Survey of arthropods in typical Golden-cheeked Warbler breeding habitat in the Wild Basin Wilderness Preserve, Austin, TX

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Abstract – Arthropod surveys conducted at Wild Basin Wilderness Preserve in 2010 yielded some 162 species of arthropods, in 10 Orders, and in 58 families. Primary Orders collected were Hemiptera (including Homoptera), Coleoptera and Lepidoptera. Images of all species were posted online (at BugGuide.net, Picasaweb.Google.com and TexasEnto.net). A master website (TexasEnto.net/Wild_Basin.html) was created with thumbnails of all species collected. The thumbnails link to BugGuide.net where each species' biological information (to the degree known to me) is posted.

Introduction – A recurring biological challenge is how to provide invertebrate identification resources that the general public as well as professional biologists can use in a self help manner given that there are nearly 30,000 insect species in Texas (E. Riley, pers. comm.), 24.7 mil people in Texas (U.S. Census Bureau, July 2009) but perhaps only 200 professional entomologists in Texas who have outreach as part of their job description. If one considers that insects are metamorphic, then the number of insect forms in Texas increases to well over 100,000.

There are complete field guides for the adult stages of only a few taxonomic groups of relatively low diversity in Texas such as butterflies, approximately 450 spp., and Odonates, 234 spp. as of 2009 (Abbott 2010). For some taxonomic groups such as Lepidoptera, it's actually the larval stage that is the most in terms of providing food for nestlings and herbivorous impact on the flora as most adults butterflies and moths only live for a few weeks and many species don't feed in the adult stage. Wagner's (2007) "Caterpillars of eastern North America" is reasonably complete for the larger caterpillars of eastern Texas, but it's a bit daunting for the uninitiated to page through over 1200 images for a caterpillar that may or may not be included therein.

Most wildlife biologists are trained in the identification and management of only a relatively small portion of the total biological diversity of the lands under their jurisdiction. Typically such training is limited to non-fish vertebrates and woody and herbaceous plants, yet invertebrates are the dominant primary and secondary consumers as well as the dominant pollinators of non-wind pollinated plants. Insects and other invertebrates also dominate the biota in terms of numbers of species, see Fig. 1.

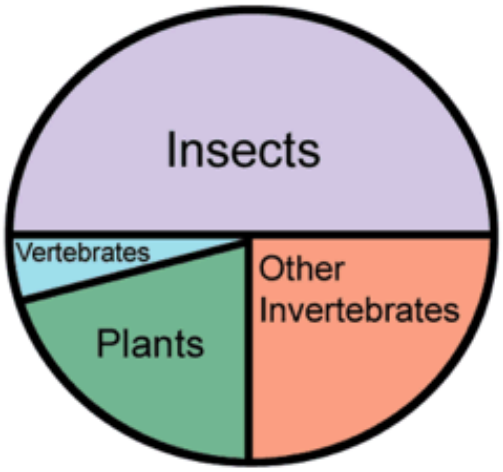


Fig. 1, Relative diversity of various taxonomic groups. (University of Sidney)

This conflict between biological training and conservation need is present even at Balcones Canyonlands Preserve which was established to protect two endangered insectivorous songbirds, seven federally-listed endangered karst invertebrates as well as approximately 25 other karst invertebrate species of concern (U.S. Fish and Wildlife Service 1996), yet neither Travis County Natural Resources nor the City of Austin has a single entomologist on staff.

Quinn's (2000) thesis was, in part, an attempt to close the gap between the knowledge of central Texas wildlife managers' and some of the entomofauna under their care, specifically the arthropods available as prey to the Golden-cheeked Warbler. Insects are in fact one of the primary driving forces of Neotropical songbird migration as their short-term seasonal spike in abundance, as exemplified by beetles in Fig. 2, provides fuel for increased activity necessitated by courtship, nest construction, egg production, nestling and fledgling feeding and territory defence.

