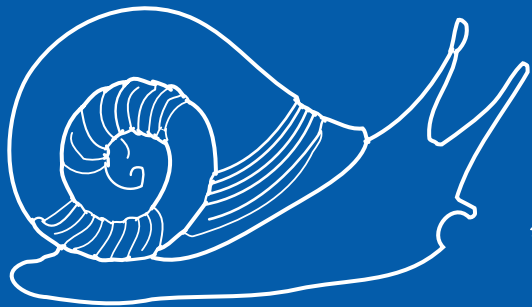


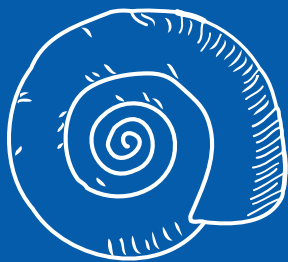


Interactive Supplement II



Snails and Bivalves Teach

Annelie Ehlvest



**Tartu Environmental Education Centre
2011**



Snails and Bivalves Teach
Annelie Ehlvest

This educational material including all appendices may be downloaded and printed from the COBWEB project website www.hyria.fi/COBWEB and Tartu Environmental Education Centre website www.teec.ee.

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CENTRAL BALTIC
INTERREG IV A
PROGRAMME
2007–2013



ENVIRONMENTAL INVESTMENT
CENTRE



**Tartu
Environmental
Education Centre**

Contents

1. Foreword 4

2. Observations and Experiments

- 2.1. Attention! Look at me! 7
- 2.2. Let's get to know each other! 8
 - "Different Species of Land Snails" 11
- 2.3. Moving at a snail's pace 14
- 2.4. A Restaurant for Snails 19
- 2.5. What's important in a snail's life? 24
- 2.6. Get to know a snail's neighbour 30
- 2.7. A Watery Study 33
- 2.8. The Power of Salt 34
- 2.9. A Mollusc's Lifespan 39

3. Games

- 3.1. Similar and different 42
- 3.2. Thai chi for snails 43
- 3.3. Snails and hedgehogs. Mussels and mites 44
- 3.4. Herb Floor Social Networking 47
- 3.5. Malacological "Alias" 59

Bibliography 71

1. Foreword

A practical, exploratory, experimental, discovery-filled and playful teaching approach is very important when acquiring knowledge and skills. We are surrounded by the diversity of nature and human society. The respect and understanding of the similarities and differences between living beings as well as their needs is one of the foremost objectives in the primary and secondary school curricula.

Snails and bivalves are a part of the diversity around us and have many features and characteristics that allow them to be used as a teaching tool for understanding the many different aspects of nature both outdoors and in the classroom. Snails and bivalves are good subjects for observation and experiments, thanks to their many characteristics:

- Molluscs do not bite and are non-toxic.
- Snails and molluscs live both on land and in water, in the school playground, in gardens, nearby ditches, ponds, rivers, lakes, etc.
- They are slow and will not fly or run away.
- Their protective shell and their mucus covered body give them sufficient strength against gentle handling.
- The diversity of the species is quite large as well as their relationships with other living creatures. Their observation can be multi-angled.
- The shells of dead snails and bivalves decompose slowly, which make their shells easy to collect, measure, compare and, if desired, be retained in a collection.
- Their empty shells are beautiful and can be used for arts and crafts such as necklace and bracelet making and mosaics.
- Their diversity makes for a wide range of possible relationships between human and mollusc.

This publication offers surveys, practical exercises and games that provide an opportunity to gain an understanding of the biodiversity in the world of snails and bivalves. Individual, pair and group activities are included in the publication. The combination of long and short exercises and activities on various topics are suited to different age groups and time constraints. These activities can then be catered to suit an outdoor excursion, individual assignment or game. It is also possible to arrange a longer and more extensive series of observations and experiments (for both individual and group work). The results may then be used in a class science fair.

This publication is divided into two major categories. The first half of the publication discusses observations and experiments, and the second half provides instructions for various games.

Each chapter outlines:

- Which methods are used (observation, experiment, game)
- The materials and resources needed
- The suitable age group (which can vary, since some exercises can be adapted for different age groups and skill levels)
- The appropriate season and location for the activity
- The recommended duration of the exercise
- The steps of the exercise
- The number of participants
- The necessary preparations for the exercise
- The course of the exercise or game
- Available supplementary material such as worksheets and cards that can be reproduced, if needed.

An introductory PowerPoint presentation entitled “Snails and Bivalves in Nature,” introduces the diversity of the mollusc species, their age and their relationship to other living organisms as well as their role in nature.

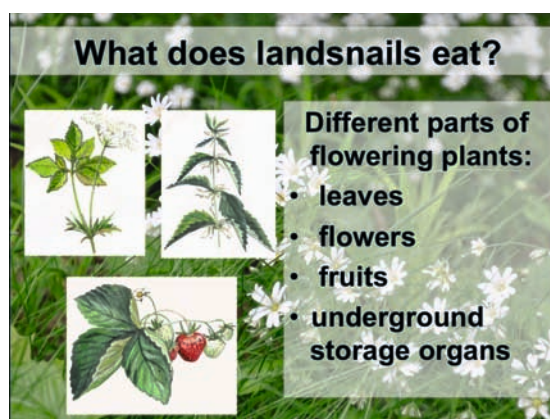
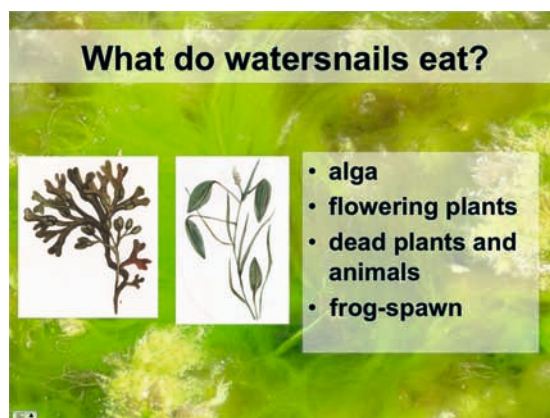
The presentation “Snails and Bivalves in Nature” as well as the brochure can be downloaded and printed from the COBWEB project website www.hyria.fi/COBWEB and the Tartu Environmental Education Centre website www.teec.ee.

This publication is intended primarily for teachers, instructors and excursion leaders, but can also be used as an activity for a rainy afternoon or summer week for any curious explorer, regardless of their age.

Simple observations and experiments of land snails may be performed in the schoolyard, local park or similar. Some activities may also be adapted to indoor use. Exercises and games can be combined depending on the time allowance and the age of the students. They may also be combined with other experiments and games, snail-related or otherwise (seasons, different habitats, etc).

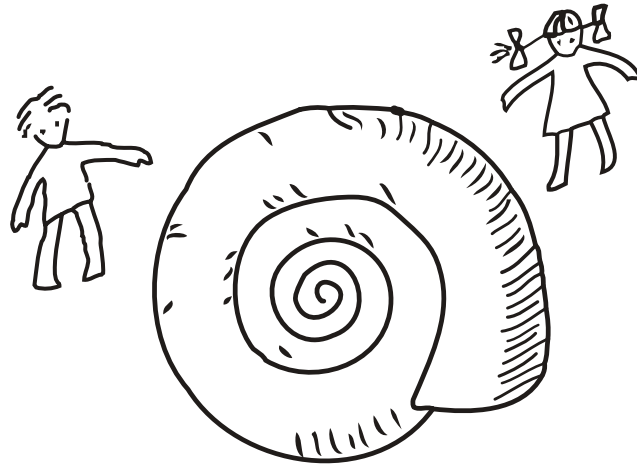
I would like to thank all of the students, teachers, interns and colleagues from the bottom of my heart, who have contributed to the development of this publication over the course of the past few years. Their very valuable feedback and encouragement proves that it is indeed possible to work with snails and bivalves. I also warmly recall all of those who at the end of the “workday” confessed that “they never would have believed that snails could be so interesting!”

Annelie Ehlvest



Internet Slideshow

2. Observations and Experiments



2.1. Attention! Look at me!

Subject

Land snail appearance and build

Materials

For every 2–3 participants: 1 Petri dish and magnifying glass; a large land snail (either collected in advance or on site).
For measuring: a half meter-long rope or empty snail shells, marbles, straws, stones or something similar.

Methods

Observation; Writing, Description; Counting; Tying knots

Duration

10 minutes

Season

Late April until late September

Location

Outside or inside (if snails have been collected beforehand. One snail for every 2–3 participants).

Age

5–12 years

Participants

Up to 24

Preparation

Before you begin your excursion, be sure that the chosen destination (e.g. park, school garden or other) does indeed have a snail population (e.g. copse snail, white-lipped snail, bush snail, Burgundy snail) and places suitable for finding snails (e.g. flower bed edges, shrub bases and other shaded areas). If for some reason it is difficult to find snails in a nearby suitable excursion destination, the snails must be acquired from elsewhere and should be kept in a vented terrarium or in a container with air-holes until observation.

Directions

Divide the students into groups of 2 or 3 and ask them to choose one large snail. All young participants may use a magnifying glass. Now begin to observe the snail.

Within each group, everyone must present their observations in turns (e.g. colour, pattern, shell lustre, speed of movement, size, etc.). Previous observations may not be repeated, but students may add their own clarifications and adjustments. For example, if a student says that the shell is brown, then the following student may point out that the shell is light brown with yellow spots. The students may continue to present their observations until all available characteristics have been covered.

For each observation a knot must be made on the “check-list” string (or a stone, marble or similar put into a pile, a bowl or bag).

Once each group has exhausted all possible descriptions, count all of the knots or stones. Make note of each group’s number. Alternatively, this may be turned into a competition and the groups with the most findings may receive the “Master Observer Award.”

To conclude, ask each of the groups to list the snail’s most prominent features. The instructor could describe some of the simpler features of the snail (e.g. shell, leg, head, base, eyes).

This observation is also suitable as a “warm-up exercise” for the following, more complex exercises and worksheets that teach about snails.

This type of exercise can, of course be used with other test subjects, natural or artificial.

For a more complicated version of this exercise, students may compare two different things, looking for similarities and differences. The choice of pairs depends on the subject and the age of the participants. Two very similar things may be compared (e.g. two of the same species of plant or animal or mushroom), where similarities are numerous and small individual differences few. Two quite different objects may be compared as well, where the differences are easier to find than the similarities.



Knots on a string

2.2. Let's get to know each other!

Subject

Land snail appearance, size and habitat

Materials

For every pair: 1 Petri dish, 1 magnifying glass, one of each worksheet "Observing Snails 1" (p. 8) and "Different Species of Land Snail" (p. 11) or a field guide on snails, clipboard, pen/pencil and a short ruler or a small calliper. (These may be shared among students).

To be shared between groups: plastic spray bottle, two thermometers for measuring air temperature, if possible a soil thermometer and psychrometer or hygrometer for measuring humidity. If possible, stools for each participant.

Methods

Observation; Measurement; Teamwork; Comparison

Duration

20–30 minutes

Season

Late April until late September

Location

Outside preferably, or inside (if snails have been collected beforehand, at least 1 snail per pair).

Age

10+ years, younger children may participate with the help of their instructor and without the worksheet

Participants

Up to 24

Preparation

Make copies of the worksheets and gather the necessary materials. Before you begin your excursion, be sure that the chosen destination (e.g. park, school garden or other) does indeed have a snail population (e.g. copse snail, white-lipped snail, bush snail, Burgundy snail) and places suitable for finding snails (e.g. flower bed edges, shrub bases and other shaded areas). If for some reason it is difficult to find snails in a nearby suitable excursion destination, the snails must be acquired from elsewhere and should be kept in a vented terrarium until observation.

Prior to the excursion it is beneficial to view the "Snails and Bivalves in Nature" presentation in class.

Directions

Divide the students into pairs and distribute the necessary tools and worksheets. Then give a brief tutorial about the environmental conditions that affect snails the most (e.g. humidity and temperature), and set up the temperature and humidity measuring instruments together. Place one of the thermometers in the sun (if the sun is shining) and a second in the shade.

Then direct the students to look for a snail that is large enough for observation and measurement. Give assistance when needed and where appropriate, offer explanations.



Tools

Date: _____

Observers: _____

Habitat

Moisture and temperature are very important for snails.

- If the relative humidity is above 75%, the majority of snails are active.

If the relative humidity is below 58%, most snails are dormant.

