THAMNOSMA TEXANA, A CHIHUAHUAN DESERT SPECIES, DISJUNCT IN THE HUALAPAI MOUNTAINS, MOHAVE COUNTY, ARIZONA.

John L. Anderson
U. S. Bureau of Land Management
21605 North Seventh Avenue, Phoenix, AZ 85358[1]

and

Cristina Francois
U. S. Bureau of Land Management
2755 Mission Boulevard, Kingman, AZ 86401[2]

[1] Present address: P. O. Box 20911, Wickenburg, AZ 85358
[2] Present address: University of Arizona, Department of Entomology, P. O. Box 210036, Tucson, AZ 85721-0036

The discovery of *Thamnosma texana* (A. Gray) Torr. in the Hualapai Mountains of Mohave County, Arizona is notable because it extends the known range of the species by over 100 kms. It is also of interest because the plant was first identified by recognizing the insects that use it as a host and because the new record seems to be an exception to the general rule that populations of *Thamnosma texana* disjunct from the Chihuahuan Desert tend to grow in locally atypical habitats.

Identification of plants in the field is primarily based on morphological characters; but, geographic range is also an important identification tool. Plant species typically occur as part of a floristic province (McLaughlin 2007). These floristic provinces, each with its own geographic range, are defined by their unique species compositions. When populations of a plant species are discovered in distant and different geographic provinces, outside their normal range, identification can be problematic. Since the usual range and floristic parameters for identification do not apply, other factors can be used to make an identification.

An instance of this is presented here from the Hualapai Mountains, Mohave County, AZ (35.065946 N 113.784616 W). In November 2011, Francois, an entomologist by training, found an unfamiliar plant species (Fig. 1A) during environmental assessment work. However, there was a familiar butterfly larva present on the plant. She identified it as the 5th instar larva (Fig. 1B) of the black swallowtail butterfly (*Papilio polyxenes*) (Fig. 1C). From a quick literature review (Finke and Scriber 1988, Drees and Jackman 1998), she found a list of the host plant species of this butterfly larva. This list (and the plant's particular odor) narrowed the options for identification. After that, based on the butterfly larva's host plant preferences and the plant's morphology, Francois identified the plant as *Thamnosma texana* (A. Gray) Torr. Anderson, previously familiar with *Thamnosma texana* (1996), subsequently visited the Hualapai Mountain site, confirmed the plant identification as *Thamnosma texana* (Fig. 1A) and collected voucher specimens

Thamnosma texana, a Chihuahuan Desert Species, Disjunct in the Hualapai Mountains, Mohave County, Arizona. *CANOTIA* 9:16-20. 2013.

(*Anderson 2011-56*, ASU) and habitat data. Approximately twenty-five plants were counted. This population of *Thamnosma texana* is the first record for the Hualapai Mountains and is a range disjunction from its known range and floristic province, the Chihuahuan Desert of Mexico, Texas, New Mexico, and southeast Arizona. It is approximately 130 kilometers disjunct northwest from the nearest population in the Upper Verde River area near the Chino Valley (*Coburn 536*, ASU) and 400 kilometers disjunct from its typical range in southeast Arizona.

Many plant species that are widely disjunct from their normal range and habitat are able to survive on locally anomalous habitats in regions where the more common vegetation type would outcompete them. These anomalous habits may differ edaphically or topographically from the more common habitats (Gankin and Major 1964, Kruckeberg 1969), and may function as refugia by providing an environmental dissimilarity to which the locally dominant species are poorly adapted and do not occur. Thus, an ecological island is left open sometimes allowing several disjuncts (even of different floristic origins) to occur together by taking advantage of atypical habitat conditions with less local plant competition. In the Sonoran Desert of central Arizona many examples of such disjunctions have been documented on late Tertiary lacustrine deposits (Anderson 1996, 2012) which provide an anomalous edaphic habitat contrasting with the surrounding igneous derived habitats. *Thamnosma texana* follows this disjunct pattern (Fig. 1E) and has been documented on late Tertiary lacustrine deposits (Anderson 1996) at the Lower Verde River near Horseshoe Reservoir (*Anderson 87-21*, ASU) and in the Verde Valley (*Lehto 21344*, ASU) as well as on the Martin Formation, a Paleozoic marine limestone at the Upper Verde River Canyon near the Chino Valley, Yavapai County (*Coburn 536*, *ASU*). It is usually a Chihuahuan Desert species that ranges from northern Mexico through west Texas, southern New Mexico and into southeastern Arizona in Cochise County and eastern Pima Counties. An examination of label data in SEINet (2012) shows that it is primarily a desert species (43 out of 67 collections) growing on limestone (51 out of 78 collections). It also occurs to a lesser degree in semi-desert grassland, interior chaparral and pinyon-juniper-oak woodlands on rocky slopes and along washes. The habitat of the disjunct populations in central Arizona mimics its usual limestone habitat in the Chihuahuan desert (SEINet 2012).

