

# TRAGOPAN PHEASANTRY

## Incubation

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### 1. INTRODUCTION

Incubation is the term used to describe the process of applying heat to an egg so that the embryo contained within develops into a chick. Aviculturists of today have three options regarding the incubation of eggs and the procedure accordingly differs somewhat in each case. Each option has some advantages and some disadvantages as compared to the other two. These options are as follows :

1. incubation and hatching by the hen pheasant (=natural incubation),
2. incubation and hatching by a broody domestic hen (=natural incubation by a surrogate mother),
3. incubation and hatching by artificial means (=incubation with electronic incubators).

### 2. EGG HANDLING

It is not difficult to appreciate that the egg is a very delicate life system. The developing embryo, with its associated membranes and blood vessels, lives in a fluid environment and is therefore not rigidly fixed to any supporting structure. Extreme care must be taken, therefore, whenever handling fresh hatching eggs, to ensure that the embryo and its associated parts are not injured. Rapid and jerky movements must be avoided, as abrupt changes in motion can cause membranes or blood vessels within the egg to tear. If we move eggs by vehicle to the incubation facility, they must be protected from vibration and jarring by setting them in foam rubber. Moreover, the eggs should be transported as early in incubation as possible, before the vulnerable blood vessel network starts to develop. Cleanliness is also important, and the one who takes care for the transport of the eggs should do everything possible to prevent the transfer of pathogens to the egg and/or incubator as well as prevent the build-up of body oils on the shell with repeated handling.

### 3. EGG STORAGE

Most rare pheasant eggs which have received NO INCUBATION can be stored for several days while retaining high probability that they will hatch. An exemption on this rule are the eggs of peacock (*Polyplectron* sp.) and Argus pheasant (*Argusianus* sp.) , which we believe are best incubated immediately after laying. We recommend that pheasant eggs be stored only if proper storage conditions are available and that they be stored for as short a time as possible, but no longer than seven days. Proper storage temperature is 15 Celsius degrees at relative humidity of 75-80%. Proper position for an egg in pre-incubation storage is subject to debate. We have odd success storing rare pheasant eggs with their large end in horizontal position and turning them through 180° at least twice daily.

### 4. NATURAL INCUBATION

Natural incubation is the incubation performed by a bird, be it a pheasant that laid the eggs, a surrogate pheasant parent, or some type of nesting chicken. The hen pheasant can be left with the job of incubation and hatching the eggs, and subsequently brooding them also. Many hens will do a very

satisfactory job since their instincts for these processes have not yet been erased due to domestication as has happened in many poultry. The main advantage of this procedure is that one does not have to worry about the correct temperature and relative humidity, turning of the eggs and the preservation of the instincts in the succeeding generations. Also, there is less contact with man and the chances of being adversely imprinted are reduced. The chicks are called to food by the hen and they start feeding, without any problems. The preservation of the instincts including those related to breeding and the natural fear of and vigilance against man are factors which may be of importance if the progeny are to be released in the wild subsequently.

If a female parent will not incubate the eggs, which is usually the case with many pheasant species in captivity, or also when the eggs are pulled sequentially to enhance laying, then the eggs ideally should be placed with a surrogate parent to obtain the initial seven to ten days of natural incubation. Various aviculturists, however, have reportedly used chickens and ducks for incubation with varying degrees of success, including, unfortunately, several broken eggs. It are in particularly those species, which lay soft-shelled eggs, such as for instance the peacock pheasants (*Polyplectron* sp.), where artificial incubation is to be recommended, to avoid broken eggs.

Sometimes when a hen Tragopan gets broody we leave the eggs of the last clutch in her basket for natural incubation. We have had several occasions where both satyr and Temminck's hens successfully incubated their eggs and raised their chicks to maturity. For this, however, it is important that the male is removed from the hen and her chicks as he might disturb the incubating female constantly and/or the young chicks once they start looking for food.

## 5. ARTIFICIAL INCUBATION

### Small incubators for exotic pheasant and other gamebird eggs

We have been using electronic incubators, both still-air and forced-air, as a routine matter, since we began keeping and breeding exotic pheasants and gamebirds. We believe we have a better control on the various parameters, affecting proper incubation, such as temperature, relative humidity, turning of the eggs, diseases and hatching. There is no denying the truth that the aviculture of common, rare and endangered pheasants in Western Europe and Northern America has come only on full swing when new and reliable "small-scale incubators, with a capacity of 100 up to 200 pheasant eggs" were made available. This was particularly the case during the last twenty five years. There is a wide variety of incubators available in the avicultural marketplace "in the West", and undoubtedly there are many that are suitable for incubating galliform eggs. We have consistently used the "Grumbach" forced-air incubators, the model Compact S84. This type is used for incubating as well as hatching and is a desirable unit for a number of reasons. It is specifically designed for counter-top operation and therefore uses little space. It is easily cleaned, constructed from plastic materials, and is fairly easy to use once the operator becomes familiar with the idiosyncrasies of each unit. We have also been working with the "Multihatch" forced-air incubators, but in a lesser extend, as they can not be used for counter-top operation and the control of temperature and humidity in such machines can not be checked and regulated as easily as for instance in the Grumbach incubators.

