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ALLOTOPIC DISTRIBUTION OF NATIVE FROGS AND INTRODUCED FISHES IN HIGH SIERRA NEVADA LAKES OF CALIFORNIA: IMPLICATION OF THE NEGATIVE EFFECT OF FISH INTRODUCTIONS.—In high elevation (>2500 m) lakes in the Sierra Nevada of California, the distributions of a native ranid frog (*Rana muscosa*) and introduced trout (*Salmo* spp.) and charr (*Salvelinus* spp.) appear to be allotopic, i.e., populations of frogs and fish appear not to co-occur in the same lake (e.g., Grinnell and Storer, 1924; Cory, 1963; Zardus et al., 1977). Although quantification of this relationship is poor, the pattern is substantiated by the occurrence of conspicuously large numbers of *R. muscosa* in some lakes that lack fish. Prior to the stocking of high Sierra Nevada lakes with salmonid fishes, which began over a century ago, fish were entirely absent from most of this region (Hubbs and Wallis, 1948; Christenson, 1977). Today, hundreds of high Sierra Nevada lakes are populated with trout and charr (Christenson, 1977).

The apparent allotopic distribution of frogs and fish has been interpreted as a case of elimination of native frog populations due to predation by introduced fishes (Grinnell and Storer, 1924; Walker, 1946; Hayes and Jennings, 1986). The hundreds of high Sierra Nevada lakes that now contain trout and charr may have previously supported substantial populations of frogs. Hayes and Jennings (1986) argued that predation by introduced fishes is the most compelling hypothesis explaining the apparent declines that have occurred among most of the native ranid frogs in western North America.

The present study tests the hypothesis that populations of two native frogs, *R. muscosa* and *Pseudacris* (=*Hyla*) *regilla*, and introduced fishes do not co-occur in high Sierra Nevada lakes. The study also assesses the importance of lake depth in determining the occurrence of these animals.

Methods.—Data were obtained for 67 lakes in the Tablelands and Ansel/Blossom lakes areas of Sequoia National Park and Kings Canyon National Park, both in California. These two areas were selected because both frogs and fishes occur in each area, numerous lakes occur in each area, and both areas lie within a 1 d hike from a road. The two areas, which together are approx. 18 km² in total area, lie 23 km apart in the watersheds of the Kings and Kaweah rivers. Forty-nine of the lakes surveyed appear on U.S. Geological Survey 15 min quadrangles (Mineral King, Triple-Divide Peak); the remainder are small and, in some cases, ephemeral. The precise locations and other data for all lakes are on file at Headquarters, Sequoia and Kings Canyon National Parks, Three Rivers, California.

Surveyed lakes ranged from approx. 2910–3430 m in elevation, from approx. 0.004–7 ha in area, and from 0.3–37 m in maximum depth. Rooted vegetation was generally sparse and restricted to water shallower than 0.5 m deep. Shorelines were typically rocky, surrounded by subalpine forest or alpine fell-fields plant communities of Munz and Keck (1965). Fingerling rainbow trout (*Salmo gairdneri*), brook charr (*Salvelinus fontinalis*), and possibly golden trout (*Salmo aguabonita*) have been introduced to several lakes in each area at various times since about 1930, and possibly earlier (Meyer, 1965; Christenson, 1977; Zardus et al., 1977). Anuran amphibians observed in each area were the mountain yellow-legged frog (*R. muscosa*) and the Pacific treefrog (*P.* [=*Hyla*] *regilla*). *Bufo bo-*