

## **Teaching materials on the subject of „Conservation of Biodiversity“ (TMBC)**

**Topic:** Neobiota

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**Grade:** secondary education

**Quality assurance:** Prof. Carsten Hobohm (UF)

**Kind of material:** Info sheet and card game

**Aim:** Provide an insight into the topic „Neobiota“ and get to know some different species

### **Method**

First, hand out the info sheet “What are invasive species” to the students. After reading the text, there can be a discussion about further invasive species. Now hand out the card game to the students. The sheets of paper should be glued to a piece of cardboard. Then the single cards can be cut out. The pictures should also be cut out. Afterwards, the pictures can be matched to the correct cards. Before gluing card and picture together, the result should be compared. If students are uncertain if they have matched them correctly, they can consult the internet or literature. Now, the game can begin!

### **Instructions:**

Shuffle the cards and hand them out to every player. Every player takes his cards and holds them so that only the first card is visible. One player starts and chooses one of the facts written on the game card. He reads out aloud for example: “Size: 5 m”. The fellow players now each read out the requested information in turn. The player with the highest value wins the cards of the fellow players and puts them under his own cards. Only the category “Introduction” is different: here the earliest date wins (e.g. 1890 wins against 1920). The category “Consequence” has fictive numbers from 0-5. Here again, the highest value wins. If there is no value given, this card wins against all others. If two players have the same number another category on the same card has to be chosen and compared to the others.

The winner of each round chooses the category on his next card. There are two ways of winning this game. The players have to decide which alternative they want to play:

1. The game ends as soon as one player runs out of cards. The winner is the one with the most cards.
2. The game ends as soon as one player owns all the cards.

Good luck and enjoy!

## What are Neobiota or non-indigenous species?

The term “Neobiota” consists of the Greek terms “neos” (new) and “bios” (life). Therefore, invasive species are organisms that were introduced by people (on purpose or unknowingly) after the year 1492 (discovery of America). Invasive plants are called neophytes; invasive animals are called invasive species (Neozoa).

Most Neobiota integrate quickly into native habitats. Many of them have lived so long in our country that they are no longer recognised as “newcomers”. Some of them increase extremely fast.

Germany has signed the Convention on Biological Diversity from 1992 and is therefore committed to the sustainable use and protection of biological diversity. Neobiota are categorised as problematic, if they fulfil three of the following points:

- They endanger and replace native species
- They change native ecosystems
- They cause economic damage
- They are hazardous to people’s health.

Neobiota have been and are introduced in different ways. Many trees and plants were planted as decorative or crop plants in private parks and gardens. Over time, the plants escape into the wild. Animals like Nutria were able to escape from fur farm or were released. The construction of the Suez Canal led to a migration from the Red Sea to the Mediterranean Sea. The Black Sea is connected with the North Sea via the Rhine-Main-Danube Canal. The ships transport alien species on their hulls and in their ballast water. The giant neotropical toad, for example, was brought to Australia for pest control in the sugar cane plantations, but then became a plague itself. As many alien species, the giant neotropical toad has no predator. Hedgehogs and toads, for example, avoid the Spanish slug, because, unlike native slugs, it secretes bitter mucus.

On the other hand, Neobiota can have positive effects on native biodiversity. They broaden the diet not only of humans (e.g. corn and potatoes). To what extent Neobiota influence the native flora and fauna has to be evaluated in individual cases.