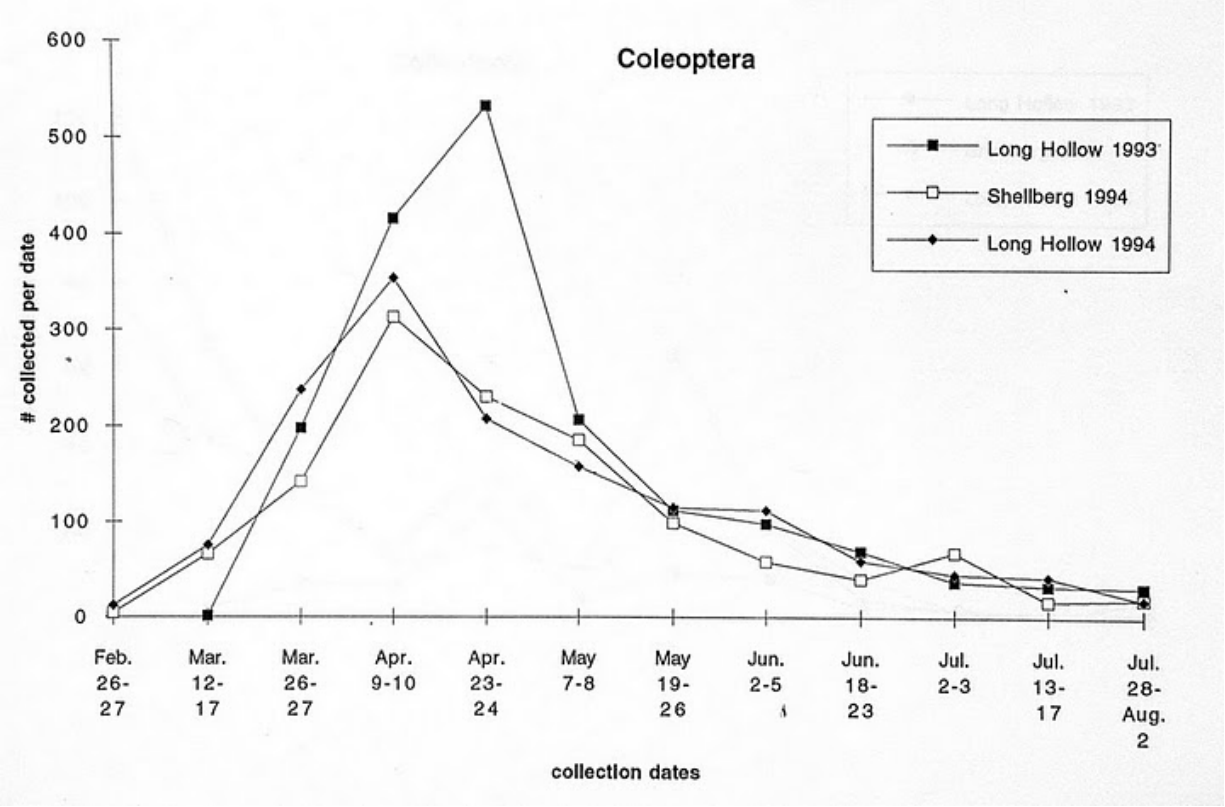


Fig. 2, Coleopteran abundance through time at two sites in western Travis Co., TX (Quinn 2000)

Over the course of two summers in western Travis County, Quinn (2000) collected some 50,000 specimens representing 1600 species that were quantitatively collected from trees in which Golden-cheeked Warblers preferentially forage (Beardmore 1994). Even though this required an *immense* amount of work, just providing the scientific names of 1600 species, their abundance through time and host preferences alone wasn't enough to provide the education needed.

Given the immense entomological diversity and the lack of suitable filed guides, what was required are identified photographs of the local entomofauna posted on-line in one place, something not practical before digital photography nor possible before the Internet.

Materials and Methods – Main collecting tools employed for surveys at Wild Basin Wilderness Preserve from May 6 to August 20 were a one-meter square beat sheet and a canvas sweep net. There was also one night of blacklighting.

The most common survey route consisted of sweeping the flowers at the Preserve entrance, including the Capital of Texas State Hwy 360 R.O.W. Then driving to the Environmental Education Center where I checked in. Form there I primarily employed the beat sheet in a loop along the outermost trails.

Specimens were brought home alive and photographed before being periodically delivered to

the Texas A&M University Insect Collection (TAMUIC) for curation. (The 50,000 specimens collected from western Travis Co. by Quinn (2000) are also curated at the TAMUIC.) Contact Ed Riley, Associate Curator, for access to all specimens: insects.tamu.edu/feature/museum/

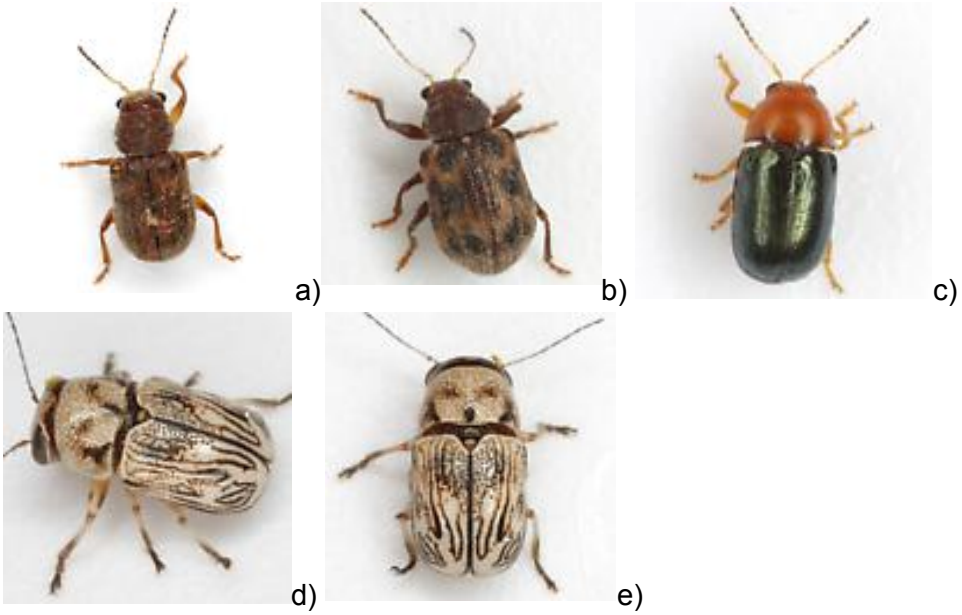
Photographs were almost exclusively shot using Canon's *seminal* MP-E 65mm f/2.8 1-5x Macro Lens (much of this project would not be practical without this unique lens), Canon's EOS 50D SLR Body, and Canon's Macro Ring Lite MR-14EX. For the occasional larger insect, Canon's EF 100mm f/2.8 Macro Lens was used.

