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**Description of data accompanying the Biological Conservation article:**

**Nyboer EA, Liang C, and Chapman LJ. 2019. Assessing the vulnerability of Africa’s freshwater fishes to climate change: a continent-wide trait-based analysis**

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This dataset contains a collection of trait information for African freshwater fish species. These data span several intrinsic species qualities such as dietary preferences, habitat use, behaviours (e.g., spawning, mating, migrations), life-history traits (e.g., size and age at maturity, growth rate, fecundity), dispersal capacity, estimates of environmental tolerance, and estimates of population size, among others. In addition, these data include several extrinsic factors affecting fish such as anthropogenic threats experienced by species, how species are used by human societies, and estimates of future climate change exposure across species’ ranges based on the Intergovernmental Panel for Climate Change’s 5th Assessment Report (IPCC-AR5).

Trait data were collected from publicly available data repositories including FishBase and the IUCN Red List species information service. In addition, data from two IUCN studies (Carr et al., 2013, 2014) were also integrated. Climate change data were collected from AFRICLIM3.0 and WorldClim1.4 climate modelling sources. Please see the online Supplementary Materials associated with this paper for in-depth descriptions of all data sources and references.

Data in this spreadsheet are split into categories based on the different trait sets used to assign vulnerability scores (see descriptions in the manuscript and the Supplementary Materials). Some data were retained in the dataset for reference even if not included the final analysis (labelled ‘extra’ or ‘for reference’). Categories are separated by colour blocks and labelled in the first row (see brief descriptions of categories below). Each trait is then labelled with details and units of measure in the column header.

Columns contain either raw data, or calculated scores (highlighted in pale yellow) of high (H), low (L), unknown (U) and in some cases medium (M) or very high (VH), depending on how each trait was categorized in terms of vulnerability to climate change based on pre-defined scoring regimes. For example, if a trait (i.e., dependence on microhabitats) was determined to make a species highly sensitive to climate change, they would get an ‘H’ score for that trait**[[1]](#footnote-1)**. Several ‘score’ columns contain Excel formulae that can be followed to understand how scores were calculated from the raw data. If there is no formula, that is because scores were generated by reading each description and assigning scores based on pre-defined criteria (i.e., scores could not be automated through Excel formulae), or because scores were calculated separately (details in Supplementary Materials). Criteria and methods used for calculating scores are in the column headers, and are described in detail in the Supplementary Materials. Availability of data in each category was variable and can be calculated directly from the spreadsheet. Major categories are listed below with brief descriptions.

TAXONOMY: taxonomic classifications (kingdom, phylum, class, order, family, genus, species) from FishBase and IUCN Red List; resolved using various taxonomy sites

LOCATION: list of regions, lakes, and rivers where a species is found

DISTRIBUTION: area of occupancy (AOO; area actually occupied by a species) and extent of occurrence (EOO; total range covered)

IUCN STATUS: how a species was assessed by the IUCN Red List assessment (see IUCN classification scheme at www.iucnredlist.org)

DEPTH RANGE: minimum, maximum, and average depth of a species

ABUNDANCE: expert-informed descriptions of abundance, commonness, and distribution of a species

FRAGMENTATION: expert-informed descriptions of the degree of fragmentation of populations of a species

ENDEMISM: indicates whether a species is endemic to a region, and its geographic location

LIFE HISTORY: includes estimates of body size, longevity, years/length at maturity, absolute and relative fecundity, Bertalanffy growth (K), and mortality

HABITATS: number and types of habitats used by a species; IUCN habitats types were tallied, and used to calculate ‘habitat specificity’ for use in this analysis

RARE OR THREATENED HABITATS: number and types of habitats used by a species that are rare or threatened by climate change

CALCULATION OF HABITAT SPECIALIZATION: calculation of habitat specificity scores

EXTRINSIC BARRIERS TO DISPERSAL: physical barriers that a species experiences that might prevent dispersal

