

## Molestan Blister Beetle

(*Lytta molesta*)

### Legal Status

*Federal:* None

*State:* California Species of Special Concern

*Global and State Conservation Status:* G2S2: Global rank, G2 = Imperiled: At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors; State rank, S2 = Imperiled: Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state.

*Recovery Plan:* None

### Species Description and Life History

Molestan blister beetles (*Lytta molesta*) are meloids thought to be dependant, to some degree, on dried vernal pool habitats (Holstein 1980 as cited in CDFG 2007). Adults are typically seen foraging on flowers for pollen, perianth structures, and fruit. Like other beetles in the family Meloidae, Molestan blister beetles can be identified to family by the presence of soft elytra (wing coverings), a fairly unusual 5-5-4 tarsal formula, and a pronotum that is narrower than both the head and upper margins of the elytra. The bodily fluids of blister beetles contain the skin irritant cantharadin, giving the family its common name (Borror *et al* 1989). It is possible that cantharadin acts as a protection against accidental beetle consumption by large herbivores, as some animals will avoid grazing on vegetation supporting large numbers of orange, red, or otherwise brightly colored blister beetles (Evans and Hogue 2006). When disturbed, meloid beetles will often purposely exude cantharadin-rich haemolymph from their leg joints, which can deter predation by small mammals and birds (White 1983).

The Molestan blister beetle can be further distinguished to species by their coloration, which is dark brown or black on the elytra and most of the head, as well the posterior, medial, dorsal surface and posterior margin of the pronotum. A wide, irregular orange band occurs dorsally along the anterior surface and lateral edges of the pronotum, although a small (as wide as the neck articulation) strip of black remains along the furthest anterior margin of the pronotum, giving the orange band a “dumbbell” shape when viewed from a head-on angle (MCZ 2006). Rarely, the pronotum is entirely black (CDFG 2007). A roughly arrowhead-shaped orange patch is located on the front of the head, centered just above two median ocelli. Additionally, the tarsi are only moderately curved, the hind trochanters (second segment of the leg) on males have a spine situated at the ventral margin of the apex, and females have sixth abdominal segments with notches or indentations along the tergal margins. As reported by CDFG (2007), Van Dyke (1929)

provides additional characters to separate the species from the related species *Lytta childi*.

Little is known about specific life history details of the Molestan blister beetle, but it is generally presumed that they share similar life history details with other species of *Lytta* or other similar meloids. The larvae of species in this genus are nest parasites of native, ground-dwelling, solitary bees (Evans and Hogue 2006), and target those bee species which frequently visit the same host plants on which the adult beetles forage. Within the bee nest, larval Molestan blister beetles consume the pollen stores collected by the bee for its own offspring, and usually consume the immature bee larvae at the same time. Meloid beetles undergo a specialized type of metamorphosis wherein the first larval instar (called a triangulin) has highly mobile, adult-like legs as opposed to the normal fleshy “prolegs” typical of most beetle larvae. It is unknown whether Molestan blister beetle triangulins actively burrow into the soil from their oviposition site to search out appropriate bee host nests, or if, as in the genera *Meloe* and *Nemognatha*, they climb up to flowers of plants visited by their bee host species. Meloid larvae with this latter strategy attach to foraging adult bees to be carried back to the nest by the bee itself. In both cases, once the triangulin parasitizes an appropriate host nest, later instars become progressively less active, until the sixth instar, or pseudopupa, has a thick exoskeleton and functionless legs. Larvae hibernate over winter in the pseudopupal form, and in the spring molt into the final, seventh, larval instar (Borror *et al.* 1989). Typically at this point, all of the host bee’s pollen stores (and probably the bee larvae itself) was consumed by the meloid larvae during the previous year, and therefore the seventh instar does not feed. The seventh instar instead quickly transforms to the true pupa, completing metamorphosis and emerging in the spring, presumably timed with their bee host species’ emergence. After mating, females excavate a small burrow in the soil, which she then covers following oviposition (CDFG 2007). Adults and larvae have been collected from April through June, but at no other times of the year (CNDDDB 2007).

