Biodiversity

Invasion of the Greylag Geese

Quelle: http://www.compass-project.eu/resources_detail.php?UG_hodnota_id=1

Sovon, a Dutch bird protection organisation, counts birds. The number of greylag geese is increasing. Is this increas worrying fpr the diversity of water bird species?
What does the concept biodiversity mean, how can it be described mathematically and what are its advantages and limitations?
How does the biodiversity of water birds change in the Netherlands (Europe/your country) and what is the impact of the growth of the greylag goose population?

Worksheet for task 1

Worksheet 1

Is the growth of the greylag goose population dangerous for other water birds?

Bird counters have shown that the number of breeding greylag geese in the Netherlands is increasing. These studies were conducted by the Dutch bird protection organisation, Sovon. The purpose was to understand how many of these birds breed in the Netherlands and the effect on other birds. The results were published on the internet.

Some of these results are shown below. Sovon is worried about the increase in the greylag goose population, because they fear that this endangers the biodiversity of the water birds.

Name	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*
Little Grebe	274	247	336	704	815	825	948	844	815	1134	1036
Grebe	10788	12319	11299	11680	10996	10524	11626	10617	9080	10050	9494
Mute Swan	4786	5551	6646	8125	9025	10150	10853	11056	11393	10771	11457
Greylag Goose	39273	47714	53448	67675	76547	87425	101680	100901	110316	114651	119559

Source: Network Ecological Monitoring, SOVON, RWS & CBS, www.sovon.nl

Little Grebe
Source: BS Thurner Hof

Great Crested Grebe
Source: MarekSzczepanek

Mute Swan
Source: Wiki commons (noname)

What has happened to the population of the four types of birds?

Discuss!

Worksheet for task 2

Worksheet 2

Questions

1. Place the following photographs in order from highest to lowest biodiversity.

2. What criteria did you use for ordering the photographs?

3. How would you define, measure, and investigate biodiversity in the case of birds?

Worksheet for task 3

Worksheet 3: Information sheet for Excel

Design a graph of the data that shows the development of the bird populations over time.

What do you want?	***How do you do it?***
Insert a formula	Numbers, formulas or text can be entered in empty cells in the spreadsheet. A formula always starts with an =. When you have typed in an = in one of the cells, you can enter one of the standard functions from the drop-down box in the upper left-hand corner, in front of the input area. When you choose, for example, SUM, from that list, then the function is entered in the input area and a help screen appears for inserting the rest of the information. Select the cells for which you want the sum (you might need to drag the window to the side) and click OK. The sum will then appear in the cell of the formula.
Copy a formula	The advantage of using a spreadsheet is that you can easily copy a formula to other places. In Excel, there are various ways to copy cells: 1. by clicking the icons for Copy and Paste on the 'standard toolbar'; 2. by working with the 'copy cross': select the cell that you want to copy and click on the block in the lower right-hand corner (the mouse icon becomes a black cross). Click and drag the cursor to fill the cells where you want to copy the formula. When you copy a formula, the relative references to the cells change in the formula. If you don't want that, use $-signs in the cell references, e.g., =(A2*A2)/(C2*C2). In this formula, the reference to A2 is relative and the reference to column C and row 2 is absolute.
Insert a graph	Select the cells with the data that you want to graph and click on *Chart* on the *Insert* menu (or click on the icon in the standard toolbar). The 'chart-wizard' gives you several options for the graph. The most important question is: which type of graph do you want? **Line** seems to be the best choice for now. By clicking-and-holding the 'Press and hold to view sample' button, you can see what the result will look like. **NB1:** A wizard is a helper that leads you, step by step, through a task. In the Chart wizard, you will see standard options to customise your graph. **NB2:** In the finished graph, you can double-click to change some of the options. Try to double-click on the line, the background, and the axes. If you keep the mouse still for a moment, a tooltip will appear telling you what feature you can edit by double-clicking.

Worksheet for task 4

Worksheet 4

If you want to compare the biodiversity of different areas, it is not enough to look only at the different numbers of species. Since the numbers of each species are different, it does not tell you much about the diversity, when there are ten species living in an area, if there are 100 animals of each kind. You need a measure for the biodiversity. Below is one way to measure biodiversity.

Look at the following model: Imagine an area where 20 animals live.

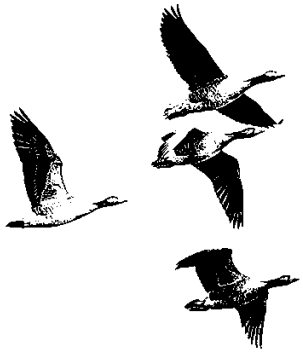
1. Imagine that very few species live in the area. How many different species could the 20 animals in the area belong to?
2. Imagine that the area was very diverse. How many different species could the 20 animals in the area belong to now?
3. How many other ways could you distribute the 20 animals between species?

