The Fishes of Texas Database and Ecological Niche Modeling for Better Understanding the Conservation Status of the State's Freshwater Fishes

Dean A. Hendrickson, *University of Texas at Austin, Texas Natural Science Center, Texas Natural History Collections, PRC 176 / R4000, 10100 Burnet Road, Austin, TX 78758-4445*

Adam E. Cohen, *University of Texas at Austin, Texas Natural Science Center, Texas Natural History Collections, PRC 176 / R4000, 10100 Burnet Road, Austin, TX 78758-4445*

Laura Dugan, *University of Texas at Austin, Section of Integrative Biology, 1 University Station #C0930, University of Texas at Austin, Austin, TX 78712*

Ben Labay, *Texas State University San Marcos, Department of Biology/Aquatic Station, San Marcos, TX 78666*

Abstract: The Fishes of Texas database compiled by the Texas Natural History Collection at the University of Texas at Austin consists of 65,876 freshwater records vouchered by specimens curated at 34 U.S., Mexican, and European collections, many unavailable online or in computerized format. An estimated 95% of all fish specimens ever collected in Texas since 1854 are represented, as are all known Texas freshwater species. All but 28 of Texas' 254 counties are represented in the 20,664 total localities, all now manually georeferenced. Locality plots reveal significant spatial gaps, and temporal distribution of sampling is similarly uneven, peaking in 1950–1970 then sharply declining. Post 1980, 27% of counties were not sampled at all and 90% were sampled <20 times. Clearly this database does not provide a current perspective on the state's fish fauna, but just as clearly it provides the best historic data ever available. After considerable effort compiling the database, then finding and correcting errors, we used the data and diverse GIS environmental parameter datasets in Maximum Entropy niche modeling (using the program Maxent; www.cs.princeton.edu/~schapire/maxent/) to predict distributions of selected species and reveal correlations between landscape-scale environmental parameters and documented occurrences. Niche modeling appears to be a promising heuristic tool to predict occurrences of species beyond recorded localities. It also helps detect probable data errors and geographic gaps in occurrence records and can be useful for predicting biotic impacts of climate change or projecting potential distributions of invasives. Hypotheses regarding the environmental factors most highly correlated with, and thus likely controlling, distributions are also readily generated. We hope to continue using these tools to prioritize areas needing new sampling to update conservation status information and to further test predictive capabilities of niche models and examine correlations between temporal changes in distributions and synchronous changes in landscape-scale environmental parameters.

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