

Cassowaries

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Cassowaries are large, black, omnivorous, flightless birds (ratites) that are found in the rain forests of New Guinea and Northern Australia. There are three species, and numerous subspecies. The double-wattled cassowary, *Casuarius casuarius*, is probably the most abundant and, therefore, the most commonly seen in captivity, the other two species are practically non-existent in collections in North America, being represented only sporadically in 3 or 4 collections.

Adult double-wattled cassowaries are 4 to 5 feet in height and will weigh 100 to 120 pounds when fully grown. The young assume adult coloration at approximately 2 years, and reach sexual maturity between 5 and 7 years of age. All cassowaries have a very poor, sporadic breeding record in captivity. They generally lay 4 to 7 large, lime to avocado-green eggs. The incubation period for these eggs is approximately 46-50 days. Cassowaries adapt quite well to captivity and thrive in a variety of climates throughout the world, however are extremely sensitive to cold and must be protected from severe weather or frost bite and death can result. They love water, relish being sprayed with a hose and are expert swimmers.

Cassowaries have many unique features. The head is crowned by a large casque which is helpful in breaking through dense underbrush. In most species the neck is decorated by brilliantly colored

patches of skin of various hues. Their almost non-existent wings are distinguished by large, veinless feather shafts that resemble knitting needles. Each of the bird's three-toed feet is highlighted by a large talon-like nail that is often used as a weapon for defense.

Cassowaries have been displayed in U.S. zoos for over 100 years. Individual birds are relatively easy to maintain in captivity. A large enclosure with some shade trees and a proper diet will suffice to maintain these birds for a long period of time. One female lived over 21 years as an adult in a zoo, and a breeding male was 31 years old when he first mated. Problems arise when one attempts to keep more than one bird together or attempts to breed them. The main problem in breeding stems from the fact that the male and female are solitary in the wild, except during breeding season, and do not usually get along well together in captivity even in large enclosures. There have been many attempts to exhibit male and female cassowaries together and many humorous tales are told about such introductions. More often than not, tragic occurrences have resulted, and exhibits of single cassowaries are common sights in many zoos.

The breeding of cassowaries in captivity has been very uncommon. The London Zoo first bred them in 1862 and again in

1863. One chick was produced each year and neither survived. This feat was not accomplished again until 1957 when the San Diego Zoo reared one chick. This success was later duplicated by two zoos and two private individuals during the early 1970's. In 1977, the Denver Zoo became the sixth place in the United States to hatch a cassowary. This accomplishment has only been attained by 8 other institutions in the world. Two other zoos have thus far hatched single specimens in 1980 in the U.S., and a private zoo has produced young yearly the past three years. By far the most successful propagation program has been that of the Edinburgh Zoo in Scotland, where at least one bird has been reared every year since the early 1960s. Normally, successful rearings have occurred by allowing the male to incubate and rear the young. Few people have artificially incubated eggs, fewer still have hatched young and a complete artificial rearing program has been almost non-existent.

The Denver Zoo's history with cassowaries is rather unique and interesting. In 1974, while building Bird World, we decided that we should exhibit these most unusual flightless birds. After locating a "pair" in another zoo, we proceeded to arrange to pick them up. During the return trip to Denver a discussion ensued as to which bird was the female, as there was confusion during the crating of

Photo by Rick Haeflner



Cassowary egg with golf ball for size comparison.

Photo by Rick Haeflner



Newly hatched chick 1 hour old.

Head of adult female double-wattled cassowary, *Casuarus casuarinus*.

Photo by Rick Haeflner



Five of eight chicks raised in 1980 on their daily exercise walk, approximately 40 days old.



