PROSPECTS AND PROBLEMS IN HATCHING EXOTIC GAME BIRD EGGS

Ursula K. Abbott
University of California
Davis, California

Use of avian species by man has been largely confined to those few which have been domesticated for a long period of time; chickens, turkeys, guinea fowl, geese and ducks. Additionally certain wild species (native and introduced) have been developed as game birds and are propagated for release or, occasionally, for market purposes. More recently, some, such as the prolific and early maturing, Japanese quail (Coturnix japonica), have been developed as pilot animals for biomedical research. The number of species used for any of these purposes is small compared with the world total. It seems probable that many of the heretofore unused species have potential for domestication and use as another human protein source, for release in areas lacking natural game bird populations or for use as pilot animals for research studies on various metabolic disorders, drug or pesticide toxicity. Implicit in each of these possible applications of game birds is the need to develop detailed information for each species on several, if not all, of the following: dietary requirements for maintenance; growth and reproduction; domesticability; behaviour; disease resistance; drug and pesticide tolerance; type of housing required; management of breeding stock including the optimal type of selection or mating program (effects of inbreeding, selection, crossing, etc.) and egg handling both prior to and during incubation. The best guide to information on many of these points is available from studies made with chickens, turkeys and Japanese quail.

Interest and research with game-bird species at the U. C. Department of Poultry Husbandry to date has included (1) problem solving (making use of information available from the well-studied domestic species on breeding, nutrition, physiology, disease and management), (2) exploration of and development of the Japanese quail as a pilot animal, and (3) studies on relationships between various avian species including hybridization, selection for hybrid fertility, chromosomal analysis, species differences in egg white proteins and species parallelism in gene mutations.

To date, we have had some experience with the following species: quail [Japanese, Brown Australian (Coturnix pectoralis), Bobwhite (Colinus virginianus texanus) and Masked Bobwhite (Colinus virginianus ridgwayi)]; partridge [Chukar (Alectoris graeca) and Himalayan Snow (Tetraogallus himalayensis)]; pheasants [Ringneck (Phasianus colchicus) including several mutants of Ringneck, Lady Amherst (Chrysolophus amherstiae), and Golden (Chrysolophus pictus)]; ocellated turkeys (Meleagris gallopavo), tinamou (Eudromia elegans), as well as Mallard ducks (Anas platyrhynchos) and penguins (Pygoscelis adeliae). A variety of species hybrids have also been studied: pheasant-turkey, ocellated-domestic turkey, pheasant-chicken, chicken-Japanese quail, turkey-Japanese quail, and chicken-turkey.

Among the field initiated problems with which the Department has been concerned have been:

1. Effect of helicopter pesticide spraying on incubating eggs of various ages. In this case incubating chicken eggs of various ages were used to examine possible effects on natural bird populations during the breeding period.

2. Attempts to alter phenotypic sex ratios in pheasants through the use of hormones.

3. Use of tranquillizers to assist in trapping wild turkeys.

4. Proper diets for hatching pheasants including birds bred for commercial meat purposes.

5. Efforts to preserve the virtually extinct Masked Bobwhite quail from Arizona.

6. Methods for artificial insemination of various game bird species.

7. Proper incubation conditions for several game bird species (Himalayan Snow Partridge, tinamou, quail).

8. Effect of pesticide residues on hatchability of eggs collected from wild Mallard ducks.

9. Testing and adapting incubators for game bird eggs.

10. Development of special incubating, brooding and rearing equipment for Japanese quail.

11. Development of a field sunlight candler to detect embryo age in wild collected bird eggs and a portable incubator suitable for field use.

12. Use of spectacles to tame birds and prevent feather picking and cannibalism.

Some common problems encountered in hatching game bird eggs are considered below as well as a number of good management recommendations:

Diet for Breeding Stock. Nutritional deficiency symptoms are often encountered among unhatched game bird embryos or young growing stock. These reflect in part, a widely held misconception that a diet suitable for maintenance or egg production is adequate for normal embryo growth. In other words, a diet permitting a game bird hen to maintain her body weight and to lay eggs may not contain adequate amounts of certain nutrients to permit a good hatch of vigorous, healthy chicks. Under these circumstances the incidence of malformed embryos and poor chicks will increase during the season as the hen gradually becomes depleted. Nutritional deficiencies that may act in this way include riboflavin, manganese, and vitamin D. Frequently, affected embryos will die about half way through the incubation period, others may hatch but symptoms of nutritional deficiencies (leg weakness, abnormal hocks, spraddling) may become apparent in the

growing bird. When undertaking work with a new species it is best to assume at the outset that the nutritional requirements will be high. It is cheaper in the long run to over-supplement and to pay a higher price for feed than to suffer substantial hatchability and growing period losses. Subsequently, experiments testing the requirements for various nutrients and protein levels can be carried out and eventually the most efficient ration formulated. High protein diets adequately supplemented with vitamins and minerals (turkey-breeder diets) have given satisfactory results with a number of game bird species including pheasants, quail, partridges.

