

Ancient Ant

(*Pyramica reliquia*)



© P.S. Ward

Legal Status

Federal: None

State: None

Global and State Conservation Status: GNRSNR: No official global or state endangerment ranking.

Recovery Plan: None

Species Description and Life History

Ancient ants (*Pyramica reliquia*) are cryptobiotic (going dormant when water supplies run out) riparian or mesic lowland specialists. In North America, most members of this genus occur in the southeastern United States, with only two native species (*P. reliquia* and *P. californica*) occurring in California (P. Ward, pers. com.). Like other ant species, ancient ants have a highly organized and specialized society, and differing sexes or castes may exhibit a different appearance. Ancient ants are small sized ants, with a pyriform (pear-shaped) head that is longer than it is wide, and relatively large mandibles tipped with 5 teeth (Ward 1988). The head, including the rounded clypeus, is densely pilose (hairy), textured, and opaque, except for a shiny frontal triangle. This species was originally described in the genus *Smithistruma*, but that genus has now been subsumed under *Pyramica* (Ward 2005).

While not much is known about the specific biology of ancient ants, they belong to a genus that is well-represented in the eastern United States, but is fairly depauperate in the west (Ward 1988). These ants are mesic habitat specialists, and have been recorded occurring with valley oak (*Quercus lobata*) in lowlands or riparian corridors. It is thought that the few populations that remain of ancient ant, as well as other mesic habitat specialist, cryptobiotic ants, are remnant populations of once more widespread mesic ants that retreated to the lowlands and riparian zones throughout the arid west.

Ancient ants are specialized predators of collembolans (springtails), which are minute, wingless soil arthropods. Ward (1988) trapped specimens of this ant in a thick layer of valley oak leaf litter, leaf mold, and rotten woody debris, which they utilize as foraging habitat.

Habitat Requirements and Ecology

Little is known about the specific edaphic and hydrological requirements for ancient ants, beyond the requirement for moist bottomland habitat with a significant layer of litter that

can foster a high population of collembolans. Collembola, their primary prey, tend to be grazers of new, living roots as well as detritivores, and high collembolan densities have been shown in several studies to affect the growth of plants (Harris and Boerner 1990, Lemons *et al.* 2005). Collembola is a large group, with subgroups affecting plants differently (Lemons *et al.* 2005), and therefore specialist predators like the ancient ant may play an important role in ecosystem health by controlling densities of collembolans and influencing their group composition.

While ancient ants have only been found in one population, where Ward (1988) described the holotypes and paratypes for the species, it is very likely that other populations exist in other lowland, riparian, or mesic oak woodland sites in the Sacramento Valley. All closely related members of *Pyramica* found in the eastern United States have similar habitats and cryptobiotic life history. Mesic woodlands and forests are much more extensive in the eastern United States than in the western United States, where arid conditions over the past geologic era have restricted the extent of mesic forests to riparian corridors, valley bottoms, groundwater seeps, and topographic depressions. This likely caused the native, mesic-adapted, cryptobiotic ant fauna to become similarly restricted and disjunct as they retreated to the moister areas. Additionally, flood control practices and development along the Sacramento River have further reduced and constrained riparian woodland habitat, which at one point occurred in corridors miles wide within the Sacramento Valley (Thompson 1961). As much as 88% of the riparian woodlands in the Central Valley may be in a degraded condition (Katibah 1984), and affected by invasive plant species, fragmentation, and disturbance, all of which may alter the necessary conditions for ancient ant populations to thrive.

While it is suggested that ancient ants are specialists with an intimate relationship to valley oaks, this may be more applicable to other rare, cryptobiotic ant species such as *Proceratium californicum*, as all current information is based on the one known population of ancient ants. While it is certain that valley oak litter and mesic valley oak woodlands should be considered critical potential habitat for this species, it may be the case that this species could also utilize habitat dominated by other broadleaved, native, mesic-adapted trees, such as Fremont cottonwood (*Populus fremontii*), box elder (*Acer negundo*), or western sycamores (*Platanus racemosa*). The size (< 2 hectares) of the remnant patch of riparian woodland that hosts the known population indicates that minimum patch size for successful breeding and population persistence is fairly small (Ward 1988).

