COMMENTS ON REARING YOUNG BUTEOS

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Introduction

A total of seven Swainson's Hawk (*Buteo swainsoni*) eggs, seven Red-tailed Hawk (*Buteo jamaicensis*) eggs and five Ferruginous Hawk (*Buteo regalis*) eggs were obtained and hatched during the springs of 1969 and 1970. Fourteen of the nineteen young birds were raised successfully in a laboratory and measured periodically from hatching through 45 or 46 days of age. Body weight and food consumption were recorded daily. The following linear measurements were taken at intervals of two to several days: Thigh, crus, tarsus, third toe, first talon, second talon, brachium, antebrachium, manus, bill depth, bill length, maximum width of the head, fifth primary feather (from the inside), fifth primary covert feather, second secondary feather (from the outside), second secondary covert feather, right middle tail feather and right middle tail covert feather.

Eggs were obtained from tree nests within a seventy-five mile radius of Fort Collins, Larimer County, Colorado including the area from Livermore, Colorado, on the north and west, Denver, Colorado, on the south and New Raymer, Colorado, on the east. Most birds were taken on or near the Pawnee National Grassland with the exception of several Red-tailed Hawks taken in the Denver and Livermore areas. The eggs usually cooled during transportation to the laboratory, but this did not prevent hatching, since all eggs obtained for the project hatched.

Incubation

The eggs were incubated in a No. 150-E, 205-watt, still-air incubator manufactured by Leahy Manufacturing Co. of Higginsville, Missouri. The temperatures used were 35.5 C (96 F) in 1969 and 37.2 C (99 F) in 1970. Stanley (1937) and Stanley and Witschi (1940) used 35.5 C to obtain later stages of Red-tailed Hawk and Cooper's Hawk (*Accipiter cooperi*) embryos for their studies. Full-term incubation of Swainson's Hawk eggs failed in 1969 at 35.5 C, so the temperature was increased to 37.2 C in 1970. This was still well below the optimum of 38.5 C (101.3 F) used for chickens (Bellairs, 1960: 136).

Humidity was not measured during incubation. There was always a shallow pan of water the size of the entire floor of the incubator below the eggs. The eggs were turned every 3 to 5 hours between 0600 and 2200 hours.

Incubation posed little difficulty, since all eggs used for the study were taken in the late stages of incubation. Red-tailed and Ferruginous Hawk eggs were

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procured 5 to 6 days before hatching on the average. Swainson's Hawk eggs were obtained only 1 to 3 days before hatching, since their abundance made it possible to observe many nests for signs of hatching.

Treatment of the Birds

All birds were reared in large classroom laboratories except for short periods at the beginning of each summer when smaller rooms were used. Effective air conditioning was not available, but ventilation was possible using large fans placed in windows. In general, the temperature in the laboratories was within a few degrees above or below ambient outside temperature during average or warm days, and several degrees higher on cold or rainy days and nights. The major differences between the laboratory and natural environments were (1) a lack of direct sunlight, (2) better shelter from winds and cold temperatures and (3) a different diet composition.

The birds were not helped out of the eggshell during the hatching process.

A rigid schedule was not established for treatment of the chicks at hatching because the birds hatched at all hours of the day. In general, they were removed from the incubator about 8 to 12 hours after hatching. If a bird hatched in the early morning hours, say at 0500, it was removed in the late afternoon. Birds which hatched in the late morning or early afternoon were removed between 2000 and 2200 hours. Those hatching in the late afternoon or evening were not removed until the next morning. Birds were fed as soon as they were removed from the incubator.

The 12 hours in the incubator after hatching was spent in a small box lined with tissue paper. The bottom two inches of a half-gallon milk carton proved adequate. Reduction of the temperature in the incubator was not necessary, nor desirable, since the incubator served as an excellent brooder. The birds showed no signs of distress when kept at 37.2 C just after hatching. Within three hours after hatching the birds were essentially dry, but some of the natal down stayed matted to the skin for the first 24 to 36 hours of life.

After the birds were removed from the incubator, brooding temperature was maintained by goosenecked electric lamps with 100-watt bulbs. Mercury thermometers placed beside the chicks allowed adjustment of the ambient temperature to within a degree or so of the desired level.

The best temperature for brooding young birds 1 to 3 days old was found to be 31 ± 1 C. The technique used to set the temperature levels was simply to observe each bird and note if it was panting or shivering. After a short period of trial and error an adequate temperature was established and maintained.

After 5 or 6 days the temperature was lowered to 27 or 28 C without harming the birds. Birds at 7 or 8 days of age did well at 25 to 26 C. Between 9 and 15 days of age the heavy second coat of down developed and the temperature was progressively lowered to room temperature (22 to 23 C) and left at that level for the remainder of development.

The nests of the birds, after they outgrew their initial incubator boxes, consisted of a larger box lined with newspaper, inside of which was placed separate plastic containers for each bird. Inside the plastic containers were still smaller

nest boxes lined with small wads of newspaper or tissue paper. The idea of box-in-a-box design was that the birds could mute (defecate) outside of the nest, but usually not outside of the plastic containers onto the other birds. Also, they could not mute outside of the larger box into the room.

As the birds became mobile, other arrangements had to be made. In 1969 I used a wire corral in the laboratory. A better arrangement used in 1970 was an open-topped cardboard enclosure constructed of large furniture boxes between two long tables. One end of the enclosure was removable for the purpose of entering to remove birds for weighing, feeding and measuring. Nest boxes lined with wads of newspaper were provided in the enclosure. These boxes were used by the birds except during the final stages of the experiment. The birds were allowed free reign of the enclosure until removed from the experiment at 45 to 47 days of age.

