Layman's report

Conservation measures to assist the adaptation of *Falco eleonorae** to climate change

LIFE EIClimA

Project identity card

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INTRODUCTION

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The islands and islets of the Aegean Sea host the vast majority of the global breeding population of the Eleonora's falcon, a migratory falcon, whose specificity lead to its nickname "pirate of the Aegean". The Eleonora's falcon has synchronized the raising of its young with the autumn migration of passerines from Europe to Africa. Although predominantly an insectivorous species, during this period of the year it switches its diet and hunts passerines, by swooping from the islands' steep coasts and islets, where it nests.

This particularity in combination with the fact that it is specialized in nesting in insular environments, its high nesting fidelity, and the fact that it is a long-distance migrant wintering in Madagascar, render it particularly vulnerable to changes, including climate change. According to climate change scenarios and forecasts, a northward shift of its distribution in the Aegean Sea is expected.

ELEONORA'S FALCON

the Pirate of the Aegean Sea

The heart of birds beats faster than humans', approx. 600-900 heartbeats/minute.

It can turn its head for 340°.

It has a "tooth" on its beak, like all falcons, which is used to immobilize its prey.

It has long tail and very long wings.

Its body length is 36-42cm and its wingspan 84-105cm.

It is named after Eleonor of Arborea, a 14th century Sardinian ruler (judge), the first one to legislate the protection of raptors.

In Greece
300 islands and islets
12,300 pairs

85% of the global population breeds on the Aegean islands.

VS

Although insectivorous, during the breeding period migratory passerines constitute its main prey.

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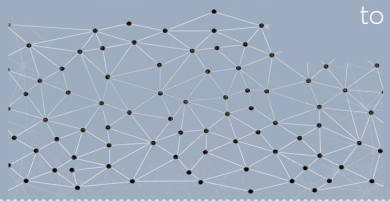
Common Greek Name:
Mavropetritis
Local Names:
Varvaki
Koustogerako
Thalassogerako
Falkoni

It overwinters in Madagascar.

It hunts in groups creating a "net" over the sea close to its colony.



It stores prey for future consumption, when the weather conditions are adverse and the migratory bird flow halts.

The Eleonora's falcon hunts also during nights with adequate moonlight taking advantage of the nocturnal migration.

It is protected under the Birds Directive.

The weakest nestling may become prey to its siblings during periods of low prey availability.

CLIMATE CHANGE AND ELEONORA'S FALCON

In the Eastern Mediterranean climate change is expected to lead to increased temperature, as well as to increased frequency and intensity of extreme weather, such as intense drought and heat waves. These changes are expected to affect Eleonora's falcon.

- The vegetation of the islets, under which Eleonora's falcon often nests, will be reduced, increasing the exposure of eggs and young to weather elements, while fresh water sources, which the species uses for drinking and preening, will be reduced or vanish, affecting the birds' fitness.

- The migratory period of passerines is expected to shift in time and/or the migratory flow is expected to decrease, leading to the loss of

vital synchronization between the raising of the Eleonora's falcon young and the migratory flow, as well as to a decrease of the food resources during this crucial period.

- In case the species is forced to abandon the islets, it will lose the benefits they offer, such as provision of shelter from terrestrial predation.

Respectively, on Madagascar, where the species overwinters, a southward shift is expected towards areas with increased human presence and threats, such as the excessive use of biocides in agriculture.

PROJECT'S OBJECTIVES

As climate change is already under way and its impacts are becoming evident, the survival of the Eleonora's falcon depends largely on its ability to adapt to it. The project has implemented management actions both to mitigate the expected impacts and to increase the species adaptability.

The project's objectives were related to:

- the improvement of the species breeding performance by reducing egg and young losses, improving the quality and increasing the availability of nesting sites, as well as of prey at selected colonies.
- the improvement of the species' conservation status in its breeding and wintering sites, by identifying its foraging areas and assessing their quality, as well as networking among experts for the exchange of knowledge and know-how.

