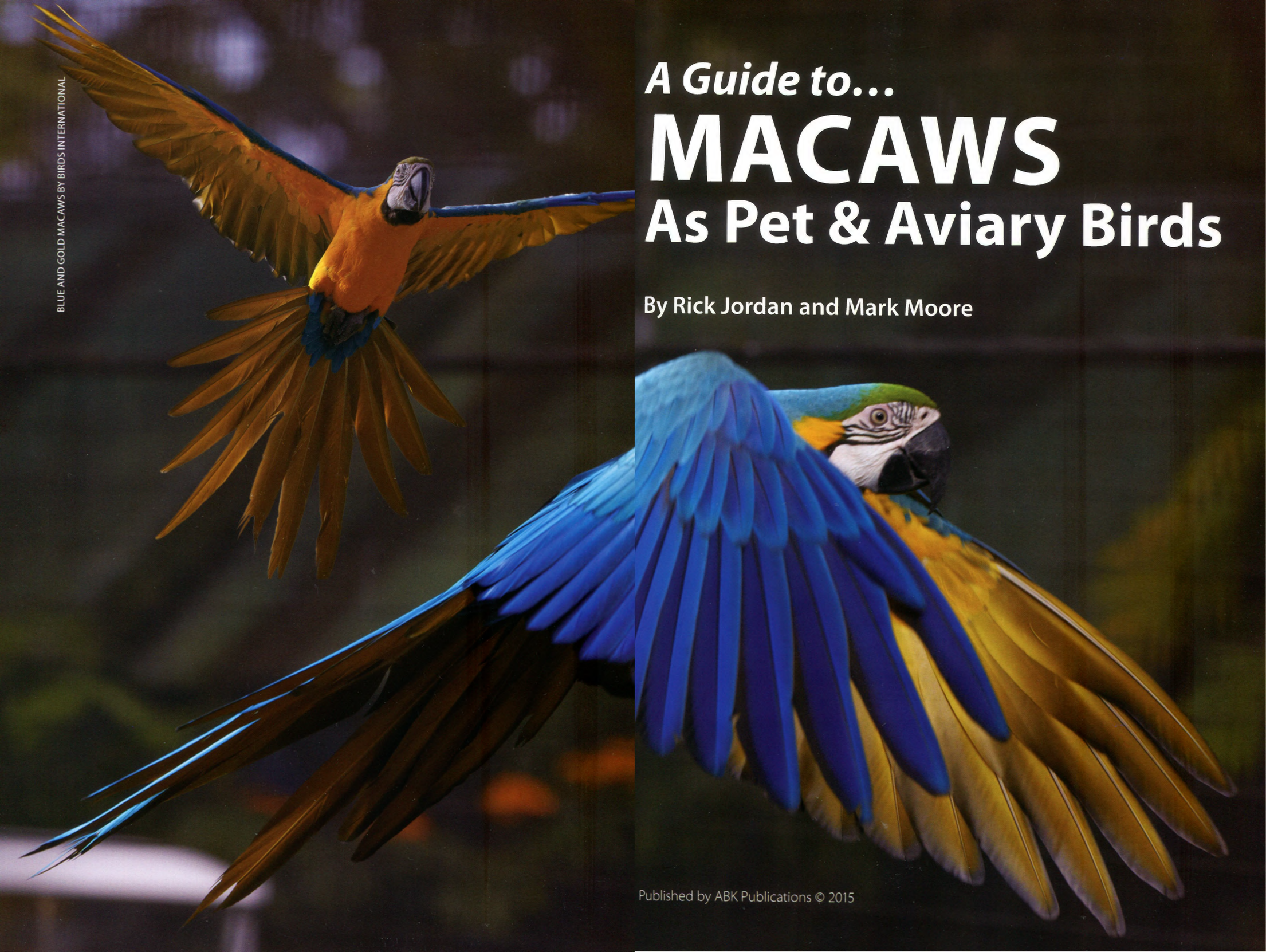
Revised Edition

A Guide to... MACAWS

as Pet and Aviary Birds

By Rick Jordan and Mark Moore



BLUE AND GOLD MACAWS BY BIRDS INTERNATIONAL

A Guide to...

MACAWS

As Pet & Aviary Birds

By Rick Jordan and Mark Moore

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COVER PHOTOGRAPHY

FRONT COVER

Main Photograph

Green-winged Macaw by David Monroger

Left from Top

Blue and Gold Macaw by Peter Odekerken
Hyacinth Macaw by David Monroger
Buffon's Macaw by Jade Welch
Blue-headed Macaw by Peter Odekerken
Red-fonted Macaw by Peter Odekerken

BACK COVER

Scarlet Macaw by Birds International

PHOTOGRAPHY

All Photographs by the authors except where indicated

Disclaimer: *Very few drugs are registered for use in birds, and most usages and dose rates have been extrapolated from mammalian therapeutics. Everyone using medications should be aware that manufacturers of these drugs will not accept any responsibility for the 'off-label' use of their drugs. The dose rates and information are based on clinical trials and practical experience, but unrecorded adverse side effects may occur. Where possible, the author has provided brand names for the drugs mentioned. These should not be taken as a recommendation for one particular brand over another, but rather as a starting point for you to find the drug of your choice. In most instances, contraindications and side effects are not listed. This should not be taken to mean that there are none—many of these drugs have not been used extensively, and reports on contraindications and side effects are not recorded at date of publication.*

Design, Type and Art Leu Creative

DEDICATION

This book is dedicated to the members and supporters of the American Federation of Aviculture Inc (AFA). At the time of publication this organisation has proudly achieved 35 years as a not-for-profit organisation dedicated to birds, bird owners, aviculturists, avian veterinarians, industry manufacturers, toy makers, vitamin supplement formulators, food manufacturers and distributors, and so much more. The AFA has been, and continues to be, an organisation of people fighting for a 'Future with Birds'.

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ABOUT THE AUTHORS

RICK JORDAN

World renowned author and lecturer, Rick Jordan has spent the last two and a half decades working with parrots, breeding parrots, and educating others about parrots. His career began in the early 1980s when he left the US Military to work for a parrot farm owned by the late Tom Ireland in Lake Worth, Florida. Following this, he sought full time employment working with parrots ending up as facility manager of the Avicultural Breeding and Research Center (ABRC) owned by Richard Schubot, in Loxahatchee, Florida.

Rick used his keen interest in parrots to develop an artificial incubation protocol for ABRC and wrote the first of four published books on psittacine biology—***Parrot Incubation Procedures***. As his career progressed, he moved on to other parrot collections, including the Loro Parque Fundación in the Canary Islands and Spain, Top Flock Aviary in Loxahatchee, Florida and Luv them Birds Inc in Miami, Florida.

He shares the knowledge gained from these experiences in several other books—***Parrots: Nursery Management***—co-authored with Howard Voren, and ***African Parrots as Pets and Breeders***—co-authored with Jean Pattison. Rick also wrote ***A Guide to Macaws*** published by ***ABK Publications***. More recently, Rick authored the online education course ***Fundamentals of Aviculture Level I and II*** for the American Federation of Aviculture Inc (AFA). He has published hundreds of articles on parrot breeding and conservation ideas in many of the more popular bird magazines as well.

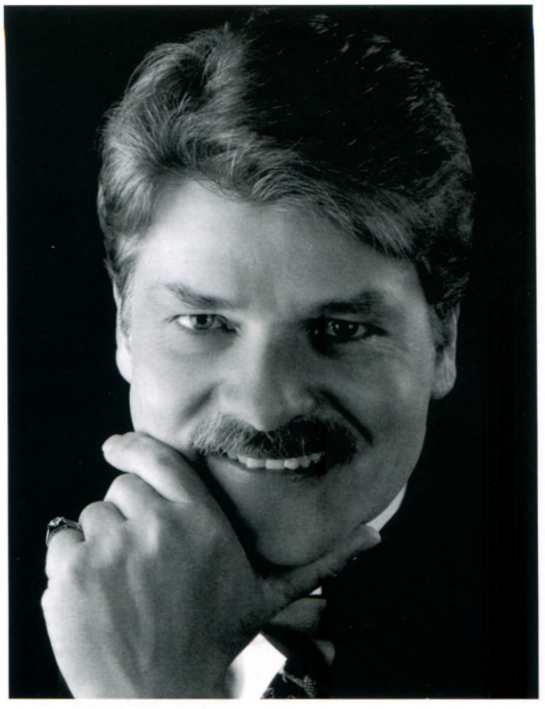
Rick and his partner, Mark Moore, own and operate Hill Country Aviaries in Texas. The facility boasts some 70 species of psittacines and has been awarded several 'US First Breeding' awards from the American Federation of Aviculture Inc (AFA). In fact, the facility is still the only one in the USA to have produced a Blue-cheeked Amazon *Amazona dufresniana* in captivity in that country. Other rarely seen amazons, such as the Yellow-lored, the Blue mutation in the Yellow-naped and the Red-browed Amazon, can be found at Hill Country as well.

Recently, Rick has turned his attention towards conservation of wild parrots and takes every opportunity to educate the public on the importance of habitat conservation and the preservation of parrots in the wild and in captivity.

Previously he served as a consultant to the government of Brazil on the Spix's Macaw and Lear's Macaw conservation committees and consulted on Maude Island, New Zealand for the Kakapo recovery program.

Rick now serves on the Conservation and CITES Committee and chairs for the AFA. In addition to his service to the AFA for the past 25 years, he is a member of numerous avicultural groups in the USA.

MARK MOORE



Mark grew up on a large farm in Pennsylvania and has been around animals all his life—including an Amazon parrot in the household. His uncle was an accomplished falconer and his mother kept doves outside the kitchen window.

Mark purchased his first parrot over 35 years ago while living in California. He kept different varieties of parrots as a hobby for nearly 20 years, learning how to care for and breed numerous species. In 1996, when he moved to Texas to assist in the operation of Hill Country Aviaries, he became a professional parrot breeder. Mark has a special interest in the smaller Australian parakeets and the breeding of colourful mutations of various popular smaller parrots, although he enjoys the challenges of some of the larger species, too.

Mark and his partner, Rick Jordan, currently own and operate Hill Country Aviaries. The facility boasts some 95 species of psittacines and has been awarded several 'USA First Breeding' awards including the Blue-cheeked Amazon *Amazona dufresniana* from the American Federation of Aviculture Inc (AFA). Other rare amazons such as Yellow-lored, the Blue mutation in the Yellow-naped and the Red-browed Amazon can be found at Hill Country Aviaries as well.

Although the farm was originally established in the 1970s, Mark and Rick have spent the last 18 years adding to the collection and expanding the nursery into a state of the art facility, where international visitors and graduate students come to learn.

During the breeding season, the Hill Country Aviary nursery can be home to several hundred baby birds and handfeeding is an around the clock routine.

Mark also volunteers a great amount of time for the AFA where he serves as editor to their quarterly journal *AFA Watchbird*, and serves as the AFA store manager.

Over the years, Mark has been fortunate enough to be able to travel to New Zealand, Mexico, Spain and Australia to see parrots in their natural environment and to view some of the greatest collections in the world.

Mark is always willing to learn new ideas and share his acquired knowledge with others.

CONTRIBUTING AUTHORS

DR BOB DONELEY BVSc FACVSc CMAVA

Dr Bob Doneley contributed the chapter *Health and Diseases in Macaws.*

Bob graduated from the University of Queensland in 1982 and worked in veterinary practices in Bundaberg, Brisbane, Toowoomba and the UK before opening his own practice, the West Toowoomba Veterinary Surgery in 1988.

Initially, his interest in bird medicine was developed shortly after graduation when he was asked to give a talk to the Bundaberg Budgerigar Association and realised that he had been taught virtually nothing on this subject whilst a student.

He was awarded his Fellowship (FANZCVS) in 2003, becoming Queensland's first specialist in bird medicine, the third in Australia. In the same year he was awarded the College Prize by the Australian College for outstanding contributions to veterinary science in Australia.

In 2010 he sold his practice after 22 years to take up the position of Head of Small Animal Services, Veterinary Medical Centre at the University of Queensland's Gatton campus. He is now an Associate Professor and Head of the Avian and Exotic Pet Service, a specialist bird practice, as well as treating reptiles, small mammals and wildlife.

Bob lectures to both University of Queensland and James Cook University veterinary students on bird and exotic animal medicine, and has published two textbooks on bird medicine, written chapters for three other textbooks and published numerous papers in veterinary journals.

CONSTANCE WOODMAN BSc M Ed

Constance Woodman contributed the chapter *Macaws as Pet and Companion Birds.*

Constance is an animal behaviourist working at the Schubot Exotic Bird Health Center at the Texas A&M University. Working under Dr Donald Brightsmith, her PhD research focusses on inducing wild behaviours in endangered, captive-raised parrots, so they can be released into the wild. She possesses two degrees, including a specialist Masters of Education from Huxley College of Environmental Science at Western Washington University where she studied the psychology of human-animal relationships.

Since 2001, Constance has worked in zoological parks and wildlife centres involving the breeding and release of rare owls, training parrots and raptors for educational shows, as well as practicing licensed wildlife rehabilitation. She has presented at the International Association of Avian Trainers and Educators and Association of Zoos and Aquariums conferences on her work with birds, including automated enrichment and training systems. She is a proud member of the American Federation of Aviculture Inc.

Constance keeps three parrots of her own—an African Grey and two Pacific Parrotlets.

ACKNOWLEDGEMENTS

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Furthermore, the loyal support of the following people is most appreciated—Matt and Allison Baird, Yara Barros, Chris Biro, Janice Boyd PhD, Barb Carapezza, Susan Clubb DVM, Concetta Ferragamo, Gary Foster, Levi Fuentes, Benny Gallaway PhD, Shane Hancock, Chris Harris, Paul Hickenlooper, Cynthia Johnson, Jean Jordan, Charles Lentz, Kilma Manso, Lisa McManus, Rick and Millie Michalek, Lucille Moore, Lyrae Perry, Cindy Ryder, Darrel K. Styles DVM PhD, Jade Welch and Jamie Whittaker.

Photographs have been contributed by many and the vigilance and enthusiasm in getting the right material to support the text has been fantastic. Particular thanks to Peter Odekerken and Jade Welch, and to the other photographers—Allan Birrell, Mark and Jaye Caudwell, Dennis Cook, Antonio de dios of Birds International, Col Gunter, Shane Hancock, Frank and Ria Illich of Ashmore Caravan Park, Rick Irwin, Cynthia Johnson of Many-Feathers, Tony J Lin, Rosemary Low, Graham Matthews of Bimbimbi Birds, Steve McKecknie of Gorge Wildlife Park, Jim McKendry, The Mills family of Perky Parrots, Steve Milpacher of the World Parrot Trust, David Monroger of pyafnet.com, Claus Nielsen, Tom and Maree O'Grady, Tod Osborne, Barbara and Harry Parish of CaraParrots, Andrew Rankmore, Gordon Rich of Wombaroo Passwell, Laney Rickman of Bird Endowment, Antonio Silva, Dorothy Schwarz, Brett and Angela Smith, Michael Stirling, Patricia Sund, Garry Taylor, David Waugh of Loro Parque Fundación, Tim Williams, Marcia Weinzettl of Criadouro FreePower, Scott and Deborah Wilson and Gail J Worth of Aves International.

Blue-throated and Scarlet Macaws at Birds International

Hyacinth Macaw
Anodorhynchus hyacinthinus

MACAWS IN THE WILD

Green-winged Macaw

PHYSICAL DIFFERENCES BETWEEN MACAWS AND OTHER PARROTS

Generally speaking, the physical characteristics making a parrot a macaw include a long, pointed tail and a medium-to-large, bare skin facial patch surrounding the eyes and/or beak. Also, most macaws have a proportionately large beak for their body size. However, not all large-beaked parrots are macaws, and not all parrots with skin around their eyes are macaws either. Like all other parrots, macaws are zygodactyl, meaning the first and fourth toe point backwards.

Macaws come in several sizes. It is not true that macaws are all large birds. In fact, the smallest macaw, the Noble's Macaw, is actually smaller than some *Aratinga* Conures, and interestingly enough, has successfully bred with members of this genus in captivity. Some biologists like to break the macaw 'group' into two subgroups—large macaws and small macaws—but the distinction is difficult since there is much variance in size from species to species.

TAXONOMY

Kingdom: Animalia
Phylum: Chordata
Class: Aves
Order: Psittaciformes
Family: Psittacidae
Subfamily: Arinae
Tribe: Arini

There are 19 species of macaw, including extinct and critically endangered species, making up six genera. Following, are the International Union for Conservation of Nature's (IUCN) Red Data status classifications of the macaw species and its trend predictions of wild populations. Keep in mind that some species may be extinct, but not yet officially classified as such, and are therefore shown as 'critically endangered' or possible extinct.

MACAW SPECIES STATUS

Species	Latin Name	IUCN Red Status	IUCN Trend Prediction
Anodorhynchus			
Glaucous Macaw	*Anodorhynchus glaucus*	Possibly Extinct	Unknown
Hyacinth Macaw	*Anodorhynchus hyacinthinus*	Endangered	Decreasing
Lear's Macaw	*Anodorhynchus leari*	Endangered	Unknown
Cyanopsitta			
Spix's	*Cyanopsitta spixii*	Critically Endangered	Unknown
Ara			
Blue and Gold (or Blue and Yellow)	*Ara ararauna*	Least Concern	Decreasing
Blue-throated	*Ara glaucogularis*	Critically Endangered	Stable
Military	*Ara militaris*	Vulnerable	Decreasing
Buffon's (or Great Green)	*Ara ambiguus*	Endangered	Decreasing
Scarlet	*Ara macao*	Least Concern	Decreasing
Green-winged (or Red and Green)	*Ara chloropterus*	Least Concern	Decreasing
Red-fronted	*Ara rubrogenys*	Endangered	Decreasing
Severe (or Chestnut-fronted)	*Ara severa*	Least Concern	Stable
Cuban Red	*Ara tricolor*	Extinct	N/A
Saint Croix	*Ara autochthones*	Extinct	N/A
Orthopsittaca			
Red-bellied	*Orthopsittaca manilata*	Least Concern	Stable
Primolius			
Blue-headed	*Primolius couloni*	Vulnerable	Decreasing
Illiger's (or Blue-winged)	*Primolius maracana*	Near Threatened	Decreasing
Yellow-collared (or Golden-collared)	*Primolius auricollis*	Least Concern	Increasing
Diopsittaca			
Noble's (or Red-shouldered)	*Diopsittaca nobilis*	Least Concern	Stable

Spix's Macaw adult (left) and juvenile—the Spix's Macaw is believed to be extinct in the wild, but is increasing in numbers under specialist captive breeding programs

Spix's Macaw chick

DISTRIBUTION

Macaws are New World psittacines originating from Central and South America and the Caribbean islands. There are several parrot genera now considered macaws under current taxonomic definitions.

Historically, there were several species of macaw inhabiting a few of the islands in the Caribbean—Cuba, St Croix, Martinique, Jamaica and the Dominican Republic are thought to have hosted an indigenous macaw at one time in their history. The Cuban Macaw certainly existed, and skins of this beautiful and extinct species can be viewed in several natural history museums across the world. If the others did exist, they are now extinct. However, in recent years, due to reintroduction by mankind, the Blue and Gold Macaw *Ara ararauna* is now breeding in the wild on the island of Trinidad in the southern Caribbean.

Blue-throated Macaws flock in wild habitat

HABITAT

Macaws inhabit a variety of wild habitats. Although many seem to prefer forested or rainforest-type habitats, there are species that live in savannah, lowland forests and desert-type areas as well. The Spix's Macaw, now believed to be extinct in nature, but growing in captive numbers, originated in a very dry area of north central Brazil, whereas the Buffon's Macaw inhabits the coastal rainforests of Costa Rica and Nicaragua. The Blue and Gold Macaw can be found in many varied habitats from forests to rainforest or even coastal savannahs.

HABITS

Generally, macaws are birds of the trees and upper canopy. They feed on nuts, seeds, leaves, bark, and fruits of palm trees and other fruit-bearing trees. Most roost in small flocks or family groups and awaken with the rising sun to go off in search of food. They are most active in the early morning and just before sundown, when they return to their roosts to settle in for the night.

Several species have been known to make an appearance in suburban areas, while others live in habitats so remote that it may take 10 hours of off-road driving to see them in their natural setting. Some may feed on the ground while others never seem to come to the ground for any reason.

Scarlet Macaws flock in the upper canopy of a fruit-bearing tree

Fruits of the Moriche Palm

Palm nuts are a popular food with the Military and other macaw species

FEEDING

Palm nuts are a popular food with the Military and other macaw species.

Macaws are like most parrots in that they seek out seeds, nuts, and fruits (mainly wild figs) of trees as their main staple. Each species has its favourite foods and will fly many miles to search out a viable food supply. In terms of idiosyncrasies, macaws have many. But they also do inexplicable things such as gather on river banks to eat clay—thought to help neutralise toxins, although this was recently refuted. Others crave the flowers of certain blooming cactus and some seek out palm nuts—but will raid corn crops if the palms are not fruiting at the time.

Macaws are vegetarians. It was once thought they might be omnivores—perhaps ingesting insects or even small mammals—but this has yet to be proven by researchers and is actually refuted by diet-analyses and studies. Probably the two main food items of a wild macaw's diet are palm nuts of some variety, and wild figs—the berries of different types of *Ficus* trees. Macaws will raid crops, especially corn crops and fruit trees if the opportunity arises, but they are not considered crop pests except in the most remote regions of Brazil where local farmers rely on their small crops to live.

BREEDING

Wild macaws are believed to stay with the same mate year after year, unless one or the other dies. The majority of the species utilise the hollows of dead trees for their nests, but there are some that nest in cliff caves or openings. One species, the Lear's Macaw, nests in cliff faces in dry scrubland and has never been known to nest in tree cavities as most macaws do.

Nesting usually commences right before their favourite food is abundant—most often after the rainy season. Clutch sizes range from 2–3 eggs for the very large macaws, to 5–6 for the smaller species. Incubation times vary from 24 days to almost 30 and fledging ages can be as varied as 10 weeks to several months. Young macaws begin to eat food on their own as soon as they emerge from the nest, but are not completely independent for several months. They may remain with the family unit for long periods of time, not due to necessity or because they cannot feed themselves, but more for social reasons.

CONSERVATION STATUS

The IUCN maintains the Red List of Threatened Species. This list is the world's 'go-to' for the status of a species in its native habitat and is used by conservation groups, government and non-government agencies, and other specialists across the globe. Top scientists in the field evaluate species for this list and provide the most up-to-date assessment of their conservation status.

It is important to mention that the conservation of parrots in general has been difficult in the past few decades. From the 1960–1990s, parrots were trapped and collected from the wild in devastating numbers. The worldwide demand for parrots as companions, zoo exhibits, and even for collections during this time period, was high. Since little was known about most parrot species, legal commercial trade took its toll on wild populations. Today, many countries have

passed internal laws to compliment the rules of the Convention on the International Trade in Endangered Species (CITES) and are prohibiting or severely limiting the numbers of wild birds that can be imported. Now the international trade in parrots is predominantly comprised of those hatched and raised in captivity. The dynamics of trade has changed in the past 10 years, and it is time for CITES to change and make the necessary adjustments to allow continued trade in captive-bred parrots.

One could debate various aspects of the commercialisation of parrots. Knowledge of parrot biology, physiology, dietary and emotional needs, and beyond, is more extensive today because of the opportunity to study them close-up and in captivity. Strangely enough, although the high volume of collecting and trapping has diminished wild flocks, in the end, it may prove to be an integral part of their salvation. Parrots and their plight are well known. They have become a main focus for conservation—breeders, pet owners, and exhibitors who were once part of the demand for wild parrots, are now the main advocates for their conservation in the wild.

Breeders and pet owners in the USA have formed non-profit foundations devoted to macaw conservation and other parrot preservation. Parrot owners around the world donate to conservation programs and contribute necessary knowledge about these birds to aid biologists working in the field.

Since its inception in 1994, the Loro Parque Fundación (LPF) has responded to the conservation needs of macaws, arguably the group of parrots whose wild populations are most threatened by human activities. The LPF has contributed over US$3 million to projects to help protect and recover these magnificent birds. They are making huge strides in the conservation and habitat preservation for many species of parrots worldwide. A private owner in Qatar now breeds more Spix's Macaws in one year than were flying free in the wild in the late 1800s. Politically correct or not, parrot owners, breeders, and companion parrot people are making a difference in the conservation of wild parrots.

Conservation efforts and financial support from groups such as the Loro Parque Fundación, Asociación Armonía (the Bolivian partner of BirdLife International), Bird Endowment and other collaborations have involved extensive research in the native habitat to locate Blue-throated Macaws and installation of supplemental nest boxes. Several large ranches were purchased to create the first-ever protected area of the 4254 hectare Barba Azul Nature Reserve, now increased to 11 000 hectares. The acquisitions were made possible with donations from the American Bird Conservancy, World Land Trust and many others to facilitate conservation of this species in its natural habitat.

Other organisations that have contributed towards conservation efforts with macaws, among other parrot species, include Parrots International, the American Federation of Aviculture Inc (AFA), the Lymington Foundation, Environmental Conservation Organisation (ECO) and Parrot Park Iquacu in Brazil, and the World Parrot Trust.

The World Parrot Trust (WPT) is devoted to protecting parrots, the most threatened group of birds on earth. Utilising the expertise of leading parrot biologists and welfare experts, the WPT delivers effective strategies to help parrots survive in the wild and thrive in captivity. The WPT works in partnership with local and international NGOs, scientific institutions, local communities, individuals and governments around the globe. It represents the most comprehensive effort of its kind and has aided 66 species in 42 countries since 1989.

Blue-throated Macaw breeding in artificial nestbox located in wild habitat in Bolivia

Spix's Macaw

Almost certainly extinct in the wild since 2000, this species population is slowly growing in captivity with the number exceeding 80 birds, at the time of publication.

In 1989, Loro Parque established a working agreement with the government of Brazil, which has been continued by the LPF to recover this species through captive breeding and habitat maintenance for future return of captive-bred birds to the wild. The program has concentrated on creating a sense of pride for the Spix's Macaw within the community. Until 2002, it monitored and protected the last known wild male in north-east Brazil, and researched its biology. During the same period a great effort was made to protect and restore their habitat. In recent years, they have focussed on improved captive breeding in the LPF Breeding Centre, and the most recent phase has involved returning Spix's Macaws to Brazil to continue the project in its place of origin.

Spix's Macaws are reportedly extinct in the wild—aviculture has saved this species in captivity

Lear's Macaw

Following the LPF project partnership with the government of Brazil, and allied efforts, the wild population of Lear's Macaws has increased to almost 1 200 specimens and its status has improved from Critically Endangered to Endangered.

This species lives in only a small region of north-eastern Brazil, and is closely identified with the Licuri Palm whose fruits it eats. The project has focused on the local communities to reduce the incidence of damage from grazing, illegal capture of young and persecution by farmers for their raids on maize crops. The beneficial use of Licuri Palm leaves to make local crafts and labeling to connect the crafts to the macaw has been an economical and sustainable project.

Lear's Macaws feeding on Licuri Palm fruit, a primary food source for this species

Continued research into the ecology of the Lear's Macaw includes remote monitoring using cutting edge technology.

The Loro Parque Fundación remains the primary contributor to the captive population, which will be used to establish new populations of Lear's Macaws in the wild. Also working in Brazil, ECO are planting Licuri Palm trees and performing valuable work and research to support the increase in the Lear's Macaw wild population.

Blue-throated Macaw

In 1995, the Loro Parque Fundación started supporting the Bolivian NGO, Armonía, in conjunction with the department of Beni in Bolivia, to recover the Blue-throated Macaw in the location to which it is endemic and only scientifically recognised in 1992.

It was listed as Critically Endangered—the major threats being habitat destruction, previous illegal trade as a pet and hunting for feathers—leaving a tiny population of perhaps less than 50 birds. The project has been so successful that the population may now be as high as 350 and is slowly increasing.

The project has achieved high awareness within local communities about the need for protection of the macaw, especially through the replacement of real macaw feathers with artificial feathers, used as decoration in the traditional headdresses of the native people.

The creation of 11 000 hectares in the Barba Azul Nature Reserve provides an area protected from livestock, with a field station to provide logistical support to researchers studying the population of the Blue-throated Macaw. Widespread installation of artificial nests has resulted in the recruitment of more young birds to the population. The Loro Parque Fundación holds the international studbook for this species, and by breeding more than 300 specimens, has contributed to a healthy captive population as a safety-net.

Buffon's (Great Green) Macaw

The Loro Parque Fundación has supported action for the conservation of the endangered Buffon's Macaw in south-eastern Nicaragua and northern Costa Rica, and also in south-western Ecuador. It mainly inhabits forests below 600m, normally humid, but in the case of south-western Ecuador very dry. In Central America the mountain almond tree is the key to the species, and selective logging has contributed greatly to the rapid and continuous decline experienced in the wild populations of this species.

Mahoe seeds—food of the Blue and Gold Macaw

Blue-throated Macaw chicks in a wild nest box placed by Asociación Armonía with support from Loro Parque Fundación and affiliated conservation groups

Three Blue-throated Macaws raised together by a wild pair in one of the Bird Endowment's Nido Adoptivo™ nest boxes placed in Bolivia by Asociación Armonía

At all sites, the Loro Parque Fundación has discovered new aspects of the ecology of the species, and promoted the protection of the species and its habitat. In Central America the Buffon's Macaw is a flagship species, and the study of the seasonal migration of this species here is considered fundamental to sustain the Mesoamerican Biological Corridor.

Although the species faces a difficult situation, the censuses show that the population is increasing in the project region.

Military Macaw

The Loro Parque Fundación supports three projects for the conservation of the Military Macaw at the extremes of its geographical range—two in Mexico and one in Argentina. In these regions this species faces the same problems of trafficking of nestlings and destruction of habitat. Each of these projects involves working with local people to increase protection on the ground, and at one site includes community monitoring.

Blue-headed Macaw

The main portion of the wild population of this species occurs in Peru, in the lowland wet forest east of the Andes. Here the Loro Parque Fundación has partnered with the government of Peru to undertake monitoring of Blue-headed Macaws. Although alteration of the forest habitat is progressing, the results of the monitoring confirm recent studies which show that the species is safer than considered previously.

Scarlet Macaw

The populations of the northern subspecies *cyanoptera* of the Scarlet Macaw have declined, due mainly to widespread removal of young birds from the natural nests for the pet trade. The Loro Parque Fundación has assisted projects in Guatemala and Belize to improve the guarding of nests, and also to recruit more young birds to the population through nest supplementation and installation of artificial nests in the forests.

Military Macaws feeding on the Sandbox Tree

Scarlet Macaws at Tarcoles Beach, Costa Rica, feed mainly on the fleshy seeds of this indigenous tree

Buffon's Macaw
Ara ambiguus

MACAWS IN CAPTIVITY

There are considerable differences between the size and personalities of macaw species. It is important to research species suited to your experience, location and whether you want a pet or breeding macaw

GENERAL MANAGEMENT

CHOOSING YOUR BIRD

Depending on the laws and importation status of the country in which you live, you may have access to 'wild-caught' parrots—birds that have been trapped and removed directly from the native habitat in their country of origin. Or, as is the case in most countries now, you may have to make your selection from birds that have been hatched in captivity. Either way, it is important to know the origin of the birds you select as your pets, companions or breeding stock.

Birds that have been trapped in the wild and imported into captivity will often look, act, and sometimes, even smell differently to those hatched locally and raised by an aviculturist. It is important to remember the stress that a bird will go through being trapped, transported,

quarantined and finally sold to the public. This stress can have detrimental effects on the overall plumage or health of the individual bird and, although most will survive the ordeal, they often need extra time, better nutrition, or even supportive therapy from a good avian veterinarian to settle into captivity either as a pet bird or an aviary subject.

Macaws that have been removed from the wild will often exhibit poor overall feathering. There may be broken feathers on the wings and tail, or missing or discoloured body feathers. This is to be expected and is not necessarily an indication of poor overall health. The feather quality of wild-caught birds is more often a result of their capture and transportation rather than previous nutrition. In fact, if one were to view these birds in their native habitat prior to capture, probably the first noticeable thing would be their reflective and near-perfect plumage. Depending on the time of year, their body weight, alertness and overall agility would be at their best too. These are the very attributes of a bird that should be reviewed when choosing a subject to be kept as a companion bird or an aviary breeder bird.

Macaws, whether wild-caught or captive-hatched, should appear to be confident on the perch. The plumage should contour the body and appear sleek and colourful and their eyes should be open wide and appear alert to any movement or activities in the area. In other words, if a macaw exhibits poor posture and seems a bit off, it probably is. Birds naturally hide their illnesses and weaknesses from observers and this makes it difficult to assess whether a bird is healthy or feeling its best.

Within the past decade or so, the captive breeding of macaws has become commonplace in most countries. Therefore, the choices presented will more than likely be birds that were hatched in captivity, not captured and taken from the wild. This is a positive situation for all concerned. Birds raised in captivity are usually relaxed around humans, giving us the opportunity to study and assess their overall health during an external examination. Fearful behaviour and posturing makes an overall examination difficult.

Some of the popular macaw species selected as companion birds

SELECTING A PET MACAW

Bonding

This Hyacinth Macaw displays a special bond with his keeper

The trend in recent years has been for pet owners to choose a baby bird before it is weaned and sitting on a perch. The idea behind this practice was that the baby bird would 'bond' with the future owner and the relationship between the two would be enhanced. More than likely this is not really the case—at least not from the bird's perspective. Humans may bond with a newly hatched baby macaw and enjoy watching it grow into the companion they seek, but the bird itself is not necessarily going to bond to the human at such a young age. In fact, if that were true, it would be difficult to find a good companion macaw because they would all be bonded to the person who handraised them. This practice of choosing a baby macaw before it is fully weaned and independent is not necessary as a rule and, in some cases, is not legal.

Baby macaws grow very rapidly. They can go from a 16g hatchling to an 850g or larger fully feathered macaw in as little as 12–16 weeks. There are some important stages during this development—some that may require special attention. However, for the most part, these birds are growing, eating, and sleeping as their natural and wild counterparts would in their country of origin.

The stages before a baby bird reaches full independence (eating on its own) can be likened to that of a human toddler. They are exploring the world, learning to balance, and getting the feel of their wings and feet. It is unlikely they are really bonding to any one person or bird during this process. And although there are many theories on this subject, the fact remains that fully fledged and weaned baby macaws can make incredible companion birds for the right person, even if they have never met before. Baby macaws are very versatile, curious, and often gregarious birds. Their adaptability enables them to adjust to new environments and new people along their journey in life.

As with human toddlers, playing and exploring is an important part of development in a young macaw. Young birds coming from breeders who encourage them to 'play together' during their growth weeks, are often more stable. These well-socialised birds are usually not shy and will go willingly to anyone that reaches out to hold them. They may enjoy cuddling up against a person more than a bird that was not allowed to socialise during development. If they were provided with different 'toys' to play with, they will probably be more adventurous and less likely to show fear towards new objects introduced into their environment.

Choosing a Young Macaw to Be Your Companion

The first step is to choose a store or breeder that takes good care of birds. You want to start with a healthy bird that has no physical or emotional needs that you cannot fulfil. It is often wise to stand back and observe young birds in their current environment before choosing the one you *think* is for you. Assuming they are all healthy, their eyes are bright, their plumage is shiny, they are alert and active, and their muscles are developed properly, choosing the right bird is like choosing the right puppy. The one that seems most interested in you may be the one that you should choose. Generally speaking, a bird that shies away from people or from a perspective pet owner may not be ready to go home yet. It may benefit from more time socialising with other birds and playing

These young Green-winged and Blue and Gold Macaws look alert, are in good feather and are healthy

Hyacinth Macaws have a most endearing nature as a pet, but grow to be large birds

with toys to build its confidence. Of course there are exceptions to every rule, and maybe a slightly shyer bird is exactly what you seek. The choice you make has to be made with your specific needs and desires in mind. If you don't want a loud, active, and gregarious pet bird, maybe a macaw is not for you. Or, maybe you can find the one out there that is a little more reserved and wants to spend time in a quiet home where confusion and chaos is not the norm.

Educate Yourself

It is vital that new pet owners educate themselves before they buy a pet bird. The internet is rife with misinformation, but it also offers places where a new bird owner may find the proper encouragement—it is important to choose wisely. Chatting with other macaw owners can often be a good first step in the education process. Signing up for pet parrot education classes or participating in blogs where people talk about their pets is a good idea too. But learn to sort the good information from the bad before you take on the confusing task of educating yourself about bird ownership. The breeder or pet store owner should be a person you can trust and the best place to ask your very first questions. If you do not feel confident that this is true, it might be wise to look elsewhere.

Although breeders are often very busy people, if you choose to buy directly from them, and they choose to offer sales directly to the pet owner, then they should take the responsibility of providing the initial education needed to properly care for your pet bird.

A Lifetime Decision

It seems important to mention that our lives change over the course of time. Our households may change as well. People can go from being single and living in an apartment to being partnered and raising several children in the household. These are things that must be considered when making a decision to take on a companion parrot.

Macaws can live very long lives—much longer than a pet dog or cat. Therefore, making the decision to get a pet macaw should not be taken lightly. Keep in mind that this bird may be with you through all the changes in your life. Macaws are very adaptable and they will accept new environments, new people, new places, but these changes may bring on changes in the birds themselves. Remember that your life changes will affect the pet macaw and it may change in order to adjust to its new environment. This is one of the reasons that people may decide to

give up a pet bird and sell it to the next owner. Although the bird will adapt once again, it is the responsibility of the pet owner to consider the long haul when choosing a macaw as a pet and not make a decision knowing they will have to re-home or abandon their bird at some point.

Adopting an older macaw may be the perfect situation for you. As mentioned, lives and priorities change. This means that there are often older birds in need of a new home. Some of these older birds may be more suitable as breeders, but many are pet birds that will flourish if given another chance as a companion bird. Interview the bird as you would a young, newly weaned macaw. Pay close attention to its behaviour towards you and make sure to spend time alone with the bird, away from its current owner where possible. Birds will act differently when with the people they are most used to seeing and interacting with. If an older bird is acceptable to your situation, find a good rescue or re-homing agency that finds new homes for healthy birds.

The responsibilities associated with caring for a macaw, such as these Scarlet Macaws, must be considered carefully—a healthy large macaw could live for 50–70 years and a small macaw for 30–40 years

SELECTING MACAWS FOR BREEDING

Green-winged Macaws are commonly bred in captivity worldwide

There a several forms of Scarlet Macaw and it is important to pair the same form for breeding

Health and Species Characteristics

Choosing birds to be used as breeding stock is a slightly different process to that of selecting a companion parrot. When breeding is the goal, the most important attribute is that the macaw is the same as the species it is to produce. In other words, a breeder should select birds that represent a healthy specimen true to a particular species and make sure that they are not too small, too large, discoloured or show signs of old age or genetically based physical limitations.

Long-term breeding requires healthy breeding birds. Some form of veterinary testing regime should be organised—discuss this with your avian veterinarian. Tests should determine whether a bird is harbouring disease or has physical problems not readily discerned by an external physical examination.

All birds brought into a breeding situation should be quarantined for a few weeks for observation and to ensure they will not spread disease throughout the collection.

Sometimes a bird that has a limiting physical issue, such as a missing eye or a damaged wing, can make a great breeder bird and produce young that fully represent the species. In such cases, mate selection will be very important to the process. A mate that will accept this physical limitation is important to breeding success. Handicapped birds often breed, but not if they are harassed by their mate. There are cited cases of macaws that were totally blind but became very dependable breeding birds. There are other cases where birds with a missing leg or foot also proved to be good parent birds. However, these are exceptions and these birds will require some special care or treatment, something that needs to be considered before attempting to set them up for breeding.

Illiger's (left) and Hahn's Macaws—both species make good pets, however as they are rare, it is important to focus on extending the population through breeding

Breeders should be aware of potential genetic issues in their breeding stock. Some genetic issues are obvious while others may be subtle. Crooked beaks, twisted toes, missing toenails, and other issues may be the result of accidents during their neonatal stages of life, either by the parent birds or the aviculturist. These issues are not necessarily genetically inherited and therefore will not manifest themselves again in the chicks produced. But weaknesses observed in adult birds, such as bad posture, heavy breathing or panting, head twitches or drooping wings, may be an indication of serious physical or medical problems, and therefore should be avoided.

Commonsense is called for by breeders—they must choose breeding stock that is strong and healthy in order to produce strong and healthy progeny.

Behavioural Issues

Behavioural issues in adult macaws are one of the most common reasons a bird may be offered for sale. Feather mutilation, plucking, and constant screaming are probably the three most common excuses given when someone decides to re-home or sell a bird. Although feather issues are generally not contagious, and are most often an individual issue if parent-rearing is planned, this trait may be passed on to progeny as a learned behaviour. The same could be said of constant screaming. It is therefore wise to decide how you will manage your breeding birds before you make the choice of breeding stock. If chicks are to be parent-reared, only those birds that do not exhibit behavioural issues and are healthy should be chosen. For aviculturists who plan to pull eggs, incubate and handrear chicks, some leeway can be given.

In fact, it is not unusual to hear a seasoned aviculturist say their best pair of breeding birds 'are plucked' or something similar. Some pairs of birds kept in captivity, especially those that seem

Feather picking is evident in this Hahn's Macaw

To avoid being bitten by a bird that is being restrained, place a firm grip around the neck and up against the lower mandible ensuring that the chest and abdomen are free to move to prevent suffocation

to 'live to breed', may over-preen each other or even pluck their own feathers. Mutilation, however, is not common in breeding pairs. It is interesting to note that breeding birds usually do not target their flight feathers, and rarely their tail feathers. It is most often the body, back, or head feathers that they clip, chew, or pluck.

HANDLING MACAWS

Restraint

It is often necessary to restrain a bird. Using a towel is preferred when a macaw must be handled and inspected closely or when a procedure is being performed, such as drawing blood for DNA testing, trimming toenails or a beak, or because the bird has injured itself somehow.

Improperly restraining a bird can cause its death. The most important thing to keep in mind when you restrain a bird is that the chest and abdomen must be free to move in and out, or the bird may suffocate. To avoid being bitten by a bird that is being restrained, a firm grip around the neck and up against the lower mandible is necessary. It is almost impossible to strangle a bird by placing a hand around its neck. The trachea is a horny, hard structure that is not easily collapsed and therefore, a firm grip around the neck and trachea will not hamper airflow.

Birds, especially macaws, are very strong. They can kick out, push their wings outward, and pull their neck in tight in one rapid movement, quickly freeing themselves from the inexperienced holder. For most procedures, it is wise to wrap the bird in a towel to help keep the wings down along the body and to keep the feet from breaking free and the sharp nails from penetrating skin. An experienced holder may be able to do this without a towel, by placing one hand all the way around the bird's neck and holding the wings and feet with the other hand. The handler will need to pull gently in opposite directions, maintaining some pressure on the lower mandible and feet, or the bird will wiggle its way loose enough to take a good bite, causing the holder to release it.

Birds that have their faces exposed, as when they are captured in a towel, will stress and scream more than if they are totally closed in a dark net. A net is preferable if the task is to simply move the bird from one place to another. A dark net of strong fabric is recommended for capture from the cage. If the fabric is dark, the bird will usually feel helpless and stop struggling almost immediately. The net should be large enough to allow the entire body of the bird to slide into the bag part of the net. At this point, the handler can simply draw the netting up around the feet, forcing the body and head tightly into the bag of the net. Transport the bird to where it needs to go before releasing it. This is a less stressful way of carrying or moving a bird.

Transportation

There are many reasons a macaw may need to be transported, either by car or air. In all cases, the most important thing to remember is safety first. Crates must hold up to travel and to the

A macaw can chew out of a container if it is not constructed of strong material

Provide food and moisture that will not spoil, such as pellets and apple for the duration of transportation

possibility that a bird may try to escape in transit. A macaw can chew out of a container in short order if it is not constructed appropriately. The heavy plastic kennels made for small dogs will usually work for short trips such as a trip to the vet surgery, but if the bird is to be in transit for extended periods of time, the container may need to be more resistant to chewing and it should insulate the bird from extreme temperatures.

Macaws have large flat feet and can balance perfectly well on the floor of the carrier, so they don't really need a perch during transport. This is often a point of contention—the common thought is that all birds need a perch at all times. This is not true and, in some cases, the added perch can cause injury or even death. Adult birds may benefit from a perch mounted into the carrier or dog kennel. Position the perch very low or, if possible, against the floor of the kennel. This will prevent strange accidents such as the bird getting its head or foot lodged under the perch during transport. Younger macaws should not be provided with a perch in the crate or carrier unless it is directly against the floor. Young birds will get their wings, head or feet caught under an elevated perch and may arrive with a broken leg or wing.

