

Nature Detectives

·3rd mobility, May 2016·
Primary school of Kouloura
Greece



alien plants
VS
native plants?

We can all coexist
In this land.

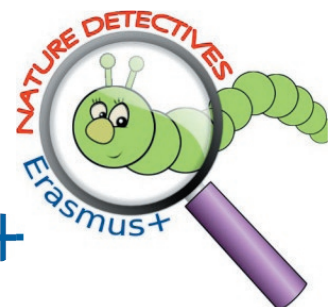
All we have to do
is get along.

Let's get active ...

Activities



Erasmus+



Actions on invasive alien plants

**prepared by Dr Nikos Krigas
(School of Biology, Aristotle University of Thessaloniki)**

**in collaboration with the Greek teachers
participating in the programme 'Nature Detectives' (Erasmus+)**

ACTIVITY 1: The alien plants have landed on my village; let's inspect them! (30 minutes)

Aim: To involve students and teachers in observing local alien plants, in naming them and in realising which of them are also common aliena in different countries

Preparation: Dr N. Krigas (School of Biology, Aristotle University of Thessaloniki) has inspected the school area, have shown the local alien plants to the Greek teachers and have prepared the species-specific identity cards.

Realisation: The Greek teachers will show these plants to their students before the start of the programme. The identity cards for the alien plants will be printed and distributed to the Greek students.

Each Greek student will act as guide to show these alien plants to the foreign participants he/she is associated with (teachers and students). The presentation of each alien plant will be implemented with the use of species-specific identity cards in plastic sheets which they will place them on the plants described.


Each Greek participant (teacher and/or student) will ask his/her foreign participants to collect some leaves of these plants for Action 2 and put them in the species-specific plastic sheet. Each participant will complete the worksheet of activity 1. The aim of this worksheet is to realise whether the local alien plants detected are also found in the countries of origin of the participants.





Extending the action: The foreign participants can also take some pictures of the alien plants. These can be used to make a quick poster (titles, names of alien plants and photographs) for all the aliens detected during the programme. The posters can be discussed with the rest of the participants.

Identity cards of local alien plants

(to be printed and placed in plastic sheet)

	<p>Scientific name: <i>Ailanthus altissima</i></p> <p>Common name: Tree of heaven</p> <p>Etymology: From the Chinese word ailanto meaning 'high till the sky' and the Latin word altissima meaning 'highest'</p> <p>Origin: China</p> <p>Mode of introduction: Ornamental tree</p> <p>Status: Invasive worldwide</p> <p>Special characteristics: Smells bad (allelopathic effect)</p>
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	<p>Scientific name: <i>Acer negundo</i></p> <p>Common name: American maple tree</p> <p>Etymology: From the ancient Greek word 'akris' meaning acute (acute leaf end) and from an old Indian (Sanskrit) word for naming the shape of such leaves</p> <p>Origin: North American continent</p> <p>Mode of introduction: Ornamental tree</p> <p>Status: Naturalised in many parts of the world</p> <p>Special characteristics: A syrup is made from the sap of the trunk.</p>
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	<p>Scientific name: <i>Iris germanica</i></p> <p>Common name: German Iris</p> <p>Etymology: From the ancient Greek divinity Iris (messenger of the Gods) and the Latin word germanica (from Germany).</p> <p>Origin: Uncertain (probably western Asia)</p> <p>Mode of introduction: Ornamental perennial</p> <p>Status: Naturalised in many parts of the world</p> <p>Special characteristics: The plants have rhizomes and scented flowers.</p>
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Scientific name: *Robinia pseudoacacia*

Common name: Black locust

Etymology: In honour of the royal French botanist Jean Robin (1520-1629) and the Greek words pseudo (false) and acis (thorn).

Origin: North America

Mode of introduction: Ornamental tree

Status: Naturalised and invasive species in many parts of Europe and Asia

Special characteristics: The tree has scented flowers and poisonous fruits (pods).



Scientific name: *Ocimum basilicum*

Common name: Basil

Etymology: Ocimum is derived from the Greek ozo which means to smell, in reference to the strong odours while the word basilicum is also of Greek origin (from the [Greek](#) βασιλεύς, [basileus](#), meaning "king", as it has come to be associated with the [Feast of the Cross](#) commemorating the finding of the [True Cross](#) by [St. Helena](#), mother of the emperor [Constantine I.](#))

Origin: India

Mode of introduction: Culinary aromatic-medicinal plant

Status: Only ornamental in non-native range

Special characteristics: The plant is medicinal and has volatile essential oils; its fragrance is much appreciated in cooking and religious rituals since ancient times.



Scientific name: *Hibiscus rosa-sinensis*

Common name: Chinese hibiscus

Etymology: The word Hibiscus is of Greek origin (mallow) and rosa-sinensis is of Latin origin meaning 'rose of China'.

Origin: East Asia

Mode of introduction: Ornamental small medicinal tree

Status: Not naturalised, not invasive

Special characteristics: The plant is medicinal and has impressive flowers which are long used for coloured tea making.



Scientific name: *Aloysia citrodora*

Common name: Lemon verbena

Etymology: Aloysia is a name given in honour of Maria Luisa Teresa de Parma (1751-1819), wife of king Carlos IV of Spain and citrodora is of Latin origin meaning 'smelling of citrus'.

Origin: Southern America

Mode of introduction: Aromatic-medicinal perennial

Status: Not naturalised, not invasive

Special characteristics: The plant is aromatic (culinary) and medicinal (tea infusion) and has lemon-scented volatile essential oils.



Scientific name: *Erigeron sumatrensis*

Common name: Broad-leaved fleabane

Etymology: Erigeron is of Greek origin meaning 'man that grows old' (due to the hairs on its seeds) and sumatrensis is of Latin origin meaning 'of Sumatra'.

Origin: Southern America

Mode of introduction: Accidentally (not intentionally)

Status: Invasive in many parts of the world

Special characteristics: The annual plant when naturalised can produce thousands of seeds.



Scientific name: *Matricaria chamomilla*

Common name: Chamomile



Etymology: Matricaria is a word of Latin origin associated with the word 'mater' (mother) while chamomilla is of Greek origin (chamai=lying down and milo=apple).

Origin: Asia

Mode of introduction: Both accidentally and intentionally as medicinal-aromatic plant

Status: Invasive in many parts of the world

Special characteristics: This annual medicinal-aromatic plant is considered as an ancient alien species.



	ERASMUS+ PROJECT		 Erasmus+
	ACTIVITES		
	NATURE DETECTIVES		

ACTIVITY 1

Worksheet 1. The alien plants have landed in my village, let's inspect them

My name: My country:

	Scientific name of plants	How is it called in Greek?	Can I find them in my country?	How do we call them in my country?	Did I take a picture?
1	Robinia pseudoacacia				
2	Acer negundo				
3	Iris germanica				
5	Hibiscus rosa-sisensis				
6	Aloysia citrodora				
7	Erigeron sumatrensis				
8	Matricaria chamomilla				
9	Ocimum basilicum				

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Worksheet 2: Make a poster with the pictures you have taken from local alien plants and give a title and present it to students of your school.