**Common Ragweed**

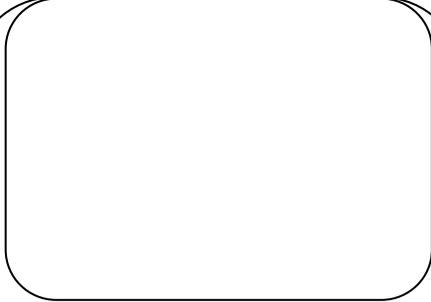
*Ambrosia artemisiifolia*

**Size:** from 0,20 m to 1,80 m

**Introduction:** in Germany since 1860, from North America

**Reproduction:** from 3000 to 60,000 seeds

**Consequence:** strong allergen, grows very competitive with other weedy plants (3)



**Himalayan Balsam**

*Impatiens glandulifera*

**Size:** up to 2,50 m

**Introduction:** in Europe since 1839, from the Himalayas

**Reproduction:** 1600 to 4300 seeds

**Consequence:** competitive with native plants, rooted plants cannot grow (low light) (3)



**Giant Hogweed**

*Heracleum mantegazzianum*

**Size:** up to 3,2 m

**Introduction:** in Europe since 1815, origin Caucasus

**Reproduction:** 21,000 fruits

**Consequence:** contact with plant juice causes skin damage, (3) competitive with native plants



**Japanese Knotweed**

*Fallopia japonica*

**Size:** up to 3 m

**Introduction:** in Europe since 1825, from China, Korea and Japan

**Reproduction:** efficient vegetative reproduction by rhizomes

**Consequence:** represses shade-sensitive native species (5)



**Canada Goldenrod**

*Solidago canadensis*

**Size:** 0.5 m up to 2.50 m

**Introduction:** in Europe since 19th century, from North America

**Reproduction:** up to 19,000 seeds

**Consequence:** represses native shade-sensitive native species (5)



**Spiny-cheek Crayfish**

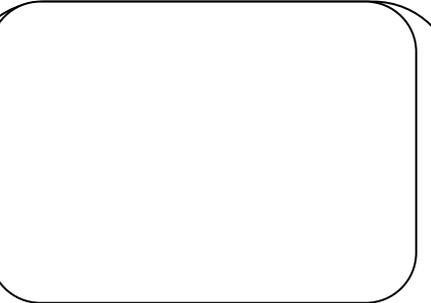
*Orconectes limosus*

**Size:** up to 12 cm

**Introduction:** in Germany since 1890, from eastern USA

**Reproduction:** up to 600 eggs

**Consequence:** main carrier of the crayfish plague, represses native crayfish (5)



**Asian Clam**

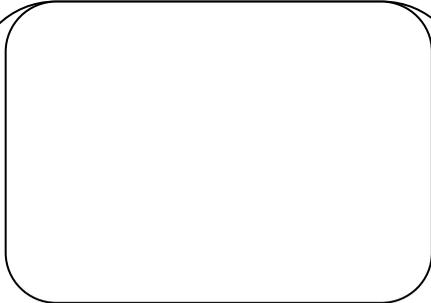
*Corbicula fluminea* x *C. fluminalis*

**Size:** up to 2,80 cm

**Introduction:** in Europe since 1980, from China and Taiwan

**Reproduction:** up to 8000 juveniles

**Consequence:** massive occurrence causes elimination of native freshwater snail (0)



**Zebra Mussel**

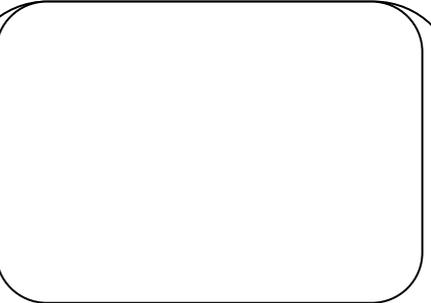
*Dreissena polymorpha*

**Size:** Up to 3 cm

**Introduction:** distribution since 1824, from Black and Caspian Sea

**Reproduction:** up to 1 million eggs

**Consequence:** massive occurrence causes choking of bigger mussels, reduction of plankton (0)



**Garden Lupin**

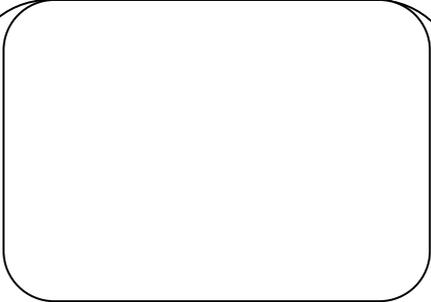
*Lupinus polyphyllus*

**Size:** up to 150 cm

**Introduction:** in Germany since 1890, from North America

**Reproduction:** up to 2000 seeds

**Consequences:** replacement of plants of montane meadow in need of protection (0)



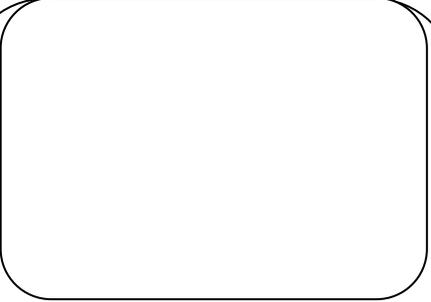
**Canada Goose**

*Branta canadensis*

**Size:** from 90 cm to 100 cm

**Introduction:** as a breeding bird in Germany since 1970, from North America **Reproduction:** 5 to 6 eggs

**Consequences:** hardly any problems, high population causes nesting place competition with grey goose (5)



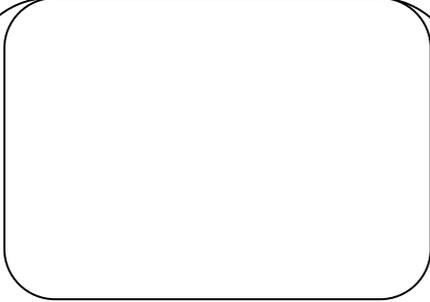
**Nutria**

*Myocastor coypus*

**Size:** up to 65 cm (+ tail 45 cm)

**Introduction:** in Germany since 1930 in Germany, from North America and Eurasia **Reproduction:** up to 24 offspring, 3 litters

