

Climate change threatens extinction for 82 percent of California native fish

May 30 2013



Fish biologist Peter Moyle, shown at Martis Creek in the Sierra Nevada, expects much of the unique California fish will disappear and be replaced by non-natives, largely as a result of climate change. Credit: Jacob Katz/UC Davis

(Phys.org) —Salmon and other native freshwater fish in California will likely become extinct within the next century due to climate change if current trends continue, ceding their habitats to non-native fish, predicts

a study by scientists from the Center for Watershed Sciences at the University of California, Davis.

The study, published online in May in the journal *PLOS ONE*, assessed how vulnerable each freshwater species in California is to climate change and estimated the likelihood that those species would become extinct in 100 years.

The researchers found that, of 121 native [fish](#) species, 82 percent are likely to be driven to extinction or very low numbers as climate change speeds the decline of already depleted populations. In contrast, only 19 percent of the 50 non-native fish species in the state face a similar risk of extinction.

"If present trends continue, much of the unique California fish fauna will disappear and be replaced by alien fishes, such as carp, largemouth bass, fathead minnows and green sunfish," said Peter Moyle, a professor of fish biology at UC Davis who has been documenting the biology and status of California fish for the past 40 years.

"Disappearing fish will include not only obscure species of minnows, suckers and pupfishes, but also coho salmon, most runs of [steelhead trout](#) and [Chinook salmon](#), and Sacramento perch," Moyle said.

Fish requiring cold water, such as salmon and trout, are particularly likely to go extinct, the study said. However, non-[native fish species](#) are expected to thrive, although some will lose their aquatic habitats during severe droughts and low-flow summer months.

The top 20 native California fish most likely to become extinct in California within 100 years as the result of climate change include (asterisks denote a species already listed as threatened or endangered):

1. Klamath Mountains Province summer steelhead
2. McCloud River redband trout
3. Unarmored threespine stickleback*
4. Shay Creek stickleback
5. Delta smelt*
6. Long Valley speckled dace
7. Central Valley late fall Chinook salmon
8. Kern River rainbow trout
9. Shoshone pupfish
10. Razorback sucker*
11. Upper Klamath-Trinity spring Chinook salmon
12. Southern steelhead*
13. Clear Lake hitch
14. Owens speckled dace
15. Northern California coast summer steelhead
16. Amargosa Canyon speckled dace
17. Central coast coho salmon*
18. Southern Oregon Northern California coast coho salmon*
19. Modoc sucker*
20. Pink salmon

The species are listed in order of vulnerability to extinction, with No. 1 being the most vulnerable.

Climate change and human-caused degradation of aquatic habitats is causing worldwide declines in freshwater fishes, especially in regions with arid or Mediterranean climates, the study said. These declines pose a major conservation challenge. However, there has been little research in the scientific literature related to the status of most [fish species](#), particularly native ones of little economic value.

Moyle saw the need for a rapid and repeatable method to determine the [climate change](#) vulnerability of different species. He expects the method

presented in the study to be useful for conservation planning.

"These fish are part of the endemic flora and fauna that makes California such a special place," said Moyle. "As we lose these fishes, we lose their environments and are much poorer for it."

More information: Moyle PB, Kiernan JD, Crain PK, Quiñones RM (2013) Climate Change Vulnerability of Native and Alien Freshwater Fishes of California: A Systematic Assessment Approach. PLoS ONE 8(5): e63883. [doi:10.1371/journal.pone.0063883](https://doi.org/10.1371/journal.pone.0063883)

Provided by UC Davis

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