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Inherent Mothering Ability of Indigenous Hen under Extensive Free-Range Management, A-Close Observational Study

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Abstract
Inherent mothering ability of the indigenous hen under extensive management is geared towards ensuring continuation of its lineage. Most of these attributes (feeding and predators response) are instinctive and transmitted to chicks during their first week of life to enhance their survival.
The study was carried out over a ten-years period base on direct keen observation of the indigenous hen from the point of attainment of puberty and associating with cocks up to the time it's raising her own brood under extensive management and recordings of inherent and instinctive traits exhibited. Maternal behaviours like egg incubation; candling and sorting; egg turning; temperature regulation and hatching are in synchrony with the hatching machine. Chick brooding and rearing periods presents the most challenging time as she has to balance between two key responsibilities (feeding and chick protection), these it was observed she do diligently to ensure the propagation of its lineage though faced with huge challenges from predators and adverse weather conditions that reduce chick population reaching maturity.

This research findings recommends feed supplementation especially during incubation, brooding and chick rearing period and confinement and protection of young chicks from predators and adverse weather conditions until they reach weaning age.

Key words: maternal behaviour, scavenging, predator, mortality.

Introduction

The influence of maternal behavior on the offspring's behavioral and physiological development is well documented. This behavior is determined by the interactions between the females' past and present social and physical environments, as well as endogenous factors. One of these latter factors, such as age, has been widely studied for its influence on the expression of iteroparous species maternal behaviour in a large range of scientific fields including psychology (McBride *et. al.*, 1969); (Nakamori *et. al.,* 2013); neuro-endocrinology (Workman L., and Andrew R.J., 1989) and, behavioral and evolution ecology (Stokes A.W., 1971).

The indigenous chicken in Sierra Leone is considered the poor man's friend especially in resource poor farm families in rural settings with women folks involved in ownership and management of the birds. The production of indigenous chicken unlike other livestock production systems has a lot of attributes such as the little space requirement for rearing, less labour, can survive and reproduce on scavenging feed base resources, can withstand harsh environmental conditions and well as diseases. The indigenous chicken also has a shorter generation interval, faster turn-over rate, and can be easily managed even by small children and is generally acceptable for its meat and eggs without religious and cultural taboos. These desirable characteristics have been buttressed by other authors (Kingori *et al*., 2010). They are regarded as the poor

man's friend especially in resource-poor households that lack inputs and are unable to provide overnight shelter for their chickens (Kingori *et al.*, 2007); (Grobbelaar *et. al*., 2010); (Khawaja *et. al*., 2012).

Despite these outstanding characteristics, indigenous chicken production in Sierra Leone is undertaken on a non-commercial bases with partially little or no form of investment in their rearing.

They are hardly supplemented with ideal poultry ration, lack veterinary interventions, with little or proper management intervention.

This paper critically examines the inherent nature of indigenous mother hen in maintaining its lineage under natural harsh conditions. The indigenous mother hen after successful mating seeks, finds and prepares her own nest in dark corners of kitchens, dilapidated buildings, and holes underneath trees where the eggs will be protected from rain and predators.

Materials and methods

The study was solely based on personal keen behavioral observation of indigenous mother hen and recordings running over 10 years of rearing experience while residing in rural areas and community observation.

Results

Observed inherent parental traits of mother hen

Incubating her eggs

The indigenous mother hen sits on and incubates her own eggs for the entire incubation period without help from its owner. During this time, she eats very little and considerably lose weight, with periodical movement off its eggs only to find feed for approximately 5 minutes maximum and also use this time to ease herself (defecation). After this exercise, she then returns to her eggs. The situation is maintained especially during the first and second weeks of incubation which coincide with embryo and chick development.

Turning the eggs

Mother hen incubates all the eggs she lays and ensures equal temperature distribution by turning her eggs with her beak. This practice ensures that all the eggs are warmed enough to allow embryo and chick development as well as to ensure that the developing chick embryo do not stick to the shell. She does this by rearrangements of eggs at the periphery to the center and opposite is the case.

