

Risk Assessment and Mitigation of Feral Pigeons Droppings on Heritage Sites Case study: Habu Temple (Luxor - West Bank)

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Abstract

Heritage sites and historic buildings are continually exposed to a variety of environmental damage-causing factors among which is the disturbing presence of wild or “feral” pigeons within these structures. This not only has a negative aesthetic impact, but also causes a great deal of physical damage due to the buildup of refuse on the roofs and walls of these structures, affecting their integrity and authenticity.

We selected the Temple of Medinet Habu as a suitable model for our study, since it is one of the most prominent Egyptian temples from the Pharaonic period, located on the west bank of Luxor in southern Egypt, where there are many feral pigeons. We will show some of the approaches that have been used to alleviate the problems caused by the presence of these birds and to address the challenges caused by their habitation of the monuments, some of which have proven successful for a brief time, in addition to suggesting some methods that could be used in the future.

Keywords: #assessment impacts of pigeon droppings- #mitigation of feral pigeon waste- #mitigation of environmental impacts on heritage buildings- #feral pigeon droppings on heritage buildings- #modern techniques to expel the birds from the heritage sites.

Negative environmental impacts of feral pigeons

Every year, the numbers of natural and environmental changes increases worldwide and these occurrences unquestionably have influence agriculture, landscapes, historic structures, and all human activities .¹

Bird fouling has caused extensive damage to historic and heritage structures. Apart from the obvious visual effects, the biggest issue caused by bird droppings is the acids contained within the excrement. This can cause irreparable damage’s on building surfaces, scarring the texture of the building, as well as damaging’s the appearance .²

Furthermore, the waste of feral birds, which is considered a global issue, causes a variety of illnesses, infections and viruses, including “Newcastle Disease.”³ ; Pigeons may actually transmit over sixty diseases through their faeces, and the deadly risk of disease to humans from touching or spreading this material is well known .⁴

There have been 176 confirmed incidents of illness transmission from wild pigeons to humans.

Aerosol transfer contributes to 99.4 % of pigeon-human illness transmission, according to researchers. The most common pathogens are Chlamydia pneumonia and modern Cryptococcus. Pigeon droppings have also been reported to spread “Histoplasmosis,” a lung disease as well as a variety of other ailments .⁵

1 Nicu, Ionut Cristi. “Natural risk assessment and mitigation of cultural heritage sites in North-eastern Romania (Valea Oii river basin).” *Area* 51.1 (2019): 142-154.

2 Abouzeid, Adam, et al, “Bird Damage to historic Buildings”, ICCROM, (2007), 1.

3 Amer, M. I. S., G. F. El-Bagoury, and M. H. Khodeir. “Studies on experimental infection of pigeons with Newcastle disease virus.” *Ben. Vet. Med. J* 25 (2013): 143-147.

4 Can pigeons spread disease, <https://www.terminix.com/blog/education/can-pigeons-spread-disease/>. 19/4/2022.

5 Weber, Walter. “Pigeon associated people diseases.” in *Bird Control Seminars Proceedings* 1979, pp. 156- 158.

Feral pigeons

Feral pigeons (*Columba livia domestica*), often known as city doves, city pigeons, wild pigeons, or street pigeons, live freely in cities, public buildings, cliffs, and mountains .⁶ The species descended from domesticated pigeons that later returned to the wild.

This species can adapt quickly to specific areas and reproduce with incredible speed⁷ . Feral pigeons have a high excretion capacity, which has a negative impact on the ancient structures, heritage buildings, and cultural properties that they commonly inhabit, as well as causing various illnesses and destroying agricultural crops .⁸



Feral pigeons are comparable to the original wild rock dove in size and form, but they have a greater degree of color variation. They are more common in urban areas, and urban pigeons have darker plumage than those found in rural areas .⁹

Impacts of feral pigeons on buildings in heritage sites

Feral pigeons defecate on the rooftops of houses, on highways, on bridges, and on large buildings, whether modern or ancient, in many places and towns where they are found. This results in damages not only to the aesthetic quality of the structures, but also architectural components and fabric¹⁰. The feral pigeon was determined to be the most common bird-related hazard around buildings in 99 % of problem cases .¹¹

The fall of bird droppings on the surfaces leads to the accumulation of sediments, disintegration, and dissolution of the tenacity of the stone, which means that the waste has a major role in the deterioration or degradation of the stone. Birds have the greatest impact, not only because they build nests on roofs and buildings, but also because they transmit many diseases, as mentioned earlier, especially when their wastes fall and dry up, turning into a powder that quickly diffuses into the air, posing a serious health and environmental risk to those working on sites and to visitors. Their nests also provide a suitable place for the formation and growth of insects, microbes, germs, and pathogens. Recent experiments have shown that bird waste contains about 4% salts; causing damage to stone due to the interaction of chemical and organic substances in the waste with the fabric of the stone.

