Differential Seed Predation on Two Species of *Arctostaphylos* (Ericaceae)

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Summary. The fire-prone California chaparral contains two sympatric species of shrubs: *Arctostaphylos glauca* and *A. glandulosa*. A previous study showed that in a stand where both species had similar amounts of coverage, *A. glauca* had fewer seeds in the soil. We attempt to answer the questions: 1) Could ground-foraging seed predators produce the lower population of *A. glauca* seeds in the soil? 2) Do predators select fruits randomly with respect to fruit size? 3) Do the fruits of the two species differ in the proportions of fruit components (i.e. seeds, endocarp, mesocarp, and exocarp) in ways that could be important to seed predators? Predation was measured on artificial caches of fruits, for 17 weeks. Selection by predators was examined by comparing weights of fruits recovered from soil samples with newly-matured fruits on the shrubs. Fruits components were characterized by dividing fruits into 3 fractions and weighing. More fruits of *A. glauca* were removed from the caches. Fruits of both species recovered from the soil were lighter than those on the shrubs. The weights of seeds, stony and fleshy fruit layers were all larger in *A. glauca*. Within fruits of *A. glandulosa*, the weights of the three components, various combinations, and ratios were all significantly correlated, while in *A. glauca* no other component, combination of components, or ratio examined was significantly correlated with the weights of the seeds.

Introduction

The California chaparral is predominately an evergreen sclerophyllous-leaved scrub vegetation adapted to that region's climate of mild wet winters and dry summers. Concomitant with the long summer droughts are frequent fires. Adaptation to fire is evidenced by these shrubs' rapid recovery after fire, either

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by sprouts from below ground vegetative parts or by the abundant production of seedlings. In fact, the seeds of many species germinate only after fire. Although some shrub species re-establish by both means equally well, others rely almost entirely on one or the other of these methods. For example, in the genus *Arctostaphylos* it is well known that after fire the non-sprouting *A. glauca* Lindl. produces large numbers of seedlings and the sprouting *A. glandulosa* Eastw. produces few seedlings (Jepson, 1916, 1939; Horton and Kraebel, 1955; Plumb, 1961; Wells, 1962, 1969; Hanes, 1971). Greater seed production by *A. glauca* was thought by some of these authors to account for the greater seedling number. This view assumes that seedling density is directly dependent on a shrub's relative production of seeds.

Recently in a mature stand of chaparral, Keeley (1973) found seed populations in the soil which are inconsistent with this view. In this study, soil samples were taken from an area with nearly equal values of relative dominance of both of these species. The soil samples contained over 25 times more *A. glandulosa* propagules than *A. glauca* propagules. Since the fruits of the former species break into several segments consisting of one to many fused nutlets (achenes), whereas *A. glauca* fruits remain intact (Fig. 1), this is not a direct reflection of the differences in numbers of fruits in the soil. However, dividing the number of *A. glandulosa* propagules in the soil by the average number of segments per fruit for that species (3.8, Keeley, 1973) shows that *A. glandulosa* had a greater (7 times) number of fruits in the soil than *A. glauca*. An adjacent burned area, which had a relatively similar density of *Arctostaphylos* shrubs prior to the fire, had qualitatively similar numbers of seedlings as those reported by the above authors (8,500/ha for *A. glauca* and 1,050/ha for *A. glandulosa*). These two facts indicate that the production of more seedlings by *A. glauca* after fire may not be explained simply by greater fruit production by that species.

Fig. 1. Fruits of *Arctostaphylos glauca* (top row) and *A. glandulosa* (bottom row). The three fruits on the left (both rows) have the outer exocarp intact. Once the fruits fall from the shrub, the exocarp and mesocarp are soon lost leaving the seeds protected by only the hard resinous endocarp (the two fruits on the right). The ruler is in mm.