Air Travel

If a bird is to be shipped via an airline, it is recommended that you construct a wooden box for its safety. The box should be large enough for the bird to move around in, but not so large that it can flap its wings or jump long distances. Birds can be injured if they flap their wings or jump with enough energy to hit their heads on the top of the crate. For this reason, standard bird shipping boxes are made rather small and shallow. Always provide good air flow through the box by drilling some one-inch holes in the sides that do not have wire windows.

Airline shipping boxes need to be marked clearly with 'LIVE BIRD' or 'LIVE ANIMAL' on the side so the airline employees do not leave them sitting outside in bad weather. In some countries it is also required to list the species and number of birds to be contained in the box. Always supply an emergency phone number or point of contact on the box.

Be sure to provide enough food and fresh fruit or vegetables for a day or two, just in case of a delay in transport. It is not recommended that water be supplied for trips less than 12 hours in length. Water will undoubtedly be spilled and will wet the birds inside the crate. If the weather is cold, or the airline compartment is cold, the bird could be chilled and become ill. Necessary moisture can be supplied with cut-up apple, pear, carrot or other fruit or vegetables.

There are very few incidents in which a bird is killed or injured by the airlines when compared to the thousands of birds that are transported by air each month. The most common accidents are often the fault of the person who designed the transportation box rather than the airline employees themselves. Boxes that are very tall and allow birds to jump can cause head injuries, and toys that swing, or loose pieces of wood can be thrown against the bird, causing injury. Heavy ceramic

bowls can cause severe injury or even be ingested during transport and, as mentioned, perches are the main cause of leg and wing injuries. The shipping box needs to be kept extremely basic for travel. Events along the way may frighten a bird causing it to react—flapping its wings frantically, or jumping in fear—this is when injury can occur. The best boxes are actually those that allow limited movement of the bird, but allow them to see out of the crate. Shipping can be stressful to the bird, but it is usually more stressful to the owner who does not know what to expect.

It is important to mention that shipping unweaned baby birds is a risky business as they can succumb to injury or death. To reduce any risks of accident or injury during shipping, and if unweaned birds '*must*' be shipped, it is best to ship when they are almost fully feathered and have the ability to thermoregulate their bodies. It is, however, easier to pack baby birds for shipping than fully grown macaws, as they can be placed into compartments in the box together in small groups. This helps them keep warm and provides some familiar feelings and sounds during transport.

Also, it is important to choose direct flights—if this is not possible, make sure you know a hand-feeder, store owner or some other person in the city where the flight connects, who is willing and able to go to the airport and pick up the birds if the flight is cancelled or placed on an extended delay. It is inhumane to ship unweaned birds and allow them to starve during transport. A fully functional plan where baby birds can be intercepted along the way is necessary. Mark the shipping crate with all emergency contact information from the origin of the flight, through its connections, and on to the final destination.

This Green-winged Macaw is a new addition to a collection—regardless of how healthy it appears, it should be placed in quarantine before being introduced to other aviary occupants

QUARANTINE AND HYGIENE

Quarantine

Quarantine is the process of isolating new birds when they first arrive in a new location, or are going to be introduced to a collection, flock or store. Isolation is suggested because birds can hide their illnesses and it is not always possible to recognise a sick bird. If a new bird is harbouring a lethal virus, or is in the stages of developing the associated disease, a short isolation process may save the lives of all the other birds with which they come in contact. Quarantine procedures should be followed for six weeks.

On arrival at a new location, all birds should be isolated from other birds in a separate room or, better still, another building. When an employee enters the quarantine area, they should be considered contaminated and not be allowed to return to areas housing other birds until they have showered and changed their clothing and shoes. Many aviculturists provide separate shoes and hospital gowns for attendants of quarantined birds. All food and feeding supplies must also be kept separate and washed or disinfected before being used on other birds.

Travelling is stressful for birds. This stress may cause a bird to develop an otherwise latent infection, often spreading the disease to other birds. The purpose of quarantine is to isolate that

spread to an area of least concern. Seek veterinary advice whenever planning to introduce new birds into a collection or to bring new birds into a retail store.

Hygiene

Hygiene is very important in the avian nursery. Baby birds are easily infected with common bacterial problems that can lead to their illness or death. Keeping counters, supplies, and equipment clean and disinfected, is probably the most time-consuming part of raising birds. In the quarantine area, it is vitally important to practice good hygiene. One lazy day can result in the infection of an entire collection of birds. Remember, even where birds do not have contact with other birds, the keeper's hands move from one cage to another, changing bowls or feeding and watering. The result is basically the same thing—pathogens are moved between cages and birds more often by human hands or feet than by the birds themselves. Washing hands, wiping all surfaces with bleach or other disinfectants and mopping the floor daily will considerably reduce the chances of spreading disease.

STRESS

Stress affecting the body has been defined as physiological stress and represents a wide range of physical responses that occur as a direct result of a stressor causing an upset in the homeostasis of the body. Upon immediate disruption of either psychological or physical equilibrium, the body responds by stimulating the nervous, endocrine and immune systems. The reaction of these systems causes a number of physical changes that have both short and long-term effects on the body.

The term 'stress', as it applies to our birds' lives, is similar. Stress occurs when 'something out of the norm' happens to a bird. A good example would be when a bird is netted or captured from its cage and examined by a veterinarian. The heart rate increases, respiration increases, and the long-term effects (if a bird is harbouring any illness at all) are a weakening of the immune system and subsequent illness.

Stress can also cause death. There have been cases where a bird seemed totally happy and content, sitting on its perch daily, climbing around, eating and behaving normally. If the owner decides to move the cage or move the bird into a new cage, the capture can cause the bird to go into cardiac arrest or respiratory failure. Generally speaking, this indicates the bird was ill—probably had a weak heart or some respiratory illness—but the stress of grabbing the bird and causing its heart rate to increase, caused a fatal event.

MOULTING

The term moulting refers to the process by which a bird replaces feathers while growing new ones. It is a natural process that occurs in all birds, usually once or twice a year. It often coincides with the breeding season (occurring afterwards) or with some dramatic change in weather or seasons. Birds rarely lose or replace too many feathers at one time to cripple their ability to keep warm or fly. And interestingly enough, moulting is often symmetrical, meaning the same feather on the right side is replaced at the same time as the same feather on the left.

Sometimes we hear the expression 'heavy moult' with reference to pet birds. More likely than not, if a bird is replacing numerous feathers at one time and actually appears 'ratty' during the process, something has triggered this unnatural moult.

Many things, usually stressors, can cause an unnatural moult. Diet changes, organ failure, extreme heat, extreme dry or humidity, stress, feather breakage and more, can cause a bird to go into a 'heavy moult' to replace damaged or old feathers. Usually there is nothing to worry about unless the bird continues to moult out the new feathers as well. Your veterinarian may be able to offer some assistance for birds that experience a heavy moult on a regular basis. Nutritional issues could certainly cause a bird to moult more often than normal.

HOUSING

Conventional Aviaries

The term conventional aviary applies to any of the original styles of aviary buildings in which there is a floor or cement slab inside the cage. These cages are often called 'walk-in flights'. A few decades ago, parrot aviaries were frequently constructed using timber frames and wire-fronted flight areas where the birds lived and bred. There was usually some type of service area under the roof where food, water and nests were protected from the rain. As aviculture has progressed, wooden structures, although still used, have been replaced by metal buildings, sheds, or even greenhouse-type structures. When timber is used, it must be maintained on a regular basis, as parrots chew the support beams and other wood structures.

Walk-in flights are designed to give enclosed birds more flight space. Inhabitants fly from ground to perch, or from perch to perch, providing much-needed exercise for parrots fed high-fat diets. Flights can be planted with trees, shrubs, grass, and other natural greenery, but experience tells us that it will quickly be destroyed by most captive parrots—especially a gregarious pair of macaws. One steadfast rule is that flight cages designed for macaws must be constructed of sturdy materials that can resist their strong beaks.

These conventional ground-based aviaries are constructed of quality materials with nest boxes positioned for external inspection

It is recommended that aviaries be constructed of heavy gauge wire and metal. Include an access corridor or aisle at the back of the aviary where food and water dishes are easily accessed and where the nest boxes are hung under-roof and protected from the elements. This aisle also provides a safety area in case birds escape from the individual flights. Doors on the flight cages should open into this safety area.

Large, enclosed aviary buildings can be constructed to house a number of smaller conventional or suspended aviary cages. The systematic placement of cages makes for easier feeding, reducing time to move from one cage to another. Be sure to monitor that breeding pairs housed like this are not aggravated by neighbouring birds. Pairs should seem content with their mates and not spend inordinate amounts of time hanging on the sides of the cages, or screaming at birds nearby.

Red-fronted Macaw—note the double layer of heavy gauge wire installed to protect conflicts between neighbouring birds

Flooring

Cement

When ground-level flight cages are used for breeding, the flooring or 'substrate' that is used becomes important. If using concrete, include an outward-sloping area that leads to gutters so that water is forced to flow away with the debris or dirt that is hosed off the aviary floor during cleaning. Although cement floors are easier to clean and disinfect, daily hosing may become too invasive for breeding birds. Additionally, hosing cement floors every day changes the environment and increases the humidity in the nest box. This can lead to high percentages of 'dead-in-shell' eggs due to elevated humidity incubation. From the standpoint of disease control, pathogens shed in faeces can become airborne when high pressure hoses are used to clean cement floors. This scenario can very quickly spread a lethal virus throughout a collection of birds. Although cement floors look good, they are not always the best choice.

The birds to be housed should also be considered. Weak flyers that frequently hit the ground should not be housed in aviaries with cement floors. Many birds become injured due to regular crashing on cement floors.

Natural Substrate

The flooring of outdoor flight cages can be covered using sand, pea gravel, rock or other natural substrate. The concern with such materials is cleanliness, but depending on the climate of the area, nature often takes its course with natural substrates. Insects and other biological cleaners work on faeces, food and other debris that is dropped to the floor. It may still be necessary to rake up debris on a regular basis.

An idea is to place rock in the flight, with a strip of sand or small-sized gravel directly under the perches and food stations. This allows for easier raking and cleaning in the areas that become soiled fastest.

Suspended Aviaries

Suspended aviaries are a popular design and the size need not be a compromise on flight space or length. They are basically cube or rectangular-shaped wire cages with a wire floor that can be hung on chains, or suspended on poles or racks. Part of the roof should be covered by Colorbond™ or similar roofing material to provide a sheltered area where food and nest boxes are located.

One of the greatest advantages of suspended aviaries is their ease of cleaning. Little cleaning is necessary if the design is correct—all debris and faeces should drop through the wire to underneath the cage. This design limits the bird's access to the ground and potential spoiled foods or pathogens. If slabs are poured under suspended aviaries, hosing off the floors or a quick sweep may be all that is necessary.

Suspended cages can present a challenge when perches need to be replaced, but there are tricks to designing these cages that can make access easier. A drop-down door placed about midway on the bottom panel of the cage is helpful. The keeper can duck down under the suspended cage, unlock the door, and stand up into the cage to replace perches. The door should open inward in case it is accidentally unlocked. That way it will not flop open and allow the birds to escape.

This suspended aviary is located overlooking bush land, an aspect the birds can enjoy

Suspended aviaries are a popular design due to the birds' reduced access to debris and associated pathogens and ease of cleaning

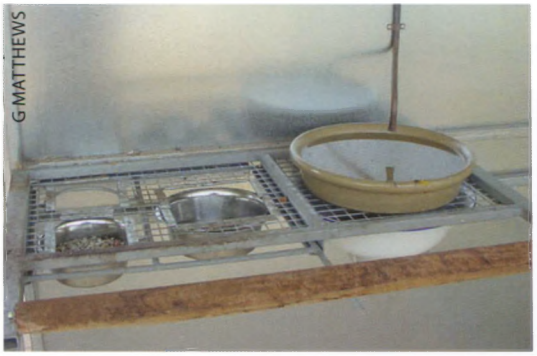
These Buffon's Macaws have been provided sturdy perches that will take some time for them to chew through before needing replacement

These Green-winged Macaws are provided with plenty of heavy branches to occupy them

Furnishings

A well thought-out aviary design should have a wire basket attachment located at the end of and under the cage where the bowls are placed. This reduces the opening and closing of cage doors, preventing escape.

Feeding Stations



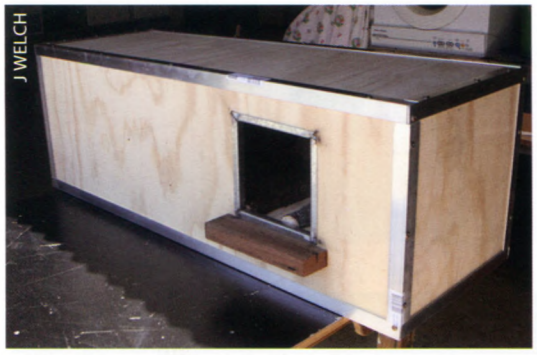
Above and below: These feeding stations are designed to be accessed without opening aviary doors

Water bowl design

Central feeding station in a communal aviary housing young Blue and Gold Macaws

Sturdy Nest Box Designs Suited to Macaws

This nest box incorporates a branch hollow as a nest entrance

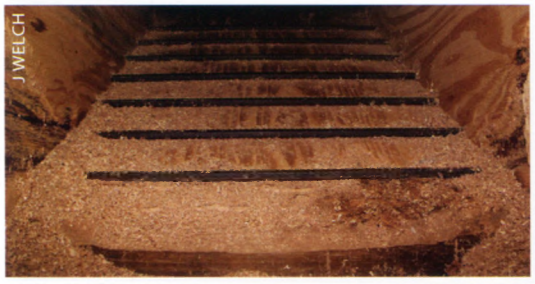


Nest box design with flashing around the corners

Nest log occupied by a pair of Hyacinth Macaws

Large macaw nest box—internal design and view when mounted on the outside of the aviary

Views of a nest box used by Green-winged Macaws, including the internal access (below left), and inspection area located external to the aviary as seen in the side-on view (bottom left and right)



Nest boxes used by Blue and Gold Macaws

Nest box used by Severe Macaws

Nest box used by Scarlet Macaws

Nest boxes are most commonly hung on the outside of cages. Placing them inside will result in frequent replacement due to chewing and will require large doors to accommodate that replacements—posing a risk of birds escaping. Nest boxes can be placed on the outside of the cage with an access hole into the cage. A wire box that is easily loosened and removed for repairs and maintenance can be constructed around this nest box for security. A regular cause of birds escaping from aviaries is a nest box that falls off or birds chewing a hole through the box. Keep up with the repairs of wooden nest boxes if they are placed on the exterior of the cage.

Nest box used by Illiger's Macaws. Note the wire box placed around the nest to prevent escape after a bird chews through the box

Predator and Rodent Control

Caged birds become the target for almost any predator lurking in the environment. Snakes, rats, raccoons, skinks, possums, weasels, and other varmints will target caged birds or the food inside the cage. Keeping predators out can be difficult and requires some ingenuity.

This aviary design has incorporated extensive predator and rodent protection, as well as shelter from a windy and cold climate

Electric Fence

Electrically charged fences or wires strung around the perimeter of outdoor flight cages may keep predators away. Depending on the type of predators in the area, a 'hot wire' single strand electric fence may be sufficient. One shock and predators might abandon the idea of invading cages. But if trees surround or canopy the cages, providing access from above rather than on the ground, the fight to keep predators out begins again. Using humane box-type traps can cut down on the number of predators in the area, but this becomes a daily battle and traps must be set every night in order to be effective.

The safest way to prevent attacks by predators is to construct a cage around the cages. Sometimes referred to as a safety or catch area, these double-wired cages work best outdoors. Leave a gap between the safety cage and the actual flight cage that is not wide enough for predators to gain access through successfully. Some predators, such as the North American raccoon, hunt in small groups. They will surround the cage from all sides, or from the top and sides, panicking birds, and causing them to crash into one wall or another. Once in reach, the raccoons reach through the cage wire and pull the extremities of the bird off. In the USA, raccoons will frequently pull the legs or wings off caged birds in an attempt to get at them during the night. Some safety measures should be employed to protect the birds from predators in outdoor cages.

Rodents

Mice and rats are also attracted to bird cages and aviaries. Usually they are more interested in the food being offered than harming the birds themselves. However, rats have been known to attack chicks in the nest box or even to kill females sitting on eggs. Plus, having rodents in cages and urinating on food or in nests is a real health issue for both birds and keepers.

Unfortunately, there are not many effective ways to keep rodents out of an aviary other than using poison. Poisoning in the aviary must be accomplished in clever ways to avoid accidentally allowing access by the birds. Since mice and rats will carry food, and in turn, poison, it could end up in the birds' food bowls. Bait stations do not really work if birds can get to them—they usually think of them as toys and will tear them apart. So the aviculturist must devise ways to allow mice or rats to get to the poison, and avoid them carrying it back to the cages.

If suspended caging is used, placing wire-enclosed bait stations on the floor of the aviary safety area will work. Since mice and rats climb as well, poison can be placed on crossbeams and other trafficked areas. Look for urine stains or darkened wood where rodents have travelled and place poison in their path. Mice love to go into tunnels. Another effective way to poison is to take pieces of PVC pipe—25mm (1inch) diameter for mice and larger for rats—and tape one end closed. Drop poison into the tube and lay it along the walls in the aviary. This proves very effective.

Bird Rooms and Ancillary Spaces

Pet owners who only keep one bird in the house run a very low risk of cross-contamination or causing illness by avoiding pathogens being carried from one bird to another. However, they should still take care to wash their hands and change clothing after visiting a pet store that houses birds, or after attending a bird sale or market. The need for satellite rooms and areas to isolate specific birds increases as the size of the flock increases.

Hospital Room

Hospital rooms are just what you would expect from the name—a room where sick or injured birds are treated or housed. Typical hospital rooms should include a brooder or warming light, clean bandages, instruments, tape, antibiotics or antibiotic ointment, handfeeding formula and syringes, at the very least. A good working relationship with a veterinarian may help you procure several of the hard-to-find items and instructions on what to do in an emergency.

The purpose of a hospital room is to have a place to house a bird that might be ill. Supplying supplemental heat to a bird that is not feeling well is important and is the beginning of good first aid. Since diagnosis of an ill bird may take some time, it could be risking the health of the other birds if it stays with the flock. Hospital rooms can be used for isolation, treatment or observation.

Out-buildings also come in handy for isolating birds that might be ill. In areas where the winter temperature drops too low for older or frail birds to remain outdoors, small out-buildings make a great place to cage them and heat a small space for them.

Like the aviaries, storage or hospital buildings, or anywhere birds are housed, will attract rodents or insects.

Prep Kitchen

Prep kitchens are usually only found in larger avicultural collections. Often the kitchen is an extension of the seed room or other storage area and may include a refrigerator, dishwasher, stove and benches. Due to the types of foods usually prepared for bird collections, it is wise to have a separate kitchen in which to work.

A sink and storage area is located in the safety corridor at the rear of this aviary

Preparation of foods in a hygienic kitchen environment—note F10™ broad-spectrum disinfectant is used to prevent contamination

A stainless steel bench provides an efficient and hygienic food preparation area

Hygiene is paramount in food preparation and cleaning

Things can get awkward when you use the home kitchen to boil 10kg of beans or bake giant sheets of cornbread for the birds. Keep the kitchen clean at all times—dirty food prep areas lead to dirty food and sick birds.

A prep kitchen is also a good place to wash up the food and water bowls. It provides an indoor work area out of the weather. Caution is needed when bringing dirty food bowls into the same kitchen that is used for food preparation. Be careful not to cross-contaminate. After washing, any bowls that have been used in the aviary should be soaked in bleach, or some other mild disinfectant, or install a dishwasher. Never use dirty bowls over and over again in the aviary, especially if giving them to different birds each time.

Supplies

Supplying an aviary with all the items that might be needed for daily function and maintenance requires a great deal of space. If the collection contains a large number of macaws, then food such as nuts, seed, beans, pelleted diets etc will take up a great deal of space. A brief list follows with suggestions as to why these items might come in handy:

- **Tools**—A tool box with essential tools such as a screwdriver, wire-cutter, hammer, rope, tape, nails, screws, hose nozzles and more. Birds can chew holes in cages and aviaries in short order. They can cut through wooden perches with ease. Be prepared to repair any permanent fixture or structure that is used to house your birds.
- **Aviary and nest box supplies**—Keep on-hand extra perches cut to size, rolled aviary netting or wire, nest boxes, and the hardware needed to hang them. A bag of wood shavings or substrate for inside the nest boxes may be needed.
- **Seed, bowls, and food storage**—Using new trash cans with lids is a good way to store extra seed or pellets, and keep rodents out. Any food items stored should be in sealed containers and not sit around in bags that can be easily chewed open. Extra sets of bowls can also be stored in rubbish cans or sealable containers. Put them away, disinfected and clean so they will not need to be washed when needed.
- **Enrichment**—Toys, wood blocks, and other forms of enrichment should be easy to access. Soiled or damaged toys should be replaced regularly to avoid illness or injury.

Security

Property and aviary security is important. Cameras can be mounted almost anywhere. Some are even battery operated and only come on when there is movement in the area. If you can get a system that sends a signal back to the house, either to your television or your computer, it is possible to run surveillance of aviaries at all times.

Dogs have long been the security choice of livestock keepers. A good dog can do the job of several human security guards. Be sure to choose a dog that is not curious or aggressive towards the birds in the aviary. Read up on dog training and make the dog feel like part of the flock. A dog, in conjunction with motion sensor floodlights, should keep most human and predator dangers away.

Birds can be spooked easily at night and may crash into the wire or sides of the cages. Large aviary facilities have begun to install low voltage lighting in, or near, aviary buildings to help birds settle in securely for the night. Solar-powered units are also available and come in many shapes and sizes. Use lighting to light paths for the security dog, or for keepers coming out to check on things at night. A stranger walking around in a dark aviary setting with a bright flashlight may cause birds to panic and injure themselves.

Property and aviary surveillance provides security for the inhabitants and the owner

FEEDING AND NUTRITION

Yellow-collared and Illiger's Macaws feeding on dandelion

From left—Brazil, almond slivers and macadamia nuts are enjoyed by macaws

Macaws eat many different foods in the wild. Many of us who keep birds try to research wild diets and to simulate them in the aviary. But different influences change the requirements of diet and nutrition—aviary life is nothing like living in the wild. Therefore, to feed a captive parrot the same nutrition in the same amounts as needed in the wild would be a huge mistake. We can look to nutritional studies of wild parrots for an idea of the types of foods they might choose, but in the end, the best nutrition for a captive bird will be that which keeps it healthy based on its daily routine and lifestyle.

***Corymbia ptychocarpa* pods are a relished food source**

Some species seem to gain weight and take on extra fat in the aviary even when fed the minutest amounts of food. Macaws are not usually included in this group and, although daily exercise may be limited by their cages, they rarely get fat when fed correctly. Captive macaws still need fats and proteins in their diets if they are expected to thrive, and especially if they are expected to breed.

How Often to Feed

Macaws should be fed once or twice a day. Small collections or companion birds might benefit from small portions of food fed at the two times of the day when birds eat—morning and evening. Pairs that are feeding babies in the nest may need supplemental bowls of fresh corn, pellets or other favourite foods several times a day. As chicks grow, more food will be consumed daily. A good rule of thumb for pairs feeding young is to make sure there is always something to eat in the bowl.

Larger collections of parrots are fed usually only once per day. This is understandable and is probably due to the labour and time needed to feed, change and wash food and water bowls.

The only real problem that might come up is that macaws are wasteful birds and might throw items of no immediate interest to them out of the bowl. For this reason, never bury the nuts under the nutritious food items! If the macaws like the nuts best, they will eat them first, often casting pellets and other nutritious foods to the floor. Of course they will not be able to get to the other food later, so then they go hungry and worse, go without the vitamins and minerals they need.

Observe your birds when they eat and get to know their eating habits. The more you know about their preferences and habits of consumption, the better you will become at presenting them with the necessary nutrition at the right time and in the right order.

How Much to Feed

So, how much food is needed for a full grown macaw each day? That will depend on what types of foods you feed them. The most commonly fed macaw diets include seeds, nuts, vegetables, pelleted diet, fruits, and maybe some cooked pasta or beans. If a macaw eats some or all of these foods daily, it is probably getting the nutrition it needs. But that is not how it works—usually each bird has a favourite food and will push the others aside. Thankfully, there are manufactured nutritious treats available and most macaws accept these readily.

Knowing how much food your bird needs each day is something you learn as you go along. Birds usually do not overeat. In other words, they will not eat every last thing you give them every day. So observing just how much your bird does eat will help you get a handle on how much to feed. Also, pay attention to what they are eating. If the only thing they eat all day is the nuts you gave them, then you will have to cut back on nuts to get them to try other foods.

Companion birds are often fed *ad libitum*. They are allowed to eat as much as they want, when they want. Some might argue this is not a bad thing, unless the bird is getting fat or only eats one kind of food. However, it is best to offer a small amount of everything. If there is something you really want your bird to eat, you might try offering only this item in the morning, and not offering any other foods until evening.

SEEDS

Are seeds bad for birds? No, not really, however many seeds do not contain the nutritional levels of pellets and fruit and vegetables. What is bad for birds is the lack of exercise and limited movement they usually live with each day. If you add a 100% high-fat seed diet to that routine, you end up with unhealthy birds. Seeds take a bad rap for being harmful to birds because prior to good avian education, seed was the normal, everyday diet fed to captive parrots. Of course these diets, combined with lack of exercise, led to many nutritional illnesses and premature deaths. When the most commonly kept parrot was the Budgerigar, it was understandable that seed diets became the norm. Most Budgies will not eat anything but seed and no one expected them to live for several decades. Thus, seed diets became the caged bird diet that was readily available in the supermarket. But we now know better, and things have changed dramatically with regard to captive avian diets.

The typical seed mix fed by many bird owners. While seed can be part of a diet, when it becomes the complete diet, problems are just around the corner

Sunflower seed and safflower seed are two of the largest commercial seed crops grown in most countries. Raw sunflower seed is actually a healthy snack for humans and, if fed in the proper proportions, for birds as well. These seeds contain flavonoids, now thought to be good disease-fighting chemicals, as well as providing fats, vitamins and minerals. Also, sunflower is a rich source of copper, manganese and magnesium, all of which support good metabolism. The vitamin content of sunflower seed includes water-soluble Vitamin B (B1, B3 and B9) and Vitamin E, both found to enhance metabolism and red blood cell development. So sunflower seeds are not 'unhealthy' unless they are the only thing a bird chooses to eat. This is a problem that occurs frequently, and birds must be encouraged to eat a varied diet.

So what are the best seeds to feed macaws? In terms of nutritional analyses and health, sunflower, pumpkin, pomegranate, flax and hemp seeds are all considered to be very healthy. Humans enjoy them as 'snack foods' too but do not rely on them alone for nutritional sustenance. No bird can live on a diet of seed alone. Eating seeds is a good thing, eating only seeds can lead to nutritional imbalances.

PELLETED DIETS

Pelleted diets for birds have evolved along the same lines as other extruded pet foods. Today reasonably well-balanced nutrition in extruded dog and cat foods is available to pet owners. The same is true of most parrot pellets.

Many breeders feed a primarily pelleted diet to breeding macaws. One Florida breeder supplies each pair with 1½–2 cups of pellets, a quarter of an orange and a quarter of an apple each day. When they are in breeding season, he offers guava occasionally. He does not add vitamin or mineral supplements to the water or food. He has maintained his flock of 20 pairs of breeding macaws on the same pelleted diet for many years. Production from the birds is higher than one would normally expect—each pair producing 2–4 offspring per year. All of the birds seem healthy, and this aviculturist does not have any higher incidence of health issues than any other breeder. This is a true testament to his pelleted diet and daily routine.

Pellets, sunflower seeds, oats, cooked corn, pellets, carrot, celery, beetroot, apple, orange, walnuts and almonds are a typical daily serve for large macaws

Pelleted diets were originally designed to be used as an all-inclusive diet. Since most bird owners resisted these instructions and added other items to the diet each day, formulas have changed slightly in pellet composition. Pelleted diets can still be fed daily, but some fruits and vegetables are also recommended. Some bird owners still give treats to their birds as well—a few nuts and some seeds each day will not throw off the nutrition as long as the birds are eating sufficient quantities of pellets.

Certain species of parrots have shown sensitivity to colours used in some pellets. Make sure to choose a brand that uses all natural dyes and colours. We are not aware of any macaw species that have demonstrated sensitivity to colour, flavouring or any ingredients used in the top brands of parrot pellets offered today.

Converting Birds to Pellets

Adding fruit and nuts to pellets can assist in the conversion to a pelleted diet

Converting birds to pelleted diets, or at least getting them to sample pellets, can be stressful for both the bird and the keeper. Some birds will lose weight during the transition, while others will give in quickly and with no stress whatsoever. Tame birds seem to be the easiest to convert.

Birds that have spent years being fed 100% seed or nut-based diets may be hard to convert to other foods—the conversion from all-seeds straight to pellets is difficult. A more logical method is to limit the seeds offered each day and add in cooked pasta or beans to encourage the bird to try new foods. Some pet owners have been successful in converting their pet macaws to pelleted diets by soaking the pellets in orange juice before offering them. Others claim they have converted their birds by offering pellets exclusively in the morning feed, and not offering any other foods until just before dark each day.

The keeper should act like the pellets are a treat, or simply begin giving them as treats instead of nuts or other less nutritious prizes. Once a bird tastes a pellet and finds it appealing, the battle is almost won.

One key point to remember is that birds will always have a preferred food or foods. If you mix the pellets with foods they prefer, they will always choose their favourites and ignore the pellets. Some birds can be fed a mixture and will still consume pellets. Some will consume the pellets first. Every individual will be different.

Do not allow a bird to lose more than 18–20% of its weight during the conversion process or it may become ill. Observe birds closely to make sure they do not change habits such as their favourite sleeping spot, and make sure they do not appear wobbly or dizzy. This can be an indication that they are growing weak from lack of food consumption.

It is difficult to assess how much food a bird eats each day. The only sure way is to weigh the food you offer and weigh the remaining food at the end of the day. This means you must catch the 'throw-downs' to include in your total waste.

SPROUTED SEEDS

There are so many opinions about sprouting seeds for pet or breeder birds, and indeed human consumption, that it is difficult for anyone to make an educated decision. Much of this negative hype originates from misinformation about natural toxins found in some sprouted seeds and legumes. Food recalls that have included sprouts have also added to the fear of feeding sprouted seed to captive parrots. But if one examines the number of food recalls that include some type of food toxin, sprouts are at the low end of the scale, and in all cases the seeds were not grown organically, but treated with pesticides and fertilisers—rich in toxic compounds.

Seeds suitable for sprouting. Top row from left: Canola, faber bean, canary. Bottom row from left: Grey-striped sunflower, mung bean, French white millet

Firstly, natural toxins exist in many of the foods we eat and feed to our birds on a fairly regular basis. Toxins are a part of our daily lives and are only dangerous if they are consumed in large amounts. For example, apple seeds, and sometimes even the skin and stem, contain amygdalin, which decomposes into toxic benzaldehyde and prussic acid (hydrogen cyanide). The amounts generally found in commercially grown apples are easily detoxified by the body. When was the last time you heard of anyone dying from eating an apple? Also, the amount of this toxin in apple seeds is dependent on the amount that was available in the soil where the apples were grown. Lesson: many foods contain some toxin that, if ingested in large amounts, could be harmful.

Adding to the negative misunderstanding about sprouts is the fact that some toxins are only toxic in scientific studies on cells that have been removed from the body. If ingested, these same toxins may not be toxic and, in some cases, may be beneficial. One such family of toxins—saponins—can be found in various sprouted beans and legumes. Saponins have been shown to destroy red blood cells in petri dishes. However, ingesting saponins appears to be beneficial, and some studies have concluded that they help to lower cholesterol in the blood and may actually be anti-carcinogens, destroying types of cancer cells.

If, after reading all of this, you still want to feed sprouts, make sure you sprout safely so as not to add to the incidence of potential problems. Maybe it will help to know that there are some aviculturists who have safely used sprouted sunflower seed, oats, mung beans and lentils for decades. Sprouting for humans has been made easy with the advent of sprouting jars and sprouting trays for home use. These kitchen tools can be used to sprout seeds for your birds as well. Follow the instructions included in these kits for the safest way to sprout. The authors have been sprouting seeds for parrots for several decades. The added vitamin C and other nutrients found in sprouts are so beneficial that it seems silly to quibble over the politics when we have experience on which we can draw.

Seeds that are to be sprouted should be of good quality. If possible you should buy only organically grown seed as pesticides—chemical fertilisers contain toxins that do not dissipate during the sprouting process.

Soak seed mix in water

Sprouting seeds— rinse and drain twice daily

After approximately three days the sprouts are ready to feed

Sprouting Method

Sunflower Seed (organic if possible)

Soak: For 1–2 hours in warm water.

Drain and Rinse: Twice a day in weak bleach and water—5cc bleach:3.8L solution, or a manufactured solution made specifically for sprouting, such as Multi-Clens™ by Passwell.

Handling: Heap in piles on flat trays and place in a warm room or location.

Feed: 24–48 hours after initial soak.

Sprouts are ready to eat when the very first sign of a root begins to appear from the seed. Give the sprouts one final rinse and allow them to dry slightly before feeding. Refrigerate leftovers for up to two days. Always smell sprouted seed to detect any mould or sourness that might be present. Never feed sprouts that do not smell fresh. Always rinse in clean water before serving.

SOFT FOODS

Soft food can mean different things to different people. If you are keeping macaws, it may be basically anything that is not a seed or a nut. In some circles, it is called 'chop'—coined by Patricia Sund—and in others it is a mixture of nutritious foods fed in addition to the normal daily fare. Soft food is readily accepted by most birds.

One good recipe for soft food came out of the Avicultural Breeding and Research Center (ABRC) in Loxahatchee, Florida. This facility was built by Richard Schubot in the 1980s and was home to several thousand large psittacines. Their daily routine included feeding soft food with the seed mix.

Coarsely chopped fruits and vegetables make up a soft food mix to supplement pellets or seed diets

The soft food at ABRC was prepared using a buffalo chopper. Not everyone has one sitting around, so a food processor with a curved chopping blade will suffice. The ABRC recipe changed daily, but the mixture is generally a bunch of different vegetables, a few fruits, some bread, monkey biscuits and calcium powder.

The vegetables and fruits do not need to be pulverised—it is probably better to coarsely chop the food and mix it together. Larger pieces are okay. In fact cranberries, blueberries, kernel corn, grapes or peas, can be added whole to the chopped part of the mixture at the last minute. There are no set amounts of any particular food that must be added because each day can be different. The following table lists the foods used in the ABRC soft food diet. To this mixture of chopped fruits and vegetables, you can add chopped or cubed bread, corn bread, cuttlebone pieces, spray millet, half-cooked pasta, raw pasta and calcium powders or oyster shell.

Vegetables	Fruits
Sweet Potato	Apple
Broccoli	Pear
Zucchini	Kiwi
Yellow Squash	Cantaloupe (peeled)
Spinach	Watermelon
Kale	Strawberries
Cauliflower	Blueberries
Corn Nibblets	Cranberries
Peas	Banana
Beets (tops or bulbs)	Papaya
Mustard Greens	Guava
Green Beans	
Peas in pod	

A selection of vegetables suitable for feeding Blue and Gold and similar-sized macaw species

Foods suitable for feeding smaller macaws such as Hahn's Macaws

FRESH FRUITS AND VEGETABLES

If you don't feed a soft food mix daily, pieces of a favourite fruit or vegetable should be offered. Parrots are vegetarians. They will usually eat almost any type of fruit or vegetable offered. It may take them a while to sample a new food and they will almost always choose what they like first, but it is important to offer a good variety.

Macaws love fresh corn-on-the-cob. Cut the cob into small chunks before feeding. If your birds are rearing chicks, fresh corn and a green vegetable should be available to them at all times in addition to their basic pellets or seeds and nuts. Although parrots may have a different daily requirement for various nutrients, knowing which foods to offer them in higher amounts may assist in designing a healthy, balanced feeding regimen. Refer to the nutritional values and benefits of fresh fruits and vegetables in the following USDA charts. Generally, apples and oranges are readily accepted by most macaws and will provide some much-needed nutrition and fibre to their diet. Although necessary, excess vitamin C can hamper calcium absorption, and therefore oranges are not recommended as a daily staple. Offer oranges two or three times a week at most.

Provide spinach in moderate amounts a couple of times per week only, due to the action of the chemical oxalate. Spinach is rich in calcium and iron, but oxalate binds it and makes it unavailable to the body.

Bananas are usually ignored or become smashed into the cage wire and are very difficult to clean off. The best way to offer this potassium-rich food is in the soft food mixture.

A good rule of thumb is to provide all foods in moderation. A varied diet is achieved if the bird will eat the foods offered.

VITAMIN AND MINERAL SUPPLEMENTS

An almost unlimited supply of vitamin and mineral supplements are available to the consumer. Many come with the promise of healing or correcting one problem or another, but the thing to remember is that usually, supplements are only needed when the body cannot get the required vitamins from the diet and some vitamins, if overdosed, can be dangerous.

WOMBAROO PASSWELL

A multi-vitamin supplement may be required if the diet is not nutritionally adequate

Supplementation is not something that should be taken on without knowledge of the effects it might have. One very important concept to consider is that vitamin and mineral supplements are never a good replacement for good nutrition.

Birds fed a mixed seed diet with added nuts, vegetables and fruits don't need many additional supplements as a rule. The same can be said of birds fed a predominantly pelleted diet. However, during the breeding season, and especially during egg-laying or when chicks are being fed in the nest, some additional vitamins or minerals may be of benefit.

Calcium

Egg-laying is a very stressful time for the female. She will take all available calcium into her blood stream to lay down a good shell on each egg she lays. If the calcium levels in her body are low, she will actually take calcium from the medullary layers of her bones to make her eggs. Calcium supplementation for egg-laying females is usually pretty easily accomplished without too much risk. In order to be useful, the supplement will need to include calcium, magnesium and Vitamin D3 in the proper proportions. Be sure to consult an avian veterinarian to acquire a good supplement that is recommended for birds.

Vitamins

Vitamins are classified as either fat-soluble (vitamins A, D, E and K) or water-soluble (vitamins B and C). This difference between the two groups determines how each vitamin is stored or affects different systems within the body.

Fat-soluble vitamins are stored in the body, usually in fat globules. If more of these vitamins are taken in than immediately needed, the body stores the vitamin for later use. However, if the diet continues to provide these vitamins, eventually the build-up in the body and tissues becomes dangerous. This condition is called 'hypervitaminosis'. In parrots, we see this most often with vitamin D3. Most enriched diets contain vitamin D3 because it is considered necessary for calcium absorption in the body. However, as vitamin D3 storage becomes excessive, and the diet is providing sufficient calcium, the body will store the calcium with the Vitamin D3. The result is calcification of the kidneys and tissues surrounding the heart, lungs, organs and crop. This is a highly prevalent disease process in handfed baby macaws. Most handfeeding formulas contain vitamin D3 and occasionally the amounts are too high for individual birds.

If taken in excessive amounts, water-soluble vitamins are usually washed from the system through normal body waste systems. This is true of vitamin C, B and B-complex vitamins. A form of the water-soluble vitamin A, known as beta carotene, is a necessary nutrient for all macaws and other parrots. Beta carotene is available in orange or red vegetables, such as carrots, sweet potato or butternut squash, and in dark green vegetables, such as spinach or peas. It is important to provide these foods and supplement them if your birds simply will not eat sufficient amounts. Supplementation with water-soluble vitamin A is fairly safe for most birds. Unfortunately, fat-soluble vitamin A is often detrimental to parrots.

Many people assume that if a bird shows signs of stress in its feathers, it is vitamin deficient. This is not always the case. Some birds have metabolic issues that hamper their ability to absorb or use certain nutrients in the diet. This may lead to black bars on the feathers or other plumage anomalies. Although this is technically a vitamin or mineral 'deficiency', it is caused by the chemistry of the body and not reflective of a deficient diet. Supplementation with additional vitamins or minerals may not correct the issue.

In summary, there is no substitute for good nutrition. If supplements must be used, use them sparingly and wisely. Macaws are in need of supplementation most often during times of stress such as breeding, egg-production or after a relocation or move.

Vegetables

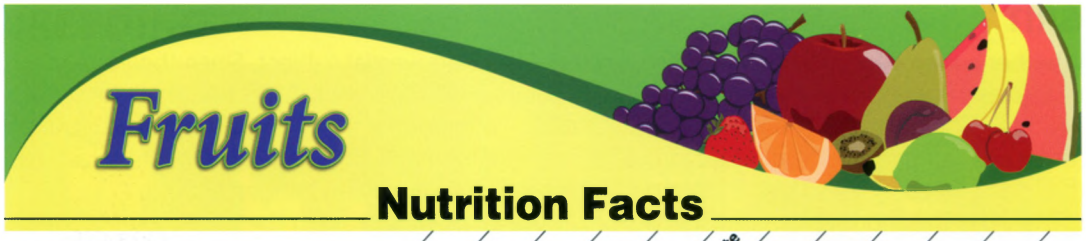
Nutrition Facts

Raw, edible weight portion. Percent Daily Values (%DV) are based on a 2,000 calorie diet.

Vegetables Serving Size (gram weight/ounce weight)	Calories	Calories from Fat	Total Fat g / %DV	Sodium mg / %DV	Potassium mg / %DV	Total Carbohydrate g / %DV	Dietary Fiber g / %DV	Sugars g	Protein g	Vitamin A %DV	Vitamin C %DV	Calcium %DV	Iron %DV
Asparagus 5 spears (93 g/3.3 oz)	20	0	0 0	0 0	230 7	4 1	2 8	2g	2g	10%	15%	2%	2%
Bell Pepper 1 medium (148 g/5.3 oz)	25	0	0 0	40 2	220 6	6 2	2 8	4g	1g	4%	190%	2%	4%
Broccoli 1 medium stalk (148 g/5.3 oz)	45	0	0.5 1	80 3	460 13	8 3	3 12	2g	4g	6%	220%	6%	6%
Carrot 1 carrot, 7" long, 1 1/4" diameter (78 g/2.8 oz)	30	0	0 0	60 3	250 7	7 2	2 8	5g	1g	110%	10%	2%	2%
Cauliflower 1/6 medium head (99 g/3.5 oz)	25	0	0 0	30 1	270 8	5 2	2 8	2g	2g	0%	100%	2%	2%
Celery 2 medium stalks (110 g/3.9 oz)	15	0	0 0	115 5	260 7	4 1	2 8	2g	0g	10%	15%	4%	2%
Cucumber 1/3 medium (99 g/3.5 oz)	10	0	0 0	0 0	140 4	2 1	1 4	1g	1g	4%	10%	2%	2%
Green (Snap) Beans 3/4 cup cut (83 g/3.0 oz)	20	0	0 0	0 0	200 6	5 2	3 12	2g	1g	4%	10%	4%	2%
Green Cabbage 1/12 medium head (84 g/3.0 oz)	25	0	0 0	20 1	190 5	5 2	2 8	3g	1g	0%	70%	4%	2%
Green Onion 1/4 cup chopped (25 g/0.9 oz)	10	0	0 0	10 0	70 2	2 1	1 4	1g	0g	2%	8%	2%	2%
Iceberg Lettuce 1/6 medium head (89 g/3.2 oz)	10	0	0 0	10 0	125 4	2 1	1 4	2g	1g	6%	6%	2%	2%
Leaf Lettuce 1 1/2 cups shredded (85 g/3.0 oz)	15	0	0 0	35 1	170 5	2 1	1 4	1g	1g	130%	6%	2%	4%
Mushrooms 5 medium (84 g/3.0 oz)	20	0	0 0	15 0	300 9	3 1	1 4	0g	3g	0%	2%	0%	2%
Onion 1 medium (148 g/5.3 oz)	45	0	0 0	5 0	190 5	11 4	3 12	9g	1g	0%	20%	4%	4%
Potato 1 medium (148 g/5.3 oz)	110	0	0 0	0 0	620 18	26 9	2 8	1g	3g	0%	45%	2%	6%
Radishes 7 radishes (85 g/3.0 oz)	10	0	0 0	55 2	190 5	3 1	1 4	2g	0g	0%	30%	2%	2%
Summer Squash 1/2 medium (98 g/3.5 oz)	20	0	0 0	0 0	260 7	4 1	2 8	2g	1g	6%	30%	2%	2%
Sweet Corn kernels from 1 medium ear (90 g/3.2 oz)	90	20	2.5 4	0 0	250 7	18 6	2 8	5g	4g	2%	10%	0%	2%
Sweet Potato 1 medium, 5" long, 2"diameter (130 g/4.6 oz)	100	0	0 0	70 3	440 13	23 8	4 16	7g	2g	120%	30%	4%	4%
Tomato 1 medium (148 g/5.3 oz)	25	0	0 0	20 1	340 10	5 2	1 4	3g	1g	20%	40%	2%	4%

Most vegetables provide negligible amounts of saturated fat, *trans* fat, and cholesterol.