6 Nagy, Kelsi, and Phillip David Johnson II, eds. *Trash animals: How we live with nature’s filthy, feral, invasive, and unwanted species*. U of Minnesota Press, 2013. Blechman, Andrew D. *Pigeons: the fascinating saga of the world’s most revered and reviled bird*. Open Road+ Grove/Atlantic, 2007.

7 Kent, Cody M., and Edward H. Burt Jr. “Feather-degrading bacilli in the plumage of wild birds: prevalence and relation to feather wear “ in *The Auk: Ornithological Advances* 133, no. 4 (2016): 583-592, “Why study pigeons? To understand why there are so many colors of the feral pigeons. Cornell Lab of Ornithology. Archived from the original, pp. 1-6.

8 Blechman, Andrew D. *Pigeons: the fascinating saga of the world’s most revered and reviled bird*. Open Road+ Grove/Atlantic, 2007.

9 Haag-Wackernagel, Daniel, Philipp Heeb, and Andreas Leiss, “Phenotype-dependent selection of juvenile urban feral pigeons *Columba livia*,” in *Bird study* 53, no. 2 (2006): 53, 169.

10 Spennemann, Dirk HR, and Maggie J. Watson, “Experimental studies on the impact of bird excreta on architectural metals,” in *APT Bulletin: The Journal of Preservation Technology* 49, no. 1 (2018): 19-28.

11 Abouzeid, Adam, et al, “Bird Damage to historic Buildings.2.

As a result, we must focus on the harmful impact of bird excrement on stone, and on discovering strategies to oppose, dissuade, or prevent birds from living in these structures.¹²

Buildings constructed of limestone are more susceptible or vulnerable to the effects of acids from bird droppings. Their acidic character is mostly due to fecal organisms; stone degradation is caused by fungi that live on pigeon droppings, not by the faeces itself.¹³

Fungi infiltrate the stone, transmitting naturally generated acids capable of dissolving the stone and forming soluble salts, particularly in limestone. This procedure increases the porosity of the stone structure, making it easier for water to permeate and penetrate.¹⁴

The physical anatomy of the pigeon clearly shows that it has just one exit for excreta (urine and faeces), which contain acids and organic compounds and are saturated with germs that destroy both stones and painted colors. Pigeon faeces is composed of 15% moisture, 2.1% phosphoric acid, 55% organic matter, 7.9% nitrogen, 20% potassium Insoluble. All these different elements produced by one pigeon in the course of a day. The effect is vastly increased with thousands of pigeons flying about all day.¹⁵

Temple of King Ramesses III at Medinet Habu – West bank of Luxor

Medinet Habu is considered one of the largest and most significant temples in Egypt during the New Kingdom period. It was a memorial and mortuary temple of King Ramses III located on the West bank of Luxor.

The temple's name, Medinet Habu refers to the old administrative city that was built inside it.¹⁶



Photo by the researcher

12 Razani, Mehdi, and Sahar Ahmad Khan Beigi, "Preventive Conservation on Control of Destructive Role of Bird's Droppings on stone architecture," in *Athar Journal* 39, no. 83 (2018): 29-41.

13 Bassi, M., and D. Chiatante, "The role of pigeon excrement in stone bio deterioration," in *International Biodeterioration Bulletin* 12, no. 3 (1976): 3-12.

14 Abouzeid, Adam, et al, "Bird Damage to historic Buildings 2.

15 Spennemann, Dirk HR, and Maggie J. Watson, "Experimental studies on the impact of bird excreta on Architectural metals", 27-37, <http://www.mazra3a.net/vb/showthread.php?t=10780.14/3/2022>. <https://www.mdpi.com/2073-4441/11/12/2567/htm>. 17/4/2022.

16 Murnane, William J., and Kent R. Weeks. "United with Eternity. A Concise Guide to the Monuments of Medinet Habu" (1980), 9.



Photos by the researcher

Some scholars believe that the word of Hapu refers to the vizier "Amenhotep son of Habu", while others believed that word refers to a Christian priest who was living in this area.¹⁷

The temple is distinguished by the beauty of its scenes and the splendid colors¹⁸, attracting visitors from all over the world.¹⁹

Places where pigeons are abundant in the temple of Medinet Habu

Many foreigners and Egyptians interested in preserving Egypt's heritage have been working and attempting to find a solution to the risk caused by wild feral pigeon encroachment and damage to heritage buildings. Pigeons are present in large numbers in the early morning, before flying to search for food and water in the cultivated areas near to the Medinet Habu, and in the irrigation canals surrounding the area. They also appear in the afternoon, before sunset, when they return in large numbers to their nesting places in the temple.²⁰

17 Hölscher, Uvo. "The Excavation of Medinet Habu vol. I General Plans and Views Hoelscher." (1934), pp.52-54.

18 Johnson, W. Raymond, "The Epigraphic Survey, Oriental Institute, University of Chicago (Chicago House)," in *Boletín de la Asociación Española de Egiptología* 14 (2004): 127-136.

