

A NEW PARASITOID OF *DANAUS GILIPPUS THERSIPPUS* (NYMPHALIDAE: DANAINAE) IN SOUTHEASTERN ARIZONA

**Additional key words:** *Brachymeria*, Chalcididae, Museum Collection, Voucher

The queen butterfly, *Danaus gilippus thersippus* (Bates) (Nymphalidae: Danainae) inhabits open woodland, grassland, and desert in the southwest United States. The larval host-plants in southeast Arizona include many members of Asclepiadaceae, but mostly *Asclepias* spp. and *Sarcostemma* spp. In general, *D. gilippus* is unpalatable to avian predators (Brower 1958) and sequesters cardiac glycosides from its larval host-plants (Cohen 1985), although investigations with the subspecies *thersippus* are lacking. There remains little published information on frequency and types of parasitism in the queen butterfly. *Brachymeria annulata* (Fabricius) (Hymenoptera: Chalcididae) (d'Araújo e Silva et al. 1968) and *Lespesia archippivora* (Riley) (Diptera: Tachinidae) (Arnaud 1978) are the two recorded queen parasitoids. In this study, we reared and identified *Brachymeria ovata* (Say) (Hymenoptera: Chalcididae) from five queen pupae.

*Brachymeria ovata* is around 5mm long with a black and yellow body. Its hind femora are black with a distal white or yellow spot. This species occurs across North and South America and is a primary parasite of over 100 lepidopteran species (Noyes 2004). *Brachymeria ovata* is commonly characterized as a larval-pupal parasitoid, ovipositing in a late stage larval host and emerging as an adult from the host pupa (Noyes 2004). In certain populations, *B. ovata* parasitizes over 55% of a single lepidopteran host species (Pemberton and Cordo 2001). Many *B. ovata* host species are chemically defended, although parasitism levels in these host species are poorly documented. For example, *B. ovata* parasitizes *Battus philenor* (L.) (Papilionidae: Papilioninae), which sequesters both alkaloids and aristolochic acids (Sims and Shapiro 1983); *Danaus plexippus* (L.) (Nymphalidae: Danainae), which sequesters cardiac glycosides (Halstead 1988); and *Utetheisa ornatrix* (L.) (Arctiidae: Arctiinae), which sequesters alkaloids (Rossini et al. 2000). Given the ability of *B. ovata* to circumvent host chemical defenses and observed high level of host parasitism, future research could investigate the relative tradeoffs of parasitism and predation in chemically defended butterfly species.

Five discolored pupae were collected from a garden of *Asclepias currasavica* (L.) (Asclepiadaceae) on the University of Arizona campus (USA, Arizona, Pima

County, Tucson) in September 2003. The unparasitized pupal color of *D. gilippus* is light green; however, these parasitized pupae were dark brown. All five pupae were reared in separate containers in the laboratory exposed to natural daylight. Each pupa yielded a single adult of *B. ovata* within three weeks, killing the host. *Brachymeria ovata* was previously unreported in Arizona, although it is known from New Mexico (Peck 1963). We also searched the University of Arizona Entomology Research Collection for other examples of *B. ovata* parasitism. We found *B. ovata* records for five lepidopteran host species in Arizona:

1) Host: *Danaus gilippus thersippus* (Bates) (Nymphalidae: Danainae) USA, Arizona, Pima County, Tucson, Arizona "A" Mountain, Roger Road, July 1969, Collected by R. Staciak (1 specimen associated with *D. gilippus* pupa);

2) Host: *Malacosoma californicum* (Pack) (Lasiocampidae: Lasiocampinae) USA, Arizona, Pima County, Sabino Canyon, April 06, 1957, Collected by Floyd Werner and George Butler, Reared from pupae (16 specimens associated with *M. californicum* pupae, another 56 specimens not associated with pupae);

3) Host: *Phaeostrymon alcestis* (Edwards) (Lycaenidae: Theclinae) USA, Arizona, Pima County, Santa Rita Experimental Range, Florida Canyon, May 1968, Collected by J. Hessel, Reared from pupae found on *Sapindus* (L.) (Sapindaceae), Specimens emerged June 02, 1968 (2 specimens associated with *P. alcestis* pupae);