Continue building the model. Consider 20 balls, where each ball represents one animal. For each type of animal, choose a different colour. When all animals belong to one species, all balls have the same colour. If there are 5 animals of one species, and 15 of another species, you would have 5 balls of one colour and 15 of another.

4. Imagine that four animals belong to type A, six to type B and ten to type C. Think about this example by using different coloured balls. What is the probability when selecting two balls at random that they are of a different colour?
5. What is this probability when 10 animals belong to type A and 10 to type B?
   The probability of taking two balls which have the same colour (or animals of similar species), is taken as a measure of biodiversity. This measure is called **Simpson's index**.
6. What is the maximum that Simpson's index can be? When is this value reached?
7. How does Simpson's index change when the diversity of the animals increases?
8. **Back to the water birds:** Calculate Simpson's index for the table of water birds in the Netherlands on page 1. How does the index change over time? What conclusions can you draw from this?

Worksheet for task 5

Worksheet 5.1



The number of greylag geese increases. Do they crowd out other water birds from their breeding grounds or do they compete with them for food?

Competition: any plant or animal species has adapted to very specific conditions in their habitat. They might need a certain temperature, for example, or require particular types of food. When two species prefer the same environmental conditions, they are in competition. For example, in a competition for food, different species in the same area prefer the same food and must compete for limited sources. Competitive exclusion principle: two species with identical demands on the environment cannot exist in the same area. The competition principle will cause the losing species to become wiped out completely.

Activities:

1. Examine how the greylag goose and other water birds compete with each other. Compare the factsheets (see worksheet 5.2).

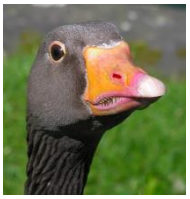
2. Are birds in your country at risk? Provide information about the number and distribution of animals in your country: http://www.ebcc.info/

3. What other factors endanger the lives of animals?

4. Now try to answer the question in the introduction to this worksheet.

Worksheet 5.2

1. Greylag Goose:

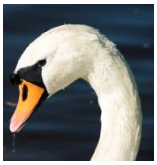


Size: 76-89 cm,
Weight: about 3.5 kg
Breeding site: soil
Eggs per clutch: 4-9
Incubation period: 28-29 days
Behaviour: migratory bird, in family groups that can form themselves into larger groups
Food: grasses, herbs, berries, water plants,roots
Feeding habits: Grazing mainly on land, grasses, herbs and sometimes water plants

2. Great Crested Grebe:

Breeding site: nest of reeds, twigs and aquatic plants floating in the reeds
Breeding season: courtship in March, breeding begins in late March to mid-April
Eggs per clutch: 3-4 eggs, rarely up to 7
Development time: young birds can swim and dive immediately, in the first 3 weeks they travel in the back feathers of parents for protection from predators (pike)
Behaviour: Mostly partial migrant, rare migratory bird
Feeding habits: Hunters that dive in search of fish and other small

3. Mute Swan:



Size: 152 cm
Weight: 10 -12 kg
Breeding site: soil
Number of broods: 1
Eggs per clutch: 5-8
Incubation period: 34-38 days
Nestling period: 120-150 days
Food: water plants, small animals at intermediate depths in the water

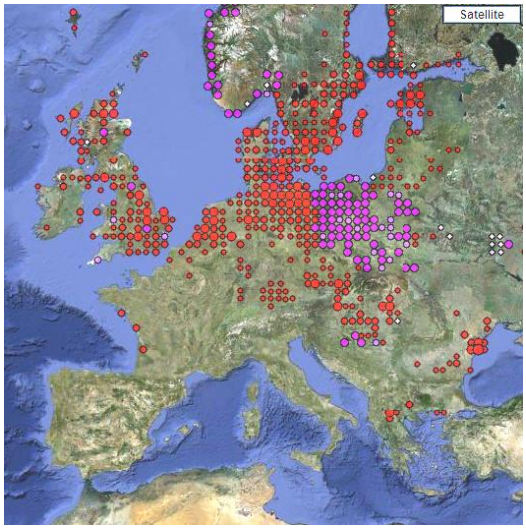
4. Little Grebe:

Size: 27 cm
Weight : 100-200 g
Breeding site: nest in the reeds
Number of broods: 2 (3)
Eggs per clutch: 4-6
Incubation period: 20-21 days
Nestling period: 44-48 days
Behaviour: partially migratory, wintering
Food: insects, small fish

Worksheet for task 6

Worksheet 6: The final report

Final task: Write a report!



Write a report to the ornithologists from Sovon in which you discuss your concerns about the biodiversity of birds.

- Explain your position
- Use your answers to the worksheets, the charts, your calculations as well as further information and images from the internet to explain your position
- Suggest proposals (with reasons) for possible measures to control and / or protect the biological diversity of water birds

Information on the number of birds in Europe can be found on the following pages:

http://www.ebcc.info/

Information on each European country at:

http://www.ebcc.info/pecbm.html

Picture Source: http://www.compass-project.eu/resources_detail.php?UG_hodnota_id=1