Sorting/candling of infertile eggs during incubation

The mother hen also has the inherent ability to detect and sort out infertile eggs during the incubation period. She uses her beak to remove infertile eggs from the lot. The mystery that remains in our thinking is how she is able to detect properties of infertile eggs before discarding. This is a form of candling she used to reduce energy loss in incubating eggs that are infertile. The question that remains is this: are the sorted eggs really infertile? By close observation the answer is yes, because in most instances, she breaks open the egg, with content watery with foul odour with no sign of embryo development and suck up the entire content).

Temperature regulation

Mother hen during the last week of incubation also regulates the amount of heat supplied to her eggs by periodically standing up with feathers rolled up after some time of seating. This act I believe is in synchrony with temperature control. The frequency of this act increases until three days to initiation of hatching.

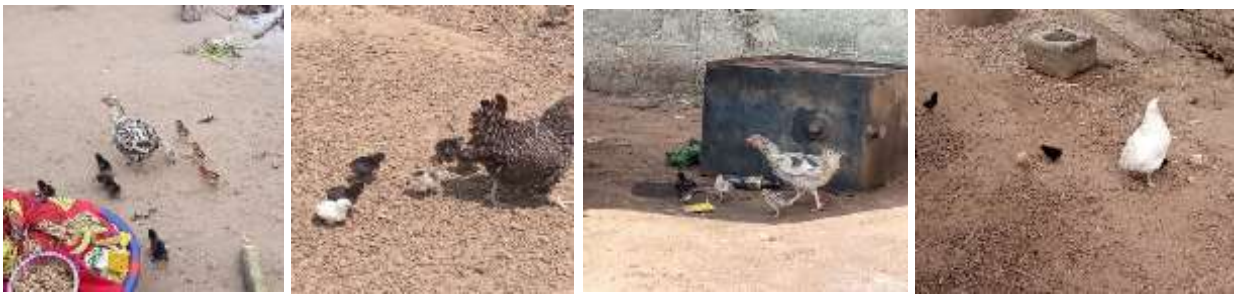
Hatching Period

The hatching period under natural conditions runs from 24-72 hours depending on the number and size of the eggs. She is very patient during this period and hardly moves away from her eggs and loose considerable weight during this period possibly due to starvation. Hatching is initiated by pre hatching and vocalization calls from the embryo a day before hatching as described by (Tuculescu R.A., and Griswold J.G., 1983) the communication between the embryo and the hen a day before hatching when the embryo emits distress calls, the hen vocalizes or moves onto the nest. Following this, the embryo becomes silent or begins to emit pleasure calls (Tuculescu R.A., and Griswold J.G., 2010). Vocalizations heard whilst still inside the egg are believed to help birds recognize their mother after hatching (Tschanz B.T. 1978); (Tuculescu R.A., and

Griswold J.G., 2010). For domestic fowl, prenatal experience of maternal vocalizations is not necessary for the chicks to discriminate between individual hens, but it does reduce the age at which recognition is learnt post-hatching, allowing the chicks to recognized their own mother's vocalizations by the time the hen and chicks leave the nest (Falt, 1981); (Tschanz B.T. 1978); (Tuculescu R.A., and Griswold J.G, 1983). She aids her young by breaking partly through the egg shell. Peeping and crack enlargement is also partly done by the chick. She patiently seats on its eggs until the last possible hatch-able egg hatch. The young chicks are dried up underneath her feathers and they are kept there until they are strong enough to move out and face the harsh challenges of their new environment. Mother hen only gets up from the shell when the chicks are completely dried and strong enough to follow her. In fact, it was observed that, moving out of her nest is initiated by the chicks especially the early hatched ones which by this time will be restless and moving away from underneath their mother's protection. It is in my view that, this time coincides with the period of starvation (depletion of retained yolk within the chick) of the newly hatched chicks especially the early hatched that will be around 72 hours old by then. In some instances, there are some unhatched eggs that are fertile with developing embryos since the time of lay varies especially when eggs do not undergo arrested incubation that is practiced in hatchery enterprises. In such a case, mother hen takes a decision whether to protect and care for the available chicks and hence venture them out of the nest to find feed resources and water. This decision in my view is a wise one because of the needed protection (harsh weather, predator's accidental death, bullies etc.) she's to provide for the majority. Does she totally abandon the remaining developing eggs? No, she always comes back to sit on them after feeding the early hatched chicks for a while and always sleeps in that same nest till she's forcefully evicted by removal of the nesting materials by her owners or completely hatched the remaining eggs. In most cases, one or two more of the unhatched eggs later hatch while she's nursing the early hatched chicks.