Photo by Rick Haeflner

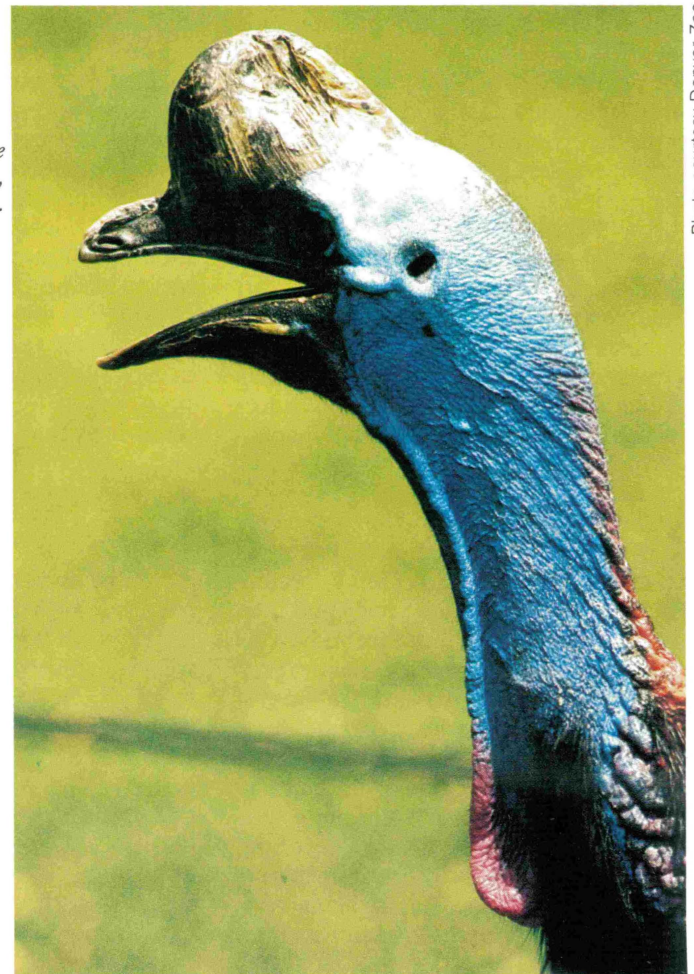


Photo courtesy Denver Zoo

the birds. Thus the seed of doubt was planted. Six months later (on of all days, Easter Sunday), we had our own bright lime-green Easter egg! Within a week our worst fears were confirmed when we began obtaining 2 eggs a day. We had two females. The search for a male began and continued throughout that summer and into the following spring. At last a male cassowary (far from a perfect physical specimen) was available on loan from another zoo, this particular bird had a very colorful and well-traveled history, far too complicated to describe here. After a long wait, he finally arrived but too late for the 1976 breeding season.

We immediately began the long and often hectic introductory process. We introduced the male bird to both females simultaneously. They chased and literally kicked him over the fence. We then introduced him to each female separately with the same results. We had decided that we would continue this process in the hope that he would assert his male dominance. Finally, in the spring of 1977, one of the females accepted him and mating was observed. Thus we began a 3 year attempt to accomplish what few other zoos had done in the past; to artificially hatch and raise cassowaries.

Cassowary rearing does not differ significantly from the other ratites. The main problem in raising them is the establishment of a proper growth rate and weight gain. An imbalance of minerals in the young birds, generally brought about by abnormally fast body growth, can cause leg or tendon displacement. In other words, the birds gain weight so rapidly that their legs cannot adequately support them. The hatching problem was also causing us great concern since cassowary hatchings in the wild, and for the most part in captivity, are the result of male parental incubation of the eggs. At the Denver zoo we were quite certain we would have to rely on artificial incubation. Temperatures and humidity levels for artificial incubation are well established for many species, but not for cassowaries.

