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NEW RECORDS OF THREE NON-NATIVE DARKLING BEETLES (COLEOPTERA: TENEBRIONIDAE) ESTABLISHED IN CALIFORNIA AND NEVADA, USA

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ABSTRACT

Recent California collection records for three adventive species of soil-dwelling darkling beetles (Coleoptera: Tenebrionidae) are provided, with observational notes on habitats and spread. *Gonocephalum sericeum* (Baudi), a widespread, synanthropic species in northern Africa and Middle East, is reported from the Western Hemisphere for the first time. The species is illustrated and diagnosed, and the genus is incorporated into a key to North American Opatrini. *Gondwanocrypticus platensis* (Fairmaire), a South American species of Crypticini often associated with nest debris of imported fire ants, has spread widely in southern California. *Opatroides punctulatus* Brullé, first discovered in the Sacramento area in 2003–2008, has recently been found in abundance in and around Reno, Nevada and is spreading to new California counties. All three species are thought to be facultative opportunistic ant associates in disturbed habitats.

Key Words: Crypticini, *Gondwanocrypticus platensis*, *Gonocephalum sericeum*, Opatrini, *Opatroides punctulatus*, introduced insects, myrmecophile, omnivory, pest, Chuck Triplehorn

*Most children collect insects (at least fireflies),
and most of them get over it in time.*

*Those of us who don't
are called entomologists.*
— Charles A. Triplehorn

Of the 447 species of darkling beetles (Coleoptera: Tenebrionidae) known to occur in California, USA (Aalbu and Smith 2014), 20 are considered to be cosmopolitan or nearly so, and many of these have pest status. Three of these are geophilous species that have been identified recently, probably representing new introductions and colonizations far from their native ranges. All have been found in disturbed, open roadside or turf habitats, usually under matted plant debris, wood, or stones, and often associated with exotic ant species. Below, we detail known new collection records for *Gonocephalum sericeum* (Baudi) and *Opatroides punctulatus* Brullé (Opatrini) and *Gondwanocrypticus platensis* (Fairmaire) (Crypticini) in order to document the spread of these exotic species.

While never having been his students in a formal sense, Charles A. Triplehorn has influenced our entomological activities for many years. We dedicate this study to Chuck and value his friendship, storytelling, pursuit of darkling beetles, and productive career as a foremost entomologist.

MATERIAL AND METHODS

Specimens are deposited in the United States National Museum of Natural History (USNM), Smithsonian Institution, Washington, DC, unless

noted as “RLA” indicating specimens in the Rolf L. Aalbu Collection, El Dorado Hills, California or “SBM” for specimens in the Santa Barbara Museum of Natural History, Santa Barbara, California. Specimen label data are quoted verbatim, with commas inserted for clarity; breaks between labels are separated by a forward slash. Inferred data and additional characters added in abbreviations are in brackets. The numbers of specimens in series bearing the same data follow in parentheses.

RESULTS

Gonocephalum sericeum (Baudi, 1875)

Gonocephalum Solier is a large genus of several hundred species worldwide (Iwan *et al.* 2010). No members are native to the Americas, but some adventive specimens have been noted previously. Occurrences of *Gonocephalum bilineatum* Walker on the eastern and western coasts of North America were reviewed by Aalbu and Triplehorn (1985), with notes on its taxonomic history and conclusion that these apparently did not result in established introductions. The genus was therefore not included in recent keys to North American opatrine Tenebrionidae. However, a second species newly reported here, *G. sericeum*, apparently is established in southern California, based on recent collections and images of live beetles. This species was recently recognized and separated among a complex of similar synanthropic species (Ferrer 2010) that are prone to colonization in regions outside their known native range. Some are considered to be agricultural pests,

damaging various vegetable crop seedlings and young plants (Medvedev 1968; Rodríguez *et al.* 2008).

