Documenting Diversity;
The Madrean Archipelago Biodiversity Assessment (MABA)

Charles Hedgcock and Dale Turner

This article describes an international research project that relied heavily on photography in the gathering of evidence for the presence of wildlife species in remote mountains of Northwestern Mexico. High-quality images were created with the use of studio techniques in field settings. These images were subsequently linked to an on-line database to provide permanent, searchable records.

Introduction

The Madrean Archipelago is a 70,000 square-mile region straddling the U.S./Mexico border (Figure 1). It spreads over portions of the states of Arizona and New Mexico in the US and the states of Sonora and Chihuahua in Mexico.

This area of mountain islands and desert seas is also known as the "Sky Islands" and lies at the crossroads of several geographic systems: two climatic zones—temperate and subtropical; two mountain ranges—the Rocky Mountains and the Western Sierra Madre; and two deserts—the Sonoran and Chihuahuan. These factors all contribute to making this one of the most species-rich areas in North America.

The Sky Island Alliance, based in Tucson, Arizona, is a grass-roots nonprofit organization dedicated to the protection and restoration of the Sky Island region. Under the administrative supervision of the Sky Island Alliance, a unique tri-national effort has been established that includes Mexican, French and US scientific, technical and financial support.

The Madrean Archipelago Biodiversity Assessment (MABA) project is a visionary three-year initiative to catalog, protect, and restore this premier biodiversity hotspot.

The authors are members of this largely volunteer effort which includes multidisciplinary field expeditions to remote areas of Northern Mexico to document the diversity and distribution of plant and animal species.

The project photographer was charged with providing images to record as well as promote the project and with providing photographic vouchers of herpetological and entomological specimens captured in the field. Voucher photos are being deposited with university museum collections as specimen

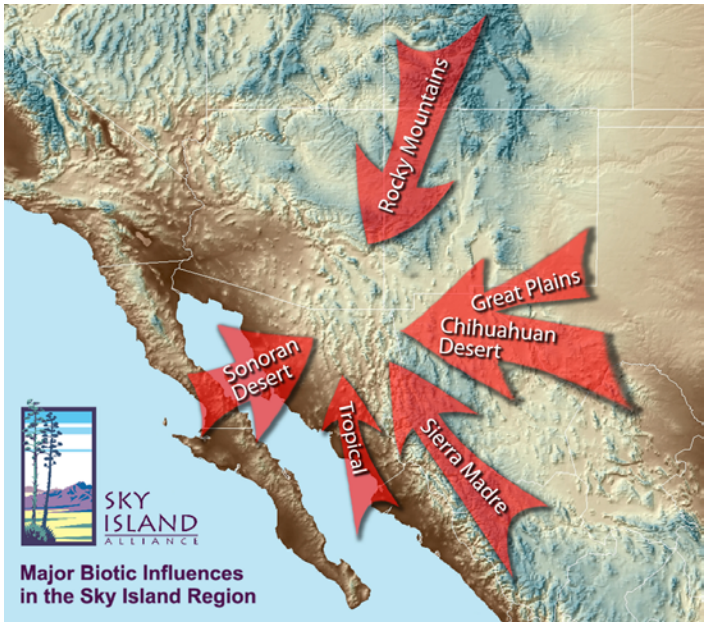

Figure 1. *Map by Sky Jacobs, courtesy of the Sky Island Alliance.*

records, and therefore must show diagnostic characteristics of each specimen with enough detail for positive identification.

Photo vouchers work around the need for special permits that are typically required for collecting and transporting specimens—especially rare, threatened, or sensitive species—between countries. In recent decades, plant and animal collecting permits in Mexico have been very difficult to acquire for both Mexican and foreign researchers, thus impeding new studies into the status and distribution of species. There are no such permits required for photographs, so these photo vouchers allow a dramatic increase in the pace of scientific research.

There are also the physical space, staffing, and other overhead requirements inherent in managing a specimen-based collection. Those issues limit the rate at which new specimens can be added to a collection, and often limit access to the specimens by researchers. Photo vouchers in a virtual museum collection eliminate these hurdles while ensuring the scientific integrity and validity of the data collected.