Cassowary courtship is an extremely long involved process that is fascinating to observe. The male will begin by erecting his feathers over his entire body and then very vigorously shake his entire body. This produces the only sound in the entire process. This is believed to be an attention getting device. The male then very cautiously and slowly approaches the female from the back towards one side of the head. If not spurned at this point he begins a very deliberate, gentle stroking, pecking of the head and neck region, that resembles a grooming procedure. This stroking continues for a considerable period of time

(up to 20-30 minutes) and proceeds down the female's side and progresses up to the base of her neck and down her back. If nothing disturbs the courtship, (if anything does, the whole process stops immediately and may or may not start again) this gentle grooming has a mesmerizing effect on the female and she will slowly sink to the ground. At this time the male will mount her and copulation takes place. Sometimes the male will not be successful in having the female lie down and will proceed to groom her on the opposite side and continue until mating is accomplished.

Cassowaries generally have a small clutch of eggs for their large size. Clutches are generally 4 eggs but very frequently will be as large as 7. Both of our laying females were exceptional and laid an average of 14 eggs. The fact that all eggs were collected as soon as they were laid, contributes to this unusually large clutch size. The eggs average 143 mm x 90 mm in size and weigh an average of 634 gms. The diet of our adult cassowaries consist of the following: chopped apples and chopped bananas spread over ratite diet.¹ The fruit is sprinkled with Vionate² and bone meal. Periodically, whole adult mice are offered and rapidly accepted. The ratite diet is offered free choice at all times.

When laid, (the first laying date in Denver is approximately the 3rd to the 4th week in April), the eggs are collected, measured, weighed, marked with an I.D. number, and immediately incubated. (Our incubation temperature is 97°F and the wet bulb reading 90-92°F). We must stress that the wet bulb reading is adjusted for Denver's climate and altitude.) This wet bulb setting was derived by weighing the eggs over successive days and measuring the weight loss of each egg. By taking the weight loss per day and predicting the total weight loss over the entire incubation period (using 50 days as the average), (and using 12-16% as an average total egg embryo weight loss during incubation) we discovered that the eggs were losing too high a percentage of total weight and the humidity needed to be raised. On the average an egg naturally incubated loses about 15% of it's total weight during the entire incubation process. By going back and using 1978 records we established that the eggs lost 18% total weight, and that was probably the main factor in our failure to hatch during that season. Incubation during 1979 at 97.5°F dry reading and 92°F wet bulb resulted in an incubation period of 48 days. The humidity had been the standard 84° wet bulb and was gradually increased until weight loss equaled 13%. All of the above was accomplished thru the cooperation of Dr. Craig Black and Jeff Birchard of Col-

orado University. They also applied a method using bell jars, oxygen, and measuring devices to ascertain the amount of oxygen, (if any), the embryos were absorbing and thus if the egg was in fact fertile. In 1979 they predicted fertile-infertile eggs with 100% accuracy. A healthy embryo near the end of it's development will consume approximately 4cc of oxygen every 2 minutes. All eggs are tested starting in the third week of incubation, as our present equipment cannot measure oxygen intake before this time.

The incubated eggs are automatically turned every 2 hours. Each egg is weighed daily throughout incubation, and upon reaching the 21st day of incubation, tested for fertility once a week thru the remainder of incubation. We have determined incubation to be 48 days, at the above temperature and humidity. A newly hatched chick weighs approximately 325 gms and is 10" high. The chick has a small spur on each wing, very small talons on each foot and distinctive wattles. In appearance it resembles an emu chick but is dark brown & tan instead of black & white.

