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A hypothetical husbandry point system for breeding flamingos in captivity

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Abstract

The concept of a point system as a tool to enable managers of captive flamingos to evaluate their enclosures and colonies regarding important elements in flamingo breeding is explained here. It is clear that no single factor is absolutely essential to breeding; rather it seems the affect of individual factors is cumulative, and once a certain level of requirements is met breeding will occur, while values above that level increase breeding success.

General colony management

Appropriate flamingo husbandry should always be paired with knowledge of individual birds and good record keeping. Any zoo or private person wanting to work seriously with flamingos should be able to identify individual flamingos at a distance, as this essential to understanding what is happening within the colony and being able to troubleshoot or otherwise alter the situation to improve success. Many managers assume that a group of flamingos will have a sex ratio of roughly 50:50. This is often not the case, particularly regarding Lesser Flamingos (*Phoeniconaias minor*), where the European population currently consists of 198 males, 76 females and 170 birds of unknown gender, and the North American population consists of 260 males, 132 females and 51 birds of unknown gender (ISIS 2008).

Zoos are often reluctant to invest time in observing a breeding colony, however 15 to 30 minutes of daily observation by a practiced observer is all that is needed to monitor most colonies. This will not be sufficient time to identify each bird on the nests each day, but if done every day gives a fairly accurate impression of which birds are paired to each other, which nests they are using, when eggs are laid and fate of the nest/eggs. The pattern of egg-laying within a colony is a measure of colony synchrony, which is usually important in breeding success. Knowing when eggs were laid is helpful if interventions are made (e.g. if eggs are abandoned or if egg management will be practiced) (Perry 2005). Productive pairs and problem birds can be identified, which is helpful in making a selection if flamingos are removed from the group. Regular observation also helps in identifying enclosure and nest area obstructions to breeding, potential predators and other risks.

There are a number of factors that are important for breeding flamingos, but there is no essential factor. The important factors can be viewed in terms of a hypothetical point system, with points awarded based on how well the enclosure satisfies the criterion for each factor. The affect of the factors is cumulative, and breeding occurs once a certain required level is reached. For example, it may be necessary to have 35 of 50 points to breed flamingos, and points accumulated above the minimum increases breeding success rate. Factors could be assigned a maximum point value indicating their importance (Table 1). While precise values (maximums and the score given

to a particular situation) may be debatable, this should not detract from the evaluation process. This system is meant to provide a tool for examining the different factors separately, so that managers can arrive at a clearer idea of how and where they can invest in improvements, with the goal of optimizing the cumulative score.

The factors and their maximum values

Colony size

Colony size might have a value of 8 points, as it is indisputably the most important factor for optimizing breeding, based on a number of studies (e.g. King and van Weeren 2005). The EAZA Ciconiiformes and Phoenicopteriformes TAG recommends a single species group of more than 40 flamingos for breeding. If this is not possible, there are some tactics to try to achieve the same effect. Reducing the amount of accessible area increases density, although a compromise needs to be made between reducing area to increase density, and having sufficient area to display. Additionally, flamingos should have ample room to move around as reduced movement reduces blood circulation, which can increase chance of foot lesions. Some zoos have reported success using mirrors to increase perceived colony size. However, as zoos tend to make multiple changes at the same time it is difficult to establish whether it is the mirrors, or any single factor, that made a difference. Again it may be the summation of all the factors that made the difference.

Security

Flamingos need to feel secure to breed. The most secure place may be a few meters from people, as long as the flamingos know that the people cannot reach them. More serious threats are larger animals held in their enclosure and predators, most commonly foxes in Europe. Flamingo enclosures should be covered or hot-wired if there is a chance of ground predators; bringing flamingos indoors every night for their protection negatively affects breeding. Flamingos may still feel unsafe if they can see potential predators, even if they cannot access the enclosure. Providing islands surrounded by water that the flamingos perceive as safe, and blocking their view past the enclosure barriers may help. Flamingos that do not feel safe tend to bunch together rather than spreading out when they are loafing. Security deserves a point value of at least 6.

Colony sex ratio

Colony sex ratio does not seem important in whether a colony breeds or not, but it certainly affects the degree of breeding success. More atypical partnerships (not male-female pairs) occur with uneven sex ratios (King 2006), which may result in reduced fertility and/or more unrest in the colony, leading to lower reproductive success. Sex ratio may be assigned a value of 4 points.

