Hermes Copper Butterfly Surveys and Translocation Efforts

Task 8: 2021 Harbison's Dun Skipper Adult Surveys

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Executive Summary

This report summarizes our survey efforts of 2021. Additional efforts for this project/task are planned for 2022 and will include a marking study to calibrate transect counts with population size estimates, and quantify habitat preferences.

The Harbison's dun skipper (*Euphyes vestris harbisoni*) has a very restricted distribution in southern California and northern Mexico and entomologists have expressed concern that threats will lead to the extirpation of populations. The larvae of this skipper feed only on San Diego sedge (*Carex spissa*) and are generally associated with riparian oak woodlands.

In 2021, surveys for Harbison's dun skipper adults were conducted to assess year to year variation in population size and update the status of each local population/site. Surveys focused on the relatively small geographic area where skippers were observed in past years. In 2013-2017, 14 sites had confirmed observations of Harbison's dun skipper adults. All but one of these sites were surveyed in 2021, with Harbison's dun skipper adults observed at only six sites. Population sizes at those six sites were similar to the smallest population sizes recorded during the 2013-2017 surveys.

Overall, transect counts (visual observations) continue to describe small populations when skippers are present. However, the large size and uneven terrain of some riparian oak woodlands, patchy distribution of adult skippers, and shifting locations of San Diego sedge present challenges to accurately categorizing presence/absence and relative population sizes.

Introduction

The Harbison's dun skipper (*Euphyes vestris harbisoni*) is restricted to southern Orange County, extreme western Riverside County, and San Diego County (Brown and McGuire 1983, Marschalek and Deutschman 2019), with one record from Mexico (Marschalek and Deutschman 2019). Entomologists have expressed concern that the skipper is rare and may be negatively impacted by habitat loss and degradation (Brown 1991, Glassberg 2001). In 1989, the United States Fish and Wildlife Service (USFWS) issued a notice of review, on which Harbison's dun skipper was listed as a Category 2 species (USFWS 1989).

Prior to our initial efforts in 2013, nearly all of the known information about this skipper was restricted to descriptions in two published papers (Brown 1982, Brown and McGuire 1983). These papers identified this subspecies as morphologically different from the other subspecies, and described its biology (life history and nectaring sources) and distribution. The larvae of this skipper feed only on San Diego sedge (*Carex spissa*) and are generally associated with oak woodlands. The known distribution of the skipper at that time included southern Orange County and San Diego County, with the skipper present in nearly all areas containing considerable numbers of the sedge. Brown and McGuire (1983) also mentioned that the skipper appears to be facing several threats related to urbanization and development. They recorded a local extirpation at Adobe Falls in San Diego due to development, pollution, and subsequent invasion of the riparian area by non-native plants.

We updated and expanded on what was known about the skipper by conducting surveys as part of a project funded by a CDFW Local Assistance Grant (Marschalek and Deutschman 2015) and a previous SANDAG contract (Marschalek and Deutschman 2016, 2017a,b). Based on these surveys for larvae and adults in 2013-2017, the current Harbison's dun skipper distribution includes the foothills in the northern and southern parts of San Diego County, extreme western Riverside County, and southern Orange County (Marschalek et al. 2019). In San Diego County, there appears to be a substantial gap around the Poway area due to local extirpations likely resulting from wildfires. It is unclear whether the skipper currently occupies Silverado Canyon, its northernmost location, following the 1987 Silverado Fire. Extirpation from Silverado Canyon would represent a substantial range contraction. To the south, the Harbison's dun skipper has been documented in northern Baja California, Mexico. There are a number of threats to the Harbison's dun skipper, including recent extirpations further reducing its distribution, habitat alteration/loss, wildfires, drought, grazing, and habitat degradation associated with the spread of the goldspotted oak borer (*Agrilus auroguttatus*).

