CLOPTON AND COOK - SURVEY OF BIG THICKET PSEUDOSCORPIONS

PRELIMINARY SURVEY AND INVENTORY OF PSEUDOSCORPIONS
OF THE PRIMITIVE TEXAS BIG THICKET

Project Description

We propose a partnership between R. E. Clopton (Peru State College, Peru Nebraska [PSC]) and J. L. Cook (Sam Houston State University, Huntsville, Texas [SHSU]) to establish a pseudoscorpion TWIG of the Big Thicket ATBI through a preliminary survey and inventory of pseudoscorpion diversity in the Primitive Texas Big Thicket.

Introduction

The pseudoscorpions are a cosmopolitan group of relatively small predatory arachnids that superficially resemble scorpions in their possession of enlarged pedipalps modified by the tarsal insertion to form chelate appendages (pinchers). Unlike the scorpions, the pseudoscorpions lack an elongated metasoma and telson (tail and sting). Pseudoscorpions are a meso-diverse group arachnids comprising ca. 3,200 species in 425 genera and 24 extant families worldwide (Harvey, 2002). Most species have been described since 1950 and the discovery of new species and genera continues as survey and inventory examines previously uncollected habitats and regions, even within the United States.

Existing Survey and Taxic Estimates.

Pseudoscorpions are primarily leaf-litter inhabitants but are also found in cave litter, bird and mammals nests, under loose and decaying bark, and in phoretic association with insects. Given their habitat preferences, the Primitive Texas Big Thicket is a likely bastion for pseudoscorpion diversity in North America north of Mexico. Approximately 250 pseudoscorpion species are known from the continental United States, primarily from areas of restricted survey California (Lee, 1979; Muchmore, 1980a, 1980b, 1984a); Colorado (Hoff, 1961); Illinois (Hoff, 1949); Michigan (Manley, 1969; Nelson, 1975); New Mexico (Hoff, 1959; Muchmore, 1976b) and South Dakota (Hoff, 1963a); and, Tennessee (Muchmore, 1966a, 1966b) as well as work in existing state collections in Florida (Hoff, 1963b, 1964a, 1964b; Muchmore, 1974a, 1974b, 1974c, 1975, 1976a, 1979; Brach, 1979). Records from Texas are limited and include some widely distributed species, but 60% of species reported from Texas are unique to the state and have not been collected since their original description (Table 1, Hoff, 1958; Muchmore 1969, 1984b). No published survey includes a systematic collection effort in Texas and no pseudoscorpion is reported from the Big Thicket region.

Reasonable taxic estimates of survey product can be drawn from work over comparable area and habitat. Hoff (1961) reported 28 species, including 5 new species, from 159 collections in Colorado. From approximately 350 collections in Illinois (including museum records), He reported 26 species, including 9 new species (Hoff, 1949). Nelson (1975) reported 29 species, including 2 new species, from ca. 170 collections in Michigan. These surveys suggest that in an area the size of the Primitive Big Thicket, one might reasonably expect to document 30-40 additional species.

| Table 1: List of Pseudoscorpion species reported from Texas, U.S.A. |
|--------------------|--------------------------|
| Also recorded outside Texas | Known only from Texas |
| Apocithonus moestus | Dinochelus aequalis |
| Chelifer cancroideis | Dinochelus stercoraeis |
| Lepromachus oblongus | Dinochelus texanus |
| Levichelifer fulvopictus | Hesperochernes unicolor |
| Parachelifer muricatus | Microcreagris infemalis* |
| Microcreagris rufula | Microcreagris reddelli* |
| Microcreagris rufula | Microcreagris texana* |
| Parachernes pulchellus | Pachyolpium minutum |
| Parachernes tumimanus | Withius texanus* |
| Withius vagrans* |

*cavernicolous species from west Texas
of pseudoscorpions of which ca. 10-20% will be new to science. The increased diversity reflects the significantly higher pseudoscorpion diversity known from Florida relative to other survey areas. As many pseudoscorpion genera are specialists restricted by the surrounding floral community, habitat complexity and disparity within the Big Thicket should also contribute to overall diversity. A reasonable taxic return can be expected from short preliminary survey: Hoff (1963a) reported 6 species, including 1 new species, with only 8 days of collecting in the Black Hills of South Dakota.

Project Methods.

Collecting, processing and disposition of specimens. Pseudoscorpions will be collected by hand-picking from logs, bark, stones, and other suitable habitat markers. Collections of duff and leaf-litter will be processed using Tulgren and Berlese funnels as outlined by Hoff (1949). All specimens will be preserved in 85-90% ethanol for identification and processing. Representative voucher specimens from all localities will be prepared as slide mounts following the procedure of Hoff (1949), and deposited in collections at Sam Houston State University and Texas A&M University. Where possible, specimens preserved in ethanol will be deposited with slide specimens for future genetic analysis or systematic revision. All by-catch will be roughly sorted and made available to systematic experts as appropriate and available.

Proposed survey localities. We propose an initial survey of up to 9 representative ecosystems within the Big Thicket as detailed in Figure 1 and Table 2.

Table 2. Big Thicket Project sample sites by ecosystem.