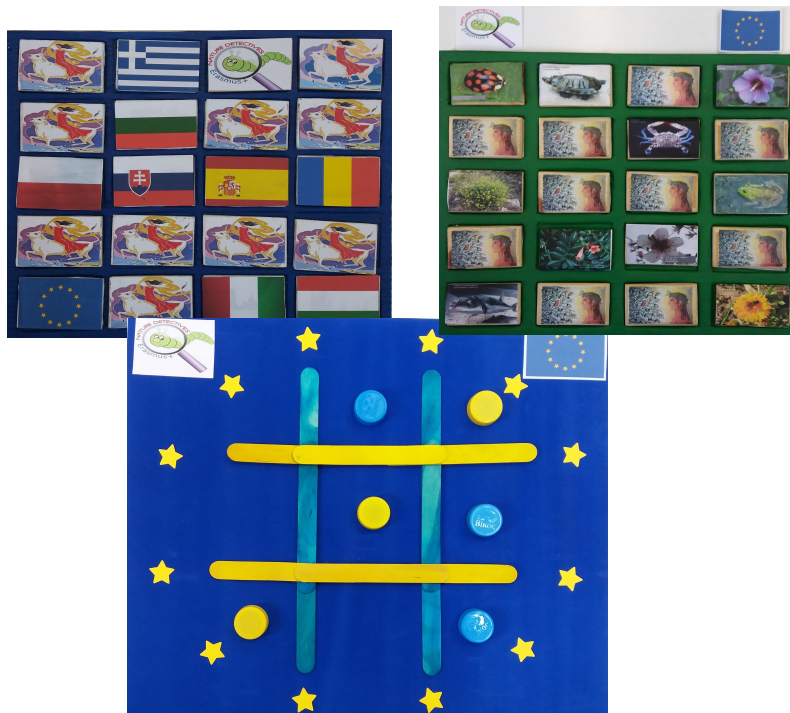
ACTIVITY 2 A LET'S PLAY GAMES WITH ALIEN SPECIES

Objective: Our students learn what alien species exist in Greece , they have to become familiar with several of them in order to without any problem to recognize them in the next activities.

Methodology: Our pupils will learn the different species which are in Greece through games.

Games : Our students will be divided in to groups and will play several educative games.

- Memory games with many pairs of alien species (plants and animals)
- Tic tac toe games
- Playing checkers , a battle between alien animals and native animals
- A digital game titled << Locate the continent of the alien species>>
<http://matchthememory.com/zwa>
- A computer game titled << Find the name of the alien species>>
<http://matchthememory.com/fyta>



The students who have completed their participation in the games will work on the activity 2B “My Collage”

ACTIVITY 2 B : Collage – Create an image with alien leaves!

Aim: To observe plant morphology of alien plants in a creative way and connect plant names with their leaves



Preparation: The leaves of the alien plants from the school neighbourhood collected during action 1, will serve as material for creating a personal collage. Given that the leaves of each plant are put in the plastic sheet of an identity card, the connection with the plant name is made evident.

Realisation: All participants will create a personal free image at school (collage) by cutting, collating and/or rotating the collected leaves (examples for participants are presented below).

Extending the action: The students can create another collage with leaves of only native plants and discuss with the rest of the participants the images produced.



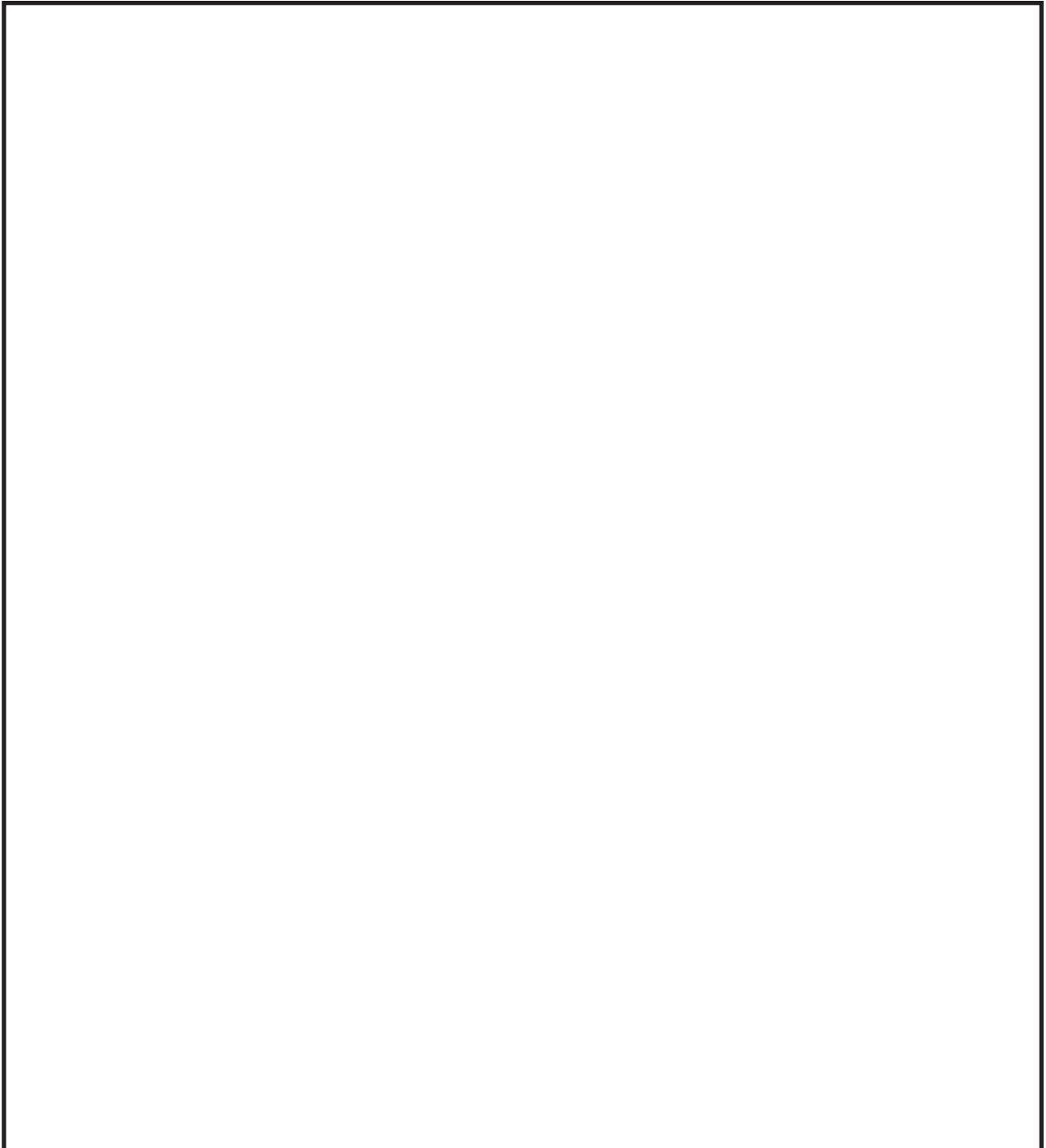
Examples of collage with leaves.