Table 1. Important factors identified for breeding flamingos in captivity and their awarded maximum point values

Factor	Points
Colony size (single species)	8
Security	6
Colony sex ratio	4
Male wing condition	4
Water areas characteristics	4
Hours of sun	4
Weather	4
Nest area characteristics	4
Display area characteristics	4
Strategically-placed barriers	4
Photoperiod	2
Substrate	2
Total	50

Male wing condition

Like sex ratio, the wing condition of the males (full-flighted, pinioned, wing-clipped etc.) probably does not have much affect on whether a breeding attempt occurs or not, although there are not enough full-flighted groups to analyze this. Wing-condition clearly has a strong influence on fertility. Copulation behaviour of males seems to be most influenced by pinioning. The response to flight restraint on males is individual. Fertility is not a 100% reliable measure of effect, as eggs can be fertilized by extra-pair copulations. Based on observations in several zoos, three-fourths to one-half of traditionally pinioned males in a colony are not able to copulate. Full-flighted males have a value of 4, long-pinioned males, wing-clipped or tenectomized males have a value of 3, traditionally pinioned males have a value of 2, and males with wing removals above the Carpometacarpus bone have a value of 1.

Water area characteristics

Easily accessible water area with gradual, smooth banks and primarily shallow bottoms (e.g. < 30 cm deep) are features in flamingo exhibits that are lacking surprisingly often. Flamingos are clearly water birds, and deserve to be in their element. Foraging behaviour is essential to flamingos, and if there is no water around flamingos will continue to make trampling movements with the feet (movements that function to stir up food in water) and bill-foraging movements in dry substrates. Flamingos usually roost in water, as this presumably confers a feeling of safety. Much displaying is also performed in water. Water, especially if the basin bottom is smooth or covered with a layer of organic material, is good for the soles of the feet, as flamingos often have foot lesion problems in captivity. Appropriate water would certainly be worth 4 points. Ideally, appropriate water areas should constitute at least half of the enclosure.

Hours of sun

Preference for sun (versus shade) clearly affects use of enclosures in northern Europe and at least in that part of the world might have a value of 4 points. Studies of colonies in warm climates should indicate if this is an important exhibit feature universally. A study of four flamingo enclosures in western Europe (Greene 2005) showed that the flamingos in the one with much sun and easily accessible water areas had the best breeding, used the largest proportion of their enclosure (including spending half the time in the water) and were more active than the flamingos in the other enclosures. Another group that did not have access to much water but did have good access to mud in which flamingos also forage, was the second most active group.

Weather

Other aspects of weather are also important. It has been frequently noticed that a prolonged period of rain, cold and clouds early in the breeding cycle depresses reproductive activities, at least temporarily. This appears to affect the synchrony of the colony (Studer-Thiersch 2000) and can effect breeding success. Warmth may be particularly important for Lesser Flamingos. The influence of weather on reproductive activities decreases once nesting has advanced to the incubation stage. Weather might have a point value of 4.

Nest area characteristics

Having a good nesting area (damp, pliable) available at the right time (when the birds are increasing display rates), can definitely be stimulating. In some cases presence of artificial nest mounds or even placing an egg on one or more artificial or flamingo-built nests can even be more stimulating. A suitable nesting area may deserve a value of 4 points.

Display area characteristics

Flamingos prefer long stretches of mostly unobstructed area for performing the "marching" display. This can be land, water or both. Too many obstructions can cause them to break off the displays prematurely, which can lead to reduced stimulation and synchronization, thereby reducing breeding success. Too hilly a terrain also impedes displays. Proper terrain is awarded a point value of 4.

Strategically-placed barriers

On the other hand, presence of an occasional soft visual barrier (e.g. a shrub, or large clump of grass or small stand of bamboo) and spreading of important resources (bathing, feeding, nesting and loafing areas) requires that flamingos occasionally need to seek each other out, which can increase synchrony (Studer-Thiersch 2000). Spreading of resources and strategically-placed barriers might also count as 4 points.

Photoperiod

While photoperiod is not usually seen as an issue in breeding flamingos, it can be a factor. Prolonged photoperiod (e.g. 24 hours a day) has stimulated reproduction in Caribbean (*Phoenicopterus ruber*) and Greater Flamingos (*P. roseus*) housed indoors (J. Lammers, B. Hiddinga, pers. comms.) and may influence moult. Photoperiod may also be particularly important in breeding Lesser Flamingos in captivity. Photoperiod may deserve a point value of 2.

Substrate characteristics

A soft substrate enhances condition of the feet and should always be available. As mentioned above, water is recommended as a substrate. Short vegetation is also good, and matting or another type of flooring that has resilience should be used indoors. Substrate might count as 2 points for breeding, but from a well-being standpoint it would count as more.

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