The objective of surveys in 2021 was to update the status of local populations in San Diego County. Although the last year (2020-2021 winter) has been relatively dry, there were a couple winters (2018-2019, 2019-2020) that experienced greater precipitation compared to the

extreme drought in 2015-2017 (Williams et al. 2020). The increased precipitation could have provided the opportunity for the skipper to increase population sizes and expand to new areas since our last surveys in 2017. Calibrating population size indices obtained from observational surveys by comparing with population size estimates from a marking study, and quantifying habitat preferences are planned tasks for 2022.

Methods

We conducted surveys for Harbison's dun skipper adults at sites where we had previously detected adults (Marschalek et al. 2019). Surveys consisted of systematic searches around San Diego sedge patches conducted during periods of appropriate weather (sunny or partly sunny, 24˚ to 35˚C, and modest wind speeds). If skippers were not detected in the immediate area of past observations, a wider area was searched. These surveys provide an index of population size and describe the adult flight season phenology, behavior, and nectar sources.

Results

We were able to detect Harbison's dun skipper adults at 6 of 12 sites with weekly surveys (Figure 1, Table 1). A single survey at San Pasqual Academy did not detect skippers, and the habitat appeared very dry and *Carex spissa* was not detected. Due to a road closure, our access to a Otay Mountain site was limited but Recon Environmental, Inc. provided observations from three areas on the north side of Otay Mountain. Overall, there were only 26 observations of adult dun skippers across all 2021 surveys (not including observations made by Recon Environmental, Inc.). Of the sites with skipper observations, the maximum daily counts were similar to the lowest maximum counts recorded in previous years. Lake Hodges had a maximum count of four adults, Barrett Lake had a maximum count of three, while two individuals were the maximum count at the other sites.