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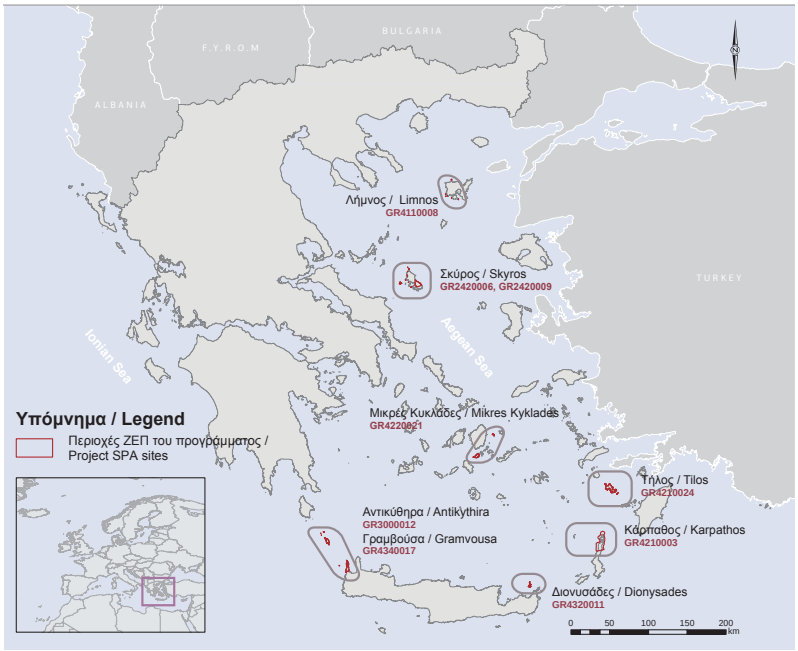
PROJECT IMPLEMENTATION SITES

The project focused on eight insular Natura 2000 sites in the Aegean Sea. Management actions were implemented at five sites; while surveys to establish the status of the Eleonora's falcon population were carried out at the remaining three sites.

The Natura 2000 network is a European Ecological Network of sites that host important habitats and species at the European level. It is the largest network of protected sites worldwide.



ELEONORA'S FALCON POPULATION CENSUS

Eleonora's falcons breed on small islets and steep coasts of islands in the Mediterranean Sea, from the Balearics to Cyprus, as well as on the Canary Islands and the islets and coasts of North Africa along the Atlantic coast. The Aegean Sea, however, is the "core" of the breeding distribution, as it hosts most of the world's population.

The Eleonora's falcon census took place from the sea, while at the same time survey of the nestlings was carried out through visits at selected colonies for the estimation of the breeding success locally.

The population of the colonies that are hosted at the project's sites is estimated to be of around 3,150 pairs.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PASSERINE MIGRATION AT ANTIKYTHERA ISLAND

During the period of raising their young, Eleonora's falcons hunt and feed mainly on migratory passerines, which use the islands and islets as stopover sites for refueling and resting.

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On the island of Antikythera, one of the main refueling stopovers of passerines in the Aegean Sea, the stopover duration, space use and the ecological preferences of the species that are the main prey of Eleonora's falcon were studied. For this purpose, passerines:

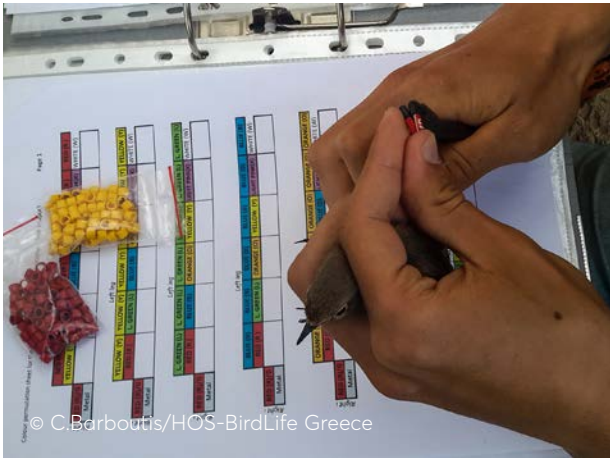
- were ringed, with metal and color rings, in order to spot and record individuals.

- were fitted with radiotransmitters to monitor their movements on the island.

- were monitored by visual observations, in order to record their presence and movements on the island.

- were monitored during their nocturnal migration by radar.