Egg Handling Before Incubation. Many of the most common hatching problems in game-bird eggs are due to improper egg handling procedures. At the time an egg is laid it is essentially a sterile package with a protective surface coating, the bloom. How long it remains so depends on the cleanliness of the pen, nests or cage floors and on the amount of handling the egg receives. A few rules applicable to all game bird eggs are:

1. Provide clean nests. Change the nesting material frequently especially in wet weather. Be careful in treating nesting material for mites or lice. Many such compounds (i.e. containing lead) can pass through the shell and may later damage the developing embryo.

2. Collect eggs frequently especially in very hot or very cold weather. Eggs at an environmental temperature of 80°F or above will continue to develop although in an abnormal way. Prolonged exposure to temperatures below 40°F will also damage the embryo and reduce hatchability.

3. Store eggs in a clean, cool fairly humid room. The best temperature is 55°F (50°-60°F is a reasonable range). Above or below this, hatchability declines more rapidly with age. Eggs held under excessively dry conditions will lose moisture too rapidly and will tend to produce an undersized chick. Eggs placed in the holding room should be clean. (Rapid growth and shell penetration of bacteria can occur under areas with adhering fecal material.) Egg cleaning if required, should be done with

a clean abrasive before holding (eggs may be fumigated for extra protection prior to storage and after any dry cleaning required). In general, washing hatching eggs is not recommended. Washing, especially if the temperature of the water is too low is an excellent way to contaminate clean eggs. If eggs are extremely dirty and must be washed (muddy pens) such eggs should be handled and incubated separately. Washing should be at a temperature well above that of the egg, 100°-105°F. The wash solution should contain a disinfectant (lye will do) and the wash water should be fresh (not reused). Washing eggs in cold water is a good way to spread infection; washing at too hot a temperature may kill the young embryo.

Length of Storage Period. The numbers of vigorous chicks obtained from a given group of eggs depends, among other things, on how long the eggs are held before incubation. Under optimal conditions of temperature and humidity, hatchability will not drop in eggs held for 7-10 days. Permissable holding time varies in different species, thus Japanese quail may show a drop after five days; turkeys, generally, not until 14 days. Some data suggests that game bird species (i.e. Chukar) may successively withstand even longer holding periods. Eggs from inbred females are less resistant to holding than crosses. Eggs held under higher or lower temperatures, than optimal, will show a decline faster than those held under optimal conditions. If eggs are held less than two weeks under optimal conditions, they need not be turned during the storage period. Usually the drop in percent hatch is gradual at first, i.e., about 1% a day for 14-21 days and then very rapidly until hatching is completely lost (4-6 weeks, depending on the species). Held eggs require additional incubation time so that settings including both fresh eggs and those held for several weeks will be highly variable in hatching time. If it is necessary to set such mixed age lots, the older eggs should be preset. Eggs should be stored on clean, open flats or racks. They should not be enclosed in egg cartons or boxes for extended periods of time.

Shipment of Hatching Eggs. Poor hatchability may also be due to improper handling during shipping. Shipping conditions for hatching eggs should be equivalent to holding conditions. Thus temperature extremes should be avoided. The carrier should be warned against permitting hatching eggs to remain on exposed loading docks during very hot or cold weather. Cases and egg flats should be clean. If reused they should be fumigated between each use. While eggs can tolerate steady motion quite well, sudden shocks should be avoided. Boxes containing hatching eggs should be well marked with "handle-with-extreme-care" signs. If shipped by air, hatching eggs should be in pressurized compartments of the plane.

Incubation Conditions. Incubators operated at the wrong temperature or humidity settings are responsible for many poor hatches or poor quality chicks. Most commercial chicken incubators are suitable for any type of game bird egg, or can easily be modified for such use. The game-bird operator should acquire modern forced-draft incubators equipped for mechanical turning of eggs and temperature and humidity control. He should avoid using small still-air machines, requiring frequent opening for hand-turning of eggs. While good hatches can be obtained with these machines, they require considerably more care. For certain species, with higher humidity requirements, they are completely unsatisfactory. Many of the small machines have inadequate air circulation and do not provide equivalent incubation conditions at all levels in the machine. The most efficient set-up is a series of moderately sized (2000-3000 chicken egg capacity) incubators and two or three hatchers. Species with similar temperature and humidity requirements can be incubated in the same machine. The operator must simply arrange his setting schedule so that all eggs will be ready to transfer to the hatcher at the same time. However, if this practice is followed special care must be taken to avoid possible disease spread between different lots. Whenever eggs from different flocks or species are hatched together, proper sanitation conditions become even more critical.

Areas that have been most neglected by those working with game bird species to date include: (1) nutritional requirements during rearing and especially the reproductive period, (2) planned genetic studies including the effects of inbreeding, crossing and directional selection and interrelationships between genetic constitution and nutritional requirements, (3) behaviour, including means of modifying tameness, wildness and controlling cannibalism.

Recently initiated programs on game species in the Department of Poultry Husbandry include developmental studies on several game-bird species; their incubation requirements, comparative hatching time as well as embryological and histological studies. We hope to expand the genetic program to include studies of various improved breeding methods and a search for commercially useful mutations. Also we expect to increase our work on comparative nutrition and on environmental requirements of several species. We hope also to interest students planning a career in game breeding and management in incorporating applicable courses concerned with genetics, nutrition and physiology of domestic poultry into their training program. We feel that increased artificial propagation of a variety of game bird species will lend to a demand for specialists with this type of training.