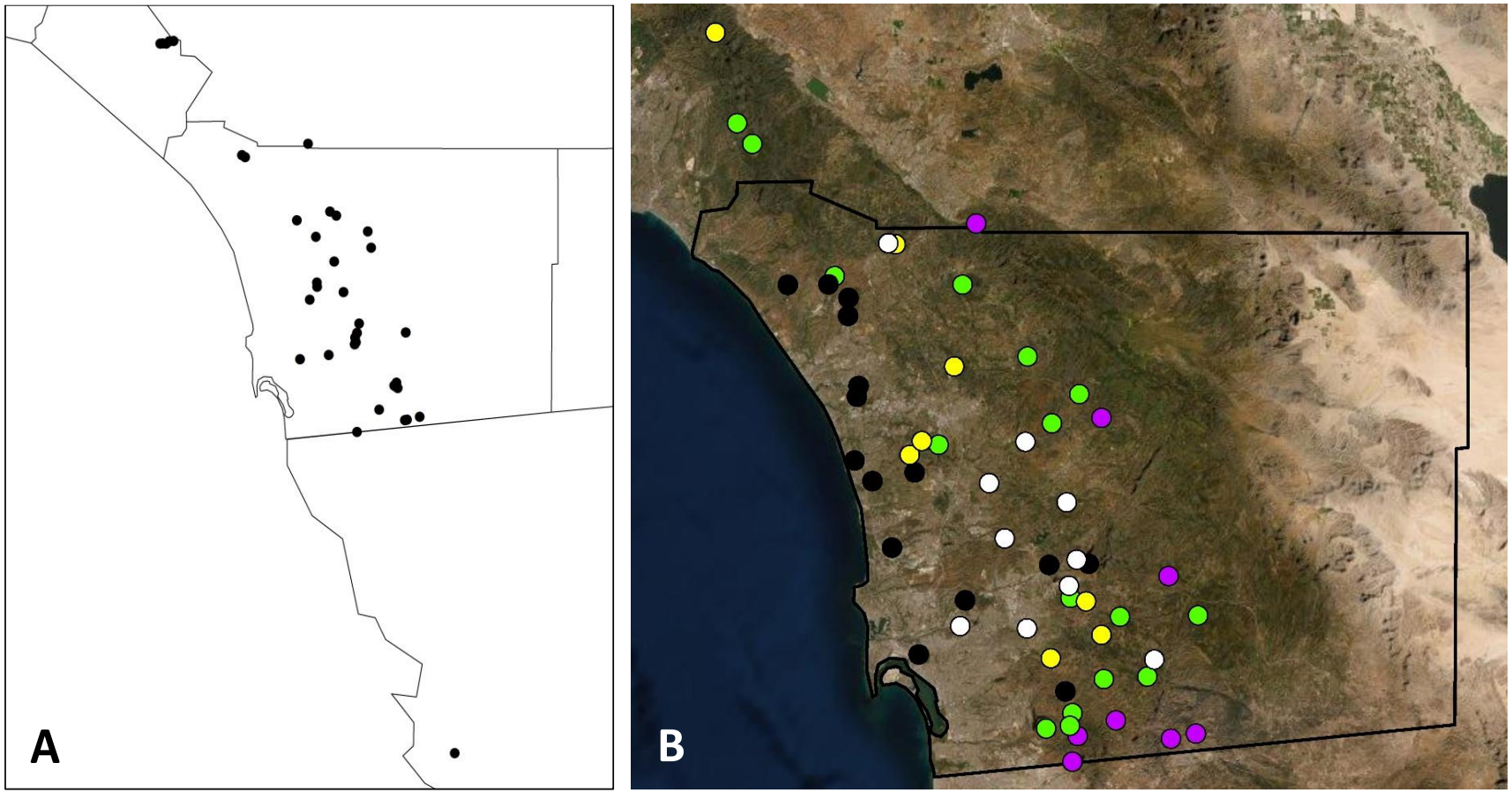

Figure 1. Harbison's dun skipper distribution in 2021. A: Map shows all known locations regardless of current status. B: Map of all known locations in the United States with the most recent status (green = extant, yellow = probably extant but uncertainty exists, white = extirpated, purple = not surveyed).

Table 1. Comparison of Harbison's dun skipper annual adult population sizes. Counts in bold represent maximum daily count for weekly surveys while counts not bolded are the highest count among two to three surveys during the flight season (one survey at SDNWR-Las Montanas (South) in 2013 and one survey at San Pasqual Academy in 2021).

Location	2013	2014	2016	2017	2021
Barrett Lake	6-8	**4**	**11**	**1**	**3**
Boden Canyon Ecological Reserve	5-6	**1**	**1**	1	**0**
Blue Sky Ecological Reserve	0	**0**	-	-	-
Calavera Nature Preserve	0	-	-	-	-
Camp Pendleton	-	-	0 (1 pupa)	-	-
Carlsbad Highlands Ecol. Reserve	0	-	-	-	-
Crestridge Ecological Reserve	1	**0**	**0**	0	**2**
Daley Ranch	1	**2**	**4**	-	**0**
El Capitan (west of reservoir)	0	-	-	-	-
Elfin Forest	-	-	1	-	**0**
Hellhole Canyon County Park	4	**1**	**1**	0	**2**
Hollenbeck Canyon Wildlife Area	6-10	**5-6**	**2**	**3-4**	**2**
Lake Hodges	5-6	**4**	**15-20**	-	**4**
Loveland Reservoir	8	**4-5** or **3-6**	**3**	**2**	-
Pamo Valley (CNF)	1-2	**2-3**	**0**	2	**2**
Red Mountain	1	**-**	**0**	-	**0**
SDNWR- Las Montanas (South)	2	**1**	**0**	-	**0**
San Pasqual Academy	0-1	**-**	**0**	-	0
Skye Valley Road	2	**2**	**15-17**	1	**0**
Sycamore Canyon County Park	0	**0**	-	-	-
Sycuan Peak Ecological Reserve	5-6	**2**	**8-12**	-	**0**

Fire likely caused the extirpation at the Skye Valley Road site, which burned in the Valley Fire during September 2020. However, skippers were observed at the northern subsite at Barrett Lake, which burned in the same fire. For the sites that had zero skipper observations and did not experience a recent fire, we did notice a relatively substantial change in the specific location of the sedge. This degree of change was not expected and provided challenges with locating skippers, if they were still present. Several of these sites have long drainages that are difficult to transverse (Boden Canyon, Red Mountain, SDNWR- Las Montanas, Sycuan Peak). It is possible that the sedge, and therefore skipper, distribution changed within the woodlands over the last several years and a survey of the entire drainage and adjacent uplands (similar to more intense efforts in 2014-2015) would be required to locate new areas of skipper activity. In 2021, we observed adults nectaring on California buckwheat (*Eriogonum fasciculatum*) and thistle (*Cirsium* occidentale).