MICROHABITATS: description of specialized microhabitats used by a species

INTRINSIC PROBABILITY OF DISPERSAL: a series of life history and ecological traits used to predict how well a species might be able to disperse; includes degree of prey and habitat specialization, dependence on specific temperature regimes, fecundity, years to maturity, length at maturity, longevity, and body size

DIET SPECIFICITY: degree of diet specialization of a species

ROCKS WITH BIOCOVER: description of whether or not a species depends on rocks with biocover

RELIES ON OTHER TAXA FOR FOOD/SHELTER/OTHER: description of whether a species relies on another taxon to make food available, to provide shelter, or for any other important part of its life cycle

TURBIDITY - FEEDING: description of whether a species’ feeding regime would be disrupted by excess turbidity in the water column

SPAWNING CYCLE: length and timing of a species’ spawning cycle, spawning grounds, spawning style, etc.

EXTRA SPAWNING INFO: info not included in spawning trait calculations; includes fertilization location, egg care, spawning needs, etc.

ENVIRONMENTAL CUES (a.k.a., complexity of life history requirements): description of whether a species requires specific environmental cues for either (a) reproduction (e.g., rains to trigger spawning) or (b) various life-history stages (e.g., larvae depend on specific conditions for survival).

DISPERSAL OF EARLY LIFE HISTORY STAGES: description of dispersal capacities of eggs and larvae depending on the manner and location of spawning, and particular habitat or condition requirements

DEPENDENCE ON PRECIPITATION ACTIVATED TRIGGER: descriptions of whether a species requires precipitation to activate crucial aspects of its life history; split into three categories including breeding migrations, juvenile migrations, and egg hatching

TURBIDITY - MATING: description of whether a species’ mating system is likely to be disrupted by excess turbidity in the water column

IUCN THREATS: threats experienced by a species within its range based on IUCN threat categories (see Supplementary Materials for details); number of threats experienced were tallied and used to calculate scores used in the analysis

IUCN CLIMATE CHANGE EXACERBATED THREATS: threats experienced by a species within its range that are likely to be directly exacerbated by the effects of climate change (see Supplementary Materials for details); number of exacerbated threats experienced were tallied and used to calculate scores used in the analysis

PROVISION OF ECOSYSTEM SERVICES (PEC; USES OTHER THAN FISHING): number of ways a species is used by human societies including aquaculture, baitfish, aquarium trade, game fish, biocontrol agents, and other uses; uses were tallied and used to calculate scores used in the analysis

PROVISION OF ECOSYSTEM SERVIES (PEC; FISHING): description of whether or not a fish is part of a fishery, and estimates of the degree of fishing (artisanal, commercial, highly commercial)

CLIMATE CHANGE CALCULATIONS: estimates of the degree to which a species’ range is predicted to be affected by climate change; calculations include estimates of average change and change in variability (average absolute deviation; AAD) for temperature and precipitation. Estimates were calculated for two emissions scenarios (RCP4.5 and RCP8.5) and for two time periods (1975 to 1955, and 1975 to 1985). Scores were based on a 25% threshold, and for the RCP8.5/2055 combination we also used a 15% and 35% threshold. Detailed descriptions of climate data calculations are available in the Supplementary Materials.

TOLERANCE TO VARIATION IN CLIMATE: estimates of a species’ tolerance to environmental variation based on the historical average variation in temperature and precipitation across its range; scores based on a 25% threshold

1. **For the final version of the manuscript we semantically altered the vulnerability dimension originally called ‘LOW ADAPTIVE CAPACITY’ to ‘ADAPTIVE CAPACITY’. Because of this change, traits that gave species a high (H) score for the ADAPTIVE CAPACITY dimension in this dataset, ACTUALLY mean the species has LOW ADAPTIVE CAPACITY (i.e., a high LOW ADAPTIVE CAPACITY). Traits included in the ADAPTIV CAPACITY dimension include those relating to fecundity, dispersal ability, and population growth. The calculations had to be left in the original form for practical purposes; however, it is important to note this semantic difference between this dataset and the paper results.** [↑](#footnote-ref-1)