- Snails prefer shadow and shade, and avoid direct and bright light.
- Snails are more active at 10–20 °C and less active between 5–9 °C and 21–35 °C.

During the observation, the weather was (select): sunny, partly cloudy, cloudy, foggy, raining, windy, calm.

Air temperature in the shade _____ C°

Air temperature in the sun _____ C°

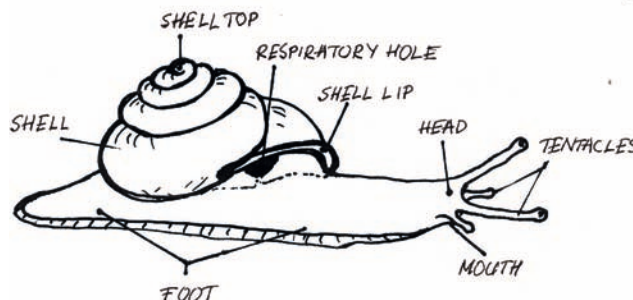
Relative humidity _____ %

Soil temperature in the shade _____ C°

Let's get acquainted!

Snails have many of the same features we have, but in different places:

- Their **head** is on their foot.
- They have **teeth** on their tongue and some species have teeth on the shell opening.
- The lip of the shell is what makes most snails unique. Adults have a thick shell, especially at the opening that has often a distinctively different colour than the rest of the shell.
- The snail's "**navel**" is a small hole on the bottom side of the shell (it can be closed, slightly open or not be there at all (e.g. copse snail)).
- The **genital pore** is where the sperm is exchanged and from where the eggs are laid. This can be found on the right side of the snail's "neck."
- The **anus and the breathing pore** share the same hole. (While the snail breathes it may release some excrement). This is located near the edge of the shell's opening.
- The **eyes** are at the tips of the tentacles. (Most snails that live on land have these).
- The snail uses the lower pair of tentacles to sense where it is going – like a blind person with a walking stick.



Exercise

Find a snail (or take one from the box) for observation.

Put it on a transparent surface (e.g. Petri dish). Give the snail a name. Be careful with your new pet - to them you're a giant! If the snail is very passive and often hides in its shell, spray some water from the water bottle on the snail. Hopefully this will help wake him up.

Found / chosen snail's name: _____

What species of snail have you found? _____

Look at the snail through the magnifying glass. Find its **shell, head, foot, eyes, tentacles, respiratory pore and anus**.

What is the colour of the snail's shell, head and foot? _____

Compare your snail with other snails of the same species collected by other groups.
Are the snail shells of the other observers a different colour than yours?

Whose snail has the darkest shell? _____

Are the snail's foot and head different colours? _____

Whose snail has the lightest foot and shell? _____

Are there any other differences you notice? _____

While you were observing the snail, was it breathing (when the breathing pore is open, it is breathing)? _____

Did the snail release any excrement during your observation? _____

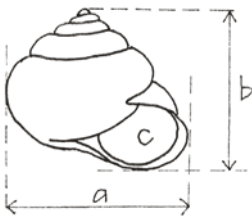
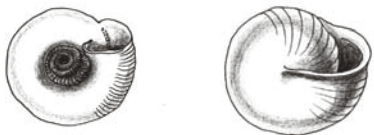
Is the snail female or male? _____

Adult snails have a strong shell, often with a thickened edge at the opening (lip) that has a different colour than the rest of the shell.

Is your snail an adult or child? _____

Give reasons for your opinion.

Measure the height and width of the snail's shell with a calliper, ruler, tape measure, or a piece of graph paper.

| | |
|---|--|
|  <p>a – width of the shell b – height of the shell c – size of the shell opening</p> | <p>Width of the shell is ____ mm = ____ cm</p> <p>Height of the shell ____ mm = ____ cm</p> <p>Is the height of the shell smaller, equal or bigger than the width of the shell? (< = >)</p> <p>Width of the shell ____ height of the shell</p> |
|  <p>Shell with navel. Shell without navel.</p> | <p>Find the place on the snail's shell where the navel may be. Does your snail have a navel?</p> <p>_____</p> |

“Different Species of Land Snails”



White-lipped snail

Cepaea hortensis

Shell: 5 to 5.5 whorls; width 1.8 to 2.2 cm; height 1.2 to 1.7 cm. Shiny, yellow, with up to five brown stripes. Stripes may not be visible. The shell's colour and pattern can vary. Shell opening: relatively narrow and stretched, the lip and mouth are white. Navel: closed.



Brown-lipped snail

Cepaea nemoralis

Shell: width 1.8 to 2.5 cm; height 1.5 to 2.2 cm; 5.5 whorls; light to dark yellow, with some pink, shiny, 0–5 brown stripes. Shell opening: slightly stretched, oval, and brown; the lip is reddish-brown. Navel: closed



Copse snail

Arianta arbustorum

Shell: width 1.2 to 1.8 cm; height 1.6 to 2.2 cm; dark brown, covered with light (yellowish) spots usually with a dark brown stripe. Shell opening: round, and slightly curved, with a white lip. Navel: closed.



Common amber snail

Succinea putris

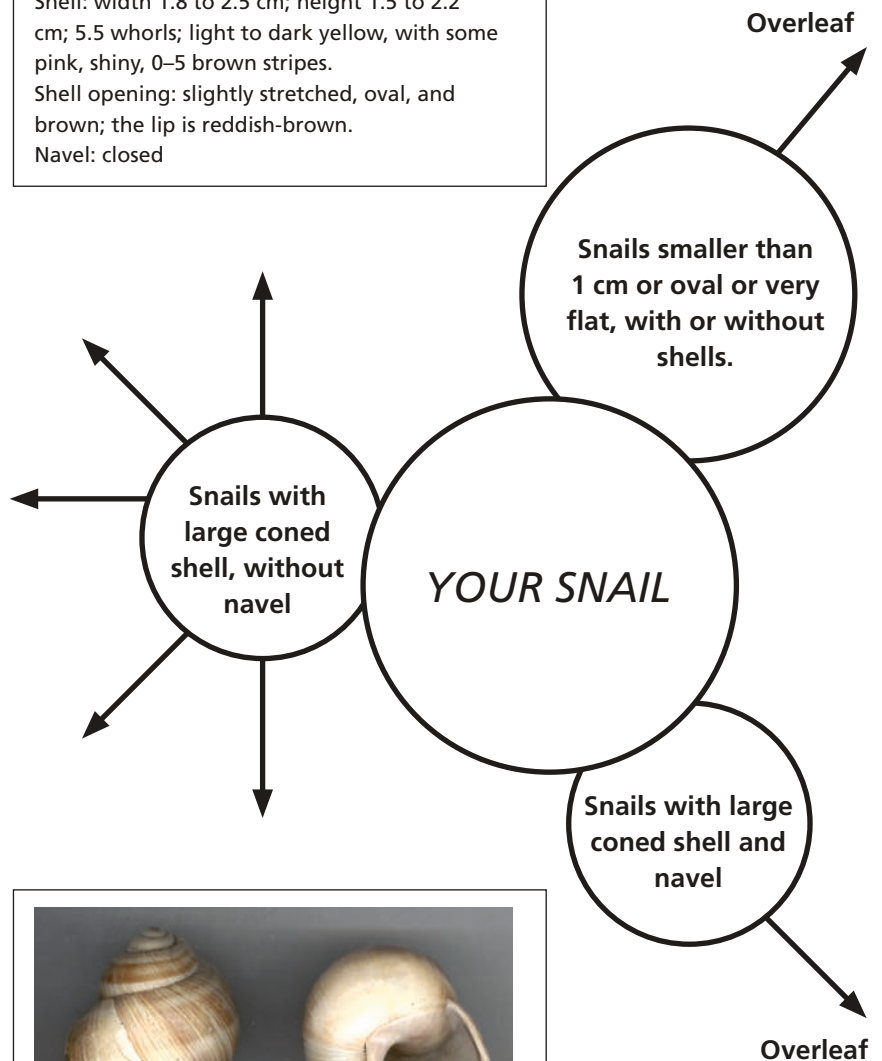
Shell: height 1–2 cm; 3–4 fast-growing whorls; shiny amber yellow, transparent. Shell opening: 2/3 the height of the shell, without a lip. Navel: closed.



Burgundy snail

Helix pomatia

Shell: width 3–5 cm; height 3.2 to 5 cm; strong; yellowish-brown to whitish-grey, with up to five dark brown or purplish brown stripes. Shell opening: white to whitish-pink shell opening and lip. Navel: very small, and partially closed with a lip.



“Different Species of Land Snails”

Overleaf
Snails with
large coned
shell, without
navel



Herald thorn snail



Brown hive snail



Hairy snail



Vertigo snail



Door snail



Glossy pillar snail



Black gloss snail



Two-toothed snail

Overleaf
Snails with
large coned
shell, without
navel



Large leaf snail
Euomphalia strigella

Shell: similar to the bush snail, but shorter; width 1.3 to 1.5 cm; height 1 to 1.2 cm; yellowish-grey to pale reddish-brown, usually with one milky white stripe; matte finish, slightly transparent.

Shell opening: slightly ellipsoidal, whitish and ribbed on the inside lip (similarly to the bush snail, the ribbing is visible as light lines)

Navel: open, wide (about 1/4 the width of the shell), the immediate area around the navel is often lighter.



Bush snail
Bradybaena fruticum

Shell: width 1.3 to 2 cm, height from 1 to 1.9 cm, uniform greyish yellow to light reddish brown, slightly shiny, quite transparent, seldom found with one brown stripe.

Shell opening: round or ellipsoidal, adults have a white 0.5 – 1 mm wide opening, with a thickened ribbed surface that is visible through its shell as lighter lines.

Navel: open, narrow (diameter 1/6 to 1/8 the width of the shell)



2.3. Moving at a snail's pace

Subject

Movement in nature, land snail locomotion, speed, the importance of mucus in a snail's life

Materials

For every two participants (or groups of 3–4) you will need: a Petri dish, a magnifying glass, one of each "Observing Snails 2" worksheet (p. 15), "Different Species of Snails" (p. 11) or a field guide on snails, clipboard, pen/pencil; measuring tape, a white plastic surface about 20 x 20 cm or an A4 piece of paper, a stopwatch, a two-minute hourglass or mobile phone stopwatch, pocket calculator, one cotton swab.

To be shared between groups: plastic spray bottle, thick paper or cardboard onto which a "snail racetrack" is drawn – a bull's-eye about 50 cm in diameter, the centre being "START" and the outer ring being "FINISH" (see photo). If possible, stools for all participants.

Methods

Observation, Measurement, Calculation, Conversion

Duration

30 minutes

Season

Late April until late September

Location

Outdoors, the first part of the exercise may be completed indoors (if the snails have been previously collected, divide at least one snail per pair)

Age

10 +, younger children may participate with the help of the instructor, without the worksheets and calculations.

Participants

Up to 24

Preparation

Make copies of the worksheets, gather the necessary materials. Before you begin your excursion, be sure that the chosen destination (e.g. park, school garden or other) does indeed have a snail population (e.g. copse snail, white-lipped snail, bush snail, Burgundy snail) and places suitable for finding snails (e.g. flower bed edges, shrub bases and other shaded areas). If for some reason it is difficult to find snails in a nearby suitable excursion destination, the snails must be acquired from elsewhere and should be kept in a vented terrarium until observation.

Prior to the excursion it is beneficial to view the "Snails and Bivalves in Nature" presentation in class.

Directions

Divide the students into pairs and distribute the necessary tools and worksheets. The importance of locomotion in the animal kingdom is briefly discussed and the differences in plant and animal locomotion are compared. Then direct the students to look for a snail sufficient in size for observation and measuring. Give assistance when needed and where appropriate, offer explanations.



The snail racetrack

Date:

Observers:

Locomotion

Movement for living organisms, especially animals, is a necessary skill.

How does locomotion help the animals (and us)? What is it used for (give at least 3 examples):

1. _____ 2. _____ 3. _____

The diverse animal kingdom has a large variety of locomotive styles and techniques.

Look around you and try to think of an animal for each type of movement. Can you see an animal around you with any of these movements? Or do you think one that lives nearby?

| Movement | Animal | Movement | Animal |
|----------|--------|----------|--------|
| Flying | | Walking | |
| Soaring | | Climbing | |
| Jumping | | Running | |

Where are you observing the animals? We are in a _____ (Select a location: park, garden, forest, meadow, etc., try to describe your location as accurately as possible.)