We have found that the success of small incubators lies in their being located in a suitable room, where temperature and humidity do not change that much. We have installed most of our incubators in our cellar where both the temperature and humidity remain practically the same year round. Also, there is a good ventilation with fresh air providing the right environment for artificial incubation.

### Artificial incubation is convenient when there is a constant supply of steady voltage

In general, when there is a steady voltage of the mains supply AND the voltage fluctuations are only very small, then artificial incubation is far more practical than natural incubation. Low and very high

voltages affect both the electronic instruments and the electronic thermostats as well and lead to poor incubation results. We have experimented that electronic incubators are far more practical than broody hens, because of the convenience of the operation and the more precise regulation of the temperature and humidity. For this, however, it is important one has access to a reliable incubator. Many aviculturists in the West use an electronic incubator exclusively for incubation and hatching since, with our advanced technology, we have things under better control than for instance aviculturists in Asia.

There is no doubt that an electronic incubator will not break an egg, nor trample a chick and that the control of disease is very much easier than with broody hens. Nevertheless, in countries like India, Indonesia, China, etc... where the wild pheasants live, there is not always a permanent supply of electricity. Also, for the purchase of a small incubator an aviculturist there has to invest large amounts of monies to afford such equipment. Thus, from the purely economic point of view, the broody hen is still much to be preferred in Asia, both in the tropical countries as in the Himalayas as well.

#### Number of incubators needed

The number of incubators needed is dependent on the number of eggs to be incubated. We commonly operate as many as 4 incubators and five hatchers simultaneously to handle a season total of something like 300 up to 400 eggs. It is recommended that at least three incubators be available for even the smallest breeding project. In this way one can be used as an incubator, one as a hatcher, and a spare is then available to operate at another relative humidity level or to use when one of the other units is being cleaned.

## **6. UNDERSTANDING THE EGG MEANT FOR ARTIFICIAL INCUBATION**

The two most critical factors in incubating an egg artificially are incubation temperature and proper egg weight loss from the time it is laid until it hatches. Egg weight loss can be in part controlled by regulating the incubator humidity. Eggs from all species of birds should lose 18% of the fresh egg weight by the time they hatch.

#### Temperature :

Proper incubation temperature is critical for ensuring the maximum hatchability of the eggs as well as the best physical condition of the chicks that hatch. Variation from the optimum temperature affects growth rate and incidence of embryonic mortality and deformity. Use of suboptimal conditions is evidenced by poor hatching success or by chicks hatching with unretracted yolk sacs, poor vigor, and developmental problems. We have successfully hatched galliforms eggs in "Grumbach and Multihatch" forced-air incubators maintained at temperatures ranging from 37.6-37.8 degrees Celsius. The optimum temperature seems to be 37.7 degrees Celsius.

We have found that developing eggs are very vulnerable to overheating but are somewhat less affected by short periods of cooling. Safe incubator operation therefore requires a double temperature control system consisting of a primary and secondary, or override, thermostat. The primary thermostat is simply the thermostat which normally controls the incubator temperature. The secondary thermostat, which is adjusted 0.5 Celsius degrees higher than the primary, will assume control of the heating element if the primary should fail, thus protecting the eggs from being overheated.

Measuring the correct temperature in the incubator is an other very important aspect of the incubation procedure. We use both mechanical ( =both alcohol and mercury ) and electronic thermometers to do this job right. It is our experience that mechanical thermometers do work the best and give the most

reliable data. Therefore that we do calibrate the digital instruments on basis of our standard mechanical thermometers.

#### Humidity :

Proper control of the incubator humidity is also critical for successful hatching of artificially incubated eggs to reach the correct weight loss. Please consult the book [Game Bird Breeders Handbook \(1993\) by Allen Woodard, Pran Vohra, & Vern Denton](#) for any greater details on the egg weight loss for galliform eggs. The Grumbach forced-air incubators come factory equipped with a humidistat which regulates the relative humidity in the incubator. The level of humidity inside the cabinet can be maintained automatically by the use of the humidistat which controls the evaporation of tiny water drops in the water vessel, which are taken with by the air flow, which passes over the surface of its water contents and transports these to the incubation cabinet, containing the eggs.

For the eggs of most pheasants, 48-50% relative humidity inside the forced-air incubator would be all right. Some aviculturists, however, prefer to have a slightly lower humidity at the beginning and a slightly higher lever at the middle and at the end of the incubation period. The incubation period (days) for eggs of various pheasant species and other gamebirds are different. These have all been well described in literature and for any greater details on these we do advice the reader to consult the book [Game Bird Breeders Handbook \(1993\) by Allen Woodard, Pran Vohra, & Vern Denton](#).