Discussion

Historically, local population sizes of the Harbison's dun skipper have been small (Brown and McGuire 1983, Marschalek et al. 2019). We found that the populations were smaller in 2021. Although only four years passed since the last surveys, the distribution of San Diego sedge changed at several sites. Because some of these riparian oak woodlands are quiet large/long, we were unable to search the entire area to determine if adult skippers were congregating in a location different than in 2017. Changes to a lesser degree were observed in 2017 (Marschalek and Deutschman 2017b) but was more related to upland vegetation rather than the precise location of the sedge. Due to these changes of riparian oak woodlands, the full woodland and adjacent uplands should represent a single management unit. Planned work in 2022 is designed to address habitat preferences.

An observation that is promising for the long-term persistence of the skipper is that adults were found in an area that burned within one year of the sightings. A northern subsite at Barrett Lake was occupied in the past (Marschalek and Deutschman 2016), burned in September 2020 (Figure 2), and was occupied in 2021. This area has apparent connectivity with a drainage to the south that did not burn and is occupied (Figure 3).

Figure 2. Valley Fire which occurred in September 2020. A) Southern portion of the Valley Fire near Barrett Lake, B) Barrett Lake northern subsite in June 2021 looking north, C) Barrett Lake northern subsite in June 2021 looking north.

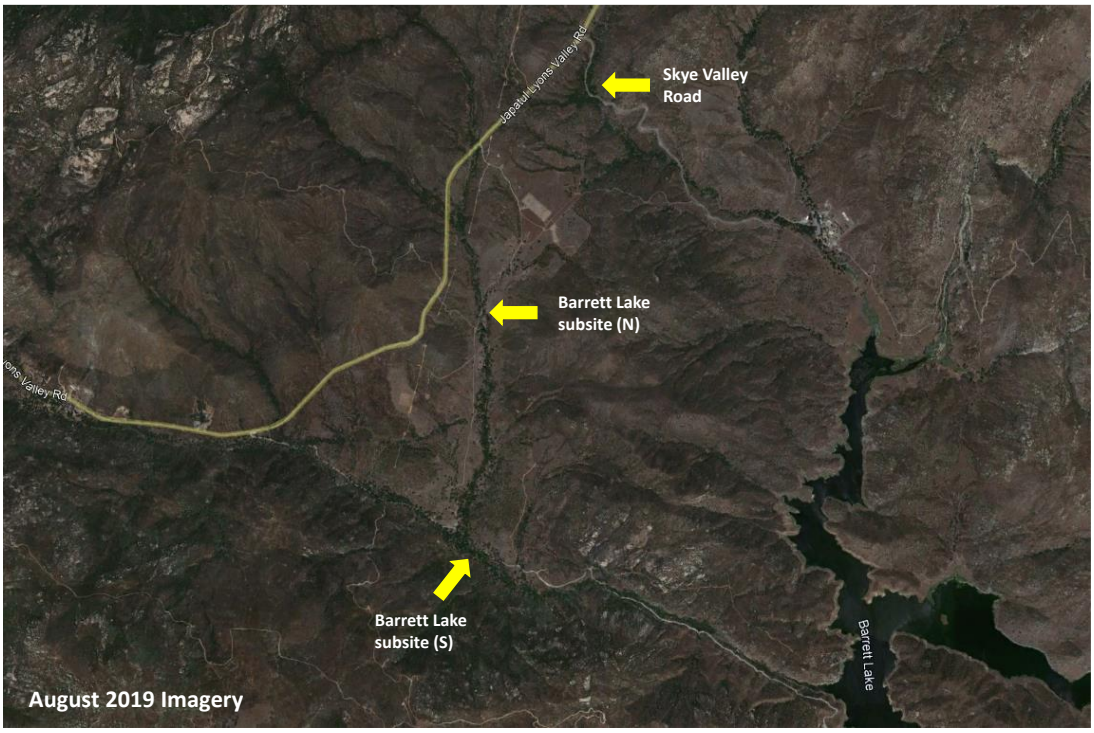

Figure 3. Map of the Barrett Lake area that includes two Barrett Lake subsites. The northern subsite burned in September 2020 and Harbison's dun skippers were present in June 2021. The southern subsite did not burn.

