

MARE – Centro de Ciências do Mar e do Ambiente

**Emc² Project 'Exploring White Crowberry Coastal Habitats'.
Book of Activities**



**M. Alexandra Abreu Lima
Lia T. Vasconcelos**

Oeiras, 2017

The document '*Emc² Project 'Exploring White Crowberry Coastal Habitats'. Book of Activities'* was compiled and developed under the direction of the Project Working Group:

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Oeiras, 2017

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Cover Photo –Outdoor activity at white crowberry habitats during Emc²projeto (A. Lima, 2016)

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Projeto E mc² - Explorar Matos de Camarinha da Costa

Financiamento MARE- FCT UID/MAR/4292/2013



Project Emc²

FOREWORD

Nowadays, acknowledging that the majority of children and young people grow in increasingly artificial surroundings (Baptista, 2009: 53) this project aims to revert this trend promoting '*outdoor experiential learning*' (Banack, 2015) activities focused on coastal flora richness and threat from invasive species, in order to inspire and help other stakeholders to develop initiatives about this issue.

This '*hands-on*' model aims to opt for more captivating and challenging innovative models for this target audience, creating restlessness able to generate curiosity, which will lead young generation to a more effective and systematic search for information/knowledge, contributing to continuous emancipatory learning. This posture aims at making these groups active agents for an attitude change concerning the natural values of their contexts.

Simultaneously, it aims to mobilize teachers giving them didactic tools/documents they may need for project development.

Project Emc² is focused on 'white crowberry' -*Corema album* (L.) D. Don-, a dioecious green shrub (in Portuguese 'Camarinhas'), which female plants produce small white edible fruits.

At global level, their geographic distribution is interesting. White crowberry plants belong to *Ericaceae* Family, to *Corema* genus, which has only two species with atlantic distribution:

- (1) ***C. conradii*** Torr.– occurring at North America East coast (here not studied);
- (2) ***C. album* (L.) D. Don**; with two subsp.:
 - (2.1.) *C. album* subsp. *album* – occurring only at Iberian Peninsula West and Southwest (Iberian endemism);
 - (2.2.) *C. album* subsp. *azoricum* P. Silva, occurring at several Azorean islands, with exception of 'Santa Maria', 'Terceira', 'Flores' and 'Corvo' (Azorean endemism).

Project Emc² activities here described of potential utility for both primary and (early) secondary schools were grouped in two parts. **PART I**, is focused on Portuguese mainland white crowberry -*C. album* subsp. *album* and **PART II**, refers to Azorean white crowberry - *C. album* subsp. *azoricum* P. Silva.

Project Emc² activities here described include an 'Outdoor Activity' (field trip to a coastal habitat location) and a Classroom Activity (Botany & Art Activity). For an evaluation of project methodology application and educational resources there are Surveys for Students and Teachers.

Project Emc² provides worksheets and didactic elements useful for the development of these living laboratories. **Annex 1** contains useful information for future development of new *'Botany and Art'* worksheets.

As this is a continuous process, with a strong commitment to communication about this subject, we encourage everyone to send us their contributions so that they can be integrated, since we believe that this process should be based on a collaborative basis in order to optimize the added value of multiple knowledge sources. If you would like to join the list of schools that receive project Emc² development updates, please contact:

M. Alexandra Abreu Lima
alexandra.abreu@iniav.pt

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Project Emc² - Exploring white crowberry coastal habitats

(Explorar 'Matos de Camarinha' da Costa)

***Corema album* (L.) D. Don**

"*Experiential learning is our primary source of knowledge*"
Hartley Banack (2015)

Project description

INTRODUCTION and OBJECTIVES

Project Emc² - 'Exploring white crowberry coastal habitats' (in Portuguese – '*Explorar matos de camarinha da costa*')- is an environmental education project focused on 'white crowberry', a dioecious green shrub (in Portuguese '*Camarinhas*'), which female plants produce small edible fruits, with a peculiar trait: - a white color (being some pink) – of interest for berry markets (Oliveira e Dale, 2012; Oliveira *et al.*, 2016). The name '*album*' refers to this white fruit color trait.