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ACTIVITY 2 B

Worksheet : Create an image with alien leaves

MY COLLAGE



ACTIVITY 3: Creative writing workshop about alien animals



Aim: To urge students write creatively about alien animals and their characteristics.

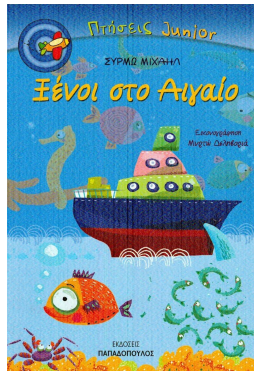
Preparation: The author Sirmo Michail will present her book “Two foreigners in the Aegean” which presents the movement of alienated fish from their country to the Aegean. There will be an entertaining presentation of the book with a theatrical play where the audience will participate.

Realisation: The students will sit around forming a circle based on the parts of the book and with a assistance of a creative writing instructor they will write their own story on alien species of animals.

Role: Each student or group of two or three students (one Greek, one or two foreign students) will present their own story and will act it on.

Teachers: The teachers will urge the students to follow up the stories and continue the play.

Extending the action: The play should be filmed with a digital camera and may be used for presenting the actions of the programme. These stories with the alien animals may be continued or repeated later in the different countries of the participants involving local alien plants of their countries.



THE PART OF THE BOOK “ **Foreigners in the Aegean sea**”

This is the story of a round sardine, of the low and humble family of Cloupeids, which lived in the Red Sea, somewhere between Sudan and Saudi Arabia. Since the name round sardine is too long we will call our roundsardine ...whatever each one of us likes to. Besides, fish and other animals do not have names of course. We humans give them names. So we will call it whatever we like. I, for example will call it **Hasan** which could be a Sudanese name. Yes, it's a male roundsardine.

.....

The story begins the moment that someone shouted: “We are being attacked, run for your lives.....”

The school was alarmed.

“Here we go again” Hasan nagged, and started swimming faster....

He kept swimming until he thought his heart would explode, and then he hid behind a sea anemone.

This has gone too far! As soon as he had escaped one , another was after him.

.....

He had heard about a channel. Suez channel. A channel that if crossed would get you to a big sea. The Mediterranean.

.....

Beyond the channel, ooohhh, beyond the channel, in the big sea....things are different there. There, the table is always set, but who can manage to get there!

- But why? Why not manage to get there? Is it that far away?

- Because, in order to get there, you have to cross the unknown. Who can cross the unknown?

The unknown. How many words came to mind at the thought of this word. Attraction, fear, expectation, dreams, insecurity, adventure, hope.

.....

But Hasan couldn't get this idea off his mind. The channel, the big sea, the unknown. Something was pushing him that way.

.....

At first, **Sekou** was at a loss. Only much later, as the days of the journey went by, did he realize the meaning of all this. He was out of his waters, away from his friends and familiar places, and who knows if he would ever see them again. And where was he going to? Into the unknown. What was this unknown? What would it be like? Who would he meet? How would he live? What would he eat? Would he be in danger? And of course he was not the only one to have these thoughts. All little creatures gathered and talked. They were all going through the same . All?

.....

- Hey little fish, why are you sad? Sekou asked.
-Leave me alone you crab.
-Look, I don't want to bother you, but well.... I saw you jumping up and down so happily and then something happened. What was it?
- Haven't you heard? They don't want to play with me because I am a Lessepsian.
- You are what?
-A Lessepsian immigrant.
- Is this a bad thing?
-I don't know. It seems it is bad to some.
- And what exactly does a Lessepsian immigrant mean?
- Do you think I know? I found out from a fish I met in the passage.
And he told the story of the name.
-Lesseps... Lessepsian, do you get it?
-Hmmm....
-Are you native?
-No.
Are you Lessepsian too?
-No. I am a stranger too but from the Gulf of Guinea.

.....



- I came here by chance, really by chance. I never wanted to leave my waters, but who asked me? Others made the decision for me. Others go with the flow, I went with the ballast.
And so the time went by, and the two friends were trying to build a life in their new country.They often met with difficulties but because they had each other they could get through them more easily.But the feeling was still the same. They were not accepted. They were not welcome here.And most importantly, they did not understand why.

.....

- What are we going to do?asked Sekou.
-Look, Hasan said, let's not forget that I made the decision to come here.And I had hope. Hope that things would be better and that I would not have to struggle everyday in order to survive. Of course I can go back. It would be hard but I can. And I will have nice stories to tell and everybody will admire me. I will be the little fish that had the big journey. But deep inside, I will know that I left, I ran away, I didn't make it. No, I am not going to give up so easily.
-Neither am I, Sekou said decisively. Even if I am a different story. Because you know that if I could, I would go back. But I can't. Therefore, I have to stay here and make it here.

.....

In the endless blue waters, somewhere in the bottom of the sea off the coast of the island of Rhodes, you could see a strange couple, a crab and a round sardine walking around, each one in his own way. They knew that there was still a long way ahead of them in this new place but they had a lot of faith that the best was yet to come. Because, my friend, fish do not change that easily. But in the end everything changes.

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ACTIVITY 3

Worksheet: Creative writing workshop

MY – ALIEN ANIMAL - STORY

A large rectangular area containing 25 horizontal dotted lines for writing.

ACTIVITY 4: What's the origin of the plants we eat? What if we could eat only native plants?

Aim: To understand that not all alien plants are invasive or harmful and realise the limitations in a 'fenced' world with European native plants only

Note the following:

Plants of American origin: tomatos, corn, pepper, aubergine, quinoa, common beans, potatos, avocado, walnut, pumpkin, pineapple, cranberry

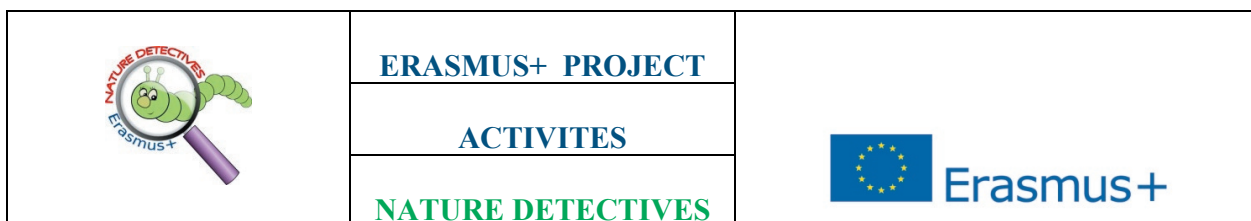
Plants of European origin: asparagus, chestnut, cucumber, grapes, apple, mustard, radish, pear, plum, cabbage, capper, fennel, fava beans, dill, parsley, olive, fig, apple, cherry, strawberry

Plant of Middle East and Asian origin: mulberry, pea, rice, pomegranate, chickpea, lentil, onion, garlic, cereals, basil, sesame, orange, lemon, kiwi

Plants of African origin: watermelon, melon, macademia, black-eyed peas

Preparation: Based on the above mentioned, the Greek teachers will make an illustrated list with different vegetables, legumes, cereals, fruits, nuts and aromatic plants indicating their origin in order to help the students realise the initial provenance of the plant products that we consume.