19 The Epigraphic Survey, Medinet Habu vol, IV, Festival Scenes of Ramses III, Oriental Institute 51. (Chicago, 1940).

20 Moussa, Mahmoud, "A preliminary study of mitigation the waste of pigeons and birds in the temples and Archaeological sites: applied to the Temple of Habu," unpublished report, Inspectorate Office of the west bank of Luxor (2017), 1.



Photos by the researcher

The locations of feral pigeons in the temple were meticulously monitored as follows:

- Above the temple - facade- upon the main gate.



- On the other side of the main entrance of the Syrian fortified gate.



- Behind right side of the main entrance, there are many feral pigeons.
- Above the entrance of the Ptolemaic pylon gate.





- Below the cornice of the hypostyle hall, as well as inside the halls of the temple and at the top of the Pharaonic reed decoration.



- Because the temple of Medinet Habu is distinguished by the depth of its hieroglyphic carvings, it is an ideal location for wild pigeons to create their nests.



Pigeons nest through the temple, defacing the carvings and painted the colours



In holes, carved inscription, gaps, or crevasses, wherever they alight, their waste destroys and defaces the fabric and decoration of the ancient structures

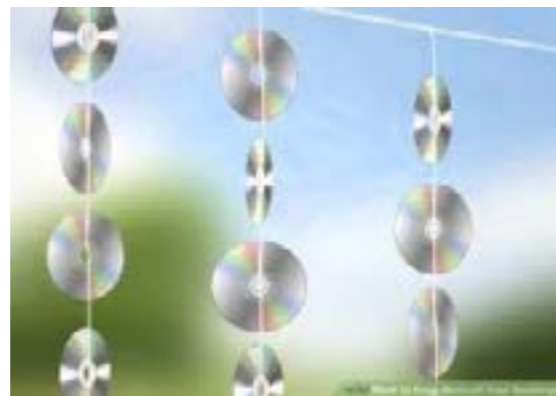
Experimental methods of minimizing, controlling, or expelling feral pigeons

- Some people advised that in areas where there are many pigeons, one could install a palm-fabric cage baited with grains and seeds and provide an opening for the pigeons to enter, but without enough room for them to fly out. Unfortunately this manual approach produced no results.



- A pigeon tower was erected outside the temple complex on the southeast side to attract pigeons, but this concept failed, since the feral pigeon does not prefer to remain in enclosed spaces, but to wander, and roam freely.

- In 2011, Chief inspector of Antiquities of Medinet Habu came up with a novel technique to evict the pigeons by hanging a number of computer CDs to reflect the sun's rays on the birds' eyes, irritating their eyesight and forcing the pigeons to flee the area for a period. Unfortunately, this idea only worked for a limited time, because these CDs only functioned when the sun's rays were reflected, and they did not work well in the afternoon, around sunset, or at night .²¹



²¹ Abd Elaty, Rania. "Al-Ahram newspaper "Egyptian Journal, no.2 (9 December 2011): 38.

- The Egyptian-French mission working at the Ramesseum Temple has also used a modern technological device that makes the sound of a falcon attacking or preying on pigeons to terrify or scare them and cause them to flee. Nevertheless the pigeons became accustomed to the sound and, after a time, were no longer terrified of it. Furthermore, the device eventually broke down and became worthless, and the pigeons even landed on it or next to it.²²

Potential new methods to mitigate, minimize, control or expel feral pigeons.

- An inconspicuously closed thermal circuit with adjacent electrical facility and a ground terminal to lower the degree of electricity could be installed, to administer a light thermal shock to the birds when they land on the buildings without being fatal. This circuit should be installed by specialists and professionals with a suitable modern technical method to avoid being visible on the building. This system should be erected in areas where pigeons thrive, such as on rooftops, on the top of cornices, and above the Pharonic reed "Khyrazan," as seen in the illustration.



- Installing a very small metal tapered barbed wire made of galvanized steel that is resistant to rust and humidity and appropriately cloured. This device could be installed in the same places frequented by feral pigeons.



Such a proposal was submitted to the Egyptian Ministry of Antiquities in 2017 under registration number (1330) from the Qurna inspectorate office, and again in 2019.²³ The Permanent Committee of Egyptian Antiquities agreed in its session held on September 28, 2021, for the German University of Tübingen to implement the same technique in Esna Temple, and the device was affixed above one column as an experiment. This has shown positive results so far.

