

# INLAND FISHES *of* CALIFORNIA

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*Life History\**. The life-history patterns of rainbow trout range from the highly migratory, sea-going pattern of steelhead populations, to the pattern of many isolated populations in small streams, where an individual trout may complete its entire life cycle in a few hundred meters of stream. When in fresh water, most rainbow trout are found in cool, clear, fast-flowing permanent streams and rivers, where riffles tend to predominate over pools. In the Sacramento-San Joaquin system they also inhabit the Squawfish-sucker-hardhead Zone in the larger streams, even though temperatures may often approach the maximum they can withstand. Mountain lakes and the cold, deep waters of reservoirs also provide suitable habitat for rainbow trout, but such populations have to be artificially maintained if suitable spawning streams are lacking. Rainbow trout will survive temperatures of 0 to 28°C. They can withstand temperatures at the upper end of this range, however, only if they have been gradually acclimated to them and if the water is saturated with oxygen. Optimum temperatures for growth and for completion of most stages of their life history seem to be 13 to 21°C. At low temperatures, they can withstand oxygen concentrations as low as 1.5 to 2.0 ppm but normally concentrations close to saturation are required for growth. Their tolerance of the varying chemical conditions of water is also broad. They can live in water ranging in pH from 5.8 to 9.6. All other factors being equal, best growth seems to be achieved in slightly alkaline waters (pH of 7 to 8), although Eagle Lake trout have adapted to the highly alkaline waters of Eagle Lake (pH of 8.4 to 9.6).

While rainbow trout are the only fish species found in many California streams, more often than not they occur with other salmonids (especially brown trout and juvenile coho and chinook salmon), sculpins (*Cottus* spp.), speckled dace, suckers (*Catostomus* spp.), and Sacramento squawfish. It is unusual, however, to find more than three to four other species in abundance where rainbow trout are common. Rainbow trout are fairly flexible in their behavior and habitat requirements. They can interact successfully with other species of fish, avoiding as much as possible direct competition for food and space. In coastal streams, juvenile steelhead interact with juvenile coho and chinook salmon and, as a result, the species select different microhabitats (Hartman, 1965; Everest and Chapman, 1972). When brown trout and rainbow trout are found in the same stream, brown trout tend to select slow, deep pools with lots of cover, while rainbow trout select the faster water (Lewis, 1969). Rainbow trout also tend to feed more on drift organisms, while brown trout feed on the bottom. The interactions between rainbow trout and various nongame species are discussed in the ecology chapter of this book.

One of the main reasons rainbow trout are so successful at interacting with other fish species is that they are highly aggressive and defend feeding territories in streams. Other salmonids recognize the aggressive displays of rainbow trout (e.g., rigid swimming, flared operculae, nipping at the caudal peduncle of invading fish) and usually react either by fleeing or by challenging the trout with similar displays, perhaps driving it off its territory. The winners of such interspecific contests are determined by

\*The literature on rainbow trout life history is so large, even just for California populations, that a literature review is far beyond the scope of this book. This summary is based largely on personal experience (e.g., Moyle and Nichols, 1973), the compilations of McAfee (1966), Carlander (1969), and Scott and Crossman (1973), the monograph of Shapovalov and Taft (1954), and the papers in Northcote (1969).