

Light Pollution; how it affects certain species.

(Submitted by Julia Zammit)

Introduction:

Light pollution has not yet been investigated and educated about to most of the world's population, especially the Maltese one, at question in the report; "Light Pollution and its effect on Yelkouan Shearwater in Malta; causes and solutions". There are many reports about light pollution, but many actual original research papers have not been made, on this matter.

Along with the other reports, this article takes into account the effect on seabirds, nocturnal animals; bats, as well as other fauna and humans themselves. Several studies similar to this have been made to show the effect of light pollution and several types of lighting/ illumination which contribute more to this problem. The intent is to investigate and issue recommendations not only for the project sites but other seabirds, sea turtles and bat colonies habitats.

Malta has a small land area with the highest population density in the EU. Thereafter, over-illumination due to population pressures is exceptionally elevated during the summer months when these seabirds are fledging. In the Canary Islands there is a similar situation. Light Pollution has also been found to effect Sea turtles, which evidently have been found not to nest in Malta anymore.

Petrels are especially vulnerable since they use the moon and the stars for navigation. Bats and sea turtles also seem to be bewildered by excessive light in their habitat. It has been found to mostly effect fledglings and hatchlings as well as juveniles by disorientating their navigation skills, behaviour, competitive interactions, predator- prey relations, reproduction; in all it appears to effect their entire physiology as a whole. Therefore, just light pollution, is a huge threat to these animals and unfortunately, might lead to their extinction.

Research:

The bird species focused on in the chosen reports is the *Procelleniformes* (the order of the tube nosed seabirds; shearwaters, petrels and albatross). In Malta these include the *Yelkouan Shearwater*, *Cory's Shearwater* and the *European Storm Petrel*. Malta hosts about 10% of the world's population of *Yelkouan Shearwater*, today a threatened species, mostly located at 'Rdum Tal- Madonna'. The Canaries are also a very large mating ground for many species of petrels.

The reports aim to educate and analyse how to reduce lighting in these areas as well as in other localities where these petrel species, Hawksbill turtles, and bat colonies have settled. Using different types of lighting, and switching off aimless heavy illumination (ex. floodlights) could make a huge difference to the population size.

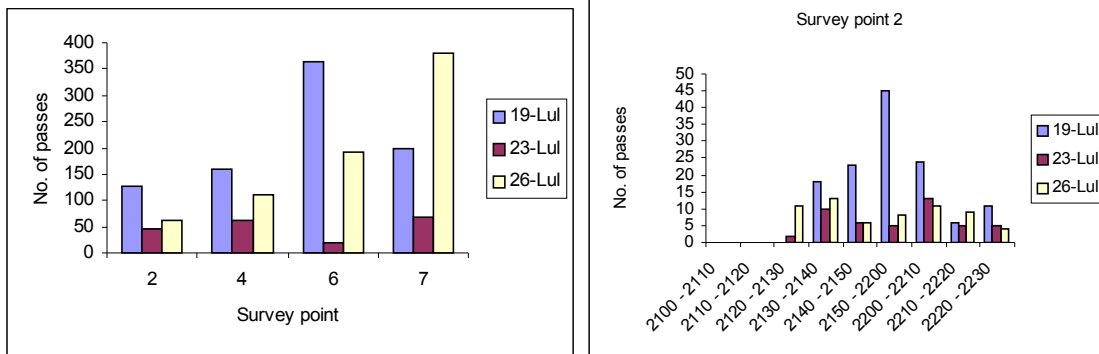
The report on bat surveys conducted at Claremont Landscape Garden, Esher in July 2004 also showed a large change between concert nights and undisturbed nights meaning the nocturnal mammals were also distressed by the changing light. Therefore the feeding activity of the species was damaged. Though the *Wildlife and Countryside Act 1981 and Conservation (Natural Habitats & c.) Regulation 1994* (which were issued under the *European Communities Act 1972*) protects bat species in Britain to be killed, injured, captured or even disturbed in anyway, it was reported in 1981 that a 70% decrease of the *pipistrelles* population was seen. Since then a discussion has arisen, that light pollution could be an underlying cause which was not addressed before hand.

Different species have variable sensitivity to artificial light. Many shearwater and petrel species are nocturnal during breeding season. This is to avoid raptors and gulls as their main predator. Being nocturnal, benefits

fledglings that leave their nest at nightfall. Consequently, according to records fledglings are the highest within the mortality rate of these species.