The photographs were processed using Picasa photo editing software. The photographic techniques used here are discussed in greater detail in conjunction with intensive efforts to photograph the beetles of Texas: TexasEnto.net/Pic_Tech.html

My own expertise as well as that of experts from across the continent were utilized for the determinations of the photographs. The determiner should be acknowledged below each photo on Picasa and BugGuide. (In most cases, if no one is acknowledged, then I made the determination.)

Results - A total of 367 arthropod photographs of various life stages were posted on-line. Some 162 species of arthropods, in 10 orders, and in 58 families were collected primarily in the Orders of Hemiptera (*sensu lato*), Coleoptera and Lepidoptera. These orders were three of the five most abundant orders identified by Wharton et al. (1996) in 22 Golden-cheeked Warbler GI tracts that Pulich (1976) collected.

Species collected in 2010 at Wild Basin that are known to be, or thought to be undescribed species include the following chrysomelid beetles, Figs. 3-7:



Figs. 3-7, Undescribed species collected at Wild Basin, a) *Xanthonia* sp., b) *Xanthnia* sp., c) *Diachus* sp., d-e) *Pachybrachis* sp.

Photographs of every arthropod were posted in a Picasa folder labeled “Wild Basin” at Picasaweb.google.com/entomike/WildBasin. This site allows the thumbnail photos to be re-sized (larger or smaller) via a “slide bar” in the upper right.

The photos were also posted as thumbnails on my master site, Wild Basin Wilderness Preserve Invertebrate Survey: TexasEnto.net/Wild_Basin.html. Moving the mouse cursor (or “mousing”) over each thumbnail yields the scientific name of the invertebrate. Clicking on a thumbnail leads to a larger image on BugGuide.net. From there, one can access family-, genus- and species-level biological information.

In addition to the photographs, the other main product of this project were some 162 BugGuide web pages, or electronic fact sheets, that were created or enhanced for the species collected at Wild Basin. These pages can be accessed via the thumbnail photos posted at: TexasEnto.net/Wild_Basin.html. Once at a photo in BugGguide, click on the **Info**, **Images**, and **Data** tabs above the photo for more information.

Some of the more important data added to the Info pages on BugGuide is the species’ range, flight period, and plant associations. Depending on how entomologically well known a species is, the information accessed by clicking the **Info** tab can include some or all of the following: synonyms, etymology, number of species in the genus north of Mexico, size, identification tips, range, habitat, flight period, food, life cycle, remarks, similar species, references, and Internet links.

Flight periods and plant associations were added for many species from quantitative data previously collected in similar habitat in western Travis County by Quinn (2000). Other print references extensively consulted for the information posted to BugGuide are included in the primary literature section of this report.

Discussion and Conclusions – The numerous detailed close-up photographs and information pages produced by this project dovetail nicely with the Wild Basin Wilderness Preserve’s mission:

> “… to promote the importance of environmental education, research, conservation and preservation.”

This information is online where it can serve the needs of a wide range of scientists, wildlife managers, outreach specialists, as well as the general public.

Unfortunately, due to delays in getting permission to begin data collection until early May, the height of the collecting season was missed, see Fig. 2. I would like to carry out more research at Wild Basin Wilderness Preserve in the following yrs, but the amount of time available to volunteer towards this project in the future is unknown.

Future intended additions to this project include putting the 50,000 specimen database I compiled for my thesis (Quinn 2000) on-line and coupling it with images I shoot throughout central Texas.

Due to the late start, this project served as something of a pilot project as the 167 species photographed, in 10 Orders, and in 58 families, probably represent less than 5% of the total entomofauna in western Travis County. Quinn's (2000) thesis was the product of an small army of 20 student workers, tens of thousands of dollars of funding from TxDOT and the expertise of a significant portion of TAMU's Department of Entomology.

Given the late start, personal funding of several hundred dollars (not including camera and computer equipment) and the expertise of the on-line entomological community, I consider this project to be very successful, particularly as the results are on-line for all to access, unlike my thesis and database (Quinn 2000). If anyone knows of any potential funding sources, please let me know.

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