Due to problems encountered previously with other species of ratites in the absorption of the yolk sac, the young cassowaries are fasted for the first 4 days. During this period the chicks are given water treated with terramycin³ 250 mg. per gallon of drinking water. The morning of the fifth day each individual bird is offered a basic starter diet containing equal parts of chopped spinach, apple, banana, diced hard boiled egg, Purina Game Bird "Checkerettes"⁴ and our soft bill bird mix. Added to this mixture are ½ teaspoon of Vionate and ½ teaspoon dibasic calcium phosphate⁵. The birds usually begin feeding on their own, if not they can be stimulated by hand motion of the food. Each bird is weighed daily and weight loss usually stops by the 7th day post hatch. We monitor the weight gains and try to maintain a steady 10 gm per day growth, through the first three weeks. We felt that any large gain above this amount, coupled with insufficient exercise, can result in the standard, disastrous, improper leg growth. Each bird when it reaches approximately 14 days in age is moved from our standard 2' x 2' x 18" high covered brooder box to an outdoor rearing pen. The indoor brooders are of plywood construction and painted with epoxy paint. There are five brooders in a "bank" each separated by either opaque or clear plexiglass. This option allows for a visual barrier or visual contact, whichever is desirable. Each brooder has a ¼" hardware cloth floor for drainage and is covered with a square of indoor-outdoor carpeting. This carpeting is changed daily and the old carpet is clean-

ed and disinfected before re-use. Heat for the chicks is provided by an adjustable 250 watt heat lamp above each brooder. The outdoor pens are 8' x 10' x 7' high and supplied with a 4' x 4' x 4' plywood shelter; all shelters have a 250 watt heat lamp fixed to the ceiling. The rearing pens provide a number of elements we feel are necessary for good growth, the most important being fresh air & sunshine. The dirt floors provide a good substrate for proper exercise and leg development. The shelters have wood shavings scattered on the floor for sanitation. The young have never ingested the shavings as has been observed in other ratites, and we have never had an impaction problem. The only observed attraction for foreign material is towards red objects which apparently resemble apple peel. The shelters provide a heated area in which the chicks are locked each night for their own protection. Twice a day the chicks are separately walked and run by an individual, a distance of approximately ¼ mile, which also aids in the proper leg development. All chicks are kept separate as most were extremely belligerent towards each other from the first day of hatch. Any initial attempts at introduction resulted in failure.

The average weight of the six checks reared at hatching was 325 gm. The

average weekly weight and average daily weight gain for the six chicks is as follows:

7 days	390.0 gm	9.2 per day
14 days	436. gm	6.5 per day
21 days	513. gm	11.0 per day
28 days	662. gm	21.0 per day
35 days	858. gm	28.0 per day
42 days	1024. gm	23.7 per day

All chicks showed a steady, average, but erratic weight gain, and we felt that they were independent at 3 months of age when they were 18" tall and weighed approximately 1800 gms.

During the 2 year period 1977-1978 we incubated a total of 22 eggs. Of these, 6 were fertile and 1 was hatched. This chick was euthanized at 6 months of age, due to a leg problem. In 1979 we had 13 eggs from our breeding female, 11 were fertile, 3 died in the shell, the remaining 8 hatched. Two chicks died within 24 hours of hatching, the remaining 6 were successfully raised. It is interesting to note one chick we eventually raised was positioned upside down in the egg and was successfully helped out and survived. All chicks are fed our standard chick starter diet, until 3 months of age. At this time we begin weaning them onto ratite diet in steadily increasing amounts until they were being fed the usual adult diet.

We feel that we have accomplished a break-thru in the artificial incubation and hatching of the cassowary and have made strides in the implementation of an artificial rearing program — but only time will tell.

Products mentioned:

¹Zoo-Preem Ratite Diet, Riviana Foods, Inc., Hills Division, Topeka, Kansas 66601.

²Vionate Vitamin-mineral powder, E. R. Squibb & Sons, Inc., Princeton, N.J. 08540.

³Terramycin — Tetracycline hydrochloride, 250 mg. capsules, Rochelle Laboratories, Inc., 700 Henry Ford Ave., Long Beach, Ca. 90810.

⁴Purina Game Bird "Checkerettes", Ralston Purina Co., Checkerboard Square, St. Louis, Mo. 63188.

⁵D-Ca-Fos, Fort Dodge Laboratories, Inc., Fort Dodge, Iowa 50501.

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Crzimek's Animal Encyclopedia, Volume 7 Birds I, pp. 106.

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Thompson, L.A., *A New Dictionary of Birds*, pp. 122-123.

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