Chick brooding and rearing:

The chick rearing period presents the most challenging time in the life of mother hen as she's faced with two crucial responsibilities (finding feed resources for her young and teaching them how to feed; and providing protection for her young). A lot of mortality seems to occur during this period in her quest to accomplish these tasks within the same time. Successful brooding with limited mortality is a key feature of assessing mothering ability of individual indigenous hens and it depends greatly on keeping the chicks away from rain and running water; and her attentiveness and rate of response in the light of danger to protect her young especially from flying predators like the Hawks that are very swift.



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(Nakamori T. *et. al.,* 2013) postulated that maternal care in chickens is facilitated by filial imprinting, a process where newly hatched chicks learn to distinguish the shape and sound of their mother, and follow them. Imprinting takes place within a sensitive period of day old or two after hatching. (McBride G. *et. al.,* 1969) and (Workman L., Andrew R.J., 1989), also revealed that preceding hatching, domestic chicks especially those reared under extensive system, and chicks of their wild ancestors spend their early lives in close proximity to, if not under, their mother, especially in the first four days. (Nakamori T. *et. al.,* 2013) also revealed that hens maintain their brood as a discrete unit away from other individuals in the social group at the periphery of the flock, with maternal behaviour persisting until the chicks are around 5–12 weeks of age (Nakamori T. *et. al*., 2013); (Stokes A.W., 1971); (Collias N.E., *et. al.,* 1966). The proximity that chicks maintain with the mother allows the expression of maternal care and the development of their social bond. This period of maternal contact which is facilitated by imprinting has important benefits for the correct development of sexual preferences, feeding behaviour, and behavioral synchrony that are transmitted through the generational line from mother hen to newly hatched chicks. For instance, sexual imprinting is

dependent on the parental phenotype of the opposite sex, with individuals seeking partners resembling similar characteristics (Cate C.T. and Bateson P., 1988). imprinting therefore forms the hub in behavioral traits of newly hatch chicks which is transmitted through their lineage to ensure continuous propagation of specie especially under extensive system with severe threats from predators, management and the environment.

Finding feed resources and teaching the young to feed:

As mentioned earlier, in most rural settings mother hen is hardly supplemented with feed and solely rely on scavenging feed resources (insects, worms, broken grains, household wastes etc.) base. The first week of chick rearing if solely based on teaching the young how to search for feed by scratching the ground to discover worms, grains, flying insects' etc.; mother hen hardly eats until when the crops of all her chicks are filled. She patiently discovers the feed resource and pecks on it for the chicks to follow suit, break the feed into particles that are easily swallowed by her chicks. Mother hen only feeds on larger particle sized feed that cannot be swallowed by her young. In this way, she ensures that the crop of the least advantage chick is filled before taking them for heat supplementation underneath her feathers while resting.

During adverse weather conditions as presented by the raining season, the highest chick mortality is recorded as a result of the chicks being soaked by rain during feeding or when they are caught by a heavy downpour amidst their return from feeding. In such scenario, mother hen immediately insulates them with her feathers by keeping them underneath her body and feathers until they are completely dried. Depending on the intensity of the rain, weaker chicks are normally not able to make it to bay or if they do, die afterwards from hypothermia.