The results for the studied passerine species indicated that they feed mainly in agricultural land and in areas with maquis vegetation, their stopover period – although varying among species – is mainly short (few hours/days), while the migratory flow of birds does not present significant fluctuations and is rather considered constant during the Eleonora's falcon breeding period.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FEEDING AREAS OF ELEONORA'S FALCON

Eleonora's falcons use different areas to feed during their annual cycle. As a result, during winter they feed at the rainforests of Madagascar, during the pre-breeding period they prefer mainland Greece, while during the raising of their young they hunt over the sea at the broader area around their colony.

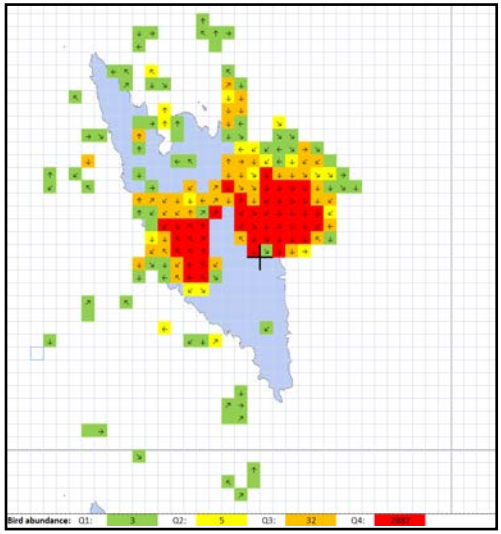
The space use by Eleonora's falcon for hunting and feeding was studied with various modern methods and the important foraging areas were identified, through:

- Monitoring, on a daily basis all year round, of the movements of six female Eleonora's falcons, breeding on Antikythera and its adjacent islets, with the use of solar GPS transmitters, fitted on their back like a backpack.

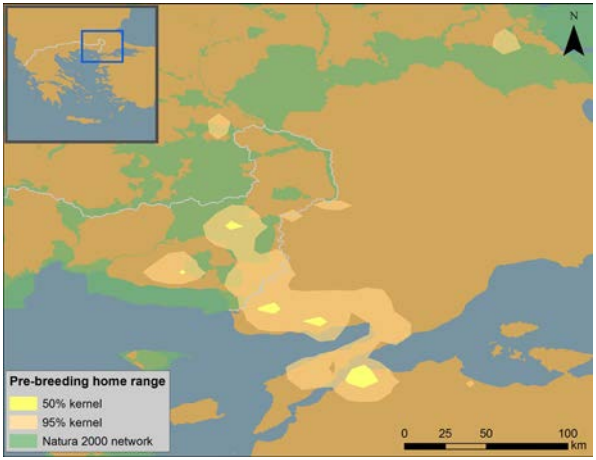
- Studying the biotopes and periods of the day the falcons prefer to hunt over Antikythera island, during the pre-breeding and breeding period with the use of visual observations and radar surveys, respectively.

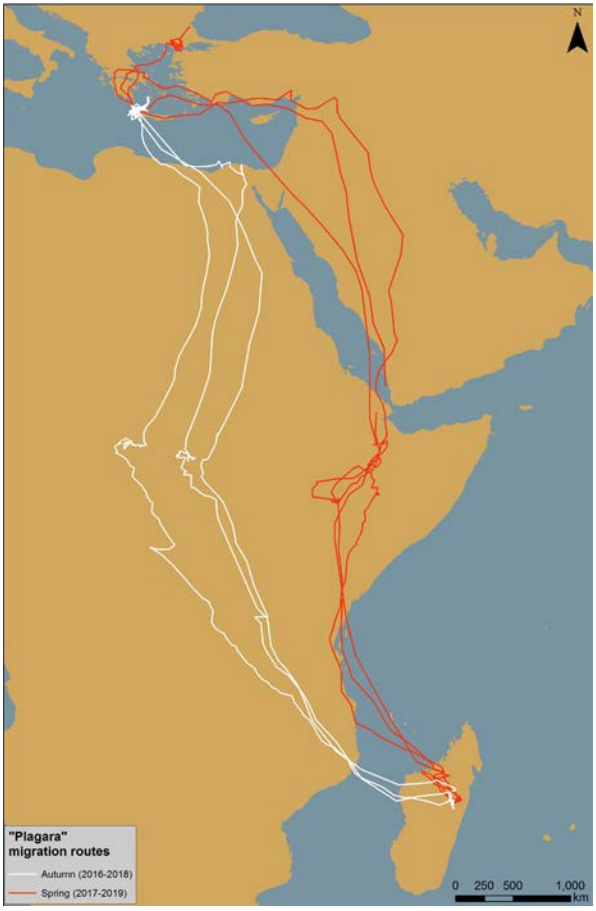
- Implementation of on-site survey at Madagascar, to assess the quality of the areas where the species prefers to hunt and feed and to record the threats and pressures it faces there.