<table>
<thead>
<tr>
<th>Ecosystem</th>
<th>Sample site</th>
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<tbody>
<tr>
<td>Baygall</td>
<td>Jack Gore Baygall Unit*</td>
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<tr>
<td>Beech-Magnolia-Loblolly Pine</td>
<td>Big Creek Scenic Area*</td>
</tr>
<tr>
<td>Cypress-Tupelo slough</td>
<td>Double Lake*</td>
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<tr>
<td>Longleaf Pine upland</td>
<td>Beaumont Unit*</td>
</tr>
<tr>
<td>Oak-Gum floodplain</td>
<td>Big Sandy Creek Unit*</td>
</tr>
<tr>
<td>Palmetto-Hardwood flats</td>
<td>Harmon Creek*</td>
</tr>
<tr>
<td>Pine savannah wetlands</td>
<td>Lance Rosier Unit*</td>
</tr>
<tr>
<td>Arid sandylands</td>
<td>Little Pine Island Bayou Corridor Unit*</td>
</tr>
<tr>
<td>Slash Pine monoculture</td>
<td>Lance Rosier Unit*</td>
</tr>
<tr>
<td>Big Thicket National Preserve</td>
<td>Temple-Inland Research Site*</td>
</tr>
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</table>

Figure 1. The Texas Big Thicket. The shaded region in the upper map depicts the historical extent of the Primitive Big Thicket. Ecosystem sample sites are marked numerically (1, baygall; 2, beech-magnolia-loblolly pine; 3, cypress slough; 4, longleaf pine upland; 5, oak-gum floodplain; 6, palmetto-hardwood flats; 7, pine savannah wetlands; 8, arid sandyland; 9, slash pine monoculture). The lower map details the units of the Big Thicket National Preserve.
Table 1: List of Psudoscorpion species reported from Texas, U.S.A. (Data from Hoff, 1958; Muchmore, 1969)

<table>
<thead>
<tr>
<th>Also recorded outside Texas</th>
<th>Known only from Texas</th>
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</thead>
<tbody>
<tr>
<td>Apochthonius moestus</td>
<td>Dinocheirus aequalis</td>
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<tr>
<td>Chelifer cancroides</td>
<td>Dinocheirus stercoreus</td>
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<td>Lamproachines oblongus</td>
<td>Dinocheirus texanus</td>
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<td>Levichelifer fulvopalpus</td>
<td>Hesperochemes unicolor</td>
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<td>Parachelifer municatus</td>
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<td>Microcreagris rufula</td>
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<tr>
<td></td>
<td>Microcreagris texana*</td>
</tr>
<tr>
<td></td>
<td>Pachyolpium minutum</td>
</tr>
<tr>
<td></td>
<td>Parachernes pulchelius</td>
</tr>
<tr>
<td></td>
<td>Parachernes tumimanus</td>
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<tr>
<td></td>
<td>Withius texanus*</td>
</tr>
<tr>
<td></td>
<td>Withius vagrans*</td>
</tr>
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</table>

Data management. Field data is recorded in bound notebooks with serially numbered pages using a standardized record and field system. A standardized EXCEL worksheet detailing all collections, specimens, and depositions will be available after material has been processed.

Activity Schedule. We expect to begin survey in the late Fall, 2006 and to make up to 9 sample collections over the course of the following year. Material will be processed during this period to make more robust estimates of taxic richness and evaluate sampling resolution.

Funding. We will conduct the preliminary survey in conjunction with our on-going survey work in the area. Basic collecting and material supplies are available through institutional or existing support. We would like to attend the Big Thicket Conference to report our finding and coordinate the remaining soil-arthropod survey work with other workers and thus request funding to cover the cost of transportation and meeting costs for the Big Thicket Conference. We request $1500 to pay for airfare for REC, for transportation costs during travel, Conference registration, and supplies.

Literature Cited.
Harvey, M. S. The neglected cousins: what do we know about the smaller arachnid orders? The Journal of Arachnology 30:357-372.
Hoff, C. C. 1964b. Atemnid and cheliferid pseudoscorpions, chiefly from Florida. American Museum
Novitates 2198:1-43.


BIOGRAPHICAL SKETCH

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CONTACT INFORMATION
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PROFESSIONAL PREPARATION

<table>
<thead>
<tr>
<th>Institution</th>
<th>Degree</th>
<th>Year</th>
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<tr>
<td>University of Nebraska-Lincoln</td>
<td>Entomology</td>
<td>B.S., 1987</td>
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<td>University of Nebraska-Lincoln</td>
<td>Parasitology</td>
<td>Ph.D., 1993</td>
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<tr>
<td>Texas A &amp; M University (Post-Doc)</td>
<td>Insect Pathology</td>
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APPOINTMENTS