Measuring the correct humidity in the incubator is a very important consideration. A good dial hygrometer is necessary to monitor the percent relative humidity in the incubator. We have found that many dial hygrometers tend to lose their adjustment over time, and we recommend, therefore, that they be recalibrated several times during the incubation season. There is no denying the truth that the present digital hygrometers, which can be bought in the avicultural marketplace are far more precise instruments than the old mechanical hygrometers. Whatever value it reads while in the incubator can be said to be satisfactory as long as the egg's rate of weight loss is correct. A change in incubator humidity will still be reflected by the hygrometer regardless of its calibration. If several hygrometers are used, however, it will be less confusing to calibrate them all and thereby standardize all the readings.

#### Hygiene :

Strict hygiene is a vital part of good and successful incubation. We clean all incubators before the beginning and at the end of each breeding season using a good disinfectant. Also, the eggs are disinfected before putting them in the incubators, so they can not easily transmit pathogen organisms to the [incubation room](#). For this we fumigate the incubation room and incubators using potassium permanganate crystals and formaldehyde. In recent years, we have hatched many chicks in forced-air incubators. One has to be extremely careful with the build up of "fluff" on the fan in the incubator. It is necessary to clean each incubator down thoroughly after each hatch. Disease control in the incubation room and units is only possible when applying good hygienic and health standards. It is not difficult to understand that under the above mentioned environmental conditions , not only the embryo's in the eggs do grow well, but also the micro-organisms which are transported with the eggs.

#### Turning of the eggs :

Egg-turning during incubation is important as it prevents the developing embryo from sticking to the shell membranes, a problem which develops if the egg lies too long in the same position. A survey of the poultry literature indicates that for optimal hatchability an egg should be turned at least eight times every 24 hours. Many incubators with automatic turning mechanisms , including the Grumbach's, turn the eggs once every hour or so as installed by the breeder. Regardless of the number of times an egg is turned each day, the interval between turning should be evenly spaced throughout the twenty-four hour period. In addition, the eggs would be turned in alternate directions, as turning in only one direction will

increase embryo mortality. Eggs can of course be turned by hand if desired, but maintaining regular turning intervals is frequently difficult if one is not always around twenty-four hours per day to monitor the incubators. Automatic turning is, therefore, an important feature of the incubator. We automatically turn the eggs in the Grumbach incubators at least 4 times per day. The "Grumbach" turning-mechanism consists of a sliding grid assembly and an enclosed motor-gear assembly, as shown in the various pictures.

#### Candling :

Candling is a technique which facilitates observation of the inner contents of an egg without opening the shell. Useful not only to determine fertility and the extent of incubation, candling can provide information about the condition of the egg shell and air cell as well as the condition and position of the embryo.

If an egg is held against light, the developing embryo, with its blood vessels and the air cell at the broader end are seen. The examination becomes easier if a small light-box, made of either wood or metal carrying a 40 watt electric bulb and a small window appropriate to the size of the egg is used in a full-darkened room. The blood vessels can be seen as thin red lines after about 72-84 hours of incubation. All infertile eggs will appear clear and these are to be rejected from the incubator, as also eggs with cracked shells. We perform candling on regular basis (at least 2 times per week) to keep track of the change air-cell and ultimately on the egg weight loss. However, candling is more an art than a science and much can be learnt from experience.

Candlers are commercially available but plans for home-made models can also be found in some books written for the lay poultry breeder. If a home-made candler is constructed, it is best to use a light bulb no larger than 40 watts to prevent the egg from being exposed to excessive heat.

## **7. HATCHING**

A hatcher is a modified incubator used to incubate the eggs during the interval from pip to hatch. We hatch eggs both in a "Grumbach Compact S84" incubator, modified as described for incubation, and in self-made still-air incubators. The "pip" is the first stage in the actual hatching process and is defined as the first crack in the shell made by the embryo. Approximately 24 to 48 hours before the egg pips, candling reveals that the air cell expands and gradually starts to extend down one side of the egg. This change in the air cell is called "draw-down". When "draw-down" begins, it is no longer necessary to turn the egg. Normally the pip, when it occurs, it will be located in the air cell. It is not unusual for the embryo to vocalize before pipping. In all pheasant species, the pip is very easy to see and appears as a small uplifted portion of shell. Occasionally, however, little or no lifting is visible, though candling will reveal a crack that can be felt if one's finger is gently passed over it. After the egg has pipped, it is moved from the incubator to the hatcher unless additional weight loss is desired.

The hatcher is normally operated at a relative humidity of 70-80%. We use an incubator temperature of 37.4 degrees Celsius which is slightly below incubator temperature.

At birth the chicks of all pheasant and gamebirds are wet with its down matted.

## **8. PROPER RECORD KEEPING**

Proper record keeping of the eggs laid, eggs made available for incubation, eggs hatched can be done by the use of incubation cards. The eggs, laid in a time span of one week, are being collected in the pheasantry. Before putting these in the incubators, they are all marked so we can keep track of their further development while in the incubators.

It is fundamental to keep proper records for all the eggs being laid during the breeding season for good incubation management. Eggs, regardless whether they are used for artificial or natural incubation, these should be clearly marked with an alcohol pen with the date of hatch expected, the species, the number of aviary or of the pair, which laid the egg,

It is important to know the family relationships of the eggs and consequently of the chicks, being born , to guarantee healthy genetic pairings in the pheasantry.