Realisation: The students will study these illustrated lists in groups and will propose a daily menu (breakfast, lunch and dinner) using only native plants of Europe. A discussion will follow on the limitations of choices regarding the daily nutrition when considering only European native plants.



ACTIVITY 4

Worksheet: Propose a daily menu (breakfast, lunch and dinner) using only native plants.

A DAILY MENU

<u>BREAKFAST</u>	<u>LUNCH</u>	<u>DINNER</u>

- Was it easy for me to prepare the menu?

.....

- What if we could eat only native plants?

.....

NOTE.

The groups that will have prepared the menus will present their end result to the participants of the programme.

ACTIVITY 5: Poll on aliens – Ask people and become a reporter about alien invasive plants



Aim: To involve students in a real-time small project on alien plants by interacting with the local inhabitants, to make students and local people understand the origin and mode of introduction of alien plants and inform them about the possible consequences of their introduction

Location: The questionnaire will be applied to the central square of Veria (to people passing-by) right after the oral presentation in the town hall.

Duration of interview: 30 minutes

Roles: The role of reporter will be given to 2-3 students (one Greek), teachers may participate and accompany the groups and may act as translators (if needed).

Rule: Only the students may ask questions. Every group should interview at least 3 persons.

Data processing (30 minutes): Right after the interviews, the accompanying teachers of each group of reporters will help students to compile the data of the interviews using the given sheets in order to produce an overview of the answers given by local people.

Data elaboration: You can use the sheets below to compile the data of the interviews made. You can focus on the following: What do people interviewed know about alien invasive plants? How the people interviewed actually define alien species? What do people interviewed believe? What do you think about the answers received? Have men and women given the same answers? Do you observe different answers according to different age classes?

Presentation: The overview of the action can be presented in short before a dinner or lunch. All the reporting teams will decide jointly what the main conclusions are regarding the people's level of knowledge on alien plants. A short discussion should be made on what should be done to improve people's knowledge on alien plants.

Questionnaire and instructions: see next page



ACTIVITY 5

Worksheet: Poll on aliens – Ask people and become a reporter about alien invasive plants!

For every person you interview, tick the following before you start (you will need one questionnaire for every person interviewed).

Man: Woman: Old: Young:

1. Do you know what an alien invasive plant is? (in Greek it is pronounced xenikó isvolikó fytó)

Yes No I do not know

- In the case of 'YES', ask the respondent:

'Can you tell me what an alien invasive plant is according to your opinion? Note down quickly his answer.

.....

- In the case of 'NO' or 'I DO NOT KNOW', ask the respondent:

Would you like me to tell you what an alien invasive plant is? If the respondent is positive, you can inform him/her as follows:

"Alien is a plant that comes from another country due to humans and was never here before its introduction with human activities".

Now you can ask the question 2.

2. The alien plants that are invasive to Greece usually come from:

Asia: Yes No Maybe I do not know

Americas: Yes No Maybe I do not know

Africa: Yes No Maybe I do not know

Australia: Yes No Maybe I do not know

Europe: Yes No Maybe I do not know

3. Most alien plants in Greece are introduced by accident or in purpose for a specific reason?

In purpose By accident Both None

4. Give us your opinion: 'For 1000 alien plants that we cultivate anywhere in Greece, 100 can escape somewhere from cultivation, 10 become naturalised in some areas, reproduce freely and expand their distribution and 1 becomes extremely invasive with huge economic impact'.

True False I do not know

5. Give us your opinion: 'A cultivated field may lose 50% of its value or more than 50% of its crop production due to the invasion by alien plants'.

Agree Disagree I do not know

Data elaboration sheet

NOTE. The results of the survey will analyzed by our students and will be published in the press , will be sent to environmental organizations and to all schools of participants.

How many people accepted to be interviewed today?

Group 1 interviewed: persons (Men: Women: Old: Young:)

Group 2 interviewed: persons (Men: Women: Old: Young:)

Group 3 interviewed: persons (Men: Women: Old: Young:)

Group 4 interviewed: persons (Men: Women: Old: Young:)

Group 5 interviewed: persons (Men: Women: Old: Young:)

Group 6 interviewed: persons (Men: Women: Old: Young:)

Group 7 interviewed: persons (Men: Women: Old: Young:)

Group 8 interviewed: persons (Men: Women: Old: Young:)

Group 9 interviewed: persons (Men: Women: Old: Young:)

Group 10 interviewed: persons (Men: Women: Old: Young:)

All groups interviewed: persons (Men: Women: Old: Young:)

What are the definitions of people interviewed about alien species?

1.

.....

.....

2.

.....

.....

3.

.....

.....

What do people interviewed believe about the origin of alien invasive species in Greece?

They come from Asia:

	Different groups of reporters										
Answer	1	2	3	4	5	6	7	8	9	10	Total
Yes											
No											
I do not know											

They come from Americas:

	Different groups of reporters										
Answer	1	2	3	4	5	6	7	8	9	10	Total
Yes											
No											
I do not know											

They come from Africa:

	Different groups of reporters										
Answer	1	2	3	4	5	6	7	8	9	10	Total
Yes											
No											
I do not know											

They come from Australia:

	Different groups of reporters										
Answer	1	2	3	4	5	6	7	8	9	10	Total
Yes											
No											
I do not know											

They come from Europe:

	Different groups of reporters										
Answer	1	2	3	4	5	6	7	8	9	10	Total
Yes											
No											
I do not know											

Overall answers (all groups)

Origin	Yes	No	I do not know	Percentage of yes
Asia				
Americas				
Africa				
Australia				
Europe				

Based on the answers received, what do most people believe about the origin of the alien species of Greece?

- 1.
.....
- 2.
.....
- 3.
.....

Most alien plants in Greece are introduced by accident or in purpose for a specific reason?

	Different groups of reporters									
	1	2	3	4	5	6	7	8	9	10
Answer	Men / Women	Men / Women	Men / Women	Men / Women	Men / Women	Men / Women	Men / Women	Men / Women	Men / Women	Men / Women
In purpose / / / / / / / / / /
By accident / / / / / / / / / /
Both / / / / / / / / / /
None / / / / / / / / / /
Overall / / / / / / / / / /

	Different groups of reporters									
	1	2	3	4	5	6	7	8	9	10
Answer	Old / Young	Old / Young	Old / Young	Old / Young	Old / Young	Old / Young	Old / Young	Old / Young	Old / Young	Old / Young
In purpose / / / / / / / / / /
By accident / / / / / / / / / /
Both / / / / / / / / / /
None / / / / / / / / / /
Total / / / / / / / / / /

Overall answers (all groups)

Answer	Men	Women	Old	Young
In purpose				
By accident				
Both				
None				
Percentage				

Based on the answers received, what do most people believe about the mode of introduction of the alien species of Greece?