White crowberry can be found at some Portuguese mainland seashore habitats (subsp. *album* is an **Iberian endemism**, with an Atlantic distribution between Gibraltar and Finisterre) and at some Azorean Islands coastal habitats (subsp. *azoricum* is an **Azorean endemism**).

METHODOLOGY

Although Project is mainly designed to reach teachers and students from the primary and (early) secondary schools, project issue actual relevance turns it interesting to wider publics. Outdoor visit methodology is centered on a playful, multi-sensory approach. Students observe plants and gather material to do a '**mini-herbarium**¹' (Outdoor Activity). Project interdisciplinary methodology allow that outdoor visits can provide experiences to take away and build upon back in the classroom, intertwining science and arts activities, such as drawing based upon *C. album* herbaria specimens images (Botany and Art Activity). There are surveys for students and teachers, useful for an assessment of project resources and methodology application.

RESOURCES FOR FUTURE USE

A 'living' project supported by FCT- It is aimed that this project, scheduled to occur between September 2016 and September' 2017, with the support of Fundação para a Ciência e Tecnologia (FCT), through the strategic project UID/MAR/04292/2013 granted to MARE, keeps 'alive' giving opportunity to build future bridges between schools, communities and interested citizens around this issue.

ACKNOWLEDGEMENTS - We are grateful to all teachers, educational communities and local associations who have agreed to participate in the Emc² project. We are also grateful to National Herbarium colleagues for their support in our research. This study had the support of Fundação para a Ciência e Tecnologia (FCT), through the strategic project UID/MAR/04292/2013 granted to MARE- Centro de Ciências do mar e do Ambiente.

¹ - Collection of material must comply with existing specific rules, which are defined taking into account plant species' conservation status.

Project Team

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Project Emc²- Exploring white crowberry coastal habitats
(Explorar 'Matos de Camarinha' da Costa)

PART I

Corema album (L.) D. Don subsp. *album*

"Experiential learning is our primary source of knowledge"
Hartley Banack (2015)

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Project Emc² - Exploring white crowberry coastal habitats

(Explorar 'Matos de Camarinha' da Costa)

Corema album* (L.) D. Don subsp. *album

"Experiential learning is our primary source of knowledge"
Hartley Banack (2015)

I.1. Outdoor Activity - Description for Teachers

Teacher Name _____

Location, date _____

Duration - 2H

Ages - from 7 years

Nº. Participants - 30

Activity type - multi-sensory approach, playful. Working perception

Material - Record sheets. Poster with plant species to observe, pencils, magnifying glasses, Self-adhesive tape (2-3 cm wide).

Goals –Motivate for discovery in natural spaces. Improve abilities of observation and communication of observed material. Disseminate the concepts of native and invasive species and flora roles in coastal habitats.

Visit- Observation of different plants and data registration through description and/or drawings. Teacher explains what can be observed, which behavior rules to follow and activity duration. Students observe different plant species, collect some material to be fixed in a sheet, to build a '*mini-herbarium*'¹, with information of: - Plant name; - Collector name (student); -Location and -Date. While collecting plant samples, pieces that have fallen should be used in order to avoid cutting the living plants. Teacher can ask some questions and start a conversation.



'White crowberry' (P. Oliveira, INIAV)

'Hottentot fig' around 'White crowberry' (Lima, M.A, INIAV)

Useful information for field trip planning:

- (1) Visit scheduling – fruit growing occurs during spring time, being their ripening at summer.
- (2) Location choice – white crowberry occurrence registration at mainland Portugal is represented '*Flora -on website*' map (Flora-on, 2014, www.flora-on.pt)

¹- Collection of material must comply with existing specific rules, which are defined taking into account plant species' conservation status.

After visit- To evaluate this activity, students fill a survey. Observation of students' behavior may also give information about knowledge improvement.

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Corema album* (L.) D. Don subsp. *album

I.2. Outdoor – Poster



Corema album (L.) D. Don – Female plant with white fruits (©Lima, M.A, 2015)



The white crowberry (left) *Corema album* (L.) D. Don – and the invasive plant *Carpobrotus edulis* (L.) N.E.Br. (centre and right) (©Lima, M.A, 2016)

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Corema album* (L.) D. Don subsp. *album

"Experiential learning is our primary source of knowledge"
Hartley Banack (2015)

I.3. Outdoor activity – Students activity worksheet

Fill out this form

Name _____

Location, Date _____

In this map of mainland (or continental) Portugal, mark with a cross this visit location.