Crawling

Snails move with the help of wavy muscle movements in the foot. They slide along with the help of mucus that is produced from glands in the foot. Snails need a lot of water in their bodies to produce this mucus. It is harder for snails to move on a dry surface than a wet one. Therefore, snails become more active after rain, in the late evening, night and early morning hours.



The sole of the snail's foot

Look closely at your snail.

Watch the snail as it moves on the Petri dish. Look at it from above and below. See how the snail's foot crawls along under it.

Describe the snail's movement: _____

Is your snail using its lower tentacles to guide itself? _____

What colour is your snail's mucus? _____

Measuring speed

Using a pencil, mark a dot in the centre of a piece of paper (or a white plastic surface). This is the start. Wet the paper/ plastic surface with water from the plastic spray bottle or a damp sponge.

Place the snail on the centre dot and let it start moving. Observe its movement for 2 minutes. Set the timer (or 2 minute hourglass). After 2 minutes, mark where the snail

finished. Measure the distance the snail travelled. If the snail did not move in a straight line, then consider any extra distance it may have travelled.

The snail travelled _____ centimetres (cm) in 2 minutes.

Do the following transductions, using a calculator (and your head!)

The snail's speed was _____ centimetres **per minute** (cm/min) =

= _____ centimetres **per hour** (cm/h) = _____ = meters per hour (m/h).

How fast did the other snails move?

Compare your results with the other groups. Calculate **the average speed among the snails** using the formula below.

The fastest-moving snail was: _____

Calculate **the average speed of all the snails (in meters per hour)**, add all of the snail speeds together and divide by the total number of snails (n).

The total number of snails n = _____ snails.

The average speed of the snails was:

____ + ____ + ____ + ____ + ____ + ____ + ____ / (n) ____ = ____ m/h

Now you have an idea of the speed of each individual snail. Now let's see if your snail can move as fast in a race. Prepare for your snail's race, be its coach, feed it and keep it moist!

Snail race

Place your snails together at the middle starting point and let them start moving on the signal.

READY! SET! GO!

Help your snail move along and go in the direction you want by: moistening its path, tempting it with food and giving it shade if the sun is shining. You are not allowed to touch the snails (to help your snail or hinder the competition).

Snail Race Results

I place _____ II place _____ III place _____

Did the same fast snails win the race? _____

How high can snails climb?

Not only does the snail's mucus allow it glide along smoothly it also works as an adhesive: this allows the snail to climb high and on different surfaces. The snail's mucus also helps it travel longer distances because it can rest inside its shell for a long time

while still staying attached to trees, walls, stems or even leaves. The snail will never fall, even while tucked inside its shell 'napping'.

Find a nearby area with tall plants (grasses, trees) and check them carefully. Can you find any snails climbing or attached to these tall plants? Or any trail of snail mucus? If so, measure the height from the ground or the length of the mucus trail, as accurately as you can.

The snail/mucus trail was _____ cm in height. Where did you find the snail? _____

Now, compare your height to the length of a snail. Keeping in mind your own height, how high would you have to climb to cover the same distance?

The length of the snail's body (foot) outstretched is ca _____ cm.

The height at which you found the snail, is about _____ cm.

Divide the height at which you found the snail by the length of its body, how many body lengths (SBL) did the snail climb? Approximate SBL = _____

Your height is ... cm. If you wanted to compete in a climbing contest with a snail, keeping in mind your difference in size, you would have to climb:

Your height _____ cm x the SBL = _____ = _____ cm = _____ m altitude.

Could you climb it (without any climbing equipment)?

Everything that is useful does not have to look nice... to laud snail mucus.

A snail's mucus is not only useful for keeping it moist and helping it stick, but also:

- keeping the snail clean
- protecting it against harmful bacteria
- protecting the snail from cuts
- helping heal its scrapes
- making many predators' lives uncomfortable (mucus is bitter, especially slug mucus)
- it plays an important part of the slug's mating ritual while it is suspended in air (with a "mucus rope")
- it is often used in expensive face creams

The colour of the mucus is unique to each species of snail!

Let your snail crawl along the edge of your worksheet. Look at the colour of mucus trail it leaves behind.

The snail's mucus is (select): colourless, milky, light yellow, dark yellow, orange.

The mucus from the bottom of the foot can be different from the mucus on the top. Take a swab of mucus from the top of the snail's foot with a cotton swab. Is there any colour on the swab?

The mucus from the top of the snail's foot is (select): colourless, milky, light yellow, dark yellow, orange.

Touch the snail with your thumb and index finger and let the mucus dry. Do your fingers remain "glued together"?

What did you notice? _____



2.4. A Restaurant for Snails

Subject

Land snail food preferences, snail traces in nature

Materials

Groups of 2–4 students will need: a worksheet (p. 21), a clipboard, pen/pencil, 2 magnifying glasses, “Different Species of Snail” (p. 11).

To be shared by the whole class (or divided among each group): 6–8 different foods in small quantities, some Petri dishes for liquids, if necessary; large thick glossy paper, or a plastic sheet, plastic bottle, a large cardboard box to cover the experiment, plant guides; if possible, a few cameras.
Snails (preferably 50 to 100).

Methods

Experiment, Observation, Evaluation, Presentation

Duration

Set up of the experiment takes 10 minutes, the duration of the experiment is 30–40 minutes including waiting period, summary of the results also 10 minutes. Compilation and presentation of the results to other groups depending on the thoroughness of the presentation, the number of groups and the form of presentations will take 20 to 90 minutes.

Season

May to September

Location

Outside, Exercise 1 may be performed inside, if the instructor has previously collected the snails in a terrarium. Exercise 2 is suitable for individual or group work as part of a take-home assignment.

Age

10 +, younger children may participate with the help of the instructor, without the worksheets and calculations.

Participants

Up to 30

Preparation

Make copies of the worksheets and gather the necessary materials. Before you begin your excursion, be sure that the chosen destination (e.g. park, school garden or other) does indeed have a snail population (e.g. copse snail, white-lipped snail, bush snail, Burgundy snail) and places suitable for finding snails (e.g. flower bed edges, shrub bases and other shaded areas). If for some reason it is difficult to find snails in a nearby suitable excursion destination, the snails must be acquired from elsewhere and should be kept in a vented terrarium until observation.

For the food experiment some of the food may be collected from the wild (dandelion, ground elder, fallen leaves, etc), be sure to include some human food (sausage, boiled egg, vegetables, cucumber, bread, cheese, biscuits, milk, beer, etc).

Prior to the excursion it is beneficial to view the “Snails and Bivalves in Nature” presentation in class.

Directions

Divide the students into groups of 2–4 and distribute the materials and worksheets. Place the snails together with the food items on a dish or glossy piece of paper. Mark down each type of food used. You will need to collect 50–100 snails in total for this experiment – either on site or gathered previously and kept in a terrarium.

Alternatively, students may be responsible for their own food and set up individual groups’ experiments. Place the food and the snails together in a dish. Then cover the snails with the cardboard box so that they will not be disturbed. Results may be recorded after 30–40 minutes. While the students wait, assign Exercise 2.



What do snails prefer?



Snails and different foods



The restaurant is open



Dinner is served!



A little peace and quiet



The moment of truth



The favourite is cucumber

Date:

Observers:

What do snails eat?**Exercise 1**

Place 6–8 different food items on a big paper sheet, some from the wild and some human. Place the food around the edges of the dish and the snails in the middle so that the snail will have an even distance between the food items.

Moisten the food. Fill out the following chart with the different foods. Cover the dish with a cardboard box and wait about 40 minutes. Snails need some time to decide where to go and what to do – rest or eat and if they want to eat, then what do they want to eat. While you wait, complete Exercise 2.

At the end of the experiment mark down how many snails were at each food. Mark down the snails that are in contact with the food.

Number of snails used in the experiment: _____

Different species of snails used in the experiment _____

| Food provided | How many snails were at this food at the end of the experiment? | % of total snails | Other observations |
|---------------|---|-------------------|--------------------|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |

The number of snails that were away from the food (on the box ceiling, walls, sleeping or elsewhere) _____

Which food seemed to be the most popular? _____

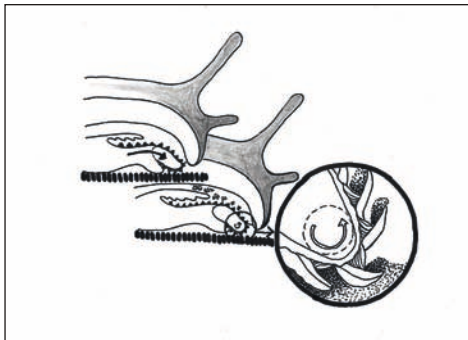
At the end of the experiment remember to return the snails to where you found them.

Exercise 2

Take a walk in your neighbourhood and try to find some plants with bite marks (check stems, leaves and fruit) and mushrooms (if they are in season). On mushrooms, a snail's bite mark is very smooth, without any visible holes.



A snail's bite marks on a butterbur plant.



Snails use their radula to break down food. This small tongue acts like a file covered with many rows of tiny chitin teeth to break down food.

Try to identify the plants and mushrooms as precisely as you can. Use field guides or ask your instructor if you need help identifying the plants. If you have a camera, take a picture of the bite marks.

On the following table, mark down which plants/ mushrooms had bite marks, and which plants had snails, mucus or excrement on them. If possible, try to determine the type of snail using the "Different Species of Snails" or a snail field guide. In addition to snails, many plant eating insects leave trails behind on leaves. Besides growing plants and ripe fruit snails also eat decaying leaves and plants and sometimes mushroom spawn, algae and decaying wood.

In the observation column you may describe anything that was surprising or unusual. If you took a photo, take note of it in that column.

Observation Table

| Plant or mushroom with bite marks | Were there any snails? Which type? | Was there any visible mucus or excrement? | Other observations |
|-----------------------------------|------------------------------------|---|--------------------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Make a summary of your findings and present it to the other groups.



2.5. What's important in a snail's life?

Subject

Land snails: lifecycle and makeup

Materials

Groups of 2–4 students need: laminated observation sheet (p. 25–28), pencil, Petri dish, magnifying glass. To be shared amongst the class: 2 thermometers for measuring air temperature, if possible earth thermometer and humidity measuring instrument.

Methods

Observation, Measuring temperature

Duration

45 minutes

Season

May – September

Location

Outside

Age

8+, younger children may participate with the help of the instructor, without the worksheet and calculations

Participants

Up to 30

Preparation

Make copies of all necessary worksheets, laminate and staple them (see the picture). The observation page can be reused if written on with a pencil that can be erased.

A location with relatively large snails will be chosen for this exercise. The temperature and humidity measuring instruments will be set up to the location (1 in the sun, 1 in the shade and one in the soil). Gather other necessary materials for the work groups.

This exercise can be turned into a game if the steps are separated and placed in different locations along with the necessary materials. This exercise may also be added to other snail-related games.

Directions

Divide the students into appropriate groups, distribute the observation pages, materials and direct them to the walk in the neighbourhood. If the various measuring instruments have been set up beforehand, the students will be shown to their location. Give assistance during observations and with collecting the data, when needed, and offer explanations, where appropriate.



Reference Guides

What is important in a snail's life?

1. Favourable housing conditions and the right shade

Moisture and temperature are very important for snails.

- 1) If the relative humidity is above 75%, the majority of snails are active. If the relative humidity is below 58%, the majority of snails are dormant.
- 2) Snails prefer shadows and shade and avoid direct and bright light.
- 3) The snails are most active at 10–20 °C and least active in the range 3–9 °C and 21–33 °C.

The weather here is...

... sunny, partly cloudy, cloudy, foggy (select one)
... Temperature in the shade: _____ °C;
... Temperature in the sun: _____ °C;

Snails like to find a peaceful place and rest under fallen leaves and logs, as well as on the underside of plant leaves.

Look around you and try to guess where the snails have settled themselves.

Go and check those places to see if you can find a snail.



What is important in a snail's life?

3. How to they look like?

Find a nearby snail to observe!

Put the snail on a transparent surface (e.g. Petri dish). Be careful with your new pet - to them you're a giant! If the snail is very passive and often hides in its shell, spray some water from the water bottle on the snail. Hopefully this will help wake him up.

Which species is your snail?