U.S. Food and Drug Administration
(January 1, 2008)



Fruits

Nutrition Facts

Raw, edible weight portion.
Percent Daily Values (%DV) are based on a 2,000 calorie diet.

Fruits Serving Size (gram weight/ounce weight)	Calories	Calories from Fat	Total Fat g %DV	Sodium mg %DV	Potassium mg %DV	Total Carbohydrate g %DV	Dietary Fiber g %DV	Sugars g	Protein g	Vitamin A %DV	Vitamin C %DV	Calcium %DV	Iron %DV
Apple 1 large (242 g/8 oz)	130	0	0 0	0 0	260 7	34 11	5 20	25g	1g	2%	8%	2%	2%
Avocado California, 1/5 medium (30 g/1.1 oz)	50	35	4.5 7	0 0	140 4	3 1	1 4	0g	1g	0%	4%	0%	2%
Banana 1 medium (126 g/4.5 oz)	110	0	0 0	0 0	450 13	30 10	3 12	19g	1g	2%	15%	0%	2%
Cantaloupe 1/4 medium (134 g/4.8 oz)	50	0	0 0	20 1	240 7	12 4	1 4	11g	1g	120%	80%	2%	2%
Grapefruit 1/2 medium (154 g/5.5 oz)	60	0	0 0	0 0	160 5	15 5	2 8	11g	1g	35%	100%	4%	0%
Grapes 3/4 cup (126 g/4.5 oz)	90	0	0 0	15 1	240 7	23 8	1 4	20g	0g	0%	2%	2%	0%
Honeydew Melon 1/10 medium melon (134 g/4.8 oz)	50	0	0 0	30 1	210 6	12 4	1 4	11g	1g	2%	45%	2%	2%
Kiwifruit 2 medium (148 g/5.3 oz)	90	10	1 2	0 0	450 13	20 7	4 16	13g	1g	2%	240%	4%	2%
Lemon 1 medium (58 g/2.1 oz)	15	0	0 0	0 0	75 2	5 2	2 8	2g	0g	0%	40%	2%	0%
Lime 1 medium (67 g/2.4 oz)	20	0	0 0	0 0	75 2	7 2	2 8	0g	0g	0%	35%	0%	0%
Nectarine 1 medium (140 g/5.0 oz)	60	5	0.5 1	0 0	250 7	15 5	2 8	11g	1g	8%	15%	0%	2%
Orange 1 medium (154 g/5.5 oz)	80	0	0 0	0 0	250 7	19 6	3 12	14g	1g	2%	130%	6%	0%
Peach 1 medium (147 g/5.3 oz)	60	0	0.5 1	0 0	230 7	15 5	2 8	13g	1g	6%	15%	0%	2%
Pear 1 medium (166 g/5.9 oz)	100	0	0 0	0 0	190 5	26 9	6 24	16g	1g	0%	10%	2%	0%
Pineapple 2 slices, 3" diameter, 3/4" thick (112 g/4 oz)	50	0	0 0	10 0	120 3	13 4	1 4	10g	1g	2%	50%	2%	2%
Plums 2 medium (151 g/5.4 oz)	70	0	0 0	0 0	230 7	19 6	2 8	16g	1g	8%	10%	0%	2%
Strawberries 8 medium (147g/5.3 oz)	50	0	0 0	0 0	170 5	11 4	2 8	8g	1g	0%	160%	2%	2%
Sweet Cherries 21 cherries; 1 cup (140 g/5.0 oz)	100	0	0 0	0 0	350 10	26 9	1 4	16g	1g	2%	15%	2%	2%
Tangerine 1 medium (109 g/3.9 oz)	50	0	0 0	0 0	160 5	13 4	2 8	9g	1g	6%	45%	4%	0%
Watermelon 1/18 medium melon; 2 cups diced pieces (280 g/10.0 oz)	80	0	0 0	0 0	270 8	21 7	1 4	20g	1g	30%	25%	2%	4%

Most fruits provide negligible amounts of saturated fat, *trans* fat, and cholesterol; avocados provide 0.5 g of saturated fat per ounce.

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GRIT

Whether a parrot 'needs' grit in its diet is certainly a controversial subject. Since there are many examples of parrots that have lived long, happy lives without it, we can assume they don't really need grit. There are also various reports of parrots having gorged themselves on grit and required surgery to remove it from their gizzard or proventriculus. From these stories it is safe to assume they don't 'need' grit and that if offered in large quantities, it may be dangerous.

The purpose of grit for smaller species of captive birds was to aid in the grinding of foods for digestion. The gizzard would maintain some of the grit particles and use it to grind seeds into digestible form.

Some avian species need grit to fully digest the foods they eat. In general, parrots and parakeets do not. Grit can also provide some much-needed minerals in the diet but this is not the safest way to provide this nutrition when keeping macaws. Mineral blocks or supplements would certainly be safer.

PRE-BREEDING AND BREEDING SEASON DIETS

Can the same diet be fed year-round? Certainly it can. However, some aviculturists manipulate diets to simulate the conditions of seasons as they would occur in the wild. Non-equatorial species may respond to light manipulation and diet change to stimulate breeding. To be totally effective this would need to be done in conjunction with moisture/humidity and temperature manipulation.

If diet manipulation is something that interests the aviculturist, it is best to know when a certain pair of birds will attempt breeding. From there it is easy to calculate when to begin diet manipulation to further encourage the process. Estimate when macaws usually lay their first clutches in your area and increase the quantity of fat and fresh foods in the diet about six weeks prior to the expected first clutch of eggs.

Macaws breed in the wild after the rainy season, when there is normally new growth of green leaves, leaf buds and green fruits on the trees. This occurrence can be simulated in the captive diet by changing half of the dry seed or pellets to increase the sprout and vegetable content. Adding a few extra nuts or other fat sources might be a further encouragement.

Feeding fatty diets to macaws on a year-round basis is not a problem if they get sufficient exercise. However, overweight birds are not the most proficient breeders and extremely overweight birds may not be healthy enough to breed.

Stimulating breeding is often more successful if you offer the foods they most often choose to feed to their offspring. Fresh corn-on-the-cob, greens and peanuts are popular foods of choice for newly hatched chicks.

Nuts in shell are relished by macaws through the year

Blue and Gold Macaw extracts walnut from the shell

BREEDING

Blue-throated Macaws

The biggest obstacle to breeding macaws for 'preservation' is that our own governments—although they claim to have a stake in the future of the species in the wild—do not supply us with the tools needed to concentrate our efforts 100%. If there were government-funded collections or facilities that took in pure species for future release or preservation, there is no doubt that many breeders would begin to contribute to this ark of genetics and participate in their programs. However, this simply has not happened and most of the breeding that takes place today in captivity is for other reasons. Indirectly, current regulations may help to educate the public and focus their attention on the importance of preservation of wild birds. However, more needs to be done if it is to work for everyone involved. There has to be a return on the investment of time and money.

Since most offspring produced in captivity will end up in the pet trade, breeder trade or used for exhibition purposes, our choices are most influenced by these final dispositions. The way we socialise our young birds has to embrace their future destination and the type of life they will probably live. We cannot socialise our captive-produced birds to be wild, unruly birds if they are to be pets. Neither can we socialise our young birds to be tame, loving, trick-trained birds if they will fly free some day in their country of origin. This is the dilemma faced by all captive breeders today. Even if we want to help conservation through our captive breeding programs, there really is no management plan in effect to accommodate that wish. Since breeding and keeping birds is expensive, there has to be some economic incentive to continue, and this is where the pet trade or breeder trade comes into the equation.

PAIRING BREEDING BIRDS

Sex Determination

Most macaw species are not dimorphic—males and females look the same. There are subtle differences that macaws can see but humans cannot. However, there is no dependable visual way to assess the sex of a macaw, and therefore DNA sex determination or surgical sexing by an avian veterinarian is recommended.

For every old wives' tale about determining sex of a macaw, there will be an exception. One old-timer claimed that 'when looking at Blue and Gold Macaws, the ones with the larger beaks and higher weights will always be the females'. Of course this is not correct, but it may be indicative of the group of birds with which this person has had experience.

There is also the old 'pelvic exam' where you place a finger on the pelvic bones and if there is a wide enough gap for your finger to fit between them, the bird must be a female, and if not, it is a male—that depends on how big your finger is, doesn't it? Pelvic width can also be an indication of sex in females that have just laid eggs, but if she recently laid an egg, is there really a reason to try to determine her sex?

Using measurements of the wings or primary feathers, tail lengths, head width, body weights or any other home-sexing method will also require that you have a fairly large pool of data from which to draw. There may be some dimorphism in length and size, but if you have only a few birds, you will not be able to make the necessary comparisons. The safest and certainly most effective and accurate ways to sex a macaw are through DNA or surgical sex determination.

Interestingly enough, there is a slight dimorphism that has been noticed in newly hatched Hyacinth Macaws. It has to be recorded very early—usually in the first week of age—as it changes and is no longer valid after that point. The shape of the lower mandible of newly hatched Hyacinths can be a determining visual clue as to sex. Males usually have a V-shaped lower mandible and females a U-shaped mandible. This is all very subjective and merely observation, but it has proven true in many cases. No other neonatal dimorphisms have been reported.

Compatibility

The actual pairing process in macaws is usually pretty easy. Breeding-age macaws that have been maintained as single birds for any length of time will often accept the first bird of the opposite sex that they encounter. This often leads to hybridisation or cross-species breeding if the aviculturist allows it. When a mate of the same species is available, the two birds should be introduced to each other in neutral territory—a cage that has not housed the male or the female previously. A large flight cage that does not contain a nest box may be the best choice. If no neutral cage is available, the rule of thumb is to use the female's cage as the introduction cage. Generally, the female is more accepting of a new bird in the cage than a male. Place both birds into the flight of choice after installing two perches within 30.5–61cms (12–24 inches) of each other and leave them.

Compatibility is vital to successful breeding

Birds will exhibit their natural behaviour if they are not being observed too closely. Unnatural behaviours such as competition, displaced aggression or shyness are frequently the result of nervousness caused by being watched by the keeper. If there is an observation point somewhere nearby where the birds cannot see the keeper, this would be the best vantage point from which to view their initial behaviour. In most macaw species aggression is usually not an issue unless the birds are in breeding condition and it is breeding season.

What are the signs that a pair is going to be compatible? Once the keepers are out of sight, two compatible birds will begin to explore each other by moving closer together. Often one bird is more wary than the other. This results in a non-aggressive chase around the cage. Eventually they will both end up on the same perch and will begin to move closer. If all this takes place without one throwing the other one onto the cage bottom or ripping out feathers, the introduction is going well.

After the initial chase and surrender, the new couple may beak at each other a little or, in the best case scenario, one will begin to preen the other, which drops its head into a submissive position. This is a great sign that things are going along in the best way possible. The last sign that two birds will be a good pair is mutual feeding. One bird may begin the violent head-bobbing to regurgitate food and place it into the willing beak of the other. This last step may take only moments or it may take weeks. One never really knows and it has a lot to do with the age and stage of breeding condition of one or both birds.

A nesting box can be introduced if the two birds seem compatible. In some pairs, both birds will begin to enter the box, and in other pairs only one bird will enter at any given time. There is no rule as to which is best.

Macaws have been known to copulate in the nest box or on the bottom of the cage. Usually copulation takes place side by side on a perch, but there are those pairs that like to mix up the location for mating.

Selective Breeding

What is selective breeding? In nature, birds get to choose each other during their search for a mate. Surprisingly, some pairs are actually closely related to each other and even siblings are not unheard of. This is all part of the natural selection of genes that are passed down to the next generation of macaws in the wild.

When humans begin to choose mates for their birds, we call it selective breeding. Even with aviculturists who try their hardest not to choose birds that appeal to them instead of birds that should be bred for their genetic materials, selective breeding takes place. It is the same in the world of humans. Likewise, breeders choose birds based on many different aesthetics and not necessarily on the things that would benefit the population as a whole.

In the wild, the fast flyers may be the best choice, especially in habitats where flying predators abound. Or maybe the strongest flyers are best because food sources are many kilometres away from the nesting sites. Humans have no way of knowing these things and therefore they choose a bird for their own reasons.

In a time when the supply of birds for breeding is limited to those being produced in your country, the selection process for breeding stock has to be altered. Under optimum conditions—where there are several birds to choose from—the ultimate choice of a mate for your breeding macaws would be one that enhances the gene pool with which you are working. In other words, put your preferences for aesthetics aside where possible. Don't always choose the biggest bird or the most muscular bird but instead look at the genetics involved and make a choice based on science and the potential future for the birds produced. If these choices produce less than desirable traits in the offspring, do not hesitate to choose a different mate for your birds.

Breeders should preserve the pure genetic material of all species in captivity

During the days of wild-bird importation, when a person could walk into an import station and choose from hundreds of macaws of the same species, the choices for breeding birds were often based on this bias for 'human preference selective breeding' and were not necessarily the best choices for the birds. This became apparent later when some pairs simply did not get along, or seemed to get along fine but never bred or produced offspring.

Smart breeders would walk through a group of macaws and choose the ones that were already bonded to each other, sitting very close together or even preening each other's feathers. Although the choices may have been limited, the birds did choose their own mates, and therefore most of the human preferences were left out of the equation. This often resulted in success after the nesting boxes were placed on the cages.

Obviously there are many different ways to choose a mate for a single breeding macaw. In most cases the eventual goal of the breeding program will determine which mate is the best for each bird. All breeders must recognise that preserving 'some' pure genetic material of each species in captivity is important. That is not to say that breeding macaws for colour, size or other preferred characteristics is never allowed.

Courtship

Display

Macaws do not have an elaborate courtship display. Neither performs a dance to attract the opposite sex. Most of their courtship rituals are very subtle, including eye dilation, head posturing, and simultaneous vocalisations. Once that is out of the way, the real dating begins with allopreening, feeding each other and suggestive body posturing. Females will usually squat low on the perch and males will dip up and down beside them. This can be very subtle and may appear to be their normal behaviour when the keeper is present.

Compatible breeding pair of Green-winged Macaws

Mutual vent preening is another courtship ritual, as seen in these bonded Blue-throated Macaws

Hyacinth Macaws are probably the most demonstrative in their courtship and mating. They seem to enjoy copulating while someone is watching. It is not unusual for a bonded pair of Hyacinth Macaws to move close together and begin 'vent rubbing' and clucking every time there is a human nearby. Of course, this is probably only the show version and actual or serious copulation takes place in private. Some believe Hyacinth Macaw males copulate in front of the keepers to ward off any competition for the female.

Mating

Mating takes place in the side-by-side position, usually combined with eye dilations and sometimes, clucking. The physical part of mating involves the male and female bringing the vents together and rubbing them on each other. Eventually semen will be produced and flow from the male's vent. The female will overt the oviduct from her vent where the semen is deposited.

Some macaws mate in the nesting box. With the advent of nest box cameras, we now know that macaws copulate often, and just about anywhere, before eggs are laid. Since the normal mating position is side by side, macaws can copulate on the perch, the bottom of the cage or in the nest box. They usually mate several times before each egg is laid.

We do not know the sperm storage capability of macaws. There may be some residual storage of semen in the female's reproductive system—enough to perhaps fertilise two eggs without copulating again. But there have not been any studies accomplished on this subject. Since keepers have observed pairs copulating and have collected infertile eggs from the nest box, we have to assume the storage capability is very limited or is restricted to a very specific time or environment.

Nesting

Nesting Encouragement

In the bird world, very few objects are placed inside the nest to provide 'nesting enrichment'. Placing anything inside a macaw nest, other than a good woody substrate or wood-chunk mulch, will result in the birds throwing it back into the cage. Macaws generally like an empty cavity in which to nest. In the wild, most macaw nesting cavities do not have any substrate or chewed wood in the bottom.

Therefore, aviculturists need to be clever and create ways to enrich or encourage nesting. One of the most common ways to enrich the nest itself is to make the entrance hole too small for the birds to enter. This means they can look inside and know that there is a cavity in there, but they must chew their way into the nest to use it. Sometimes this mutual task is all that is needed to stimulate

a willingness to breed. Another method of enrichment might be to fill the entire nest with wood shavings or bark and allow the birds to empty it to the point where they are comfortable for nesting.

Although captive macaws may not need much nesting enrichment, other species of parrots often respond positively to such clever endeavours. The aviculturist should always be thinking of ways to make the caged environment more exciting. Providing leaves, branches, sticks, hay or other materials may stimulate the breeding cycle when dealing with pairs of birds that simply do not show any interest in nesting.

Nesting Materials

Since macaws do not really build their own nests, it is up to the aviculturist to supply the needed substrate in the nest box. In the wild, birds chew the nesting cavity and there will be small amounts of sawdust, sand, feathers, or dirt under the eggs and chicks. But rarely has it been noted that macaws will gather materials such as leaves or twigs for a nest.

The eggs sit directly on the chewed wooden nest floor—tree hollows are surprisingly soft inside and do not crack the eggs. Generally, a captive nest box does not resemble a wild macaw nest. In the wild, macaws nest in tree cavities that are a tight fit for the female, let alone with sufficient space for eggs and chicks. In captivity we usually supply a giant wooden nest box which leaves a lot of space for eggs to roll around. This is the main reason for substrate, which keeps the eggs in one spot for the female and absorbs the faeces of the chicks. The usual depth of substrate is approximately 5–10cm (2–4 inches)—any deeper and the eggs may get buried.

In captivity, the most commonly used materials in the nest are wood shavings, sawdust, sand or mulch. Whichever you choose, it must be clean and sanitary to avoid infections in the eggs or chicks. Caution is in order here. Sometimes chicks in the nest will ingest the substrate, especially chunky wood shavings. This is rare, but the keeper should always be alert to this when inspecting the crops of the growing chicks.

Nest Inspection

Inspecting the nest is part of the keeper's duties. Nest inspections are carried out for several reasons but primarily to make sure the box is still secure. Macaws can be voracious chewers and can chew out of a wooden nest box very rapidly. Also, inspections of the nest are useful for egg inspection and assessment, chick observation and to avoid dangerous situations such as loose wires in the box or to make sure there is nothing in there that would hamper nesting. Mice, rats, squirrels or snakes sometimes get into macaw nesting boxes, and some pairs will not enter the box if they do not feel it is a secure place to nest.

How often you inspect the nest is up to you, but when dealing with problem parent birds that break or eat eggs, the keeper may have to check the box several times a day during a laying cycle. The trick is to look inside fast and get out. Allowing the macaws to observe you observing them may reduce their trust in that nest box. For this reason it is best to do nest inspections when the birds are not inside, although sometimes that is impossible because some pairs practically live inside their nest boxes.

There are many tricks to safely procuring eggs or chicks from a nest box. Since the parents' first priority will be to protect their nest, the battle may be fierce. Some aviculturists use welding gloves and just reach in without hesitation. Others may have designed a long-handled scoop to reach under or past the protective parents to scoop up eggs or small chicks. Elaborate aviary set-ups include some type of slide-closing door that allows the keeper to trap the parents outside the box, but the trick to that is catching them out of the box. Even in aviaries with slide doors you will find that parent macaws are so protective they will run to attend to their nest whenever they hear a noise or sense that humans are around.

Egg size comparison. From left—Green-winged Macaw, Scarlet Macaw, Double Yellow-headed Amazon, African Grey and White-bellied Caique eggs

Eggs and Clutch Sizes

The eggs laid and incubated at one time are known as a 'clutch'. The number of eggs laid in one clutch varies from species to species and, to a lesser degree, from individual to individual. We often refer to average clutch sizes when classifying captive parrots, but this expression may be misleading and, depending on the methods of husbandry, could vary quite a bit. For example, an aviculturist that allows the parent birds to lay a full clutch and begin to incubate the eggs will certainly experience a different number of eggs in each clutch from someone who removes the eggs from the nest as they are laid. In fact, 'pulling' eggs often triggers an internal mechanism to 'replace' these in the clutch, and this can lead to the laying of a string of eggs that far outnumbers the expected normal clutch size. Wild birds frequently replace eggs in a clutch due to loss through predation or accidental breakage in the nest.

Clutch sizes vary from the expected two or three for Buffon's Macaws to upward of five for Red-fronted Macaws. Some Scarlet Macaw pairs have been known to lay five or six eggs in a clutch. Two or three eggs per clutch is considered normal for the other larger species. The smallest clutch size is probably that of the Hyacinth Macaw, with an average of two eggs. Smaller species, such as the Illiger's, Yellow-collared, Severe, Hahn's, Noble's or Blue-headed Macaws, may lay larger clutches of up to five eggs.

Females in their teens or slightly older tend to lay more clutches per year. Of course, once again, this is dependent on husbandry. If the parent birds are allowed to incubate, hatch, and rear the young, usually only one clutch per year can be expected.

There are reports of captive macaw females laying 15–20 fertile eggs at the rate of one every 3–4 days. This can only happen when each egg is removed from the nest as it is laid. Although this type of management may increase productivity, and may be vital to some programs dealing with very rare species, it is not to be done without thought to the health and wellbeing of the birds involved. This example is only mentioned to give the aviculturist an idea of the variability in clutch sizes, dependent on husbandry practices.

String clutching or laying of eggs is not something that can be expected of every female. This usually only occurs with females in their prime reproductive age and when they are in top condition. String clutching should only be encouraged in an emergency situation, not as a means to increase profits. If the diet and overall health of the laying female is not perfect, it could lead to illness or death of the female.

Some people use this method of reproduction to increase productivity of a pair of birds. Caution is warranted—if you cannot artificially incubate or you do not have a surrogate incubating female in place, the final production may actually be less than if you allowed the parents to lay their clutches in a natural rhythm.

Husbandry practices that have worked well in aviculture over the years include:

- Pulling eggs as they are laid for artificial incubation or surrogate sitting
- Pulling the entire clutch of eggs after the female has laid the last egg
- Allowing the parents to fully rear the entire clutch
- Pulling chicks as they reach a certain age ie at 2–3 weeks of age

Depending on the methods used, a second or subsequent clutch of eggs may be laid. Usually female macaws lose the desire to lay and incubate if they have hatched and fed chicks for more than a week or two. This is one way to shut down a female and make her stop laying eggs for that season. Allowing her to feed a chick or two for a couple of weeks will stop her producing eggs until the next full breeding season. Chick feeding causes different hormones to be produced in the female's body that trigger her to become broody (motherly) rather than to produce more eggs.

It is interesting to note that simply removing the nesting box is not always effective in stopping egg-laying. The female may continue to lay eggs off the perch or in her food bowl. Some have been known to lay eggs on the bottom of the cage and go on to incubate and defend them.

Any bird that only lays one egg in the clutch may be suffering from a physical problem and should be seen by an avian veterinarian. It is not unheard of for a laying female to 'drop' a yolk into her abdomen and become very ill during her laying cycle.

Egg Candling

Candling an egg is the process of holding a bright light to it to assess if it is fertile or not. Generally speaking this is best done in a dark place, but experienced aviculturists may be able to candle in daylight and tell at a glance exactly what is happening inside an egg. The more experienced a person becomes, the easier it gets to recognise the different stages of development.

Egg candling will indicate whether an egg is fertile, the stage of embryo development, the beginning of the hatch process and the position of the chick in the egg

There are many reasons that learning to candle eggs is important. With regard to nest management, it is wise to remove infertile eggs from the nest. If an entire clutch of eggs is infertile, the female will still sit on them for an entire hatching cycle and longer. This results in some females not trying to nest a second time that season, causing an important loss of time for the breeding program. The best case scenario would be to wait until the clutch is complete and the female has incubated for about 7–10 days.

Candle the eggs, and if the entire clutch is clear, move them to an incubator, relieving the female of her sitting duties and allowing her hormones to recycle and potentially lay another clutch.

The laying cycle is totally dependent on hormones. Different hormones are produced in a female after she begins to incubate the eggs and these hormones 'shut off' the laying cycle. If a female is in prime breeding age and is healthy, a second or subsequent clutch of eggs can be triggered by removing the first clutch from the nest box. This is very important if the first clutch is infertile.

Managing the eggs takes some experience. Deciding whether the removal of eggs is warranted or, for example, whether to remove only one or two, or to allow the female to incubate an entire clutch, is part of the entire management picture. In order to make those types of decisions, one must know the ramifications or benefits of each scenario. For example, allowing infertile eggs to be incubated with good eggs may cause a problem later because infertile eggs often become

contaminated with bacteria and may even break or explode. Nest management relies somewhat on a cumulative knowledge base of macaw breeding husbandry.

Breeding Problems

When we speak of breeding problems, it usually implies that something is wrong. Breeding macaws is not difficult once the basics are learned—the proper supplies are acquired and the breeder follows a plan. However, breeding birds does require some experience or at least access to a reservoir of knowledge.

Once a male and a female of breeding age have been selected and the cage and nest box are in place, the process should progress on its own. Sometimes, however, things don't go as planned. This could be the fault of the breeder not knowing exactly how to do something or what to do. Usually breeding problems are caused by something simple, like the birds having been incorrectly sexed, or perhaps it is something a little more complex such as the male coming from an area where the breeding season is at a different time of year. It is up to the aviculturist to observe the birds, analyse the results and solve the problem, whatever it may be.

Stunted growth is a breeding problem that can occur as a result of genetics or parent health

Privacy

One mistake often made by new breeders is a lack of respect for the privacy of the breeding birds. Often, inspections during the nesting process are not tolerated and may result in broken eggs or injured chicks. If their privacy is violated too often, a pair of birds may abandon nesting and not attempt it again until the environment has changed. There is a thin line between close management and privacy violation.

When locating the nest box, do not position the entrance hole opening facing bright sunlight. Nesting birds do not like sun shining into the box. The nest box is the most private of all places for a breeding pair of macaws. This is a haven where no human should be seen.

How does one manage a pair of breeding birds without looking into the nest box? Simple rule—don't open the inspection door when the birds are inside. This causes stress and an immediate reaction by the parents trying to secure the box. If eggs need to be candled or chicks observed, it should be accomplished with the parents outside the box. Rigging some type of slide-down door or screen over the entrance hole is the best way to ensure they remain outside.

There are very few exceptions to the nest box rules. One exception might be where the parent birds have been conditioned to accept your intervention or presence. Macaws in breeding mode behave totally differently to when they are not—the nicest pet bird in the world may suddenly become a tiger when it begins to nest.

Privacy from other pets and other birds can sometimes be an issue as well. When possible, breeders should observe their pairs to see whether they are reacting to other animals, sounds, light or any environmental change. It is true that most captive birds will adjust to other animals making an appearance once in a while, but this is different to placing them in cages beside another bird that they simply cannot tolerate. If either pair reacts by hanging on the wire and screaming at a close neighbour, a divider may need to be constructed to block visual view. Once a pair of birds

has nested successfully, it is not wise to change the neighbouring birds or allow a new dog or cat into the area of the cage, especially during breeding season.

Mate Aggression

Although it is rare for a pair of macaws to fight upon introduction, it can happen. For the most part macaws are laidback about a new bird in the cage with them—especially if the bird is the opposite sex and both birds are of breeding age.

Mate aggression in macaws is rare. A little spat over food or perch space is common. A nip from the male to get the female back into the nest is not unheard of, but a knockdown fight would be very unusual. If pairs fight to the point where feathers fly or blood is drawn, it would be wise to split them up. Try introducing them in side-by-side cages for a few weeks to see whether they have a permanent incompatibility.

Military Macaws can be very protective of their environment and may display displaced aggression if provoked

Protective aggression (displaced aggression) is much more common in pairs of macaws than actual mate aggression. Displaced aggression occurs when a danger is perceived by one bird and it attacks the other bird due to its anger or perception that something must be defended. This is common in some species of macaws and will be noticed when a human walks up to the cage. If a pair of birds sits amicably together, eats together and even goes into the nest box together, but attacks each other when the keeper arrives with food, this is classic displaced aggression. The best way to deal with it is to feed the birds and vacate the area as quickly as possible. Switching mates will not change this behaviour. It is an innate reaction to perceived danger.

Infertility

Do not confuse infertility with eggs that do not hatch. The difference is that infertile eggs never began development because the male and female either did not mate or did not mate properly.

Incubation problems can disguise themselves as infertility as well. If the embryo dies in the first three days of life, the egg may appear to have been infertile. Use a surrogate sitting female to incubate the eggs of pairs as a test of fertility. If the eggs develop under the surrogate or chicken, then the incubator is killing them early in development.

Probably the most common cause of infertility in macaw pairs is immaturity. Young birds may 'play copulate' and not really get it right. Then the female is stimulated and lays eggs anyway. This is common in larger species under the age of four. As the pairs mature together, fertility should increase.

If pairs are mature and healthy and they attempt to nest but produce only infertile eggs, problem-solving is in order. Are the perches tight and stable? Do the birds have adequate privacy? Is the nest box large enough for them to copulate if they choose to? Any of these common issues could be the cause. Also, it could be something simple that was overlooked, such as long, pointed toenails. The male may place a foot onto the back of the female during copulation and, if his nails are sharp, she may push away, resulting in infertile eggs.

Bacterial issues in the female reproductive tract (causing infertility or early embryonic death) are rare. Papilloma virus and the associated swelling or warts are becoming more common and this condition can definitely cause infertility in macaws. If infertility is consistent in a pair of birds and avicultural changes do not solve the problem, the birds may need to see a veterinarian for a complete examination to make sure there are no reproductive problems.

Huge clutch sizes of infertile eggs may indicate that the 'pair' is actually two females.

Common Issues that Can Lead to Infertile Eggs

Issue	Resolution
Perches too loose for copulation	Replace perches or adjust sizes
Nest box too small for copulation	Replace with larger nest box
Toenails long and sharp	Cut nails on both birds
One or the other mate is too young	Remove infertile eggs and encourage replacement clutches
Lack of exercise	Increase flight space, especially for males
Diet insufficient for breeding	Feed abundant sources of fat and protein to encourage breeding
Health issues	See an avian veterinarian
Consistent infertility	Have birds scoped by an avian veterinarian
Privacy issues	Rearrange housing to provide privacy or replace neighbours with amicable birds

Incubation

Macaw pairs that have proven themselves as good incubators and parent birds can be very valuable to a breeding collection. Artificial incubation requires substantial amounts of time and expertise to get it right. If a pair takes on the job of incubation and/or hatching, it makes it much easier and will increase the overall success rate of the facility.

Illiger's Macaw incubating her eggs

Attentive Illiger's Macaw and newly hatched chick

Incubation is more than simply keeping an egg warm to make it hatch. It requires knowledge of the physiological processes that take place inside the egg as well as the intricate methodologies of the process.

The way parents incubate eggs is difficult to simulate in an artificial incubation system because there are periods of active heat application and periods of heating and cooling that have not been measured scientifically to date. This natural heating and cooling rhythm is not fully understood and therefore, there are no machines designed to replicate the behaviour of parent birds.

Most macaw pairs will begin incubation after the second egg is laid. Some actually begin immediately the first egg is laid. The female does all of the incubation. It is rare for a male macaw to sit on eggs but he may sit beside the female in the box. Sitting females can be very defensive of the nest and have been known to grab eggs in their beaks and break them if they are disturbed or feel threatened.

The first two weeks of incubation are crucial. During this time the parents are very attentive and may actively incubate the eggs around the clock, with very short breaks for feeding. As the eggs near hatching, the periods of cooling are increased, and it is not unusual to see the female off the nest and out of the box. If eggs must be candled in the nest, this is the best time to do it.

If eggs are to be pulled for hatching artificially, the safest time to remove them is after the first egg has received three weeks of natural incubation.

Parent-rearing

Handrearing baby macaws can be a labour-intensive job. From start to finish it may take upward of 16 weeks. It requires incubators, brooders, other specialised equipment and supplies and the expertise to do the job correctly. The option is to allow parent birds to rear their own young. Once the decision to allow the parent birds to rear is made, it is difficult to intervene if there are issues. Baby macaws become very shy in the nest box and once they know who the parent birds are, they may refuse to eat for a human. Decisions on parent-rearing must be made early in the breeding cycle and the parents should not be disrupted once the chicks hatch.

Human Interaction

Parent-reared birds accustomed to seeing or being around humans can become some of the best future breeding birds. The difficult part is giving the young chicks any human interaction while they are still in the nest box. With most pairs that demonstrate normal protective behaviour, this

Blue-throated Macaw parent-reared chicks at five weeks old

From left: Yellow-collared, Hahn's and Illiger's Macaw juveniles placed together for socialisation

can be very dangerous. If the parents are defensive, chicks could be killed in acts of displaced aggression. In some cases the parent birds are calm and allow a peek into the box, or even allow humans to handle the chicks and then place them back into the box for rearing. These chicks may eventually become some of the best adjusted birds in the aviary.

A system where the parent birds can be locked out of the box while the keeper is handling and interacting with the chicks would be ideal. It is irresponsible to try and handle chicks when there is obvious danger of them being injured or killed by the parents.

Parent-reared and non-socialised chicks can be very nervous and flighty. One of the most effective ways to avoid their innate fear and nervousness is to expose them to humans from a young age. As mentioned, this can be a danger to them as well and it needs to be accomplished with safety in mind. Those chicks left to be fully parent-reared with no human contact may be too wild or nervous to settle in and become good parent birds themselves. Of course there are exceptions to every rule in aviculture, and sometimes the small amount of exposure to humans that results after fledging is enough for birds to settle and become trusting.

Common Problems Associated with Parent-rearing

- Health problems including viral transmission or bacterial issues
- Injuries occurring when the parents protect their young
- Physical problems that result from nutritional deficiency (calcium problems and crippling)
- Smaller clutch rearing—often parents will only rear one or two chicks
- Plucking or feather-destruction by the parent birds
- Extreme shyness or other behavioural issues in the chicks

ARTIFICIAL INCUBATION

The choice to artificially incubate eggs and handrear chicks should not be made without research. Although it may be a labour of love, it is also intensive and time-consuming. Both incubation and rearing require a lot of knowledge of the birds themselves and their physiological needs. It also requires knowledge of avian diseases, nutritional issues, normal growth, medical needs and so much more.

It is advised to use more than one incubator to provide high and low humidity environments, depending on the stage of egg development

Egg Sterilisation

Poultry studies at the Texas A&M University revealed that one of the most effective ways to sterilise the shells of eggs, without reducing their hatchability, was with the use of UV light and hydrogen peroxide. In the past, aviculturists often fumigated eggs with caustic substances that risked the lives of any hatched chicks in the room and possibly even the human keepers. These archaic practices are no longer necessary.

The studies revealed that 99.9% of all micro-organisms normally found on the shells of freshly laid chicken eggs could be killed by a simple dip into hydrogen peroxide and subjection to a few short minutes of concentrated UV light—small UV steriliser cabinets are available and affordable for this purpose.

A simple and effective way to eliminate most bacteria, fungi and viruses from the incubator is to dip all incoming eggs in a 3% solution of hydrogen peroxide, allow the excess to run off, then place the wet egg onto the shelf of a UV sterilising unit and expose the shell to 2–3 minutes of UV light.

This process can be used on fresh eggs that are not compromised or cracked, up until the chick has begun the hatching process and pipped the shell.

Equipment

The first step to a good artificial incubation program is to acquire a dependable machine. The difference between a good machine and a mediocre machine will be ease of use and reliability of temperature. There are many machines to select from—choose one that has a solid state thermostat and automatic turning unit that allows for an adjustment in turning frequency.

The ultimate set-up is one that includes multiple machines. Three machines would be a good start—one machine for incubation, one for hatching, and one for problem eggs or manipulation of the humidity for eggs that are not progressing properly.

Some facilities can get by with only one machine, by understanding and using the different heat levels within the machine. If only one machine is available, it will be necessary to incubate, hatch and maybe even brood younger chicks in that machine. This situation is not ideal, but it can be effective.

Pay attention to humidity levels and be very aggressive about disinfecting. Eggshells brought in from breeding pairs are a potential source of disease in the nursery and the incubation facility.

Machines with solid state temperature controls are easier to use than those with an ether wafer and a trigger switch. Solid state machines usually have a dial where you simply set the temperature you desire. It is still prudent to place several thermometers within the machine to double-check the calibration periodically.

There are two basic designs of incubators. One allows heat to rise within the machine and is often heated from the bottom. This is known as a *still-air* incubator. The other has an internal fan that distributes the heated air around evenly—called a *forced air* or *fan-driven* model.

Depending on the amount of time being spent on the actual management of the machines and eggs, either model will work well. But if you plan to put the eggs into an incubator and walk away, you will need a forced-air model. Still-air incubation requires frequent candling of eggs and relocating them into different heat levels in the machine.

Automatic Turning Units

Automatic turning units make egg incubation much easier than manual egg-turning. Eggs must be turned frequently during incubation to effect proper vein structure and chick growth. Most turning units are designed for poultry eggs and will be set to turn the eggs a fraction of a turn each hour. For parrots this is not perfect, it would be best if the eggs were turned about a quarter of the distance of the egg 'breadth' every four hours. Also, eggs are best turned in the same direction each time until it is no longer possible (due to the distance they will travel), then you can turn them back the other direction. To turn them back and forth may cause development in only one quarter of the egg. This may lead to early embryonic death in parrot embryos.

Incubation Temperature

Over the past several decades aviculturists have experimented with different temperatures in artificial incubation. Machines cannot apply heat in the same way as a sitting female, so direct application of moist heat to the shell in the upper portion of the egg only is necessary. Experimentation with different 'constant' temperatures has resulted in settings that affect the highest rate of hatch.

Using probes under the parent birds tells us that the female's breast basically generates incubation temperatures of about 38.3°C (101° F), but this is not a constant temperature maintained around the clock. Females get off the nest and allow certain periods of cooling. We call this process 'incubation rhythm'. This rhythm is very difficult to simulate in a machine because we have never charted the actual periods in a live bird. They all seem to know when to get up and when they must return to the nest. Therefore, we have had to develop an artificial system in which eggs hatch at the highest rate possible under unnatural conditions.

We do know that the embryo, even from a very young age, will position itself within the egg where it can best benefit from the proper amount of heat. In other words, when it is cool and needs more heat, it often retreats to the middle of the egg where the heat is still the highest. The yolk will float to the top of the egg during incubation to absorb the applied heat of the female's breast, but the embryo can pull itself into the middle of the yolk too.

This is not necessary in incubators with a fan-driven heat system as the heat distribution is the same all around the incubating egg. If the eggs are allowed to cool, very young embryos may actually 'disappear' from the candling light as they pull themselves down into the yolk where the heat is highest.

So, after years of experience with incubating parrot eggs, the temperatures that seem to work best under a constant level are 37.3–37.5°C (99.2–99.5°F) for incubation and a slight 1°C decrease in temperature for hatching—if you use a separate machine to hatch.

Humidity

Humidity in the incubation environment controls the transpiration of water from inside the egg. The eggshell is not a complete structure—it is a honeycomb of shell over a rubbery membrane. This allows eggs to evaporate or transpire moisture from inside through the tiny pores in the eggshell.

Eggs transpire moisture as they age or incubate. This process is natural and is necessary at a controlled rate for proper hatching. Ultimately an egg will lose about 16–24% of its original weight by transpiring water into the surrounding atmosphere during its incubation period. The amount of water already contained in the surrounding atmosphere or incubator environment will determine how fast moisture can be transpired from an egg. The drier the air in the atmosphere, the faster water will transpire. The opposite is also true. If the atmosphere is already humid and moist, transpiration slows down.

As a rule, eggs that do not lose an acceptable amount of moisture during incubation will not hatch. The extra moisture inside the egg will be absorbed by the embryo, causing tissues to swell with edema or subcutaneous water. This makes it very difficult for the chick to manoeuvre inside the shell and get into the proper position for hatching. High humidity deaths such as this are often obvious on egg necropsy—the chick will look bloated with extra fluids under the skin and the head may still be tucked under the wing.

Experience with eggs is invaluable when determining humidity levels. An experienced aviculturist can candle an egg and make an educated judgment about the size of the air-cell at the large end of the egg. On any given day of incubation that air-cell should be a certain size. If it remains too small, there is not enough moisture transpiring from the egg, either due to high humidity in the incubator or a poorly structured eggshell. Lowering the humidity may be enough to increase the transpiration but usually, if an egg has been incubated for two weeks or more and is too slow to lose weight, it will take more aggressive moves to increase water loss. If humidity manipulation is not enough, a cardboard emery board or light sandpaper can be used to sand the shell over the air-cell area. This often causes a more rapid transpiration and may save the growing embryo inside.

Generally speaking, macaw eggs should lose approximately 18–22% of their original weight as they incubate. Lower humidity settings for the first two weeks of incubation are recommended. The best relative humidity to target inside the machines is 40–42% for incubation. This may be difficult, as it is lower than the average household humidity. Therefore a dehumidifier may need to be installed in the room where the machine is located. Heated air, such as that in the incubator, will contain less humidity than the surrounding cooler air. If there are numerous eggs being incubated at the same time, the eggs themselves will humidify the machines.

In most areas of the world, the water trays on the machines are probably best left dry. Adding humidity to an already humid environment will mean certain death.

Embryos that die in the very late stages of development and never manage to pip the shell are indicative of an excessively high humidity incubation environment. As mentioned, the chicks take on extra fluids and cannot move inside the egg. Therefore they cannot get into the hatch position or manage to raise their heads and pip the shell.

The frequency of egg-turning is most important in the first two weeks of incubation

Egg-turning

Eggs are turned during incubation to keep the blood vessels growing properly. If they are not turned, the embryo begins to grow and the blood vessels remain in the upper portion of the egg. Eventually the embryo will die. If eggs are turned too often, the blood vessels never spread out around the entire breadth of the egg and embryonic death comes very late in incubation, usually in the last quarter.

An old-timer once said that females turn their eggs because they get hot against the skin and become uncomfortable. Over the course of time and evolution, it then became necessary to turn eggs during incubation for them to develop correctly. We don't know if that is true, but we do know that all parrots turn their eggs. In fact, out of more than 10 000 species of birds, there are only a few that do not turn their eggs during incubation. Interestingly enough, the species that do not turn eggs use something other than their body to incubate their eggs—they do not sit on them.

The incubators designed to hatch poultry may include an automatic turning unit. These machines are also designed to hold eggs in the vertical position for incubation. Remember that chicken eggs have been artificially incubated for hundreds of years, maybe thousands, and the systems that work for them today have evolved as well.

On the other hand, parrot eggs still incubate more successfully if laid in the horizontal position and rotated on the breadth of the egg. Consequently, a tipping back and forth on the length of the egg is not sufficient for many eggs.

The frequency of egg-turning is most important in the first two weeks of incubation. Through trial and error, a system of 4–6 turns in the same direction each day has resulted in the highest hatch rate. Automatic turners can only turn in the same direction until the eggs reach the opposite side of the machine, then they must reverse direction and push eggs the other direction. For this reason an occasional turn by hand is recommended. A protocol of hand-turning once or twice a day in addition to the machine rotation of four times a day will probably result in the best hatch rate.

When hatching begins, turning becomes unimportant. Once the chick pips into the air-cell, turning is no longer necessary. Continued turning is not usually a problem, but most aviculturists move eggs off the automatic turning unit into hatching dishes at this time. It is not absolutely necessary to stop all turning at this point but it is no longer required for development. An occasional turn of the egg during hatching may be beneficial to alert the chick that someone is waiting for them to hatch.

In review, all parrot eggs must be turned during incubation. Laying them on their sides is the most successful positioning and turning them 4–6 times a day in the same direction is recommended. Eggs do not need to be turned so frequently during hatching, but may benefit from the occasional turn.

Incubation Periods

An incubation period is the amount of time it takes a certain species to fully develop inside the egg. Official incubation periods are not calculated from the time of laying but from the time incubation actually begins. The full incubation period is the time spent under actual incubation until hatch.

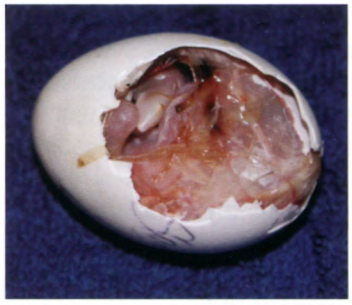
Incubation periods vary from species to species. There are some similarities within each genus, but these are usually size-based. For example, many of the medium-to-large Amazon Parrots have a 28-day incubation period, while many of the smaller Amazons have a 23-day incubation period. The same is true of the genus *Cacatua*.

Some of the more commonly kept macaw species are listed below with their full incubation period. Hatching time is usually the last three days of the incubation time listed.