Feeding

The most time-consuming activity in studying young birds in the laboratory is their feeding. The preparation of food and the actual presentation of the food to the chicks takes about one and one-half hours per day per bird. This time includes cutting meat into small pieces or grinding it, warming it to room temperature or above before each feeding, dipping each piece into warm water and then coaxing the birds to peck at it. When this is done on a schedule of every four hours from 0600 until 2200 hours, by the time one feeds the sixth or eighth bird, it is time to begin again.

The birds were usually ready to eat within 3 to 5 hours of hatching, although they were left in the incubator about 12 hours on the average before being fed. For the first 48 hours after hatching, feeding was a hit and miss proposition because the birds were quite inept at grabbing food. Their neck muscles were not developed sufficiently to control their over-sized heads.

A 4¾-inch curved-ended forceps proved to be a very satisfactory feeding tool. It was important that the tips of the forceps met perfectly so that small pieces of meat could be grasped readily and easily released when inside the hawk's mouth. When the birds were clumsy at feeding time, or stubbornly refused to eat, the best procedure was to place the food far back in the mouth behind most of the tongue.

It was found to be better to space the feedings of a very young bird 3 to 4 hours apart, than to keep the crop full constantly. It is not unnatural for the crop to empty periodically. To determine if a very young bird should be fed the crop was inspected. If the food in the crop was firm, the bird was not fed. If the crop was empty or a little very soft food remained and the bird was easily stimulated, it was fed.

If a very small bird ate too much, chances were it would cast (regurgitate) some of the food soon after the meal. This was not cause for alarm, even though food lodged in the throat sometimes caused slight breathing difficulties with the bird gulping air for several minutes rather than breathing normally.

Problems arose when a bird ate too much and did not put the meal over (pass it from the crop to the proventriculus) in a reasonable amount of time.

Several years ago I lost two hatchling red-tails to an unknown malady. The only symptoms involved a failure to put over food and eventual regurgitation of very dry, sour-smelling bits of food. Death followed within a few hours. The first Red-tailed Hawk hatched during this study died in a similar manner a few days after hatching. A malady called sour crop, characterized by similar symptoms, occurs in grown birds of prey.

Dehydration is always a danger when raising wild birds in captivity. In 1969, at the suggestion of Dr. Paul H. Baldwin, I began giving half an eyedropper of water once or twice a day and dipping the meat in water as it was fed. The mutes (feces and urates) became somewhat more watery than one might normally expect, but no more trouble with sour crop was encountered that year.

In 1970 two red-tails again developed sour crop. As soon as it was detected that food was being put over too slowly, or in one case when sour meat was regurgitated, I forced all food out of the crop, gave the bird an eyedropper full of flat coke (sugar water), and replaced the food with breast meat from a freshly killed pigeon and portions of coagulated blood. Both birds recovered without interruption of the increase in body weight.

One cause of sour crop seems to be feeding too much food without adequate moisture. It is a lethal problem if not dealt with immediately. Preventives include spacing the meals properly, giving natural amounts of blood or supplementing the moisture content of the food with water, and feeding the best food available. Good food for newly hatched raptors includes pigeon breast, liver, heart and leg meat, or the red viscera and leg muscles of small birds, mice, young rats or other rodents. Poor food includes rabbit muscle, beef heart, chicken (except for a small amount of liver or gizzard) and other foods with a high muscle content. Many of these low grade foods can be used in small amounts if vitamin and calcium supplements are given. The problem is not one of caloric content. The danger lies in the tendency to use these easily prepared foods too extensively thereby depriving the birds of an adequate diet.

When raising several birds of varying ages, one must not carelessly increase the size of the pieces of meat fed the youngest birds. It is easy to begin cutting larger pieces of meat for larger birds and then to feed the larger pieces to small birds. This may well be another source of sour crop.

The critical period during which feeding had to be precisely controlled lasted for 7 to 10 days after hatching. After that time the birds grew well and ate aggressively. The pieces of meat given were larger than before, and small bones, small amounts of fur and some feathers were given. Bone was incorporated into the diet quite early, but the acceptance of bones by each bird varied. Some day-old birds accepted the ribs and crushed skull bones of mice and the neck vertebrae of sparrows; some birds ten days old refused them.

The problem of feeding an ample amount of bone was solved by grinding whole mice, rabbits, pigeons, chicks, etc., very finely at first, and somewhat coarser later on. The food items were skinned and eviscerated. Evisceration was a practical procedure, since the digestive tracts rendered an odor to the ground food which made it relatively less palatable to the birds and less acceptable to the researcher. It is well documented in the literature that intestines are usually

discarded before the prey is fed to the young. Furthermore the digestive tracts of pigeons often carry a disease called trichomoniasis which is caused by a flagellated protozoan.

In general, only as much food as was demanded by the birds was given at each meal, but it was often difficult to get the birds to start eating. Holding the meat at about a 30-degree angle above the beak and 1 to 2 inches away was the most effective method. If the mere presence of food did not elicit feeding responses, moving the forceps in a circular motion in front of the birds often stimulated the birds to peck at it. Tearing dead animals apart near the birds and cracking bones in the process seemed to be a strong feeding stimulus. Once a bird took one bite, it was often anxious for a varying number of additional bites in rapid succession. After the feeding tempo slowed, a two-minute pause followed by several more bites usually ended the feeding.

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