The late Tertiary lacustrine deposit at Burro Creek on the Mohave/Yavapai County line lies in between the Verde Valley and the Hualapai Mountains. Despite much field work there *Thamnosma texana* had not been found (Anderson 1996, 2012). The discovery of *Thamnosma texana* farther to the northwest in the Hualapai Mountains raised the possibility that it might occur at the geographically intermediate Burro Creek lacustrine locality and had been overlooked. Anderson searched there again in December 2012, especially under the *Quercus turbinella* shrubs, without success.

The Hualapai Mountains population of *Thamnosma texana* does not follow the disjunct pattern of occurrence within an anomalous habitat as described above. Here, *Thamnosma texana* grows within the locally common habitat (Fig. 1D) of granitic hills at 1310 m with a mix of common Interior Chaparral and semi-desert grassland plant species (Brown 1982), rather than lacustrine limestone Sonoran Desert habitat similar to the disjunct populations in the Verde Valley and lower Verde

Valley (Anderson 1996). In the Hualapai Mountains it is usually found growing next to or under *Quercus turbinella* Greene. Other associated species are *Aloysia wrightii* A. Heller, *Aristida purpurea* Nutt., *Baccharis brachyphylla* A. Gray, *Berberis haematocarpa* Woot., *Bouteloua curtipendula* (Michx.) Torr., *B. eriopoda* (Torr.) Torr., *Canotia holacantha* Torr., *Cylindropuntia acanthocarpa* (Engelm. & Bigelow) F. M. Knuth, *Echinocereus engelmannii* (Parry) Lemaire, *Eragrostis intermedia* Hitchc., *Ericameria laricifolia* (Gray) Shinners, *Eriogonum inflatum* Torr. & Frem., *Hilaria rigida* (Thurb.) Benth. ex Scribn., *Krameria erecta* Willd. ex Schult., *Lotus rigidus* (Benth.) Greene, *Melampodium leucanthum* Torr. & Gray, *Opuntia chlorotica* Engelm. & J. M. Bigelow., *O. phaeacantha* Engelm., *Pappostipa speciosa* (Trin. & Rupr.) Romasch, *Psilostrophe cooperi* (Gray) Greene, *Scutelaria mexicana* (Torr.) A. J. Paton, *Senegalia greggii* (A. Gray) Britton & Rose, *Stephanomeria pauciflora* (Torr.) A. Nels., and *Yucca baccata* Torr.

The occurrence of *Thamnosma texana* in the Hualapai Mountains is surprising, both for its wide disjunction and for its presence in a common habitat. However, it is not alone in its disjunction from a typical range in southeastern Arizona onto a common habitat in the Hualapai Mountains. Two other species have similar distributions. *Sophora arizonica* S. Wats. [*Dermatophyllum arizonicum* (S. Wats.) Vincent] is a disjunct species from southeastern Arizona, found in the eastern foothills of the Hualapai Mountains (Fig. 1E). It is an Arizona endemic whose nearest relative, *Sophora gypsophila* B. L. Turner and J. M. Powell, occurs in west Texas within the known range of *Thamnosma texana*. In southeastern Arizona the two occur together in the Swisshelm (*McManus 572*, ARIZ) and Whetstone Mountains (*McLaughlin 190, 219,* ARIZ). *Parthenium incanum* H. B. K. is another predominantly limestone species from the Chihuahuan Desert with a parallel range to *Thamnosma texana*. At the western edge of its range in the Hualapai Mountains (*Anderson 95-25*, ASU) and the Cerbat Mountains (*Anderson 94-18*, ASU), it occurs on a common granitic hills habitat or other volcanic substrates, rather than limestone. However, its range in Arizona is more continuous, rather than disjunct, and extends to northwest Arizona. This co-occurrence of other Chihuahuan Desert species in the Hualapai Mountains may provide clues of an older biogeographical pattern and evidence of the past vegetative history of the region.

ACKNOWLEDGMENTS

We thank Rebecca Peck and Ammon Wilhelm from the BLM Kingman Field Office for field assistance. Much appreciation is extended to Samuel Jaffe for the use of the black swallowtail butterfly larva picture and Tom Murray for the use of the black swallowtail adult pictures. Liz Makings at ASU provided valuable assistance preparing figures, making plant distribution maps and reviewing the manuscript.

LITERATURE CITED

ANDERSON, J. L. 1996. Floristic patterns on late Tertiary lacustrine deposits in the Arizona Sonoran Desert. Madrono 43:255-272.

ANDERSON, J. L. 2012. Further floristics on late Tertiary lacustrine deposits in the southern Arizona deserts. Madrono 48:123-128.

BROWN, D. E. (ed.). 1982. Biotic communities of the American Southwest-United States and Mexico. Desert Plants 4:1-342.

DRESS, B. M. and J. A. JACKMAN. 1998. A field guide to common Texas insects. Gulf Publishing,Houston, Texas.

FINKE, M. D. and J. M. SCRIBER. 1988. Influence of larval growth of the eastern Black Swallowtail butterfly Papilio polyxenes (Lepidoptera: Papilionidae) of seasonal changes in nutritional parameters of Umbelliferae species. American Midland Naturalist, 119:45-62

GANKIN, R. and MAJOR, J. 1964. *Arctostaphylos myrtifolia*, its biology and relationship to the problem of endemism. Ecology 45:792-808.