1.
.....
2.
.....
3.
.....
4.
.....

Give us your opinion: 'For 1000 alien plants that we cultivate anywhere in Greece, 100 can escape somewhere from cultivation, 10 become naturalised in some areas, reproduce freely and expand their distribution and 1 becomes extremely invasive with huge economic impact'.

	Different groups of reporters									
	1	2	3	4	5	6	7	8	9	10
Answer	Men / Women	Men / Women	Men / Women	Men / Women	Men / Women	Men / Women	Men / Women	Men / Women	Men / Women	Men / Women
True / / / / / / / / / /
False / / / / / / / / / /
I do not know / / / / / / / / / /
Total / / / / / / / / / /

	Different groups of reporters									
	1	2	3	4	5	6	7	8	9	10
Answer	Old / Young	Old / Young	Old / Young	Old / Young	Old / Young	Old / Young	Old / Young	Old / Young	Old / Young	Old / Young
True / / / / / / / / / /
False / / / / / / / / / /
I do now know / / / / / / / / / /
Total / / / / / / / / / /

Overall answers (all groups)

Answer	Men	Women	Old	Young
In purpose				
By accident				
Both				
None				
Percentage				

Based on the answers received, what do most people believe about the above statement?

1.
.....
2.
.....
3.
.....
4.
.....

Give us your opinion: 'A cultivated field may lose 50% of its value or more than 50% of its crop production due to the invasion by alien plants'.

	Different groups of reporters									
	1	2	3	4	5	6	7	8	9	10
Answer	Men / Women	Men / Women	Men / Women	Men / Women	Men / Women	Men / Women	Men / Women	Men / Women	Men / Women	Men / Women
Agree / / / / / / / / / /
Disagree / / / / / / / / / /
I do not know / / / / / / / / / /
Total / / / / / / / / / /

	Different groups of reporters									
	1	2	3	4	5	6	7	8	9	10
Answer	Old / Young	Old / Young	Old / Young	Old / Young	Old / Young	Old / Young	Old / Young	Old / Young	Old / Young	Old / Young
Agree / / / / / / / / / /
Disagree / / / / / / / / / /
I do now know / / / / / / / / / /
Total / / / / / / / / / /

Overall answers (all groups)

Answer	Men	Women	Old	Young
Agree				
Disagree				
I do not know				
Percentage				

Based on the answers received, what do most people believe about the above statement?

1.
.....
2.
.....
3.
.....
4.
.....

ACTIVITY 6 : Open class: Proportion of alien plants in urban floras - Plants on and around the Byzantine Walls of Thessaloniki

Aim: To realise that alien plants may be few or numerous in different habitat types or places

Description: Based on examples found on spot, Dr N. Krigas will explain adaptations of alien plants to human activities and will present a short overview of the flora diversity of the Byzantine Walls of Thessaloniki in respect to the metropolitan city of Thessaloniki and in respect to other cities of the world.

Realisation: The students will perform on spot biodiversity assessment in groups of four persons, they will explore the local species richness and they will understand why in Thessaloniki and especially on the Byzantine walls there are fewer alien plants in respect to other parts of the city or in respect to other European cities.

The area of the Byzantine Walls of Thessaloniki is the exact site where the initial introduction of *Ailanthus altissima* (tree-of-heaven) took place in Thessaloniki about a century ago as a fast growing ornamental plant in street treelines; now this plant has become an invasive alien species.

Extending the action: The participants may study the scientific research on the flora of the Byzantine Walls of Thessaloniki (see Krigas et al. 1999) which illustrates similarities and differences detected in comparison with other wall floras of European cities.

Comparison with other wall floras

A comparison between the flora of the Byzantine Walls of Thessaloniki and other European and Mediterranean wall floras (Bergmeier 1990, Brandes 1987, 1992, 1995, 1996, Guggenheim 1992, Hruska 1987, Karschon & Weinstein 1985, Lisci & Pacini 1993, Lötschert 1984, Segal 1969, Weinstein & Karschon 1977, Werner & al. 1989, Woodel & Rossiter 1959) reveals both similarities and differences. The similarities are exemplified by the presence of typical wall-dwelling taxa, which are found

- (i) all over Europe and often in the Mediterranean area, such as *Antirrhinum majus*, *Diplotaxis tenuifolia*, *Convolvulus arvensis*, *Parietaria judaica*, *Sonchus asper*, *S. oleraceus*, *Sedum album* and *Saxifraga tridactylites*.
- (ii) mainly in the Mediterranean area, such as *Bromus madritensis*, *Calendula arvensis*, *Capparis spinosa*, *Chrysanthemum coronarium*, *Conyza bonariensis*, *Ephedra foeminea*, *Ficus carica*, *Hyoscyamus albus*, *Lactuca viminea*, *Malva parviflora*, *Mercurialis annua*, *Sisymbrium irio*, *Sonchus tenerrimus*, *Veronica cymbalaria* and *Urtica pilulifera*.

The main differences concern

- (i) the absence of pteridophytes, which are frequently found in other wall floras of Europe (e.g. *Asplenium ruta-muraria*) and the Mediterranean area (e.g. *Anogramma leptophylla*) or in both of them (e.g. *Ceterach officinarum*),
- (ii) the restricted occurrence of some typical wall-dwellers both in Europe and the Mediterranean area, such as *Cymbalaria muralis* and *Erysimum cheiri*, and
- (iii) the dominant occurrence, not recorded elsewhere, of a number of taxa, such as the Balkan *Verbascum undulatum* and the Mediterranean *Allium guttatum*, *Asphodelus fistulosus*, *Clypeola jonthlaspi*, *Peganum harmala*, *Salsola kali* and *Sisymbrium orientale*. However, it should be noted that only a few E Mediterranean walls have been studied. Further information may reveal that these taxa have a wider occurrence in the wall floras of the Mediterranean area.



Current invasion of *Ailanthus altissima* (tree-of-heaven) in the area of the Byzantine Walls of Thessaloniki.



Fig. 5. The NE side of the Walls in 1913, when *Ailanthus altissima* was planted for ornament. – Photograph by Fred Boissonnas, courtesy of the Folklife and Ethnological Museum of Macedonia, Thessaloniki.

ACTIVITY 7: Bad smell is a weapon! Find out why *Ailanthus altissima* (tree-of-heaven) smells bad!





Aim: To understand how little things in nature can affect big things and procedures

Preparation: Collection of *Ailanthus altissima* leaves.

Observation: The glands of the collected leaves of *Ailanthus altissima* should be observed in small groups of students with the help of magnifying glass. The students should press the glands with their fingers in order to release the bad odour.

A short discussion should follow on the allelopathic impact of the plant's volatiles (alteration of root soil chemistry, inhibition of seed germination of other plants, avoidance of herbivory); these features facilitate the propagation-proliferation potential and the spread of this invasive alien plant in new areas.

