

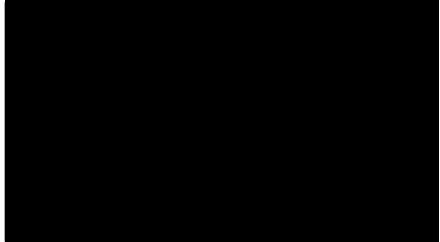
NESTING BEHAVIOUR AND NEST SITE  
SELECTION OF THE DOMESTIC HEN

by

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I certify that the substance of this thesis has not already been submitted for any degree and is not being currently submitted for any other degree.

I certify that any help received in preparing this thesis, and all sources used, have been acknowledged in this thesis.



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## GLOSSARY

## Abbreviations Used in This Thesis

%	percentage
B x W	Black Australorp x White Leghorn crossbred
B x R	Black Australorp x New Hampshire crossbred
°C	degrees Centigrade
cm	centimetre
D.F. or df	degrees of freedom
F	variance ratio
Ln	nth laying day
M.G.	material gathering
M.G. 'to back'	material gathering to the back while on the nest before oviposition
M.G. 'in shed'	material gathering to the back while off the nest (moving about the shed) before oviposition
M.G. 'after lay'	material gathering to the back after oviposition
M.S.	mean square
m	metre
min	minute
mls	millilitres
N.S.	not significant ( $P > 0.10$ )
$P <$	probability less than
-	$0.10 < P < .05$
*	$0.01 < P < 0.05$
**	$0.001 < P < 0.01$
***	$P < .001$
R x W	New Hampshire x White Leghorn crossbred
S.S.	sum of squares
sq.cm or $\text{cm}^2$	square centimetres
sq.m or $\text{m}^2$	square metres
UNE	University of New England

## SUMMARY

In the production of eggs from domestic hens housed in floor pens, the laying of eggs on the shed floor rather than in provided nests can constitute a considerable problem. Floor eggs tend to be dirty, have a reduced hatchability and are time consuming and costly to collect and clean. A number of other problems and vices are believed to be associated with the floor-laying habit. An understanding of the nesting behaviour and nest preferences of hens needs to be acquired if this problem is to be eliminated or minimised by manipulation of the hens' environment, the nesting facilities provided or the management of the hens.

The extent of our current knowledge of the nesting behaviour of domestic hens and their wild relatives and of the preferences for nest sites exhibited by these birds was reviewed.

In this study, experiments were conducted to establish the behavioural repertoire of nesting hens and how behaviour patterns might be affected by maturity of the hens, their social status and breed, the nesting environment and the housing environment in which the birds lived. The response of hens to a number of factors relevant to the nest, and their selection for such factors, was also investigated. The effectiveness of several of these factors in the establishment of nest usage habits in flocks of hens was then studied.

The nesting behaviour of broiler hens in deep litter floor pens was found to consist of a number of component activities. Pacing, or locomotion, and nest calling were usually found to initiate the nesting sequence and were components of the 'nest-seeking' phase, along with nest examination. Whilst on the nest, hens performed a number of nest building and material gathering movements, components of the 'nest attentive' phase, which resulted in the formation of a nesting depression in the site. For a variable length of time prior to oviposition, hens sat firmly on the nest and often continued sitting following oviposition.

The time from initiation of certain events in the pre-laying sequence to oviposition tended to increase as the time of eventual oviposition grew later in the day.

Quantitative differences were found between hens in the extent to which certain nesting behaviours were exhibited and this was found to be correlated with social status. Hens higher in the flock hierarchy tended to exhibit nest-seeking behaviours to a lesser extent and attended to the nest to a greater

extent than did lower ranking hens. Most hens were extremely conservative in their selection of a nest or floor site.

As hens matured, behaviour relevant to nest attentiveness increased, and behaviours relevant to the search for a nest decreased, in importance in the nesting sequence. If hens were prevented from using previously established nests they responded with an increase in the nest-seeking component and a decrease in the nest attentiveness component of the behaviour pattern. Breed differences were also found to exist in terms of the extent to which hens would exhibit certain behaviours. Old English Game bantams usually preferred nest-seeking behaviours to a lesser extent and attended to the nest to a greater extent than did White Leghorn hens, broiler hens being intermediate between the two.

The extent to which hens performed certain nesting behaviours was also quantitatively affected by hens' environment. Hens in laying cages paced, called and performed escape movements more often, and more intensely, and spent less time sitting during the nesting sequence than they did in deep litter floor pens. Strain differences were found in this respect.