**Consequences:** digging on the (5) riverbank may cause economic damage



**Chinese Mitten Crab**

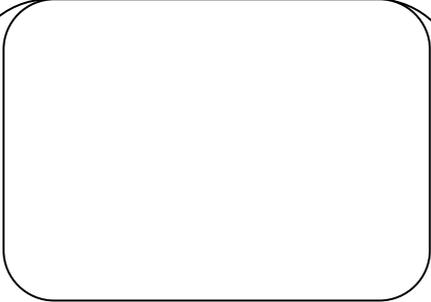
*Eriocheir sinensis*

**Size:** up to 30 cm (with legs)

**Introduction:** in Germany since 1912, from China

**Reproduction:** Up to 900,000 eggs

**Consequences:** so far no ecological damage known, can dig holes in protective barriers (5)



**Raccoon**

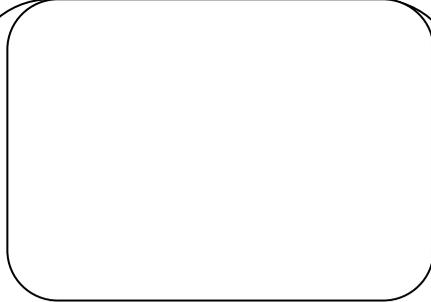
*Procyon lotor*

**Size:** up to 71 cm

**Introduction:** in Germany since 1927, origin North America

**Reproduction:** 2-3 offspring

**Consequence:** negative effect on (2) native biodiversity not yet proven



**Octopus Stinkhorn**

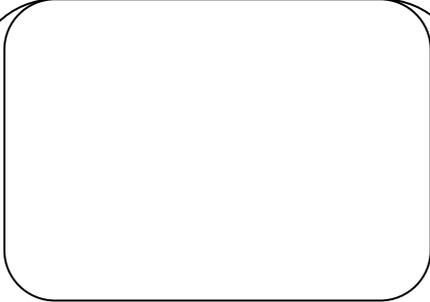
*Clathrus archeri*

**Size:** up to 10 cm

**Introduction:** in Germany since 1934, from Australia

**Reproduction:** spores

**Consequence:** so far no negative effect on native nature (2)



**Spanish Slug**

*Arion lusitanicus*

**Size:** 8 – 12 cm

**Introduction:** in Germany since 1980, from France **Reproduction:** up to 400 eggs

**Consequence:** replacement of native slugs not yet proven, no native predator (2)



**Waterweed**

*Elodea nuttallii*

**Size:** up to 3 m

**Introduction:** in Germany since 1953, from America

**Reproduction:** vegetative reproduction

**Consequence:** might cause decrease of water soldier (3)



**Giant Neotropical Toad**

*Bufo marinus*

**Size:** up to 23 cm

**Introduction:** in Australia since 1935, from South and Central America

**Reproduction:** up to 30,000 eggs

**Consequence:** mass distribution, replaces native species (3)



**European Rabbit**

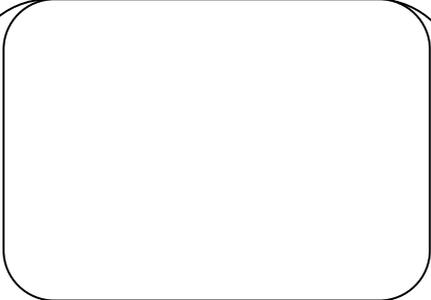
*Oryctolagus cuniculus*

**Size:** up to 45 cm

**Introduction:** in Australia since 1860, origin Iberian Peninsula

**Reproduction:** up to 42 offspring, 7 litters

**Consequence:** endangers native fauna, habit competitor (3)



**Japanese Rose**

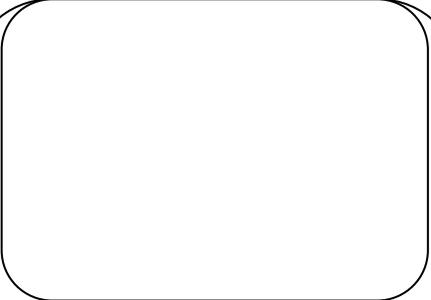
*Rosa rugosa*

**Size:** up to 2 m

**Introduction:** in Germany since 1854, from East Asia

**Reproduction:** vegetative reproduction and seed

**Consequence:** restricts shade-sensitive plants (2)



**Asian Lady Beetle**

*Harmonia axyridis*

**Size:** up to 8 mm

**Introduction:** in Germany since 2002, from China and Japan

**Reproduction:** up to 400 eggs

**Consequence:** so far no negative effect known for native Lady Beetle, damage in viticulture (2)



**American Rhea**

*Rhea americana*