The collection of biological information in the field is the backbone of the MABA project. To make this information available to others, a web-based regional database documenting

***Figure 2**. Funnel trap array, Animas Valley, Sonora, Mexico. Funnel trap arrays were used to capture animals moving about at night. Trap arrays consisted of a hardware cloth drift fence, approximately 30 meters long, with a pair of box-funnel traps at each end. Animals that encountered the drift fence would follow it until they encounter a trap. Animals that crawl into the trap are unable to find their way back out and are held in the trap until released.*

***Figure 3**. Western Patch-nosed Snake, Salvadora hexalepis deserticola. Captured animals were photographed to document key characteristics that would positively identify them. Images like these were taken immediately upon capture, before an animal had an opportunity to escape. After the initial photographs were taken and data recorded about the individual, more esthetically pleasing images were attempted, sometimes successfully, on site.*

species diversity in the region—the Sky Island Regional Scientific Information Database (SIRSID)—is being developed. The photographs will also become part of the SIRSID database.

Materials and Methods

Animals were located by physically searching various habitats and areas where they were likely to be hiding. Small hand-held mirrors were used to reflect sunlight into rock crevices and overhangs. Rocks and logs were rolled or lifted. Care was taken to replace disturbed items to maintain good contact with the soil and protect valuable microhabitats. A keen eye was always kept when hiking through habitats for small animals that may suddenly dart from cover.

Two funnel trap arrays were also used to capture animals that moved about at night. Trap arrays consist of a hardware cloth drift fence, approximately 30 meters long, with a pair of funnel traps at each end. Animals moving across the area that encountered the drift fence would follow it along looking for a way through and get caught in the traps (Figure 2).

Photographic gear in the field consisted of a 12.3 MP Nikon D90, with either an 18-105mm zoom or 55mm Micro Nikkor lens. Supplemental lighting came from either a Vivitar 283 flash with LumiQuest Pocket Bouncer diffuser and Wein flash adapter, or a 12" Photoflex collapsible reflector. Images were captured in RAW and processed in Photoshop upon return to the US.

Captured animals were photographed to document key views that would positively identify them. These images were taken immediately, before an animal had an opportunity to escape (Figure 3).

After the initial photographs were taken, and data recorded about the individual, more aesthetically pleasing images were attempted on site. Some especially handsome specimens were held overnight in cloth "snake bags." The animals were returned to the place of capture during the cooler morning hours. There, with the animals more subdued, "Beauty Shots" were attempted that captured the animal *in situ* (Figure 4).

The documentation of reptiles included any road kill that the group was able to recover. Road kill is designated as "DOR" "Dead on the road" in the collection data (Figure 5).

Base camps for much of the field work were established in small rural ranch houses provided by the Mexican land restoration group Fundación Cuenca Los Ojos. These buildings allowed for impromptu studios to be set up indoors. Small animals, such as lizards and arthropods, captured by members of the team or animals that were too difficult to photograph in the field, could be documented in this studio set up (Figure 6).

The studio setup consisted of a small plastic aquarium or clear plastic shoe box with substrate and "props" to create a more natural looking setting for the photograph. The enclosure was placed on a Lazy Susan to allow the photographer to rotate the enclosure to best document the animal as it moved about. A battery-powered Vivitar 283 electronic flash served as the main light source and was used with a collapsible diffuser made from PVC pipe and

Figure 4. *Green Rat Snake, Senticolis triaspis. This particularly handsome specimen was held overnight in a cloth bag. The animal was returned to the place of capture during the cooler morning hours. There, with the animal more subdued, "Beauty Shots" were made that captured the animal in situ.*

Figure 5. *Gopher Snake, Pituophis melanoleucus, DOR. Documentation is made of all reptiles encountered, including any road kill that the group was able to recover. Road kill is designated as "DOR" "Dead on the road" in the collection data.*