At the same time, blood and tissue samples were collected, in order to carry out toxicological analyses to estimate the contaminant load of Eleonora's falcon by environmental pollutants, such as insecticides and heavy metals.



Ornithological radar.
Eleonora's falcon abundance at Antikythera.





The most important feeding areas of the Eleonora's falcon, during wintering, are located in the northern and central part of Madagascar, during breeding, within 100km radius around the colony, while during the pre-breeding period the species travels long distances away from its colony in search of food at different habitats, such as forests and cultivated land, going as far as the SE Balkans.

RAT ERADICATION

Rats have been introduced unintentionally by humans on most islets where Eleonora's falcons breed, causing negative effects on their ecosystems. They prey on Eleonora's falcon eggs and young and destroy vegetation, which provides cover and protection from weather elements.

Mitigation of existing threats is essential for the improvement of the Eleonora's falcon ability to respond to climate change impacts. The largest ever rat eradication operation in the Aegean Sea took place on the groups of islets Makares and Dionysades. Upon completion, a total of 7 islets covering an area of 705ha became rat-free. The benefits are already evident regarding both Eleonora's falcon breeding success and the recovery of the islet ecosystems.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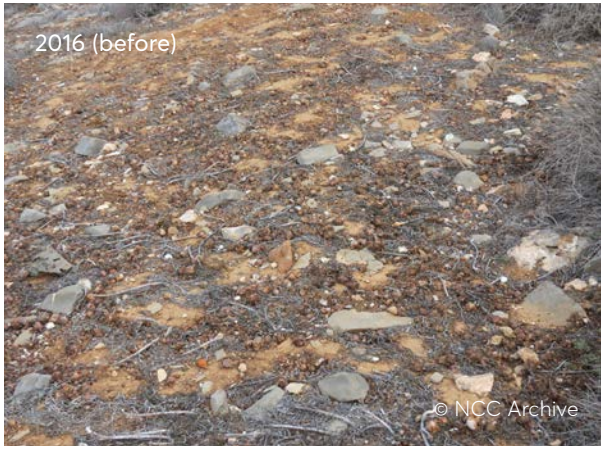
2016 (before)
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2017 (after)
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ARTIFICIAL NESTS

The Eleonora's falcons do not build nests but instead place their eggs on the ground under bushes or rocks, in crevices or potholes. The nests usually provide shelter from weather elements, as well as protection against predators.


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The availability of suitable nesting sites is important in regards to the temperature increase and the extreme weather conditions, as a result of climate change. In this scope, more than 1,000 nests were installed at 5 project sites. The artificial nests were mainly made of stone and were constructed from the material available on the islets, but in cases where such material was not available, wooden nests were placed. The artificial nests were already occupied by breeding pairs during the first year following their construction. Their occupancy reached up to 65%, as evidenced in one colony on Crete.

REFUELING OASIS

Climate change is expected to affect the passerine migration and consequently the available food sources for Eleonora's falcon during the critical period of breeding. The number of birds that migrate is expected to drop, while the migration period is expected to shift in time compared with the current situation.

The main parameter for assisting the passerine migration, and subsequently to ensure adequate amount of food sources for the Eleonora's falcon, is the existence of proper refueling and resting stopover sites along their migration route, where birds can stay for longer periods of time.

For this purpose, a 1.13ha land plot was purchased on Antikythera. This is only the second case of land purchase through a LIFE project in Greece, dedicated exclusively to nature conservation, following the purchase of the Sekania beach, Zakynthos, acquired for the protection of the loggerhead sea turtle.

