Predicting local species lists: an example and a challenge

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Partially Supported by a U.S. National Science Foundation REU Grant to the Biology Department at UMass Boston Rachel Skvirskey PI

**Introduction**

Lists of species are the basis of biodiversity science. Typically after an outing, naturalists and scientists alike, make a checklist of the species observed. Checklists can be used for basic science such as calculating diversity indices and making range maps or for more applied purposes such as planning reserves for rare and endangered species and managing invasive species. Checklists are so central to biodiversity science there is even a journal called Check List http://www.checklist.org.br.

While preparing for field excursions, it is common practice among scientists and others to make another kind of species list, a Predicted Local Species List (PLSL), comprised of what might be found during a survey. By and large, only experts with local knowledge of specific taxa, have the ability to make such predictions. The smaller the geographic area covered the more “local” the list and the more useful it will be.

In this poster we specify methods to produce PLSLs, illustrate one method using data from NatureServe and comment on the role of PLSL for Biodiversity Species Science.

**Question – What species are found here? What is my PLSL?**

Two different routes to predicting a list

- **Observation Location**
  - Data of Individuals
    - Observation
    - Reviewed
    - Shared Record
  - Collection of RSRs
- **Species Data on Maps**
  - Data on Maps
  - Range Map
  - Collection of Range Maps

These two approaches have different strengths. Starting with a map means there has already been an attempt to interpolate over space and time. This is an advantage with biodiversity observations are scarce because it incorporates expertise implicitly. For many places in the world and many taxa this is likely to be a good starting place. Starting with observational data gives one many more options for modeling.

**An Example for Mammals in California Using NatureServe Data**

To advance the idea of a local species list, we created a website that takes a user specified location in California and returns a list of all the mammals that occur within approximately 10 km of that point. This list includes hyperlinks to encyclopedic species information. The species distribution data underlying the project were range maps provided by NatureServe.

**Local Species Lists for Biodiversity Research**

Enter a California location to get a list of local mammals:

![Local List](local_list.png)

**What is a Local Species List?**

After you enter your location, you will be provided with list of all the mammals within 10 km of your position (as long as it is in California). Each species name is linked to encyclopedic information about that animal. This is your local species list.

**Other Examples**

Most other examples of “Local lists” we have found seem to derive from checklists for areas delineated by political boundaries (a wildlife sanctuary, a town). eNature.com uses political boundaries but add the ability to filter by morphological group, color, size and habitat. Map of Life has the ability to compute a list from an arbitrary location that has a 50 km radius. eBird produces a local list every time you go to enter data about observations. Bird species are ranked as Frequent, Infrequency and Not Reported. The BirdsEye app also provides information in the form of local lists and seasonal occurrence from eBird data.

**What programs and processes do you know that predict local lists?**

Biodiversity data are widespread, valuable, and disorganized (Jetz et al, 2012). But there is hope. In A Vast Machine author Paul Edwards documents the long history of the development of weather forecasting (thanks Rob Guralnick for the tip). In the USA we have many jokes about weather forecasts but their accuracy has greatly increased in the last 30 years and now we depend them daily. Various efforts in biodiversity science are being made to predict biodiversity occurrences because of integral role biodiversity plays in many environmental challenges (over harvesting, invasive species, infectious disease transmission, etc.) As more data get collected the kinds and quality of models that predict local species list will increasing allow biodiversity scientists, as meteorologists are, to crank our own scientific engine. The dynamics distribution maps and migration forecasts of birds using eBird data point the way to the future.

**A Challenge: Building and Cranking the Biodiversity Knowledge Engine**

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