During December 2010 in Orange County, California, the collection of a series of female beetles, immediately recognized as a species of *Gonocephalum*, prompted a search for other records and a possible species identification. It was soon discovered that images of identical live beetles from nearby localities had been posted by insect photographers on the popular website BugGuide (2015a), with the following data: “Shipley Nature Center, Huntington Beach, Orange County, California, USA, May 26, 2008; Found three of these on the underside of a piece of dead bark on the path” (photograph by Elliotte Rusty Harold); “Palos Verdes Peninsula, Los Angeles County, California, USA, June 18, 2011” (photograph by Emile). With a “search image” for this species, a single male specimen was located among unsorted specimens of *Blapstinus* Sturm in the USNM collection, which had been found by Robert F. Denno at the same locality 30 years prior to the collection above.

Specimens Examined. “CALIFORNIA: Orange Co., Newport Beach, 26 December 1980, R. F. Denno” (1 male); “CALIFORNIA: Orange Co., Newport Beach, Back Bay, 33°38'02"N, 117°53'06"W, 16 December 2010, under matted dead grass at roadside, sandy soil / W. E. Steiner, J. M. Swearingen, N. J. Vandenberg, M. A. Brown, collectors” (8 females).

While this species has been established in California for at least 35 years, it has apparently not spread as aggressively as have some other exotic species. Its native distribution includes northwestern Africa and the Arabian Peninsula, and it has been introduced to Spain (Ferrer 2010; Iwan *et al.* 2010).

Diagnosis. In keys to the genera of North American Opatrini (Aalbu and Triplehorn 1985; Aalbu *et al.* 2002), *Gonocephalum* runs to the couplet containing the monotypic genera *Ephalus* LeConte and *Pseudephalus* Casey, which are flightless, convex, and very different in appearance from *Gonocephalum* species. The following couplet is inserted in the key of Aalbu *et al.* (2002) to separate *Gonocephalum* from these genera:

- 3a(2). Body form broadly oval, convex; front tibiae apically broad, spatulate.....3b
 - Body form elongate oval, not very convex; front tibiae unmodified..... *Gonocephalum*
 3b. Elytra without striae, but with dense, confused granules..... *Ephalus*
 - Elytra with punctate striae, fine granules on intervals only..... *Pseudephalus*

Gonocephalum sericeum is dark brown to nearly black, 8.0–9.5 mm long and widest at mid-length

of elytra, 3.5–3.8 mm (Fig. 1). Specimens have been confused with *Blapstinus dilatatus* LeConte, which are of similar size and may co-occur in sandy soil habitats. In *G. sericeum*, the cuticle is shiny, but in some specimens it may bear soil encrustations that obscure this. The eyes are deeply emarginate but not divided by the epistomal canthus as in species of *Blapstinus*. The epipleura end before the elytral apex, not entire as in *Blapstinus* species. The head and pronotum are granulate, not punctate, with decurrent, thick, golden setae; the elytra have punctate striae with relatively smooth intervals bearing similar setae (Fig. 2).

No ant associations of *G. sericeum* have been recorded in California, but myrmecophily in a related *Gonocephalum* species has been reported (Bakr *et al.* 2007). In Orange County, *G. sericeum* co-occurs with the following species, a known facultative myrmecophile.

Gondwanocrypticus platensis (Fairmaire, 1883)

Mention or listing of this South American species as occurring in California (Steiner 2010; Aalbu and Smith 2014; Steiner and Swearingen 2014) is substantiated below with specimen label data. Images have also been posted on BugGuide (2015b) with the following information: “Palm Springs, Riverside County, California, USA, June 26, 2012” (photograph by Stephen Luk); “Long Beach, Los Angeles County, California, USA, April 8, 2014” [and January 27, 2012] (photograph by Kim Moore); “University Community Park, Irvine, Orange County, California, USA, May 18, 2013” (photograph by Ron Hemberger); “Webb Canyon, ~2000 ft. elevation, Los Angeles County, California, USA, March 18, 2009” and “April 7, 2010” (photograph by Harsi S. Parker).

