Nest Selection in Weaver Birds

Introduction

All bird species reproduce through the use of a cleidoic egg, a structure which utilizes a hard shell to protect the developing embryo inside. This egg must be placed in an appropriate environment in order to grow correctly and hatch into a healthy chick (Hansell, 2000). The vulnerability and special requirements of the egg led to the construction of special locations to place the eggs which eventually led to the current nests that are created by today's birds. These nests can range from simple mounds of dirt where decaying refuse is placed inside in order to maintain a suitable temperature for the developing eggs, to the simple cup shaped nests commonly put together by many species of birds, and to the elaborate woven nests that weavers create. The type of nest required depends on several factors such as the level of dependency of the offspring, level of safety from common predators, protection from the elements, and mate selection. This leads to the main question of the paper of what in fact makes a nest suitable for a certain species of bird, specifically Village and Baya Weavers.

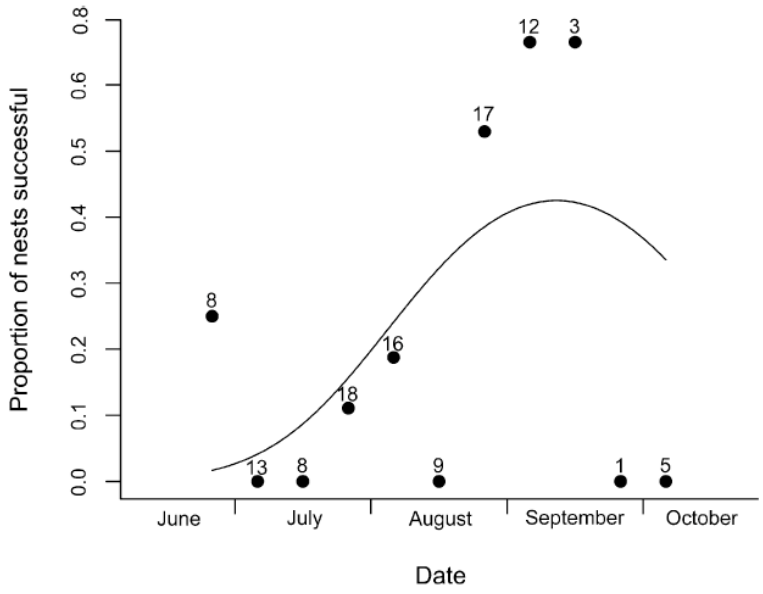
Chick Development and Nest Location

The level of development for a newly hatched chick is one of the main determining factors in deciding what kind of nest a bird needs to create. This level of development can be ranked to eight classes according to Mike Hansell (Table 1). Stages of development range from "extreme independence to total dependence" with varying degrees in between. The majority of birds in the wild, almost 70% of all species produce offspring which are stage 8, or altricial type 2 (Hansell, 2000). These naked and

defenseless chicks need a protective home in a location where it is out of reach from predators and shielded from the elements.

1. Superprecocial	No Parental care, prolonged incubation time and are able to fly soon after hatching
2. Precocial 1	Follow parents and feed alone, downy feathered
3. Precocial 2	Like precocial 1 but food is show by parents
4. Precocial 3	Like precocial 2 but young are fed by parents
5. Semiprecocial	Downy-feathered hatchlings, fed by the parents and do not leave the nest; high postnatal growth rate
6. Semialtricial	Downy-feathered hatchlings, fed by the parents and do not leave the nest; high post-natal growth rate
7. Altricial 1	Display no motor activity, downy feathered, eyes closed at hatching; high growth rate
8. Altricial 2	Hatch without external feathers, eyes and ears closed at hatching, grow very rapidly(exception large sea-birds)

Table 1: Eight Classes of chick development. (Table taken from Hansell, 2000)



Another important consideration for the success of a nest is the potential location that is selected for the nest. Several factors are included into this such as a specific location on a tree, the type of tree used, thickness of the branches and other variables all playing a critical role in determining the odds of success. Obviously a nest affixed to a thick branch is more secure and can withstand the wind better thereby lowering the chance it may get blown down, yet at the same time the larger branch increases the possibility a predator such as a snake can then enter the nest and eat the eggs. A field study done by Suhel Quader (2006) analyzed these various attributes over several years with nesting Baya Weavers (Ploceus philippinus). His first study found that there was a strong correlation between fledgling success rate and date of clutch completion which suggests that there is an optimal time for building a nest and starting a brood (Figure 1). Overall through the experiment Quader found that fledgling success rate was highest on nests that were attached to thorny branches, high off the ground, and on thick branches. Since nest success went up with increasing branch size this

Figure 1: Proportion of Successful Nests Relative to Date of Clutch Completion

suggests that the stability of the nest is more important than the increase in predation that such a nest would experience from being on a thicker branch and therefore more accessible. Another important thing to note is that fledgling success increased with the

use of finer fibers where the nest is possibly more insulated from the elements and has a stability advantage over nests constructed of course fibers.