Extending the action: The students may study the native range of *Ailanthus altissima* and compare it with its current world distribution and its distribution in a city (Berlin) in order to understand how effective this "weapon" is: Bad smell with its allelopathic impact associated with quick growth and strong shading effect, high seed production, effective dispersal of seeds and strong vegetative reproduction (see illustrations by I. Kowarik and Säumel 2007, below) are important features that have made *Ailanthus altissima* a major alien invasive plant in many continents.

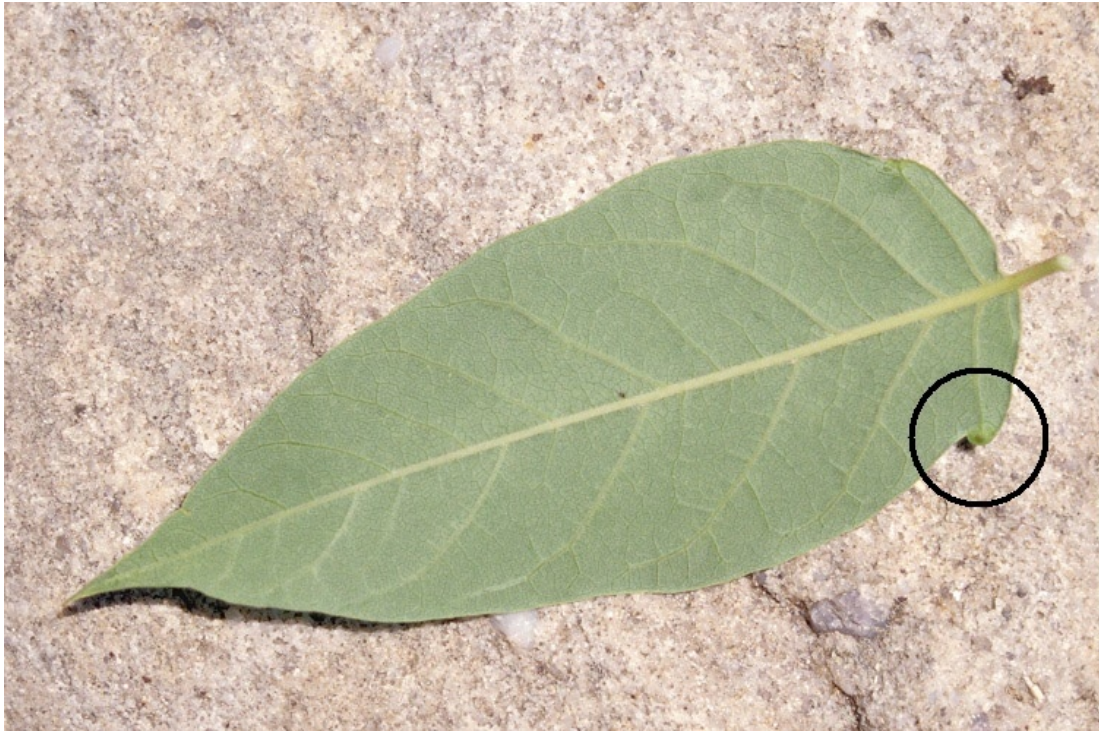
	ERASMUS+ PROJECT		 Erasmus+
	ACTIVITES		
	NATURE DETECTIVES		

ACTIVITY 7

Worksheet: Bad smell is a weapon. Find out why *Ailanthus altissima* (tree-of-heaven) smells bad!

Name of plant			
I managed to cut a leaf.	YES		NO
I can see the glands without the use of a magnifying glass	YES		NO
How many glands does each leaf have?			
How do they smell when I press them with my fingers?	GOOD	BAD	REALLY BAD
What do I think of it?			
My conclusions			

NOTE. *The pictures below are indicative!*



Ailanthus altissima bad smelling glands on the deciduous leaves.

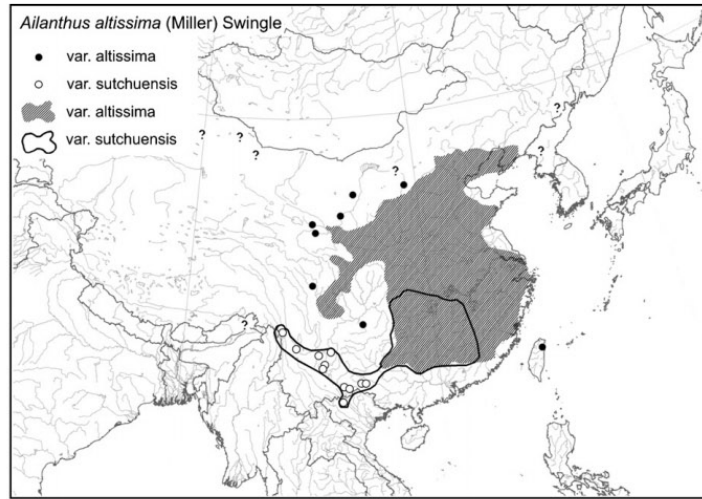


Fig. 4. Native range of *Ailanthus altissima* in China and North Vietnam, with a differentiation of the ranges of the varieties *altissima* and *sutchuensis* (distribution data compiled and mapped by E. J. Jäger & E. Welk, AG Chorology, Institute for Biology Halle/Saale). Herbaria records of possibly synanthropic occurrences are given by question marks.

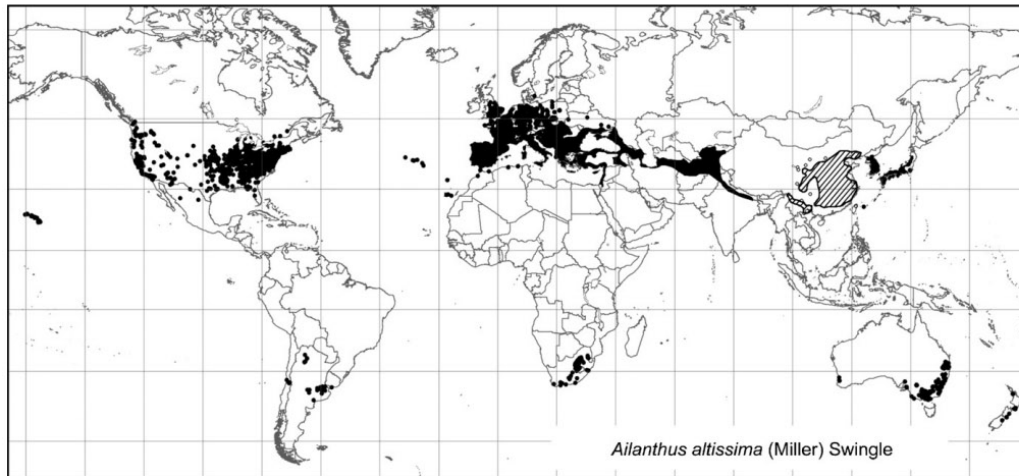


Fig. 5. Range of *Ailanthus altissima*, with a differentiation of the native Chinese range (hatched; including possible early range expansions within China), and of the secondary world-wide distribution (black) resulting from the range expansion since the introduction of *Ailanthus* to Europe in the 1740s (distribution data compiled and mapped by E. J. Jäger & E. Welk, Institute for Biology Halle/Saale).

