

Introduction

The database enterprise used in this project is the IUCN (International Union for Conservation of Nature) Red List of Threatened species, which tracks the conservation status of species worldwide. The data is used to evaluate species threats and the probability of extinction, helping drive decision-making and policy change.

The IUCN Red List categorizes species into one of eight conservation statuses: data deficient, least concern, near threatened, vulnerable, endangered, critically endangered, extinct in the wild, and extinct. Additionally, the database tracks species taxonomy and country occurrences. Taxonomy is broken down by a hierarchical classification consisting of domain, kingdom, phylum, class, order, family, genus, and species.

This document will describe how the IUCN Red List data is structured in a relational database. An Entity-Relationship (ER) diagram will capture species taxonomy, extinction risk, and country occurrences to provide a structured way of managing and analyzing these data.

This document will also test the database with a query to identify which families in the database are considered threatened.

Requirements Description

The portion of the IUCN Red List enterprise captured by this system focuses on the classification, conservation status and geographical occurrence of species. The objective of this system is to structure and organize species-related data in a way that supports scientific assessment, reporting, as well as policy and conservation planning.

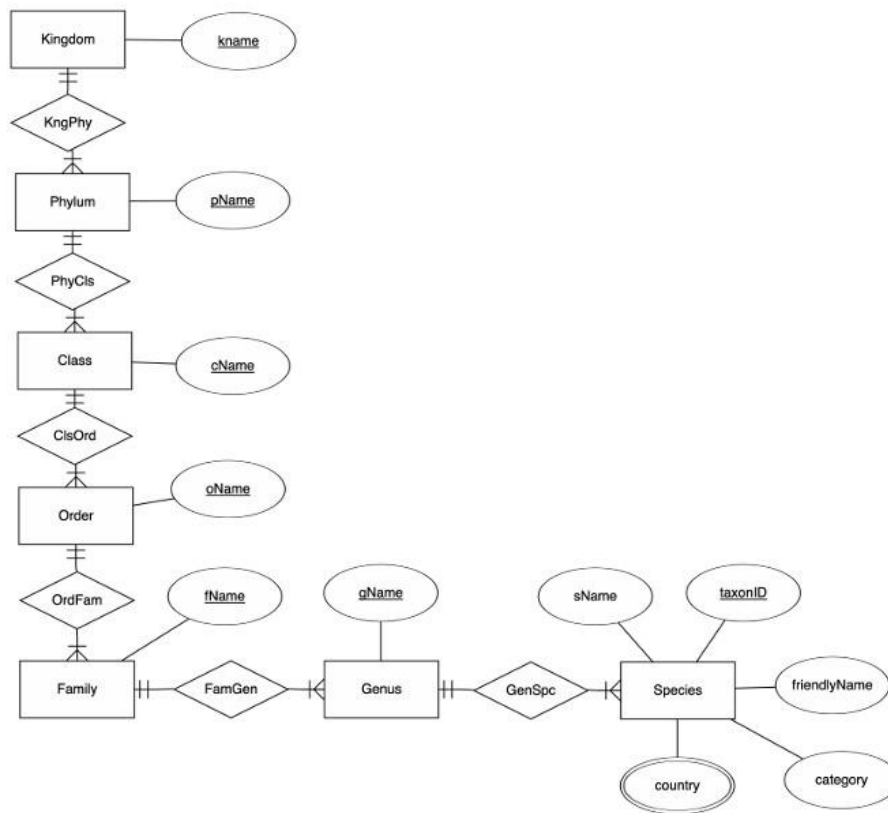
At the heart of the enterprise is a standardized taxonomy that classifies each organism to a biological hierarchy. This system models the taxonomy from domain down to the species level using a taxonomy table, with each entry having a specific rank (class, phylum genus etc.).

Each species is also associated with a conservation status using the IUCN's Red List categories, which reflects the species risk of extinction. These categories are based on scientific assessments and include labels such as "least concern", "critically endangered", and "extinct". The system connects each species to a single conservation status.

In addition to taxonomy and conservation status, the system records the geographical distribution of species. Each species occurrence is linked to one or more countries where the species has been observed, allowing stakeholders to track regional distributions and understand extinction risks.

ER Diagram

Marine Mammal Hierarchical Biological Organization, Country Occurrence and IUCN Red List Category Entity Relation Diagram (ERD)



Uncaptured Constraints

Some uncaptured constraints appear on the ERD. An example is that a species must have exactly one Red List category at a time. The ERD shows a relationship but does not guarantee that only one active category is assigned per species. Another issue is that taxonomic ranks must follow a specific order. The ERD does not enforce that class cannot be a parent of family.

Relational Schema: Syntax Summary and Table Details

kingdom (kingdom_name)

phylum (phylum_name, kingdom_name)

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foreign key (kingdom_name) references kingdom (kingdom_name)

class (class_name, phylum_name)

foreign key (phylum_name) references phylum (phylum_name)

order(order_name, class_name)

foreign key (class_name) references class (class_name)

family(family_name, order_name)

foreign key (oName) references order (oName)

genus (genus_name, family_name)

foreign key (family_name) references family (family_name)

species (taxonid, scientific_name, friendlyName, category, genus_name)

foreign key (genus_name) references genus (genus_name)

country_occurrences(taxonID, country)

foreign key (taxonid) references species (taxonid)

Table name	Attribute	Description
Kingdom	<u>kname</u>	scientific name of the kingdom. Primary Key
Phylum	<u>pName</u>	Scientific name of the phylum. Primary Key
Class	<u>cName</u>	Scientific name of the class. Primary Key
Order	<u>oName</u>	Scientific name of the order. Primary Key
Family	<u>fName</u>	Scientific name of the family. Primary Key
genus	<u>genus_name</u> family_name (FK)	Scientific name of the genus. Primary Key
species	scientific_name	Scientific name of the species
	<u>taxonID</u>	Unique ID for species, Primary Key
	friendlyName	Common name for species
	category	Threat level
	genus_name	Name of the genus (FK)
country_occurrences	<u>taxonid</u>	Unique ID for species, foreign key
	<u>country</u>	Country where the species is found, part of multivalued composite primary key.

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Results of SQL Query

A SQL query was conducted to isolate the number of threatened species per family exist in the database, and the results used to create the pie chart below.

