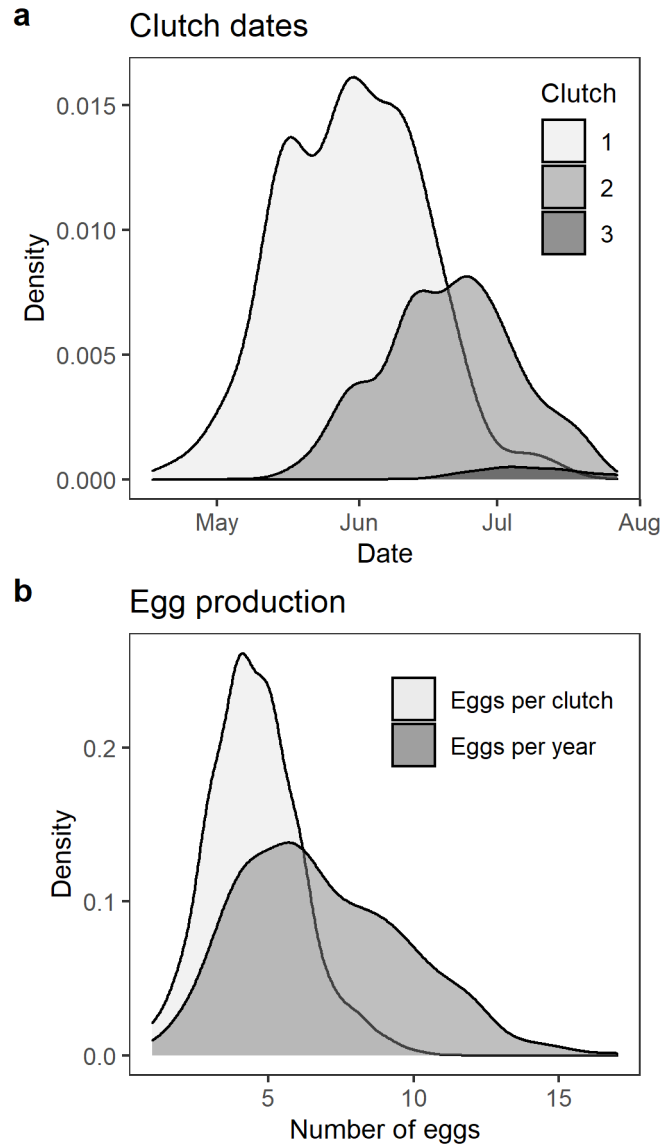


Fig. S2. Density plots illustrating the distribution of (a) egg-laying dates for the first, second, and third clutches laid in a given year and (b) clutch size and total annual egg production for radio-telemetered desert tortoises ($n = 536$ individual-year combinations) at 12 sites across their range. In panel (b) the light gray curve (“Eggs per clutch”) displays the distribution of individual clutch sizes while the darker gray curve (“Eggs per year”) illustrates the distribution of total annual egg production.

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