Conclusions

While time consuming, it would be informative to completely and thoroughly survey entire riparian oak woodlands to determine all areas used by the adult skippers. These woodlands can range from about 100 meters to several kilometers in length. Most of our work has focused on surveying specific locations where skippers were observed in the past so these findings do not necessarily representing the entire woodland (habitat patch). This attempt at efficiently monitoring the Harbison's dun skipper introduces some uncertainty considering the patchy distribution of adult skippers and the shifting distribution of San Diego sedge. The dynamic nature and composition (poison oak and uneven terrain) of the riparian woodlands results in needing more effort to detect adult butterflies compared to other San Diego butterflies. For example, Hermes copper (*Lycaena hermes*) and Quino checkerspot (*Euphydryas editha quino*) are relatively consistently found on the same roads/trails or hilltops, respectively.

Like other butterflies in southern California, population sizes of the Harbison's dun skipper are declining. Studies across the western United States (Forister et al. 2021) and much of North America (Crossley et al. 2021) have found that most butterflies, including both specialist species and relatively common species, have declined over the last several decades. Both studies contributed these trends to increased temperatures and decreased precipitation, resulting in about a 1.6% annual decline (Forister et al. 2021). The western United Stated has experienced a megadrought over the last two decades, being the second driest 19-year period since 800 CE (Williams et al. 2020). These geographically widespread conditions extending over several decades pose substantial challenges for conservation. For a species that only feeds on a plant that requires more soil moisture than most other plant species, the predicted dry conditions through the end of the century (Global Climate Change Impacts in the United States 2009) will continue to threaten the long-term viability of the Harbison's dun skipper.

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Literature Cited

Brown, J.W. 1982. Only where the *Carex* grows. Environment Southwest. 498:22.

Brown, J.W. 1991. Sensitive and declining butterfly species (Insecta: Lepidoptera) in San Diego County, California. Draft report prepared for Dudek and Associates. 27 pp.

Brown, J.W. and W.W. McGuire. 1983. A new subspecies of *Euphyes vestris* (Boisduval) from southern California (Lepidoptera: Hesperiidae). Transactions of the San Diego Society of Natural History. 20:57-68.

Crossley, M.S, O.M. Smith, L.L. Berry, R. Philips-Cosio, J. Glassberg, K.M. Holman, J.G. Holmquest, A.R. Meier, S.A. Varriano, M.R. McClung, M.D. Moran and W.E. Snyder. 2021. Recent climate change is creating hotspots of butterfly increase and decline across North America. Global Change Biology. 27:2702-2714.

Glassberg, J. 2001. Butterflies Through Binoculars: The West. Oxford University Press, New York. 374 pages.

Global Climate Change Impacts in the United States, Thomas R. Karl, Jerry M. Melillo, and Thomas C. Peterson, (eds.). Cambridge University Press, 2009. Accessed from: https://nca2009.globalchange.gov/projected-change-north-american-precipitation-2080-2099/index.html

Forister M.L., C.A. Halsch, C.C. Nice, J.A. Fordyce, T.E. Dilts, J.C. Oliver, K.L. Prudic, A.M. Shapiro, J.K. Wilson and J. Glassberg. 2021. Fewer butterflies seen by community scientists across the warming and drying landscapes of the American West. Science. 371:1042-1045.