Briefly describe the location (e.g., hilly or flat, dry or wet; sounds and smells)

Gathered material to obtain a 'mini-herbarium'

While collecting plant samples, it is preferable to gather plant pieces that are fallen in order to avoid cutting the living plants. To 'build' a '*mini-herbarium*', collected material is fixed in a sheet with self-adhesive tape, with label data: (1) Current Plant scientific name; (2) Collector name (student); (3) Location, and (4) Date.

List:

Drawing(s) – in a notebook some drawings about the landscape and plants can be made with the corresponding label with name, location and date.

More info: <http://www.theplantlist.org/tpl1.1/record/kew-2737495>

p.s.: Fulfilled Worksheets can be send to alexandra.abreu@iniav.pt

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Corema album* (L.) D. Don subsp. *album

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Hartley Banack (2015)

I.4. Outdoor activity – Students survey

Name _____

School _____

Location, date _____

1. Describe what pleased you much in this visit.

2. Would you like to pursue a career related with nature?

2.1. Yes ___

2.2. No ___

Justify your answer-

3. Did you know the 'white crowberries' (PT 'camarinhas')? If so, do you know how local populations use them?

3.1. Yes _____

3.2. No ___

4. Did you know the plant we call 'hottentot fig' (PT 'chorão')? If so, describe what you have learned about it.

4.1. Yes ___

4.2. No ___

5. How do you evaluate the visit (mark with a cross)

Very good	Good	Poor	Very poor

You have finished the survey. Thanks for collaboration.

p.s.: Fulfilled surveys can be send to alexandra.abreu@iniav.pt

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Corema album (L.) D. Don subsp. album

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Hartley Banack (2015)

I.5. Outdoor activity – Teachers Survey

Teacher Name _____

School _____

Location, date _____

1. Describe briefly by which means this visit may have contributed for science and botany students learning process.

2. How do you evaluate the visit (mark with a cross)

Very good	Good	Poor	Very poor

Suggestions and comments:

You have finished the survey.
Thanks for collaboration.

p.s.: Fulfilled surveys can be send to alexandra.abreu@iniav.pt

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Corema album (L.) D. Don subsp. *album*

I.6. Botany and Art activity - Moledo

Around the world botanists keep a record of plant species and are helped in this task by illustrators who draw studied plants. Illustrations can be done in digital format, with illustration *software*, or in paper with pencil or brush.

Drawing activity: Based upon Figures 1 and 2, as well as on white crowberry plants you may have seen in nature, make a **drawing, with pencils, about this species in a A₄ sheet** (it can be used this worksheet last page).



Figure 1 – Photo of white crowberry specimen- *Corema album* (L.) D. Don held at Herbarium LISE (E.A.N.- Estação Agronómica Nacional) – nº 24780

Collector – Braun Blanquet *et al.*; **Date** – 14 May 1949; **Location** – Moledo beach dunes (Camarido)

(Photo: Alexandra Abreu, 2016)

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Figure 2- White crowberry illustration from Flora Vasculare
(web: <http://www.floravasculare.com/index.php?spp=Corema%20album>)

INTERESTING INFORMATION:

LEAVES - White crowberry shrubs, usually between 30-75 cm tall, can reach 1 m and their very small **leaves** (called 'ericoid') are covered by a very thick cuticle to minimize water loss by transpiration, allowing them to survive summer high temperatures.

FRUITS - White crowberry female shrubs produce spherical small **fruits** (5-8 mm diameter) – known as '*camarinhas*'- of white or pinky color.

Acknowledgements - To LISE Herbarim (Estação Agronómica Nacional), Oeiras. This study had the support of Fundação para a Ciência e Tecnologia (FCT), through the strategic project UID/MAR/04292/2013 granted to MARE- Centro de Ciências do mar e do Ambiente.

p.s.: Fulfilled activity worksheets can be send to alexandra.abreu@iniav.pt

Thanks for collaboration.