In this plot a "refueling oasis" for passerines was created. Following the necessary landscaping work, 105 fruit trees were planted, including fig, locust, olive trees and pomegranates, and 0.45ha of legumes and cereals such as split peas, broad beans and barley were cultivated. The area was fenced, a permanent irrigation system was installed, and a nursery was built for the production and preservation of seeds of cultivated local varieties for the future needs of the oasis.


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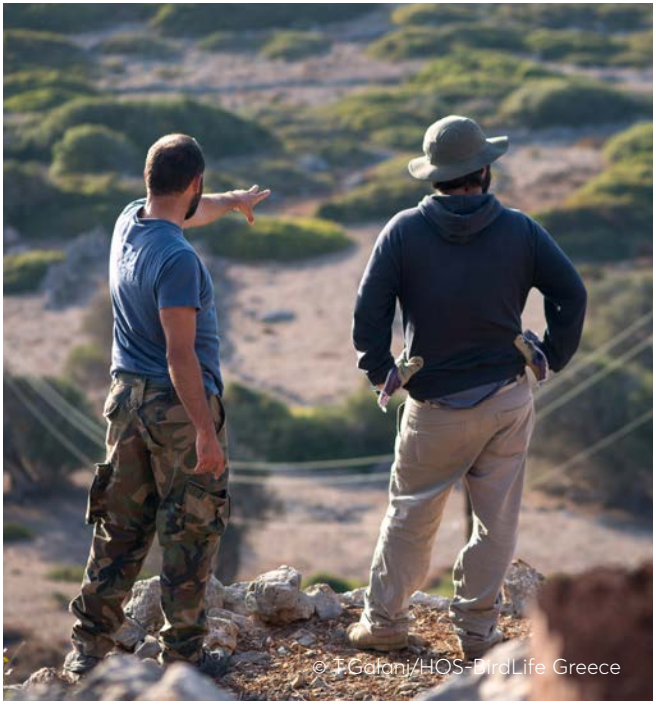
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INFORMATION AND AWARENESS RAISING

The local insular communities at the project sites coexist with the Eleonora's Falcon every summer. The combination of field work with simultaneous information dissemination and raising public awareness of the local communities on topics they are interested in was the key communication priority. Especially for actions such as rat eradication, timely and proper information dissemination of the islet users was an important factor in their success. Based on the response of the local communities it turns out that the tangible actions' results were probably the best ambassadors for the promotion of the project.

Furthermore, younger generations of local communities became acquainted with the Eleonora's falcon and were informed of climate change through educational activities, becoming eventually the local "messengers for climate".


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AFTER LIFE

The experience gained through the project concerning the implementation and efficiency of the good practices applied was incorporated in the "Good Practice Guide for the adaptation of the Eleonora's falcon to climate change", which will allow competent authorities responsible for the protection of Eleonora's falcon and other species of insular ecosystems, such as Management Bodies of protected areas, to make use of it during the implementation of similar management activities in the future.

The project's results have already been used for the study and protection of the species, but also for information dissemination and awareness raising purposes, beyond the framework of project. The first artificial nest construction action for the Eleonora's falcon, utilizing the knowledge gained through the project, is a fact and more actions are expected to take place in the coming years.

Furthermore, the "refueling oasis" is already an integral part of the activities carried out by the Antikythira Bird Observatory.

THE PROJECT IN NUMBERS

- 1.13ha were purchased exclusively for nature protection and the construction of a refueling oasis for passerines.

- 105 fruit trees were planted and 0.45ha cultivated in the refueling oasis.

- 7 islets, of 705ha, are rat-free.

- 650km were walked during the first month of rat eradication operation at Dionysades complex.

- 1,100 artificial nests were constructed for the Eleonora's falcon.

- 1,534 pupils became "messengers for climate".

- 6 Eleonora's falcons were monitored with modern telemetry devices; the falcon named "Plagara" covered 7,000km between Madagascar and its nest successfully for 3 consecutive years.

- 4,463 passerines were ringed.

- 13 scientific papers and conference contributions were produced.


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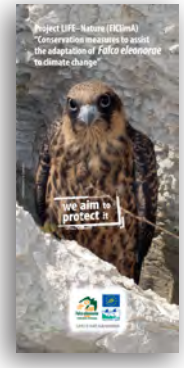
PROJECT'S PUBLICATIONS



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