Look at the snail through a magnifying glass. Find its **shell, head, foot, eyes, tentacles, respiratory pore and anus**.

What colour is the snail's shell, head and foot?

Was your snail breathing during the observation (when the respiratory pore is open, then it is breathing)?

Did your snail produce excrement while you were observing it?



Snail with navel



Snail without navel

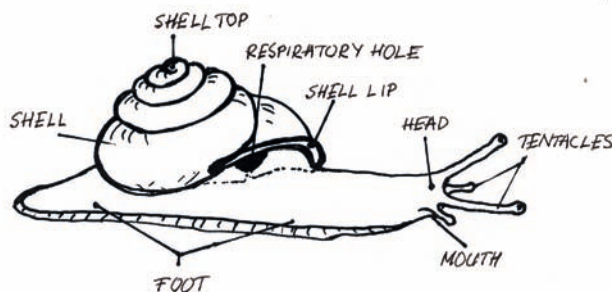
Find the place where the snail might have a navel. Does it have one?

What is important in a snail's life?

2. The beautiful and lasting snail body

Snails have many features in common with ours, only sometimes in a different place:

- Their head is on their foot.
- They have teeth on their tongue and some species have teeth on the shell opening.
- The lip of the shell is what makes most snails unique. Adults have a thick shell, especially at the opening that has often a distinctively different colour than the rest of the shell.
- The snail's "navel" is a small hole on the bottom side of the shell (it can be closed, slightly open or not be there at all).
- The genital pore is where the sperm is exchanged and from where the eggs are laid. This can be found on the right side of the snail's "neck."
- The anus and the breathing pore share the same hole. (While the snail breathes it may release some excrement).
- The eyes are at the tips of the tentacles.
- The snail uses the lower pair of tentacles to sense where it is going –like a blind person



What is important in a snail's life?

4. A snail's pace and its crazy climbing abilities

Snails move with the help of wavy foot muscle. They slide along with the help of mucus that is produced from glands in the foot. Snails need a lot of water in their bodies to produce this mucus. It is harder for snails to move on a dry surface than a wet one. Therefore, snails become more active after rain, in the late evening, night and early morning hours.

Watch the snail as it moves in the Petri dish from above and below. Look at how its foot is moving.

Is your snail using its lower tentacles to guide itself?
What colour is the snail's mucus?

Find a nearby area with tall plants (grasses, trees) and check them carefully. Can you find any snails climbing or attached to these tall plants?

Look at how high the snail has climbed and compare it with the length of its body.

Snails can climb several meters high! Could you climb up a 100m tower without the help of any climbing equipment?



Why does the snail not fall down?
Did you guess it?
The answer is in the next exercise.

What is important in a snail's life?

5. Mucus

Not only does the snail's mucus allow it to move smoothly, it also acts as glue: this lets the snail climb on different surfaces, especially high ones. The snail's mucus also helps it travel longer distances because it can rest inside its shell for a long time while still staying attached to trees, walls, stems or even leaves. The snail will never fall, even while tucked inside its shell napping.

Touch the snail's body with your finger. Now put your thumb and index finger together. Do they stick?

The snail's mucus also:

- Helps keep the snail clean
- Protects it against harmful bacteria
- Protects the snail from cuts and scrapes
- Helps heal its scrapes
- Makes many of its predators uncomfortable
- Is sometimes used as an ingredient in expensive face creams



The mucus is sticky



What is important in a snail's life?

7. Food, of course! We almost forgot...

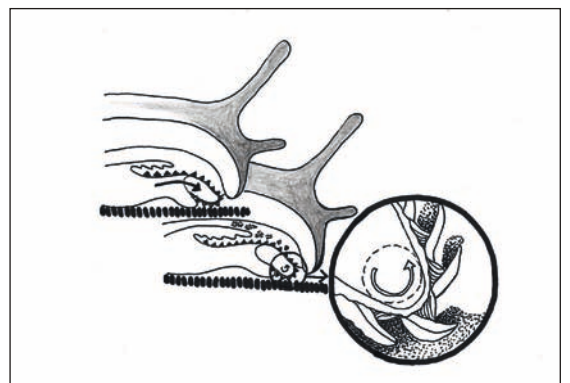
A snail's diverse and healthy menu:

- Different parts of flowering plants like leaves, flowers, fruits and roots
- Mushrooms – mushroom spawn as well as mushrooms
- Algae, ferns and moss
- Lichens
- Cadavers: The copse snail eats other dead snails.

Take a walk in your neighbourhood and try to find some plants with bite marks (check stems, leaves and fruit) and mushrooms (if they are in season). On mushrooms, a snail's bite mark is very smooth, without any visible holes.



Snails like the butterbur plant



Snails use their radula to break down food. This small tongue acts like a file covered with many rows of tiny chitin teeth to break down food.

What is important in a snail's life?

6. Sex and offspring

Adult snails have a thick shell with a thickened edge (lip) that has often a different colour than the rest of the shell. Large land snails are fully grown at the age of 3–4 years.

Is your snail an adult or a child?

What gender is your snail? Select:

- Female
- Male
- Both female and male

The correct answer is the last choice. Land snails are hermaphrodites, meaning they are both male and female. First, the snail will produce sperm and exchange it during mating. Mating takes place over many hours and is different for each snail species. Then, the egg cells develop and are fertilised. Eggs are finally laid in the soil.

The land snail's genitals are found between the head and foot, on its "neck."



Snails mating



What is important in a snail's life?

8. Read and think. What do you have in common with a snail?

If you think that you do have something in common with the snail, nod your head, yes.

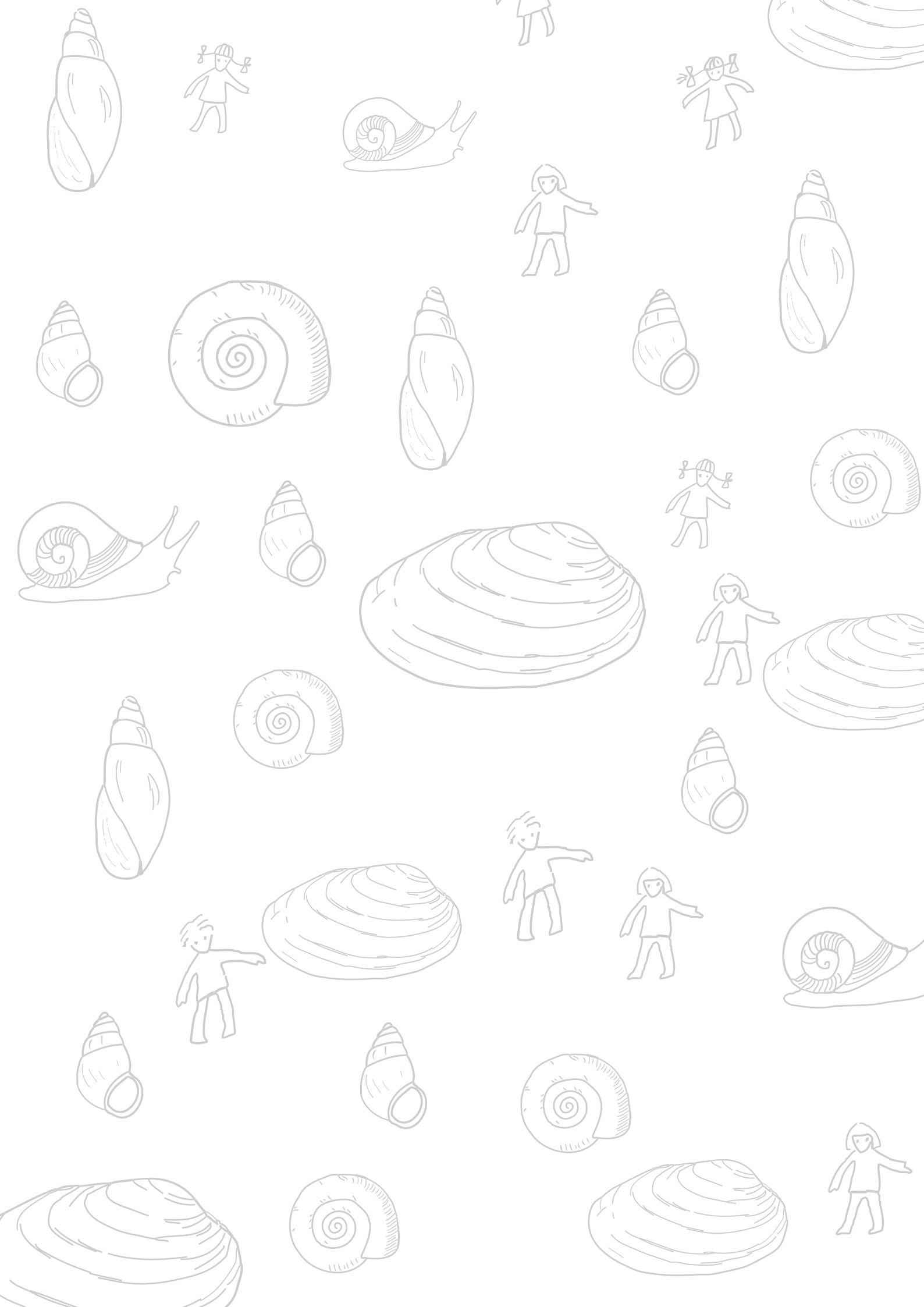
If you don't think you have anything in common with the snail, shake your head, no.

- Snails crawl with one foot.
- Snails love rain and fog over sun.
- Snails eat mushrooms. Snails lay eggs.
- Snails need food to live. Snails can eat paper.
- Snails do not sing. Snails get sick sometimes.
- Snails do not have a nose. Snails need water to survive.
- Snails do not have ears. Snails have teeth on their tongue.
- Snails do not go to the dentist. Snails need to rest sometimes.
- Snails breathe. Snails breathe through a hole on the side of their body.
- Snails eat strawberries. Land snails are fully grown in 1–4 years.
- Snails produce mucus from the foot to move constantly on a damp path.
- Snails do not have toes. Snails are able to drink water through their foot.
- Land snails are hermaphrodites, meaning that the snail is both male and female.



The Burgundy Snails

What do humans need to survive?



2.6. Get to know a snail's neighbour

Subject

Animals of the mould and herb floor, eating habits and adaptations; relationships between different animals

Materials

Groups of 3–4 children need a work-sheets, clipboard, pen/pencil, magnification box, magnifying glass, metal table-spoons or small sand shovels; simple animal field guides

Methods

Observation

Duration

25 minutes

Season

May to September

Location

Outside, different habitats (garden, park, forest, compost heap)

Age

8–14

Participants

Up to 24

Preparation

Make copies of the worksheets and gather the necessary materials. This exercise is best performed in an area with a variety of plants, fallen leaves, mould, and fallen branches.

Directions

Divide the materials to the groups and ask them to get to become familiar with the animals of the surrounding mould and herb floor. Try to identify the invertebrate animals as accurately as possible. Look for decaying logs, decaying bark from trees, plant leaves, etc. Leave the area as clean as you found it. Return all collected specimens to their habitat when the exercise is completed.

Look for vertebrate animal trails as well: mole hills, mouse tracks, etc.

Compare all the results at the end.



Who are their neighbours?

Date:

Observers:

Who live under mould, bark and moss?

Look for a variety of invertebrate animals around you, what do you see?

Look under plant leaves, fallen leaves and mould.

Place them in the magnification box and try to identify as many as you can.

They all have an important role in nature.

Write down what kind of animals you have found.

Animals that eat decaying plants and animals are:



Springtail



Earthworm



Disk snail



Tick



Copse snail



Millipede



Wood louse

Animals that eat living plants/fruit are:



White-lipped snail



Amber snail



Aphid



Copse snail



Ant



Butterfly (caterpillar)



Weevil

Animals that hunt and eat other animals:



Ground beetle



Myriapoda



Glow worm



Ant



Spider

Did you see any other animals that were not shown in the pictures? _____

Which ones? _____

Look for other animal tracks: mole hills, mice tracks, etc. If you see something, write or draw, what you found.

Count how many different animals you saw. There were _____ animals in total.

Can you count how many legs the collected animals have in total? _____

How much life is in the soil?

Many animals live underground and are very small. Most of them we cannot see, not even with a magnifying glass.