Specimens Examined. “CALIFORNIA: Alameda Co., Livermore, 37°40'54"N, 121°46'07"W, 11 October 2009, coll. W. E. Steiner & J. M. Swearingen” (4, + associated ant *Tetramorium* sp. possibly *caldarium* (Roger)); “Fresno Co., Fresno, near airport, 36°46'22"N, 119°44'12"W, 18 October 2009, coll. W. E. Steiner & J. M. Swearingen” (1); “Kings Co., 7 km N Avenal, 36°04'02"N, 120°06'21"W, 12 October 2010, coll. W. E. Steiner & J. M. Swearingen / Under stones and leaf litter, roadside turf on sandy clay soil” (1, + associated ants *Solenopsis xyloni* McCook); “Merced Co., Merced, 37°18'12"N, 120°29'54"W, 11 October 2009, coll. W. E. Steiner & J. M. Swearingen” (7, + associated ants *Linepithema humile* (Mayr)); “Orange Co., Newport Beach, 33°38'24"N, 117°52'32"W, 16 December 2010 / W. E. Steiner, J. M. Swearingen, N. J. Vandenberg, M. A. Brown, collectors” (1); same data except “Back Bay, 33°38'02"N, 117°53'06"W, under

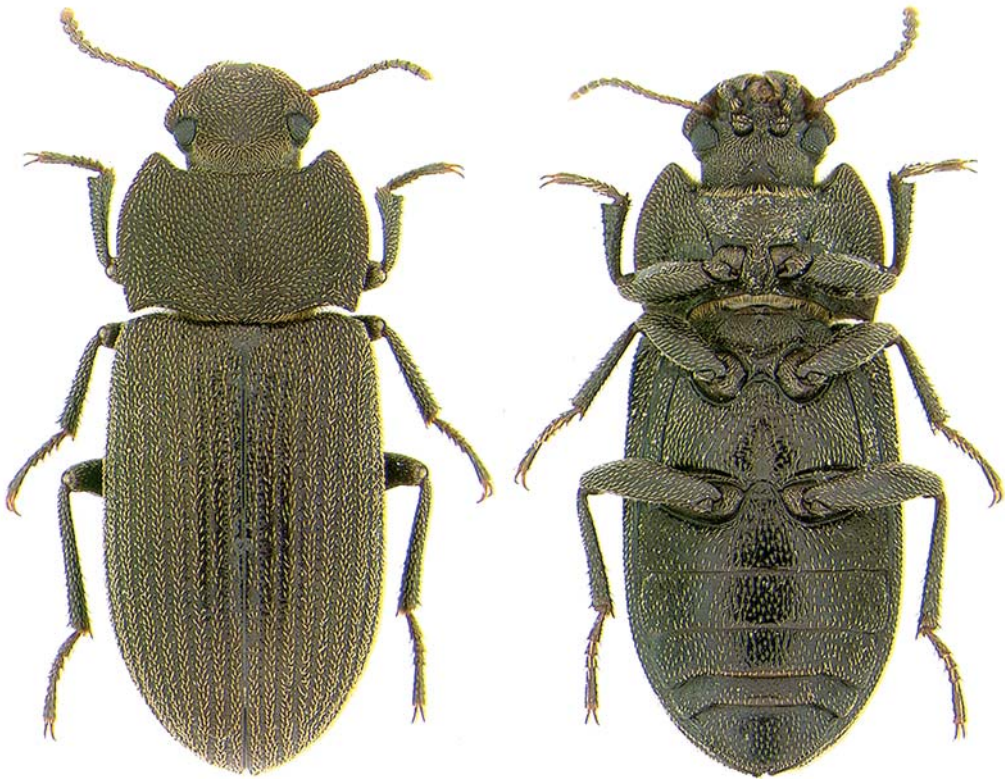


Fig. 1. *Gonocephalum sericeum*, female, dorsal and ventral view. Total body length = 8.9 mm.

matted dead grass at roadside, sandy soil” (1 seen but not captured); “**Riverside County**, Palm Desert, 33°43'15"N, 116°21'45"W, 9 June 2010 / Under grass thatch and leaf litter, open edge of



