Biological Profile – Red-crested Cardinal *Paroaria coronata*, (Miller, 1776)
by Josef Lindholm, Cameron Park Zoo

Order	Passeriformes
Family	Emberizidae [or Fringillidae (C.G. Sibley & Ahlquist, 1990, C.G. Sibley& Monroe, 1990)]
Other names used	Brazilian Cardinal *Loxia coronata*, Miller, 1776 *Fringilla cucullata*, Viellot, 1790
Distribution	Southeastern Brazil (Mato Grosso and RioGrande do sul), eastern Bolivia, Paraguay, Uruguay, and Argentina south to Mendoza, La Pampa, and Buenos Aires (Ridgley, 1989). Introduced population Widespread on Oahu, localized on Kauai, Lanai, Maui, and Molokai (Pratt, et al, 1987). . Numerous recorded sightings in South Florida (Long, 1981, D.A. Sibley, 2000).
Population Size	Not listed as threatened, and generally considered "common to locally abundant" throughout most of range (Ridgley, 1989). However, Ridgley (1989) states: "In demand as a cage bird, and as a result has declined in many populated areas.
Sex ratio	Monagamous, so male/female ratio presumed roughly equal, though difficult to confirm as adults are essentially identical in appearance.
Migratory status	Sedentary (Ridgley, 1989).
Habitat	Semiopen country, with scattered trees and shrubbery, especially near water (Ridgely, 1989). In Hawaii, favors lawns, parks, and dry thickets (Pratt, et al, 1987).
Niche used	Forages for seeds, fruits, berries, and insects, on ground and in shrubbery , in pairs or flocks. Often perched in trees or bushes. In Hawaii, commonly observed on walls or roofs, and picks up crumbs, etc. left by humans. (Ridgley, 1989)
Territory	
Type and size	Territory size for breeding pairs in the wild not documented. A minimum of "ten feet of open flight" is recommended by Pendleton (1996). Territory is

	centered around potential nesting cites, and includes foraging areas. Nonterritorial outside breeding season.
Development And defense	Flocks break up into breeding pairs. Both sexes sing. Males vigorously attack both conspecifics and other species. In aviaries, severe and often fatal injuries may result (Pendleton, 1996). Pendleton (1996) notes that "as the birds reach puberty, males will become noticeably aggressive, charging at the cage walls, calling, stretching their necks and engaging in combat anything that moves".
Spacing between Territories	Not documented, but Pendleton (1996) suggest only one breeding pair be maintained in any aviary.
Diet, Resource use – Change over course of year	Primarily seeds, but specific plant species do not appear to have been noted for South American populations, nor have I found plant list for Hawaiian birds. Foraging appears to be mostly terrestrial. Pendleton (1996) recommends both "rich finch seed" and "parakeet mix". "Fruits and berries" (Long, 1981) are also eaten. Pendleton (1996) provides aviary birds with a wide array of fruits, as well as cucumber and thawed green peas. Insects appear to be eaten all year, but especially during the breeding season. Pendleton (1996) recommends mealworms, quarter inch crickets, and waxworms, but warns that waxworms will impact the crop before the tenth day after hatching, and that mealworms may be a source of coccidiosis. In addition she strongly recommends vitamin enhanced soaked monkey chow.
Body condition profile – Changes over course Of year	No seasonal changes in body condition documented.
Annual cycle	
Time of breeding	In Argentina, October and November (Long, 1981). In North American aviaries, February through August (Pendleton, 1996).
Timing and sequence of molt	Not documented.
Testes and follicle size – Changes over course	Not documented, but it may be inferred from decrease in aggression outside of breeding season that

of year	testosterone level drops.
Environmental factors influencing initiation of breeding cycle.	Not documented in the field, but October through November breeding season in Argentina coincides with the Southern Hemisphere summer.
Social interactions.	
Breeding season.	Exclusive pairs, males aggressive towards all conspecifics, as well as other seed-eating or insectivorous birds. Male and female maintain continuous contact through vocalizations. Pendleton (1996) observes: "A true pair will never range out of sight of one another, and should they become separated, the male will thunder out his summons, a call that is unique and unmistakable, guttural and demanding."
Non-breeding season	Forms "large flocks" (Ridgley, 1989). In Hawaii, Paul Breese (pers. com.) notes, that in contrast to North American Cardinal (*Cardinalis cardinalis*) and Yellow-billed Cardinal (*Paroaria capitata*), flocks often consist of up to twenty birds.
Mating activities	
Mating system	Monogamous
Behaviors associated with courtship.	Pendleton (1996) reports: "Often, the hen will clack her beak during advances by the male, indicating her interest… Birds ready to nest will display relaxed congeniality towards one another. They do not engage in mutual grooming, but remain solicitous of the other's allegiance. Mating occurs in swift attacks by the male, usually on the ground when the hen becomes inattentive… A male that fails to mount the hen will trigger a series of disasters culminating in an egg-bound hen."
Age at first breeding.	Pendleton (1996) states: "At about nine months, the hens will begin to take on the shape of an English budgie, with thick breast, wide shoulders, and a generally more square apearence. Males will retain the lanky look of the adolescent, gaining length, but little weight. Both hens and cocks will strut, fan the tail, arch the back and court."