### **Habitat Requirements and Ecology**

As with so many insect species, very little is known about the specific habitat requirements for Molestan blister beetles. Holstein (1980) reported that he did not find or collect them in grasslands lacking dried vernal pool habitat, and collected specimens foraging on the perennial clover *Trifolium wormskioldii* (CDFG 2007, CNDDDB 2007); however, this is only one correlative, subjective observation, and other collections do not provide similarly detailed habitat information that could corroborate this hypothesis. Others have collected adults foraging on lupines (*Lupinus* spp.) and the common non-native annual red-stemmed filaree (*Erodium cicutarium*), but provide no further data on other potential forage species, bee larval host, or habitat specificity (CDFG 2007). While additional collection and occurrence data and research are needed, a possible explanation for the species’ apparent reliance on vernal pool habitat, as well as their rarity, is that these beetles prefer solitary vernal pool bee specialists as hosts. So while it may be that Molestan blister beetles are only collected on dried, vernal-pool vegetation, an adjacent upland habitat matrix that supports native, ground-dwelling bee nests should be considered a necessary habitat component.

While adult blister beetles consume pollen and perianth parts while foraging, some species also act as pollen vectors for their forage plants. Pollen attaches to the underside of the beetle, its legs, and its head while foraging, and can be transmitted to the sexual structures of subsequently visited flowers, especially those with exerted stigmas. It is unknown which plant species these beetles effectively pollinate, but flowers with a simple, open morphology such as *Erodium* may be easily pollinated by accidental pollen transfer during beetle foraging activities. Alternatively, closed flowers with fused perianths such as those seen in *Lupinus* and *Trifolium* may be more likely to only be damaged by the beetle's foraging behavior, as pollen would most likely be deposited on the outside of the perianth of any uneaten flowers rather than on the stigma.

## Species Distribution and Population Trends

### *Distribution*

Distribution records for the Molestan blister beetle show that its range extends throughout the Central Valley from Kern County to Yolo County. It has been collected in Central Valley annual grasslands in Fresno, Contra Costa, Merced, Madera, Tulare, Kern, and Yolo counties. CNDDDB (2007) reports one vouchered record from Yolo County, a 1956 collection from the Cache Creek Canyon area, in the Glascock Mountain 7.5-minute USGS quadrangle (Occurrence #16 for Element IICOL4C030). However, given the descriptions of habitat from which the species has been collected in other counties, much of Yolo County's annual grasslands, especially those supporting vernal pools, may represent suitable habitat for the species.

### *Population Trends*

Actual population trends for the Molestan blister beetle are unknown, but the CNDDDB reports no official collection records for the species since 1980 (CNDDDB 2007). Halstead and Haines (1992) described new distributional records for the species, extending records to Madera County, but give no date of the collection that prompted this reassessment of range for the species, and given other records they discuss, the referenced collection could have dated to early as the 1930s. According to CNDDDB records, the species was collected relatively frequently in the mid 20<sup>th</sup> century compared to recently, with the majority of collections with a known collection year occurring in the 1950s. Some collections and descriptions of populations indicate that when and where the beetle is present, it often occurs in large numbers, as one collection was of 1,136 larvae, and possibly in the same year at this same site, 64 adults (Occurrence #10 for Element IICOL4C030). Other collections describe 52 (Occurrence #11), 8 (Occurrence #14), and "an unknown number" or "several" (Occurrences #1 and 15) adults being collected at once, while another record indicates a collection of 1,800 larvae (Occurrence #4). This is not unusual among meloid beetles, which are often locally but ephemerally abundant (White 1983). Other species of meloid beetles, including other species of *Lytta*, are often found swarming over preferred host plants in great numbers (Evans and Hogue 2006). Like other meloid beetles, individual populations of Molestan blister beetles may

undergo dramatic boom and bust cycles, appearing in great numbers in favorable years and appearing locally absent or very rare at other times. This increases the chance to locate populations in good years but also increases the chance of overlooking populations, or incorrectly assessing historic populations as extirpated, in “bust” years.