Fig. 2. *Gonocephalum sericeum*, detail of elytron and suture.

sandy turf; coll. W. E. Steiner & J. M. Swearingen” (12, + associated ants *S. xyloni*); “**CALIFORNIA: San Mateo Co.**, San Bruno, Forest Lane Park, 37°37'58"N, 122°25'05"W, 22 October 2010 / Under matted grass thatch on sandy soil, edge of open turf; colls. W. E. Steiner & J. M. Swearingen” (10, + associated ants *L. humile*); “**Stanislaus County**, 2 km SE. Turlock, 37°27'58"N, 120°49'37"W, 11 October 2009 / W. E. Steiner & J. M. Swearingen collectors” (1, + associated ants *Tetramorium* sp. possibly *caldarium*, *Solenopsis* probably *aurea* Wheeler); “**San Diego County**; Fashion Valley, 32°45'56"N, 117°10'03"W, 12 December 2007 / W. E. Steiner & J. M. Swearingen collectors” (12, + associated ants *L. humile*); same data except “12 December 2010” (3, + associated ants *L. humile*).

Our 2007 collection of *G. platensis* in San Diego County is the earliest known record for the state; it has evidently spread rapidly northward to the San Francisco Bay area. We have searched suitable habitats in the Napa Valley and north to Chico during 2009–2014 without detecting the beetle, but its further spread to these areas is anticipated. Whether the beetle arrived in California via Mexico

or was introduced from the southeastern US (*e.g.*, transported in potted plants) is curious speculation. Earliest US specimen records indicate spread from Mobile, Alabama after 1929 across the southeastern states from Delaware to Texas (Steiner and Swearingen 2014), where it can be very abundant and often associated with debris around ant nests. It is thought to have been introduced to this region in association with imported fire ants (*Solenopsis* Westwood). This “weed species” has also reached the Bahamas (Steiner 2011) and Cayman Islands (Thomas *et al.* 2013). California collections with associated ants have involved primarily non-native ant species. The Argentine ant, *L. humile*, was also associated with *Opatroides punctulatus* Brullé in the Sacramento area (Aalbu *et al.* 2009).

Opatroides punctulatus Brullé, 1832

First discovered in the Sacramento area during 2003–2008 (Aalbu *et al.* 2009), this species was recently found in abundance in and around Reno, Nevada, and in California it is spreading to additional counties. The species is widespread in the Mediterranean Region and three subspecies have been recognized (Ferrer 2005), but the origin of the US population has not been determined.

Specimens Examined. “**CALIFORNIA:** **Butte Co.**, Chico, in town, 39°43'37"N, 121°50'14"W, 7 October 2014, coll. W. E. Steiner & J. M. Swearingen” (1); “**CALIFORNIA:** **Merced Co.**, Santa Nella, 37°06'07"N, 121°0'59"W, 12 October 2010, coll. W. E. Steiner & J. M. Swearingen” (2); “**CALIFORNIA:** **Colusa Co.**, Maxwell Rest Area, 39°14'25"N, 122°10'47"W, 7 October 2014, coll. W. E. Steiner & J. M. Swearingen / Under rock and thick matted grass thatch on loose soil, open roadside” (12); “**CALIFORNIA:** **El Dorado County**, El Dorado Hills, 38°38'20"N, 121°04'54"W, 18 June 2012 / Running on ground in open dry grassland; colls. R. L. Aalbu, W. E. Steiner & J. M. Swearingen” (2); same data except “Under dead vole in open dry grassland” (10); same data except “38°38'17"N, 121°04'36"W / Found running on ground midday, open patio” (1); same data except “20 June 2012” (3); same data except “20 June 2012 / Under leaf litter in soil depression, garden near wall” (4); same data except “11 October 2014 / On ground at night” (1); same data except “except “12 October 2014 / Under rocks on clay soil in open garden” (3); “**CALIF.**, El Dorado County, El Dorado Hills, XI-28-2011, 38°38'[] 16.69"N, 121°04'37.21"W, 538', under rocks, R. Aalbu” (10 RLA); “**CALIFORNIA:** **Placer Co.**, 5 km N Folsom, east of Folsom Lake, 38°43'44"N, 121°10'45"W, 20 June 2012 / Under leaf litter on dry hard soil at roadside; coll. W. E. Steiner & J. M. Swearingen” (5); “**CALIFORNIA:**