<table>
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<tr>
<th>Years</th>
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<tr>
<td>2005-present</td>
<td>Professor of Biology, Peru State College</td>
</tr>
<tr>
<td>2001-2005</td>
<td>Editor, <em>Comparative Parasitology</em></td>
</tr>
<tr>
<td>1999-2003</td>
<td>Head, Department of Natural Science, Peru State College</td>
</tr>
<tr>
<td>1998-2005</td>
<td>Associate Professor of Biology, Peru State College</td>
</tr>
<tr>
<td>1995-present</td>
<td>Foreign Agent, Harold W. Manter Laboratory for Parasitology,</td>
</tr>
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<td></td>
<td>University of Nebraska State Museum, University of Nebraska-Lincoln</td>
</tr>
<tr>
<td>1995-1997</td>
<td>Assistant Professor of Biology, Peru State College</td>
</tr>
</tbody>
</table>

EXTRAMURAL GRANTS FUNDED

- National Science Foundation: *Microbiological Survey & Inventory of gregarines parasitizing aquatic and riparian insects of the Texas Big Thicket*. Funded October, 2004 – October 2007; $200,000.
- National Science Foundation: Research Experience for Undergraduates Supplemental Grant. Funded: 2006-2007; $10,000
- National Science Foundation: *Microbiological Survey & Inventory: Eugregarinida (Protista: Apicomplexa) parasitizing selected mandibulate arthropods of the Nebraska Sandhills*. Funded: May 15, 1997-May 15, 2001; $177,780.

RECENT PUBLICATIONS


PROFESSIONAL PREPARATION:
University of Southern Colorado, Pueblo, CO Geology B.Sc. 1986
University of Southern Colorado, Pueblo, CO Zoology M.Sc. 1992
Texas A&M University, College Station, TX Entomology Ph.D. 1996
Texas A&M University, College Station, TX Entomology Postdoc Res. Assoc. 1996-97

APPOINTMENTS:
Associate Professor, Dept. Biol. Sci., Sam Houston State Univ., Huntsville, TX (2005-present)
Assistant Professor, Dept. Biol. Sci., Sam Houston State Univ., Huntsville, TX (1999-2005)
Assistant Research Scientist, Texas A&M Univ., College Station, TX (1997-1999)
Instructor, Texas A&M Univ., College Station, TX (1998)
Instructor, Blinn College, Bryan, TX (1996-1999)

RECENT PUBLICATIONS:

RESEARCH GRANTS AND CONTRACTS:
2006-2007. Texas Army National Guard. ($25,000)
2005-2006. Texas Army National Guard. ($40,000)
2004-2006. Texas Army National Guard. ($100,000)
2004-2007. RUI Collaborative Research, National Science Foundation. ($232,584)
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SYNERGISTIC ACTIVITIES:
Mentorship:

Undergraduate students:
Efthymios Gkotsailias, 2005; Entomotoxicology: Insects as Toxicological Indicators
Erica Eddins, 2005; Evaluation of Mosquito Control to Manage West Nile Virus in Montgomery County, TX
Jovanne Cole, 2006; A Distribution Study of Adult and Larval Damselflies of Double Lake
Edward Realoza, 2006; Composition of Gyrinid Aggregations in East Texas, Including the Big Thicket (Coleoptera: Gyrinidae) Texas
Sixteen additional undergraduate student projects before 2005

Graduate students (thesis advisor):
Robert Puckett, 2001-2003; Mayflies as bioindicators of east Texas stream water quality.
Melissa Layton 2002-2005; The ecology of Diadasia rinconis in central Texas, with an investigation of its parasites.
Kc Wendler 2003-2005; A seasonal faunal succession study in east Texas and development of the green bottle fly, Phaenicia coerulescensis.
Three additional current graduate students

Professional Memberships:
Entomological Society of America
Southwestern Entomological Society
Entomological Society of Washington
International Society of Hymenopterists
Coleopterists Society
Southwestern Association of Naturalists
Texas Academy of Science
American Entomological Society
New York Entomological Society
Int. Union for the Study of Social Insects
Entomology Collections Network
American Microscopical Society
Southwestern Association of Parasitologists
Am. Soc. of Ichthyologists and Herpetologists

Professional Service:
Reviewer for: Zoologica Scripta, Ecological Entomology, Southwestern Entomologist, Comparative Parasitology, Annals of the Entomological Society of America
Advisor appointment for: Houston Museum of Natural Science, Moody Gardens
Professional Leadership: Academic Director for Texas Academy of Science, President of Big Thicket All Taxon Biological Inventory

COLLABORATORS AND OTHER AFFILIATIONS:
Collaborators:
W.I. Lutterschmidt (Dept. of Biol. Sci., Sam Houston State Univ.), T. J. Cook(Dept. of Biol. Sci., Sam Houston State Univ.), D. C. Bates (Dept. of Sociology, Sam Houston State Univ.), C. T. Baldwing (Dept. of Geography, Sam Houston State Univ.), S. B. Vinson (see below), S. O'Keefe (Moorehead State Univ.), R. E. Clopton (Peru State College)

Graduate and Postdoctoral Advisors:
M.Sc. advisor - Dr. S. J. Herrmann, Dept. of Biology, Univ. of S. Colorado
Ph.D. Advisor - Dr. R. G. Gold, Dept. of Entomology, Texas A&M University
Postdoctoral advisor - Dr. S. B. Vinson, Dept. of Entomology, Texas A&M University