Species	Incubation Period in Days
Blue and Gold *Ara ararauna*	26
Scarlet *Ara macao*	26
Military *Ara militaris*	25–26
Green-winged *Ara chloroptera*	28
Hyacinth *Anodorhynchus hyacinthinae*	28
Buffon's *Ara ambigua*	28
Severe *Ara severa*	25–26
Yellow-collared *Ara auricollis*	24–25
Noble's and Hahn's *Diopsittaca nobilis*	23–24
Blue-headed *Primolias couloni*	23–24
Blue-throated *Ara canindae*	25–26

Hatching

The hatching period usually begins about 72 hours before the end of the incubation period. The only way to see the beginning of the hatch process is through candling. The very first sign of hatching is when the chick begins to 'wiggle' in the egg and punctures the inner shell membrane into the air-cell. This coincides with the time when the chick begins to breathe air, which is a very important step in the process. This is called the 'internal pip'.



Blue and Gold Macaw hatching sequence

If the chick manages to penetrate the inner membrane and begins to breathe air, it must then raise its head and, using the tiny sharp egg-tooth at the end of its beak, push a pip mark into the outer shell. The pip mark is often visible from the outside and is shaped like a diamond—it is a small crack in the shell where air can flow into the egg. If the pip mark is in the air-cell end of the egg, it signifies that the chick is in a good position and can probably manage to hatch on its own, assuming the incubator environment is appropriate for hatching. The normal time from internal pip to external pip is less than 24 hours.

Upper left: Smallest chick—Scarlet Macaw female weighing 22g at one day old. Bottom left: Middle-sized chick—Green-winged Macaw male weighing 36g at six days old. Right: Larger chick—Green-winged Macaw female weighing 203g at 18 days old

It is not usual for a newly pipped egg to remain quiet, with few signs of progress for another 24–36 hours. During this time the chick is absorbing the yolk sac that has been providing nutrition throughout the developmental stages. When hatch time arrives, the chick will begin to rotate inside the egg, pushing small cracks along the breadth and all the way around the large end of the egg. Once it has made an entire rotation, it will begin to push its head upward to pop the top off of the egg. The pushing and normal struggle of a hatching chick is necessary. These muscle contractions pull the last of the yolk into the abdomen and prepare the chick for life outside the eggshell.

Blue-headed Macaw hatchling at three days old

Normal Hatch Weight

It would seem that females of any given species would lay eggs of a similar size but this is not true. There is a large variability in the size of eggs laid, and subsequently, in the final hatch weight of the resulting chicks.

Through experience we have learned that smaller chicks have just as much a chance of survival as larger ones of the same species. Some Blue and Gold Macaws produce chicks that hatch at about 16g, while others may produce babies that hatch at 25g or larger. Survival and their potential adult weights seem to be about the same and are not dependent on chick hatch weights.

Some larger chicks are heavier because they did not absorb all the nutrients from the yolk, and instead store this inside their abdomen. It is difficult to explain how to make this determination, but, in many cases, chicks with an absorption problem will not do well after a couple of days in the nursery. They will pale, or slow in digestion and the abdomen might swell even larger than it was at hatch time.

The colour of the internal yolk is also something that may trigger alarm and a need for assistance. Yellow yolk inside the abdomen is often a sign of trouble, whereas green or even black abdomens indicate the chick is utilising the internal yolk effectively.

In any case, where a 2–6 day-old chick slows digestion and shows signs of swelling of the lower abdomen, seek assistance from a good avian veterinarian and request the chick be placed on a suitable antibiotic known to be effective for anaerobic bacteria. Usually this needs to be in the form of injections. Often only a couple of injections will get the chick back on track to absorb the remaining yolk properly.

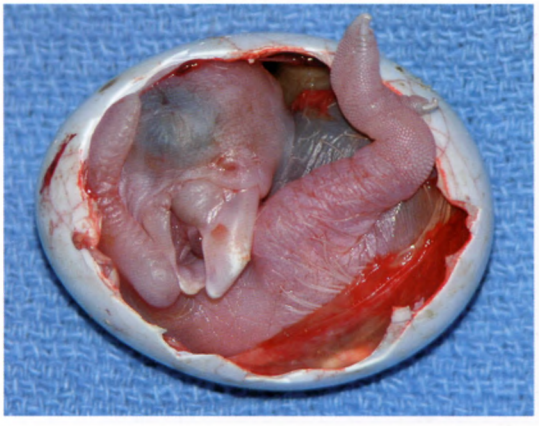
Assisting the Hatch

Sometimes things are not exactly right inside the egg and the chick may have a difficult time breaking free. In most cases, it is due to a dry hatching environment causing the inner shell membranes to adhere to the chick and keep it from rotating properly. Once hatching time has arrived and the yolk sac is fully absorbed, the chick will begin to get aggressive within the shell. If the pip marks seem to be occurring in the same place, and the chick is not rotating, a little extra moisture will probably solve the problem.

Assisting any hatch requires some experience. Breaking active blood vessels will weaken or even kill the chick. Always progress slowly and observe the chick and membranes for active blood supplies when assisting the hatch.

If the time is right for hatching, a simple procedure of removing some shell over the air-cell and dabbing the membranes with sterile water will resolve all the hatching issues. Use a clean cotton swab and sterilised water to moisten the membranes and/or wet the face and head of the chick inside. If the chick begins to struggle again after being moistened, it is a good sign that the hatch will pick up where it left off.

In cases where the chick has exhausted itself and no longer has the energy to hatch, more aggressive hatch assistance may be necessary. Once again, be cautious not to break active blood vessels or veins and cause bleeding.



This Blue and Gold Macaw embryo, malpositioned in the egg, requires assistance to hatch

Generally, a little blood loss is not a big problem, but any time a broken vein continues to bleed, it must be stopped. Applying light pressure with moist cotton-tipped swabs will often clot the bleeding vein.

Hatch assistance experience is only gained by hands-on work. The most talented of hatching professionals have hours and hours of experience. Of course they have learned to follow the rules over their years of experience too. Never rush a hatch! Chicks will almost always do the work with a little encouragement.

If chicks are pulled from the egg too soon, and the yolk has not been absorbed into the abdomen, their chances of survival are greatly reduced. Simply applying moisture inside the egg and keeping the hatching egg warm and humid is usually enough. Any time an eggshell has been compromised by hatching assistance, it must be placed into the hatcher with a plastic cover over the dish to keep the fans and moving air from further drying the membranes.

Brooding

A reliable brooder is required for the successful development of macaw babies

This nursery set-up includes a number of brooders catering for various stages of chick development—note the scales for weight monitoring

Keeping newly hatched chicks warm is called brooding. In the nest, the parents sit loosely on the chicks to provide them with body heat. Most baby parrots do not have the ability to self-regulate body heat. This will come in time—usually a few weeks—but if they are not kept warm when very young, the systems of digestion and respiration begin to shut down and the chick will die.

Close observation of the chicks will provide clues as to the proper temperature. Baby parrots usually sleep most of the time. If they are constantly moving or screaming and flapping wings, they may be too warm. If brooding in clutches, babies that are too warm will separate themselves and move to different corners of the brooding container. Those that are comfortable will huddle in a pile and sleep soundly. Those that are too cool will struggle to be on the bottom of the pile all the time.

As the weight of a chick increases, the brooder temperature is reduced. Monitoring chick weight is essential to alert of potential development problems

Close observation of brooding chicks will provide clues as to the correct brooder temperature

Lutino Blue and Gold Macaw—at this stage of development birds cannot self-regulate their body temperature as the immature feather structure is not able to maintain body heat and therefore the juveniles need to be placed in a brooder for warmth

Most aviculturists are guilty of over-brooding more often than under-brooding, probably because cool chicks don't digest their food very well and rapidly become ill. Those that are over-brooded a bit may do fine but may be slightly dehydrated or small compared to chicks that were perfectly comfortable. It does take some experience to calculate the optimum temperatures to keep young parrot chicks.

Equipment

There are many models of commercial brooders available to the aviculturist. There are also instructions available on how to build your own brooder. In all cases, these are electronic devices and they require constant monitoring to make sure they do not overheat or over-cool the chicks.

Commercially manufactured brooders are certainly the safest and most dependable way to keep baby birds warm in the nursery, although you can use heat pads or even heat bulbs and light—if using the latter, chicks must be checked almost hourly. There have been many accidental burns or deaths caused by overheating baby birds with heating pads. Towels or similar substrate help to insulate chicks from dangerous heat levels.

The usual set-up is to place a heat pad under a section of an aquarium, warming the glass on the bottom to a certain temperature. This method is best used on chicks of an age where they can move if they get too hot. Older babies will walk to the cooler side of the aquarium when overheated. Tiny babies that cannot walk will simply be overheated and, if not attended to quickly, die.

Heat bulbs can also be used to keep chicks warm. But as with heating pads, there must be a cool spot where the chick can retreat from excessive heat. Be cautious when using infrared bulbs to brood baby birds. They concentrate the heat in one spot and may burn a baby's skin rather quickly. Never simply turn on a heat bulb and walk away. Using such variable heating equipment requires constant monitoring.

Brooding Temperature

Newly hatched macaw chicks must be brooded at temperatures near that of incubation. The first brooder is often set at about 35°C (95°F). This temperature seems good for babies kept as single birds or in small clutches. As they grow over the next week, the temperature will have to be reduced by a few degrees. As a general rule, as the weight increases the temperature is reduced—only reduce temperatures by a few degrees each time you turn it down.

After the first two weeks most baby macaws that do not have their down feathers will be

comfortable at about 29.4°C (85°F). Once they develop down and begin to show feather spots on the skin, the temperatures can be set at about 27.8°C (82°F) and kept there until the birds actually begin to feather. Often by this time room temperature is enough to move the chicks to open boxes.

Signs of low brooding temperatures include slow digestion, cold skin, inactivity when being fed, cool beak, lack of feeding response, redness of the skin, or paleness of the skin. Over-brooded chicks are usually very active. They may pant. They flap their wings while trying to sleep. They may not grow properly and, in severe cases, the beak may grow out of alignment.

The first two weeks of life are the most important. As chicks begin to thermo-regulate their own temperature, brooding becomes less of an issue.

Special Notes on Brooding Baby Macaws

At about three weeks of age, baby macaws can usually be leg-banded for identification. Use the 'three toes forward, one toe back' method to slip the closed band over the foot and around the upper ankle.

This is also the stage when baby macaws become mobile. When you are changing containers or washing brooders, they may make a run for it and end up on the floor. Never leave a baby macaw of this age unsupervised. Prepare clean boxes or buckets and transfer the bird directly to the new container. Do not sit them on the counter while you work.

A note about macaw handfeeding formula may be helpful here. If the formula is not totally fulfilling the baby macaw's dietary requirements, it may become overly hungry and exhibit abnormal behaviour, such as becoming frantic whenever a person is nearby. Baby macaws should sleep most of the time and should only pump or become active when they are being handled or fed. If they are pumping on each other, the formula may not be quite right. The addition of some extra fat such as peanut butter, almond butter, coconut oil or, if you are spoon-feeding, some raw ground nuts of any sort, may solve the problem. Frantic baby macaws may hurt each other by pumping on wings, legs or breaking holes in each other's tender beaks.

Incubation Problems and Troubleshooting

Most early dead-in-shell chicks are blamed on the parent birds. The veterinarian may cite nutritional issues with the female or infection in the reproductive tract, but these are almost never the real cause of the issue. Incubation problems are difficult to analyse and solve, so blaming the parents is often the easiest thing to do.

Very early embryonic death is usually related to temperature or vibration. If the trays in the incubator are vibrating too much, they will cause disruption of the delicate blood vessels. Often this results in what we call a 'blood ring', where the blood that has formed recedes to the outermost ring of development on the yolk. Vibrations or bumping eggs in these very early stages can result in sudden death of the embryo. After three weeks of incubation, vibrations or even slight bumps will have no effect on the growing chick. Some eggs have been known to hatch even after being dropped and cracked in the last week of incubation.

The first week of incubation requires a steady temperature as well. If the egg has been incubated and cellular division has begun, any extreme cooling will stop development, often permanently. Be sure to maintain a constant temperature until the egg reaches a few weeks of development. At that point, some periods of slight surface cooling will not have a negative effect.

Late-stage dead-in-shell death, or hatching failure, can be caused by several things. Most often it is excessively high humidity that brought about the failure. High humidity in the machines is not necessary until the chick has actually pipped a hole in the outside shell. Before this, excessive humidity causes the egg to maintain moisture, which weakens the chick and restricts its movement within the egg.

HANDREARING

Equipment

Before pulling baby macaws from the nest, you will need some nursery equipment and supplies. Depending on the age of the chicks, you might need a brooder to keep them warm, syringes or spoons to administer food, some type of handfeeding formula, bedding, disinfectants, medical supplies and paper towels.

Choose a handrearing diet that has been proven safe and effective for baby macaws. There are several commercially manufactured brands that are dependable, or you may opt to make your own from a favourite recipe. The formula may be the most important 'equipment' in the nursery.

Equipment used in handrearing includes curved spoons, gavage needles, feeding tubes, syringes and a mortar and pestle—used to pulverise formulas so it can pass through the selected feeding instrument

Every baby bird is different. Some of them adjust to being fed by a human in only a minute or two and others may take days to get used to formulas and feeding methods. This is often age-dependent—younger birds adjust faster. Some babies accept and like a syringe, while others may do better if spoon-fed. Be sure to have all the necessary equipment on hand ***before*** bringing a baby into the nursery.

Remember there is no substitute for experience! If you don't know how to feed a baby macaw, get some lessons by working for a breeder or someone who feeds baby macaws on a regular basis.

The table details suggested items that you should have available before attempting to brood and feed a baby macaw.

Brooding Equipment	Feeding Equipment	Weaning Equipment
Brooder or heat pads/lamp	Syringes or spoons	Small cages
Plastic buckets or tubs	Formula	Moveable perches
Substrate	Microwave	Dishes
Towels and paper towels	Spoons, forks, whisks	Towels
Thermometer	Small dishes or cups	Toys
Tissues	Thermometer	Seed, nuts, food
Baby lotion (moisturiser)	Feeding tubes (if required)	

Feeding Response

The term 'feeding response' refers to the action of bobbing the head and accepting food being offered to a baby parrot. Macaws generally have a very strong feeding response when they are healthy and their brooding environment is maintained correctly.

Most baby macaws will respond at feeding time when touched anywhere on the head or beak. The proper way to trigger the response necessary for proper feeding and swallowing is

Formula should be fed as a diluted, thin mix for the first few feeds of a baby macaw's life—most will respond at feeding time when touched on the sides of the mandibles

to gently touch the fleshy pads located on the sides of the upper and lower mandibles. Right-handed feeders may find it easier to use the forefinger and thumb of the left hand to solicit the response, while feeding with the right hand. Birds that respond to feeding are usually swallowing correctly.

The first-time handfeeder attempting to feed a baby macaw may be surprised at the vigorous feeding response exhibited. Macaws often jump toward the syringe when touched, and honk and vocalise loudly. Older birds will spread their wings in an attempt to keep the other babies from competing for formula. This is all quite normal and usually signifies that a baby bird is doing well.

The difference between a normal feeding response and one that is frantic and desperate should be obvious to an experienced hand feeder. In many cases a baby macaw in trouble will already be thin or losing weight or may not be digesting food properly. This causes them to become very hungry all the time and they lunge desperately for food when approached or touched. If there are signs of illness, it is time to visit the veterinarian.

Frantic feeding responses are a sign of trouble. As mentioned, it can be a sign of illness, but it can also be an indication that the formula is not well balanced. Baby macaws that feel hungry, even if they have a full crop, act very differently to those that are feeling well and satisfied. Starving macaws may approach feeding time or any human touch with 'frantic violence', a sign that the bird is not getting sufficient nutrition. Strangely enough, birds that are starving or are deficient in nutrition may also have slow-digesting crops. This adds to the desperation the bird feels and causes it to lunge frantically, or even attempt to hurt siblings that might compete for the syringe full of food. If it is suspected that a baby bird is starving (even though being fed regularly) it may be wise to have a veterinarian perform a bacterial culture and analysis to see if some bacteria is slowing digestion.

First Feeds

Incubator-hatched Chicks

When is an incubator-hatched baby macaw ready to accept food for the first time? When it is strong enough to stand up and solicit food by exhibiting a feeding response. Newly hatched chicks do need some recovery time after the struggle of hatching, but most are ready to eat within hours of emerging from the egg. After scrubbing hands with a sanitiser, simply place warm fingers on the fleshy pads of the beak and see whether the baby begins to pump gently, indicating it is ready to eat.

Usually the first few times a baby macaw is fed, the formula is offered as a diluted, thin mix. The extra water helps to hydrate the baby and keeps the digestive tract moving properly. Feeding extremely thick food at such a young age will often cause crop stasis. Adding a drop or two of water to the crop contents until it is digested may help move things along, but be cautious when feeding water to a newly hatched baby. Make sure to offer thin formula or water one drop at a time, and allow the baby to swallow before adding more. It is very easy to aspirate liquids into the lungs of a new chick.

Special 'day one' formulas are available. These usually contain extra vitamins and perhaps digestive enzymes. They are great for the first few days and help the chicks to gain strength but should not be fed on a long-term basis. Too many vitamins can be just as dangerous as not enough.

Incubator-hatched macaw chicks may need to be fed every hour for the first 10–12 times. As they gain strength, the formula can be thickened slightly to slow digestion times. For the first two days, expect to be feeding every 2–3 hours on an 18-hour schedule. Long periods of time where there is no food in the digestive system of a chick causes dehydration and eventually crop stasis. Monitoring weight is the easiest way to assess if the chick is doing well. After the first day, baby macaws should not lose weight—they should gain each day, even if only a gram or two.

As days progress, the crop will grow to hold more food at each feeding. This is normal and eventually helps to reduce the number of times a baby needs to be fed.

Parent-hatched Chicks

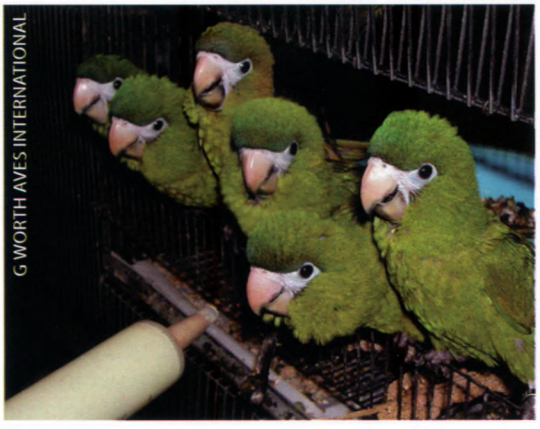
Baby macaws that are pulled from the parental nest to be handfed are a bit easier to handle. Depending on the age handfeeding begins, the crop is often already large enough to hold food for several hours, thus reducing the frequency of feeding and the stress levels on the aviculturist. The first time formula is offered to a parent-started macaw chick, it can be fairly thick in consistency. There is no need to feed thin formula unless you are dealing with a dehydrated bird.

Blue and Gold Macaws at 38 and 41 days old

Formulas

Over the years food formulas for baby macaws have changed dramatically. During the 1970s and '80s many breeders created their own formulas, often using the types of foods they fed to the parent birds. Homemade slurry may have included primate chow as a base, with added human baby foods, peanut butter, other nut butters, vitamins, water, fruits, vegetables, or basically anything an adult bird might choose to feed to its young. These ingredients were blended smoothly enough to go through a syringe with ease. Although often unbalanced, many homemade formulas did prove to be effective and baby macaws were successfully reared.

Feeding chunky baby formula with the addition of crushed nuts is a more natural way to feed baby macaws. There is some anecdotal evidence that this method, administered via a spoon, results in better growth rates



Noble's Macaws being handfed formula by syringe

As aviculture became a worldwide endeavour, the need for some standardisation of formulas evolved. Several commercial parrot food companies became interested and began to research the nutritional needs of baby macaws and other parrots. Eventually commercial handrearing formulas became available and helped to revolutionise the industry.

Blue and Gold Macaw chick being fed via syringe

Today, most people who handrear parrots use some type of commercially manufactured rearing diet. It is easier and provides scientifically researched nutrition rather than guess work. Some commercial diets do have their issues periodically since they are manufactured in large processing plants. Sometimes extra vitamins or some other ingredient may be added by mistake. Observing the chicks to make sure they are growing correctly is the best defense against any variables.

Protein and Fat Levels

What is proper nutrition for a baby macaw? Experience has shown us that macaws fed from day one (hatch) grow best on formulas with a crude protein of 18–22% and fat levels of 12–22%. Baby macaws that have the advantage of being parent-fed for a few weeks will do well on lower levels, while incubator-hatched chicks grow best on middle to high-range levels. Commercial diets usually try to stay in the lower ranges so as not to exceed tolerances. Therefore most breeders add a little fat and protein to these instant diets by stirring in some peanut butter or other high-fat, high-protein foods. Be cautious whenever adjusting formulas for baby parrots, however, as excessive protein or vitamins can be dangerous and cause severe long-term health issues.

Formulas with excessive protein amounts fed over an extended period can cause birds to grow long limbs and thin bodies. Healthy baby macaws do not look like this. In fact, parent-fed baby macaws are often rounded, fat babies with shorter limbs and wings.

Monitoring body weight as chicks develop is a good way to judge the effectiveness of a formula. Baby birds should gain weight daily through their growth time, up until the beginning of the weaning process, when most healthy baby parrots are about 15–20% heavier than their parents. Genetics also play a valuable role in size, so an overall health assessment is more important than eventual body weight.

Socialisation

In the past decade, the proper socialisation of young parrots has become the subject of many unofficial studies and a few good magazine articles. It seems that the old way of spoiling baby parrots and treating them like 'puppies' does not necessarily help them adapt to a life in captivity as adult birds. In fact, some species of parrots become so altered by this anthropomorphic socialisation that they grow up neurotic or nervous and may not even know they are birds at all. Isolation was used in the past to make baby macaws enjoy or crave human interaction. They were handfed individually and separated from all other parrots in the nursery for weaning. This was supposed to make them more human-like and increase their ability and willingness to mimic the human voice. It may have worked, but when some pet macaws were placed in a breeding situation, they did not know what to do. Also, some pet birds became very frustrated when they were left alone all day with no human interaction because they had become accustomed to being fussed over.

The current attitude towards socialisation for young parrots is to make sure that they interact with other parrots as they mature and wean. Raising baby macaws today means allowing them to be birds and act like birds. Proper or accepted socialisation means allowing them to interact with birds of their kind or, if no other macaws are available in the nursery, encourage them to play with other parrots such as cockatoos or Amazons. This seems to be more important in the later growth stages, before and during the weaning stage. In reality, it has made many nursery chores easier as the older macaws will often teach younger birds how to wean and eat from a bowl. The final result is that the birds are more stable. They do not crave human attention 24 hours a day, and they know how to play with toys and keep themselves busy rather than screaming or pulling out feathers to obtain human attention.

Socialising baby macaws produces more stable birds that function well as pets

Group or clutch socialisation is somewhat common now and it will probably prove to be effective in reducing the number of pet birds that simply cannot adjust to a captive life. Fears that a 'bird-socialised' parrot would bite or be obnoxious have proven to be unwarranted. In fact, this new way of socialising baby macaws is producing more stable birds that function well as pets, and still know how to breed, given the opportunity.

As with any animal husbandry, the processes used are often part of a learning curve. We now know that juvenile socialisation is important and we have become aware of the need for enrichment in a companion parrot's life as well.

These macaws are encouraged to socialise and interact with other juveniles

Preventing Future Behavioural Problems

This subject is certainly one of true debate. What makes a pet parrot so neurotic or fearful that it plucks its own feathers out or chews them to shreds? Although macaws are not really known for this type of activity as adults, there are a few that fall into the habit, and breaking that cycle can be very difficult. It seems that cockatoos and some African species are more prone to becoming

Natural browse provides mental and physical enrichment

plucking or mutilating parrots than macaws.

Many of the behavioural issues we see in pet parrots these days are actually caused by the current environment, and not necessarily by the way in which they were reared. In fact, many parent-reared or partially parent-reared pet birds are just as prone to these undesirable behaviours as handfed birds. To fully eliminate these behaviours in pet parrots will require work by the breeders, handrearing experts, and ultimately the pet owners themselves.

Building confidence in the birds we produce can be difficult, but it seems to be a key factor in behavioural issues. Fearful (insecure) birds often become biting or screaming companion birds. Biting or screaming birds then get abandoned and sent back into the system through some type of rescue operation or volunteer. Over and over, the bird is subjected to situations where humans are 'trying' to make it happy and resolve behavioural issues. The lucky ones are returned to breeders and allowed to live out their lives without the daily expectations of being the perfect companion.

This is not to say that all pet birds should be recycled back into a breeding situation, only that we, as professionals, need to recognise if this is the best solution for the problem. Birds are all individuals and, although they will exhibit some innate behaviours, much of what they do and how they react is learned from their many experiences with humans, their environment and interactions with other birds. A bird that is not a good pet for one person may be the perfect companion for someone else—after several attempts to find the right situation, someone has got to step up and make the right decisions.

Placing foraging items in the aviary prevents boredom and associated problems—nuts can be placed in the holes of this log

Preparing baby macaws for their future life in captivity is an important task for which we, unfortunately, do not have all the answers. Our new ways of socialisation have certainly helped to reduce behavioural issues—an indication that we are on the right path—but owners and companions need some education as well. We cannot expect any parrot to behave the way we *want* it to behave without providing it with some guidance. There is no substitute for a well-trained, properly socialised, companion parrot, and although 'training' is sometimes considered a bad word, it is exactly what is needed. Pet parrots need to know what to expect of us and what we expect of them because this builds confidence in the bird.

Well-adjusted companion birds are those that know what you want them to do when you issue a command such as 'step up'. They are also willing to play and entertain themselves when you are not around. Birds such as this evolve through a system of juvenile 'games' and interactions with other birds and humans. They have to be taught how to play and they must learn to trust their human keepers.

Punishment is not acceptable—at least not the punishment we normally associate with training our own children. A system

of rewards works best for training parrots, and we call this 'positive reinforcement'. If they have a favourite food or a favourite perch, or even a favoured activity such as dancing to loud music, use this as a reward. Pet owners must know ahead of time that when they acquire a parrot it will require some work and invested time to become the stable, well-behaved companion they expect. Some of this work can begin with the breeders as well. Breeders must educate themselves as to the best methods to build confidence in young parrots and begin to introduce them to situations and training that will benefit their future life in captivity.

CHICK DEVELOPMENT

Stages of Development

It seems that there will be as many opinions on this subject as there are people breeding macaws. Breeders and pet owners tend to project human maturation and development stages onto the animals they keep and love. To some degree this has merit, but birds are not humans and their lives and purposes are different and so are the stages of their lives as they mature. We must use terms that we all understand to explore this subject and therefore we have to assign the biological terms often used to describe the development of a human child.

The synopsis following is not an ornithological breakdown of the stages of avian development. It is an opinion as to how young macaws would fit into the different ages and stages of human growth. It is meant to provide the keeper with an idea of how fast a macaw can mature and develop. As the ones in charge, it is our job to accommodate them properly and provide them with challenges and enrichment suitable for their age and stage of life.

Neonatal

'Neonatal' development in parrots can be defined as that stage after hatch, but before the eyes open. In parrots, this time is the most vulnerable as the newly hatched chick cannot yet thermoregulate its own body temperature and must rely on its parents (or the aviculturist) to provide it with heat. Parrots are basically helpless at this stage of life. They cannot feed themselves and they cannot avoid predators or dangerous situations. With regard to aviculture, they can only eat and sleep. However, chicks do respond to touch and temperature variations and they can move to some degree and position themselves to be more comfortable.

Infant

The 'infant' stage would probably coincide with the time when a chick first opens its eyes, through to when it begins to develop good co-ordination and motor skills. Every species will enter these developmental stages at different ages. Some parrots mature very rapidly and can go from neonate to adolescent in as few as eight weeks. Macaws do not grow or mature quite that quickly.

Macaws that have just opened their eyes are not aware of who and what is around them, but they can detect approaching movement, daylight and darkness. They may recognise the person attending to them at some point. Infant macaws are learning to move their feet and wings, and they will find the most comfortable position in their brooding container to sleep. Their activities are still limited to eating, sleeping and some early touching with their tongues and limited relocation skills.

Toddler

When baby macaws begin to move about with skill and use their wings for balance as they walk or run, they are entering the 'toddler' stage. In humans this stage may coincide with playing and an increased curiosity about things around them.

This Hyacinth Macaw is in the infant stage of development

This developing Blue and Gold Macaw stretches its wings

Handreared Yellow-collared Macaw juvenile

Blue and Gold Macaws explore their surroundings

This Green-winged Macaw is developing a strong awareness of its environment

These Blue and Gold Macaws fledglings are fully independent

Although toddler macaws seem curious, they most often choose to stay put in the containers where they sleep, and don't venture too far. Macaws of this age know when food is coming and get excited to see the syringe.

Preadolescence

From toddlers, macaws jump right into preadolescence. This is the stage where they are almost fully feathered and aware that they are birds. They play regularly and explore the world around them, often jumping out of their brooding containers or tubs, and using their beaks to feel surfaces or to introduce themselves to other macaws or birds in the vicinity.

Their foot to mouth co-ordination is not yet fully developed and they rarely balance on one foot to play. Instead they may pin a toy down with one foot and reach their beak down to touch it or manipulate it.

Adolescence

The time when a fully feathered young macaw is in a cage and beginning to explore adult foods would be adolescence. They are fully aware of other birds, toys and any changes that take place around them. They are also beginning to look out for dangers or fast-approaching strange objects or persons.

If placed in groups, they play and can stand on one foot to explore with the other foot. They flap their wings with vigour and are beginning to slim down for future flight. Believe it or not, at this stage they seem to be aware of sexes as well. It is not unusual for young macaws to sit in pairs or choose a playmate of the opposite sex.

Young Adult

Young adulthood begins when a macaw can feed itself and can fly or flee from danger. This is consistent with post-weaning age birds. They are fully independent, but still exploring and building their self-confidence. Sexual awareness is obvious, but birds of this age do not practice copulation or explore a nest box with the same 'ideas' in mind as would an adult macaw.

Adult

Once they reach adulthood, macaws will seek out a mate, copulate regularly, and view the nest box as a place to raise a family, not just as a toy or something to destroy for fun.

Weaning

The weaning process is one where a baby macaw is slowly converted from being handfed with formula to eating adult diets such as pellets, seeds and nuts. Large macaw species may begin to pick up foods and explore at as young as 7–8 weeks of age but will probably not wean until they are about 14–20 weeks old.

The best time to introduce adult foodstuffs to baby macaws is in their preadolescent stage (mostly feathered with the tail half the adult length). Don't expect such young birds to pick up and ingest food immediately, as it is a process that may take several months to complete. Start by presenting adult foods to

Parent-reared Blue-throated Macaw fledglings learning to eat together

the young and allowing them to play with and explore the items. Chances are they will make a huge mess on a daily basis for many weeks to come, but eventually they will crack a seed or nut and begin to ingest foods on their own.

There are no real tricks to weaning baby macaws. They will wean when they are ready and at the proper age to do so—although there are some foods that attract them sooner than others. Some breeders like to introduce 'soft foods' first—items such as fruits and vegetables, soaked parrot pellets or even different nutty breads.

It is true that baby macaws may play with these food types first, and they may even eat them, but since they offer little satisfaction for hunger, these same chicks will still beg for food on the same schedule as before. This brings up the other school of thought on weaning young macaws, one where you offer only seeds, nuts or parrot pellets first. The concept is that when the young birds begin to swallow foods, they are consuming foods that actually curb hunger. Thus weaning will move along faster.

Whichever method you choose, the secret to weaning is not to allow the birds to lose too much weight while you wait for them to eat the offered foods. It is actually best to continue handfeeding on the same schedule as before, even after introducing weaning foods. You may try handfeeding them on the same schedule, but reducing the amounts fed. This might be a more natural way to increase their curiosity in the offered foods.

In the native habitat, the parent birds will stop going down into the nest to feed the chicks. Instead, they will stay at the entrance hole of the nest and entice the young to come up to them and eventually to leave the nest altogether.

Weaning Cages

Weaning cages are designed so that a baby macaw can be housed in front of the food dishes. If you place young macaws into huge dome-top cages and offer them bowls of food, they will spend most of their time climbing about and may not touch the food or the bowls.

Weaning cages are usually built short and smaller—more like a countertop model cage. Place the perches low and the food bowls right in front of the birds. Entice young birds to explore the offered seeds and other foods by placing a syringe full of formula into the bowl with it.

Weight Monitoring

Over the course of a few weeks, chicks will begin to eat food from the bowls. The only real way to know how much they are eating is to monitor their weight. You can also feel their crops to see whether they are ingesting food or just playing with it. Be aware that some foods are digested rapidly and may not stay in the crop very long.

Weight management is a more scientific way to monitor intake. Young macaws should not lose more than 18–20% of their initial weaning weight during the process. At any time weight loss is high or the birds seem 'out of sorts', offer more formula to build the bird back up again. Never allow the bird to get weak or sickly from the process. Weaning takes time, and there is no healthy way to force a bird to your time schedule.

Fledging

In the natural habitat, the term fledging refers to the act of a young bird emerging from the nest and taking its first flight. In terms of captive breeding, it can mean several things—the first real flight, weaning, or if parent-rearing the young, the first time young leave the nest box and do not return for the night.

Parent-rearing macaws can be a very rewarding experience. There are certain dangers or at least cautions in order as well. Young fledglings are not exactly stable on foot or wing when they

first emerge from the nest box. They can crash into wire enclosures or hit the cement floors hard enough to cause major injuries. Always keep an eye open for trouble with newly fledged chicks.

One issue that arises on occasion with parent-reared birds is aggression toward the youngsters by one parent. Although not common, this can happen and may result in the young birds starving to death before they learn how to eat on their own. Sometimes intervention is needed, which may require pulling the fledged chicks out of the parent cage and finishing them by hand. This is an unfortunate situation and very stressful on both the birds and the keeper. Birds that have not been fed by a human will not know your intentions. They may fight you and not eat for days on end. Some birds resist human feeding for so long that they will need to be force-fed with a tube until they adapt to the situation.

Usually, parent birds will rear just fine as long as there are no huge interventions during the process or gross violations of their privacy. Be sure to offer plenty of nutritious foods for the parents to choose from and for the young birds to explore. The length of time this process takes will vary from species to species and bird to bird.

Removing the young birds from the parental cage before they are weaned is not recommended. As with handfed birds, the chicks are often fully independent by 16–20 weeks of age, but there are exceptions. Also, be aware that young birds may accept 'feedings' from their parents long after they are weaned. The only true way to know if a parent-reared bird is weaned is to observe it eating on its own and to confirm that it has actually consumed the foods provided.

An important aspect of fledging is learning how to fly. This is important for both parent-reared and handreared macaws. One of the old practices thought to keep captive birds tamer was to clip their wings before they ever knew how to fly. Of course we now know that this practice leads to very unstable birds that are often insecure and exhibit behavioural issues later in life. There is no set rule as to how much flying a baby macaw should be allowed to perform before its first wing-clipping, but at the very least they should have had the chance to take a few flights across the room. Flight is an important exercise for birds and it is part of their psychological and physiological life.

RECORD KEEPING

There are no hard and fast rules on how or what kind of records must be kept when breeding parrots or other animals in captivity. There may be many reasons why breeders purposely avoid record keeping, such as taxes and privacy. But in the end, record keeping is important to the industry as a whole and there needs to be some consistency to the methods used.

A few computer programs designed to help breeders keep records are available. Avimate3 is software built specifically for bird breeders. It was designed a decade ago and does have some technical issues, but it is still very useable and provides a platform to track breeding birds, their mating, eggs produced, chicks hatched, dates, places, eventual leg band numbers and their species. These are the most important data to know about any captive-produced bird. You can download a free copy of Avimate3 from www.afabirds.org.

If a computer program is not used for keeping track of offspring and other important events, some paper trail of data should follow the birds wherever they go. In other words, give a copy of a bird's individual record to the person who acquires the bird from you. At the very least he or she will want to know the date it was hatched, the species information (maybe proof of purity of the parents), and the leg band number, microchip details and other identification.

Sample of Basic Record Keeping

Species
Blue and Gold Macaw *Ara ararauna*
Parent Birds
Female: Wild-caught female (XTT-998)
Male: Captive-bred male (HCA-1107), hatched 2008
Notes
Female acquired from John Smith of California in 2000. Suspected to be of wild-caught origin. Male bird raised by Tracy Jones of Arkansas and purchased in September 2008
Offspring of XTT-998 x HCA-1107

Hatch Date	Ring Number	Microchip	Sex	Comments
8/15/2013	STU-002	None	Male	Large bird
8/17/2013	STU-003	None	Female	Missing toe left foot, rear.
8/19/2013	STU-004	None	Unknown	

The international conservation community is becoming increasingly concerned for the many species of parrots in the wild. This has led to a tougher scrutiny of the hobby of raising captive parrots. Without good record keeping, the hobby may become a national activity, as birds bred in one country will have to remain there. This is partly due to the fact that breeders without records cannot prove they are breeding a species, or how successful they have become at it. One way to begin communication between conservationists and aviculturists is through our record keeping. Good, sound records demonstrating that birds are being bred and that no birds have been taken from the wild to supplement the production will eventually lead to a better relationship and, hopefully, a more relaxed system of trade between countries.

Trading offspring between breeders is a very basic and necessary activity that keeps the hobby strong through good genetic management.

Basic Identification

It is difficult to permanently mark a bird with identification. Tattoos eventually wear off due to the elasticity of the bird's skin, and leg bands can be removed or cause danger. Microchips are a great way to identify an individual, but they are not visible to the eye—that works both in favour and against their use as the preferred method for marking.

The industry of bird keeping has evolved to the point now where international co-operation between breeders is necessary to keep genetics viable. With this necessity comes the need to identify each individual that will enter into trade.

Leg bands have long been the standard and acceptable way to identify birds and that is still true today. However, bands can also be dangerous. They can be removed and they can be forged, building distrust from lawmakers and conservationists. Nevertheless, leg bands, along with sound record keeping, will begin to close that gap of mistrust and begin to improve relationships. Therefore breeders must find a way to standardise their records and share information worldwide. Perhaps a worldwide registry for the most endangered species is the answer. It would have to be a registry that can be used by lawmakers and governments to identify legitimate captive-raised birds without compromising the privacy of the breeders or owners. Much work is needed on this front if aviculture is to survive long-term and gain the respect it deserves in the conservation community.

MUTATIONS

Mutations developed in the Blue and Gold Macaw include the NSL Lutino (*aka* Recessive Yellow), the Cinnamon, Blue, the sex-linked recessive Opaline, Greygreen, Pied and 'Golden'.

A Blue mutation is under development in the Scarlet Macaw. It is recessive in inheritance.

The Bronze Fallow, an albinisitic mutation, has been bred in the Buffon's Macaw. It is recessive in inheritance.

More details and photographs of mutations are included in the individual *Species* chapters.

Normal (left) and Bronze Fallow Buffon's Macaws

Opaline Blue and Gold Macaw

Opaline Blue and Gold Macaw juvenile

Non sex-linked Lutino Blue and Gold Macaw

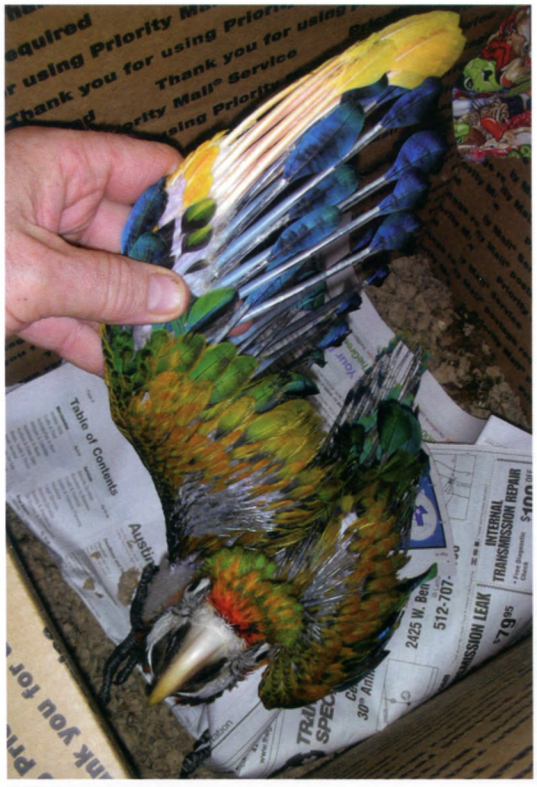
Normal (left) and Blue Opaline mutation Blue and Gold Macaws

HYBRIDISATION

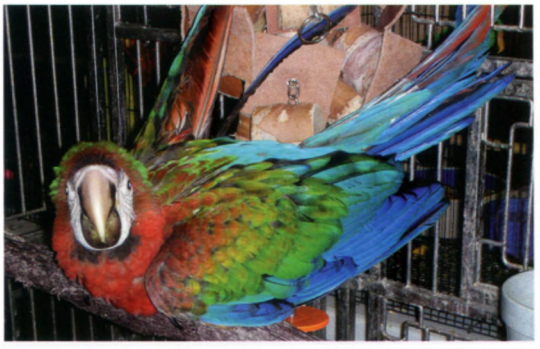
'Catalina' hybrid bred from a Scarlet x Blue and Gold Macaw mating

'Harlequin' hybrid bred from a Green-winged Macaw x Blue and Gold Macaw mating

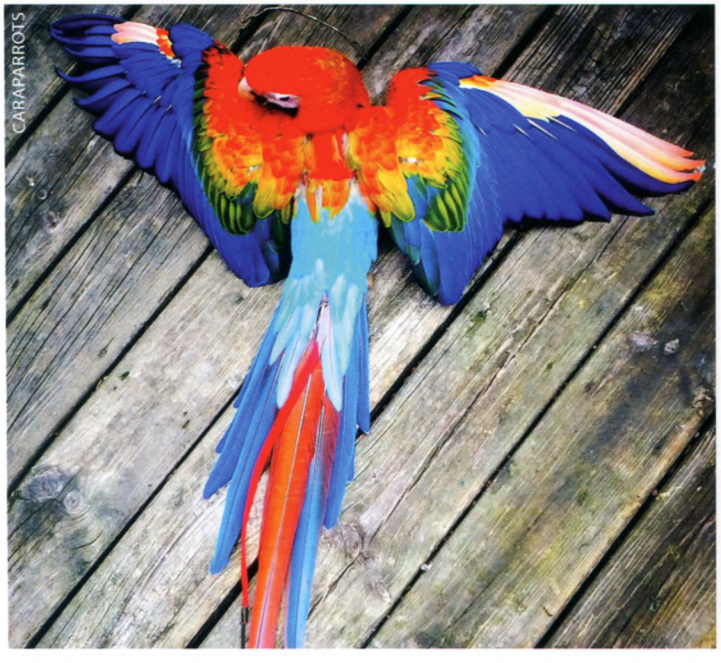
'Miligold' hybrid bred from a Military x Blue and Gold Macaw mating



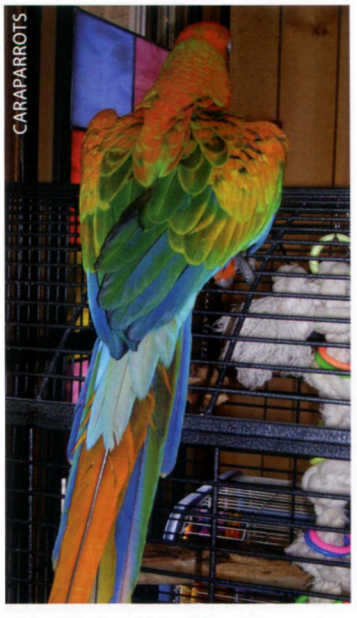
This second generation hybrid of unknown heritage displays unusual light pink and white primary feathers—symmetrical on both wings



Hybrid bred from a 'Catalina' (Scarlet x Blue and Gold) x Harlequin (Green-winged x Blue and Gold) mating



This 'Camelot' hybrid bred from a Scarlet x Catalina (Scarlet x Blue and Gold) mating displays unusual markings



'Capri' hybrid bred from a 'Camelot' (Scarlet x Catalina {Scarlet x Blue and Gold}) x Scarlet Macaw mating

Macaw hybrids are created when the parent birds are of two different species. This is equivalent to the new 'designer dogs' that are being created to fulfill a pet trade demand. Although dogs are all the same species, crossing the different breeds creates a new type and look for the family that wants something different. Not all of these creations exhibit positive attributes and in a similar fashion, parrot breeders must use some discrimination when attempting to create hybrids.

Over the course of a few decades, the pet trade has given new names to the most commonly produced hybrid macaws. For example, if the female is a Scarlet Macaw and the male is a Blue and Gold Macaw, the resulting chicks will be the hybrid known as the Catalina Macaw.

The subject of hybridising macaws has become something of a war in aviculture around the world, fueled mainly by those who consider captive pet and aviary birds are a reservoir of genetics for possible future conservation efforts. Other bird enthusiasts regard hybrids as just another product that can be offered to the trade.