Sequence of courtship activities with respect to territory development.	Pendleton (1996) observes: "It is the hen who must approve the nest, but the cock who must weave it. Thus the cock may suggest first one site and then another. A careful curator will watch the activities of the cock, who will select a site and then call joyously to attract the hen's attention… When the hen expresses her desire to mate, the male begins feverishly building the nest".
Mate selection	The commencement of nest-building by the male appears to be a major factor, as may vocalizations. There are no discernable differences in male and female plumage.
Nesting activities	
Nesting cycle	Generally only one nest is constructed each season, but up to three clutches may be fledged (Pendleton, 1996).
Length of time	Time required for male to construct nest not documented.
Nest constituents.	Open, cup-shaped nest is composed of plant material. No field documentation of plant species utilized. Pendleton (1996) lists favored nesting items as "sticks, pine needles and pliable twigs, followed by hemp string cut into two inch lengths and unraveled scattered about the flight" as well as "green Easter grass and fresh Spanish Moss". Rejected items are "yarn, hair, thread, feathers, and native grass".
Nest substrate and location.	Nest woven into twigs of trees and bushes. In aviaries, will also weave nest into wire side of aviary, hanging plants or nest boxes (Pendleton, 1996).
Proximity to other nests.	Other nesting pairs are not tolerated (Pendleton, 1996).
Involvement of pair in construction	The nest is constructed solely by the male, though female may have a role in site selection (Pendleton, 1996).
Eggs	
Clutch size	Two to four (Long, 1981), though two to three appear to be most frequent (Pendleton, 1996).
Timing of laying	One egg daily (Pendleton, 1996)

Description	"White eggs, speckled, mottled, and streaked, especially at the large end, with grayish or brownish-olive." (Butler, 1925)
Incubation-Parental involvement	Female primary incubator (Pendleton, 1996)
Egg hatching-Timing and sequence	Incubation appears to commence with first egg (Pendleton, 1996) so chicks hatch on consecutive days. Ten day incubation period.
Parental involvement In chick care.	Both parents feed chicks while prior to fledging. Once chicks have left nest, feeding and guarding assumed solely by male (Pendleton, 1996).
Fledging activity.	Chicks leave nest between two and three weeks after hatching. Usually they are quite small, and remain dependent on the male (Grenville Roles and James Mejeur, pers.com.).
Chick dispersal.	While female may produce three clutches of chicks in one season, all fledged birds remain with their parents, the male providing primary care after fledging. Juveniles flock with parents until they the brown head plumage of immature birds gives way to the adult's bright red plumage, at about a year of age, at which point they become objects of aggression from the male parent (Pendleton, 1996).
Major causes of mortality.	Not documented for wild or feral populations. Pendleton (1996) regards conspecific trauma and juvenile coccodiosis as primary mortality agents in aviculture.
Predation.	Not documented.
Average life expectancy.	Not documented under wild or feral conditions. Among 41 specimens maintained at the National Zoological Park through 1928, the maximum longevity was ten years, eight months (Mann, 1930).

References:

Butler, A.G. (1925) The typical finches. ***IN*** **Avicultural Society** (1930) *Aviculture Vol.I.* Stephen Austin and Sons, Ltd., Hertford.

Long, J.L. (1981) *Introduced birds of the world*. Universe Books, New York.

Mann, L.Q. (1930) List of animals exhibited in the National Zoological Park during its first 40 years. ***IN* Mann, W.M.** (1930) *Wild animals in and out of the zoo.* The Series Publishers, Inc., New York. 295-358.

Pendleton, E. (1996) Domestic breeding of the Brazilian Cardinal. *A.F.A. Watchbird* XXIII (No.6) 9-12.

Pratt, H.D., **P.L. Bruner & D.G. Berrett** (1987) *The birds of Hawaii and the Tropical Pacfic*. Princeton University Press, Princeton.

Ridgley, R.S. (1989) *The birds of South America.* University of Texas Press, Austin.

Sibley, C.G. & J.E. Ahlquist (1990) *Phylogeny and classification of birds: A study in Molecular evolution.* Yale University Press, New Haven.

Sibley, C.G. & B.L. Monroe (1990) *Distribution and taxonomy of birds of the world*. Yale University Press, New Haven.

Sibley, D.A. (2000) *National Audubon Society The Sibley guide to birds.* Alfred A. Knopf, New York.