Task for practicing SEM

Introduction to structural equation modeling and mixed models in 

Day 9: SEM

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Task 1

Jena Biodiversity Experiment

Day 9 Task 1

Jena Biodiversity Experiment

www.THE-JENA-EXPERIMENT.de

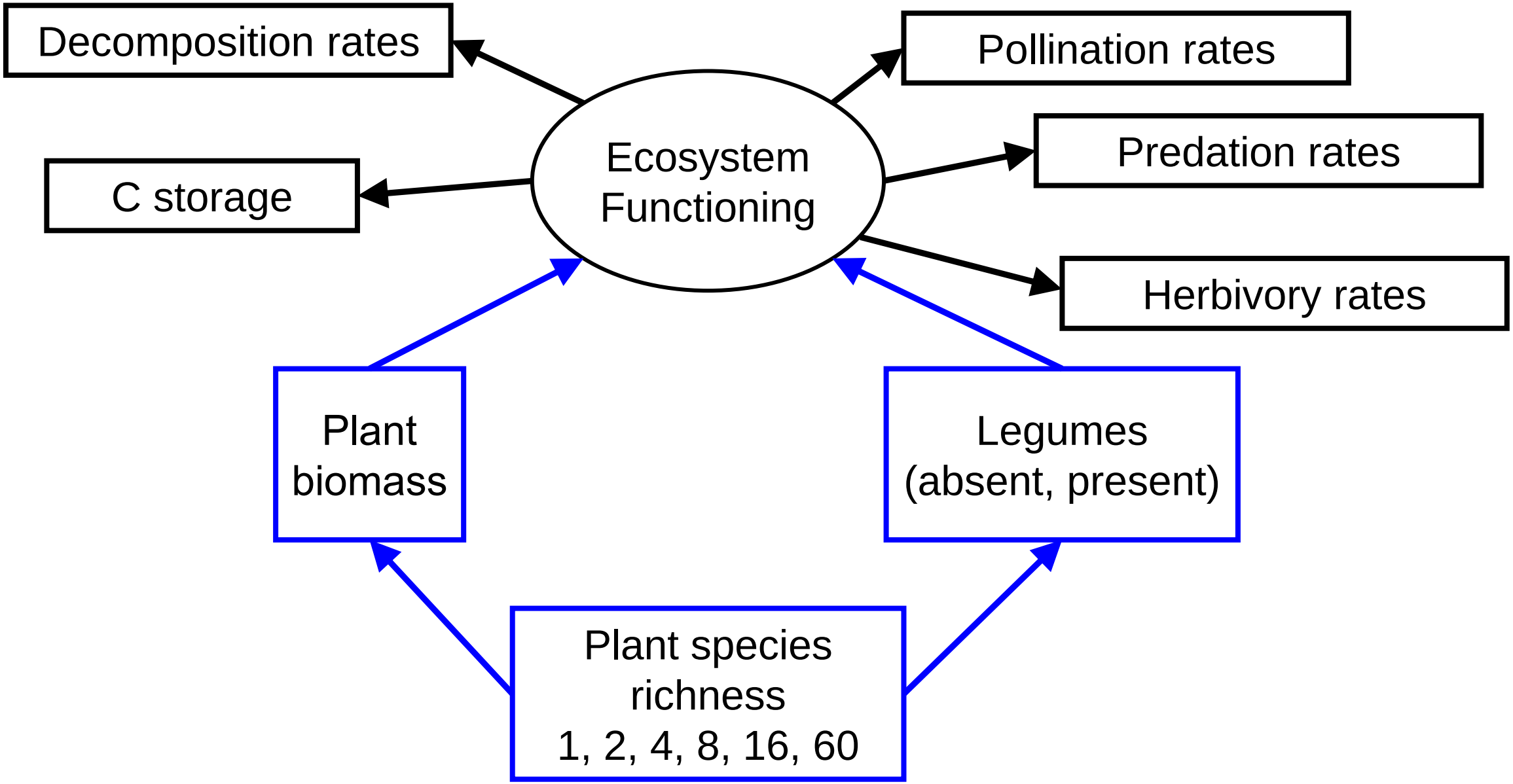
- Established in 2002
- 82 plots of 20 x 20 m
- Experimentally manipulated plant species richness: 1, 2, 4, 8, 16, 60 species