²² Leblanc, Christian. "Unpublished mission report – French archaeological mission: Ramesseum temple", 2009.

²³ Moussa, Mahmoud, " A preliminary study of mitigation the waste of pigeons and birds in the temples and Archaeological sites", 10.



On the capital of the column

- Some specialist manufacturers may install small circular metal pieces that can be fastened to the spots where these birds perch, resembling flame or fire, preventing the pigeons from approaching the surfaces where the pieces are fixed, as seen in this video: <https://www.youtube.com/watch?v=P09XZge3pBI>

- It would be possible to enlist falcon trainer who hunts pigeons for a length of time, so that he may lead the falcon to the pigeons' nests in the temple to frighten them, and we could certainly expel the pigeons completely by repeating this method multiple times.²⁴

This concept was proposed to the Egyptian Ministry of Antiquities in 2017 and again in 2019. One year and two months later, a German falcon trainer named "Johann Heinrich Hamacher" presented the same idea to the Egyptian Ministry of Antiquities but proposed a very expensive offer.



²⁴ Ibid, 10.

- A new technical innovation

All of the preceding approaches relied either on waiting for pigeons to arrive at the site or on standing on the roof before pursuit could begin. However, it is worth noting that the birds will flee from anything that moves towards them or in their direction. Therefore, the new approach described below radically is quite different, since the innovation or machine will chase the pigeons.

Description of the Invention: A Robotic Artificial Falcon that can be controlled remotely.



Advantages and significances of the invention:

- 1- A new invention that ensures a high degree of reliability, that when birds or pigeons detect the flying falcon device they will fly.
- 2- It is a high-tech electrical device that can be used to force pigeons to vacate ancient heritage sites.
- 3- It causes no damage, and leaves no residue or harmful side effects.
- 4- It may be easily relocated and utilized in several locations.
- 5- It may be used to expel the birds from a safe distance, rather than using any other method that has to be attached to the monuments.
- 6- It will not touch the buildings, as it will be equipped with sensors to prevent it from approaching the architectural surfaces.
- 7- A device that releases rays from the falcon's mouth, like flame or fire, to terrify the birds, can be provided with the machine.
- 8- Additionally a camera can be installed in the falcon machine's body to monitor the site or provide panoramic filming.
- 9- It is a moveable device that attacks the pigeons, rather than being stationary, waiting to attract birds, which is a better technique of suppressing and expelling the birds, therefore it is an expulsion method rather than an attraction method.
- 10- It could be utilized at any time and transported in any direction, including through corridors and tiny rooms, depending on its size.
- 11- It may be employed in any archaeological site, large or small, open or closed.
- 12- It may be utilized anywhere in the world.
- 13- It could be used in other fields, such as for agriculture, to preserve crops and legumes, and it could also be used in grain silos and other areas.
- 14- It is possible to generate a sizeable profit by creating and selling the device resulting in financial benefit.

Two phases might be used to conduct the experiment. To test how well they can drive away feral pigeons, the first stage involves the use of sound and laser beams. We carried out this initial step in Medinet Habu Temple as per the instructions of the Secretary-General of the Supreme Council of Antiquities as a first partial experiment to actualize the notion of producing a flying mechanical falcon.

The experiment utilized the sound of a hawk pouncing on its prey while shining a safe laser beam source in the presence of representatives of the Qurna Inspectorate Office and security guards. The experiment proved a resounding success, as the pigeons flew out of the building at breakneck speed.

The experiment was repeated again the next day to ensure its effectiveness, and we still have two options for manufacturing the falcon's shape and the flying action. This conclusively confirms the success of this plan for expelling pigeons from all archaeological sites.



Photos by the researcher during the application and the conduct of the experiment

This Falcon machine could be designed by professional engineers or specialists working through qualified companies, and it could be modified according to their specialized expertise. On the other hand, by means of this article I would like to assert and protect my patent and intellectual property rights, along with copyright, as well the usage rights for the device registered at the real documentary office, with the number (3612) May, 21st, 2022.

Conclusion

The problem of feral pigeon breeding and its increasing severity maybe considered as one of the most important challenges affecting the preservation of historic sites, as well as the degradation and destruction of cultural structures that follow therefrom. We chose Medinet Habu temple on the west bank of Luxor in southern Egypt as a model since it is one of the most prominent historic sites facing this challenge. We have discussed some previous attempts and methodologies for pigeon mitigation. We have provided some fresh ideas that may be applied and used in the future, using current technologies in the protection, preservation, and conservation of cultural property. The most important solution that we presented here is the new falcon shape technical machine, which may be considered as a new innovate technique/ method that can be used all over the world. This has led to remarkable achievements in eliminating pigeons from the temple and in safeguarding the heritage property structures for future generations, by applying and partially implementing the experimental solution at the temple of Medinet Habu.

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