Is Color a Determining Factor in Nest Selection and Construction?

The color of the nest should be an important and easily assessable factor in determining the quality of a nest by a male for construction and a female for choosing an appropriate nest. The ideal color should optimally be green, which is the color of fresh foliage and the color brown should be selected against since it indicates that the vegetation is dead. If this is the case then we should optimally see a selection by males for green nest building materials and a strong preference for green nests over brown ones by the females in nest selection.

Nicholas and Elsie Collias performed a study on a group of Village Weaver birds, (Ploceus cucullatus), where they separated a population of young birds and created two different groups which were then deprived of normal nesting materials for certain amounts of time. A control group of normally reared weaver birds was used in order to compare the results with the weavers that were completely deprived of anything closely resembling nesting materials. They then tested the birds by using uniformly sized materials of varying colors, from green to white and then counted the number of times each color was selected. This experiment was performed on six consecutive days while the birds were seven months old for the deprived birds. The results show that even on the first day of seeing these objects green was picked more often than the other colors and especially on the final days of the studies where green was the popular choice 79 percent of the time (Table 2). The control birds also showed an immediate preference for green under similar testing procedures.

Number of times each color was selected							
	Green	Yellow	Blue	Red	Black	White	Percentage Green
First two days	51	42	0	11	2	28	38
Second two days	163	16	6	13	1	29	71
Third two days	147	4	6	4	7	18	79

Table 2: Selection of nest materials of different colors by four male weavers (Table taken from Collias & Collias, 1984)

This innate preference for selecting green nest building materials makes sense for males since the green vegetation should be the most flexible and workable which is required in order to weave a complex nest.

The idea of color selection also applies to females when choosing nests and was tested via an experiment by C.H. Jacobs, N.E. Collias, and J.T. Fujimoto (1978). They tested the response that females had to nests of different color by painting nests either brown or green. A fresh nest created in the wild begins green and lasts about two days before it begins to yellow and then eventually turns brown approximately a week later as the vegetation dies. Ideally the females should pick the nest that provides the safest environment for her eggs which should be the freshest and best constructed nest. Since older nests have spent more time in the sun and weather their strength should be somewhat compromised compared to a fresh nest (Jacobs *et al.*, 1978), influencing the female to pick the newest and greenest nest that she can find. If this is the case then the results should show that females pick the green nests preferentially over the brown nests, regardless if it is a nest painted green versus a normal nest. The data in Table 3 suggests that the paint used had little effect on the females choosing nests and there was almost no difference in choosing between a normal nest and a green painted nest, whereas there was a slight preference for a green color over brown. The results from this experiment show

that the females seem to visit nests based on the amount of displays that the male does at any given nest instead of picking a nest based on color. The males in turn display at all newly built nests equally independent of what color it was painted which leads to the fact that the once the female accepts the nest temporarily she uses some other method to determine if it is adequate, such as quality of the weave and the display of male (Jacobs *et al.*, 1978).

Colour	No. of nests	Times available*	Times chosen	% of available nests chosen	*P* (*z*-test)**
Painted green	58	92	26	28·3	0·08
Painted brown	53	85	16	18·8	
Painted green	30	53	14	26·4	0·49
Normal	31	73	19	26·0	
Painted brown	23	40	8	20·0	0·23
Normal	24	58	16	27·5	

*On days of acceptance of any nest in the aviary.
**P = probability of no difference in preference between the two types of nest indicated (z-test, Dixon & Massey 1969).

Table 3: Female nest acceptances both temporary and permanent

Conclusion

The manor in which birds select their nests can be identified as somewhat of a common sense approach as in placing it in an area that is safest from harm, whether it be nature of predators, yet it can also these simple answers can be more complex than they first appear. The study with nest location by Quader showed us that there are pros and cons to virtually all locations such as if you nest on a thorny tree you will reduce the amount of predation from snakes, yet the predation from mice ends up equaling that of snakes since they also have a safe place to live. The study also showed the importance of things that aren't so obvious such as an optimal time exists for building a nest and starting a brood to achieve maximum survival of fledglings. This then leads to the

question of how birds decide to place their nests in certain locations and if this is a learned behavior or just an innate ability such as the use of color selection among Village Weavers. Male weavers are born with a predisposition towards the color green because they know that is the optimal color of material to build their nests. Overall I find it fascinating that these amazing birds are able to build such complex nests with essentially trial and error and are able to use risk management to find the ideal places for their nests and I believe this will provide researchers questions to study for years to come.

References

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