It is important to keep in mind that the captive bird trade (sales of birds bred in captivity) is the economic basis that keeps most aspects of aviculture alive. There are very few breeders of captive birds who are paid to do so by conservation programs or governments of countries seeking to preserve a species. This means that income is necessary in all breeding, selling or adopting situations for the industry to survive.

Some of the first hybrid macaws to be hatched in the USA belonged to Parrot Jungle, in Florida, although not all the breedings were planned. The original owners of this tourist attraction were also the first to breed pure Scarlet Macaws in captivity in the USA.

The most interesting data to come out of this early experience with flocking macaws is that some macaws will choose a mate of another species even if one of their own is available. Apparently this takes place in captivity more often than in the wild as there are very few hybrids ever noticed in the natural habitats.

Animal rights and extremist groups in some countries are in the process of getting laws passed to prohibit the keeping or breeding (private sector) of rare or endangered species. In the USA it is now illegal to sell a Blue-throated Macaw from one state to another without a Federal Governmental permit. These extremist groups have now lobbied the American government to add most macaw species to the list of endangered species, effectively limiting any sale or export of birds for American breeders. This means that macaws will be 'dead' economically in American aviculture, and any incentives to breed them, other than for release programs back to the wild, will soon be gone.

Exporting offspring is also very difficult due to CITES regulations pertaining to commercial trade in Appendix-listed birds. So, what will happen? Most likely, the giant reserve of genetic materials of these rare birds in the USA will begin to disappear. The alternative will be an attempt to keep the hobby alive—therefore aviculture will cross-breed macaws so they can continue to keep them and have them as pet birds.

Before the crunch on endangered birds in the USA, hybrids were common but the majority of macaws being produced were pure species. The rarest of the rare were often not hybridised indiscriminately, although some hybrids were produced either by accident or because a suitable pure mate could not be easily found.

Buffon's Macaw hybrids, for example, are rarely seen but they have been crossed with Hyacinth Macaws and Scarlet Macaws. It seems that many of the hybrids that are offered into the pet trade are second generation or higher hybrids, where a hybrid is bred to another hybrid. Another desired hybrid that is commonly seen is the Camelot Macaw (Scarlet x Catalina), which is a pure species bred with an existing hybrid.

The most commonly seen hybrids were Catalina Macaws (Scarlet x Blue and Gold), Miligold Macaws (Blue and Gold x Military), Cactus Macaws (Scarlet x Military), Ruby Macaws (Scarlet x Green-winged) and Harlequin Macaws (Green-winged x Blue and Gold).

Most of the hybrid combinations within the genus *Ara* are fertile. Their second generation or higher offspring appear to be fertile as well. However, when an *Ara* Macaw is crossed with *Anodorhynchus* (Hyacinth Macaw), the resulting chicks appear to be sterile as no second generation offspring have ever been successfully bred. This has limited the number of Hyacinth Macaw hybrids considerably.

Hybridisation and colour mutation breeding are part of the hobby of aviculture. For those who love birds and love the 'strange' or 'unusual', hybridisation can be fun and exciting. It becomes a problem when both the captive population of a species and the accompanying wild population of the same species become threatened or endangered. Even though our captive birds are rarely needed for wild bird conservation programs, there is the chance that they will be someday. For this reason there must be some type of preservation and management of our captive birds. Care needs to be taken in maintaining pure species above all.

This management, however, must also allow for the recuperation of economic losses too. Breeding and keeping birds is expensive and time-consuming. Zoos and other public institutions may be participating in conservation programs, but the private sector still relies on the pet and breeder trade for their sales and return.

If governments are going to prohibit activities with endangered birds or animals, after allowing decades of their legal acquisition and breeding, they should fund programs for captive breeders. The alternative would be for the government itself to take on the responsibility and buy up and preserve pure species that may be in danger of extinction. To allow decades of private enterprise revolving around captive breeding, pets, companions, education, entertainment and the like, then decide it is all illegal, is not the way to preserve species. Involving the private sector (aviculture) in wild-bird recovery programs is the only way they will succeed.

Hybrid Breedings

F-1 Hybrids (1st Generation)
Scarlet x Green-winged = 'Ruby'
Scarlet x Military = 'Shamrock'
Scarlet x Buffon's = 'Verde'
Scarlet x Blue and Gold = 'Catalina'
Scarlet x Yellow-collared = 'Voren's macaw'
Military x Blue & Gold = 'Miligold'
Military x Buffon's = 'Miliffons'
Buffon's x Green-winged = 'Buffwing'
Buffon's x Blue and Gold = 'Bluffon's'
Green-winged x Blue and Gold = 'Harlequin'
Green-winged x Military = 'Calico'
Hyacinth x Blue and Gold = 'Caloshua'
Hyacinth x Military = 'Milihy or Milicinth'
Hyacinth x Buffon's = 'Emerald'
Red-fronted x Blue and Gold = 'Maui Sunset'

F-2 Hybrids (2nd Generation)
Ruby x Blue and Gold = 'Ruby Gold'
Ruby x Catalina = 'Rubalina'
Shamrock x Scarlet = 'Miami'
Harlequin x Scarlet = 'Scarlequin or Tropicana'
Harlequin x Blue and Gold = 'Harlegold'
Catalina x Green-winged = 'Flame'
Catalina x Scarlet = 'Camelot'
Calico x Green-winged = 'Cameo'
Catalina x Ruby = 'Rubalina'
Catalina x Blue and Gold = 'Catablue'
Green-winged x Harlequin = 'Jubilee'
Harlequin x Catalina = 'Harlina or Maui Sunrise'
Harlequin x Blue and Gold = 'Harlegold or Harleblue'
Shamrock x Catalina = 'Shamalina'
Hyacinth x Catalina = 'Hyalina'
Shamrock x Blue and Gold = 'Shammy-Gold'
Scarlet x Miligold = 'Starlight'
Miligold x Catalina = 'Milicat'
Military x Catalina = 'Milalina'
Ruby x Harlequin = 'Rubyquin'
Ruby x Miligold = 'Quatro'
F-3 (3rd Generation Hybrids)
Camelot x Scarlet = 'Capri'
Ruby Gold x Scarlet = 'Ruby Punch'
Camelot x Catalina = 'Camelina'
Camelot x Harlequin = 'Fiesta'
Camelot x Blue and Gold = 'Camegold'
F-4 (4th Generation Hybrids)
Capri x Scarlet = 'Paleo'
SUPPLIED BY CYNTHIA JOHNSON

The Blue and Gold Macaw is a popular pet bird worldwide

MACAWS AS PET AND COMPANION BIRDS

By **CONSTANCE WOODMAN** BSc M Ed

Macaws, such as these Blue-throated Macaws, are loud and active birds that enjoy socialisation. Such needs and the associated commitment are to be considered seriously when selecting a pet macaw

CONSIDERATIONS

Responsibilities

Choosing to bring a macaw into your life as a companion animal is an exciting time. Many people enjoy the planning and preparation stages prior to living with a macaw. Researching the species, caging and lifestyle changes that come with a macaw can be fun. You'll find good ideas and a network of useful support (such as bird sitters) through discussions with local bird club members, regional or national parrot associations, local experts, and online forums. Macaws are long-lived, interesting, and emotional companions that can enrich their keeper's life.

Because macaws were not bred to live with humans, they have the same needs as their wild cousins. A good place to start understanding the needs of a macaw is to consider their natural life history. The life of a macaw in the wild is one of exploring and flying many miles each day. Macaw learning and problem solving is suited to their complicated job of finding food. To eat, they must locate many different kinds of plants, fruits, nuts, and tasty 'creepy crawlies' that are only available seasonally.

Macaws have to choose safe sleeping spots, and learn to avoid dangerous animals while recognising and benefitting from harmless animals. They develop into sexually mature adults, with all the drama that entails, choose what to feed and how to care for their babies, and defend their nesting sites. Sometimes, they compete and fight with each other. Macaws form intimate family and social groups, as well as participate in large flocks, and do so for many years of their long lives. Creating a home that allows expression of natural behaviours requires planning. Learning how to live with their natural behaviours also requires planning.

Like all parrots, macaws are social, craving proximity to, and daily interaction with their peers, as well as exercise. If you choose to be the main companion for a macaw, you will have to spend several hours a day or more with your bird to meet its needs. A macaw will need toys and activities to keep active when not interacting with others. Macaw care is much more complex than for a pet that is selectively bred to be domesticated. Based on other domestic pets, expectations of what pet care will be like, do not apply to macaws. You will not be able to keep a macaw happy and healthy by changing its food, refilling its water and leaving it alone in a cage.

If you do not wish to spend several hours a day acting as the main companion to a macaw, you may consider pairing two macaws of the same sex to keep each other company. Maintaining a social group of large macaws offers more challenges, so talk to those experienced in keeping multiple macaws.

Issues that are Peculiar to Macaws

Unlike quieter companion birds, such as parakeets, finches or pheasants, macaws are loud—a quiet macaw is rare. Their natural calls include squawks, screeches and screams that can be heard a long distance away. This makes them generally unsuitable as apartment birds because they can be heard through walls. If outdoor caging is planned in a neighborhood, it will probably require talking to neighbours to make sure noise isn't an issue. (For more details on pet suitability and noise levels of individual species see the *Species* chapters.)

Macaws are also incredibly powerful. The larger species can pop apart metal welds, and all species can demolish woodwork in a home. Because of their strength, toys and caging must cater for large, strong parrots. Medium-sized bird toys can pose a hazard. For example, hard plastic beads that are safe for a much smaller Amazon parrot could be shattered into harmful splinters by a big macaw beak. The small macaw species, sometimes called mini-macaws, are less powerful but still very strong for their size. For all species, consideration must be given to whether bird toys, caging or accessories are safe for their bite strength.

What Species are Suitable for Your Situation?

There are 14 species of the 17 confirmed macaw species bred for the companion pet trade and zoological displays. The other three species are classified as near extinction and are under strict specialist breeding programs to ensure their survival.

In terms of personality, macaws can range from being emotional, moody or nippy, to being snuggly, loving, playful and protective, all in the same day. In large macaws, personality must be taken into account as their bite can be solid and destructive producing high emotion in the victim.

Captive macaws love exploring interesting foods, chewing wood blocks and swinging on a swing

Large macaws, such as the Blue and Gold and the Hyacinth, have reputations for being more relaxed birds. The Scarlet Macaw has a reputation for being more aggressive. This said, this author's best relationship with a snuggly, gentle macaw has been with a Military Macaw, so individual personality can contradict popular trends. During their 'teenage' years and during breeding seasons, most macaws will undergo a temporary personality change, just like people.

They are intelligent with similar mental attributes across species. A macaw will enjoy challenges, such as puzzle feeders or trips to a new place in the car, and also be content with a daily routine. When not interacting with others, captive macaws generally love exploring interesting foods, chewing wood blocks, swinging on a swing, and shaking macaw-proof bells. In this way, they can be kept active fairly easily and have their mental needs met. Macaws will typically not disassemble their cage hardware, but may figure out simple cage locks, loosen bolts, and occasionally pull their toys and perches down.

This is not a group of birds kept primarily for their talking ability. They often learn to mimic sounds and a few words, but seldom does one find a macaw that compares to an Amazon parrot or African Grey for mimicry and vocabulary. Macaws can mimic at very high volumes. This can be delightful fun or problematic, depending on the content of their words and noises. For example, if you have children who regularly hurl insults at each other across the house, a macaw *will* learn to join in, using the loudest and most inappropriate expressions.

These Green-winged Macaws are noisy and their large size demands a suitable size flight in which they can exercise—more likely to be located in a country region

Size is a consideration—note the difference between the Hahn's (left) and Illiger's Macaw

Age

You may need to consider whether to buy a baby or an adult macaw. Baby birds learn to grow up with your lifestyle and you can influence their expectations and to some degree, their personality. There is a joy to experiencing a baby companion bird. However, a well-adjusted adult bird that needs a new home can be enjoyable as well. Their vocalisations, favourite games and odd behaviours are already known. If selecting a bird that has already gone through sexual maturity, you can skip dealing with a 'hormonal teenager' macaw.

Macaw Species Overview

Common name	Scientific name	Size	Bred in captivity?	Status in the wild
Blue and Gold	*Ara ararauna*	Large, 85cm (34in)	Mostly common worldwide	Least concern, decreasing
Green-winged	*Ara chloropterus*	Large, 90cm (35in)	Very common	Least concern, decreasing
Blue-throated	*Ara glaucogularis*	Large, 85cm (34in)	Uncommon to rare	Critically endangered, stable
Scarlet	*Ara macao*	Large, 85cm (34in)	Very common	Least concern, decreasing
Military	*Ara militaris*	Large, 75cm (30in)	Very common	Vulnerable, decreasing
Red-fronted	*Ara rubrogenys*	Large, 60cm (24in)	Less common	Endangered, decreasing
Severe	*Ara severus*	Medium, 46cm (18in)	Less common	Least concern, stable
Hahn's	*Diopsittaca nobilis cumanensis*	Small, 30cm (12in)	Common	Least concern and decreasing
Noble Macaw (often confused with the related Hahn's Macaw)	*Diopsittaca nobilis nobilis*	Medium, 41cm (16in)	Less common	Least concern, stable
Buffon's Macaw, Great Green Macaw	*Ara ambiguus*	Medium, 38cm (14in)	Less common	Least concern, increasing
Blue-headed Macaw	*Primolius couloni*	Medium, 43cm (17in)	Uncommon	Vulnerable, decreasing
Illiger's Macaw	*Primolius maracana*	Medium, 43cm (17in)	Less common	Near-threatened, decreasing
Yellow-collared Macaw or Golden-collar Macaw	*Primolius auricollis*	Medium, 38cm (14in)	Less common	Least concern, increasing
Catalina Macaw (Blue and Gold x Scarlet) hybrid	Hybrid *Ara arauna x Ara macao*	Large, variable adult size	Common	Not a true species
Hyacinth Macaw	*Anodorhynchus hyacinthinus*	Very large, 100cm (39in)	Common	Vulnerable to extinction, decreasing

Hybrids

Hybrid macaws are also available and gaining popularity. Hybrids occur when two related species are bred together to produce a cross-breed. Hybrids often have traits that are a mix of both parent species. Hybrid macaws can be exceedingly stunning in colour. In the USA, hybrid birds bypass the legal hurdles associated with macaws on protected species lists, such as the United States Endangered Species Act. This is because hybrids are not a species. Unfortunately, a hybrid macaw's offspring cannot contribute to the bloodlines of either of their parent's species. Some breeders produce hybrid birds to help offset the costs of breeding pure species of less marketable birds.

Some breeders produce hybrids instead of producing a pure species. If the species being hybridised are common in captivity, hybridisation has little impact on the captive numbers of a popular species. However, to hybridise rare macaws when there are not many pure species in captivity, impacts negatively on captive populations. As a buyer your choice of purchase influences the progress of the captive population.

See *Hybridisation* on page 94.

HEALTH CHECK FOR YOUR NEW BIRD

It is vital to know if your new macaw has a normal, healthy body. Request a health guarantee from your breeder or bird seller as part of purchasing any new bird. Then, take your new bird to an avian veterinarian to detect any underlying health issues. If health issues are present, talk to your veterinarian and breeder to decide the course of action that is right for you. Intentionally keeping an unhealthy baby may not be a good idea, especially if the breeder can manage those issues better than you can and will replace the baby as part of the health guarantee.

In addition to a physical exam, disease testing and even vaccination may be recommended by your veterinarian. Macaws are susceptible to several diseases—avian bornavirus causes the condition proventricular dilation disease (PDD), commonly called macaw wasting disease. Avian herpes virus (Pacheco's), chlamydia (psittacosis) and avian polyomavirus are also potential health concerns. Your new macaw health check should also include testing any current pet birds for disease. For example, a very old and healthy Cockatiel could be carrying bornavirus, causing illness in your new macaw.

Your health check will also establish a relationship with your veterinarian. This is important for emergency situations as veterinarians will not prescribe medicine to a bird they have never seen before. In fact, it is illegal for a veterinarian to dispense medication for a bird they have not seen, or for a condition they have not diagnosed and for which the medication is required. Most veterinarians will require, as a minimum, an annual examination to continue to prescribe ongoing medication for a chronic problem, eg arthritis. This is problematic especially if a bird is too ill to move. If it is too ill to move, treating it at home is unlikely to help the bird. So establishing a relationship with a veterinarian can save your bird's life in an emergency. Your veterinarian can also show you how to safely restrain your

The posture of this Blue and Gold Macaw indicates stress. If the breathing pattern remains constant, rather than just when the bird is approached, it could indicate severe respiratory disease, with urgent veterinary advice recommended

bird in case of emergency, such as a bleeding toenail, or entanglement. The hinges of macaw jaws have delicate bone structure, so one should be trained how to grasp a macaw.

For more information see *Health and Diseases* on page 124.

PREPARING FOR YOUR NEW PET MACAW

Before you receive your new macaw, you should have, at least, a large cage with toys, a breathable fabric cover for the cage at night to block light and drafts (if desired), pelleted food, a carrier, and a bird first aid kit. If you rent your home, make sure you have discussed macaws with your landlord. You may want to make major caging decisions before you acquire your bird.

Providing a Safe Environment

Bird-proofing a space where your bird may be able to jump down or fly up and explore is *important*. There is always the chance a caged bird will get out, or a bird trained to stay on its play gym will one day decide to go adventuring. Test wall paint for lead content. Remove any pest traps or poisons from accessible areas of your home. A macaw is built to fly, so even with a clipped macaw, consider ceiling fans a hazard. Electrical outlets will need to be blocked, and electrical cords minimised and tucked out of reach behind heavy furniture. Toilets, sinks and tubs are drowning risks and should be behind a closed door. Stoves and fireplaces are burn risks.

A macaw can open cupboards, break open any plastic container, pop the cap off a beer bottle, pick up and throw glass containers, and put holes in metal containers, including pressurised cans. Cleaning products should be kept in a separate room from your bird for safety's sake. The top of the book shelf is not a safe storage place. Because a bird operates in three dimensions, and even with a wing clip, a macaw will creatively learn how to climb to the top of furniture and windows. A macaw can also use its beak like a ratchet and slide or tip over furniture, so tall vases and statues must have very secure bases, and avoid storing 'off-limits' items under lightweight furniture.

Long strings, such as those hanging from blinds, can be tangle hazards. Pictures or mirrors on the wall can be knocked loose and fall. Wood moulding can be chewed, baseboard pried away, and carpet pulled up. If you leave a macaw alone out of its cage, anticipate that the bird will find a way to access anything in the room, and limit the dangerous items in the space. Can your ceiling light handle the weight of a bird hanging from it?

Interactions with pets and people should be very carefully considered and monitored. Mammal bites, such as those from a playful cat or dog, inject bacteria into a bird with their pointed teeth and cause serious infection. A dog snapping in surprise can crush a macaw. Mould from unchanged animal bedding or garden soil can greatly harm a bird. One of the most common causes of injury to pet birds is big bird versus little bird interactions, where a larger bird harms a smaller bird by playing rough. People who fall asleep snuggling their bird have killed their bird by rolling over in their sleep.

You will also have to avoid any sources of air pollution—aerosol sprays, candles (there is no

Depending on the macaw species, some bird toys are unsafe for a strong beak—these flexible, plastic and PVC toys are unlikely to shatter in the beak of a smaller macaw

such thing as a bird-safe candle), over-heating non-stick pans, and fungus from wet soils are sources of air pollution. Just as canaries died in coal mines to alert underground miners, your bird will suffer from air pollution that doesn't bother you. Placing a bird's cage near an air-conditioning vent can cause birds to become too cold or warm while the rest of the home is cosy.

Heavy-duty plastic pet carriers are required for macaw transportation

RESTRAINT

Carriers

A carrier will be required for your bird to travel in locally. Macaws are very good chewers, so normal, plastic pet carriers will eventually be destroyed, resulting in a bird that escapes from the carrier or gets hurt. Some people choose to use metal wire carriers or small parrot-specific travel cages for transport. Others buy the heavy duty thick, hard plastic carriers meant for strong dogs, and buy a new carrier as the bird destroys the old one. Your carrier should be either quite long or tall, to accommodate a macaw tail.

When loading a bird into a car, know that they can rock forward and backward easily like a seesaw. Putting the bird in the car sideways allows for better balance during turns and stops. Having a perch mounted inside the carrier is preferred, but if you choose to place your macaw on the floor of a solid carrier, you must place a towel or newspaper down. A macaw can injure its legs sliding around on smooth plastic in the car.

Harnesses

Some bird owners use a parrot body harness with a leash on their bird to enable it to play outdoors, knowing it can be retrieved immediately. Harnesses create a sense of security for bird keepers when outdoors, or in a new indoor space, especially with an unclipped bird. Harnesses can also make the presence of a bird more acceptable in public when a free-roaming bird is not allowed.

Harnesses must be used with care. Harnesses can also become nooses, and it is possible for even a clipped bird to catch a strong breeze and end up tangled and dead in a tree. A macaw can also chew through a harness, and then become dangerously tangled. Harnesses must be used with diligence and in consideration of the risks involved. They require more, not less supervision because of entanglement risks.

Jessing—placing straps on the legs of a falconry bird—should not be applied to parrots. Parrots have much more delicate legs than predatory birds and jessing as a form of leash is not appropriate.

Blue and Gold Macaw juvenile enjoys outdoor-time in a harness

WING CLIPPING

Wing clipping is a common practice but is not well understood by some macaw keepers. The long 'flight' feathers at the end of a macaw's wing provide the thrust needed for flight. The shorter, secondary feathers, further along the wing, create lift and carry the bird upward. In wing clipping, the primary feathers are reduced in length, restricting their ability to generate thrust. Because the secondary wing feathers generate lift, it is possible that a macaw with a severe clip could fly up in a heavy wind, but it will have little voluntary flight control. Clipped macaws on balconies or backyards occasionally get carried away by a very strong wind, but are unlikely to fly very far in any other weather. Talk to your breeder or veterinarian about wing clipping.

Left: Before (1) and after (2) and (3) a full wing clip. If you are clipping your bird for the first time you may wish to make a shallow clip to check on the effect. Be careful as the bird will not expect a change and can be injured easily

Incorrectly, the secondary feather group has been trimmed—this bird will not be able to glide down safely in a fall

Cutting too many feathers too deep will leave a stumpy wing that becomes injured. Growing feathers, called pin-feathers, will bleed and cause pain if cut, and should never be trimmed

Types of Wing Clips

Beauty Clip

The first two flight feathers are left intact to create the look of an unclipped bird when the bird is at rest.

Baby Clip

Clipping just the tips of the flight feathers allows for brief flights across a room, but prevents the bird from travelling long distances during flight in calm weather. The bird loses a little maneuverability as well. This type of clip is referred to as a baby clip because it allows a young bird to learn basic flying skills while reducing escape risk. With a lot of hard flapping, the bird can temporarily gain altitude.

Normal Clip

This is a clip made partway through the flight feathers so that a bird can generate enough thrust to fall slowly, or to flutter hop from perch to perch with confidence. The bird should flutter down at a shallow angle across most of a room, but will not gain altitude while flapping. The extent of the cut will determine the incline of the downward flight.

Severe Clip

When flight feathers are cut all the way down, the bird cannot glide or flutter, but falls almost straight down while panic fluttering. This type of clipping creates birds that are scared of heights and leads them to maintain a death grip on their perches instead of confidently playing.

Single Wing Clip

The single clip is an outdated and dangerous habit. Only one wing is clipped, so if the bird escapes it flies in a large circle and typically crashes.

BATHING

In the wild, macaws clean by bathing. Your macaw will need baths daily to every few days to remove feather dust and keep its skin clean. Bathing time is an excellent way to socialise and play with a macaw. You can mist-bathe a bird using a hand-held mist bottle or a mister attachment made for birds for your shower. You can also place your macaw in the bath with a little cool or lukewarm water on the bottom of the deep end of the tub. You can put your bird on a shower perch or the shower floor and have the shower running aimed off to the side of the shower enclosure. (Always give your macaw a space it can move into to avoid spraying water in case it gets too much in its nose and needs a break.) You can also offer a shallow pan of water in the bird's main living area.

NAIL CLIPPING

Regular nail grooming prevents potentially dangerous overgrowth and points that scratch the arms and hands of the bird keeper. An overly long toenail can get snapped off and bleed profusely or get stuck on cage bars, entrapping a bird. Scissors can be hard to use, whereas a

This Hahn's Macaw juvenile is being trained to be acceptant of restraint for future routines such as veterinary examinations and nail clipping

dog toenail clipper is an excellent tool. Some keepers use a file and do regular, subtle shortening. Nail clipping should only be done a little at a time—about 3mm (1/8 inch) or less. Otherwise, there is risk of cutting into the nail quick, causing bleeding and pain. By doing a little at a time, even overly long nails can be safely trimmed at home.

Nail clipping is best done as a fun game where you and your bird practice handling and examining feet together. In between actual clipping, you can go through the motions of clipping and foot examination with lots of treats and praise. Restraining a macaw for nail clipping is unnecessary if a clipping routine is practiced for fun.

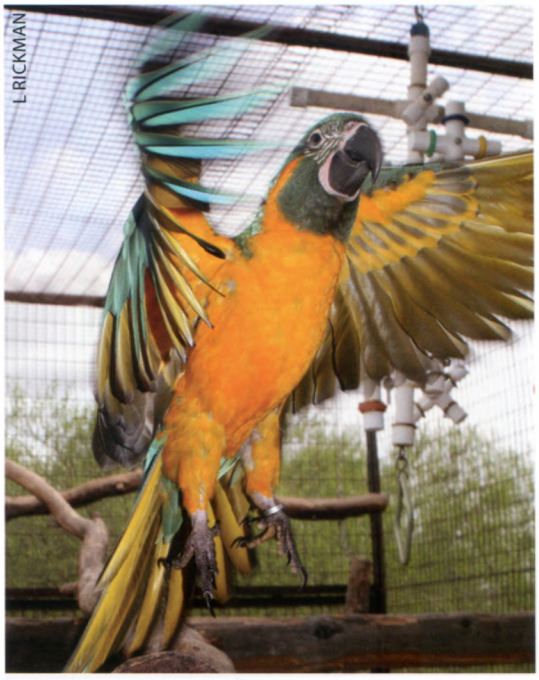
ENRICHMENT THROUGH FLIGHT

If you have ever had dreams of being the person on television using a whistle to train dolphins, you might be the right person to take up macaw free-flight. Choosing to free-fly a captive parrot is a lifestyle choice and takes dedicated time and effort beyond all other bird keeping commitments. If you choose to take up free-flight with macaws, you will have a new and decades-long hobby that consumes a significant amount of time per week.

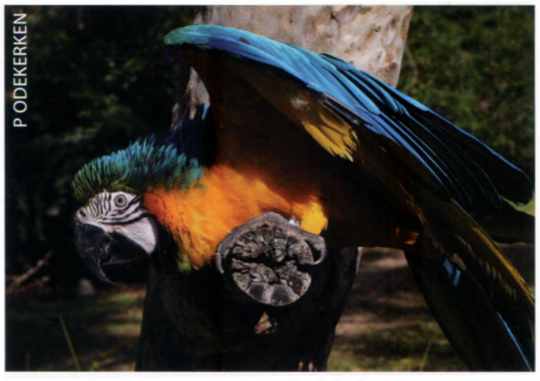
It is an outrageously wonderful experience to confidently fly a macaw indoors or outdoors and there is a vibrant community that participates in flying their pet birds, but the choice cannot be made lightly.

Indoor flying is less risky than outdoor flying because the risk of loss is reduced, as long as drapes, blinds, doors or door curtains are used to prevent window strikes, ceiling fan chop-ups, toilet drowning and stove top landings. (A spooked parrot will often try to bolt through a window because they can fly faster than they can think.) Small parrots have lots of maneuvering room indoors, but even if you own a 4000 square metre mini-mansion, a macaw will not have enough room to really turn and glide, making indoor panic flights awkward and a little more hazardous. A macaw can do back and forth flights, which can be fun to watch and healthy for the bird as it flies from cage to play gym to your arm then down to the floor to find mischief and test your ability to bird-proof a room.

Flying is an excellent form of exercise. However, if an indoor flying bird gets outside, it will have the athleticism to fly a long distance, but have no idea what it is doing, therefore ending up lost and hurt.



A 16-week-old Blue-throated Macaw practices flight skills



This Blue and Gold Macaw is carefully monitored during outdoor-time in case of being spooked by predator birds

Without strong personal development in animal behaviour and animal training skills, you will lose or injure your bird if you choose to fly outdoors. If you have a bad day, and try to fly your bird because you are distracted, you will probably end up with a lost or injured bird. Sometimes accidents happen, and even an excellent trainer loses their beloved bird occasionally.

Should you choose to free-fly your macaw outdoors, you will need to begin with a baby bird and connect to the free-flight community before acquiring your bird. This is because, like children, basic motor and learning skills are developed in childhood, and there is a limited window of opportunity for peak learning. A bird that has lived in a cage, or only in a flight cage, may never develop the full set of skills. A good comparison is learning to play an instrument—children who are the most successful at piano or violin are those who begin early. It is much harder for a 40-year-old adult who has never been allowed to touch an instrument or listen to music to pick up a violin and become an expert.

I recall an account of a man who flew his bird indoor for weeks, getting the bird to come to his hand on command. Then, the first time the bird was outside, ever, the bird bolted and flew away with a flock of pigeons. The man spent hours recovering his bird and realising his inadequacies he had the bird wing trimmed. It was brave of this man to share his story showing that assumptions about how flying works can lead to poor outcomes.

HOUSING

Will your bird be housed indoors, outdoors, or both? Indoors, you will need to consider macaw-proofing any rooms your bird accesses. Outdoors, you will need to consider protecting your bird from predators, weather and disease and from wild bird droppings and disease carrying mosquitoes.

Indoor housing should be as large as you can afford in terms of space and pricing. A macaw needs the space to climb, flap, and play. There are many ways to provide housing—an indoor space can include a devoted bird room or caging and play gyms placed among existing furnishings. Some people create a parrot 'island' within a living room by laying down tiles or vinyl flooring and creating a barrier too high for the bird to climb, then covering the floor with wood shavings. Alternatively, you can create a raised perching island (something like a pool table) with walnut bedding that can be easily sifted clean. Some people have a smaller sleeping cage in a dark, quiet part of the house and a larger daytime cage in an active, bright part of the house. A space conserving option is to have a single smaller sleeping cage with lots of external perches and toys mounted on the cage for supervised play time.

People who take their macaws out with them daily may have only a small sleeping cage and use the world as a play gym. However, such a setup is inadequate on the days the macaw keeper cannot take their bird out. Very few people have a lifestyle suited to being outside with their macaw several hours every day.

Cages should be sturdy and solid for macaws. Bar spacing should match the size of your bird, with spacing small enough so that the bird cannot entrap its head. For the largest macaws, including Hyacinth and Military Macaws, welded stainless steel, which is stronger than iron, is preferred by many bird keepers.

Building a permanent outdoor aviary is an option, as is placing a house cage outdoors. Safety is your biggest concern, so be aware that predators can and *will* reach through the single layer of bars on an outdoor house cage. House cages placed outside must be observed during use. Pre-fabricated wire outdoor cages can be beautiful, but must be considered in light of local populations of predators such as owls, hawks, falcons, mice, rats, possoms, cats, dogs, foxes, snakes and dangerous insects. You may be surprised to learn how many hidden predators are present.

Above and right: large, sturdy cages suitable for housing your pet macaw indoors

A well-constructed aviary should protect your bird from predators as well as weather. Double wire, concrete or wire foundations that prevent burrowing, a roof that is predator-proof and provides protection from the weather, and a wall blocking the prevailing wind in cold climates, are essential. Suspended aviaries, a few feet above the ground, may be appropriate if ground or burrowing predators are a concern. *Security* is another consideration and is discussed on pages 47 and 113.

A macaw appreciates weather and the entertainment provided by outdoor activities. Whether your macaw spends temporary time in a house cage, or full time living in an aviary flight cage, your bird will enjoy it!

Perching

Your macaw will probably sit on the highest perch in its cage or play gym. If the perch is hard and smooth, your macaw may develop a dangerous condition of pressure sores on its feet, known as bumblefoot. To avoid foot problems, favourite perches should be textured and of varying size, such as a natural branch. More than one kind of perch should be placed at the highest level to maximise comfort. If your macaw is a perch chewer, providing a wooden board in a metal perch holder can offer a perch that changes shape and size as your macaw destroys it.

Rope perches are made from rope twisted around a heavy inner wire. They are also known

These sturdy perches provide a climbing challenge and exercise in a caged environment

as 'boings,' and offer a soft, variable surface even when your bird is a 'perch potato'—staying in one spot. Because of macaw bite strength, rope perches can become a tangle hazard very quickly. Rope perches are best offered when you are home to observe your bird, such as a play gym that the bird does not have access to when caged. If placing a rope perch in the cage, sisal or jute rope is less of a tangle hazard than cotton. Any item that starts to unravel, leaving lose threads that the bird may ingest, should be replaced.

Sturdy tree branches are required for macaw perches and enrichment

Nail trimming perches made with sand or concrete can wear down toenails reducing the need to trim. Be aware that such perches can also wear down the bottoms of the feet, so keep an eye on the underside of your bird's toes.

Heated perches can be a great way to warm an indoor bird during winter. There is some argument as to whether heated perches can alter the cold adaptation of outdoor living birds, so outdoor use varies among bird keepers. Heated perches or an area of heating panels can offer a bird that is cold or not feeling well, gentle heat, and improve their quality of life. Be aware that macaw beaks are very powerful and can shear through electrical cords, even if encased in a metal spring. If you offer a heated perch or warming panel, you may have to be creative by encasing the cord in a PVC pipe, wall mounted cord channel, or mounting the cords to the wall behind the cage.

Swinging perches offer a challenge to climb onto and off, while shifting your bird's weight as it breathes and preens. A swing perch can help prevent foot problems by distributing weight across different parts of the feet as it moves.

Toys and Entertainment

Enrichment is the addition of items to the captive environment to promote a high quality of life. Successful enrichment is defined by the bird living a happy, high-quality life. There are many ways to offer enrichment and there are lots of opinions on the topic. A good basic set-up is to have several toys and foraging opportunities on offer. By rotating the offerings every few days, the bird can have new fun things without becoming bored.

Blue and Gold Macaw crawls among strung wooden blocks as a form of play

Foraging opportunities occupy macaws when you are not available

These 'bird-safe' toys provides play-time enrichment and chewing opportunities that keep the beak trimmed

Large macaw toys can be fun to buy but are quite expensive, so mixing purchased toys with creative homemade toys is often best. For example, if a macaw regularly sticks its head in a food metal bowl and mumbles to hear its voice echo, then all you have to do is mount an empty dish for a toy. Pull the bowl out before the macaw becomes bored with it, and the macaw will be interested next time you mount the 'echo chamber'.

Successful macaw enrichment set-ups can appear very different, but be equally good. For example, an indoor set-up with adequate human attention, a house cage with lots of colourful commercial toys, a television and a play gym can create a quality of life similar to two birds in a simple, wire outdoor flight cage, gnawing on perches and enjoying food-based enrichment and each other's company. Again, success is meeting the bird's needs.

Toy Options

The most basic toy is untreated pine wood for chewing. Chewing is the most natural play for a parrot. Chewing on rough items will reduce or eliminate the need for beak trimming. Lava rocks or small concrete blocks can also be strung to provide rough surfaces for chewing or digging through. Wood for play may be safely coloured by being sprayed or dipped in natural (non-chemical) food colouring—avoid purchasing wood that has been painted.

Toys must be sized and built for the species you keep. Bird-proof bells, where the clapper is welded into the bell, are fun. Some birds like several different sounding bells to ring.

SECURITY

Macaws are often perceived as valuable and may be attractive to a thief. You may wish to have a fenced property, a cage lock, or other security in place for an outdoor aviary. House cages where birds are visible from the street, or chatter and call at passers-by, invite theft attempts.

Internet-based video security systems are popular because their price is low. Being able to monitor a bird room or outdoor aviary from a cellphone offers peace of mind, and services that store recordings allow you to double check any evidence of tampering.

Locks on outdoor cages should be easy for the macaw keeper to open in an emergency. For example, spinning combination locks can prove difficult to open during a weather event at night. Some padlocks can freeze during a sudden chill. Consider that smaller cages can be put in the back of a pickup truck regardless of a door lock.

Some keepers with macaws will keep a large or medium-sized companion dog as a deterrent to theft.

DIET

Provide food items in a stimulating and interesting way to create exercise and entertainment

A selection of nutrient rich foods to feed to your pet macaw

Macaws need free access to fresh food and water. They have high metabolisms and prefer to eat throughout the day. Food and water should be changed daily at a minimum. High quality pelleted diets have been scientifically proven as an excellent basic diet for maintaining a non-breeding bird. A basic diet can be supplemented by pre-packaged seed and dry fruit mixes, or with foods you prepare yourself. If providing fresh vegetables or fruit, expect to have to offer food, remove food, and then clean up leftovers before food has a chance to spoil. Pellets must be stored in a dry place or they will become mouldy and need to be thrown away. Be aware that pelleted diets lose their nutritional value after being exposed to the environment after a period of time. If you buy bulk pellets, seal and freeze the portion to be stored to maintain its nutritional value.

For more information see *Feeding and Nutrition* on page 48.

Water

When you offer open bowls of water for drinking and bathing, you will need to change the water as it becomes soiled. Macaws will often bathe in their water bowls and mix food in water (some macaws like their pellets moist and soft and will place them in their water bowls).

Water bottles are less likely to be soiled, but can clog up. Sometimes a clogged water bottle and a bird keeper who is not attentive, can lead to a dead or severely dehydrated bird. Water bottles can also become growth chambers for brewing bacteria in the sun.

Regardless of how you provide water, hygiene and thoroughly cleaned equipment are vital. During flood events or other times when a water system is compromised, always offer bottled or purified water.

Dangerous Foods

Many house plants, caffeine in drinks or candies, nicotine from tobacco products, sugar alcohol from sugar free gum, alcohol from beverages, bromide produced from eating chocolate, and the cyanide from inside cherry pits, apple seeds, and other stone fruits are all dangerous to macaws. Other foods commonly believed to be dangerous include avocado, mushrooms, and onions. Be aware that raw foods which are normally served cooked, or spoiled foods, may not be safe. For example, uncooked beans may have dangerous toxins, and potatoes that have been allowed to sprout and go green will be toxic. Peanuts can sometimes contain a fungal toxin or fungal spores, so some bird keepers do not offer peanuts, or they buy only aflatoxin-free peanuts that have been tested. Unfortunately, dried corn may also be a source of aflatoxin, although this food is not commonly offered to pet parrots, and less commonly attributed to aflatoxin poisoning.

Food items can be placed in foraging toys to entertain during meal-times

Foods for Enrichment

Modern pelleted diets are nearly nutritionally complete for maintaining a non-breeding adult macaw, so added foods are given for fun value more than nutrition. Meal time can be an excellent way to keep a bird active and interested. Macaws can enjoy group meal times and being fed as a way to interact with their human or bird companions. Foods that are challenging to eat are fun for a macaw—they can do things smaller birds cannot, such as work through thick peels and break open hard nut shells such as walnuts and almonds, peas in the pod, unpeeled bananas, corn-on-the-cob, half a head of cabbage, a squash or pumpkin, pomegranates, unpeeled pineapple, human food grade pine nuts still in the cone, and so on. Small foods such as millet seeds and safflower seeds which require shelling also pose a challenge.

Always wash the skins of fruits or vegetables by rubbing or scrubbing them thoroughly under flowing water. The friction will remove pesticides and disease agents or if unsure that this is sufficient then remove the peel before offering the food.

Frozen then thawed and cooked foods, such as frozen vegetable medleys, can be fun, but will rot very quickly compared to fresh foods. If you offer frozen, then thawed and cooked foods, remove them once your bird has finished eating. If you offer cooked foods, let them cool

Nuts are a relished food item

until tepid. Macaws *will* swallow big bites of hot food and gulp hot drinks burning themselves badly in the process. Because wild macaws feed each other pre-chewed foods warmed by their bodies, they find warm, soft food to be very interesting and will rapidly consume dangerously hot food.

Arranging food in a unique way can be fun for a macaw, too—for example, placing chunks of fresh corn-on-the-cob and sweet potato on a bird feeding skewer (skewer feeders are a popular bird toy.) The bird then gets to peel and pry the food from the skewer, as though feeding from a wild plant. Food arrangement can also include feeding from multiple dishes or hiding food along a play gym.

Food, including regular pelleted diets, may be hidden in puzzle feeders. Such foraging toys are widely available, and include mazes, drawers, wire cages, treasure chests, screw-together food holders and sliding lever toys. The simplest foraging toy is to mix food in with a safe non-edible object, such as wood blocks or ice-cream sticks, and let your bird dig for a meal. It has been scientifically shown that animals prefer to work for their food, even when a bowl of food is available. This is called 'contra-freeloading'. You can freely offer food and still expect your bird to use foraging toys. It is important that free access to food and water still be provided.

Be aware that most commercially available foraging toys are made for medium-sized birds. A macaw may be able to snap acrylic or polycarbonate plastic that is not thick and designed for macaws. Wet foods should not be used in puzzle feeders because it makes cleaning difficult and the nooks and crannies can become bacteria and mould growing spots.

You can also feed occasional junk food treats through particularly difficult foraging dishes or puzzle feeders as added motivation for the bird to try and figure out the puzzle. Small, sweet treats are relished by macaws. Macaws may spend a very long time foraging for small cubes of dried, sweetened fruit or other food items.

Supplements

Knowledge of macaw wild diets indicate that these species have diets lower in protein and some minerals than a human diet. When sharing table foods with birds, be sparing with meat, and avoid processed food high in protein, added vitamins or minerals, such as a protein bar, or baby food.

If you are feeding a high quality pelleted diet, it is unnecessary to supplement vitamins, protein powder, or mineral supplements. Notice what your macaw actually consumes as it is possible to offer a poor diet by accident when supplementing pellets—if you offer a large bowl of seed mix and pellets, but your macaw is only consuming sunflower seeds, your macaw will not be as healthy.

A supplement that can be given freely is calcium blocks. It is very unlikely that a macaw will consume enough calcium to become sick. For female birds that lay eggs, or birds with growing bones, calcium is important. Diet supplemented with yellow, orange and red plant foods rich in beta carotene will not harm your macaw and may offer some benefit.

Vitamin A, an important nutrient, breaks down fairly quickly in stored pellets. The beta carotene from plant foods is made into vitamin A in a bird's body.

There is some discussion that certain macaw species need extra fats—your veterinarian can help you decide if certain kinds of nuts should be regular supplements to your bird's diet.

More supplements are not always better. Recently, there have been vitamin D poisonings from macaws consuming too much vitamin D supplement. Macaws appear to be particularly susceptible to this problem. Occasionally, they can get iron storage disease from having too much iron in their diet.

BEHAVIOUR

TAMING

Use food treats that are not included in the daily diet to support training and reinforce desired behaviour

Domesticated animals have been selected and bred to work well with, and for, people. Likewise, parrots can live with humans because they are naturally highly social, intelligent and adaptable, flourishing in a variety of conditions. So we must work within the needs of the wild animal for it to have a high quality of life. Unlike domesticated animals, we tame a wild bird, meaning we help it adapt to living and working with us by creating mutual trust and a sense of security.

Sharing and offering food is an excellent way to build trust. It is an example of working together to reach a goal, just like training for stepping up, presenting toes for nail clips, and being petted. A useful basic rule for taming a bird is 'always end on a high note'. By being creative and finding ways to keep experiences positive, a macaw can enjoy all aspects of husbandry, such as being wrapped in a towel and having its nails groomed.

By making interaction positive and never overdoing an activity to the point where it's no longer fun, your bird will know that you respect its limits, and that you can be a great source of joy and companionship. When an activity ceases to be enjoyable for a bird, the keeper has pushed beyond the macaw's limits.

TRAINING

Training is increasing the frequency of a desired behaviour in a macaw or decreasing the frequency of an undesired behaviour. The best way to understand this process is to watch it, either by attending a workshop, or through videos, such as those on YouTube™. Try to learn from several trainers to gain differing perspectives. Before training a bird, try training a friend as practice and have them train you. It's a bit like the party game 'charades'. If you can train a friend to perform the example behaviour without frustration or confusion, you can probably train a bird.

Behaviours a Macaw Should Know

Listed here are some basic behaviours that will allow you to easily manage bird care in normal and emergency situations—it is called *operant conditioning*.

- Take food from the hand
- Step-up onto and off of an arm
- Step onto and off of a stick
- Step into and out of a carrier
- Accept handling of the feet for grooming
- Accept having a towel placed over the bird (in case the bird needs to be immobilised)

It is acceptable to train a parrot in a way the bird obviously enjoys. Training can be very simple or be complex. Here is an easy beginning exercise. To impress friends at parties, you can refer to it as 'operant conditioning using positive reward on a continuous reinforcement schedule'.