In a depth of 10cm of soil covering about a shoe size 44 you may find:

200,000 protozoan + 600 wheel animals + 5 earthworms + 150,000 nematodes + 500 ringworms + 2000 spring tails + 5000 acarines + 2 millipedes + 10 snails + 2 isopods + 100 billion bacteria + 80 mosquito and fly larvae + 20 beetles + 75 spiders.

What do you think, why do we need all of these? _____

2.7. A Watery Study

Subject

Water snail behaviour, routine, breathing, nutrition; differences between pulmonata snails (with partial lung) and river snails (with gills), adaptations for life in water; water surface tension

Materials

For each group (2–3 children): an observation sheet, clipboard, pen/pencil; a plastic or glass jar or a small aquarium for closer observation; if possible, a stopwatch and camera, thermometer for measuring water temperature.

Methods

Observation, Recording results, Observation Summary, Result Comparison, Presentation

Duration

20 minutes for set-up, 30–60 minutes for observation, 30 minutes for results summary. Presentation time depends on how much practice is needed for the presentation type selected.

Season

May to September

Location

Outside at a body of water where large water snails are present.

Age

9–14

Participants

1–24

Preparation

Divide the students into groups and explain the goals of observation and hand out the tasks, prepare the observation sheets. It is up to the teacher, which areas of interest to focus on, as well as the length of time to be spent on the exercise. The observation sheet may ask to describe: species of snail, size, how the snails are obtained, observers, observation location and time, length, water temperature of collection point and of observation tray water, plants, and anything else placed in the aquarium or other data. The behaviour of the snails in every minute of observation should be recorded on a separate line, with columns for notes. For example, if the observation period is to be 30 minutes long, then the observation table should be prepared with at least 30 lines.

Make sure that there are large water snails present in the observed body of water.

Directions

Before beginning the exercise, fill the jar with water from the local water body where the snails were collected. Add some water plants and gravel or stones to keep the plants on the bottom of the jar, then add the snail or snails.

If it is possible to observe both the pulmonata snails (e.g. great pond snail, ramshorn, marsh pond snail) and the river snails (lister's river snail, faucet snail), then compare the differences in their breathing and their behaviour. If you are observing many different snails at once, then a separate sheet should be made for each type and each snail's observer. When observing the pulmonata snails, make special note of the length of their breaths (measuring how long their breathing pore stays open).

All behaviour during the observation period should be recorded.

The observation may be assigned as individual, pair or group work.

After the end of the exercise, all snails must be returned to where they were collected from.

A summary and presentation of results may be performed directly after the observation or assigned as homework or as a class presentation (in the form of a poster, slide presentation, simple graph, etc).

The summary should specify things as: the amount of breaths the snail took within an hour; the average duration of breathing; the duration of the shortest and longest breaths (this can be measured with a stopwatch); whether the snail ate during the observation; whether the snail was at the surface of the water and moving underside the water surface; if there were many snails in the same container, were they in contact with each other; any other relevant observations.



A watery study

2.8. The Power of Salt

Subject

The effects of salinity on snails and bivalves, environmental conditions affecting organisms; salinity of the Baltic Sea, different stages of the Baltic Sea; snails and bivalves in water, organisms of narrow and wide ecological amplitude

Materials

For each group (2–6 children): an observation sheet, clipboard, pen/pencil. Optional special equipment: nets, water observation tools, magnifying glasses, rubber boots, rulers or callipers, stools, snail identification book; map of observation location, atlas, Baltic Sea salinity map.

Methods

Observation, Measurement, Comparison, Evaluation

Duration

90 minutes

Season

May to September

Location

Outside, near water (either sea or fresh water bodies).

Age

13+

Participants

1–24

Preparation

Make copies of worksheets and gather all necessary materials. Assemble groups. It would be best to fill in the location details on the worksheets previously (or after the observation) in the classroom using maps.

Directions

The observation may be carried out with small groups where each group is responsible for their own data collection. Or one sole observation sheet may be completed for the whole class, bringing together every student's findings. Small groups encourage independent learning and gathering on past group work experience.

Background

Baltic inland freshwater and coastal waters have many similarities in their species.

After the ice age, the Baltic Sea has seen many changes in its waters that have affected the fauna. Throughout different periods, marine species have inhabited the Baltic Sea, and during fresh water eras fresh water species have moved into the sea. As the salinity of the water increased, those species tolerant to the increase in salinity remained there.

Many of our lakes that are far from the coast (Lake Peipsi) were once inlets of the sea but, because of continuous gradual uplift of the land during a long period of time, they have separated from the sea, which can explain the many similarities between the species. However, many of our fresh water lakes connect to the sea by river basins, which also carry many of their species along but also enable the species to spread in the opposite direction.

The changing in temperate environmental conditions is one of the biological characteristics of high ecological plasticity, wide ecological change in water temperature, salinity, oxygen conditions, as well as other environmental factors.

The biota of the Baltic Sea is quite rich in organisms, but poor in species, as it holds species that cannot tolerate the high salt content of the oceans or the fresh water of the lakes. Many species live in constant stressful temperature and salinity conditions, leading to an increased sensitivity to environmental change. The number and growth rate of species in the Baltic Sea falls with the decrease in salinity in the eastern and northern waters. The size of the molluscs is also affected by the salinity of the water.



A mussel in the salty water of the North Sea is much bigger than these in the brackish water of the Gulf of Finland

Date:

Observers:

Observation Site (select the most appropriate):The Baltic Sea ☐

Name of the area on the map _____

Geographic coordinates _____

Name of the bay _____ Name of the beach _____

Other details _____

Closest river, which flows into the sea _____

The mouth of this river is about _____ kilometres away.

The beach is (select): sandy, muddy, rocky, other (specify) _____

Other observations: _____

Lake ☐Pond ☐River ☐Stream ☐

Name of the observation area on the map _____

Geographic coordinates _____

This freshwater source is called _____

Does the body of water connect to the Baltic Sea? _____

If so, write down where the waterway passes through to connect to the Baltic Sea, starting from your current observation location until the river flowing into the sea/bay.

The water's route to the sea: _____

The water's edge is (select): sandy, muddy, rocky, other (specify) _____

Other observations: _____

Salinity in seas.

Although the salinity of water varies, the various types of salts contained in seawater remain virtually constant.

Sodium salts give the water its **salty flavour**, but magnesium salts give the water its **bitter taste**.

| SEA WATER SALT NAMES | SYMBOL | % OF SALTS |
|--|--------------------------------|------------|
| 1. Sodium chloride, or table salt | NaCl | 77,8% |
| 2. Magnesium chloride | MgCl ₂ | 10,9% |
| 3. Magnesium sulphate | MgSO ₄ | 4,7% |
| 4. Calcium sulphate | CaSO ₄ | 3,6% |
| 5. Potassium sulphate | K ₂ SO ₄ | 2,5% |
| 6. Calcium carbonate | CaCO ₃ | 0,3% |

Which of the salts in the table above are also found in freshwater and tap water, and give water its hardness to create scale build-up, and provide lime for snails and bivalves to strengthen their shells? _____

Fresh water also contains soluble salts to a small degree, but in freshwater it is called mineral content.

Taste the water of the observation site.

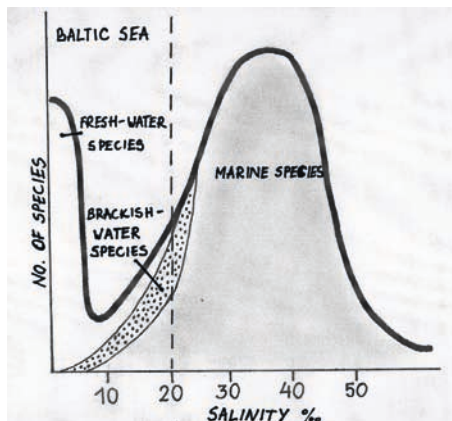
Is it fresh, slightly salty or very salty? _____

Salinity content:

North Sea 35 ‰, Danish straits 20 ‰, centre of Baltic Sea 6–15 ‰, backwaters of the Gulf of Finland 3–2 ‰, in freshwater from 0 to 0.5 ‰.

How salty do you think the water is at your observation site? _____

Salinity and water organisms



The proportion of different salt water species in waters with different levels of salinity

Organisms that live in water have different preferences in the salinity of the water, and this significantly affects their population size. Brackish Baltic Sea water contains part saltwater species, part freshwater species and some brackish water species. The fresher the water, the bigger the proportion of salt-tolerant freshwater species.

In the brief 12,000 year history of the Baltic Sea, the salinity and temperature have changed constantly and can be divided into several different stages. Most of the stages are named after the Latin names of molluscs that lived there in certain time periods

Ancylus Lake - *Ancylus fluviatilis*, the river limpet snail is widespread in European rivers and some lakes.

Yoldia Sea - *Portlandia (Yoldia) arctica* is a species that lives in the Arctic Ocean's cold and salty waters.

Littorina Sea - *Littorina littorea*, the common periwinkle is widespread across all European coastlines from the north all the way to the west coast. They also live in the White Sea and on the North American coast. They live in the saltiest part of the Baltic Sea from the Danish Strait to Bornholm Island.

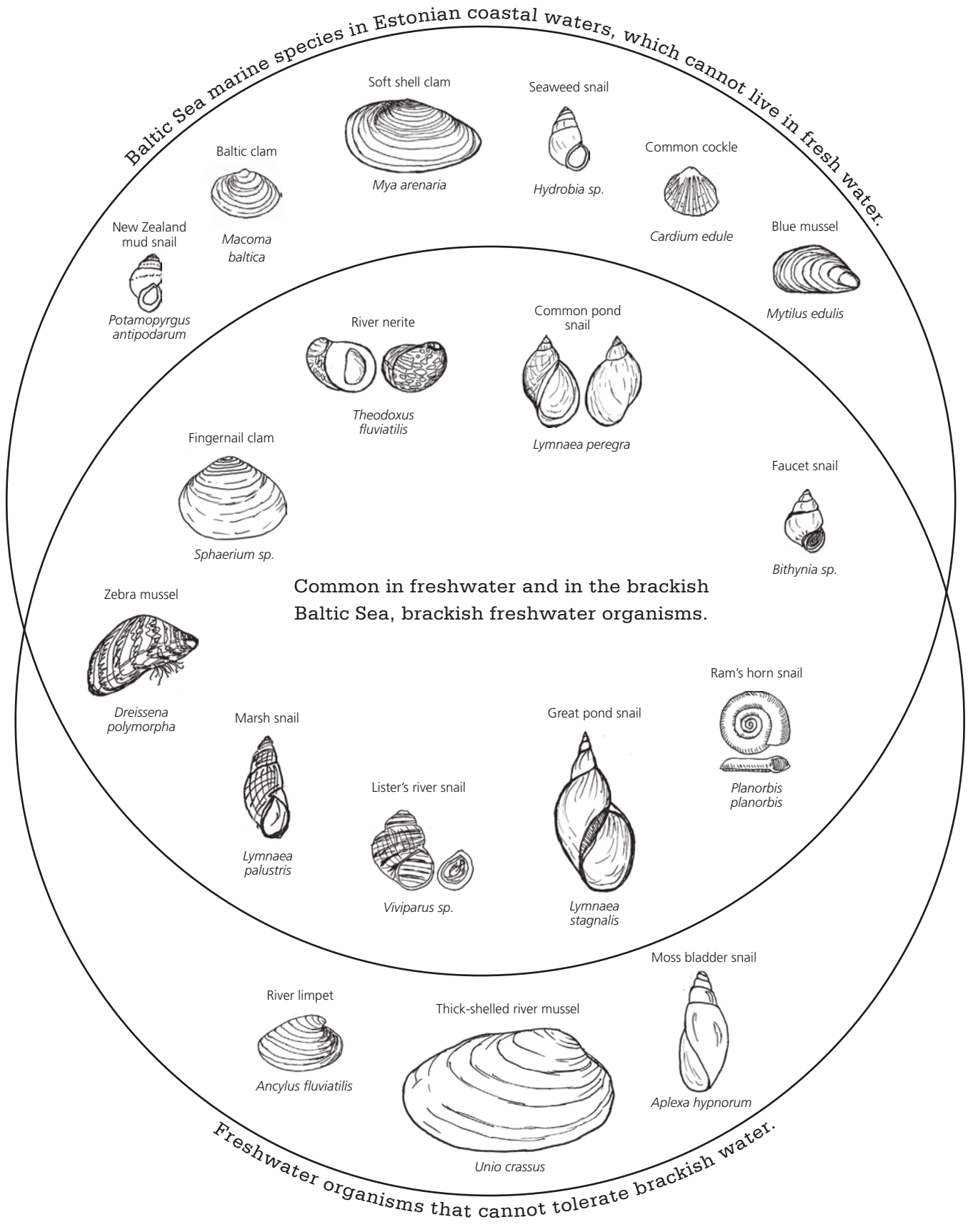
Limnea Sea - *Lymnaea peregra*, common pond snail is widespread in Eurasia and North Africa, in freshwater and low salinity brackish coastal areas.