Photo credit: *A. Weigelt*.

```
read_csv("Data/Jena.csv")
> str(jena)
tibble [82 × 9] (S3: tbl_df/tbl/data.frame)
 $ plant_sr      : num [1:82] 1 1 1 1 1 1 1 1 1 1 ...
 $ legumes       : chr [1:82] "absent" "absent" "absent" "absent" ...
 $ plant_biom    : num [1:82] 50.1 139.4 55.1 76.4 180.6 ...
 $ C_stor        : num [1:82] 0.925 6.405 1.134 6.048 2.452 ...
 $ decomposition: num [1:82] 0.101 0.569 0.12 0.581 0.179 ...
 $ pollination   : num [1:82] 0.146 0.438 0.124 0.381 0.114 ...
 $ predation     : num [1:82] 0.0254 0.4806 0.1141 0.3783 0.0616 ...
 $ herbivory     : num [1:82] 0.159 0.693 0.338 0.615 0.248 ...
```

Day 9 Task 1

Jena Biodiversity Experiment



Day 9 Task 1

Jena Biodiversity Experiment

Tasks:

1. Build and assess the SEM model shown on fig. 1

2. Test the model fit

3. Find the standardized coefficients

4. Find the explained variances for each endogenous variable in the model.

5. Calculate direct, indirect, and total effects of "Plant species richness" on "Ecosystem Functioning"

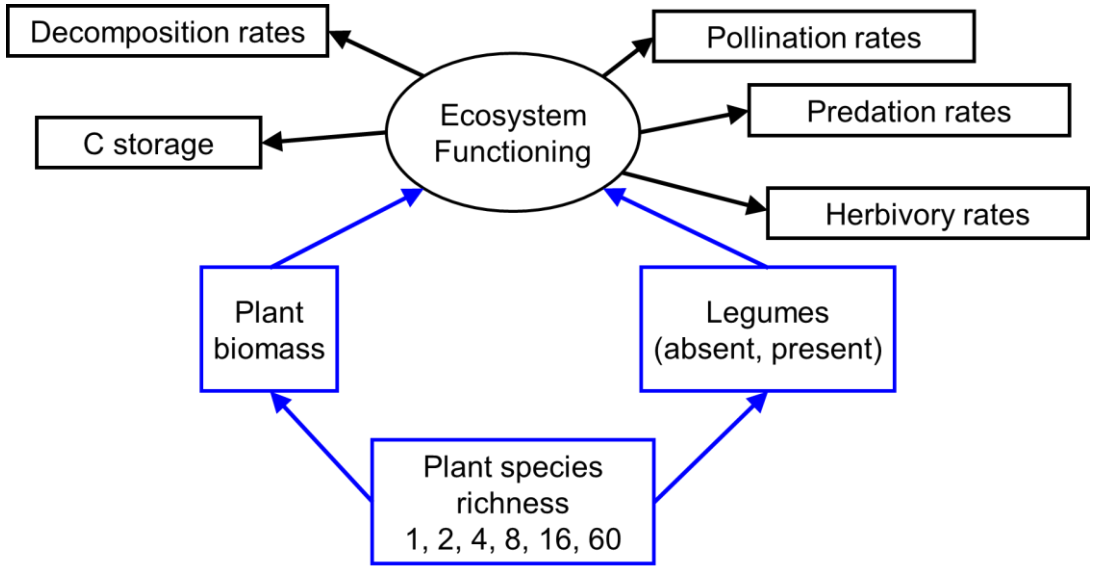
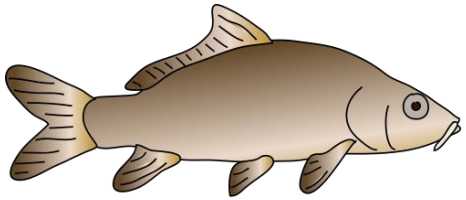


fig. 1

Task 2



Invasive fish in ponds

Day 9 Task 2

Invasive fish in ponds

- **`Connect`** – connectedness of pond to other water objects (0-disconnected; 1-connected)
- **`Macr`** – number of species of macrophytes
- **`water_T`** – water temperature
- **`HII`** – human impact intensity index
- **`Tot_fish`** – total number of fish species in pond
- **`Invas_fish`** – number of invasive fish species in pond

```
read.csv("Data/pond.csv")
> str(pond)
'data.frame': 120 obs. of  6 variables:
 $ Connect   : int  0 0 0 0 0 0 0 0 0 0 ...
 $ Macr      : int  20 18 15 14 12 3 21 18 10 18 ...
 $ water_T   : num  14.2 15.6 18.8 17 17.5 ...
 $ HII       : num  2.31 1.83 3.11 2.66 2.63 4.11 2.7 2.56 4.12 2.47
...
 $ Tot_fish  : int  11 15 15 19 17 18 15 18 19 16 ...
 $ Invas_fish: int  1 1 1 4 3 11 1 2 7 2 ...
```