**Size:** up to 1,40 m

**Introduction:** in North Germany since 2000, from South America

**Reproduction:** up to 30 eggs

**Consequence:** no negative effect on native flora and fauna proven (2)



**Black Locust**

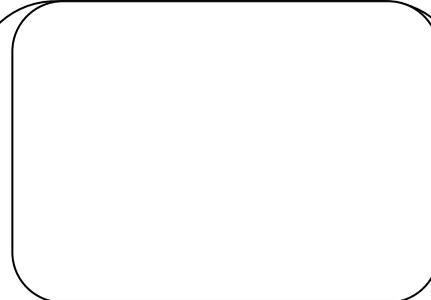
*Robinia pseudoacacia*

**Size:** up to 38 m

**Introduction:** in Germany since 1634, from North America

**Reproduction:** 4-8 seeds per hull

**Consequence:** other plants can be replaced, especially in unimproved grassland (4)



**Black Tailed Python**

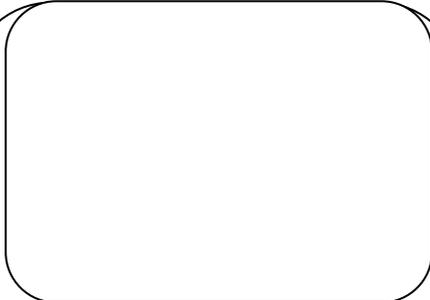
*Python molurus*

**Size:** up to 3 m

**Introduction:** in Florida since 1979, from Southeast Asia

**Reproduction:** up to 30 eggs

**Consequence:** negative effect on native fauna, e.g. wildcat, possum, carrao (4)



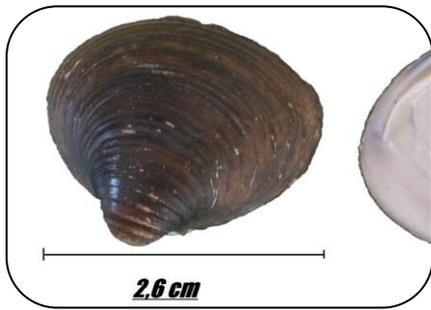
**Grey squirrel**

*Sciurus carolinensis*

**Size:** up to 30 cm

**Introduction:** in England since 1889, from North America

**Reproduction:** up to 14 offspring, 2 litters **Consequence:** considered to be replacing the native squirrel (4)





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#### **References:**

Jagel, A. et al. (Landesamt für Natur, Umwelt und Verbraucherschutz Nordrhein-Westfalen (LANUV NRW). , 2014): Neobiota (<http://neobiota.naturschutzinformationen-nrw.de>; downloaded 16.01.14)

Melzer, T. (2012): Schutz gebietsfremder Pflanzen auf Hamburger Stadtgebiet. (<http://www.gneunzehn.de/assets/melzer.pdf>; downloaded 15.01.14)

Nehring, S. (Bundesamt für Naturschutz. , o. J.): Neobiota. Gebietsfremde und invasive Arten in Deutschland (<http://www.neobiota.de/grundlagen.html>; downloaded 10.01.14)

o. A. Chinesische Wollhandkrabbe ([http://de.wikipedia.org/wiki/Chinesische\\_Wollhandkrabbe](http://de.wikipedia.org/wiki/Chinesische_Wollhandkrabbe); downloaded 12.01.14)

o. A. Neozoen in Vorarlberg-Einwanderer im Tierreich (<http://www.neobiota.at/neozoen/index.html>; downloaded 12.01.14)

o. A. Nutria (<http://de.wikipedia.org/wiki/Nutria>; downloaded 10.01.14)

Schäufele, J. Neozoen – Neue Tiere in Deutschland (<http://www.heimische-tiere.de/Neozoen.htm>; downloaded 17.01.14)

Hobohm, C. (2009): Neobiota. -Unterricht Biologie 344, 2-45 S., u.a.Freiburg

Wenning,S. (2013): Neobiota Aufgaben für Unterricht und Exkursion.-Bio-Innovativ 1, 5-34 S., Nordersted