Indigenous hen learning her chicks to feed

- **Challenges posed by flying predators (Hawks and Crows)**

Predators especially flying predators pose a great challenge to mother hen in executing one of her primary tasks of providing protection. The flying predators are very dangerous and operate during the dry season which coincides with the period of raising their own young. The hawk in particular patiently observes mother hen feeding her chicks and strike at the least presenting opportunity. The hawk has a high success rate with an 80% or more accurate of successful rate of its raid. In most instances, mother hen is caught off guard while finding feed resources, in some instances, she noticed the presence of the predators and stay on guard. Mother hen during alert periods has chirping signals that signify danger to her young and immediately this signal is blew, all the chicks hide themselves under leaves, run into nearby shelter, sprawl to the ground etc. and remain in those seclusions till she blows another signal that the danger had elapsed at which time, all the chicks move out of their hiding spots and run to her protection. The frequency of hawk attacks depends on the hawk population in the area and the rate of successful attacks. It was observed that the more successful the attacks, the more the frequency of attacks. The success of attacks was also observed to be correlated with the amount of tree cover. The more the tree cover to shadow the predator, the more successful the attack. Attacks are usually unsuccessful in open fields and clear skies because mother hen can easily spot the shadow of the predator and notify her young by instituting the alarm chirp.

In some instances, there is a physical battle between mother hen and the hawk until intervention from owners and or other mature birds arrive at the scene before the hawk decides to make its escape. The

hawk had a mission of no failure in order to be able to feed her own young with maggots in decomposing chick carcasses.

This threat continues until the chicks are weaned which only commence on the onset of another laying clutch of fertile eggs by mother hen.

- **Challenges posed by other predators (Fox, rodents, snakes, wild black ants)**
  - **I. Fox:** fast moving and attack all age categories of birds but the chicks and growers are more susceptible to attack and raids. Mother hen is most times helpless fleeing for her own survival but creates noisy alarm that usually scared the predator away.
  - **II. Rodents:** especially rat's cause harm to chick population directly by feeding on them and indirectly by cutting off their shanks in most cases which eventually lead to their death especially the very young chicks. Rodent attack is usually at night which render mother hen helpless in executing her protective function.
  - **III. Snakes:** attack is frequent in secluded terrains like nest located underneath trees, dark overcrowded outside kitchens. Major predator is the black cobra mainly preying on the eggs. Mother hen is usually helpless and, in most instances, end of losing her life if found during the attack.
  - **IV. Wild army of black ants:** another notorious predator whose army raid attack is usually during odd hours when owners are asleep. Chicks are very vulnerable especially when lock up in shelters that prevent their escape. In some case their attack commences on daybreak where all other poultry around the vicinity end up preying on the predator until their crops are filled.

- **Factors influencing weaning period**

  From personal observations of the mother hen, there were several observed factors influencing the time of weaning. These includes but not limited to the following

  Level of availability of scavenging feed base resources or feed supplementation by the owner during chick rearing period: This is also directly correlated to the mortality rate. The higher the availability of feed resources, the less she ventures far away in search of feed resources and the faster the rate of growth of her young and the less likely her young are exposed to harsh weather conditions, the less the frequency of attacks as spotted by the flying predators. In addition, rate of body development and reproductive organs evolution of mother hen is also greatly enhanced.

  Number of running cocks, frequency of mating and initiation of lay: local chicken production under natural rural conditions are on free run or extensive system characterized by indiscriminate and uncontrolled mating by dominant cocks. The more the number of matured cocks, the more the frequency of mating and in most times, the cock aggressively bully the chicks by pecking on them hard to drive them away and get access to mother hen. This in turn induce weaning as the chicks usually move away from their mother and start independent survival either singly or in group with their peers.

  Forceful weaning by mother hen: in situations where the second scenario does not exist, the chicks run with their mother until they are semi-adults. In this scenario, there is vigorous competition between mother hen and her off springs especially with feed resources challenge. During this period mother hen institutes vigorous beating by pecking on her young with her strong beak during feeding. This practice if continued for a while drives away chicks to seek independent life and fend for themselves either individually or in group with their peers.

Conclusions:

From my careful observation of mother hen, the following can be concluded:

1. Mother hen has inherent mothering ability to ensure the survival of its young and continuation of her lineage this task she execute diligently.
2. Mother hen inherent abilities are instinctive and transmitted along her lineage from generation to generation.

3. Predators and adverse weather challenges pose a threat to increase chick population reaching maturity under the extensive free run system existing in most rural settings.
4. Predators and adverse weather conditions undermine mother hen in executing her duties

Recommendations:

1. Feed supplementation especially during incubation, brooding and chick rearing period
2. Confinement and protection of young chicks from predators and adverse weather conditions.

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