Species Distribution and Population Trends

Distribution

Ancient ants are known from only one location in the world, in a remnant patch of riparian habitat near the junction of Hwy 113 and Yolo County Road number 17 (Ward 1988), however, subsequent surveys at this site have been unable to find the species again (Ward pers comm). There remain significant areas of riparian woodlands and forests in

the Sacramento Valley that could support the species, and it is possible the ancient ant may occur in similar, nearby habitat in Yolo County.

Population Trends

The ancient ant was only recently described, and population trends are currently unknown. However, it is unknown how many, if any, other populations exist, and the species may be assumed to track the extent of suitable habitat such that loss of riparian forests will negatively affect population density, recruitment of new colonies, and the continued existence of the known existing population.

Threats to the Species and Other Conservation Issues

The primary threat to ancient ants is loss of riparian, valley bottom, and mesic floodplain forested habitat in the Sacramento Valley. Most areas that likely supported ancient ants were near permanent water, but not subject to flooding and were probably the first ones to be disturbed during the agricultural conversion of the Central Valley (S. Heydon pers. comm.). Other possible threats include the invasion of remaining riparian patches by exotic plant species, low oak recruitment, and mosquito abatement programs which spray pesticides into riparian corridors. Collembolans, their main prey base, are also affected by any buildup of insecticides from agricultural practices. Although Ward (1988) did not mention invasive Argentine ants (*Linepithema humile*) to be a potential source of mortality and population extinction for this species, it is possible that invasions could represent a threat to the ancient ant as well.

Significant data gaps relating to many aspects of the ecology of the species exist, including knowledge of the extent of the species distribution, details on reproductive biology of the species, sources of mortality, and precise factors influencing site choice and fidelity, including necessary vegetation associations. The minimum patch size for population persistence can be assumed to be no larger than 2 hectares. Dispersal ability is also unknown, but winged reproductive castes may be able to disperse to disjunct but nearby riparian sites.

Riparian woodlands and forests, mesic, forested, valley bottom lowlands, and forested groundwater seeps with significant litter should be assayed for ancient ant populations in an attempt to locate any additional populations of the species. Other rare, cryptobiotic ants such as *Proceratium californicum* were found with the ancient ant, so it is possible that suitable habitat for one mesic-adapted ant species can support other, rare, similar species. Conservation of suitable habitat within the vicinity of the only known occupied habitat may benefit this species.

Contributors to this species account:

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

References

Photo Credit: Copyright © P.S. Ward www.antweb.org

Harris, K.K., and R.E.J. Boerner. 1990. Effects of belowground grazing by collembola on growth, mycorrhizal infection, and P uptake of *Geranium robertianum*. *Plant and Soil* 129(2): 203-210.

Katibah, E.F. 1984. A brief history of riparian forests in the Central Valley of California. In R.E. Warner and K.M. Hendrix (eds.), *California Riparian Systems: Ecology, Conservation, and Productive Management*. University of California Press, Berkeley, xxix + 1035 pp.

Lemons, A., K. Clay, and J.A. Rudgers. 2005. Connecting the plant-microbial interactions above and belowground: a fungal endophyte affects decomposition. *Oecologia* 145(4): 595-604.

Thompson, K. 1961. The riparian forests of the upper Sacramento Valley. *Annual Association of American Geogr.* 51:294-315.

Ward, P.S. 1988. Mesic elements in the Western Nearctic ant fauna: taxonomic and biological notes on *Amblyopone*, *Proceratium*, and *Smithistruma* (Hymenoptera: Formicidae). *Journal of the Kansas Entomological Society* 61(1): 102-124.

Ward, P.S. 2005. A synoptic review of the ants of California (Hymenoptera: Formicidae). *Zootaxa* 936: 1-68.