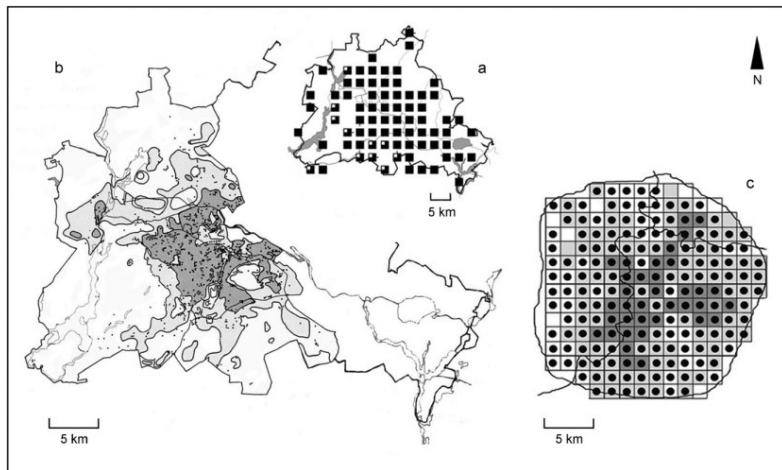


Fig. 6. Concentric distribution of *Ailanthus altissima* in a Central European city (a), Berlin: adapted from Regionalstelle, 2006; (b), relationship between location of trees (dots) and different temperature zones in the western part of Berlin: the warmest zone is in darkest shade; adapted from Kowarik and Böcker, 1984) and area-wide distribution in Rome as an example of a Mediterranean city (c, adapted from Celesti-Grapow, 1995).

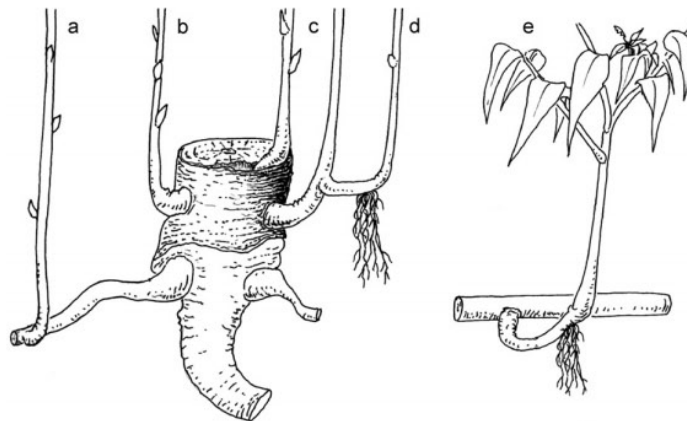


Fig. 9. Vegetative regeneration in *Ailanthus altissima* from (a) roots, (b) pre-existing buds in the hypocotyl, (c) adventitious buds on a cut section, (d) axillary buds of cataphylls present at the base of the new shoots, and (e) from stem fragments (a–d adapted from Bory et al., 1991).

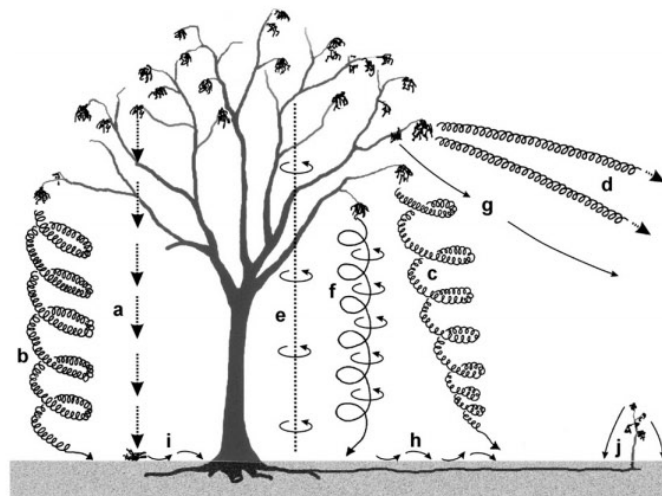


Fig. 10. Different types of transport of samaras of *Ailanthus altissima* (adapted from Bory and Clair-Maczulajty, 1980). Vertical fall of seed clusters (a), rotation of samaras about their longitudinal axis leads to spirally (b), spirally twisted (c), and straight-lined flights (d). Rotation about the short axis leads to vertical descent flights without spinning in the horizontal plain (e), or to spiral descents in a helical manner (f). Samaras can also fly without rotation (g), and can be moved secondarily over the soil (h). Also seed clusters or parts of them can be moved secondarily by wind (i). In addition, seed release occurs from root suckers (j).

ACTIVITIES 8-9 : Open course: Biodiversity, local cultural and natural heritage – Exploring treasures! (Excursion to the Byzantine monasteries of the Meteora geological park and to the prehistoric cave of Theopetra)

Aim: To explore the strong connections between natural and cultural heritage, to realize that rich biodiversity and natural habitats with low anthropogenic impact can exclude the spread of invasive aliens, to understand what a botanical treasure is. To know a national geological special phenomenon which belongs to UNESCO'S word heritage monuments.

Description: During the excursion to Meteora geological park and Theopetra prehistoric cave the students will have the opportunity to realise that alien plants are primarily associated with the anthropogenic (man-made) habitats and urbanisation.

The students will observe the cliff formations and the vegetation in Meteora rocks and Theopetra cave and will walk a biodiversity-rich pathway with native plants in Meteora (which excludes alien plants).

The students will have the opportunity to visit a local orthodox monastery topping the impressive rocks, will get in contact with the Byzantine art and ambience , they will realize aspects of the monk's everyday life and with teamwork training process they will discover the history of Meteora.



The Meteora geological park with the monasteries on the top of the rocks.



Aspect of the biodiversity path in the area of Meteora.

With the help of Dr N. Krigas, the students will compare these observations with other observations made in places where we will stop by for eating and they will realise how alien plants aggregate only in man-influenced habitats.

Additionally, in Theopetra prehistoric cave the students will have the opportunity to explore wild growing populations of the nationally and internationally protected, rare and threatened, local Greek endemic plant *Centaurea kalambakensis* (Asteraceae family).



Flowering heads (left), plant individual (center) and dried specimen of *Centaurea kalambakensis* (right) deposited in the herbarium of Royal Botanic Gardens, Kew (UK).





Aspect of the rock massif of Theopetra area.



Aspect of the rocky entrance of Theopetra prehistoric cave which is the habitat of *Centaurea kalambakensis*.

Note: The following activities 8A, 8B and 9 will help the students in order to achieve all the above goals.

	ERASMUS+ PROJECT	
	ACTIVITES	
	NATURE DETECTIVES	

ACTIVITY 8 A

Worksheet: I realize that alien plants are primarily associated with the anthropogenic habitats and urbanization.

Point 1	Pathway through the Meteora rocks	
Tick for every alien plant you see		
Total number of aliens plants you see in point 1		
Point 2	The central square of Kastraki (The village below Meteora)	
Tick for every alien plant you see		
Total number of aliens plants you see in point 2		
Where did you see the most alien plants?	Point 1	Point 2
What do I think of it?		