Although some breed, experience or age and environmental effects on the nesting sequence were found, all studies indicated considerable individual variability between hens within the flock in terms of the extent to which they would perform certain activities and the intensity at which these were performed.

Patterns of water usage were found to be markedly affected by the timing of oviposition. Water usage declined several hours prior to oviposition, increasing shortly prior to or immediately after oviposition. However, the actual pattern of water usage varied considerably between different hens.

A test-pen technique was developed whereby nest selection by hens could be studied under more controlled conditions than previously possible and so preferences for certain factors related to the nest determined with a greater accuracy.

Studies conducted into the selection of different nest types by hens indicated that hens responded to a number of criteria in their selection of a nest site. Hens demonstrated a preference for nests containing some form of nesting material over nests without a nesting material. The quality of the nesting material which was suggested to be of importance in this respect is its ability to be 'manipulated'.

Another factor which affected the selection of nests by hens was the stimulus provided by a nest-egg(s). Some evidence was produced to suggest that complete responsiveness to eggs in the nest may only develop with maturity and, perhaps, experience with the process of laying.

Although initially influenced by prior experience, hens tended to select unlit nest sites in preference to illuminated nest sites. It was suggested that this response may be to light intensity differentials and might be used to orient the hen to more confined or concealed nest sites.

Hens responded to a number of criteria believed to be associated with the degree of confinement of the nest site and its concealment value in their selection of a nest. The size, or sense of confinement of the nest was of some importance. Hens selected nest recesses on the basis of the angle, or size, of the recess, sites being most confined, but still large enough to allow the hen to sit and perform complete rotations and foot scraping nest building activities, being most often selected. The appropriate nest angle differed for two different breeds and it was suggested that this may have been an effect of bird size. Hens also demonstrated a tendency to nest next to a confining barrier. Overhead confinement was frequently selected in preference to vertical confinement only when overhead confinement was provided at a height above the floor which, apparently, was close enough to the bird to release nest examination or entry and sitting and which was not so close as to interfere with nest building activities.

Hens demonstrated preferences for laying in nests of particular depths (height of the front entrance 'lip'). This effect varied for different breeds and it was suggested that hens select nest depths which provide adequate concealment to them while sitting on the nest. Hens sitting in nests of different depth tended to orient themselves in the nest in different ways and it was suggested that this may provide a technique for establishing whether nests provided to hens afford adequate concealment or isolation to the nesting hen.

Certain types of physical/visual barrier types were found to be preferred to others as cover for nesting sites. Hens, in the selection of a nest site, seem not to seek visual isolation from their fellow flock-mates. Concealment from the general flock area could, however, be important.

At the beginning of lay, young hens tended to select elevated nests, after using ground level nests for the first few days in a barren pen environment. This response was suggested to result from the birds' inability to find

a nest site which is adequate in terms of the degree of confinement or isolation it provides at groundlevel. Hens tested in pens with frontal barriers provided to the nests laid many less of their eggs in elevated nests than did their counterparts tested in barren pens with unconfined nests. Hens may therefore select for elevation as a means of achieving isolation.

The rearing and previous laying experience of hens influenced their subsequent selection of nest elevation. Pullets, reared on the floor, subsequently developed elevated nest usage habits in an individual test-pen situation more readily than did their counterparts reared in laying cages. Hens which had previously laid in provided nests in deep litter floor pens laid more eggs outside the provided nest options on testing than did hens which had previous experience of laying in laying cages.

Prior experience with the testing environment before the onset of lay reduced the number of eggs laid by naive birds in floor areas outside provided nest options. Allowing hens previous experience with the process of laying in their home cage was even more effective in this respect. A hormonal mechanism controlling the apparent lack of responsiveness of some birds to stimuli from the nest options on the first few occasions that they lay was postulated.

The results of these studies on nest 'preferences' are discussed in terms of their biological significance and practical implications.

Small scale studies of the nest usage habits of flocks of hens in deep litter pens indicated that some factors found to influence nest selection characteristics might be useful in manipulation of floor-laying levels in commercial situations. While the provision of nest-eggs was unsuccessful in reducing floor-laying levels, there was some indication that adding extra dimensions of confinement to the nest might encourage such habits. Floor-laying levels were markedly affected by the type of approach to the nest-set and also by the height of the provided nests above the pen floor. It is suggested that the accessibility of nests to hens could be a major factor determining the levels of floor-laying produced by a flock of hens. Elimination of preferred floor-laying sites was also effective.

The results obtained in this research suggested that hens were capable of responding to a number of factors in their selection of a nest and that some of these could be gainfully applied to the design of nesting facilities and management principles for commercial situations. Further research into this area is warranted.