Teach Your Macaw to Wave Hello—an Easy Training Exercise

Identify your macaw's favourite treat and stop providing this item in the food bowl. Spend a few days saying the word 'Good!' *quickly* and loudly. Each time you say the word 'Good!' make sure the macaw receives a small piece of the treat and promptly eats it. Do this 30–40 times over a few days. Your macaw will now know that the word 'Good!' means a treat is coming.

Now, your macaw will be watching you, waiting for you to quickly say, 'Good!' The very *instant* the macaw lifts a foot from the perch during its normal activities, say 'Good!' and deliver the treat. Do this until your macaw figures it out, and begins lifting its foot to try and get you to say 'Good!' Do this for 10 minutes at a time, three times a day.

If your macaw does not understand what's going on after a few sessions, probably you are too slow in demonstrating exactly what behaviour elicits 'Good'. Be quick, clear, and loud, as timing is everything. A clicker can work in place of 'Good!' if you have trouble being fast and clear.

After your macaw begins lifting its foot around you a lot (so you will say 'Good!' and it will get the treat) you can raise your standards. Now, only say 'Good!' when the foot is accidentally lifted a bit higher. If the bird gets frustrated based on its body signals, work on an earlier standard instead, get good at that standard, and then work forward again.

Work with the macaw's pace of learning and keep raising your standard gradually. For example:
Criteria 1: Lift foot from perch.
Criteria 2: Lift foot higher.
Criteria 3: Lift foot high and wave it just a little.
Criteria 4: Lift foot high and shake it a bit.
Criteria 5: Lift foot high and shake it a lot.
Criteria 6: Lift foot high and shake it a lot, but only get 'Good!' and a treat when the trainer is also waving their hand.

By breaking the training up into short sessions throughout the day, it stays fun and the bird avoids frustration and getting tired of treats. After the above process, when you wave a hand at the macaw, it will wave back and you can say 'Good!' the moment it waves long enough, and give it a treat. This same formula will work well for training other basic behaviours.

Body Language

Another basic rule is 'learn the bird's signals'. Your macaw can express its emotions in many ways. Become aware of the following ways a macaw can communicate its inner state and how it is reacting to you and the environment. This is a partial list, so try to discover all the ways your bird is communicating to you.

Eye Pinning

This occurs when a pupil becomes small, showing off the coloured iris of the eye. It indicates excitement of some kind, good or bad. Macaws pin their pupils in certain patterns when they mimic words or sounds, and sometimes it appears they pin their pupils in those same patterns when they are thinking about certain sounds or words.

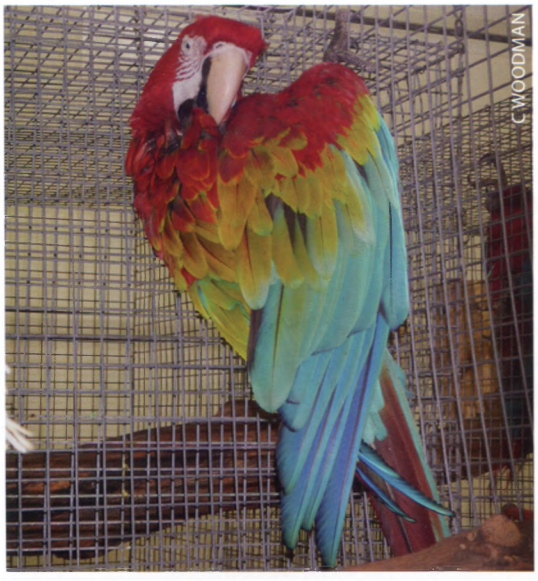
Skin Blushing

The skin around the eyes can blush to the point of looking like a sunburn—similar to blushing in humans, when we exhibit loving feelings or extreme anger.

Foot Posture

Macaws may raise a foot as a 'please stop now' gesture, such as humans do with their hands. They can raise a foot to invite stepping up, or to show they are indecisive of where to go. A foot raised and tucked into the body shows contentment.

Green-winged Macaw raises a foot to indicate 'Stop!'



The feather position and grooming posture of this Green-winged Macaw indicates it is content

The fluffed-up feathers, general posture and facial blushing in this Buffon's Macaw is indicative of territory protection

Beak and Tongue Position

Macaws pant when stressed. The more the beak hangs open, the higher the amount of stress or overheating. As in humans, breathing fast can indicate excitement, panic or being too warm and overexerted. The tongue can bob, or make clicking noises against the mouth during stress. If a macaw is tongue clicking, the animal is very stressed and the environment should be changed. Tongue clicking and beak gaping also occur during heat stress, and water poured or misted onto the feet can offer fast cooling if heat, not stress, is the culprit.

Feather Position

A macaw will raise its head feathers up and toward you if aggressive. Watch the head feather position and you will avoid most bites and acts of aggression. Raising the head feathers is different than puffing them up to invite snuggles and grooming—take the time to learn the subtle differences in feather posture. A very, very stressed macaw can 'frizz' all its feathers out like a frightened cat's fur, indicating it is not in a mood to be interacted with. A scared macaw will 'slick down' all its feathers. Macaws also slick down when too warm. A slightly puffed-up bird is typically a happy bird.

Wing Position

In humans, tensed arms signal tension. If a macaw's wings (a bird's arms) are tense, the long flight feathers at the end of the wingtips will cross like a big 'x'. As the bird calms, the wing tips relax into a neutral position. Macaws can also flick their wings open for a moment, this can look interesting, but is a signal that the bird is nervous and uncomfortable.

Foot Grip

Whether on your arm, or on the perch, the tightness of the grip can indicate emotion. A 'white knuckle' grip shows high negative emotions, whereas a gentle, confident grip shows comfort. This author can tell if staff members have a good relationship with an animal by how tense the macaw's feet become on my arm when the staff member enters the space.

Head Bobbing and Wing Shaking

This can be part of immature begging for food, sexual begging, or dancing as part of a fun game. Begging for food or sexual interaction usually involves the body low and the head up, whereas playful dancing and bobbing involves the body in an upright posture. Macaws love to bob as a form of play, and will relish if you bob and weave with them while they call and chatter. Watch for head bobbing and eye pinning with their feather position. You will be able to tell when the fun has become too exciting—a bite may be imminent when several excitement signals occur at once.

Tail Bobbing with Breathing

This is another sign of distress, often of breathing problems or pain. Learn your macaw's normal tail movements so you can see when the animal is distressed by the change in its tail motions.

Tail Shake

When the tail wags back and forth for a couple of seconds, the bird is ready for something new or different, such as moving on to another part of an activity.

When a bird suddenly puffs all its feathers up, doubling its size, then shakes loudly and obviously, this is a sign of comfort, and getting settled. Rousing is often followed by grooming or a tail-shake.

New keepers may find the rouse of a large bird surprising or intimidating, but should regard this expression of positive emotion kindly, or it will confuse the macaw. (Think of the reverse, if you sighed and nestled into a chair, and your bird yelped in terror, you would be seriously confused.)

Stretching

As with human beings, stretching indicates getting ready to move or getting comfortable after sitting somewhere too long. Birds may often stretch after you do, and may enjoy it if you stretch when they do. Groups of birds will stretch together before an activity as a way to coordinate the group to act.

Regurgitating Food

Macaws can store food in an organ called the crop and share it. Macaws feed their mates, their friends, their siblings in the nest, their babies, and sometimes other macaw's babies. It is possible to discourage regurgitation of food onto the keeper, but a bird may bring up some food if it is quite happy to see you.

Sometimes regurgitation is a sign of digestive problems, so again, take the time to observe what is normal for your bird when it is healthy.

Parrots may be motivated by more than access to food stimuli as a reinforcer for behaviour. Alternative reinforcement options might include tactile handling

BEHAVIOURAL PROBLEMS

Behavioural problems begin because of either health or husbandry issues. The best ways to avoid behavioural issues is to get a health guarantee and a health check, and choose a macaw species that is easy for you to care for. For example, a mini-macaw species can be much easier to exercise, take out in the car in a carrier, and buy or make toys for than a Scarlet Macaw.

Screaming

Expect loud calls in the morning and evening (sometimes referred to as the call to flock), when you leave your home and when your macaw can see you from a distance. These are normal behaviours and expressing these behaviours is healthy for a macaw. However, constant screaming, or screaming in order to gain affection or toys is not normal and occurs by giving the bird something it wants when it screams. Do not start that behaviour pattern, ever. Instead, give the macaw desirable items or attention when the macaw does something that you don't mind, such as using a quieter noise, or reaching with its head or foot for a desired item. Occasionally, screaming is stereotypical, and very repetitive, having nothing to do with receiving a desired thing. Stereotypic screaming is a serious behaviour problem that needs to be managed by a competent trainer. Stereotypic screaming usually arises from boredom when a macaw lives in an unstimulating environment lacking in affection and play.

Illiger's Macaw—screaming usually arises from boredom and a non-stimulating environment

Biting

Biting has several causes. By identifying the root of the causes, the behaviour can be avoided. Many times, biting becomes the best way a macaw can find to interact with its human companions. For example, if a macaw seeks drama and interaction, the best way to get drama may be to make its keeper call out and dance around in pain. Then, the keeper pays lots of desired attention to the macaw while being loud and exciting! To avoid such an unfortunate scenario, one must recognise that bites will happen, and how one responds will influence whether bites increase or decrease in frequency.

One way to respond to a bite is to react as little as possible and then calmly give the bird a 'time-out' while you consider what led to the bite. If your macaw seeks drama and excitement, then be gushing and dramatic, but *only* when your macaw uses its beak gently.

The best way to avoid dangerous face bites is to keep faces away from macaws. Shoulder perching, head perching, and face to face kisses offer the opportunity for a bite, especially with novice macaw keepers, children, and guests the bird does not know intimately.

Biting may also be motivated by changes in a macaw's body. During the moult, petting can be very uncomfortable for a bird, and even cause pain. Watch for signals and stop before the bird inflicts pain.

Breeding season can cause increased levels of aggression so bites happen more easily. A bird may become defensive of its cage, a favourite spot in the house, a favourite toy, a favourite person, and act much more aggressively. Moving a hormonal macaw to a neutral space, such as a play gym or a trip in the car, can create interaction that does not increase the frequency of bites. Training a bird to step up onto a stick when the bird is content offers a safe alternative to receiving a bite when the bird is agitated. Carefully watching macaw body signals will avoid bites, and by avoiding bites, a macaw will not get into the habit of biting.

Although this Blue and Gold Macaw is very tolerant of children, supervision when handling birds is necessary in case of an unexpected bite

Feather Chewing

Birds have a strong instinct to groom. If not adequately stimulated, a macaw can over-groom, barbering feathers by chewing them, or even plucking. Some macaws may become addicted to the release of brain chemicals after the painful feeling of pulling out a feather, as do humans who pathologically cut their skin. The best way to respond to feather grooming issues is to do so early, before a mild habit becomes a major problem. If your bird is over-grooming itself or a companion, shown by ratty looking feathers, provide toys and food that involve lots of beak work. By providing activities that are incompatible with feather over-grooming, the bird will not be able to over-groom and you may be able to prevent a habit from starting. Once a feather chewing habit is established, it can be very hard to stop. Also be aware that skin and feather chewing may be related to skin conditions, such as lice. Always consult a veterinarian if there is a change in your bird's behaviour.

If the macaw is adequately stimulated but is over-grooming due to stress, the keeper will need to alter the environment. Making sure there is an adequately long sleep night cycle, that the bird is not picking up on social stress from its companions, that the bird is not being bullied by companions, and that the bird is actually eating a balanced diet from what is provided, are key things to consider.

Hand-shy Birds

A hand-shy bird has typically been restrained or grabbed at by hands and developed an associative fear. Preventing hand shyness involves creating many more positive than negative experiences with hands. Some birds, even babies, may already be hand-shy when they come to their new home.

To habituate a macaw to your hands, try 'talking' with your hands when interacting, to create a positive experience involving hands

A useful behavioural tool is *habituation*. Habituation occurs when an animal gets so used to experiencing something, the animal stops caring about it. To habituate a bird to your hands without it being a chore, try talking with your hands when interacting with a macaw. By sneakily brushing your hands along the cage bars and gesturing toward the bird as part of your communication, a macaw will become used to large hand motions and your hands on its cage. Do not try to sneak in petting or tail grabbing, simply allow the bird to become used to hand motions. This can take several days to weeks depending on the level of shyness.

Habituation can work in many situations where there is fear. For example, if opening food doors is a problem, then brush your hand against the food door periodically until the bird no longer responds. Then, brush the door and touch the lock mechanisms, slowly working up to opening and closing the door over and over, without any response from the macaw.

Once habituated to hands and hand motions, your macaw can begin hand contact that is a positive experience. Giving food by hand and giving treats by hand when the bird approaches, signal that your hands mean comfort and stepping up.

Stick step-up training, where the macaw steps onto a stick in your hand, but is not perched directly on your hand, can be an excellent intermediate step to becoming comfortable with hands for stepping up, especially if a familiar perch is used.

HEALTH AND DISEASES IN MACAWS

By **DR BOB DONELEY** BVSc FANZCVS CMAVA

INTRODUCTION

Care must be taken when restraining a macaw at any age, as the bare skin on the side of the face bruises easily—note the green colour, normal for bruising in birds

By and large, macaws are a robust group of birds, enjoying a healthy and active life for 50–70 years (large macaws) or 30–40 years (miniature macaws). But, as with any animal, health is not a guarantee and they can be beset with any number of disease problems. These problems can be broadly grouped into infectious diseases caused by bacteria, fungi, viruses, parasites and Chlamydia) and non-infectious diseases—developmental problems or degenerative diseases such as arthritis and heart disease.

As a general rule, young macaws are more likely to be affected by infectious diseases because they are still developing their immune systems. Older macaws, having survived the perils of their youth, are more likely to be afflicted with non-infectious problems. This is a generalisation and not a strict rule—it is not uncommon for an older macaw, immunosuppressed by say a poor diet, to succumb to an infection. In the past, when our knowledge of husbandry, nutrition and biosecurity was comparatively poor, infectious diseases were much more common in all age groups. Thankfully, as we learnt how to better manage and care for these magnificent birds, the incidence of these diseases has dropped dramatically.

But we must not allow complacency to creep in. Only by careful selection of birds, excellent husbandry and a good diet can we hope to continue to improve and maintain the health of the birds in our care. If we choose to share our lives with these birds, it is our responsibility to ensure they are cared for properly. To do this, we need to be aware of the problems faced by macaws in captivity and, ideally, plan to prevent—rather than treat—these problems.

In this chapter, I will present the more common problems seen in macaws, grouped by four age groups:

1. Neonatal—hatch to weaning
2. Juvenile —weaning to sexual maturity
3. Adult—sexual maturity to old age *and*
4. Geriatric—birds in the last 25% of their expected life span.

The problems seen in each age group will be divided into infectious and non-infectious diseases. Again, there is some crossover between all of these divisions. For example, older birds can contract an infectious disease or a developmental problem may continue to afflict a bird into adulthood. If you have a problem with your macaw, look first in the age group your bird falls into. If the condition is not listed there, check earlier sections, as it may be first seen in a younger age group.

This chapter is not meant to replace a consultation with your avian veterinarian if you do have a problem. Not all conditions affecting macaws are presented here—that would take a book in its own right. The information is presented here to give you some background information, not to encourage you to 'do it yourself'. Veterinarians cannot accept responsibility for any bird that they

have not seen personally and conducted a hands-on examination. It is illegal for veterinarians to dispense any prescription medication for a bird they have not seen and examined in the past 6–12 months. This is a state and federal law in Australia, and likely to be applicable in other countries, applying to doctors and dentists as well. So this chapter is not a means for macaw owners to self-diagnose their birds and then ask their vet for medications; rather, it is to help you understand what is happening with your bird, and what can be done to help it.

NEONATAL (FROM HATCH TO WEANING)

Macaws are altricial birds, which means that their chicks hatch with their eyes and ears closed, totally naked except for some wispy down feathers and absolutely dependent on their parents for food, warmth and security. (In contrast, precocial chicks, such as chickens, hatch fully feathered, eyes and ears open and able to eat by themselves.) At this stage, the chicks' health is determined by their parents, the incubation process and the environment they are reared in. The impact of their parents revolves around three key factors—the health of the parents, their diet and their genetics.

Given that the nutrition of the developing embryo hinges on what the female has put into the egg before the shell is laid down, and that the newly hatched chick is totally dependent on its parents (or a handrearer) for food, the importance of good feeding of the breeding macaw is obvious. This is discussed elsewhere in this book and should be read carefully by those intending to breed their macaws, and by those who already do so. Remember, the hallmark of a good diet is not just whether the birds will breed, but that they can produce strong, healthy chicks year after year.

Similarly, antibodies are passed onto the embryo through the egg yolk and albumen, and a healthy parent will be able to pass on much of that protection to the chicks. This maternal protection generally lasts until the chicks are 3–6 months old, by which time their own immune system is starting to mature.

Closely related parents, seen in small populations, can start to produce lethal or debilitating genetic effects. This is not commonly seen at this time but, as breeders start pursuing colour mutations, the deleterious effects of line breeding and inbreeding will make themselves obvious.

It is often difficult to artificially replicate the incubation process to achieve the same success as natural incubation. Guidelines and techniques have been developed and, when followed, give excellent results. However, anything that gives a chick a shaky start in life will affect its health. Incubator temperature, humidity, ventilation and hygiene are important aspects of artificial incubation that need to be well understood by those undertaking it.

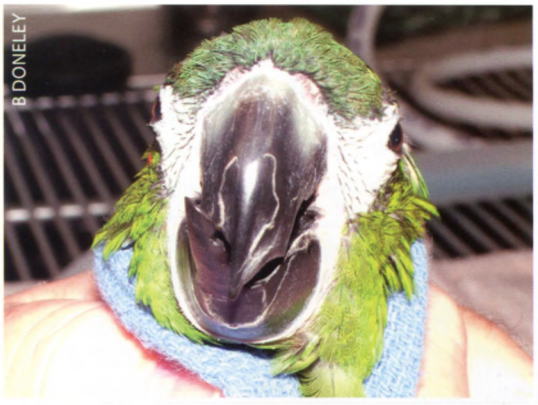
Finally, the environment in which the chicks are reared is vitally important. We need to strive to replicate the natural 'nesting log' environment, where chicks are kept warm and quiet, closely socialising with their siblings and parents. Because artificial diet has higher water content than natural diets, hygiene becomes a key factor when handrearing is undertaken. Advice on handrearing is given elsewhere in this publication, but the take-home message is that it will have a direct effect on the health of the developing chick.

Non-infectious Diseases

Scissor or Wry Beak

This term is used to describe a condition where the upper beak is turned to the side, either from the level of the cere or at the tip of the beak. The lower beak, normally fitting inside the upper beak, then starts to overgrow on the side not in wear and this worsens the situation. Although disfiguring, most birds adapt to the problem and are able to eat—unless the overgrowth of the opposing beaks prevents normal grasping and chewing of food. It is thought to be associated

Trans-sinus pinning to correct scissor beak in a macaw



This Hahn's Macaw was never treated for scissor beak—note how the beaks are overgrowing

with incorrect incubation parameters (temperature, humidity, ventilation or turning of the egg) or poor parental nutrition. Some cases are acquired conditions, associated with trauma to the cere and frontal bones of the skull, perhaps during overly exuberant feeding or playing.

If caught very young, the deviation may be corrected conservatively by applying gentle pressure with your fingers on the beak for 10 minutes at a time, 2–3 times a day. If this fails, or if the problem is not identified early enough, veterinary intervention is required. Two techniques are used—trans-sinus pinning, where a pin is placed through the frontal sinus and bent to run alongside the beak so that a rubber band connecting the beak and the pin applies constant pressure on the beak to straighten it gradually, and an acrylic ramp, placed on the lower beak to push the upper beak back into place. Both techniques are effective and, if used early enough, can correct the problem in just a few weeks.

Kinked or Wry Neck

This condition occurs when either a neck vertebrae does not fully develop or when the tendons in the neck have contracted on one side, pulling the head to that side. The result is the head is pulled over to one side and is unable to straighten. It is thought that a combination of poor diet and malpositioning within the egg is the culprit. Padded splinting will often resolve the problem but, again, early intervention—before tendon contraction becomes permanent—is needed for a good result.

Leg Rotation

The combination of poor diet, fast growth rates and excessive movement while being handreared—and sometimes genetics—can result in either the femur (thigh bone) or the tibiotarsus (shin bone), or both, growing unequally and turning outwards. The result is that the foot, instead of pointing forward, points out to the side or even backwards. This affects the bones of the leg, the joints and even the muscles. Worse, it may throw all the weight bearing onto the good leg, causing it to buckle under the strain.

Leg rotation in a juvenile macaw

This is not a condition that can be remedied by splinting and requires surgical intervention to correct. Some cases may require several surgeries to overcome the multitude of problems usually present. Sadly, some cases may not be able to be fully corrected.

Other Limb and Spinal Deformities

As a chick grows, its legs and wings are required to support the weight of the body and the feathers. If the chick's parents were fed a calcium-deficient diet, or the chick is fed a poor quality diet, the bones may not be strong enough to cope with the demands placed on it. The result can be bowing and other deformities of the bones—and sometimes even fractures can occur. These problems may not become apparent until the chick starts to become more mobile, especially when it starts to fly.

Affected chicks may stand 'pigeon-toed', have a hunched back (kyphosis, a spinal deformity) or break their wings when they flap them. Some of these deformities will respond to confinement and rest, combined with improved diet. Many others, however, will require surgery. Some birds may be so badly deformed that euthanasia may be required. Sadly and frustratingly for vets, many of these problems are easily prevented by simply providing a balanced diet.

Toe Constriction

Commonly seen in young macaws, this condition has the appearance and the effect of a tourniquet placed around one or more toes. The 'tourniquet' is actually a thin band of fibrous tissue running around a joint in the toe. The bird starts to grow, but the tourniquet doesn't. The effect is to restrict the blood supply to that part of the toe beyond the constriction. At first this part of the toe swells up and becomes red, then it starts to become blue and eventually black, before falling off. This whole process takes a week or two, during which the associated pain causes lameness and loss of appetite.

Toe constriction, restricting blood supply, is often seen in young macaws

It seems that this band forms when the nest box is too dry, but the exact mechanism remains unclear. In the early stages, increasing nest humidity and applying moisturising cream may help to soften and remove the band. If this is not working, veterinary care is required—the band is either cut in several places or removed completely, and the toe is bandaged to keep it moist while it heals. Painkillers and antibiotics may be required at your veterinarian's discretion.

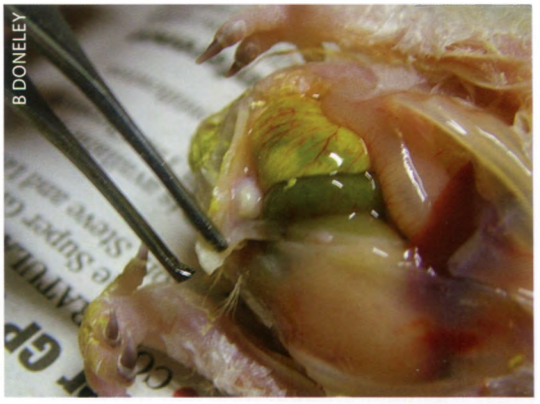
Anteroflexion of the Back Toes

This is a relatively uncommon problem where one or more of the back toes is flexed forward, under the foot, so that the bird is walking on the top of the toe. This is probably a nutritional and incubation problem and, if not treated with splinting early, will become permanent as the joint between the toe and the foot deforms and finally fuses. Treatment requires careful splinting of the toe into a normal position for 2–3 weeks.

External, Retained or Infected Yolk Sac

During incubation, the embryo develops on top of the yolk, which eventually develops a connection between the chick's intestines and the yolk itself. In the last days of incubation, the yolk is drawn into the embryo's body through the umbilicus, which should close off, sealing the yolk inside the body.

After hatching it becomes a rich source of nutrition for the chick, and is absorbed over a week or so while the chick's gastrointestinal system matures. Three things can go wrong with this process—the yolk sac may not be drawn fully into the body before hatch, the yolk may not be fully absorbed and starts to decay inside the body, or infection may enter the yolk sac before the umbilicus is fully closed.



Omphalitis (yolk sac infection) in a very young macaw chick caused death

These conditions are related to incubation and brooder problems and poor hygiene. Anything affecting the chick's development in the last few days of incubation can cause a yolk sac problem. Poor hygiene will lead to infection. Maintaining good incubation records is the first step to identify the cause of the problem, and impeccable hygiene in the incubator and brooder is essential.

All three conditions are serious and often life threatening. Affected chicks stop growing, become dull and lethargic, stop eating and may have a distended body. Antibiotics are rarely enough to treat these conditions—surgical removal of the yolk sac is usually required. Although the surgery is relatively simple, we are talking about operating on a chick in the first 1–3 weeks of its life and therefore the prognosis is guarded.

Crop Stasis

The crop is used by parrots to allow rapid but intermittent intake of food while maintaining a constant flow of food into the digestive tract. When working properly, the chick's crop is filled by the parent bird or the handrearer and then empties out over 4–6 hours, ready to be re-filled. Crop stasis occurs when the crop stops emptying and becomes distended with food and fluid. In some cases this food becomes a rich medium for the growth of bacteria and yeast and starts to ferment. This produces a characteristic smell, giving rise to the term 'sour crop'.

One of the great misconceptions is that crop stasis is caused by yeast, and that treatment with mycostatin (Nilstat®) is all that is required. This is actually the flipside of the real problem—the crop has stopped working properly and this has allowed the yeast to grow. So, while treating for infections may be part of the treatment of crop stasis, it is not addressing the cause of the problem.

Crop stasis is caused by anything that causes the digestive tract to slow down. This could be due to problems in the crop, such as crop burns, foreign bodies, or problems elsewhere in the body, such as chilling, overheating, generalised illness, foreign bodies, dehydration, or the food itself—it may be too hot, too cold, too thick or due to a change in diet. The flow-on effects of crop stasis are dehydration, inadequate food and secondary infections.

Initial treatment for crop stasis is to remove the material in the crop with a crop needle, and then flush the crop gently with warmed saline several times. The chick should be checked to see if it is cold or too hot, and the temperature corrected. Oral rehydration can be attempted, but if the crop is not working at all, the bird will need subcutaneous fluids given by injection. This should only be done under veterinary supervision—at the same time, the vet can check to see if a secondary infection is present and prescribe the appropriate treatment.

Crop Burns

This is not seen now as often as it used to be. In the earlier days of handrearing, some breeders heated up their handrearing formula using a microwave. They did not realise that this heating was uneven

and while the formula seemed to be at the correct temperature, there were super-heated 'hot spots' in the food. Once ingested, these hot spots settle to the bottom of the crop and burn the lining, eventually burning all the way through. Initially the chick loses its appetite and appears lethargic. Careful examination of the crop shows a reddened area that blanches after a few days. This blanched area then forms a scab and finally sloughs off, leaving a hole right through the crop and skin.

This condition requires surgical correction, usually delayed until the full extent of the burn has become obvious. Even chicks with large and extensive burns will do well and recover completely, as long as veterinary care is provided.

Throat and Crop Trauma

Young macaws are vigorous feeders, exhibiting an almost violent head bobbing when being fed. It is not uncommon for inexperienced handrearers to inadvertently traumatise the back of the throat, the oesophagus or the crop with a syringe tip or crop needle when the chick unexpectedly thrusts its head up against a feeding implement.

In the worst case scenario, the handrearer does not realise this has happened and deposits food under the skin, outside the crop. If this happens the food will rot and death occurs in a few days.

At any time when feeding a macaw, if the feeding device comes out of the mouth with blood on it, veterinary care should be sought. Early surgery to repair the damage and remove any food may save the chick's life.

Stunting

Any chick that has suffered a severe and ongoing setback during its growth can end up stunted. Common problems include inadequate food intake, poor quality food, severe health problems or poor husbandry. Affected chicks, while still growing, start to fall behind the weight gains expected for that species at that age. Physical characteristics include an over-sized elongated head, bulging eyes, eyes and ears failing to open fully, thin toes and wings, abnormal feathering, and loss of muscle mass. These chicks are often hungry all the time, constantly calling for food.

Early recognition of stunting, followed by identification of the cause are the key elements in reversing this situation. It is often surprising how these chicks make such a complete recovery so long as these elements are addressed. Again, veterinary involvement can make a huge difference.

Behavioural Problems

The biggest behavioural problem in this age group is the chick that refuses to wean and continues to beg for food long after it should be eating independently. This behaviour can be due to undetected medical problems, so a veterinary examination is called for.

If the chick passes the health examination, some 'tough love' may be required. The owner needs to cut back the volume and frequency of feeding while at the same time ensuring the bird is given plenty of solid food to explore. The chick should be encouraged and rewarded with praise when it eats solid foods and ignored when it is begging for a syringe or spoonful of handrearing formula.

Infectious Diseases

Neonatal chicks have a poorly developed immune system, relying instead on the antibodies passed on to them by their mother through the egg yolk and albumen. Exposure to a pathogen (a disease-causing organism) will result in one of three possible outcomes—the chick succumbs to the infection, perhaps even dying from it, the chick is transiently infected and mounts an immune response and throws off the infection (and possibly stays immune from it), or the chick is infected, doesn't get sick, but remains a carrier of that pathogen. Which outcome will result is determined by the interaction between the chick, the pathogen and the environment. See Figure 1.

The major pathogens affecting neonatal macaws are viruses, bacteria, fungi and Chlamydia.

Avian Polyomavirus (APV)

This is the most common virus affecting neonatal chicks. Infection does not always result in disease, with the age, species and general health of the chick determining whether it will get sick. In macaws, the most susceptible age group are those aged less than 14 weeks. Older chicks can get infected, but they usually don't die unless they are immunosuppressed.

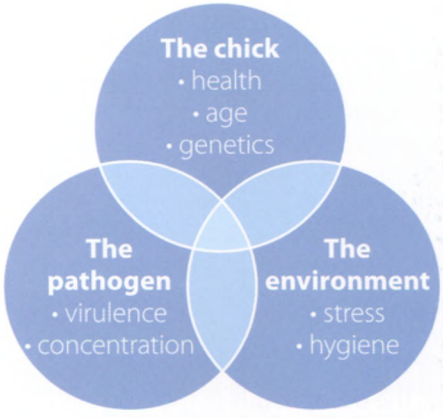


Figure 1 The interaction between the chick, pathogens and the environment

Many affected chicks will die suddenly, with little warning. A few, however, will live for a day or two before dying. These chicks refuse to eat, their crop stops working, they become very pale and develop extensive bruising all over their body. Intensive veterinary care may save some of these chicks, but most die. Survivors may develop feather abnormalities.

A vaccine against APV is available in the USA, but not elsewhere. This virus is spread through the droppings of infected chicks, so prevention revolves around traffic control in the nursery. Cockatiels, budgerigars and lovebirds are thought to be important carriers of the virus, so these birds should never be kept with macaws, and their chicks should not be reared with macaw chicks. The practice of 'contract handrearing' (where a nursery rears chicks from several different breeders) needs to be examined closely, as chicks brought in from multiple collections increase the risk of disease introduction.

DNA testing for this virus is available and should be performed and interpreted by your avian veterinarian as part of your quarantine process.

Chlamydia

Chlamydia psittaci, the pathogen responsible for the disease Chlamydiosis (or Psittacosis), is widespread and can affect all birds, not just parrots. It can affect any age group, but has its major effects on younger birds. Part of its significance is that it is a zoonotic disease ie transmissible to people, where it causes flu-like symptoms and pneumonia—and occasional deaths.

The typical scenario is the introduction of a new chick into a nursery. A week later it is sick, and other chicks begin to look ill. The signs seen are determined by the age of the chick when affected—young chicks may die within hours of looking unwell, while older chicks may develop a purulent discharge from the eyes and nose. The urates in the droppings, usually white, may turn green. Death ensues within a few days if treatment is not given.

Because of its zoonotic potential, this is another disease best handled by your avian veterinarian. DNA tests and other tests are available to diagnose this disease, but the fastest means of diagnosis is often a necropsy performed on a freshly dead chick. This is another disease that can be tested for during quarantine. Treatment, for both the birds and the owner if necessary, is rapidly effective but must be done for 45 days.

Aspergillosis

This is a fungal respiratory infection caused by *Aspergillus fumigatus*. It can affect macaws of any age group and can affect any part of the respiratory tract—the sinuses, airways, lungs or air sacs.

Fungal colonies, like bread mould, start to grow in the respiratory tract and cause difficulty in breathing. In some cases it can spread outside the respiratory tract and cause disease elsewhere in the body—in bones, muscles, even the spine. Affected birds are usually presented gasping for air and a change in voice. It is a difficult disease to diagnose, as there are no blood tests that are 100% accurate—instead veterinarians rely on X-rays and endoscopy to identify these colonies.

Aspergillosis is not a contagious disease—it is does not spread from one bird to another. However, several birds can pick it up from the same place. This is usually a dirty nest box, incubator or brooder. The fungus starts to grow in these spots and releases clouds of fungal spores. If these are concentrated in a small area and the chick breathes them in, disease usually results. In some birds, however, it may take months after initial exposure before disease becomes apparent.

Treating Aspergillosis is a long, difficult and expensive process. Three to six months of anti-fungal therapy is usually required, and some birds may need assistance with their breathing until the disease has settled. This may mean oxygen chambers, nebulisation and even breathing tubes put into the air sacs if the airways are blocked.

Bacterial Infections

Because of their still-developing immune systems, chicks are more susceptible to bacterial infections than older birds. Bacteria such as *Pseudomonas, Klebsiella* and *E. coli* are commonly associated with bacterial sepsis in chicks. Often the infection comes from the chick's environment. *Pseudomonas* and *Klebsiella*, for example, are usually associated with water and are usually seen in chicks that have hatched into contaminated brooders.

Depending on the severity of the infection, affected chicks may be mildly ill or they may die acutely. The indiscriminate use of antibiotics by both breeders and veterinarians has given rise to 'super-bugs'—bacteria that are resistant to many different antibiotics. For this reason it is best that a swab be collected for culture, the bacteria identified and tested to see which antibiotics are the most appropriate. A course of antibiotics may be started while waiting for the results, but you must be prepared to change the antibiotics once the results are in.

JUVENILE (WEANING TO SEXUAL MATURITY)

These are the 'teenage' years, when young macaws, like their human counterparts, can get into mischief. Developmental problems, although present earlier, may only become obvious as the chicks become more active. There are still some infectious diseases, especially some of the viral diseases, which are seen mainly in this age group, but most of the problems seen at this age are related to either trauma or behaviour.

Non-infectious Diseases

Wing clip-related trauma

Wing clipping (or trimming) is done to limit the ability of a bird to gain height and speed while indoors. It is not done to prevent a bird from being able to fly at all.

Problems arise when the wings are trimmed before the bird has learnt to fly and land safely. If only one wing is trimmed the unbalanced bird is more likely to make a landing more like a crash. Also, when too many feathers are removed, this causes the bird to fall like a rock. The result is that birds fall and land badly, and can damage their keel, their wing tips and sometimes even break limbs.

There is considerable debate about wing trimming, with valid arguments on all sides. Everyone agrees that no wing trim should ever result in trauma to the bird. For this reason I advise that you think carefully about whether you want your bird's wings trimmed at all and then, if you still want

it done, have your avian veterinarian show you how to do it safely. Never trim the wings before the bird has learnt to fly (and land) safely. Breeders and pet shops must stop trimming wings, especially those on young birds that may not have had the opportunity to learn how to land safely.

Behavioural Problems

Common behavioural problems seen in this age group include feather damaging behaviour, screaming and one-person bonding. Birds have some innate or instinctive behaviours, but most of their behaviours are learnt—either by mimicking other birds or by the response a certain behaviour receives. It is often said that there is no such thing as abnormal behaviour, but there is often normal behaviour expressed inappropriately. Screaming is a classic example—it is normal behaviour for macaws to scream loudly early in the morning and late in the afternoon yet it is inappropriate to do so in a small house in suburbia.

Behavioural problems arise from several different points—a lack of adequate socialisation, a lack of suitable training, and unrealistic expectations on the part of the owner. It is beyond the scope of this chapter to delve too deeply into the causes and treatment of behavioural problems, but I would like to make the following points:

- Birds reared in isolation and then kept in isolation are more likely to have behavioural problems.
- Owning a bird is a lifelong commitment and owners cannot 'put the bird aside' when their expectations are not being met.
- Changing a bird's behaviour may require that you change your behaviour as well.
- The sooner behavioural problems are recognised and treated the more likely it is that a successful outcome will be obtained.

In some cases it may be that a 'successful' treatment is that the bird does the unwanted behaviour less, and is otherwise healthy and happy.

Avian veterinarians rarely use drugs these days to modify behaviour. Instead, a combination of behavioural analysis, environmental and social modification, and training are used to achieve the best possible outcomes.

Poisoning

Young macaws are by nature curious animals, willing to chew on virtually anything. This predisposes them to poisoning from household items that contain toxins such as lead and zinc. Signs of poisoning can include tremors, seizures, excessive thirst, vomiting and watery droppings. If these signs are seen, veterinary care should be sought urgently. With the right treatment and supportive care, recovery is usually rapid and complete.

Another poisoning seen occasionally with pet macaws is acute respiratory distress when the bird is exposed to the fumes given off by burning non-stick cookware. Affected birds frequently collapse and die without warning. Others will exhibit severe respiratory distress and, with urgent veterinary attention, may survive.

Respiratory Hypersensitivity

This is an asthma-like condition seen in macaws that share the same air space as parrots producing powder down, such as cockatoos and Grey Parrots. Inhaling the feather dust from these birds triggers an inflammatory response in the macaw's airways. Affected birds develop a wheeze and sometimes a cough, their respiratory rate increases and they start to mouth breathe. They become very weak after any exercise and may start to lose their appetite and drop some weight.

Diagnosis requires blood tests, X-rays and sometimes even a lung biopsy. Treatment can be difficult, making prevention much easier. Macaws should never be housed with cockatoos or Grey Parrots and air filtration units may be needed to reduce dust particles in the air.

Infectious Diseases

In addition to those infectious diseases discussed earlier there are a few diseases most commonly seen in this age group.

Internal Papilloma Disease (IPD)

Now known to be caused by Psittacine Herpesvirus, IPD is still rare in Australia although common in the USA. One strain of the virus causes Pacheco's Disease—an acute viral hepatitis with a near 100% mortality rate. Other birds, infected with this strain or other strains, do not get the hepatitis form of the disease, but instead develop wart-like growths (papillomas) in the cloaca and mouth. They may experience difficulty eating and more commonly strain to defecate, and they pass blood in their droppings. The papillomas may sometimes be seen protruding from the vent, looking like a small raspberry.

Although papillomas can be surgically removed, the bird can never eliminate the virus from its body and they will eventually reoccur or appear elsewhere. Eventually bile duct cancer develops in the liver, leading to the bird's death.

Reliable DNA testing is now available to test for the virus and this, as with Avian Bornavirus (ABV) testing, should be performed during the quarantine period after purchase.

Some macaws infected with Internal Papilloma Disease develop papillomas in the mouth or the cloaca—as seen here

Undigested seed is often seen in birds with PDD—the proventriculus and ventriculus are not able to soften and then grind up the seed

Proventricular Dilatation Disease (PDD)

Also known as Macaw Wasting Disease, PDD has been diagnosed in most countries, including Australia. Current thinking is that the disease is due to Avian Bornavirus (ABV), and that it is an inflammatory response to the virus, localised in nerve endings, that causes the clinical signs seen in affected birds. The most common syndrome is weight loss in a bird that is passing undigested food in its droppings. This is due to a loss of nerve function in the digestive tract, preventing the normal digestion of food. However, other nerves can be affected and conditions such as weakness, paralysis, blindness and seizures can occur.

It is only recently that ABV has been implicated as the cause of the disease. This complicates diagnostic testing, as veterinarians are still searching for the best diagnostic test. Biopsies of the crop and other parts of the digestive tract may show the characteristic nerve lesions, but only in about 50–70% of infected birds. A DNA test is available, but the results need to be interpreted carefully. Not all birds with PDD will test positive for ABV, and not all birds that test positive for ABV have PDD. However, it is reasonable to say that a bird showing clinical signs consistent with PDD that tests positive for ABV, can be said to have PDD. With time, it is likely that newer and better

tests will improve our ability to diagnose this disease, but at the time of writing we have to be careful about confirming or negating a diagnosis of PDD.

There has been some success treating birds with PDD with anti-inflammatory drugs, but long-term success is uncommon.

ADULT (SEXUAL MATURITY TO OLD AGE)

Macaws of breeding age have usually developed resistance to most infectious diseases, although they can still contract diseases such as Aspergillosis and Chlamydiosis, especially if they are immunosuppressed. IPD and PDD can still be seen in this age group, as it may take several years from the time of infection until clinical signs are seen.

Most of the problems seen at this age are associated with breeding. However, this is also the age group where some of the effects of long-term malnutrition start to become apparent. These two groups are not independent of each other and are often closely intertwined.

Non-infectious Diseases

Egg Binding

Egg binding can occur in both aviary and companion birds, and is most common in overweight and unfit hens. Although a calcium deficiency is often blamed, it is rarely the only factor involved. Sudden changes in environmental temperature, unexpected stress, excessive or first-time egg laying can all be part of the problem. Lack of physical fitness and the presence of large amounts of fat in the body can add to the difficulties in laying an egg.

Affected birds may be intermittently straining and have trouble breathing. Some will present collapsed, exhausted and in shock.

Forget stories you have been told about steaming the bird's vent (all you'll do is scald the area) or giving the bird some oil (how is the oil supposed to move from the digestive tract into the uterus to lubricate the egg?).

Seek urgent veterinary attention, as this can rapidly escalate into a life-threatening condition. Until you can get to a vet, warm the bird with direct heat (such as a heat lamp or a hot water bottle) and give it some water (preferably with sugar added for extra energy). If you have calcium syrup on hand, give that as well. Be careful not to stress the bird too much doing this, and do not give anything by mouth if the bird has collapsed.

Prevention revolves around keeping the bird lean and fit and maintained on a well-balanced diet. If it is a pet bird, discuss with your avian vet how to reduce or eliminate reproductive behaviour that leads to egg laying.

Yolk Peritonitis

Occasionally a female will lose a yolk into the abdomen, instead of being captured by the oviduct. The body does not recognise that the yolk is part of the body and mounts a strong inflammatory reaction against it. Part of this reaction is the production of large amounts of fluid to try and dilute the yolk, but this fluid is not reabsorbed. The end result is a large accumulation of fluid in the abdomen, with adhesions forming between the internal organs. Despite the name—peritonitis—it is actually a sterile process, so the bird does not develop sepsis. Instead, it finds it difficult to breathe (the air sacs are compressed) and may develop other medical issues such as pancreatitis.

This is a surgical problem. Conservative treatment may help, but surgery is needed to remove the yolk, the fluid and the adhesions. The bird's breeding life is almost certainly finished—this needs to be taken into account when making a decision on her future.

Hepatic Lipidosis (Fatty Liver Disease)

Birds that are fed excessive amounts of dietary fat, such as seed and nuts, store it in the abdomen and liver. After a few years there is so much fat in the liver, it starts to fail. These birds may develop blood-clotting defects—they bruise easily and have trouble stopping the bleeding from a cut or broken blood feather. Their beak and nails may overgrow and their feathers become dull and may even change colour. The liver becomes swollen and painful, and this may cause the bird to start picking at the feathers on its back and belly. Towards the end of the disease the bird starts to lose weight and its appetite may decrease.

This disease is often diagnosed by a combination of X-rays (showing an enlarged liver) and blood tests (showing reduced liver function and very high cholesterol).

Treatment takes many weeks or months—dietary fat must be decreased, dietary protein must be increased, and vitamins need to be added to the diet. Liver protective drugs may be needed and the whole process has to be monitored carefully.

Prevention is better than cure. While macaws appear to require more fat than other bird species, it shouldn't be overdone!

Gout

Uric acid is the end product of protein metabolism in birds. Formed in the liver, it is transported in the blood to the kidneys where it is filtered and excreted as urates, the white part of the bird's droppings. This whole system hinges on normal kidney function—if this is not present the levels of uric acid in the blood start to rise.

If this rise is sudden, as seen with acute renal failure, the uric acid in the blood is deposited over the surface of many of the internal organs, especially the heart. This affects the electrical activity in the heart and often results in sudden heart failure and death with minimal warning. This condition is known as *visceral gout* and is often diagnosed at necropsy.

