Simple outputs from many matrices

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This example produces some basic output such as the population growth rate (λ) and damping ratio (Caswell 2001) for a subset of species and populations given some selection criteria.

First, use subsetDB (from the Mage package) to subset the database to the data of interest: only mean matrices for bony fish from studies of 3 years duration or longer, and with a matrix dimension of 3 or greater.

The object x is now a version of the **comadre** database object that contains only the matrices that match the search criteria.

These matrices can now be analyzed by applying functions in a loop, or by using lapply.

For example, to calculate population growth rate and damping ratio for the subset of matrices, first create an empty data.frame to accommodate the output

and then use the functions in popbio package to derive demographic output (the user may need to install the package first).

```
library(popbio)
```

```
for (i in 1:length(x$mat)){
   output$lambdas[i] <- Re(eigen(x$mat[[i]]$matA)$value)[1]
   output$damps[i] <- damping.ratio(x$mat[[i]]$matA)
}</pre>
```

To examine the output:

output

>

```
lambdas
                  damps
> 1 1.5061504 1.303947
> 2 1.3331871 1.242002
> 3 0.9704512 1.468910
    1.0798558 1.326919
> 5 0.9529318 1.127114
> 6 1.0854466 1.146005
> 7 0.9091956 1.031997
> 8 0.9027406 1.027850
> 9 0.9140835 1.035914
> 10 0.9999592 1.005268
> 11 1.1102061 1.310725
> 12 1.3618336 1.293028
> 13 1.2283756 1.380559
> 14 1.1321531 1.288657
```

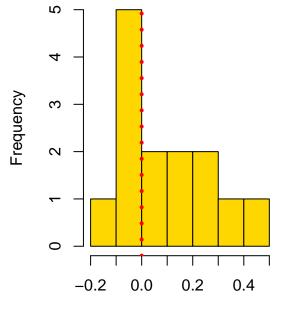
These parameters are presented in the same order as the metadata so we could also add the species name to this data.frame:

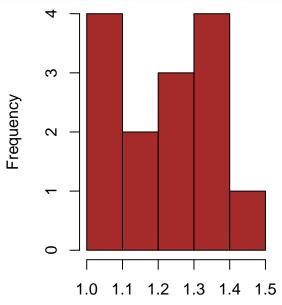
```
data.frame(Species = x$metadata$SpeciesAccepted,output)
```

Species lambdas damps

```
> 1
                  Ammocrypta_pellucida 1.5061504 1.303947
>
 2
                 Catostomus_commersoni 1.3331871 1.242002
 3
                   Genypterus_blacodes 0.9704512 1.468910
 4
                   Genypterus_blacodes 1.0798558 1.326919
> 5
                   Genypterus_blacodes 0.9529318 1.127114
> 6
                   Genypterus_blacodes 1.0854466 1.146005
> 7
              Oncorhynchus_tshawytscha 0.9091956 1.031997
> 8
              Oncorhynchus tshawytscha 0.9027406 1.027850
> 9
              Oncorhynchus_tshawytscha 0.9140835 1.035914
> 10 Sprattus_sprattus_subsp._balticus 0.9999592 1.005268
> 11
                     Zoarces_viviparus 1.1102061 1.310725
> 12
                     Zoarces_viviparus 1.3618336 1.293028
                     Zoarces_viviparus 1.2283756 1.380559
> 13
> 14
                     Zoarces_viviparus 1.1321531 1.288657
```

Plot the population growth rates and damping ratios derived from these matrices. In this plot, the vertical, dashed red line indicates population growth rate = 1 (or log $(\lambda) = 0$)





Log population growth rate

Damping ratio