

Summary of Research Program of David B. Richman

INTRODUCTION: Over the last 27 years at NMSU I have concentrated on two related (but not always directly connected) areas of research. First the biological control of weeds and plant pests and second the taxonomy, biodiversity, ethology and life-histories of arachnids, especially spiders. These two research lines have often overlapped, starting with studies on spiders as predators of crop pests in soybeans and citrus while I was a postdoctoral student at the University of Florida, working under the direction of Willard H. Whitcomb. At New Mexico State they overlapped with studies on spiders as predators of pecan pests and as potential predators of the introduced leaf beetle, *Diorhabda elongata*, in a biological control program against tamarisk (saltcedar), a damaging Eurasian weed tree of waterways.

BIOLOGICAL CONTROL RESEARCH: When I first came to New Mexico State University in the summer of 1978, I was involved on research on the natural enemies of broom and threadleaf snakeweeds, both native weedy composite half-shrubs. These studies lasted for over 20 years and produced seven journal articles and one proceedings article (the last published in 2005), eleven extension publications and report chapters, and one Internet site. Results included data on the effects of the snakeweed long-horned beetle, the snakeweed flowerhead weevil, the snakeweed leaftier, the snakeweed leafhopper, the snakeweed grasshopper and a summary publication on insects that actually feed on woody snakeweeds. A description of a new species of parasitoid, *Cremastus crossidiae*, that attacks the snakeweed long-horned beetle, was published by Gupta (in Gupta and Richman 1986). Four of my seven successful M.S. graduate students were funded through this project. This project involved two of our three departmental disciplines.

The other project with which I was involved from 1978 to 1989 (with a break from April 1981 to January 1983, when I returned to the University of Florida for a second postdoctoral under Dr. Whitcomb) was the range caterpillar project. My work on this project produced or helped produce six journal articles, including several in the journals of the Entomological Society of America. Results included genetic and morphological verification of the range caterpillar populations in northern Mexico and documentation on egg and pupal parasitoids of this native range pest.

Later work involved studies on natural predators, including, parasitic Hymenoptera in various crops, spiders on alfalfa, cotton and pecans and as potential predators of an exotic biological control agent, and the leafhopper vector of curlytop virus in chili peppers. These have produced nine journal articles and three extension publications, two of which are currently in press. Three of my seven successful graduate students were funded through these projects. The curlytop virus project involved all of the disciplines represented in our department, as weeds serve as a reservoir for the virus (a plant pathogen) and the virus is transmitted by an insect.

One side result was the publication of the "Manual of the Grasshoppers of New Mexico", of which I was the senior author. This is now the standard manual for New Mexican short-horned grasshoppers.

ARACHNID BIODIVERSITY, TAXONOMY, BEHAVIOR AND LIFE-HISTORY RESEARCH: My training, both at the University of Arizona (B.S. 1970, M.S. 1973) and the University of Florida (Ph.D. 1977) centered on

invertebrate zoology, especially on arachnids. My M.S. thesis and Ph.D. dissertation focused on the taxonomy, morphology and ethology of jumping spiders (Salticidae), but under Dr. Whitcomb's direction at Florida I published on the life histories of both a salticid (*Lyssomanes viridis*) and a sparassid crab spider (*Heteropoda venatoria*). While at NMSU I have published revisions of the salticid genera *Naphrys* and *Chianattus* (as *Habrocestum*), *Hentzia* (two publications), *Thiodina* (with Rick Vetter at UC-Riverside), and *Sassacus*. In these thirteen new species were described. Publications included nine journal articles or notes, seven extension publications, two Internet sites and eleven book chapters. Of the latter, three were for the "Encyclopedia of Entomology" and summarized published research on jumping spiders sac spiders and scorpions, and the other eight were co-authored (four as senior and four as junior) chapters in the "Spiders of North America", which was a project of the American Arachnological Society. I was on the core committee (Spider Genera of North America Revision Team or SGNART) of the AAS to develop this manual. The manual is now the standard work for the identification of spiders in North America, north of Mexico, although it also covers the northern border states of that country. I have also co-authored review articles on the ethology and evolution of jumping spiders, the first being published both in Russia and in the United Kingdom.

Finally, my work on taxonomy resulted in the further development of the Arthropod Museum, which now contains an estimated 140,000 specimens, of which over 31,000 are databased. The collection serves as a repository for research voucher specimens, as well as a source for teaching, outreach and diagnostics specimens. As Curator of the Museum I have loaned materials out to other researchers working on revisionary projects on velvet ants, wolf, funnelweb, oonopid, zorocratid, salticid and theridiid spiders, short-horned grasshoppers, waterboatmen, long-horned beetles, and others. Collections such as the Arthropod Museum are important infrastructure components that back up major research efforts in the biological, chemical, and cultural control of pest insects and weeds, as well as taxonomic studies, and they provide vital data on biodiversity and ecological makeup of the agricultural and rangeland systems in which we work. With both biological control agents (such as *Diorhabda elongata*), and pest species (such as *Diaprepes abbreviatus*, the sugarcane root stalk borer weevil, which I worked on in Florida and Puerto Rico) it is necessary to understand their taxonomy (both beetle "species" are now known to really be a complex of species), their biology, and the ecological associations (both of which can differ greatly between nearly identical species), in order to properly understand the problems involved and to design rigorous research programs. Voucher specimens in well curated museums are vital to such work.