More often, though, kidney failure is more chronic and the rise in uric acid is slower. The uric acid is deposited in the tissues around the joints, provoking intense pain and inflammation. This results in arthritis, lameness and a reluctance to move. This is known as *articular gout*. Although painkillers and anti-gout medications can help, this condition cannot be reversed and euthanasia may be required if a reasonable quality of life cannot be achieved. This is obviously a step taken only after all options have been explored and the situation is discussed between you and your veterinarian.

Behaviour

Sexual maturity brings with it a new suite of behaviours, some of which can clash with an owner's expectations. These behaviours include aggression in defence of a nesting site or a partner (which may be the owner, rather than another bird), courtship behaviours and attempts to mate, and attention-demanding behaviour. That once happy, well-adjusted juvenile may become a raging hormonal monster.

Owners must expect these changes and plan for them by maintaining a normal social relationship with their bird—avoid one-person bonding and maintain a training program. Avoiding the bird because of these behaviours may escalate the problem and even introduce more problems, such as feather damaging and redirected aggression.

The role of environmental enrichment and foraging behaviours in replacing sexually directed behaviours cannot be overstated. Advice from avian veterinarians and qualified animal behaviourists should be sought and this should be done early on rather than waiting until unwanted behaviours have become ingrained.

GERIATRIC (THE LAST 25% OF A BIRD'S EXPECTED LIFE)

The word 'geriatric' is derived from two Greek words: *geri*—old man, and *iatric*—of or pertaining to a physician or medicine. Geriatrics is therefore the prevention and treatment of diseases of the elderly. This has long been a neglected area in bird keeping—probably because poor diets and husbandry meant that few birds lived long enough to be classified as geriatric. But as bird owners gain more knowledge and experience in keeping their charges, the life expectancy of many birds is increasing.

Well-cared for and well-fed large macaws can expect to live for 50–70 years and miniature macaws for 30–40 years. (Mind you, birds fed an all-seed diet and confined in a small cage have a life expectancy of a half to two-thirds of their expected life spans.) Geriatric care should therefore be provided to large macaws from their late 30s, and miniature macaws from the age of 20.

As birds age their body parts start to wear out just as ours do, and we see the same sorts of problems in these geriatric companions as we expect to see in ourselves. Infectious diseases are uncommon, although secondary infections as the body starts to fail can occur.

Secondary infections can start to occur as the body starts to fail due to age

Musculoskeletal Problems

Years of a combination of poor diet, inadequate perches and often obesity result in problems with the feet and joints of the legs.

Bumblefoot, an infection on the underneath of the feet, starts off as calluses that then thin and becomes susceptible to infection. The final outcome is infection in not just the superficial layers of the skin, but sometimes extending deeper into the tendons, joints and bone. Antibiotics, pain relief, anti-inflammatory drugs and sometimes even surgery are needed to address this problem. In addition, diet and husbandry changes are essential components of both prevention and treatment protocols.

Degenerative joint disease (arthritis) is common in older macaws. It is aggravated by restricted exercise, poor diets and obesity. Diagnosis can be made on the basis of clinical signs and radiographic evidence. Treatment requires weight control, anti-inflammatory drugs and controlled exercise.

Weak bones are common in older birds. The effects of a calcium-deficient diet are often compounded by inadequate exposure to unfiltered sunlight in birds housed indoors. This means the bird becomes deficient in Vitamin D3 and can't absorb the little calcium that is in the diet.

The thin bones that result, frequently break, especially if the bird falls heavily. Bone and joint cancer have also been reported. As with other species, the incidence is higher in older birds than young.

Heart Disease

It is thought that somewhere between 10–40% of companion birds have some form of cardiovascular disease. However, nothing like these numbers are reported by vets because of the difficulties encountered in diagnosing the problem.

Factors predisposing birds to heart disease include restricted exercise, poor nutrition, obesity and keeping birds in a climate that they did not evolve in (for instance, keeping macaws in European winters).

Some of the conditions seen include murmurs (associated with thickened heart valves), atherosclerosis and congestive heart failure. Birds with heart disease may be weak, have laboured breathing, their abdomen can be distended with fluid, and they may have seizures.

Diagnosis of heart disease requires a thorough physical examination, X-rays, ultrasound and an ECG. A variety of drugs are now available to treat heart disease in dogs and cats and many of these have been successfully used in birds, including macaws.

Cataracts (Nuclear Sclerosis)

Nuclear sclerosis is an age-related change in the density of the lens that occurs in all older animals. It is caused by compression of older lens fibres in the middle of the lens by new fibre formation. These changes are not uncommon in older birds and rarely require treatment. However, if desired by the owner, a referral to a veterinary ophthalmologist can be organised for cataract removal surgery.

Skin and Feathers

Skin and feather changes in older birds are not uncommon. In particular, darkening of the skin and feather loss/untidiness are age-related changes. However, some hormone problems such as suspect hypothyroidism can also cause dermatological changes—these changes should not be attributed to age without a thorough investigation.

Pointers to Maintaining Your Bird's Health

Buying Birds

- Only buy from reputable breeders or pet shops.
- Never buy an unweaned baby unless you have a lot of experience hand rearing parrots.
- Quarantine new birds. This means separating them physically from other birds and tending to their needs after the more established birds have been fed and watered. During the quarantine period (6 weeks) arrange a health check with your avian veterinarian, including a physical examination, disease testing and microchipping.

Housing

- Ensure you have the largest cage you can afford and will fit into your house or yard.
- Make sure the cage furniture (water and food dishes, perches, etc) are macaw proof or safe if chewed on and eaten.

Feeding

- Feed your bird a varied and balanced diet. An all-seed diet is bad, and so is an all-pellet diet. A good formulated diet, vegetables, fruit, seed and nuts can all be fed on a daily basis.
- Replace your birds' food and water every day.

Behaviour

- Remember that macaws are loud, boisterous birds. This is normal behaviour and you have to accept that. Understanding their behaviour, training your bird, and making social and environmental modifications can all help to maintain a harmonious relationship between birds and your environment.

CONCLUSION

Looking at the pattern of disease problems in different age groups, it is obvious that good husbandry and good nutrition are essential elements in managing the health of your macaw. This is done initially to protect the younger bird from infectious diseases and to prepare them to fight diseases with a healthy immune system, and to minimise the impacts of sexual maturity and then ageing.


LORO PARQUE FUNDACIÓN
SPECIES
Military Macaws
Ara militaris

Blue and Gold Macaw
Ara ararauna

BLUE AND GOLD MACAW

Ara ararauna

Blue and Gold Macaw exhibiting defensive posture

Other Name Blue and Yellow Macaw
Length 76–90cm
Weight Range 890–1300g
Breeding Age in Captivity 3–4 years
Clutch Size 3–4 eggs
Incubation Period 26–28 days
Fledging Age 14–18 weeks

DESCRIPTION

The Blue and Gold is a large macaw with medium blue on the back, yellow on the front and darker blue—almost cobalt on the primaries, and a bar of black directly under the lower mandible. Some green is situated on the forecrown which fades into blue on the head. The large, white bare skin on the facial area is marked with thin lines of black feathers above and below the eye. The beak is black and the feet are dark grey.

Juveniles have darker, undefined eyes, usually dark grey—once mature, the iris is pale yellow. The plumage of juvenile birds is usually duller than that of the adults.

Blue and Gold Macaw adults

IN THE WILD

The Blue and Gold Macaw can be found in the wild throughout Central and South America, its distribution ranging from as far north as Panama, to as far south as northern Argentina. Throughout its range, the Blue and Gold Macaw remains fairly common despite its heavy collection for the pet and breeder trade. Forshaw (1989) reported that its decline or absence in many accessible areas may be due to habitat destruction and trapping.

Although the Blue and Gold Macaw is the most commonly found large macaw in the wild, someday it may become quite rare in areas where human populations are expanding. The habitat of many species is undergoing change and some populations may die out or move to more suitable feeding and breeding areas.

Since 1992, the USA has taken a bold step towards resolving this problem by discontinuing the importation of this species from the wild. Other countries have started to take steps to reduce the number of birds being taken from their natural habitat, but more needs to be done.

Despite its high reproductive rate, this species cannot sustain itself indefinitely with the number of birds that are being captured for local and international pet and breeder trade. Legislation that prohibits importation for the pet market and restricts the number of imported birds each year for breeding purposes is required. Such measures need to be put in place as soon as possible in countries where they are not already governed.

The need to remove more Blue and Gold Macaws from the wild has been greatly reduced in the past years. This is due partly to its adaptation to captivity and its prolific nature in a captive environment. It has been documented that some pairs can produce up to a dozen or more offspring in a single season.

Globally, the price of Blue and Gold Macaws has fallen to a point where it may actually be less expensive to buy captive-bred birds than to import wild-caught birds. Exporting birds from the USA is not difficult, and this trade in captive-bred birds has a very positive impact on the conservation of wild birds of the same species.

This species has been introduced to the island nation of Trinidad where it is breeding freely in the wild. The translocation of these birds was undertaken because it was rumoured that Blue and Gold Macaws were once indigenous to the island. A few pairs have also been reported flying free and breeding in Miami, Florida. There is no population data on these introduced birds, and they are difficult to locate if they exist at all.

REGIONAL VARIATIONS

Although there are no official geographical variations reported for this species, several aviculturists claim that there are two, possibly three forms of *A. ararauna*. For example, some claim that birds from Brazil are larger and others claim that those from the Guianas have a lighter yellow on the chest area.

We disagree with these attempts to classify this species into several forms, especially geographical colour forms (Jordan pers. comm.) Furthermore, the pairing and breeding of two 'lighter coloured' birds always results in offspring that are similar to the parent birds. On second-generation breeding, one light bird bred to one darker bird results in a mixture of light and dark chicks. Therefore, it is our contention that the colour forms of this species are, in reality, a dominant genetic trait, and not a geographical colour form. Juniper and Parr (1998) also state that there are no geographical variations to this species, and there are no breakout subspecies listed under the current nomenclature by IUCN. Often, when a group of birds in one area seem to have a more 'turquoise' colour to the blue, it is due to a local food source they have been feeding on. Following a few months on a captive diet the general colouration reverts to normal. Much of the variation seen in these birds is a function of the age, amount of sunlight received, nutrition, or genetic characteristics that have been selectively bred in captivity.

IN CAPTIVITY

Blue and Gold Macaws are popular companion birds

Blue and Gold Macaw eggs

Blue and Gold Macaw protecting nest box

Opaline Blue and Gold Macaws at their nest box

The Blue and Gold Macaw is one of the easiest macaw species to breed in captivity. They are prolific breeders and make excellent avicultural subjects. Several generations have now been produced in many countries including the USA, South Africa and Australia. The demand for this species has remained high, although prices have dropped dramatically since the early 1990s.

Blue and Gold Macaws make good companion birds for those who can handle large birds and they are common in the pet trade in the USA. They are becoming more freely available in Japan and Australia, including several high-priced colour mutations.

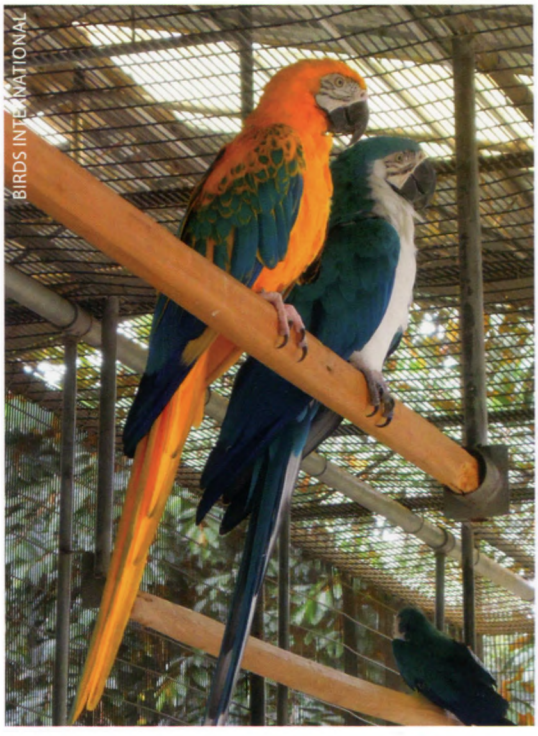
The original popularity of this species may be due to the abundance of wild-caught birds that were captured and imported into the USA during the 1980s and other consumer countries that continue to allow imports today. Records for the USA indicate that in the boom years more than 30 000 Blue and Gold Macaws may have been imported. Of course not all of these birds would have remained in the USA as some were re-exported to other countries where it was not legal to import from range countries.

Blue and Gold Macaws are very hardy birds. Even those captured in the wild and transported were usually healthy, resilient birds.

MUTATIONS

Top left and right: Non sex-linked (NSL) Lutino Blue and Gold Macaws

Blue mutation Blue and Gold Macaw



Opaline (left) and Blue mutation Blue and Gold Macaws

Top left and right: Opaline Blue and Gold Macaws

Bottom left and right: Blue Opaline Blue and Gold Macaws

Cinnamon Blue and Gold Macaw

Greygreen Blue and Gold Macaw

Greygreen (left) and Normal Blue and Gold Macaws

Greygreen Blue and Gold Macaw chick

In captivity, there are a growing number of mutations of the Blue and Gold Macaw. This is to be expected as this species has responded well to captive breeding efforts. At the time of publication, the known mutations are NSL Lutino (aka Recessive Yellow), 'Cinnamon', Blue, Opaline (sex-linked recessive), Greygreen, Pied and a mutation dubbed 'Golden'. All these mutations are very expensive and are still in the stages of being established in captivity.

The 'Cinnamon-type' mutation that appeared in US aviculture in the 1980s is recessive in inheritance. A second cinnamon-looking mutation has been produced and the inheritance mode has not yet been determined—it may be a 'Dilute'.

The recessive Blue mutation results in a blue and white colouration. The stunning NSL Lutino was first seen in the breeding of two males, and other yellow females and males have been produced from the same 'normal-looking' parent stock. Another mutation being bred in South America is described as a 'Grey (or Black) and Gold' Macaw—it is possibly a Greygreen mutation. The Pied and Greygreen mutations require further investigation.

Comment

The prolific breeding capacity of the Blue and Gold Macaw and its adaptability to most situations makes it a great companion bird. Their large size makes it inhumane to cage them in small, cramped quarters. Larger cages also enable the viewer to appreciate these birds in their 'true colours' in dramatic flight.

Blue and Gold Macaws love to display their aggression when they finally decide to breed. They will hang on the sides of their cage and hold their wings open, exposing the gold undersides to the keeper. They will vocalise in high-pitched shrills and dilate their eyes in an attempt to scare anyone away. Blue and Gold Macaws will blush, but usually not out of anger as seen in Military and Buffon's Macaws.

It always amuses us to see well-bonded pairs of Blue and Gold Macaws interacting. They will grab each other by the beak and rapidly pump their heads up and down. Often when approached, they will actually 'hold hands' as they perform this mock-feeding demonstration.

Pet Suitability: Probably one of the best macaws for adaptability to the pet bird environment. On a scale of 1–10, where 10 is the perfect pet for anyone, the Blue and Gold rates an 8. Plucking can be a problem with any 'bored' pet bird, but this species tends to have less feather problems than most of the other species.

Nature: Captive birds exhibit a gentle nature and are generally not aggressive towards each other or other pets in the household.

Mimic Ability: Pet owners often report that Blue and Gold Macaws, kept for several years as a pet, mimic many words and short phrases. They tend to be easy to train and can be trained to repeat a word or phrase on demand.

Noise Level: All macaws can be noisy—there is no doubt of that. Blue and Gold Macaws are not known to be the loudest or the most insistent screamers unless they are answering the calls of another bird. Most are reported to be quiet and content to play alone when provided with good enrichment.

Breeder Suitability: An unusual regard surrounds breeding this species. Most breeders, even seasoned biologists in Brazil or other areas of the natural habitat, report this species to be difficult to breed in captivity. However, the Blue and Gold is probably the most commonly kept and bred macaw in the USA and Canada. In fact, they are so reliable that they are often used as surrogates to hatch and parent-rear more difficult species, such as the Hyacinth Macaw. As with any breeding macaws, they can be very defensive of the nest when eggs or chicks are present and must be provided respect and privacy. They do not seem to mind other pairs of captive birds in the nearby environment.

Scarlet Macaw *Ara macao cyanoptera*—the North Columbian subspecies—note the large blue dots on the yellow wing band

SCARLET MACAW

Ara macao

The Scarlet Macaw is one of the most attractive of the large macaws

Other Names
Red and Yellow Macaw, Red Macaw
Length 81–96cm
Weight Range 800–1200g
Breeding Age in Captivity
Three plus years of age
Clutch Size 3–5 eggs
Incubation Period 26–28 days
Fledging Age 14–18 weeks

DESCRIPTION

The Scarlet is a large, red-coloured macaw. The wings are tricolour with red at the shoulders, a yellow band across the middle and dark blue on the primaries. The conspicuous rump and vent area is powder blue. The beak is horn-coloured on the upper mandible, fading to black at the back and onto the lower mandible. The facial skin patch is white, the iris is pale yellow and feet are dark grey. Juveniles resemble adults with the exception of a dark eye and dull plumage.

IN THE WILD

Historically, the Scarlet Macaw existed from southern Mexico through Central America to South America as far south as southern Brazil, Bolivia and northern Argentina. The incredible beauty of this species can be blamed for its demise, as collection for local and international trade has extirpated this species from many of its former range. The collection or hunting for its feathers has also taken a huge toll on populations of this beautiful bird.

Today, the Scarlet Macaw is rarely found in southern Mexico and is completely absent from El Salvador, only rarely seen in areas of the Pacific slopes of Nicaragua, and on the Caribbean coast of Costa Rica, where it was once reported as abundant. There are a few strongholds where the Scarlet Macaw is still considered common, these being the Amazon basin and the Guianas (Juniper and Parr, 1998).

Despite being listed as 'least concern' with a downward trend in population by the International Union for the Conservation of Nature (IUCN), recent field reports show that Scarlet Macaw populations may actually be on the rise in the wild, especially in Costa Rica and Peru. This is

partly due to the interest taken by several organisations in the conservation and breeding of this magnificent bird. Eco tourism businesses protect the nesting areas of local macaws and increase the awareness of the local inhabitants to the needs of the wild birds. Preservationists in Costa Rica have established a breeding reserve, and have actually released Scarlet Macaws back into the wild successfully. A new generation of macaws, offspring of released birds, has been documented in Costa Rica as well.

Research on Scarlet Macaws, especially their 'nestling diets' is being accomplished by Dr Donald Brightsmith and his team that manage the Tambopata Macaw Project. The biologists, aviculturists and veterinarians involved with this project are seeking answers to several questions that have stumped macaw enthusiasts for decades. Why do many parrot species gather at the clay licks in Peru? What exactly do the wild macaws feed to their nestlings before fledging? These dedicated biologists may have the answers soon.

This Scarlet Macaw form from the Southern Mexico and Yucatan Peninsula region is rare in captivity

The Nicaraguan is the largest form of Scarlet Macaw. It is characterised by an almost yellow wing band tipped in blue

REGIONAL VARIATIONS

There is much confusion about the various forms of the Scarlet Macaw. Juniper and Parr (1998) state that there are two forms—*Ara macao macao* and *Ara macao cyanoptera*—but evidence we collected with associates seem to indicate that there are at least three, possibly four different races of this species that exist in nature. Examining undocumented captive-bred specimens proved to be useless and only added more confusion to the issue. However, there are many pairs of Scarlet Macaws in the

Scarlet Macaws and nest

USA and many of these pairs are of known origin. This has allowed us to examine the birds and to establish a rough guideline of where the different races occur in the wild.

Additionally, we have travelled to several countries where the Scarlet Macaw exists in the wild and have compared the different forms with those recorded birds now held in captivity.

The first regional variation is found in the northernmost areas of the distribution, from southern Mexico to Nicaragua and has possibly integrated into flocks within Costa Rica. This bird is the largest of all forms—some captive birds measuring over 100cm in length and weighing more than 1500g. This Nicaraguan form is bright red and has three distinguishing features—a darker red to the plumage of the head and body, a broad yellow band on the wings where most of the feathers are tipped in blue, and an extremely long and wide central tail feather that swoops outwards and is tipped in light blue.

Compared to the Nicaraguan form, the second form is a slightly smaller bird. The head is smaller in proportion to its body and the body itself is shorter and slightly stockier. The most distinguishable feature is the narrower yellow band across the wings where most of the yellow feathers are tipped in bright green. This form is found throughout Bolivia, Brazil and possibly Guyana and Venezuela. The lighter red colour of this form also tends to fade to orange in bright sunlight. This is especially noticeable around the ear openings and over the back of the head. Some specimens have patches of green on the nape. This seems to be an inherited trait, not related to geographical distribution, although many specimens have originated from Guyana.

The origin of the third form remains a mystery. It is a smaller bird, both in length and weight. We suspect that it originates from a remote region of the range. The head and body are a similar colour to the Nicaraguan form, and there is a broad band of yellow on the wings. In addition to the smaller size, the most obvious characteristic is a total lack of colour dots on the yellow wing coverts. This very attractive macaw is not common in captivity in the USA.

IN CAPTIVITY

The Scarlet Macaw has responded well to captivity and been bred for several generations in the USA, South Africa and other countries. Once an expensive species, Scarlet Macaws are now considered to be one of the most common macaws in aviculture. It is easily bred, even by the novice aviculturist. There was a Florida breeder who produced as many as 65 young annually. Similar successes are reported across the country, but in smaller numbers.

Scarlet Macaw chick at seven days old

The biggest issue with breeding Scarlet Macaws is that there are several identifiable forms of the species that are now considered subspecies. It is often difficult to find the correct subspecies for breeding of pure birds because prior to 2010, most aviculturists considered a Scarlet Macaw to be a single species and ignored the regional variations of colour and size. Therefore, interspecific crosses have been produced by accident, worldwide.

MUTATIONS

Only one Scarlet Macaw mutation has been recorded in captivity—a recessive Blue, first bred by Antonio De Dios of the Philippines around the year 2000. In this mutation, the yellow and red

pigments are removed from the plumage and replaced by white. Black regions of the plumage are unaffected. Close observation of the Blue mutation suggests that a small degree of melanin is present in the plumage as the former red areas appear to retain a pale sky-blue colour. This mutation is still very rare in captivity.

As international trade in this species is restricted due to its listing in the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix I, inbreeding in captivity will undoubtedly uncover new recessive mutations in this species in the future.

Blue Scarlet Macaw mutation

Comment

The Scarlet Macaw can be an extremely 'nippy' companion bird, especially when approaching the breeding season. Some Scarlet Macaw females are ten times meaner than males. We have seen females throw males off the perch in an attempt to get them to protect the nesting area. Of course, there are males that will stand up to these 'pushy girls' and even some that will dominate regardless of the situation. The one thing we do not relish is placing a hand into the nest box of a laying Scarlet Macaw when she has eggs. Depending on the nature of the bird, you could pull back a bloody stump!

Nutrition of the nestlings is very important. If chicks are being handfed, a well-balanced diet is essential. The results of poor diet in the avian nursery will be crooked beaks or stunted, small birds. It appears that Scarlet Macaws require a high fat, high protein diet to grow properly. If the breeder lacks the experience to properly handrear this species, they should leave the chicks for parent-rearing rather than allow the development of pet birds that are small or have crooked beaks.

Pet Suitability: Some people think of the Scarlet Macaw as 'difficult' when, in fact, they are simply independent. Like the Military, Scarlet Macaws are a less 'touchy-feely' species than most macaws. They prefer to interact from their perch or play stand. This does not mean a bird cannot be taught to step-up and be content to be held. But in general, Scarlet Macaws are less affectionate than Blue and Gold Macaws.
Nature: Inquisitive and independent—not the hugging or affectionate type.
Mimic Ability: Scarlet Macaws are good mimics. Most will pick up words easily and some will repeat short phrases.
Noise Level: Medium to loud during active times of the day. They can be very quiet and play or amuse themselves if they want to.
Breeder Suitability: Scarlet Macaws are reasonably easy to accommodate and breed in captivity. Breeders should try to acquire a male and female of the same geographic variation to avoid mixing forms. They respond to the standard breeding set-up and nest box and can be voracious chewers of wood. Aggression is common during nesting and some pairs may injure chicks in an attempt to protect them.

Military Macaw
Ara militaris

MILITARY MACAW

Ara militaris

The Military (shown) and Buffon's Macaw display facial blushing when defending territory

Military Macaws are successful breeders in captivity

Other Name Green Macaw
Length 66–76cm
Weight Range 750–1100g
Approximate Breeding Age in Captivity From three years of age
Clutch Size 3–4 eggs
Incubation Period 26–27 days
Fledging Age 14–18 weeks

DESCRIPTION

The Military Macaw is predominantly green, of medium size and has dark blue primaries. Military Macaws feature a prominent area of red feathers on the forecrown and a varying intensity of red-brown colour on the throat. The facial skin area is white (flushed with red when excited), marked with small black feather lines under the eye and red above the eye. A pale blue patch on the nape area appears on some birds and is possibly an indication of a regional variation. The tail has a wide band of orange-red near the top and is tipped in blue. The beak is black and the feet are grey. The Military Macaw is shorter and more compact compared with other species. Juveniles resemble adults but have dark, undefined eyes and occasionally have lighter streaks of colour in their beak.

IN THE WILD

The Military Macaw is found as far north as south-western Mexico and can be found in small isolated populations in parts of South America—it is absent from all of Central America. Isolated populations are found in Columbia, Ecuador, Peru, northern Venezuela and possibly Argentina—it may be extinct in Argentina as reports from this area are sporadic and unconfirmed. The Military Macaw is not a rare bird, but it is included under CITES Appendix I, due to its strong resemblance to the endangered Buffon's Macaw (Great Green Macaw).

Left and right: Bolivian subspecies of the Military Macaw *A. m. boliviana*

REGIONAL VARIATIONS

Military Macaw *A. m. boliviana*

Juniper and Parr (1998) reported that four subspecies of the Military Macaw have been proposed, quoting *A. m. militaris*, *A. m. sheffleri*, *A. m. mexicana* and *A. m. boliviana*, and add that 'no consistent visible racial differences exist'. We agree, but consider that *A. m. boliviana*, the subspecies from Bolivia, does appear to have significant differences in size and colouration. Representatives captured in Bolivia and imported into the USA, demonstrate a larger size and a very distinct red-brown colour patch under the chin that extends downward and onto the upper breast. This colour is absent from all other Military Macaws of other known origins. Additionally, these birds weigh over 200g more than other captive birds captured in other areas. To add some confusion to the argument, three birds that were examined were basically the same size, but did not have the reddish brown throat—these birds were supposedly of Mexican origins. Certainly, there can be a size variation in any given population depending on available food supplies.

It appears that *A. m. sheffleri*, supposedly from south-west Mexico, was divided from *A. m. mexicana* based solely on its tail length, and we confer with Juniper and Parr that *A. m. sheffleri* is an invalid subspecies.

The individual subspecies of the Military Macaw, combined with the differences in each specimen, makes accurate identification difficult.

IN CAPTIVITY

Military Macaws breed readily in captivity, although prices for captive-bred birds have fallen dramatically in the past decade, partly attributed to the reputation that it is not a good pet bird.

Prior to the early 1990s, the Military Macaw was smuggled across the USA-Mexican border on a regular basis. Today, due to its low commercial value, Military Macaws are rarely found in illegal trade along this border and they have disappeared also from public flea markets in Mexico.

Captive populations in the USA and South Africa are stable and possibly growing. In Australian aviculture this species is rare.

Military Macaw breeding pair in defense of their nest entrance

MUTATIONS

None recorded.

Comment

The Military Macaw and its closely related cousin, the Buffon's Macaw, are the only two macaw species that seem to become so angry when you approach the breeding cage that they blush bright red—the colour of their forecrown. They will also bite if you get too close.

In the nest box, Military and Buffon's Macaws are known for destroying eggs. Often as a display of displaced aggression, they will pick up an egg and crush it right in front of you. Both species make excellent parents if you can provide the right degree of privacy, while still being able to service the cage and feed them.

Some pet owners say the Military Macaw is a nippy bird. This could be due to the extreme precision of the sharply curved beak, and its subsequent sharp point. Most pet macaws will nip or pinch in an attempt to communicate their dislikes.

Pet Suitability: For some reason, the Military Macaw has a bad reputation as a pet or companion species. However, the authors have had many positive experiences with this species and find them to be great companion birds. Military Macaws may tend to lunge with their beak before actually stepping up, but most of them, if well socialised, are not aiming to bite, they seem to be making sure someone really wants to pick them up. Properly trained birds respond as well as any companion macaw.

Nature: It seems that the Military Macaw can be testy by nature. They are not mean or aggressive, but they take a little time to develop a trusting relationship. There is certainly a difference in the nature between this species and the Blue and Gold Macaw.

Mimic Ability: Don't expect a pet Military Macaw to be the best mimic in the genus. However, they do learn a few words rather rapidly if they hear them repeatedly. Like any generalisation, there are exceptions and some pet owners report that their Military Macaws can and do talk a lot.

Noise Level: Good news! The Military is not a loud and consistently annoying screamer. If content in their surroundings, most Military Macaws are rather quiet compared to others in the macaw family.

Breeder Suitability: A good pair of compatible Military Macaws can be very prolific breeders. They make very protective parent birds and nest inspections should be attempted with caution. They respond to the normal macaw breeder set-up and a horizontally placed nest box large enough to move inside of with ease. When introducing birds for the first time, be careful not to allow one to dominate or starve the other.

Buffon's Macaw
Ara ambigua

BUFFON'S MACAW

Ara ambigua

Buffon's and Military Macaws are the only two macaw species that show anger by displaying a bright red facial blush

Other Name Great Green Macaw
Length 81–89cm
Weight Range 1000–1450g
Breeding Age in Captivity
Four plus years of age
Clutch Size 2–3 eggs
Incubation Period 26 days
Fledging Age 14–18 weeks

A difference between the Buffon's and the Military Macaw is that the Buffon's does not display blue on the nape, often seen in the Military Macaw

DESCRIPTION

The Buffon's Macaw strongly resembles the Military Macaw, but is much stockier and heavier, often reaching one and a half times the weight of the Military Macaw. The difference in the plumage colour is obvious when the two species are seen next to each other, but it is difficult to describe in words. The Buffon's Macaw is a more yellow-green than the Military Macaw and in bright sunlight the Buffon's Macaw can appear to be a golden yellow. The forecrown and facial lines above the eye are red and below the eye are black. The beak is larger and much heavier than that of the Military Macaw and may be streaked with a white or horn colour, especially in young birds.

A note of interest—the Military Macaw often displays a solid patch of blue on the nape and this is not found on the Buffon's Macaw. There have been birds with sporadic flecks of blue in the plumage, but they did not form a defined blue patch or area typical of the Military Macaw. Both the Military and Buffon's Macaws have identical colouration in the central tail feather—the only difference in this feather will be its length which is generally longer in the Buffon's Macaw.

The Buffon's Macaw beak is heavier than the Military Macaw and may be streaked with a horn-colour when young, as seen in this juvenile

IN THE WILD

The Buffon's Macaw can be found from eastern Honduras southward into northernmost Columbia and western Ecuador. In Nicaragua, Costa Rica and Honduras, the Buffon's Macaw is found mainly on the Caribbean slope of these countries. It is now listed as endangered in CITES Appendix I. In Costa Rica, as with the native Scarlet Macaw, there are a few foundations that have taken an interest in the conservation of these native species. Captive produced offspring have been released successfully in Costa Rica and appear to have integrated into wild populations with no problems. The status of this species is tentative at best throughout its range. Conservation efforts must incorporate captive breeding and release if it has any chance of survival into the distant future.

REGIONAL VARIATIONS

Two subspecies of the Buffon's Macaw are reported—*A. a. ambigua* and *A. a. guayaquilensis*—the latter supposedly confined to Ecuador and possibly southwestern Columbia (Juniper and Parr, 1998). We have never examined specimens or had confirmation of *A. a. guayaquilensis* in the wild or captivity, however, we have seen birds reported to be this 'supposed' subspecies which are suspected as hybrids, either from the wild, or created in captivity using *A. militaris*.

IN CAPTIVITY

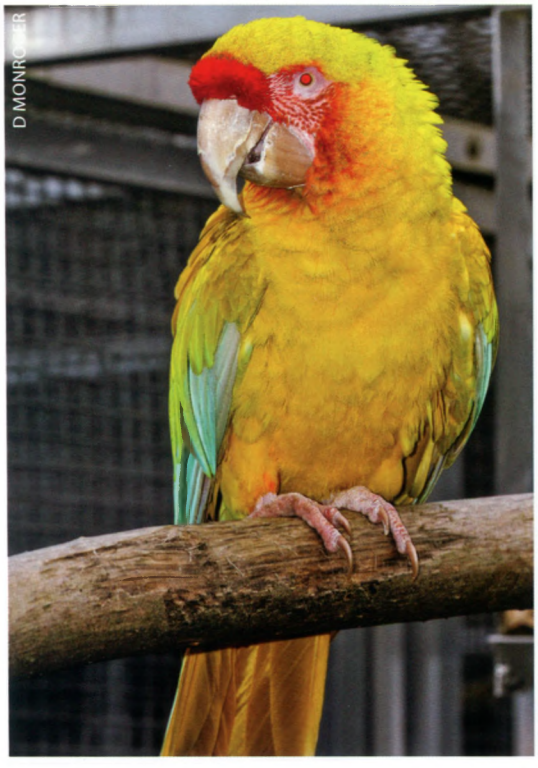
Successful breeding of the Buffon's Macaw was on the increase in the USA some years ago, evidenced by a huge decline in price, however there has been a more recent price increase due to the rarity of this species in captivity worldwide. Currently the biggest demand is for breeding purposes and not the pet trade.

The exact number of Buffon's Macaws held in aviculture is 'sketchy'—a survey accomplished approximately 10 years ago by the Conservation Committee of the American Federation of Aviculture Inc. reported a minimum of 35 pairs in the hands of their members, and that offspring have been produced by a number of breeders. Several breeders have produced second-generation offspring as well.

The most common problem associated with breeding Buffon's Macaws is mate incompatibility. This species can be difficult to pair due to displaced aggression toward their mates. Strangely, males and females alike can be aggressive, often injuring their potential mate. Once compatible pairs are established, breeding is usually not difficult. However, this displaced aggression is sometimes so severe that birds will attack their nestlings or break the eggs when they are approached or interrupted. Many Buffon's Macaw breeders remove eggs from the nest and incorporate the use of surrogate feeder parents or handrear the young.

Buffon's Macaws are voracious wood chewers in captivity, sometimes to the point where it is near impossible to supply them with a suitable perch that will last for more than a few days. Commercial timber studs have been introduced to the aviary, only to be made into toothpicks in a matter of a few days.

MUTATIONS



Left and right: Fallow Buffon's Macaw

The Fallow, an albinistic mutation, has been bred in the Buffon's Macaw. It is recessive in inheritance and young are born with a red eye that darkens as the chick ages. The general plumage is a very light yellow-green with pale blue primaries and an almost pink forecrown.

The classification of Fallow mutations is very difficult without determining their relationship to other mutations that often do not exist yet. All should have a red eye, but some are clear ruby red and others a darker red.

There are possibly two different Fallow mutations in the Buffon's Macaw. If this is the case, then mating the two together would produce wild-type offspring and be very undesirable for the continued survival of both mutations. Therefore, careful selection of mates to avoid mixing different mutation gene pools would be a wise course.

Comment

The Buffon's Macaw and its closely related cousin the Military Macaw are the only two macaw species that show anger when you approach the breeding cage, displaying a bright red facial blush—the colour of their forecrown. They will also bite if you get too close. In the nest box, Buffon's and Military Macaws are known for destroying eggs. Often as a display of displaced aggression, they will pick up an egg and crush it right in front of you. Both species make excellent parents if you can provide the right degree of privacy, while still being able to service the cage and feed them.

Bronze Fallow Buffon's Macaw

Pet Suitability: With a similar personality to that of a Military or Scarlet Macaw, the Buffon's Macaw can make a nice pet bird. Most tend to resist training and are somewhat independent, but this also means they require less entertainment and have fewer frustrations in the caged bird environment.

Nature: The Buffon's Macaw is not known to be extremely affectionate, not even to each other. They can be determined and stubborn. Anecdotal evidence would place them in the nippy category, but this is simply a way for them to demonstrate what they want. However, there are exceptions to the rule, and there are many very happy pet owners that report this species as being very gentle and sweet.

Mimic Ability: Most individuals will learn to mimic a few favoured words. Getting a Buffon's Macaw to repeat something on demand is a challenge, but when they want to talk, they often reveal a secret repertoire of learned words they use only when they feel it is appropriate.

Noise Level: Individual birds have been known to be noisy at the expected times of day—dawn and dusk. For the most part, pet owners report this species as basically quiet, but if a bird is determined to make noise, it can be very loud.

Breeder Suitability: Not the easiest species of macaw to breed in the caged environment. The hardest part seems to be mate selection and compatibility. Most pairs, even those that breed regularly, show some displaced aggression when humans are nearby. The secret to breeding Buffon's Macaws is to give them plenty of privacy, and not to interact with individual birds during feeding time. Mate abuse should not be tolerated and if a bird is injured, a new mate may be in order.

Green-winged Macaw
Ara chloroptera

GREEN-WINGED MACAW

Ara chloroptera

The Green-winged is the heaviest of all macaw species

Other Name Red and Green Macaw
Length 84–92cm
Weight Range 975–1450g
Breeding Age in Captivity From four years of age
Clutch Size 2–4 eggs
Incubation Period 26–28 days
Fledging Age 14–18 weeks

DESCRIPTION

The Green-winged is a large, stocky red macaw similar to the Scarlet Macaw, however it is a darker red and on the wing band, the yellow of a Scarlet Macaw is replaced by dark green. A better name for this species would have been the 'maroon' macaw.

Noticeable features are red feather lines across the white facial skin area leading above and below the eye. Compared with other macaw species the Green-winged Macaw is the heaviest in body weight, albeit not the longest, if you include the tail length—they have a shorter, more pointed tail than in the Scarlet or Blue and Gold Macaws.

The Green-winged Macaw is not the easiest of the large macaw species to breed in captivity

IN THE WILD

This species is widely distributed from southern Panama southward throughout central South America and is found in parts of Argentina, Columbia, Venezuela, the Guianas, Brazil, Ecuador, Peru and Bolivia. Its status in the wild appears to be stable. However, deforestation and collection for local and international trade are still threats to its wild existence.

REGIONAL VARIATIONS

None recorded.

IN CAPTIVITY

Green-winged Macaw at nest box

Size comparison between Green-winged Macaw (left) and Scarlet Macaw eggs

Green-winged Macaw chick at 49 days old

During the 1980s, the Green-winged Macaw was one of the most commonly imported species of macaw imported into the USA. Therefore, little effort was placed on learning its breeding biology until the early 1990s when the importation of wild parrots was prohibited by federal legislation. Despite this lack of concentration on the species, Green-winged Macaws are commonly bred in captivity worldwide. Second and subsequent generation breeding has increased.

In the past, one of the most common problems associated with the Green-winged Macaw in captivity was the high occurrence of *papillomatosis* in imported birds. These venereal-type warts, caused by a herpes virus, were common and were very contagious. In severe cases, affected birds are rendered sterile as physical copulation becomes almost impossible unless the warts are removed. As imported older breeding stock is replaced by captive produced birds, this problem is being 'bred out' of the population.

The Green-winged Macaw is becoming more popular in the pet trade. Captive-bred and handreared birds tend to be gentle and can become talented mimics. In optimum conditions and with proper nutrition, this species tends to live a long life. Birds that have reached the age of 70 years have been reported, but not confirmed.

MUTATIONS

None recorded.

Comment

Green-winged Macaws can be difficult to 'get started' as breeders. This species tends to show the least interest in breeding when new pairs are formed. Although they may be a good pair, they might not approach the nest box or make any attempt to breed for years. Green-winged Macaws kept for breeding can be very noisy and vocal. They are also destructive and will quickly destroy wooden perches or nest boxes.

Pairs that seem out of sync can be brought into breeding condition by providing them with 'nesting chores'. One of the most common chores can be created by nailing a thin piece of wood across the entrance to the nest box. Place a small hole in the center of the wooden cover and the birds will begin to chew their way into the box. The time spent working together on this project tends to stimulate breeding attempts and can even improve the attitude between the paired birds.

Once you get this species breeding, they do seem to be consistent. They make good parent birds and excellent pet or companion birds, and often talk better (mimic more clearly) than many of the other macaw species.

Pet Suitability: Probably not a bird for the shy pet owner. Green-winged Macaws make good pets for those that know how to handle a large parrot. Even the grip of their large feet can break skin, but it certainly would not be done purposefully. Green-winged Macaws should be housed in large cages where they can play with provided enrichment during their alone time. When introducing other pet macaws, be cautious and watch for any aggression. They can be housed with other pet macaws after they are introduced and get to trust each other. Not suitable for small children based solely on their strength.

Nature: Most pet Green-winged Macaws are gentle. Like the Military Macaw, this species 'seems' to choose whether it wants human interaction at any given moment—they may resist stepping-up when they would prefer to be alone. Of course there are as many personalities as there are species and some Green-wings are loving and great pet birds.

Mimic Ability: This species is probably one of the better talkers of the large macaws. They can, and often do, pick up words and phrases rather quickly once they are comfortable in their pet home. This is an easy species to train to mimic on command by providing a favoured treat as a reward.

Noise Level: Loud. Most 'honest' Green-winged Macaw owners will report that their birds can be loud, especially when they want something. The scream of a full grown macaw can be irritating and this particular species has a very high pitched tone, often used when they are trying to make themselves known.

Breeder Suitability: The Green-winged Macaw is not the easiest species of large macaw to breed in captivity. However, a pair that has produced fertile eggs will usually be consistent and breed each year. Probably the most difficult thing to do is to get a pair started. After introduction it may improve breeding chances by providing them with some type of nesting enrichment.

Red-fronted Macaw
Ara rubrogenys

RED-FRONTED MACAW

Ara rubrogenys

Red-fronted Macaw—note the smaller facial area compared with some of the larger macaws such as the Scarlet Macaw

Red-fronted Macaw adult

Other Names None
Length 61–71cm
Weight Range 375–550g
Breeding Age From three years of age
Clutch Size 3–6 eggs
Incubation Period 24–25 days
Fledging Age 16–18 weeks

DESCRIPTION

The Red-fronted is a medium-sized macaw that is predominantly olive green. Areas on the head and neck may be greener than the body. The forehead, cheek patch, thighs and bend of shoulder are orange-red. Primary wing feathers are dark blue. The tail is a mixture of olive and blue. Unlike most of the larger macaws, the Red-fronted Macaw has a very small facial skin area surrounding the eye and extending to the growing edge of the beak. There are very fine black lines on this skin area. The beak is black and the iris is orange in mature birds. Juveniles resemble the adults but have a dark iris.

IN THE WILD

The Red-fronted Macaw is found in a very small area of south-central Bolivia. The species is 'locally common but declining and threatened with global extinction', and 'threatened mainly by habitat destruction' (Juniper & Parr 1998). As with many species that are threatened in South America, grazing goats and cattle in the natural habitat have had, and will continue to have, a huge detrimental effect on their survival. Goats and cattle compete for food sources and eat the young trees that in maturity would provide more food for these macaws.

REGIONAL VARIATIONS

None recorded.

IN CAPTIVITY

The Red-fronted Macaw makes a gentle companion bird

Red-fronted Macaw chick at 14 days old

The Red-fronted Macaw was a rare and expensive avicultural subject until the early 1990s. Successful captive breeding, large clutch sizes and reduced prices have brought this bird to the point where it is now commonly offered in the pet trade in the USA. Previously, Red-fronted Macaws were found only in the hands of collectors (not always the best place for breeding). This meant that breeding was sporadic and inconsistent until this species was released into the hands of competent aviculturists. Today, most collections hold at least a couple of pairs and many are breeding second and higher generation offspring. There is a studbook for the Red-fronted Macaw in the USA, but it does not invite private sector breeders to participate, despite the fact that most of the Red-fronted Macaws produced are bred by private owners.

In Australia, this species is still very rare and coveted with few breeding successes, largely due to its shy, often timid or nervous nature that needs significant environmental privacy.

This endangered species is in need of avicultural participation worldwide, free from politics and ego. Because of the lack of encouragement for private breeders to participate in survival plans, this species is most often sold into the pet trade in the USA.

MUTATIONS

None recorded—however, a Lutino mutation was supposedly hatched in California. The owner did not succeed in rearing the bird and it died before it was weaned. No other offspring have been reported.

As blood lines become congested in captivity, new mutations will most certainly appear. Many captive birds probably carry genes for mutation colours, but as long as unrelated birds are available and used for breeding, these recessive traits will not come together into one bird, thus producing a visual mutation.