There is much overlap in species between the Baltic coastlines and freshwater bays. You can find them too in your area!

Observation

Explore the shores of your observation area, the aquatic plants, rocks, driftwood, water, and the bottom. Use nets and other available tools for catching, researching and observing. Try to find a variety of snails and bivalves. Collect living specimens as well as their empty shells. Use your field guides to identify them. Mark the findings on the observation sheets.

Molluscs found on the observation site



Salinity affects the growth and development of organisms.

The decrease in water salinity is stressful to marine species as is the increase in water salinity to freshwater species. Often the increase in salinity may **stunt growth**, i.e. reduce their size.

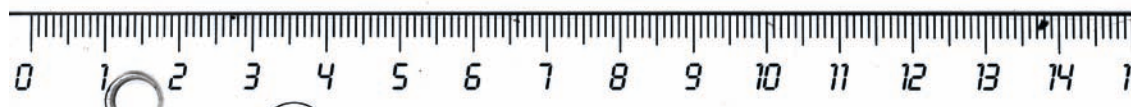
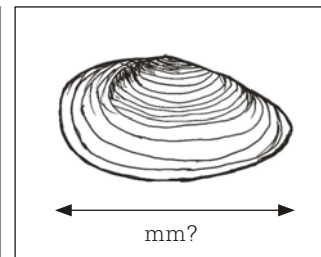
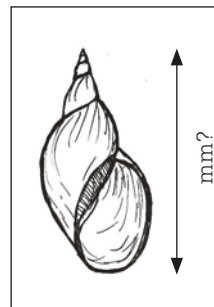
The following table shows the effects of the changes in salinity on molluscs' shells (length or width).

| SALINITY TYPE | 35‰ | 2–3‰ | 0–0,5‰ |
|-----------------|--------|---------|----------|
| Blue mussel | 150 mm | 27 mm | — |
| Common cockle | 45 mm | 16,5 mm | — |
| Soft shell clam | 105 mm | 36,5 mm | — |
| Pond snail | — | 4–6 mm | 12–14 mm |

Measure the shells of the largest snails and bivalves in the observation area.

Measure the height of the shells of snails and the length of the shells of the bivalves.

Measure the dimensions of the largest shells of three different species (either living specimens or their empty shells) with a calliper or ruler. Record the measurements in the table. Preferably record the measurements of the different species listed in table above (if you found any). But you may record the measurements of other snails as well.



Record the measurements in the table.

| SPECIES | 1. shell Largest measure of the shell | 2. shell Largest measure of the shell | 3. shell Largest measure of the shell |
|---------|--|--|--|
| 1. | | | |
| 2. | | | |
| 3. | | | |

2.9. A Mollusc's Lifespan

Subject

The life, routine, growth and development of organisms in nature

Materials

Shells of bivalves or snails, ruler

Methods

Observation, Counting, Categorising, Measuring

Duration

10–30 minutes

Season

Year round

Location

Outside (near water, in a park or forest) or inside (if you have empty shells)

Age

7+

Participants

1–24

Preparation

Discuss the growth and evolution of organisms, their routine in nature and the lifespan of various species (average and maximum lifespan).

Practical fieldwork should take place near a body of water where empty bivalves' shells have washed ashore and can be easily collected for examination. If assessing the age of snails, find a park with a large snail population where many different sized copse snails or other large-shelled snails may be found.

Directions and Background

Examine the lives of various animals from the literature and compare their lifespan to the lifespan of bivalves – the life expectancy of snails and molluscs of different species is highly variable.

Small land snails and small water snails without shells as well as slugs live only 1–2 years. Large land snails with shells live 6–10 years, reaching sexual maturity at about 3–4 years. Lister's river snail can live for up to 14 years. Land snail shells no longer grow after reaching sexual maturity. Bivalves will continue to grow throughout their lives. This growth is what creates the rings on their shells – like growth rings of trees. Bivalves grow rapidly in their first years and many species show growth rings close together near the umbo. Rings developed in subsequent years do not offer an accurate assessment of the age of the mollusc; therefore a cross-section study of the shell can be carried out in laboratories.

Many species of bivalves hold a world record for the oldest non-colonial animals on earth. A 405-year-old ocean quahog *Arctica islandica* was caught in the Atlantic Ocean off the coast of Iceland in 2007. Many of the same species have been found nearing 400 years in age. Living up to 200 years is very common for the ocean quahog.

The oldest living bivalves (freshwater pearl mussel) under protection in Estonia have been found in the Puditsoo river (132 years old) but in Karelia rivers at least 163 years old.

Another protected thick-shelled river mussel has been found in the Vigala river ageing 90 years, holding the world age record for its species. Other species of river bivalves can live a long time – about 40–60 years. The fastest growing lake clam's life is shorter, living only about 20–30 years. Blue mussels live about 10 years.

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The longeval Icelandic Ocean quahog

Reading the growth rings on a bivalve's shell.

Try to assess the approximate age of the bivalves by counting the growth rings on the outside of their shell. Large freshwater clams, as lake and river bivalves, are an easy and good example for counting – but also sea bivalves. Start counting from the umbo, right to the outer edge of the shell, counting the most distinct lines, which are formed during growth deceleration in the winter months.

Estimated age assessment of the copse snail.

Find an assortment of sizes of copse snails.

Try to estimate an age for each of the snails by dividing them into 4 categories.

- The first group (shells about 2–5 mm) are under one year.
- The second group (shells about 6–10 mm) are one year old.
- The third group (shells about 11–17 mm) are two years old.
- The fourth group (shells about 18–22 mm) are three years old and older.

It is quite difficult to estimate the exact age of snails but adult copse snails have a thick and slightly curving shell edge that is a unique characteristic for adult copse snails. The shells of young snails are soft because their shell has not yet begun to calcify.

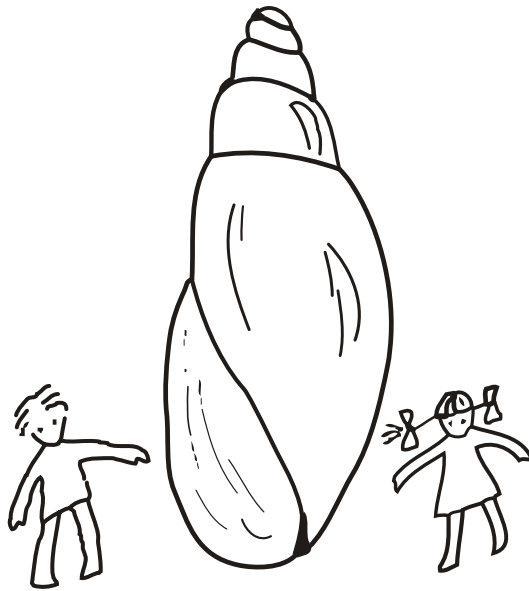


Determining the age of the clam



Everybody is small in the beginning

3. Games



3.1. Similar and different

Subject

Similarities and differences between species' needs, unique characteristics

Materials

List of Statements for the game leader

Methods

Game

Duration

4–6 minutes

Season

Year round

Location

Outside or inside

Age

5+

Participants

Up to 24

Preparation

The instructors can create a list themselves or copy the one provided here.

Descriptions

The participants and the teacher/game leader stand together in a circle.

Instructor says something about snails, all of which are true. If the statement is also true for people, then the students will step into the middle of the circle and say: "We're similar." If the statement is false for people, then the students will stay in their place and say: "We're different."

It is advisable to add some statements to the following list that are appropriate for the age group and interests of the children.

Statements

Snails breathe.

The snail's breathing pore is located on their side.

Snails do not have a nose.

Snails need water to survive.

Snails crawl with one foot.

Snails constantly produce mucus with their foot to moisten their path and allow them to move.

Snails eat mushrooms.

Snails lay eggs.

Land snails are hermaphrodites, meaning that the snail is both male and female.

Snails do not have ears.

Snails have teeth on their tongue.

Snails do not go to the dentist.

Snails need to rest sometimes.

Snails love the rain and fog more than the sun.

Snails need food to survive.

Snails can eat paper.

Snails eat strawberries.

Snails eat decaying wood.

Land snails are fully grown at 1–4 years.

Snails can reproduce themselves.

Young snails grow on their own without their parents' help.

Snails do not have toes.

Snails can drink water through their foot.

Snails do not sing.

Snails do not play the piano.

Snails can get sick sometimes.

Snails cannot see colours.

Snails can tell the difference between light and dark.

Snails can smell food.

Snails heal their wounds with their mucus.



We are similar yet different

3.2. Thai chi for snails

Subject

The unique locomotion of snails. Different animals' movements depending on their sense organs and needs.

Materials

Incentive, in which direction the movement will start: something edible (candy, fruit, juice box, etc.) or the next worksheet or a new exercise for a longer study day

Methods

Relaxed movement game

Duration

5–10 minutes

Season

Year round

Location

Outside and inside

Age

5+

Participants

Unlimited

Preparation

Before the game starts, it is important to carefully study the movement of the snails. It is worth taking a few moments to do a short study (watch the snails' movements closely: how fast do they move, how they are turning, combing a path, do they make any sudden movements? Do they jump?). A longer observation may also be carried out using the exercise "Moving at a snail's pace". In the latter case, this game may be carried out alongside a food themed exercise.

Directions

Participants form a large circle at least 15 meters in diameter. Some kind of treat or incentive (e.g. juice, fruit, candy or some kind of tool for the following activity; one per participant) is placed in the centre of the circle. If preferred, a line may be formed instead of a circle, so long as participants are standing at least 15 meters from the treats.

After observing the snails, the participants take their starting-places and then start approaching the incentives, trying to imitate the slow movement of snails, while not making any rapid motions.

Incentives should be enough that participants will not move too fast when thinking they will miss out.



Smoothly moving towards snacks

3.3. Snails and hedgehogs. Mussels and mites

Subject

Snails and bivalves in nature; Everything has its place in nature

Materials

To define the playing area, three ropes of about 5 meters in length, if lines cannot be drawn any other way. List of statements for the game leader.

Methods

A running game for the end of a school day or activity break

Duration

10–20 minutes

Season

Year round, preferably between April and October

Location

Outside, on a flat surface, with enough space to run around; gymnasium

Age

9–15

Participants

Up to 24

Preparation

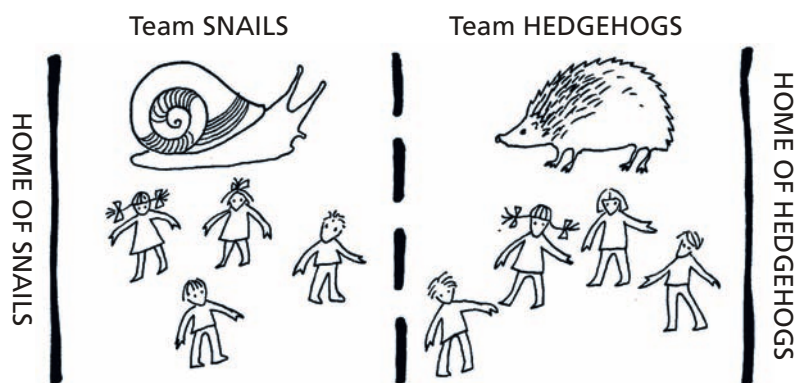
Students are divided into two teams. The playing field is divided into two parts of equal size, suitable for running on an open and relatively flat area of ground (15 meters + 15 meters). The game area boundaries should be clearly marked with three ropes or sticks or something similar. Students may be asked to help set up the playing area.

Instructions

Groups are placed on opposite sides of the playing field behind their lines. One side HEDGEHOGS, one side SNAILS, with a centre line dividing the two. Behind each group's respective line is their safe area where they cannot be caught. Teams must be ready to attack or flee depending on the validity of the statements that are being called out by the game leader. If the statement is correct, then the SNAILS must flee to their side of the field and cross their home line before the HEDGEHOGS catch them. If the statement is false, then the SNAILS attack the HEDGEHOGS and must try to catch them before they cross their home line. If a player is caught, then he/she becomes part of the opposite team and moves to their playing field. Before the next statement, the participants come back to the playing field between the start line and home line.