ACTIVITY 8B

Worksheet: Let's discover the history of Meteora

1st Work Group

METEORA

Meteora is a complex of huge dark-coloured sandstone rock formations which rise outside the town of Kalabaka and the village of Kastraki in Thessaly, near the mountain range of Pindos. On the top of some of the rocks the Monasteries of Meteora are built and they are included in the list of UNESCO world heritage monuments. The cave of Theopetra is found inside these rocks. Their average height is 313 m.

Meteora belong to UNESCO's world heritage monuments because they comprise a unique harmonic combination of Byzantine architecture and natural beauty. The buildings of the monasteries seem like art treasure since inside them one can find iconography, a continuance of Byzantine art. They are also a heritage treasure because they contain manuscripts, byzantine documents, silver reliquaries, Gospels, portable icons, crosses made of Holy Wood.

Answer the following questions briefly and share your answers with the other groups

QUESTIONS

1. What are Meteora?
2. Why are Meteora characterized as a UNESCO world heritage monument?

ANSWERS

1.....
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2.....
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2nd Work Group

METEORA

Meteora is a complex of huge dark-coloured sandstone rock formations which rise outside the town of Kalabaka and the village of Kastraki in Thessaly, near the mountain range of Pindos. On the top of some of the rocks the Monasteries of Meteora are built and they are included in the list of UNESCO world heritage monuments. The cave of Theopetra is found inside these rocks. Their average height is 313 m.

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Answer the following questions briefly and share your answers with the other groups

QUESTIONS

- 1. Where are Meteora located and what is their height?**
- 2. Why are Meteora considered as art treasure?**

ANSWERS

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2.....
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3rd Work Group

METEORA

Studies have shown that the rocks of Meteora were formed about 60 million years ago, during the Palaiogene Period. The formation of the geological landscape has not been clearly interpreted yet, although it has been the subject of study of many Greek and foreign geologists.

The most prevalent theory is that of the German geologist Alfred Philippson. According to this theory, in the early years there was a vast lake in the geographic region of Thessaly. According to tradition, a huge earthquake split the mountains in two and between Mount Olympus and Mount Kissavos a passage was formed, known as Tempi. The water of the lake flowed into the sea and Thessaly became a plain.

Then a solid cone appeared, covered by the lake water until that time, created by a mass of river stones, sand and mud that a river had carried to the area.

Later on, this huge mass was split because of the corrosive forces of the water, strong winds, heavy rainfall and earthquakes forming hills and rocks in different shapes and sizes – present day Meteora. Philippson's theory is considered complete because it explains the “pebbly character” of the rocks and hills.

Answer the following questions briefly and share your answers with the other groups

QUESTIONS

- 1. When were Meteora approximately formed ?**
- 2. What was there in the area of Thessaly before Meteora were discovered and how were they finally discovered?**

ANSWERS

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2.....
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4th Work Group

METEORA

Studies have shown that the rocks of Meteora were formed about 60 million years ago, during the Palaiogene Period. The formation of the geological landscape has not been clearly interpreted yet, although it has been the subject of study of many Greek and foreign geologists.

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Answer the following questions briefly and share your answers with the other groups

QUESTIONS

- 1. The theory of which scientist is the most prevalent about the formation of Meteora ?**
- 2. How is it finally believed that the rocks of Meteora were formed ?**

ANSWERS

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2.....
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5th Work Group

METEORA

The name Meteora is attributed to the head of the monastery of Great Meteoro, Saint Athanasios of Meteora, who called "Meteoro" (floating in the air) the broad Stone on which he climbed for the first time in 1344.

Another version attributes the name to Astronomy where the term "Meteoro" is used for any light phenomenon appearing in the Earth's atmosphere as the result of a meteoroid entering it, that is a rocky body that can vary in size from a few millimetres to a few metres. And the rocks of Meteora seem to be hanging from the sky.

Due to their special morphology, Meteora offered an ideal refuge, during the Ottoman rule, to the monks and residents of the area in the cavities of their rocks, their crevices and their tops.

Answer the following questions briefly and share your answers with the other groups

QUESTIONS

1. **How is it believed that Meteora took their name?**
2. **Where in the rocks did the monks and residents of the area took refuge during the Ottoman rule?**

ANSWERS

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2.....
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6th Work Group

METEORA

The wild and inaccessible landscape was an ideal place for the christian hermit monks that had settled in the area looking for peace and quiet through praying and christian perfection, at a time which is not known with accuracy.

According to the various opinios of Byzantinologists, it is believed that it started before 11th century. Other historic information , however, mention as the first hermit monk a certain Varnavas who in 950-970 established the old Skete of the Holy Spirit.

In general, monastery life in Meteora was in recession at the time of the decline and fall of the Byzantine Empire and the ensuing Ottoman rule in Thessaly in 1393. However, at the end of the 15th century and mainly in the 16th century Meteora were at their peak, since new monasteries were created, catholic and monastery buildings, adorned with unsurpassed works of iconography.

With the passing of time, this monastery state began to be reinforced with monks and reached its peak around the 17th century. However, from then on their decline started with the result that only six out of the twenty four monasteries are active today. The monasteries of Meteora that can be visited today are : Metamorphosis Of the Saviour, Varlaam, Saint Nicholas, Anapafsa, Rousanou, Holy Trinity and Saint Stephanos.

Answer the following questions briefly and share your answers with the other groups

QUESTIONS

- 1. When and why did the monks settle in Meteora?**
- 2. How many monasteries were there active in the 17th century and how many today?**

ANSWERS

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2.....
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7th Work Group

METEORA

How did the first hermit monks climb the tall and steep cliffs of Meteora? There are three existing theories:

First, the hermit monks cut down a very tall tree (there were lots of those at the time) and by laying it on the rock they managed to climb to the top.

Second, they nailed iron stakes inside the rock and they gradually reached the top. (stakes of that kind were found in many rocks).

Third, they flew a kite with a strong rope over the rock. The rope was entangled in one of the trees of the rock and by using it they climbed to the top.

Following, the monks used rope ladders, pulleys and baskets as means of communication and supply of their monasteries. In the 1920s this method was abandoned because steps and tunnels were carved on the rocks. This is the only way of access to the monasteries for the countless visitors from all over the world.

Answer the following questions briefly and share your answers with the other groups



QUESTIONS

1. How is it believed that the first hermit monks climbed to the top of the rocks?
2. How did the monks climb until the 1920s and what is the way of access today?

ANSWERS

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2.....
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	ERASMUS+ PROJECT	
	ACTIVITES	
	NATURE DETECTIVES	

ACTIVITY 9

Worksheet: Exploring a national treasure.

Name of plant	Centaurea Kalambakensis	
Does it have leaves?	YES	NO
Does it have a blossom?	YES	NO
What's the colour of the blossom?		
Other observations.		
Do I have it in my country?	YES	NO
Have I seen it anywhere else?		
What have I learned about it?		

My picture