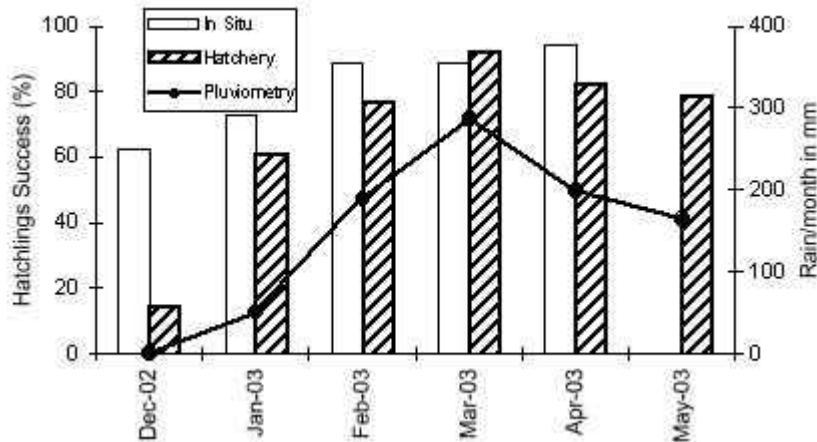
The following species were detected at Claremont Landscape Garden during the research conducted; Common pipistrelle (*Pipistrellus pipistrellus*), Soprano pipistrelle (*P. pygmaeus*), Daubenton's bat (*Myotis daubentonii*), Noctule (*Nyctalus noctula*), Serotine (*Eptesicus serotinus*).

Total number of bat passes during the survey period at each survey point (Whitefield et al, 2004). 19-Jul – Days before the concert, 23-Jul – Day of the concert in the park, 26-Jul – Few days after. One notes the effect still seen after several days.



When dealing with Sea Turtles; Hawksbill Turtles, in Brazil, the *Projeto TAMAR – IBAMA (the National Sea Turtle Conservation Program of Brazil)* used different methods to prevent disorientation during nesting of the species (*Eretmochelys imbricate*).

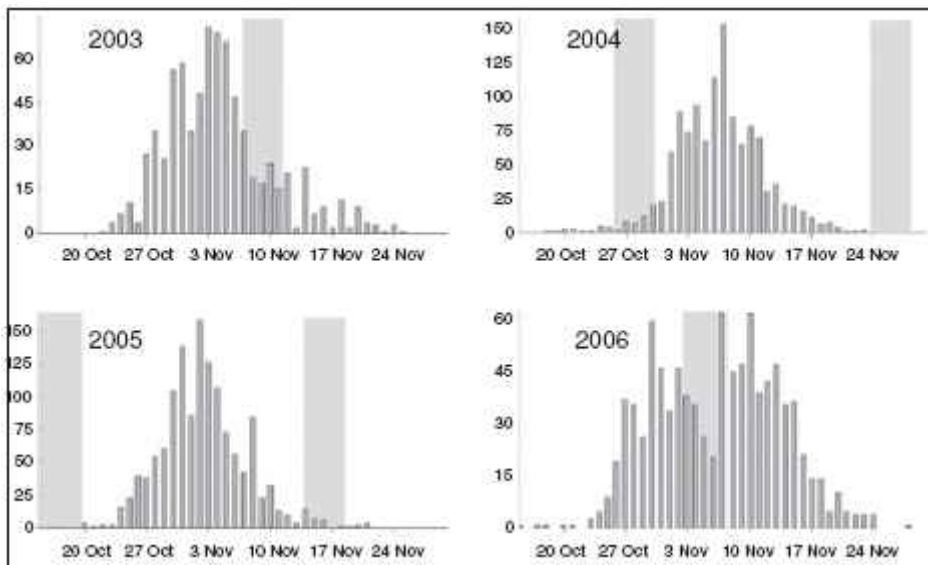
Pluviometric changes of hatching success through the nesting season (Mascarenhas et al, 2004).