Figure 6. *Tool shed studio, Sonora, Mexico. Base camps for much of the field work were established in small rural ranch houses provided by the Mexican land restoration group, Fundación Cuenca Los Ojos. These buildings allowed for impromptu studios to be set up indoors. Small animals, such as lizards and arthropods, captured by members of the team, or animals that were too difficult to photograph in the field, could be documented in this studio set up.*

Figure 7. *Detail of a typical studio setup. The studio setup consisted of a small plastic aquarium or clear plastic shoe box with substrate and "props" to create a more natural looking setting for the subject. A Lazy Susan to allow the photographer to rotate the enclosure to best document the animal as it moved about. A battery powered Vivitar 283 electronic flash served as the main light source and was used with a collapsible diffuser made from PVC pipe and rip-stop nylon. Two compact light stands, several small sheets of foam-core for reflectors, ring-stands and various other clamps make up a simple, portable configuration.*

Figure 8. *Mountain Skink, Eumeces callicephalus, Photographed in an arrangement similar to that shown in Figure 7. The animal was released into the enclosure and exposures were made while leaning over the open top of a plastic aquarium.*

rip-stop nylon. Two compact light stands, several small sheets of foam-core for reflectors, ring-stands and various clamps were also employed (Figure 7). All photographic paraphernalia had to break down and fit into two boxes for transport in the back of a four-wheel drive pickup truck.

Animals were released into the enclosures with exposures made while leaning over the open top (Figure 8).

Data collected for each of the animals identified in the field were later transferred from field notes to voucher sheets. These individual voucher sheets were saved as a Word document (Figure 9) and, along with the voucher image files, placed in a digital folder for each individual animal. The entire set of folders was then saved on a compact disc (CD). Copies of the CD's were then delivered to the University of Arizona Department of Herpetology to be included in their herpetology collection. A second set is kept with other data collected by the Sky Island Alliance.

Making these data collected in the field available to others is the backbone of the MABA project. The Sky Island Regional Scientific Information Database (SIRSID) is being developed and can be viewed by visiting: http://www.madrean.org

In time, each animal in the SIRSID will have its own page with photographs, locality information, a brief description of the animal with information about distribution, habitat, etc.

Conclusion

Photography has served a critical role in this international research effort, providing evidence of each species found. Use of portable studio equipment allowed the creation of high-quality images in remote field sites.

In addition to the site mentioned above, more information can be found at: http://www.skyislandalliance.org.

Photo Voucher Data Form, Herpetology Collection (UAZ)
University of Arizona Museum of Natural History

Collector(s) Photo #:

Species: *Senticolis triaspis*

Country: Mexico

State: Sonora

County / Municipality: Agua Prieta

Specific Locality: Rancho el Pinito, Sierra San Luis, Sonora, Mexico.

Latitude-Longitude or UTM: N 31.19339, W -108.93845

Elevation: 1435 meters

Observer: Dale Turner, Charles Hedgcock

Photographer(s): Charles Hedgcock

Date of Photograph: 9/23/2009

Habitat: Broadleaf deciduous riparian forest

Weather:

Sex/Age/Size: female, 521g, total length 1427 mm, SVL 1120, tail 307.

Other Notes: Crawling across floor of narrow rocky canyon, with Arizona cypress, oak.

Contact: George Bradley, 520-621-3187, gbradley@u.arizona.edu,
http://eebweb.arizona.edu/collections/sitemap.html
hedgcock_figure 9.doc, 24 August 2011

Figure 9. *Data collected for each of the animals identified were transferred from field notes to voucher sheets. These individual voucher sheets were saved as a Word document along with the voucher image files. Copies of the files were then delivered to the University of Arizona, Department of Herpetology to be included in their herpetology collection. A second set is kept with other data collected by the Sky Island Alliance.*

Acknowledgements

Primary support for the MABA project is provided by the Veolia Environment Foundation. Additional support has come from the Turner Foundation, U.S. National Park Service, Fundación Cuenca Los Ojos, Overland Society, Spot Image, and individual donors.

The authors would especially like to thank Fundación Cuenca Los Ojos for providing living quarters and lab space for portions of the field work.

Authors

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