### **Threats to the Species and Other Conservation Issues**

In the absence of other species-specific information it can only be assumed that the primary threat to the Molestan blister beetle is past and ongoing habitat loss, specifically of Central Valley annual grassland habitat. Presumably, the species is closely tied to dried vernal pool habitat (Holstein 1980 as cited in CDFG 2007); potentially further restricting the amount of remaining suitable habitat for the species. A related threat to the species may include increasing rarity or extirpation of populations of native, ground-dwelling, solitary bee species preferred by the Molestan blister beetle as larval hosts, although it is currently unknown which specific (or how many) bee taxa the Molestan blister beetle utilizes as larval hosts. A more general threat may include the increasing area within Central Valley grasslands that is heavily and routinely sprayed with pesticides for agricultural activities and mosquito-abatement programs.

The most significant data gaps relating to many aspects of the ecology of the Molestan blister beetle include minimum patch size for successful breeding colonies, parameters of population sinks, specific habitat and host plant requirements, which native bee taxa provide suitable larval host habitat, and the degree of host-specificity the species shows to both adult forage plants and larval bee hosts.

While it is unknown whether the Molestan blister beetle absolutely requires dried vernal pool habitat, the best habitat information from available collection records indicate that at least in some circumstances, the species prefers and utilizes this habitat type above other, even adjacent, grassland communities. Therefore, dried vernal pools, both those with native plants such as *Trifolium wormskioldii* as well as heavily invaded vernal pools with large populations of red-stemmed filaree, should be considered to be potential habitat for the species.

### **Contributors to this species account:**

Kelly Hardwicke, HT Harvey & Associates  
Steve Heydon, UC Davis Bohart Museum of Entomology

### **References**

Borror, D.J., C.A. Triplehorn, and N.F. Johnson. 1989. *An Introduction to the Study of Insects*, 6<sup>th</sup> Ed. Thomson Learning Inc., Singapore. xiv + 875 pp.

- California Department of Fish and Game (CDFG). 2007. Species Account for the Molestan blister beetle (*Lytta molesta*). Prepared by Sandra Shanks. Accessed online from The Department of Fish and Game Biogeographic Data Branch (<http://www.dfg.ca.gov/bdb/html/invertebrates.html>) on 9 August 2007.
- California Natural Diversity Database (CNDDDB). 2007. Rarefind. California Department of Fish and Game, Sacramento, CA.
- Evans, A.V, and J.N. Hogue. 2006. *Field Guide to Beetles of California*. University of California Press, Berkeley. xiv + 334 pp.
- Halstead, J.A., and R.D. Haines. 1992. New distributional records for some candidate species of *Lytta* in California (Coleoptera: Meloidae). *Pan-Pacific Entomologist* 68(1): 68-69.
- Holstein, G. 1980. As cited in [CDFG 2007]. Letter to Dr. John Pinto with collection information for *L. molesta*.
- MCZ Type Database @ Harvard Entomology. 2006. Accessed online at <http://mcz-28168.oeb.harvard.edu/mcz/index.htm> on 9 August 2007.
- Selander, R.B. 1960. Bionomics, systematics, and phylogeny of *Lytta*, a genus of blister beetles (Coleoptera, Meloidae). *Illinois Biological Monographs* 28:1-295.
- Van Dyke, E.C. 1929. New species of Meloidae (Coleoptera). *Bulletin of the Brooklyn Entomological Society*. 24(3):127-133.
- White, R.E. 1983. *A Field Guide to the Beetles*. Houghton Mifflin Company, Boston. xii + 368 pp.