20–30 statements may be called out in one game. Choose an even number of true and false statements, trying to mix them up as much as possible, so as not to have true-false-true-false alternating with each turn.

Depending on the topics being studied in the classroom, the names of the groups may be changed, for example MITES and MUSSELS. The same game may be played using different animal names, however it would be good to assign animal names that are opposing in nature, for example, if one animal attacks/eats the other in the nature, it would also be the attacker in the game in case of a correct statement.



All topics covered in the game are related to this publication and the presentation materials of “Snails and Bivalves in Nature.” This presentation may also be used to explain the words in the following game “Malacological Alias.”

Important! Choose 20–30 statements that are appropriate to the age of the participants and the subjects already covered. Statements may also be chosen to correspond with the weather on the day and the location.

The following range of statements is divided into two columns, depending on whether they are true or false. The statements at the beginning of the list are the simplest and the statements at the bottom of the list are more complex.

True Statements

In comparison to humans, snails move slowly.
Snails do not have ears.
Snails have one foot.
Slugs are snails without shells.
Snails are covered with mucus.
Snails need mucus.
Land snails eat mostly plants and mushrooms.
The Burgundy snail has the largest shell in Estonia.
Cough medicine is made from snail mucus.
Face cream is made from snail mucus.
Snails need lime to grow their shells (calcium salts).
The giant clam is the world’s largest bivalve.
Bivalves eat plankton.
Land snails are hermaphrodites (both males and females).
The world’s oldest living animal is the Icelandic ocean quahog, who has lived 405 years.
The shells of glass clams are used in lampshades and windows in the Philippines.
Exotic snail shells have been used as money.
Snail blood is blue.
Glow worms only eat snails.

False Statements

Snails have four legs.
Snails speak Spanish.
A snail’s favourite food is sausage.
Snails are not useful to anyone.
The saltier the sea water, the smaller the mussels.
Snails like to sunbathe to become brown.
Snails do not live in the sea.
Snails do not live in rivers.
Snails do not need oxygen to survive.
Hedgehogs despise slugs.
Bivalves do not eat plankton.
In Estonia, snails only live on land.
All water snails use their gills for breathing.
All snails breathe with their lungs.
Snails have teeth on the bottom of their foot.
All snails and bivalves are harmful to humans.
Snails and bivalves need to live in an acidic environment.
The radula is used for reproduction.
The fingernail clam only eats fingernails.
The hermit crab uses tins to protect its soft shell.
All bivalves must attach themselves to something and cannot move actively.



3.4. Herb Floor Social Networking

Subject

Land snail habitat, organisms of the herb floor and mould floor, nutrition, food chains, energy

Materials

Whistle, role playing cards for each participant

Methods

Running game for large groups

Duration

40 minutes

Season

May to September

Location

Outside, in a forest or park

Age

9–15

Participants

20–50

Preparation

Print out the cards, cut them to size and laminate them. The cards can be prepared with reserve so that extra participants would also be supplied. Cards can be found on p. 49–57 and the role is associated with the animal or plant's place on the food chain. The cards are marked by six different colours:

Brown – decaying matter (5 cards)

Green – plants (14 cards)

Blue – decaying matter eaters (2 cards)

Yellow – herbivores (6 cards)

Red – carnivores (2 cards)

Orange – omnivores (1 card)

It is important to find a suitable playing area and set clear boundaries. To help you, select natural boundaries (e.g. river, road, forest dividing line, etc). You may explain them while you explain the rules of the game, and if necessary, walk the students to each of the boundaries. The area should be big enough that there is enough space to hide, but also run, catch and chase. However, the area cannot be too large that the whistle cannot be heard. Choose a sparse forest or wildlife park. However, it is also important that the landscape is not too littered, uneven or otherwise inappropriate for running.

The first time you play the game, it will take about 10 minutes to explain the rules and get set up.

The game will be more interesting if played with 30 or more players. It can be played with a smaller number of players, but the number of cards will have to be reduced. Keep in mind the proportion of predator cards to food cards, or remove decaying matter and decaying matter eaters (blue and brown cards).



Forest trails make good boundaries

Explain the whistle sounds

1 long sound – decaying matter and plants (brown and green cards) will have 5 minutes to go and hide themselves from their predators. After they have found their hiding place, they may not move until they are caught or the game finishes.

2 long sounds – decaying matter eaters and herbivores will have 5 minutes to start searching for their food (blue and yellow cards).

3 long sounds – carnivores will have a 5-minute head start to start searching for food (red cards).

4 long sounds – The fox (mostly carnivore, partly omnivore) will have 5 minutes to search for the food.

With a continuous series of whistle blows, the game is over, and no one is to continue hunting for food. All players must then return to the centre of the field.

Instructions

The start and finish of the game is a central point in the middle of the playing area. The game leader explains the rules and distributes the cards. Each group of cards provides different roles and different amounts of physical exertion, therefore those children not wishing to run, should be able to choose more passive roles (decaying matter, and plants). The proportion of passive roles should be a bit more than half of the players.

Each card describes the role as well as the abilities and tasks in this game. Participants should become familiar with their roles while waiting for their turn.

Every five minutes, sound the whistle for the next group to start, starting with passive roles and finishing with carnivorous and omnivorous roles. During the game, the “eaten” players will hand over their card and their collected cards to the person who “ate” them. They will then make their way back to the centre. Cards must be kept in the game and not hidden.

At the end of the game, look to see who, what and how much was eaten. All players will lay their collected cards out in front of them and the food webs in nature are briefly discussed.



Whistles and cards

Role Playing Cards "Herb Floor Social Networking"



YOU ARE DECAYING MATTER



Task

Find a comfortable, shady spot, and then wait. You can be eaten by animals that eat decaying matter (blue cards). You must give up your card to them if you are caught. If you are caught, go back to the starting point.

YOU ARE DECAYING MATTER



Task

Find a comfortable, shady spot, and then wait. You can be eaten by animals that eat decaying matter (blue cards). You must give up your card to them if you are caught. If you are caught, go back to the starting point.

YOU ARE DECAYING MATTER



Task

Find a comfortable, shady spot, and then wait. You can be eaten by animals that eat decaying matter (blue cards). You must give up your card to them if you are caught. If you are caught, go back to the starting point.

YOU ARE DECAYING MATTER



Task

Find a comfortable, shady spot, and then wait. You can be eaten by animals that eat decaying matter (blue cards). You must give up your card to them if you are caught. If you are caught, go back to the starting point.

YOU ARE DECAYING MATTER



Task

Find a comfortable, shady spot, and then wait. You can be eaten by animals that eat decaying matter (blue cards). You must give up your card to them if you are caught. If you are caught, go back to the starting point.

YOU ARE A FOX



Task

Your stomach is empty and you are looking for millipedes and snails to eat (blue and yellow cards) or thrushes and hedgehogs (red cards). You also may eat two plants (green cards), if you find them. If you find them, take their cards.



Role Playing Cards “Herb Floor Social Networking”



YOU ARE A GROUND ELDER



Task

Find a comfortable, shady spot, and then wait. Herbivores can eat you (yellow cards). You must give up your card to them if you are caught. If you are caught, go back to the starting point.

YOU ARE A GROUND ELDER



Task

Find a comfortable, shady spot, and then wait. Herbivores can eat you (yellow cards). You must give up your card to them if you are caught. If you are caught, go back to the starting point.

YOU ARE A GROUND ELDER



Task

Find a comfortable, shady spot, and then wait. Herbivores can eat you (yellow cards). You must give up your card to them if you are caught. If you are caught, go back to the starting point.

YOU ARE A GROUND ELDER



Task

Find a comfortable, shady spot, and then wait. Herbivores can eat you (yellow cards). You must give up your card to them if you are caught. If you are caught, go back to the starting point.

YOU ARE A GROUND ELDER



Task

Find a comfortable, shady spot, and then wait. Herbivores can eat you (yellow cards). You must give up your card to them if you are caught. If you are caught, go back to the starting point.

YOU ARE A WILD STRAWBERRY



Task

Find a comfortable, shady spot, and then wait. Herbivores can eat you (yellow cards). You must give up your card to them if you are caught. If you are caught, go back to the starting point.



Role Playing Cards “Herb Floor Social Networking”



YOU ARE A WILD STRAWBERRY



Task

Find a comfortable, shady spot, and then wait. Herbivores can eat you (yellow cards). You must give up your card to them if you are caught. If you are caught, go back to the starting point.

YOU ARE A WILD STRAWBERRY



Task

Find a comfortable, shady spot, and then wait. Herbivores can eat you (yellow cards). You must give up your card to them if you are caught. If you are caught, go back to the starting point.

YOU ARE A WILD STRAWBERRY



Task

Find a comfortable, shady spot, and then wait. Herbivores can eat you (yellow cards). You must give up your card to them if you are caught. If you are caught, go back to the starting point.

YOU ARE A WILD STRAWBERRY



Task

Find a comfortable, shady spot, and then wait. Herbivores can eat you (yellow cards). You must give up your card to them if you are caught. If you are caught, go back to the starting point.

YOU ARE A STINGING NETTLE



Task

Find a comfortable, shady spot, and then wait. Herbivores can eat you (yellow cards). You must give up your card to them if you are caught. If you are caught, go back to the starting point.

YOU ARE A STINGING NETTLE



Task

Find a comfortable, shady spot, and then wait. Herbivores can eat you (yellow cards). You must give up your card to them if you are caught. If you are caught, go back to the starting point.



Role Playing Cards “Herb Floor Social Networking”



YOU ARE A STINGING NETTLE



Task

Find a comfortable, shady spot, and then wait. Herbivores can eat you (yellow cards). You must give up your card to them if you are caught. If you are caught, go back to the starting point.

YOU ARE A STINGING NETTLE



Task

Find a comfortable, shady spot, and then wait. Herbivores can eat you (yellow cards). You must give up your card to them if you are caught. If you are caught, go back to the starting point.

YOU ARE A DISK SNAIL



Task

Your stomach is empty and you are looking for decaying matter to eat (brown cards). If you find it, then take their card. Carnivores can eat you (red cards) and foxes (orange card). You must give up your card to them if you are caught. If you are caught, go back to the starting point.

YOU ARE A MILLIPEDE



Task

Your stomach is empty and you are looking for decaying matter to eat (brown card). If you find it, then take their card. Carnivores can eat you (red cards) and foxes (orange card). You must give up your card to them if you are caught. If you are caught, go back to the starting point.