Marschalek, D.A. and D.H. Deutschman. 2015. Initial investigation of critical biological uncertainties for Harbison's dun skipper (*Euphyes vestris harbisoni*) on conserved lands in San Diego County. California Department of Fish & Wildlife Final Report. 23 pp. + app.

Marschalek, D.A. and D.H. Deutschman. 2016. Rare butterfly management and conservation planning: Harbison’s dun skipper flight season surveys. Final Report for San Diego Association of Governments. 23 pp.

Marschalek, D.A. and D.H. Deutschman. 2017a. Rare butterfly management and conservation planning: Harbison’s dun skipper host plant, larval, and hibernaculum surveys. Final Report for San Diego Association of Governments. 14 pp.

Marschalek, D.A. and D.H. Deutschman. 2017b. Rare butterfly monitoring and translocation: 2017 Harbison’s dun skipper flight season surveys. Final Report for San Diego Association of Governments. 11 pp.

Marschalek, D.A., D.K. Faulkner and D.H. Deutschman. 2019. Ecology of the threatened Harbison’s dun skipper (*Euphyes vestris harbisoni*) for conservation efforts within a habitat conservation plan. Journal of Insect Conservation. 23:331-339.

United States Fish and Wildlife Service. 1989. Endangered and threatened wildlife and plants; Animal notice review. Federal Register 50 CFR 17. 54:554-579.

Williams, A.P, E.R. Cook, J.E. Smerdon, B.I. Cook, J.T. Abatzoglou, K. Bolles, S.H. Baek, A.M. Badger and B. Livneh. 2020. Large contribution from anthropogenic warming to an emerging North American megadrought. Science. 368:314-318.

Appendix A: 2021 adult Harbison's dun skipper observations

Date	Site	Latitude	Longitude	Life Stage
18-May-21	Crestridge	32.82896	-116.85852	Pupa
18-May-21	Crestridge	32.826299	-116.860519	Pupa
19-May-21	Barrett Lake	32.69666	-116.703223	Pupa
1-Jun-21	Barrett Lake	32.71244	-116.70251	Adult
3-Jun-21	Pamo Valley	33.158269	-116.840172	Adult
3-Jun-21	Pamo Valley	33.158315	-116.840182	Adult
4-Jun-21	Hellhole Canyon	33.221526	-116.933237	Adult
9-Jun-21	Barrett Lake	32.69702	-116.70332	Adult
9-Jun-21	Hollenbeck Canyon	32.69476	-116.79263	Pupa
9-Jun-21	Hollenbeck Canyon	32.69542	-116.79375	Adult
11-Jun-21	Hellhole Canyon	33.221461	-116.933143	Adult
11-Jun-21	Hellhole Canyon	33.22105	-116.932689	Adult
12-Jun-21	Lake Hodges	33.082887	-117.113816	Adult
12-Jun-21	Lake Hodges	33.082866	-117.113814	Adult
12-Jun-21	Lake Hodges	33.083057	-117.114329	Adult
12-Jun-21	Lake Hodges	33.083075	-117.114336	Adult
15-Jun-21	Barrett Lake	32.71183	-116.70238	Adult
22-Jun-21	Barrett Lake	32.71241	-116.702248	Adult
22-Jun-21	Hollenbeck Canyon	32.694556	-116.793695	Adult
22-Jun-21	Hollenbeck Canyon	32.69457	-116.793783	Adult
23-Jun-21	Crestridge	32.82628	-116.860524	Adult
23-Jun-21	Crestridge	32.82628	-116.860542	Adult
25-Jun-21	Hellhole Canyon	33.22134	-116.933175	Adult
25-Jun-21	Hellhole Canyon	33.221474	-116.933152	Adult
28-Jun-21	Barrett Lake	32.713088	-116.702527	Adult
28-Jun-21	Barrett Lake	32.713088	-116.702527	Adult
28-Jun-21	Barrett Lake	32.713088	-116.702526	Adult
29-Jun-21	Lake Hodges	33.08311	-117.1144	Adult
29-Jun-21	Lake Hodges	33.082877	-117.113982	Adult
29-Jun-21	Lake Hodges	33.082888	-117.113981	Adult