

# ISLAND BIOSPHERE RESERVES AND THE PROTECTION OF THE NOCTURNAL ENVIRONMENT

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*“Some people transplant in spring, but the inhabitants of Babylon do it when the constellation of the Dog rises, which is the time that most people do it because plants germinate and grow quicker in this season.”*

Theophrastus, 6<sup>th</sup> Century B.C. *“History of plants”*

*“Is there any light-house at the Azores: if so, land-birds would probable sometime fly against the glass and be killed. In this case it would be advisable to examine not only their feet and beaks for earth, but to try the whole contents of their alimentary canals and place such contents on damp pure sand under a small bell-glass and see if any seeds were present which would germinate. If so to grow the plant and name it”*

Letter from C. Darwin dated on 2 July 1881 to Francisco Arruda Furtado

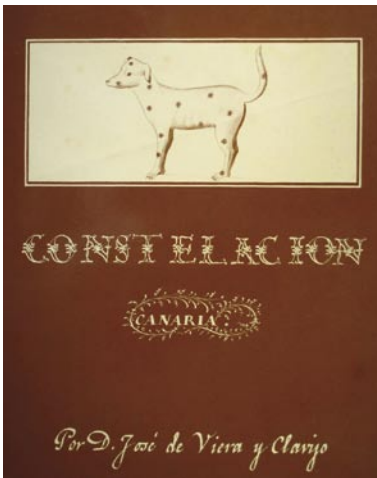
We know that in general, islands are eco-systems with a small surface area, but where biological phenomena of pronounced importance occur and develop and where we often find a rich and varied flora and fauna characterised by a high degree of endemism. Among these islands, Hawaii, the Galapagos, Juan Fernandez and the Canaries are leading examples, world wide, because of their high percentages of endemic species – over 40% (in the case of the flora) of their native biota.

The very fact that they are island eco-systems makes the biological processes that occur in them specially delicate and interesting, including facets such as their population, colonisation and internal development. Due to the fact that they are complex and a lack of research however, little is known about how they should be handled and conserved.

In the case of the Canary Islands, the recent creation of research centres has partially offset the deficit of information available for managing the biological wealth of these eco-systems, but at a time when the list of species to be found in the islands and the range of each one of these remains incomplete, a task



The Queen of the Night (*Cereus nycticalus* = *Selenicereus pteranthus*) chromolithograph by Ernst Heyn (1895)



that will take many more years to finish, there are practically no sophisticated studies that have been conducted on the reproductive biology of many of these species and, therefore, studies of their survival, or studies aimed at understanding the relations between living creatures and the night life. I think that, in general terms, these characteristics can be applied to most of the island territories that form part of the Biosphere Reserve network.

One of the issues that affect islands and that has been significantly associated with their biological wealth is the role they play on the migratory routes followed regularly for thousands of kilometres by millions of birds, most of which use the

night time and its stars for navigating, using complex and still mostly unknown processes, in order to find their way along routes that sometimes cover thousands of kilometres. This is an especially important case if science wants to conduct migration studies, requiring clean skies with a full moon for counting the numbers of passing birds.

Many studies have already highlighted the importance of the stars in the life cycle of a wide range of organisms, including species of turtles, amphibians, bats and many birds, even if these are highly complex and, as yet, little understood mechanisms that not only involve direct vision, but other factors related to the position of groups of stars, polarised light, magnetic fields or different combinations of these factors.

Another factor that we must not lose sight of with regard to the possible repercussions of poor stellar visibility, and especially due to the effects arising from inadequate lighting (excessive, poorly installed, etc.), are the repercussions that have an impact on the survival of several sea birds, particularly during the stage that they are first learning to fly, after breeding on coastal cliffs. This is a well known phenomenon in the Canary Islands and several campaigns have been organised to recover the birds most affected, in particular the Little Shearwater (*Puffinus assimilis*), an endangered species, whose chicks are dazzled by the lighting of the built up areas, causing the chicks to become disorientated, fly into buildings and, in many cases, their death.

According to the latest data provided by BIOTA Canario (Izquierdo et al., 2001, 2004) the total number of known species to date in the Canary Islands amounts to 13,333, 3,665 of which are endemic terrestrial species, with insects as the largest group with some 2200 exclusive species. This latter is one of the groups that is affected by lighting at night, which both disturbs their habitats and causes them to make untimely forays that can lead to their death, although, obviously their size makes them less noticeable and they make less “environmental noise” in comparison with the problems caused for birds and other vertebrates.

It can be fairly said that artificial light is especially harmful in island eco-systems where there is an abundance of endemic species and they are distributed throughout the island territory, suffering the direct and indirect impacts of “social progress”. If we bear

in mind the wealth of endemic species in the Canary Islands, and the fact that many of them are distributed through much of the island area, each one according to its own different eco-system, it is highly difficult and complex, although absolutely necessary to establish a strategy to protect the night skies, even if many of these species can escape the prejudicial effects of artificial light, especially in the mountainous areas. I believe that we are still a long way from being able to know exactly how many species are currently suffering the negative effects of artificial lighting, and how many are really in danger because of this threat. It is therefore recommendable to establish cautionary measures for any territory, in the specific case of lighting, and appropriate controls must be put in place to monitor public and private installations to avoid the unnecessary illumination of some areas and thus make significant financial and environmental savings.

The World Network of Biosphere Reserves, many of whose member reserves are genuine laboratories with ideal conditions for studying these phenomena, represents an especially important framework for establishing a research system aimed at making a significant contribution to the observation, study and control of these effects, and to make a positive contribution to maintaining biodiversity and opening innovative new paths in the field of sustainable development.



The baobabs comprise eight species with large, spectacular, nocturnal flowers. The African baobab, *Adansonia digitata*, has long been known to be bat-pollinated. On the island of Madagascar, *Adansonia rubrostipa* (above) is pollinated by long-tongued hawkmoths. © Giuseppe Orlando.