YOU ARE A THRUSH



Task

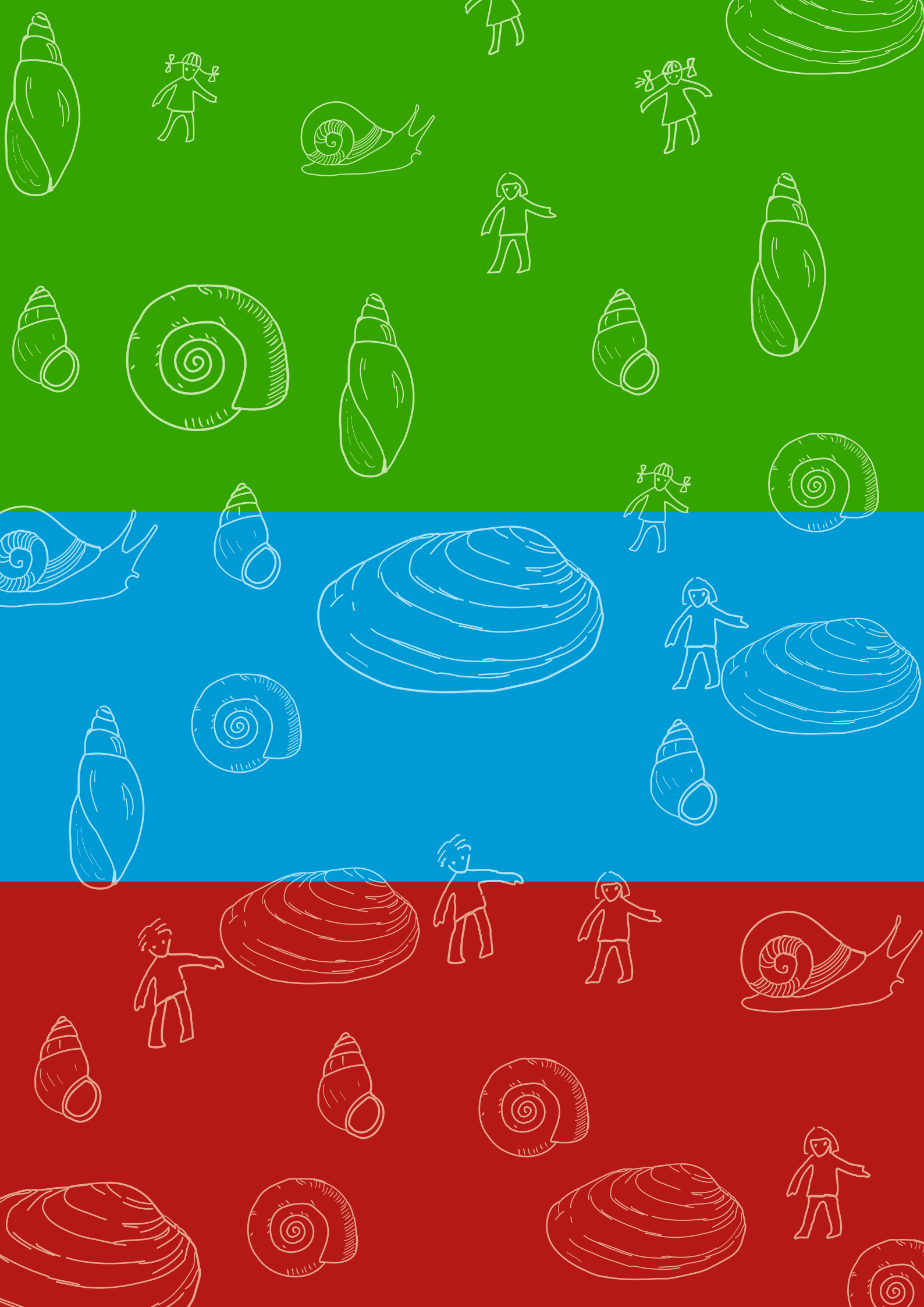
Your stomach is empty and you are looking for millipedes and snails to eat (blue and yellow cards). If you find them, take their cards. A fox can eat you (orange card). You must give up your cards to them if you are caught. If you are caught, go back to the starting point.

YOU ARE A HEDGEHOG



Task

Your stomach is empty and you are looking for millipedes and snails to eat (blue and yellow cards). If you find them, take their card. A fox can eat you (orange card). You must give up your cards to them if you are caught. If you are caught, go back to the starting point.





YOU ARE AN AMBER SNAIL



Task

Your stomach is empty and you are looking for plants to eat (green cards). If you find it, then take their card.
Carnivores can eat you (red cards) and foxes (orange card). You must give up your card to them if you are caught.
If you are caught, go back to the starting point.

YOU ARE A ROUNDBACK SLUG



Task

Your stomach is empty and you are looking for plants to eat (green cards). If you find it, then take their card.
Carnivores can eat you (red cards) and foxes (orange card). You must give up your card to them if you are caught.
If you are caught, go back to the starting point.

YOU ARE A COPSE SNAIL



Task

Your stomach is empty and you are looking for plants to eat (green cards). If you find it, then take their card.
Carnivores can eat you (red cards) and foxes (orange card). You must give up your card to them if you are caught.
If you are caught, go back to the starting point.

YOU ARE A COPSE SNAIL



Task

Your stomach is empty and you are looking for plants to eat (green cards). If you find it, then take their card.
Carnivores can eat you (red cards) and foxes (orange card). You must give up your card to them if you are caught.
If you are caught, go back to the starting point.

YOU ARE A WHITE-LIPPED SNAIL



Task

Your stomach is empty and you are looking for plants to eat (green cards). If you find it, then take their card.
Carnivores can eat you (red cards) and foxes (orange card). You must give up your card to them if you are caught.
If you are caught, go back to the starting point.

YOU ARE A WHITE-LIPPED SNAIL



Task

Your stomach is empty and you are looking for plants to eat (green cards). If you find it, then take their card.
Carnivores can eat you (red cards) and foxes (orange card). You must give up your card to them if you are caught.
If you are caught, go back to the starting point.

3.5. Malacological “Alias”

Subject

Summary and repetition to explain the concepts related to molluscs: mollusc build, lifestyle, diversity, interaction with other organisms and the environment, mollusc products

Materials

Timepiece (preferably 1–2 minute hourglass, a stopwatch or watch with second hand), “Alias” cards (p. 61–69), score-keeping materials (such as a pencil and paper, or a cup to be filled with: empty snail shells, pearls, stones, marbles, etc)

Methods

Game, teamwork

Duration

30–40 minutes

Season

Year round, but preferably in spring to autumn, when the game can be associated to mollusc studies, observations and tests

Location

indoors, outdoors (spring to autumn)

Age

13 +. Easier words may be chosen for age groups 10 and older

Participants

2–24

Preparation

Print out and cut the vocabulary cards pages 61–70.

Divide the students into groups and explain the rules. Divide the cards between each of the groups. The cards are to be placed face down and are not to be looked at until the game begins.

Instructions

Groups may have from 2–4 participants. The game should also have at least one game leader – the judge, who can also have an assistant or assistants (for following the rules, keeping time and awarding points).

In each round one member of the group explains to the others the words on the card. Each group will have 1–2 minutes, during which its members will try to guess as many definitions as possible.

Before the start of the game, agree upon any extra gestures that may be used to explain the words, e.g. mime, hand gestures and noises.

Time is kept with a two-minute hourglass. Once the time begins, one member of the first group will try to explain their word to the rest of the group, using snail and bivalves related terminology. The other group members will try and guess the word. Once the time runs out, the points are calculated, and it is the next group's turn.

It is easier to keep score if the words are explained in order, so that in the first round the first word on every card is explained, in the second round the second word is explained and so on.

Scoring

One point is awarded for each correctly guessed term that is explained without reference to snails or bivalves.

Two points are awarded for each term that is guessed correctly in reference to snails or molluscs.

For example, the term “NAVEL” in:

Explanation 1: “A scar on the human body/ hole in the middle of the belly” = 1 point

Explanation 2: “A round opening on the bottom of the snail shell, which is present in some species, but not others” = 2 points.

The scorekeeping procedure is agreed upon at the beginning of the game. Points may be written down or marked with empty shells, raisins, etc. A point will be taken for every term that is not explained or is incorrectly guessed or not guessed at all.

Thereafter the turn goes to the next group.

The number of rounds can be agreed upon ahead of time, but be sure that each group has an equal amount of turns to explain and guess.

Setting the rules, changing the rules and explaining the rules are all part of teamwork and depend a lot on the instructor and the students. There are several possible versions of this game, so therefore it can be played in many different ways.

“Alias” is the classic vocabulary game that you can play as a pastime with a friend, as well as a competition between the groups. This variation of the games uses vocabulary associated with the mollusc theme. Vocabulary cards (pp 61-70) provide a total of 171 words with each card having 3 words that are related to snails and bivalves, their build, ecology, uses, and so on.



Time is running out...

Vocabulary Cards, "Malacological Alias"



| | | |
|--|---|---|
| 1. GLOCHIDIUM 2. SHELL 3. PEARL | 1. BURGUNDY SNAIL 2. STRAWBERRY 3. OTTER | 1. CALCIUM 2. NAVEL 3. GILL |
| 1. PURPLE 2. COPSE SNAIL 3. MUSHROOMS | 1. GLOW WORM 2. HUMIDITY 3. TENTACLES | 1. COAT 2. BUTTON 3. GROVE SNAIL |
| 1. PLANKTON 2. THRUSH 3. SEA | 1. SOLE 2. UMBO 3. SALT SHAKER | 1. MUSSEL 2. ALGAE 3. SHREW |
| 1. WATER 2. THROAT 3. FOOT | 1. APPETIZER 2. SLUG 3. CUCUMBER | 1. FLATWORM 2. LIGHT 3. BREATHING PORE |



Vocabulary Cards, "Malacological Alias"



| | | |
|--|---|--|
| 1. SPIRAL 2. COUGH SYRUP 3. FRESHWATER PEARL MUSSEL | 1. DECAYING MATTER 2. WILD BOAR 3. SUN | 1. HEAD 2. HERMAPHRODITE 3. FACE CREAM |
| 1. GREAT POND SNAIL 2. CRUSTACEAN 3. AMERICAN MINK | 1. OXYGEN 2. EGG 3. ESTUARY | 1. LIME (CALCIFICATION) 2. LISTER'S RIVER SNAIL 3. TREE |
| 1. MITE 2. MARSH 3. TEETH | 1. CRAWL 2. GLUE 3. ICELANDIC OCEAN QUAHOG | 1. FRUIT 2. SEA DUCK 3. ACID |
| 1. GANGLION 2. COLD-BLOODED 3. EGGSHELL | 1. GREAT SLUG 2. SEED 3. HEDGEHOG | 1. pH 2. KIDNEYS 3. EYES AT THE TIP OF THE TENTACLES |



Vocabulary Cards, "Malacological Alias"



| | | |
|---|---|---|
| 1. HERMIT CRAB 2. RAMSHORN SNAIL 3. MYCELIUM | 1. MALLARD DUCK 2. LAKE 3. EYES IN EYE SOCKETS | 1. MUCUS 2. ASHTRAY 3. FRESHWATER MUSSEL |
| 1. BOLETUS MUSH-ROOM 2. CENTIPEDE 3. RIVER | 1. MOLLUSC 2. STOMACH 3. TINNED FOOD | 1. OYSTER 2. FLY AGARIC 3. GLOW-WORM |
| 1. POND 2. HEIGHT 3. LIVER | 1. NECKLACE 2. BALTIC CLAM 3. STINGING NETTLE | 1. CARRION BEETLE 2. TEMPERATURE 3. SIPHON |
| 1. LUNG 2. EARRINGS 3. COMMON CLAM | 1. ALGAE 2. GROUND BEETLE 3. FOREST | 1. GASTROINTESTINAL TRACT 2. TRAIL 3. BROOCH |



Vocabulary Cards, "Malacological Alias"



| | | |
|--|--|--|
| 1. COMMON COCKLE 2. SEAWEED 3. GREAT TIT | 1. SHADOW 2. RADULA 3. NERVE CELLS | 1. MONEY 2. ZEBRA MUSSEL 3. GARLIC |
| 1. COMMON TOAD 2. SOIL 3. HEART | 1. FEEL 2. LAMP 3. THE GREAT RAMSHORN SNAIL | 1. SEA ANEMONE 2. SHREW 3. FISH |
| 1. EGG (OVUM) 2. THE SENSE OF TASTE 3. WINDOW GLASS | 1. RAMSHORN SNAIL 2. WINTER RYE 3. MOLE | 1. SALT 2. SEED STORAGE 3. BLUE |
| 1. PLATE 2. GREAT SLUG 3. CARROT | 1. SQUIRREL 2. CARBON DIOXIDE 3. EYELASHES | 1. FLAT WORM 2. JEWELLERY 3. GREAT CLAM |



Vocabulary Cards, "Malacological Alias"



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| 1. PONDWEED 2. FOX 3. THERMOMETER | 1. ANUS 2. INLET 3. RING | 1. SCALLOP 2. GARLIC 3. BADGER |
| 1. MAGNIFYING GLASS 2. MOTHER OF PEARL 3. LARVA | 1. ROAST 2. FINGERNAIL CLAM 3. MOSS | 1. SEA DUCK 2. MUD 3. HERMAPHRODITE |
| 1. OUTLET 2. FORAGE 3. GLASS CLAM | 1. WEED 2. EEL 3. PLANT | 1. NATURE CONSERVATION 2. PEST 3. ALIEN SPECIES |



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The project "Communicating the Baltic – COB-WEB" is designed to work with universities, museums and nature schools, developing environmental education programs, teaching aids and materials.

Leading partners are Hyria College and partners of the Tartu Environmental Education Centre, Tallinn University of Technology Institute of Geology, University of Tartu, Environment Department of Tallinn, University of Latvia, Latvia's Natural History Museum, Harakka Nature Centre, the Finnish Capital Recycling Centre, the Villa Elfvik Nature House and Nynäshamn Nature School.

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