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DRAWING White crowberry

Teacher Name _____

Student Name _____

School _____ Location, date _____

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Project Emc² - Exploring white crowberry coastal habitats

(Explorar 'Matos de Camarinha' da Costa)

Corema album (L.) D. Don subsp. *album*

1.7. Botany and Art - Sines

Around the world botanists keep a record of plant species and are helped in this task by illustrators who draw studied plants. Illustrations can be done in digital format, with illustration *software*, or in paper with pencil or brush.

Drawing activity: Based upon Fig. 1 and 2, as well as on white crowberry plants you may have seen in nature, make a **drawing, with pencils, about this species in a A4 sheet** (it can be used this worksheet last page).



Figure 1 – Photo of white crowberry specimen- *Corema album* (L.) D. Don held at Herbarium LISE (E.A.N.- Estação Agronómica Nacional) – nº 41438

Coletor – P. Silva *et al.*; **Date** – 8 May 1957; **Location** – Sines (Baixo Alentejo)
(Photo: Alexandra Abreu, 2016)

Projeto Emc² - Explorar Matos de Camarinha da Costa

Financiamento MARE- FCT UID/MAR/4292/2013



Figure 2- White crowberry illustration from Flora Vasculare
(web: <http://www.floravascular.com/index.php?spp=Corema%20album>)

INTERESTING INFORMATION:

LEAVES - White crowberry shrubs, usually between 30- 75 cm tall, can reach 1 m and their very small **leaves** (called 'ericoid') are covered by a very thick cuticle to minimize water loss by transpiration, allowing them to survive summer high temperatures.

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DRAWING White crowberry

Teacher Name _____

Student Name _____

School _____ Location, date _____

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PART II

***Corema album* (L.) D. Don subsp. *azoricum* P. Silva**

"Experiential learning is our primary source of knowledge"
Hartley Banack (2015)

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II.1 Outdoor activity –Description for teachers

Teacher Name _____

Location, date _____

Duration - 2H

Ages - from 7 years

Nº. Participants - 30

Activity type - multi-sensory approach, playful. Working perception

Material - Record sheets. Poster with *C. album* (L.) D. Don; subsp. *azoricum* P. Silva; pencils, magnifying glasses, strip self-adhesive tape 2 to 3 cm wide.

Goals –Motivate for discovery in nature. Improve abilities of observation and communication of observed material. Disseminate concepts of native and invasive species and flora role in coastal habitats. Highlight that 'white crowberry' has only two subspecies: (2.1.) *C. album* subsp. *album* – occurring only at Iberian Peninsula West and Southwest (Iberian endemism); and (2.2.) *C. album* subsp. *azoricum* P. Silva, occurring only at some Azorean islands (Azorean endemism).

Visit- Teacher talks about coastal plants, behavior rules and activity duration. Students observe plants, collect some material to fix in a sheet to 'build' a '**mini-herbarium**'¹, with label data: (1) Current Plant scientific name; (2) Collector name (student); (3) Location, and (4) Date. While collecting plant samples, fallen pieces can be used to avoid cutting the plants.



Fig 1- *Corema album* (L.) D. Don subsp. *azoricum* P. Silva
(Photo : P.V. Araújo, <http://acores.flora-on.pt/index.php#/h189f>)

Useful information

(1) Visit scheduling – fruit growing occurs during spring, being their ripening at summer.

(2) Location choice- it should be based upon white crowberry occurrence data available at <http://siaram.azores.gov.pt/flora/flora-vascular/camarinha/1.html> (all islands, except 'Sta. Maria', 'Terceira', 'Flores' and 'Corvo' islands).

¹- Collection of material must comply with existing specific rules, which are defined taking into account plant species' conservation status.

After visit- For activity evaluation, students fill a survey. Students' behavior observation may provide information about knowledge improvement.

