

California, Davis, *in litt*, 2002). This is illustrated by the phylogenetic tree based on mtDNA in which Sonoma County California tiger salamander is the first branch after the outgroup (groups known from independent evidence to have branched off earlier than the groups under study; Avise 1994, Weir 1996) (Shaffer and Trenham 2002). This branch is strongly supported statistically (with bootstrap probability of 100 percent) on a phylogenetic tree constructed by the neighbor joining method (a method used to construct phylogenetic trees; NJ, Avise 1994, Weir 1996). Bootstrapping is a method of statistically testing the significance of particular patterns; it involves resampling (with replacement) from the existing data sets and then reassessing the frequency with which particular groups appear in trees generated from the resampled data (Avise 1994, Weir 1996). For the Sonoma County California tiger salamander branch a bootstrap probability of 100 percent means that 100 percent of the trees generated from the resampled data had the same configuration. A bootstrap probability of seventy percent is the normal criterion for statistical significance in the systematic literature (Hillis and Bull 1993 as cited in Shaffer and McKnight 1996). In addition to being strongly supported using the NJ method, the branch pattern indicating that the Sonoma County population is distinct is supported by maximum likelihood and parsimony (Shaffer and Trenham 2002), two other methods of constructing phylogenetic trees (Avise 1994, Weir 1996). In addition, Shaffer and Trenham (2002) report preliminary results of analyses of two nuclear genes. These preliminary results also show that Sonoma County California tiger salamanders are genetically distinct from other California tiger salamanders. Shaffer *et al.* (1993) suggest that the differences are so large that the Sonoma County population may warrant separate taxonomic recognition (Shaffer *et al.* 1993).

In the proposed rule we relied on the 2 percent divergence value as evidence that the Sonoma County California tiger salamander population is discrete. At the time, we were using the best available information (Shaffer *et al.* 1993). We note that systematists typically identify species boundaries by using phylogenetic analysis rather than absolute levels of sequence divergence (Avise 1994, Weir 1996, Hedrick 2000). As noted above, the phylogenetic tree (which indicates relationships among populations or groups) constructed from the more comprehensive mtDNA data of

Shaffer and Trenham (2002) indicates that Sonoma County California tiger salamanders are very distinct relative to other California tiger salamanders, and separated from them on a branch that is strongly supported statistically. Therefore, the most comprehensive available genetic data (Shaffer and Trenham 2002) for California tiger salamanders strongly indicate that Sonoma County California tiger salamanders are distinct from other populations of the species.

Significance

Under our DPS policy, once we have determined that a population segment is discrete, we consider its biological and ecological significance to the larger taxon to which it belongs. This consideration may include, but is not limited to, evidence of the persistence of the discrete population segment in an ecological setting that is unique for the taxon; evidence that loss of the population segment would result in a significant gap in the range of the taxon; evidence that the population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range; and evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics. We have found substantial evidence that two of these significance factors are met by the population of the California tiger salamander that occurs on the Santa Rosa Plain in Sonoma County.

The extinction of the Sonoma County population would result in the loss of a significant genetic entity and the curtailment of the range of the species. As discussed above, the Sonoma County population is genetically distinct from other populations of California tiger salamanders. Loss of the Sonoma County population would also eliminate the most northern coastal extent of the range of the species. The Sonoma County population is geographically isolated. Genetic analysis of the species supports the hypothesis that no natural interchange of the Sonoma County population occurs with other California tiger salamander populations.

Conclusion

We evaluated the Sonoma County population, addressing the two elements which our policy requires us to consider in deciding whether a vertebrate population may be recognized as a DPS and considered for listing under the Act. We conclude that the Sonoma County population is discrete, as per our policy, based on its geographic separation and

genetic divergence from the rest of the California tiger salamander populations. We conclude that the Sonoma County population of the California tiger salamander is significant because the loss of the species from the Santa Rosa Plain in Sonoma County would result in a significant reduction in the species' range and would constitute loss of a genetically divergent portion of the species. Because the population segment meets both the discreteness and significance criteria of our DPS policy, the Sonoma County population of the California tiger salamander constitutes a DPS which qualifies for consideration for listing. An evaluation of the level of threat to the DPS based on the five listing factors established by the Act follows.

Previous Federal Action

On September 18, 1985, we published the Vertebrate Notice of Review (NOR) (50 FR 37958), which included the California tiger salamander as a category 2 candidate species for possible future listing as threatened or endangered. Category 2 candidates were those taxa for which information contained in our files indicated that listing may be appropriate but for which additional data were needed to support a listing proposal. The January 6, 1989, and November 21, 1991, NORs (54 FR 554 and 56 FR 58804, respectively) also included the California tiger salamander as a category 2 candidate, soliciting information on the status of the species.

On February 21, 1992, we received a petition from Dr. H. Bradley Shaffer of the University of California, Davis (UCD), to list the California tiger salamander as an endangered species. We published a 90-day petition finding on November 19, 1992 (57 FR 54545), concluding that the petition presented substantial information indicating that listing may be warranted. On April 18, 1994, we published a 12-month petition finding (59 FR 18353) that the listing of the California tiger salamander was warranted but precluded by higher priority listing actions. We elevated the species to category 1 status at that time, which was reflected in the November 15, 1994, NOR (59 FR 58982). Category 1 candidates were those taxa for which we had on file sufficient information on biological vulnerability and threats to support preparation of listing proposals.

We discontinued the use of different categories of candidates in the February 28, 1996, NOR (61 FR 7596), and defined "candidate species" as those meeting the definition of former category 1. We maintained the California tiger salamander as a candidate species in that NOR, as well