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## A NEW LARVAL FOOD PLANT, COLLINSIA CONCOLOR, FOR THE ENDANGERED QUINO CHECKERSPOT, EUPHYDRYAS EDITHA QUINO

Additional key words: Antirrhinum, Plantago, Cordylanthus, Castilleja, diapause

Before the Quino checkerspot, Euphydryas editha quino (Behr), was placed on the federal endangered list, larvae of this checkerspot were only known to feed on erect plantain, *Plantago erecta* E. Morris (Plantaginaceae) (Emmel & Emmel 1973, Mattoni et al. 1997, Osborne & Redak 2000). Recently, Plantago patagonica Jacq. (Plantaginaceae), Antirrhinum coulterianum Benth. (Scrophulariaceae), Castilleja exserta (A. A. Heller) (Scrophulariaceae), and Cordylanthus rigidus (Benth.) **Jepson** (Scrophulariaceae) were added as ovipositional food plants for this checkerspot (Pratt et al. 2001). Plantago.. patagonica and A. coulterianum were identified as major prediapause and postdiapause larval food plants at elevations higher than 1,300m, seven kilometers south-southwest of Anza, Riverside County, California. It appears that A. coulterianum is the preferred ovipositional food plant where both *P. patagonica* and *A.* coulterianum co-occur, but during drought years, when A. coulterianum does poorly, P. patagonica becomes the main food plant (Pratt et al. 2001).

Observation numbers of prediapause larval clusters vary with plant species. There have been hundreds of clusters observed on *Plantago erecta* at many locations, over 50 on Plantago patagonica, and over 130 on Antirrhinum coulterianum (Pratt et al. 2001). Yet only two larval clusters have been observed on Castilleja exserta and five clusters on Cordylanthus rigidus in a region ten to thirteen kilometers west of Tecate, San Diego County, California (Pratt et al. 2001). Since C. exserta and C. rigidus are abundant at Quino checkerspot occupied sites, it is surprising that more checkerspot larval clusters have not been observed on these plants. So far, C. rigidus is used as a prediapause food plant only where P. erecta is present for postdiapause larvae. The advantage of Cordylanthus in these areas is that P. erecta is often a poor prediapause food plant since it dries out early in the season, while C. rigidus continues to grow well into summer.

Although Quino checkerspot larvae have been found on larval food plants below 900m (the upper elevation range for *Plantago erecta*) and above 1,300m, no larval food plants are known between 900 and 1,300m. While searching for ovipositional and prediapause food plants on 13 April 2008, twenty kilometers southwest of Anza,

Riverside County, California, at 1,050m elevation, Pratt observed a female Quino checkerspot crawling over the ground with its abdomen curled under. Even though no known food plants were observed in the area, this observation was believed to be an ovipositional search behavior. Upon closer examination, Pratt observed numerous tiny *Collinsia concolor* E. Greene plants forming a ground cover. These plants were a reddish brown color blending with the soil surface. Pratt searched the nearby *Collinsia* and found a large, partially hatched egg cluster under a *Collinsia* leaf (Figure 1). Freshly eclosed larvae were found on a nearby leaf.

When Pratt and Pierce returned to the area on 19 April 2008 they found approximately 20 prediapause Quino checkerspot larval clusters at elevations that ranged from 1,050 to 1,075m. These larvae were in first to third instar. Despite extensive searching, no larval clusters were observed on nearby Castilleja exserta and Antirrhinum coulterianum.

After observing prediapause larval clusters on Collinsia concolor, Pratt was able to locate additional clusters on this plant species at other locations. At eight kilometers south-southwest of Anza at 1,366m on 5 May 2008 a prediapause Quino checkerspot larval cluster was found on a *C. concolor* plant at the northern open edge of one large Collinsia patch on a north facing slope (Figures 2 & 3). Over 40 additional larval clusters were found on Collinsia also on north facing slopes at eight kilometers south of Anza at 1,270m on 6 May 2009. extensive searching of neighboring Antirrhinum coulterianum plants, no larval clusters were found on this snapdragon, even though larval clusters were common on Antirrhinum at 8.5km southsouthwest of Anza on south facing slopes on 5 May 2008.

Quino checkerspot females oviposit in nature upon Plantago erecta, Plantago patagonica, Collinsia concolor, Antirrhinum coulterianum, Cordylanthus rigidus, and Castilleja exserta. Although C. rigidus and C. exserta are placed in the Scrophularaceae along with C. concolor and A. coulterianum, recent DNA studies show that Plantago species in the Plantaginaceae are more closely related to Collinsia and Antirrhinum than they are to Castilleja and other parasitic members of the

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FIGS.1-3. 1. Partially hatched Quino checkerspot egg cluster on *Collinsia concolor* twenty kilometers southwest of Anza, Riverside County, California. 2. *Collnsia concolor* plant eight kilometers south-southwest of Anza, Riverside County, California with first instar Quino checkerspot larvae. 3. First instar Quino checkerspot larvae at the base of a *Collinsia concolor* plant.

Scrophularaceae (Olmstead et al. 2001). Cordylanthus is a parasitic member of the Scrophularaceae (Hickman 1993). Olmstead et al. (2001) place the parasitic members of the Scrophularaceae in the Orobanchaceae and Antirrhinum, Collinsia, and Plantago in the Veronicaceae. Searches for Quino checkerspots should occur in areas that have sufficient quantities of these plants to support larval development to adults. The only exceptions are C. rigidus and C. exserta, which may require extensive stands of other food plants to support complete larval development.

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