More info: <http://www.theplantlist.org/tpl1.1/record/kew-2737495>

p.s.: Fulfilled activity worksheets can be send to alexandra.abreu@iniav.pt

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***Corema album* (L.) D. Don subsp. *azoricum* P. Silva**

II.2. Outdoor activity – Poster

'White crowberry'-***Corema album* (L.) D. Don**- is a dioecious green shrub (in Portuguese '*Camarinhas*'), which female plants produce small white edible fruits. *Corema* is a genus of two species in the plant family *Ericaceae*. These two species have an Atlantic distribution:

(1) ***C. conradii* Torr.** – occurring at North America East coast (here not studied);

(2) ***C. album* (L.) D. Don**; with two subsp.:

(2.1.) ***C. album* subsp. *album*** – occurring only at Iberian Peninsula West and Southwest (**Iberian endemism**);

(2.2.) ***C. album* subsp. *azoricum* P. Silva**, occurring at several Azorean islands, with exception of 'Santa Maria', 'Terceira', 'Flores' and 'Corvo' (**Azorean endemism**).



Fig. 1-*Corema album* subsp. *azoricum* P. Silva- Female plant with white fruits. (Photo: P.V. Araújo, <http://acores.flora-on.pt/index.php#/h189f>)



Fig. 2-*Corema album* subsp. *azoricum* P. Silva – White crowberry subsp. 'azoricum' at an Azorean landscape. (Photo: P.V. Araújo, <http://acores.flora-on.pt/index.php#/hB7JU>)

More info:

<http://siaram.azores.gov.pt/flora/flora-vascular/camarinha/1.html>

<http://www.theplantlist.org/tpl1.1/record/kew-2737495>

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***Corema album* (L.) D. Don *subsp. azoricum* P. Silva**

"Experiential learning is our primary source of knowledge"
Hartley Banack (2015)

II.3. Outdoor activity – Students worksheet

Fill out this form

Name _____

Location, Date _____

In this map of Azores archipelago (*Região Autónoma dos Açores*), mark with a cross this visit location.



Fig. 1- Map of Azores archipelago (*Região Autónoma dos Açores*)
(Source: Adapted from Paulo Miranda, 2017)

Brief location description (e.g., hilly or flat, dry or humid; sounds and smells)

Gathered material to obtain a 'mini-herbarium'

While collecting plant samples, it is preferable to gather plant pieces that are fallen in order to avoid cutting the plants. To obtain a '*mini-herbarium*', collected material is fixed in a sheet with self-adhesive tape, with label data: (1) Current Plant scientific name; (2) Collector name (student); (3) Location, and (4) Date

List:

Drawing(s) – in a notebook draw details about the landscape and plants with the corresponding legend(s), with name, location and date.

More info: <http://www.theplantlist.org/tpl1.1/record/kew-2737495>

p.s.: Fulfilled Worksheets can be send to alexandra.abreu@iniav.pt

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***Corema album* (L.) D. Don *subsp. azoricum* P. Silva**

"Experiential learning is our primary source of knowledge"
Hartley Banack (2015)

II.4. Outdoor activity – Students survey

Name _____

School _____

Location, date _____

1. Describe what pleased you much in this visit.

2. Would you like to pursue a career related with nature?

2.1. Yes ____

2.2. No ____

Justify your answer-

3. Did you know the 'white crowberries' (PT 'camarinhas')? If so, do you know how local populations use them?

3.1. Yes _____

3.2. No _____

4. How do you evaluate the visit (mark with a cross)

Very good	Good	Poor	Very poor

You have finished the survey. Thanks for collaboration.

p.s.: Fulfilled surveys can be send to alexandra.abreu@iniav.pt

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II.5. Outdoor activity – Teachers Survey

Teacher Name _____

School _____

Location, date _____

1. Describe briefly by which means this visit may have contributed for science and botany students learning process.

2. How do you evaluate the visit (mark with a cross)

Very good	Good	Poor	Very poor

Suggestions and comments:

You have finished the survey.
Thanks for collaboration.

p.s.: Fulfilled surveys can be send to alexandra.abreu@iniav.pt

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II.6 Botany and Art – Graciosa Island

Around the world botanists keep a record of plant species and are helped in this task by illustrators who draw studied plants. Illustrations can be done in digital format, with illustration *software*, or in paper with pencil or brush.

Drawing activity: Based upon Fig. 1 and 2, as well as on white crowberry plants you may have seen in nature, make a **drawing, with pencils, about this species in a A₄ sheet** (it can be used this worksheet last page).