KRUCKEBERG, A. R. 1969. Soil diversity and the distribution of plants, with examples from western North America. Madrono 20:129-154.

MCLAUGHLIN, S. P. 2007. Tundra to tropics: the floristic geography of the North America. Sida, Botanical Miscellany No. 30, botanical Research Institute of Texas, Fort Worth, TX.

SOUTHWESTERN ENVIRONMENTAL INFORMATION NETWORK. 2012. SEINet. http://swbiodiversity.org/sinet/index.php. Accessed April 2012.

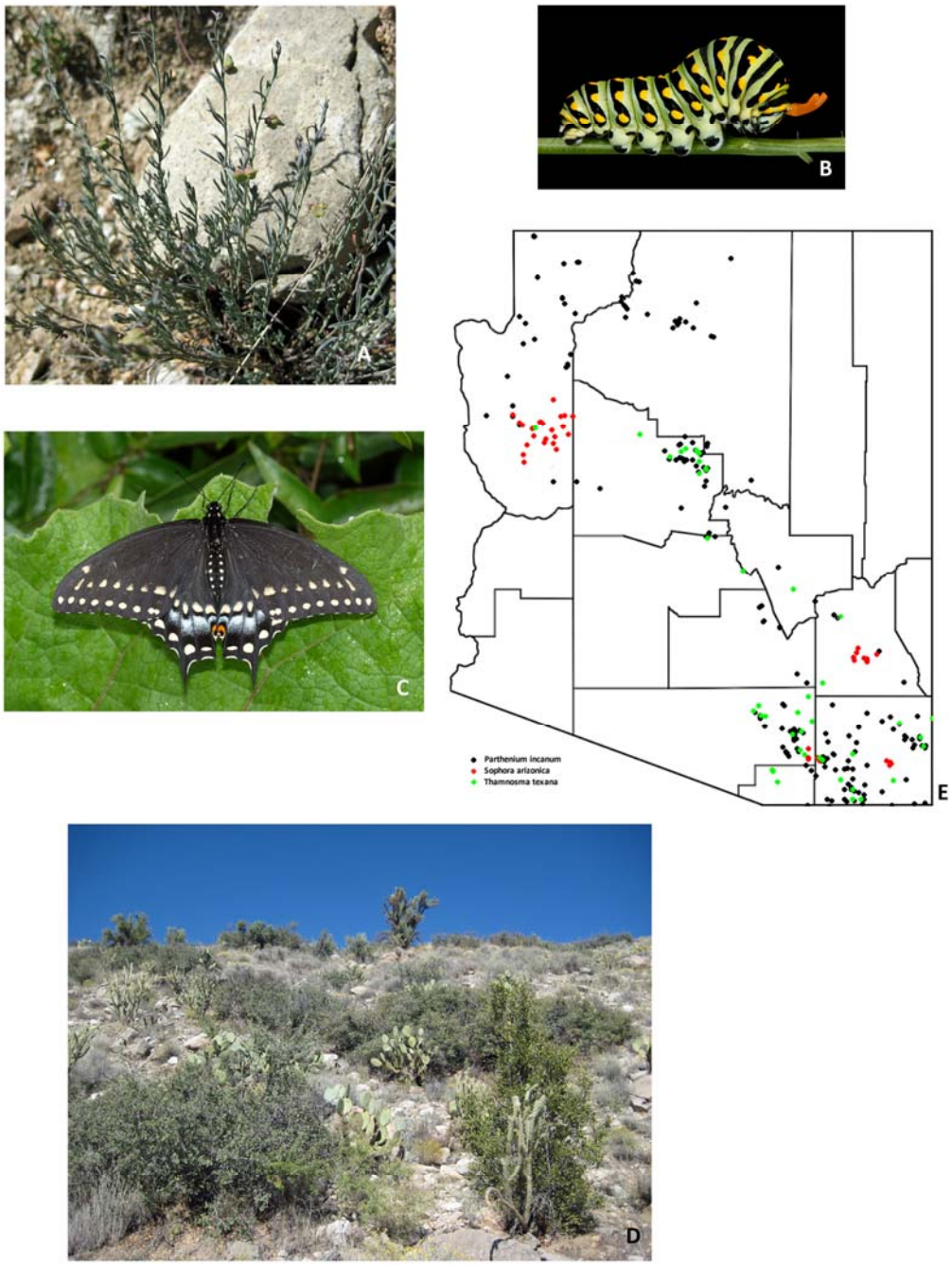

Figure 1. A. *Thamnosma texana* in Hualapai Mountains. **B.** Fifth instar larva of *Papilio polyxenes*, black swallowtail butterfly (photo by S. Jaffe). **C.** Adult female of *Papilio polyxenes* (photo by T. Murray). **D.** Granitic hills habitat of *Thamnosma texana* with interior chaparral and semi-desert grassland species. Glaucous green shrubs are *Quercus turbinella*. **E.** Map of *Thamnosma texana* (green dots), *Sophora arizonica* (red dots), and *Parthenium incanum* (black dots) in Arizona.