4) Host: *Pontia protodice* (Boisduval & Leconte) (Pieridae: Pierinae) USA, Arizona, Maricopa County, Goodyear, October 07, 1955, collected by F.F. Bibby, Reared from pupae (5 specimens associated with *P. protodice* pupae);

5) Host: *Simyra henrici* (Grote) (Noctuidae: Acronictinae) USA, Arizona, Cochise County, Saint David, Pond on Apache Powder Road, September 1998, collected by C. Olson, Reared from pupae by M. Singer and J.O. Stireman III (2 specimens associated with *S. henrici* pupae). These specimens are currently housed in J.O. Stireman III's personal collection.

*Phaeostrymon alcestis*, *P. protodice*, and *S. henrici* are new host species records, and *P. alcestis* is a new host family record (Lycaenidae) for *B. ovata* (Noyes 2004).

This combined approach of field observations, laboratory rearing, and collection research was a simple yet fruitful method for documenting parasitoid host records. It exemplifies the importance not only of maintaining and utilizing museum collections, but also of vouchering parasitoids from butterfly rearing in museum collections (Peigler 1996). Our voucher specimens were deposited in the Entomology Research Collection at the University of Arizona, Tucson, USA.

We would like to thank M. Toliver and two anonymous reviews for helpful comments on this manuscript.

#### LITERATURE CITED

- ARNAUD, P.H. JR. 1978. A host-parasite catalog of North American Tachinidae (Diptera) United States Department of Agriculture, Miscellaneous Publication Number 1319. ii + 860 pp.
- BROWER, J.V.Z. 1958. Experimental studies in some North American butterflies. Part 3. *Danaus gilippus bernice* and *Limenitis archippus floridensis*. *Evolution* 12:273-285.
- COHEN, J.A. 1985. Differences and similarities in cardenoloid content of queen and monarch butterflies in Florida and their ecological and evolutionary implications. *J. Chem. Ecol.* 11:85-103.
- D'ARAÚJO E SILVA, A.G., C.R. GONÇALVES, D.M. GALVÃO, A.J.L. GONÇALVES, M. DO NASCIMENTO SILVA & L. DE SIMONI. 1968. Quarto catalogo dos insetos que vivem nas plantas do Brasil. Rio de Janeiro. 1: xxvii + 622 pp.
- HALSTEAD, J.A. 1988. First records of *Platychalcis* in North America and new host records of *Ceratomecia* spp. and *Brachymeria ovata* (Hymenoptera, Chalcidae). *Entomol. News* 99(4):193-198.
- NOYES, J.S. 2004. Universal Chalcidoidea database. <http://www.nhm.uk/entomology/chalcidoidea>. Natural History Museum. Department of Entomology. Cromwell Road, London SW7 5BD UK
- PECK, O. 1963. A catalogue of Nearctic Chalcidoidea (Insecta: Hymenoptera). *Can. Entomol. (Suppl.)* 30:859-863.
- PEMBERTON, R.W. & H.A. CORDO. 2001. Potential and risks of biological control of *Cactoblastis cactorum* (Lepidoptera: Pyralidae) in North America. *Flor. Entomol.* 84(4):513-526.
- PEIGLER, R.S. 1996. Catalog of parasitoids of Saturniidae of the world. *J. of Res. Lepid.* 33:1-121.
- ROSSINI, C., E.R. HOEBECK & V.K. IYENGAR. 2000. Alkaloid content of parasitoids reared from pupae of an alkaloid sequestering moth (*Utetheisa ornatrix*). *Entomol. News* 111(4):287-290.
- SIMS, S.R. & A.M. SHAPIRO. 1983. Pupal color dimorphism in California *Battus philenor* (L.) (Papilionidae): mortality factors and selective advantage. *J. Lep. Soc.* 37(3):236-243.

KATHLEEN L. PRUDIC, *Department of Ecology & Evolutionary Biology and Bio5: the Institute for Collaborative Bioresearch; Email: klprudic@email.arizona.edu* AND CARL OLSON, *Department of Entomology, University of Arizona, Tucson, Arizona 85721*