Figure 1 – Photo of white crowberry specimen- *Corema album* (L.) D. Don subsp. *azoricum* P. Silva held at Universidade dos Açores Herbarium– nº 1909

Colletor – Carlos Filipe da Silva Picanço; **Date**- 26 September 2011; **Location** – Graciosa Island ('Pico do Timão')

(Photo: Mónica Moura, 2017)

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Figure 2- White crowberry illustration from Flora Vasculare
(web: <http://www.floravascular.com/index.php?spp=Corema%20album>)

INTERESTING INFORMATION:

LEAVES - White crowberry shrubs, usually between 30-75 cm tall, can reach 1 m and their very small **leaves** (called 'ericoid') are covered by a very thick cuticle to minimize water loss by transpiration, allowing them to survive summer high temperatures.

FRUITS - White crowberry female shrubs produce spherical small **fruits** (5-8 mm diameter) – known as 'camarinhas'- of white or pinky color.

Acknowledgements - To Universidade dos Açores Herbarium. This study had the support of Fundação para a Ciência e Tecnologia (FCT), through the strategic project UID/MAR/04292/2013 granted to MARE- Centro de Ciências do mar e do Ambiente.

p.s.: Fulfilled activity worksheets can be send to alexandra.abreu@iniav.pt

Thanks for collaboration.

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DRAWING White crowberry

Teacher Name _____
Student Name _____
School _____ Location, date _____

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***Corema album* (L.) D. Don subsp. *azoricum* P. Silva**

II.7. Botany and Art – Pico Island

Around the world botanists keep a record of plant species and are helped in this task by illustrators who draw studied plants. Illustrations can be done in digital format, with illustration *software*, or in paper with pencil or brush.

Drawing activity: Based upon Fig. 1 and 2, as well as on white crowberry plants you may have seen in nature, make a **drawing, with pencils, about this species in a A₄ sheet** (it can be used this worksheet last page).



Figure 1 – Photo of white crowberry specimen- *Corema album* (L.) D. Don subsp. *azoricum* P. Silva held at Universidade dos Açores Herbarium– nº 1876.

Colletor – Mónica Moura; Date – 18 June 2011; Location – Pico, Farol da Manhenta.

(Photo: Mónica Moura, 2017)

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Financiamento MARE- FCT UID/MAR/4292/2013



Figure 2- White crowberry illustration from Flora Vascular
(web: <http://www.floravascular.com/index.php?spp=Corema%20album>)

INTERESTING INFORMATION:

LEAVES - White crowberry shrubs usually between 30-75 cm tall, can reach 1 m and their very small **leaves** (called 'ericoid') are covered by a very thick cuticle to minimize water loss by transpiration, allowing them to survive summer high temperatures.

FRUITS - White crowberry female shrubs produce spherical small **fruits** (5-8 mm diameter) – known as 'camarinhas' - of white or pinky color.

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p.s.: Fulfilled activity worksheets can be send to alexandra.abreu@iniav.pt

Thanks for collaboration.

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DRAWING White crowberry

Teacher Name _____

Student Name _____

School _____ Location, date _____

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Annex 1

In addition to the 'Botany and Art' worksheets with images containing geographic references to 'Moledo', 'Sines', 'Ilha Graciosa' and 'Ilha do Pico', the development of new 'Botany and Art' worksheets can be done with images of other White crowberry *specimens*, collected at different mainland Portuguese coastal locations, as indicated in Table 1.

Table 1- List of some White crowberry *specimens* held at LISE Herbarium (E.A.N. – Estação Agronómica Nacional, Oeiras), with information about their collection date and location/habitat.

Location and habitat data (<i>in Portuguese</i>)	Date (<i>in Portuguese</i>)
Praia de Vieira, <i>in pinetis</i> solo arenoso	11 Maio 1960
Nazaré, nos pinhais, terrenos arenosos	29 Junho 1962
S. Martinho do Porto	s.d.
S. Pedro de Moel, nos pinhais	Julho 1939
Costa da Caparica, Pinhal do Rei, <i>in arenosis</i>	19 Fevereiro 1989
Setúbal, Tróia; terrenos arenosos	28 Setembro 1944
Algarve, Sagres a caminho de S. Vicente, nas areias	13 Fevereiro 1941

p.s.: for educational purposes, digital images of these *specimens* can be send upon request to <alexandra.abreu@iniav.pt>

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