This research study occurred on 2.9 km of nesting beach. Though, some nests were moved higher up the beach, while others put into hatcheries, it was shown that there was a higher success rate when left in situ. The aim in moving the hatchlings was to avoid light pollution effects on the young turtles. Over all in the year of this study there were more successful hatchlings than in the year before. In the year before, the researchers had collected all hatchlings which were emerged at night, and released them that same morning. This was to avoid disorientation of the hatchlings due to the heavily lighted nesting grounds. However, most hatchlings

seemed lethargic by morning; it was said to be due to energy losses while waiting till release. In 2003, the researchers noticed that eggs kept in hatcheries but released immediately after emergence had a much easier time to crawl to the sea, then hatchlings moved from their nest. Therefore, the easiest way seems to avoid much tampering with eggs. It seems from these results that, over illumination could only be avoided by limiting lighting on the nesting grounds.

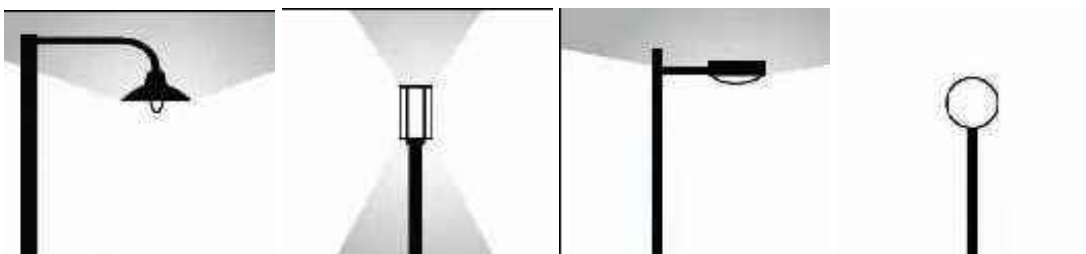
Rodriguez et al, in 2009, studied the amount of fledglings found grounded; alive and deceased. They noted in their study that most birds found grounded were fledglings thought to have just left the nest. The birds found alive were released in daylight not reduce chances of disorientation. The study showed that most species studied had severely been affected by the moon phase. Fewer fledglings were found grounded when there was a full (bright) moon, while a much larger number was found during other phases. This is probably because the moon is outshone by the lighting on the islands.



Number of fledglings found grounded. The shaded areas show full moon phase ± 2days.

Conclusion:

In Brazil, IBAMA (the National Environmental Agency) has established some laws to protect recognized nesting beaches. Though these seem to help, the researchers still conclude that these laws are not enough to protect the studied nesting sites. Introducing laws is what most organizations wish to do, to reduce photo pollution. Education about the problems occurring due to this type of pollution might be a more effective way to go, in some cases. Avoiding certain types of lighting seems to be the best way forward.



Inappropriate lighting; many used for lighting sea shores.

According to ecological point of view, light pollution needs to be taken more into consideration, and more research should be done to quantify which and how many species are actually affected by this source of pollution. Sources have shown that light pollution can affect plants (exhibiting leaf-loss, and triggering of early photo-period), fish (sea trout), insects, as well as zooplankton, *Daphnia*. Disturbances, such as mentioned above, can cause huge population drifts, as well as decrease in populations themselves. This could lead to eventual extinction of the species, affecting ecosystems overall, along with other threats that have been taken into more ecological consideration.

References:

Original Research papers:

“Report on bat surveys conducted at Claremont Landscape Garden Esher in July 2004”

Lynn Whitfield and Ross D Baker
Surrey Bat Group, December 2004

“Attraction of petrels to artificial lights in the Canary Islands: effects of the moon phase and age class”

Airam Rodriguez & Beneharo Rodriguez
British Ornithologist Union, 2009

“Nesting of Hawksbill Turtles in Paraíba- Brazil: Avoiding Light Pollution”

Rita Mascarenhas, Robson Guimarães dos Santos, André Souza dos Santos, & Douglas Zeppelini
Marine Turtle Newsletter 104:1-3, © 2004

Sources:

Last Picture From:

“Light Pollution and its effect on Yelkouan Shearwater in Malta; causes and solutions”

Helen Raine, John J Borg, Dr. Andre Raine, Suzanne Bairner, Matthew Borg Cardona
With assistance from the Light Pollution Awareness Group
Birdlife Malta, December 2007

“A review of ecological effects of Road Reconfiguration and Expansion on Coastal Wetland Ecosystems”

Travis Longcore, Ph.D, Catherine Rich, J.D., M.A.
November 2001