120 ponds

Day 9 Task 2

Invasive fish in ponds

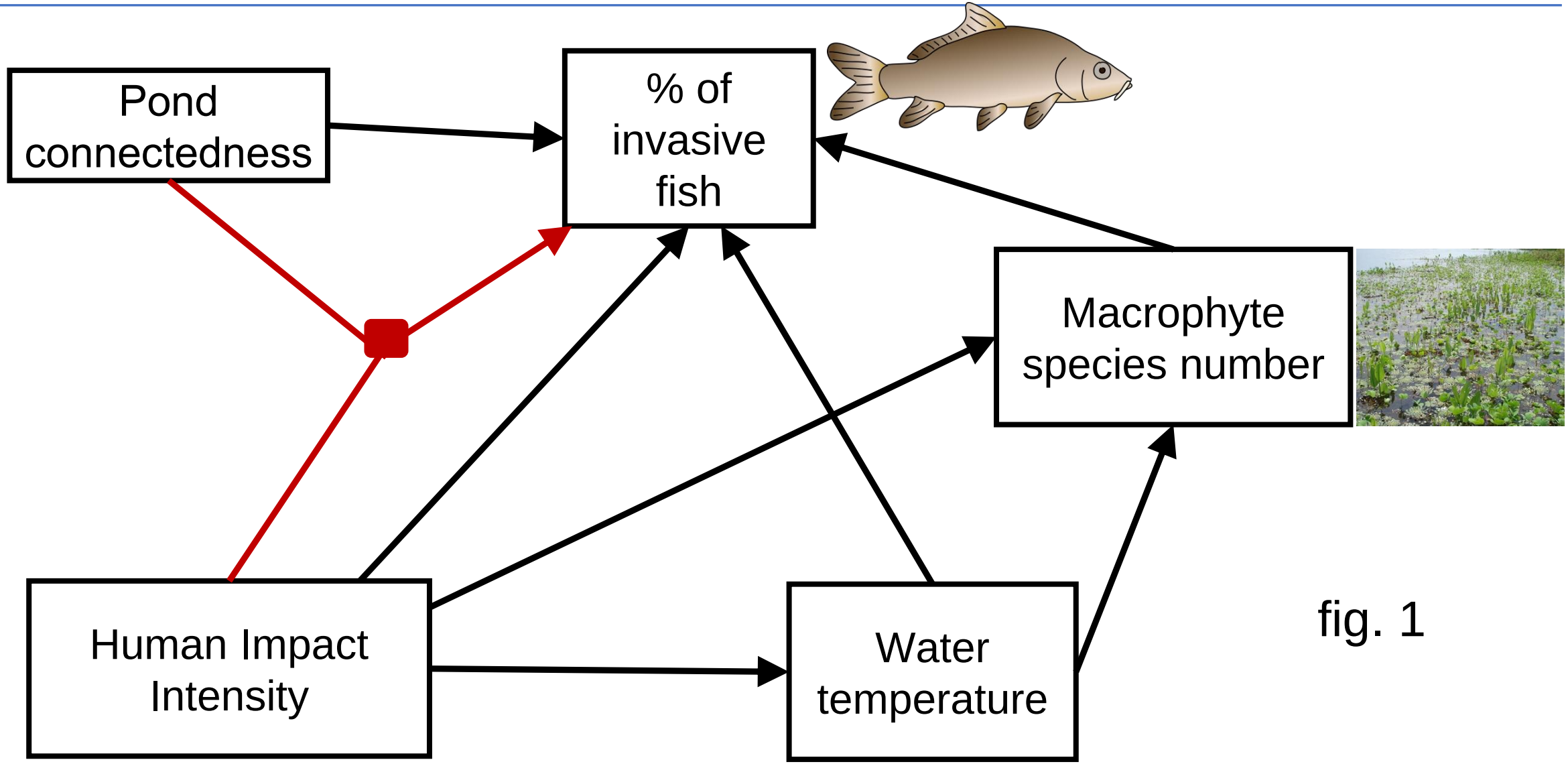


fig. 1

Day 9 Task 2

Tasks:

1. Build the SEM model (model 1) as shown on fig. 1, including the interaction among pond connectedness and human Impact Intensity

2. Test the model fit

3. Fill in the standardized coefficients and the explained by model variances.

4. Calculate direct, indirect, and total effects of "Human Impact Intensity" on "% of invasive fish".

5. Build model 2, which excludes the interaction among pond connectedness and human Impact Intensity. Compare model 1 and model 2. Select model which more accurately represents the data.