Sac[ramen]to Co., Folsom, 38°40'16"N, 121°09'18"W, 19 June 2012, W. E. Steiner *et al.* / Under wind-blown leaf litter on pavement, at curb corners near hedge plantings” (2); “**CALIFORNIA:** Sacramento County, Intl. Airport terminal, 38°41'31"N, 121°35'12"W, 1 July 2012 / Under wind-blown debris on pavement, at curb near hedge planting; colls. W. E. Steiner & J. M. Swearingen” (2); “**CA, Santa Barbara Co.**, 34.4537, -119.8139, Goleta, N. Kellogg Ave., 07 June 2010, coll. M. & K. Caterino” (1 SBM); “**CA, Santa Barbara Co.**, 34.3997, -119.7024, Santa Barbara, Leadbetter Beach, 26 February 2012, coll. Y. Gomy & N. Degallier” (1 SBM); “**CALIF., Tehama Co.**, outside of Inskip Cave lava tube, under bark, V-29-2004, R. Aalbu” (1 RLA); “**CA, Ventura Co.**, 34.3940, -118.9259, W. Ventura St., 07 June 2010, coll. K.J. Hopp” (1 SBM). “**NEVADA: Washoe County**, Reno, at airport, 39°30'15.5"N, 119°46'34"W, 19 November 2011, coll. W. E. Steiner (9); **NEVADA:** Washoe County, Reno, parking lot edge near Convention Center, 39°29'29"N, 119°48'47"W, 15 November 2011, coll. W. E. Steiner & J. M. Swearingen” (29, + 1 associated larva); “**NEVADA:** Washoe County, Reno, south of Virginia Lake, 39°29'48"N, 119°48'27"W, 18 November 2011, coll. W. E. Steiner” (5); **NEVADA:** Washoe County, Sparks, cobble garden along Nugget Avenue, 39°32'01"N, 119°45'05"W, 18 November 2011, coll. W. E. Steiner” (10); same data except “curb garden along Nugget Avenue, 39°31'58"N, 119°45'40"W, 19 November 2011” (3); same data except “roadside of S. Stanford Way, 39°31'56"N, 119°44'36"W, 18 November 2011” (22); same data except “N[orth]. levee area along Truckee River, 39°31'04"N, 119°44'30"W” (14).

All Nevada specimens were found under rocks and leaf litter in urban roadside areas and often in curb garden plantings. The series taken near the Reno Convention Center represents a fraction of the population observed at the site, many clusters of beetles being found under rocks or soil clumps among leaf litter on open ground. It is interesting to note that the same site was sampled three years prior (November 2008), but no *O. punctulatus* were found at the time. However, a series of *Blapstinus discolor* Horn was taken in the same microsites. No *Blapstinus* or other beetles were found there in 2011, indicating that *O. punctulatus* had arrived in the Reno area after 2008 and is possibly displacing the native Tenebrionidae in the same habitats.

The agricultural pest status of *O. punctulatus* was reviewed (Aalbu *et al.* 2009) with mention of its potential as a turf pest. The beetle could also become a household nuisance pest in North America. A fully winged species, it was observed in Israel to enter a dwelling “attracted by lights” (Kaufmann 1969) and soon after was found feeding on various

stored foods. Kaufmann (1969) found *O. punctulatus* to be omnivorous and “preferred meat to all other food”, including both raw and cooked meat of several kinds; on a diet of cereal alone, development of larvae to adults was proven doubtful, but those feeding on meat grew faster, larger, and with more vigor. Our observation of the cluster of beetles under a dead vole suggests that, while moisture may be the initial attractant, carrion may serve as food for the breeding of *O. punctulatus* in the field, given suitable soil conditions and other ecological factors.

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