Comment

Although not as prevalent as it was in the 1980s, breeders of the Red-fronted Macaw report feather plucking and other behavioural issues with their breeding stock. In that decade, many of the captive subjects were wild-caught—maybe that had something to do with the issues. There have been many speculative answers to this strange habit but no actual solution that works in every situation. It is interesting that the authors have never had feather issues with breeding Red-fronted Macaws. Maybe it is due to housing this species in stand-alone cages that are not immediately next to other birds, or maybe the pairs themselves are very content with each other and do not spend time plucking themselves or their mates.

Whenever a pair of macaws exhibits nervous habits such as plucking, they should be provided with a nest box and privacy. Usually, a change of venue and the addition of a nest has some effect on their behaviour. The one thing that is not practiced enough in aviculture is the 'swapping of mates' in an attempt to change behavioural issues. It makes sense that two breeders with uncooperative pairs might want to swap a bird to see if it improves compatibility.

Once good pairs are established, this species can be prolific. Clutch sizes of up to six eggs have been reported, and parental habits are often positive. Chicks pulled for handrearing seem to follow the same guidelines as other juvenile macaws and do well on most of today's commercial handfeeding diets.

Pet suitability: The Red-fronted Macaw makes a gentle and somewhat shy companion bird. When housed with other pet macaws it is rarely the dominant bird in the flock and usually prefers to play alone.
Nature: Shy, but excited to learn and interact with human keepers.
Mimic Ability: Red-fronted Macaws are not known to be the best talkers. Most companion birds will pick up a few words and mimic in their own voice.
Noise Level: This species is considered to be quiet as an aviary bird and fairly quiet as a pet. They do have a higher pitched screech than most of the larger macaws, and a repeated chortle during times of excitement that can be annoying.
Breeder Suitability: For several decades from the 1960s, this species was considered to be difficult to accommodate and breed in captivity. Many of the imported birds developed feather anomalies and it was assumed they were a nervous species. But once the species had been bred a few times, and captive birds were available, things changed and the species began to breed more readily. Whether this was due to placing a captive-bred bird with a wild-caught, or whether it only took time to settle in, is not fully understood. Now, the Red-fronted Macaw is readily bred in many aviaries around the world and is commonly available to the breeder and pet trade.

Hyacinth Macaw
Anodorhynchus hyacinthinus

HYACINTH MACAW

Anodorhynchus hyacinthinus

The Hyacinth Macaw is one of the most gentle of macaw species, albeit mischievous

Other Names None
Length 81–94cm
Weight Range 1100–1600g
Breeding Age 7–8 years of age
Clutch Size 2–3eggs
Incubation Period 28 days
Fledging Age 16–20 weeks

DESCRIPTION

The Hyacinth is a large, cobalt blue macaw with yellow facial skin around the eyes and along the growing edge of the upper and lower mandible. The underside of the wings and tail is black. The beak is black and the eyes are red-brown in the juvenile and female, and dark brown to black in the male. The feet are grey and the nails are black.

Hyacinth Macaw adult—note the white toenail

The colour contrast of cobalt blue and yellow in the Hyacinth Macaw is most attractive

IN THE WILD

The Hyacinth Macaw is found in the heart of South America. Their varied habitats include areas of northeastern Brazil, eastern Bolivia and northernmost Paraguay. Habitat destruction and collection for the local live bird and feather trade are blamed for its continued decline. It is protected throughout its natural range and is listed in CITES Appendix I as Vulnerable.

The biggest pressure on Hyacinth Macaws in the wild is habitat destruction. In the past, uncontrolled illegal trade took its toll, but today goats and other livestock are denuding the land where this species feeds. In fact, any macaw species that eats palm nuts is at risk due to increased agriculture in their habitat.

Studies in the Brazilian Pantanal region indicate an increase in wild Hyacinth Macaw populations in that area. Biologists who have studied and observed this species for over 20 years claim the nestling production is rising and the total population has increased dramatically. Dedicated biologists, such as Dr Neiva Guedes of Brazil, have made a huge impact on the conservation of Hyacinth Macaws and as her work continues, this species still has a chance to recover from its historic decline.

REGIONAL VARIATIONS

None recorded.

IN CAPTIVITY

The Hyacinth Macaw is now fairly common in captivity outside of its native countries of Brazil, Paraguay and Bolivia. The history of this magnificent species is sad as many specimens have been illegally removed from the wild and have met with their death while being smuggled to marketplaces across the world. One reason for the smuggling of this species can be directly attributed to the difficulty in obtaining permits to sell captive-bred representatives of this species from one country to another.

Although this species is not really easy to breed, the captive breeding of the Hyacinth Macaw has been quite successful. Captive pairs have proven to be quite consistent once they are established. Breeders with large specialist collections of Hyacinth Macaws do not seem to be as successful as smaller breeders with one to five pairs. Although this has not been proven, it appears that when high concentrations of pairs are gathered together in one location, only dominant alpha and beta pairs breed. Of course there could be other factors, such as how closely they are housed, that may play an important role in breeding success.

Registration with CITES and governmental agencies remains difficult due to parameters to trade this species for commercial purposes, dependent on its consistent production to the second generation within a facility. One facility in Miami, Florida was approved in 2014 as a CITES commercial Hyacinth breeding facility. This was no easy task, but hopefully now it will pave the way for other smaller breeders to register their multiple generation breeding of Hyacinth Macaws, and maybe the international trade in this bird can continue with captive produced representatives.

Hyacinth Macaw egg

Hyacinth Macaw at two days old

Hyacinth Macaw juvenile

In 1991, over 90 pairs of Hyacinth Macaws were reported on the World Wildlife Fund for Nature (WWF), Traffic USA and the AFA, joint survey of breeders. However, this survey was only distributed to an estimated 1% of the known psittacine breeders in the USA.

This species is more commonly seen in collections worldwide and young birds are being offered for sale at lower prices than in the past. Young Hyacinth Macaws are now a common sight in pet stores in the USA, adding credibility to the belief that they were bred in larger numbers than in the recent past. As more experienced breeders retire or resign, this is one species that will decline in captivity and it may become very rare again in the pet trade.

MUTATIONS

None recorded. In the villages near its natural habitat in northern Brazil, it is not uncommon to hear the stories of a 'White' Hyacinth Macaw. However, this bird has never been photographed or officially documented.

Comment

Big beaks equal big chewing! More Hyacinth Macaws escape through the back of a wooden nest box than any other species. They can chew through a nest box overnight if they are determined to do so. In many cases, they will not fly away, but will remain in the area and fly around until someone opens the cage so they can get back in to eat. Due to the chewing nature of most macaws, and the Hyacinth Macaw in particular, nest boxes should be constructed from very hard woods like oak, or most of the Australian eucalypts. Large, sturdy perches should also be provided.

As captive-reared pets, this species is the gentlest and seemingly the most intelligent of the macaws. Just because they are gentle, however, does not mean that they are not mischievous. Hyacinth Macaws get into trouble if left unsupervised in a house, something that should never be done. As pet birds reach sexual maturity at about eight years of age, they may choose one person as a mate and display some aggression when approached by others.

Pet Suitability: Probably one of the most gentle of the larger macaws. Hyacinth Macaw owners frequently compare their pet birds to puppies. They require large, strong cages and plenty of enrichment to keep them busy and occupied during cage time.

Nature: The words, gentle, docile and inquisitive have all been used to describe the nature of a Hyacinth Macaw.

Mimic Ability: One of the better mimics, the Hyacinth Macaw seems to have two voices, a low guttural voice and a high sweet tone. Most captive birds learn several phrases and words and can be taught to speak on command easily.

Noise Level: These are a large bird with large sound capability. However, unless they are unhappy about something, pet Hyacinths rarely perform by screaming. But when they do, it will carry for a long distance and everyone will know there is a bird nearby! Most pet birds are fairly quiet and content.

Breeder Suitability: This is another species that is not purported to be an easy subject to breed in a caged environment. They are heavy wood chewers and have been known to break welds and chew heavy gauge wire as well. They develop a very strong pair-bond when compatible. Good pairs make excellent parent birds, but will generally only fledge one youngster at a time. Pairs need privacy and often display unexpected aggression during egg laying or rearing of young.

Blue-throated Macaw
Ara glaucogularis

BLUE-THROATED MACAW

Ara glaucogularis

Blue-throated Macaw *Ara glaucogularis*

The Blue-throated Macaw displays a large, turquoise blue area on the throat, compared with the Blue and Gold Macaw

Other Name Caninde Macaw
Length 84–91cm
Weight Range 650–1000g
Breeding Age in Captivity 4–12 years
Clutch Size 3–5 eggs
Incubation Period 26 days
Fledging Age 14–18 weeks

DESCRIPTION

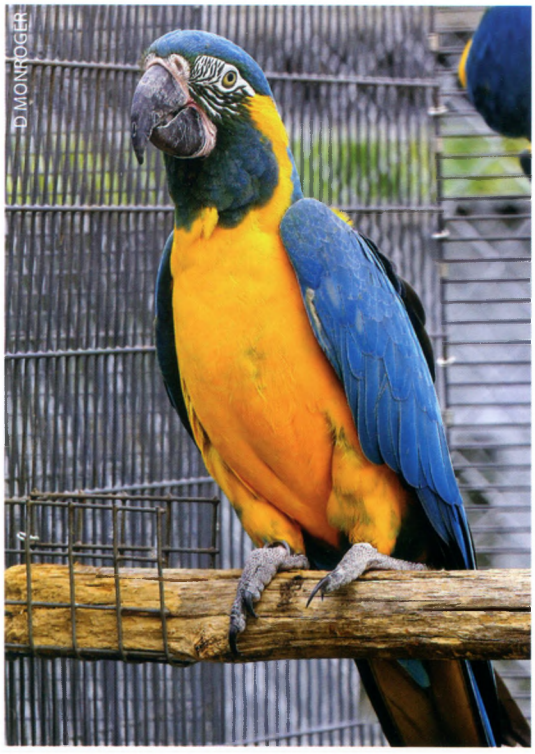
The Blue-throated is similar to the Blue and Gold Macaw, except the blue of the body is strongly marked with green giving an overall turquoise colour to the back of the head, wings and tail. A large area of the throat is also bluish turquoise. Compared to the Blue and Gold Macaw, the Blue-throated Macaw is smaller in body size, but has a longer, more pointed tail. Juveniles resemble the adults but with a dark eye and slightly duller plumage.

IN THE WILD

The Blue-throated Macaw is severely endangered in the wild. The range for this species is very small and it is only found in a remote area of northeastern Bolivia. Domestic legislation in Bolivia protects the Blue-throated Macaw, however poaching for trade is still reported on occasion. Trade in this species is probably local, as the economics of international trade to the USA and most other countries would not support large-scale illegal activities. CITES commercial registration of the many smaller breeders of this species in the USA would benefit conservation of wild resources by allowing the international trade in captive-bred specimens.

REGIONAL VARIATIONS

None recorded.



Blue-throated Macaw

Blue-throated Macaw male protecting chicks in the nest

Blue-throated Macaw parents (centre and right) with fledgling

IN CAPTIVITY

The Blue-throated Macaw is now more common in captivity in the USA, Spain, and South Africa than it is in its natural habitat. Ten years ago there was a survey of CITES Appendix I species by the CITES Committee of the American Federation of Aviculture Inc and this species was the second most commonly reported macaw—only the Scarlet Macaw was reported in larger numbers in captivity. Second generation successes are on the rise and this species is popular in the USA pet trade.

In early 2014, the US Fish and Wildlife Service added the Blue-throated Macaw to the US Endangered Species Act. Although this law was designed to assist in the conservation of USA native species, it will erode the successes and reduce the breeding of this macaw in captivity in this country. The law creates a permit system for any sales that take place from one State to another and does not support or encourage the use of any listed species in the pet trade.

Blue-throated Macaw fledgling in the wild

This will undoubtedly reduce the breeding and availability of Blue-throated Macaws rather than encourage conservation.

Similar legal trade issues have stalled the successes of breeders in Spain where hundreds of captive-hatched birds are now prohibited in international trade by CITES rules. It seems that some conservation laws actually make it easier to buy smuggled birds than legal ones! Legal trade in legal birds would undoubtedly relieve some pressure on the remaining wild flocks as the Blue-throated Macaw struggles to survive in its native habitat.

MUTATIONS

None recorded.

Comment

A good friend in Texas, Laney Rickman, coined the expression 'moonwalk' when describing the behaviour of captive-bred Blue-throated Macaws. I had to laugh because this is exactly what I have also noticed in my domestically produced birds when they are approached (R Jordan pers. com.). Both the male and female bow their heads and position their rumps almost level with the cage floor and walk backwards side by side in unison. During this time they also dilate their eyes and emit short 'blasts' of high-pitched yelps.

Once nesting begins, the pair can be very aggressive towards keepers and towards their own chicks. It is best to stay clear of nesting Blue-throated Macaws if you want them to parent-rear the young.

On a serious note, this species was finally receiving the attention it needed to help the remaining wild birds in Bolivia. Through captive breeding programs in the USA and other countries, money has been funneled into Bolivia whereby nest boxes are provided to wild pairs. With new legislative restrictions on commerce in this species, there is no doubt that funding will diminish and wild birds will have to fend for themselves.

Pet Suitability: This species is touted to be a great pet bird, similar to the Blue and Gold Macaw. Pets can be very affectionate and seem to want to learn common commands. They are best kept as a single bird for pet purposes—bonded birds, even of the same sex, may become aggressive.

Nature: Gentle and animated. Individuals may be very affectionate and desire human interaction.

Mimic Ability: Not known to be the best talkers, Blue-throated Macaws usually mimic when they are excited or emotional. Most will learn a few words.

Noise Level: This species is not reported to be loud. They can emit a high pitched scream on occasion, but usually only during excitement. Generally they remain quiet and are content to play alone during cage time.

Breeder Suitability: The Blue-throated Macaw is one of the most difficult to breed in captivity, although pairs that finally settle into the task are usually dependable and will breed every year. Some pairs will re-clutch annually and can produce large numbers of offspring. For some reason, this species often requires more time to accept a mate and begin breeding. Some successful breeders in the USA report that pairs may take 5–12 years before attempting to nest. There have been no secrets uncovered to make the breeding of this species easier—it is usually a matter of time.

Severe Macaw
Ara severa

SEVERE MACAW

Ara severa

The Severe Macaw displays a variable temperament at times and can be very loud

Other Name Chestnut-fronted Macaw
Length 41–48cm
Weight Range 300–550g
Breedng Age in Captivity From three years of age
Clutch Size 3–5 eggs
Incubation Period 25 days
Fledging Age 10–14 weeks

DESCRIPTION

The Severe Macaw is green overall. The crown is washed in blue. The forehead, chin and cheeks are brown, and the primary wing feathers are dark blue. The tail is orange-brown at the top fading to greenish blue near the tip. The inside shoulders of the wing extending to the carpal edge are red. The inside tail is red-brown, the beak is black and facial skin area is white with small chestnut-coloured feather lines. The iris is dark grey in juveniles developing into light yellow in mature birds. Feet can vary from brown to dark grey in colour.

Severe Macaw—note the red on the inside of the shoulders and tail

Top left and right: Severe Macaw males—note the bare facial area

Severe Macaw juveniles

IN THE WILD

The Severe Macaw is found from eastern Panama southward to central Bolivia. Countries of origin include Panama, Bolivia, Ecuador, Columbia, Peru, Brazil, Venezuela, the Guianas and Surinam. Widely distributed and common in most areas of its range, the Severe Macaw is listed in CITES Appendix II, as are all psittacines that are not included in Appendix I.

REGIONAL VARIATIONS

There are two recognised subspecies—*A. s. severa* and *A. s. castaneifrons*, however the two forms have been mixed in captive breeding. In captivity it is often noticed that there are two distinct sizes of Severe Macaw, but breeders have traditionally not paid much attention to this since ornithological literature has never indicated that there may be more than one race. The problem comes into play when breeders are not aware of the two races and choose small females and large males for their breeding stock.

IN CAPTIVITY

The Severe Macaw is very common in captivity around the world. Breeding data indicates that this species responds well and breeds easily in many different types of avicultural establishments. Of all the mini macaws, the Severe Macaw is probably the second most commonly found species in the pet trade, although the demand for this species as a pet seems to have diminished slightly. However, pet trade demands are cyclical and often driven by price. In the meantime, if interest in this species declines with breeders, it may disappear from aviculture.

MUTATIONS

No mutations have been confirmed.

An interesting colour variance has appeared in this species—a 'Red Pied'. This has since proven to be some type of metabolic disorder that is becoming somewhat common in green-coloured macaws. Several Severe Macaws exhibiting this strange colour pattern have shown up. Many have returned to normal colour after a few years, and none have bred out similar coloured young.

Comment

Although most species of macaws tend to prefer a 'horizontal' nest box where they can walk in and to the side, in my experience, most Severe Macaws nest better in deep, vertical nest boxes. Care must be taken to prevent the female from jumping down onto the chicks or the eggs, therefore a good ladder is required—this will also enable the chicks to eventually get out of the box.

If there is a large clutch of eggs, usually the smallest or youngest chicks will be ignored once the older babies begin to grow and compete for food. Smaller chicks may need to be removed for handrearing, or at the very least, handfeeding should be supplemented in the nest box.

This species is loud! When it is being sold as a pet or companion bird, the breeder should be honest and tell clients that there will be times when they may not be able to hear themselves think.

Pet Suitability: Can be a very nice pet bird, usually preferring one person in the household. They are easy to accommodate, requiring medium-sized cages and plenty of enrichment and wood to chew.

Nature: This species can be a 'Dr Jeckle or Mr Hyde' type bird. If they like you, they are as sweet as any pet, and if they don't like you, they can be very aggressive and go that extra mile to bite or terrorise. Pet owners should take some time with each individual bird to ascertain the chemistry between them. Once they are trusting of an owner, Severe Macaws can be sweet-natured and willing to do anything to please their keeper.

Mimic Ability: Good talkers in captivity. Some pets mumble like a human voice all day long when they are playing alone.

Noise Level: Some have reported this species to be unbearable screamers. They have a high-pitched scream and will not hesitate to use it when they are not happy. This species is probably not the best bird for an apartment dweller.

Breeder Suitability: Fairly easy to breed once compatible pairs are established. The normal breeder set-up with a grandfather clock-style nest box and medium-sized cage is preferable. Extremely aggressive parent birds can injure chicks or break eggs if the nest is disturbed. Good pairs can be very prolific and lay many fertile eggs in one season.

Red-bellied Macaw
Ara manilata

RED-BELLIED MACAW

Ara manilata

Red-bellied Macaw adult

Other Names None
Length 46–51cm
Weight Range 275–450g
Breeding Age in Captivity
From three years of age
Clutch Size 3–5 eggs
Incubation Period 25 days
Fledging Age 10–14 weeks

Red-bellied Macaw photographed nesting with partner close to Leticia, Colombia, near the Amazon River

DESCRIPTION

The body of the Red-bellied Macaw is predominantly green, marked with lighter spots of yellow. The primaries are dark blue and the tail is dark olive. The most distinguishing feature of this species is its yellowish facial skin patch which is usually wrinkled-looking and lacks the finite feather lines of most other macaws. The beak is black, feet are dark grey and iris is brown. A small maroon patch is present on the lower abdomen giving this species its common name.

IN THE WILD

The Red-bellied Macaw is still quite common throughout its range. Its wide distribution ranges east of the Andes from Columbia, Brazil, Venezuela (in very isolated locations), the Guianas, Trinidad, Ecuador and Peru to Bolivia. This species appears to be somewhat migratory, making it difficult to accurately assess its status. Funding for a wide scale evaluation and count is needed.

REGIONAL VARIATIONS

None recorded.

IN CAPTIVITY

The Red-bellied Macaw has proven to be a difficult subject to establish in captivity. Breeding is not the problem as many pairs have produced offspring, however high mortality rates in adult birds often plague aviculturists. Longevity problems appear to be associated with nutrition, as viral or bacterial agents are rarely found on post-mortem examination. Originally, this species was exported from the wild and holders have battled with high mortality rates, coupled with an unexplainable and incurable strange yellow colour to the faeces of some birds. Despite the unusual mortality rates, some representatives continue to breed and live on in captivity.

If you compare the number of birds that have been imported into the USA with the number that are now held in aviaries, it is apparent that this species will never be established and is rare in some countries.

Specialisation with this species may be beneficial, if it is not already too late to gather enough specimens to maintain genetic diversity.

MUTATIONS

None recorded.

Comment

Unfortunately, it is too late to save the Red-bellied Macaw in USA aviculture. Although it was never imported in large numbers, today it is almost impossible to find a pair, let alone a mate for a single bird. Imported birds are now reaching older age if they are still alive, and few if any successful breeders offer this bird for sale anymore.

Captive mutations tend to be more prevalent in species that are rarely bred and where unrelated stock is low, it creates congested bloodlines. As the Red-bellied Macaw becomes rarer and captive stock is utilised for breeding rather than pet purposes, a colour mutation may appear.

Pet Suitability: Although rarely available, the Red-bellied Macaw can be a very affectionate and loving pet bird. They do not require huge cages but should be provided with plenty of enrichment and toys, as well as out of cage time.
Nature: Sweet and loving is most often reported by pet owners. Some birds can be a bit shy as well.
Mimic Ability: This species is not reported to mimic very often. Most pet owners claim they will only mimic a few choice words.
Noise Level: Quiet as pet birds and noisy in the aviary if kept in numbers.
Breeder Suitability: This is one of the most difficult macaw species to breed in captivity. There seems to be some nutritional component missing in the diets of captive Red-bellied Macaws and they tend to have a short life span in a caged environment. Although some have been successful with breeding this species, and repeated breeding does occur, most pairs do not respond to the normal macaw set-up and will spend most daylight hours in the nest box. This species is famous for fouling the nest, probably due to the large amount of time spent hiding there.


P ODEKERKEN
Illiger's Macaw
Ara maracana

ILLIGER'S MACAW

Ara maracana

The Illiger's, one of the smaller macaw species, is reported to make an excellent companion bird

Other Names None
Length 41–46cm
Weight Range 280–450g
Breeding Age in Captivity
From three years of age
Clutch Size 3–5 eggs
Incubation Period 25 days
Fledging Age 12–16 weeks

DESCRIPTION

The general plumage of the Illiger's Macaw is green, the forehead is red and the top of the head and lower cheeks and neck are strongly marked with blue. The lower abdomen is red, the inside of the tail is golden and the primaries are dark blue. The facial patch is white, marked with very small feather lines of light brown. The beak is black and the feet are flesh-coloured.

Illiger's Macaw breeding pair

Illiger's Macaw adult

IN THE WILD

Although it appears to be extinct in Argentina, the Illiger's Macaw still ranges throughout central and southern Brazil and parts of eastern Paraguay. A small population exists near Petrolina Brazil, where a release program funded by the Loro Parque Fundación released birds in the late 1990s. This pilot-release population should be old enough to breed now, and hopefully will prove to be a success, producing wild birds from captive stock.

Overall, the Illiger's Macaw is rare in the wild. Habitat destruction and former collection for trade have reduced flocks considerably. Once again, the existence of goats and cattle in the natural habitat is causing great difficulties for the future survival of a macaw species. The Illiger's Macaw is listed in CITES Appendix I and considered vulnerable.

REGIONAL VARIATIONS

None recorded.

IN CAPTIVITY

During the decades of the 1970s and 1980s, the Illiger's Macaw was considered rare in captivity worldwide. Busch Gardens in Florida was one of the original successful breeding facilities and is probably responsible for this species being common in aviaries across the USA today. They are found in the pet trade despite their status as Vulnerable in the wild.

The Illiger's Macaw has proven to be a highly successful captive subject. Despite inbreeding, this species continues to be prolific in captivity and has been bred to a minimum of three, possibly more generations in aviaries across the USA. Worldwide, the Illiger's Macaw is not as common as in the USA, but its popularity as a captive subject is growing, and an increasing number of breeders are paying attention to this species.

MUTATIONS

In Europe, there are reports of a Lutino, however no photographs or other form of proof have been verified. No other mutations have been reported.

Comment

Once very rare in aviculture, the Illiger's Macaw is now fairly common throughout world aviculture. Most successful breeders have provided the standard vertical nest box often used for larger conures, but others have had success with the typical horizontal nest box. Many of the original captive-bred birds were parent-reared, but subsequent generations are now being produced and handreared with great success. Pet birds that are returned to the breeder trade are often some of the best subjects for breeding. This is probably due to their familiarity with humans and the fact they are calmer and less stressed in the caged bird environment.

The Illiger's Macaw has become a successful breeder in captivity

Illiger's Macaw at nest

Pet Suitability: Although this species is not as popular as a companion bird as some of the other mini-macaws, their suitability as a pet is touted as excellent. Many pet owners report the Illiger's Macaw as a devoted pet that usually does not select one person, and often enjoys the company of other members in the household. Some feather picking issues have developed in birds that appear to become bored during long periods of time alone.

Nature: Affectionate and sweet in nature. Some individual birds can be shy.

Mimic Ability: Talking may not be the number one attraction to this species, but most companion birds will mimic several words or short expressions. Sounds seem to be easy for this species and many learn to sneeze or cough after hearing their owners do the same.

Noise Level: Single pet birds will probably be rather quiet with the exception of early morning and early evening, the normal active times of the day. Pairs are quiet unless they are defending their space or warning of an intruder in the area.

Breeder Suitability: Finding a compatible pairing may be the biggest issue when trying to breed the Illiger's Macaw. Stable pairs have been known to accept large conure-style housing—a suspended aviary measuring a minimum of 1.5m (5ft) long x 1m (3ft) wide. The nest box need only measure 23cm (9in) square x 46–51cm (18–20in) deep. Make sure to include a suitable inspection door that does not allow the parent birds to exit the box. The Illiger's Macaw are very good parents and will protect their young and eggs vehemently.

Reliable breeding pairs will lay multiple clutches each year if eggs or chicks are pulled for rearing. Young that are handreared still grow up to become good breeders at about 3–4 years old.

Yellow-collared Macaw
Ara auricollis

YELLOW-COLLARED MACAW

Ara auricollis

The Yellow-collared is a small macaw with distinctive yellow feathers on the nape

Other Names Yellow-naped Macaw, Yellow-necked Macaw
Length 35–43cm
Weight Range 225–350g
Breeding Age in Captivity From three years of age
Clutch Size 3–5 eggs
Incubation Period 24 days
Fledging Age 12–14 weeks

The Yellow-collared Macaw is an active bird, similar to some of the larger conure species

DESCRIPTION

The Yellow-collared is a mini-macaw with predominantly dark green plumage. The thin yellow line of feathers around the back of the neck gives this species its name. The primaries are dark blue and the forecrown is dark brown to black. The tail is a burnt orange colour near the top fading to blue at the tip. The feet are a lighter flesh colour, the beak is black and strongly marked in horn on the upper mandible. The bare facial skin area is cream-coloured and the iris is orange.

Yellow-collared breeding pair

IN THE WILD

Still quite common throughout its range, the Yellow-collared Macaw seems 'unaffected by trapping' (Juniper and Parr, 1998) and persists in areas even where habitat changes have occurred. This species can be found in northern and eastern Bolivia, southwestern Brazil, northern Paraguay and the very northwestern area of Argentina. There is an isolated population in central Brazil. Yellow-collared Macaws may be seasonal visitors in some areas or may be migratory in parts of its recorded range.

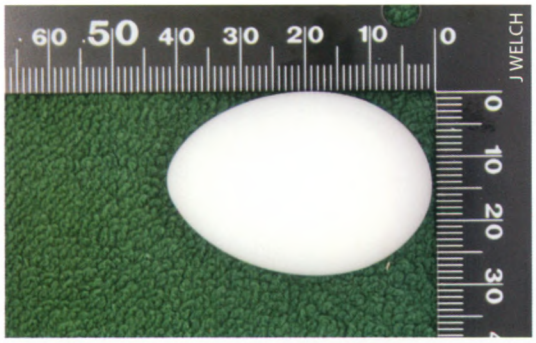
REGIONAL VARIATIONS

None recorded.

IN CAPTIVITY

Large numbers of Yellow-collared Macaws were imported into the USA, mostly during the 1980s. It was a very common and desired companion bird for a decade or two and was probably the most common of the mini-macaws kept in aviculture in the USA. However, it is fast disappearing from the pet trade due to its unsuitability as an apartment subject—this species likes to express itself rather loudly. Due to the reduced demand as a pet bird, breeding successes have also plummeted.

It has proved to be a very easy species to breed and is prolific in captivity. This species is rare in aviculture in Australia, although in the next decades numbers will surely increase.



Yellow-collared Macaw eggs and chick at seven days old

MUTATIONS

None recorded.

Comment

The Yellow-collared Macaw was the very first macaw species that I kept as a pet. I acquired a wild-caught male and had to tame him to make him part of my household. It took many weeks of concentration, and there were times when I almost gave up (R Jordan pers. comm.). If tamed or purchased as a captive-bred baby, this species can be quite endearing. Even as a breeder bird, the personality of this small macaw is desirable if one can get past the noise level it can produce.

This species prefers vertical nest boxes to large horizontal-type boxes, and they can raise four chicks in a 30.5cm x 30.5cm square space. Try to keep the nest clean as the more chicks there are, the more litter and dirt they produce.

Disruption of the nest seems to be tolerated reasonably well, with most parent birds remaining outside the nest while you tend to the young or the cleaning chores. In cases where parents are very aggressive and refuse to leave, you may endanger the lives of the chicks by intervening.

Pet Suitability: The Yellow-collared Macaw makes a great companion bird. They are known to be active and inquisitive birds and should be supplied with plenty of enrichment to keep them busy.

Nature: Similar to the larger conures, Yellow-collared Macaws are very active in the caged environment. They can be affectionate pets but may show aggression toward strangers.

Mimic Ability: Most Yellow-collared Macaw pet owners report success with voice or mimic training. Some claim their birds will repeat short phrases as well.

Noise Level: Single pet Yellow-collared Macaws will be quieter than groups or pairs set up for breeding. Probably not suited for apartment living, this species has the potential to be loud and heard when they demand attention. Most pet owners report a typical noise scenario—where their bird makes some noise at dawn and again at dusk and are reasonably quiet and content throughout the day.

Breeder Suitability: This species is fairly easy to accommodate and breed in captivity. The usual set-up is similar to that of the larger conures. Nest boxes should be deeper than wide and substrate such as wood shavings should be supplied. Stable pairs that are not stressed from human interaction make great parent birds and will often parent rear up to four chicks in one clutch.

Blue-headed Macaw
Ara couloni

BLUE-HEADED MACAW

Ara couloni

The Blue-headed Macaw is a small species with a quiet temperament

Other Name Coulon's Macaw
Length 40–45cm
Weight Range 300–450g
Breeding Age 3–4 years of age
Clutch Size 3–4 eggs
Incubation Period 25 days
Fledging Age 12–16 weeks

DESCRIPTION

The Blue-headed is a small olive-green macaw whose entire head and primaries are dark blue. The tail is burnt orange at the top, fading to blue at the tip. The beak is black, strongly marked in horn and white on both upper and lower mandibles. The facial patch is dark blue-grey, the iris is yellow and the feet are flesh to grey-coloured. The head and mandible of this species are very heavy and strong compared to other macaws of similar size.

IN THE WILD

Although the Blue-headed Macaw is not endangered, it has a limited range in the wild. They are reported in eastern Peru, extreme western Brazil and in a few preserves in eastern Bolivia. They appear to prefer steep cliffs along riverbeds. The Blue-headed Macaw is listed in CITES Appendix I and is protected throughout its range.

REGIONAL VARIATIONS

None recorded.

Blue-headed Macaw adult

Blue-headed Macaw babies

IN CAPTIVITY

The Blue-headed Macaw remains one of the rarest of all macaws in captivity worldwide. This is due to the difficulty in capturing wild birds and its protection under national legislation. Permits to export this species from Peru have been issued on occasion, but never in large numbers. It is still protected by law in Peru, but some exceptions have been issued and a few birds have been exported to breeders in Europe.

Probably the largest captive population of this species exists in the Czech Republic. Breeders in that country have been the most successful in reproducing this species in captivity. Second and higher generation breeding is known to have occurred, but permits to export offspring are rare, due to the unknown origin of the original breeding stock—many importing countries will not allow the birds to move without documentation as to their parent stock and the legal acquisition status.

The Blue-headed Macaw has also proven to be a capable breeder in the USA. A collection in Florida successfully breeds and each year offers several birds to the avicultural community. Other collections have reported second generation breeding from birds originating from the Florida facility. A few other bloodlines were also introduced legally into the USA when a consignment of birds were sent to the Bronx Zoo and subsequently made their way into private sector breeding programs.

Breeding has been recorded by aviculturists in Mexico, Panama, the Canary Islands, Germany, the Czech Republic, The Netherlands and South Africa. Other breeders are likely to have been successful as this species has proven easy to breed in captivity. Its rarity was due mainly to its late arrival in worldwide aviculture.

MUTATIONS

None recorded.

Comment

As breeding increases with this species there is a possibility of a colour mutation surfacing in captivity.

Pet Suitability: The authors have several years of experience with this species. It is not normally available as a companion bird due to its rarity in aviculture, but Hill Country Aviaries has now reared over 20 individuals. Handreared birds exhibit good companion traits. They seem to want to interact with human keepers and they play well alone or in small groups.
Nature: This species is similar in personality to the Illiger's Macaw. They can be a little shy at first, but warm up fast and are excited to step-up and be held.
Mimic Ability: Of the birds housed at Hill Country Aviaries, only a few have tried to mimic human voice. As this species becomes more available as a companion, it will probably prove to be a fairly good mimic.
Noise Level: The Blue-headed Macaw is generally quieter than the Severe Macaw. Like any species in the genus, they can scream and screech, however the Blue-headed Macaw tends to be shyer and reserve screaming for times of panic or excitement.
Breeder Suitability: Until recently, this species was considered very rare in captivity. In recent years and as birds became available from either wild-caught or captive stock, it has proven to be a fairly easy species to accommodate in captivity. Maturity seems to occur at about 3–4 years of age, and good pairs can be very prolific, laying clutches several times in one season.

Hahn's Macaw
Diopsittaca nobilis nobilis

HAHN'S MACAW (RED-SHOULDERED MACAW)

Diopsittaca nobilis nobilis

Hahn's Macaw male

Other Name Red-shouldered Macaw
Length 28–33cm
Weight Range 220–350g
Breeding Age From two years of age
Clutch Size 2–6 eggs
Incubation Period 24 days
Fledging Age 10–14 weeks

The nominate Red-shouldered Hahn's Macaw is slightly larger than the subspecies, the Noble's Macaw

Hahn's Macaw breeding requirements are similar to those of the larger conure species

DESCRIPTION

The Hahn's is a mini-macaw with a general plumage of green with yellow on the underparts. The forehead and crown are blue, the bend of the wing is red and the under-tail is olive green. The facial area is white, marked with hair-like dark grey feather lines. The upper mandible is horn-coloured in the young, darkening to black as the bird matures. The lower mandible is black and the feet are dark grey.

The Hahn's Macaw is slightly smaller than the Noble's Macaw *Diopsittaca nobilis cumanensis*. In the past there was a third subspecies of the Red-shouldered Macaw that was only differentiated from the Noble's by having longer wings. Very little is published or known of this third subspecies *Diopsittaca nobilis longipennis*—it was discovered is in the western-most part of its habitat in Brazil.

IN THE WILD

The Hahn's Macaw is common throughout its natural range of north-eastern Brazil, south-eastern Venezuela and the Guianas. This species seems to prefer tropical lowlands, swamps and savannahs. Although IUCN reports this species as of Least Concern, populations have declined, due to habitat destruction.

REGIONAL VARIATIONS

The name Hahn's Macaw is the common name used to distinguish the nominate form of the Red-shouldered Macaw. The other subspecies is commonly referred to as the Noble's Macaw *Diopsittaca nobilis cumanensis*. The difference in these two distinct subspecies is mainly the colour of the upper mandible—the Noble's Macaw has a horn-coloured upper beak and the Hahn's Macaw has a black upper beak. The body colouration of these two species is very similar and one would have to compare them side by side to see any differences. The Noble's Macaw has a lighter

Hahn's Macaw breeding pair at the nest box

Hahn's Macaw clutch

Hahn's Macaw chicks at 22 and 25 days old

Hahn's Macaw chicks at 30 and 33 days old

shade of green on the upper chest area. The third subspecies has not been seen in captivity and has only been described as similar to the Noble's, but with longer wings.

IN CAPTIVITY

The Hahn's Macaw used to be quite common in captivity in the USA. It was exported from countries of origin in large numbers and has proven easy to establish in captivity. This species breeds readily when compatible pairs are introduced and several generations have been produced in captivity. The habits and activities of the Hahn's Macaw are more similar to *Aratinga* conures than to *Ara* macaws. The decline in breeding and availability of this species is unexplainable. Suddenly, after many years of it being common, it is now difficult to find and only rarely offered into the pet trade in the USA. The worldwide captive status of this species remains common.

MUTATIONS

There have been reports of a Blue mutation although no confirmation or photographs support this. No other mutations have been reported.

Comment

We regard the small Red-shouldered—Hahn's and Noble's Macaws—as merely 'large conures'. However, one could also view some of the larger *Aratinga* conures as, perhaps, 'small macaws', and therefore the delineation between the two groups is superficial at best.

Breeding these two small species is similar to breeding *Aratinga* conures. They require cages that give them room to spread their wings and fly for exercise, and nest boxes that shelter the young from rain and inclement weather. They are not fussy eaters and seem to consume more food in a day than most of the larger macaws. Their personalities are 'feisty' like that of their conure cousins and each individual has a personality of its very own. For the most part, they make loving parent birds and devoted pets. One would certainly not be disappointed in keeping a Hahn's or Noble's Macaw as a pet.

In the future, in the USA, both these subspecies will be available only to collectors. On a worldwide scope, the Noble's Macaw may actually become more common in aviculture as Brazil loosens their trade restrictions on Brazilian breeders.

Hahn's and Noble's (Red-shouldered) Macaws

Pet Suitability: Similar to a larger conure, Hahn's and Noble's Macaws can make great pets. They are inquisitive by nature, although some individuals have been reported as shy. It appears these species require plenty of enrichment to keep busy and avoid feather anomalies.
Nature: Curious, inquisitive, sweet, shy, aggressive—the Hahn's and Noble's Macaws can be any or all of these personalities in a caged environment. Most are reported to be sweet and affectionate pets with their owners.
Mimic Ability: Fairly good mimics, both subspecies can learn words and short phrases. They have small, high-pitched speaking voices that are often difficult to understand.
Noise Level: The potential to make noise is high in this species. Most birds are quiet in the caged environment, but some will scream for attention.
Breeder Suitability: Of all the smaller macaws, these species are fairly easy to breed in captivity. They accept large conure-sized nest boxes designed in the grandfather clock style. If provided with sufficient privacy they will often rear their own chicks.

Noble's Macaw
Diopsittaca nobilis cumanensis

NOBLE'S MACAW (RED-SHOULDERED MACAW)

Diopsittaca nobilis cumanensis

The Noble's Macaw is a subspecies of the Red-shouldered Macaw group

Other Name Red-shouldered Macaw
Length 28–33cm
Weight Range 220–350g
Breeding Age From two years of age
Clutch Size 2–6 eggs
Incubation Period 24 days
Fledging Age 10–14 weeks

DESCRIPTION

The Noble's is identical to the Hahn's Macaw except that the upper mandible is horn-coloured at maturity compared to black in the adult Hahn's. This subspecies also has a lighter colour green on the chest and lower abdomen. The body is often shorter and stockier, making this subspecies appear larger than the nominate race.

The Noble's Macaw is distinguished from the Hahn's Macaw by its horn-coloured upper mandible

IN THE WILD

The Noble's Macaw is found in the interior of Brazil, south of the Amazon River, in central and eastern Bolivia and southeastern Peru. This species is reported as generally common throughout its range.

REGIONAL VARIATIONS

The third subspecies of the Red-shouldered Macaw may actually be a regional variation as very little is known or reported on this bird, although Juniper and Parr (1998) described it as being a slightly larger bird with more yellowish plumage and olive underparts.

IN CAPTIVITY

The Noble's Macaw is distinguished from the Hahn's Macaw by its white or horn-coloured upper mandible. This species has always been much less abundant in aviculture than the nominate form, the Hahn's Macaw. It has not proven difficult to breed, but has been difficult to find, as imports of this subspecies have never been common. The Noble's Macaw is rare as a caged bird outside of Brazil, its country of origin.

MUTATIONS

None recorded.

Comment

See *Comment* for the other subspecies, the Hahn's Macaw.

Handreared Noble's Macaw chick (above) and fledglings

Lear's Macaw
Anodorhynchus leari

LEAR'S MACAW

Anodorhynchus leari

The Lear's Macaw is similar to the Hyacinth Macaw, but is shorter and stockier with a larger yellow cheek patch

Other Names None
Length 65–74cm
Weight Range 750–940g
Breeding Age in Captivity From 4–5 years of age
Clutch Size 2–3 eggs
Incubation Period 28 days
Fledging Age 16–20 weeks

DESCRIPTION

The Lear's Macaw strongly resembles the Hyacinth Macaw, but is shorter and stockier with a larger yellow cheek patch. The overall plumage is more 'turquoise' than in the Hyacinth Macaw and the facial skin is more extensive. There are some strong green tinges to the feathers of the head. The underside of the tail and wings is dark grey, the iris is dark brown and the beak, although predominantly black, may be marked with areas of lighter grey.

The Lear's Macaw is rare in captivity

The colour contrast of cobalt blue and yellow in the Lear's Macaw is most attractive

IN THE WILD

The Lear's Macaw is found in a very restricted area of Bahia in northeastern Brazil. This area is quite close to the former range of the Spix's Macaw. It is a dry land where goats have destroyed young trees and food sources.

In the previous edition it was reported that only 139 birds remained in the wild. This number has proven to be very inaccurate due to recent conservation efforts in the wild and more intense study—the latest estimates now indicate over 1000 birds fly free in Brazil. This species prefers cliffs for nesting, although some nesting does occur in hollow tree cavities.

Several groups have come together to support the conservation efforts for the Lear's Macaw in Brazil and across the globe. The American Federation of Aviculture Inc, Parrots International, Lymington Foundation, Amigos de las Aves (USA), Nutropica Bird Foods (Brazil) and the Loro Parque Fundación have joined forces and supported the 'corn subsidy' program taking place in Brazil.

Lear's Macaws have been raiding the corn fields of local subsistence farmers who, in turn, sought permission to eradicate the birds. Instead, conservation groups came together and have created a subsidy program whereby lost crops are replaced by corn grown in other areas of Brazil. The farmers are happy with the program—the birds can fly free and still raid the corn crops with the population of the wild Lear's Macaws increasing annually.

Note that it is captive breeders that are most interested in saving this species and have put one foot forward to helping local conservation groups to accomplish their work. Even though this species is not common as a pet bird, aviculturists have made a huge impact on its conservation.

Lear's Macaw feeding on Palm Tree nuts

Lear's Macaw chick at 20 days old

Lear's Macaw chick at 27 days old

Lear's Macaw chick at 48 days old

Lear's Macaws near fledging at the Loro Parque breeding centre

REGIONAL VARIATIONS

None known.

IN CAPTIVITY

The Lear's Macaw is the rarest of all the large macaws in captivity. There are now no known specimens in the USA. Historically, it has been kept and bred at Busch Gardens in Tampa, Florida, but has since been lost. Recent legal acquisition by Mr Guth, a conservation breeder in Germany, and by the famous Loro Parque in the Canary Islands, has successfully increased the captive population of this species greatly. Additionally, several birds are held at the Rio Zoo and the São Paulo Zoo in Brazil. In the past 10 years, several attempts to smuggle this species out of Brazil have been discovered resulting in some birds being confiscated and returned to Brazil for repatriation.

MUTATIONS

None recorded.

Comment

Captive pairs of this species are rarely seen. It is important to consider where these birds have originated in the wild, and the type of nests they choose when allowed to do so—most wild Lear's Macaws nest on cliffs in caves or holes.

Biologists report that wild pairs usually only fledge one or two chicks per nest, even where the cavity is large enough for a human to crawl into. It makes sense that this species has evolved to use cliff caves or openings for nesting and that aviculture should take this into consideration when they design a captive environment for the birds—the wild is a good place to research when forming ideas for captive breeding pairs. This may prove to be unnecessary in the future, and perhaps the standard wooden box will be suitable.

Wild Lear's Macaws also fly many miles daily in search of favoured foods, indicating that exercise may also be vital to keeping this species healthy or content in the caged environment.

As Lear's Macaws become more common in captivity we will surely learn about more secrets to successfully keep and breed them—their long-term health in captivity is an important aspect of aviculture.

Artificial nesting site designed to replicate the wild nest

Spix's Macaw
Cyanopsitta spixii

SPIX'S MACAW

Cyanopsitta spixii

The Spix's Macaw is the rarest captive-held macaw in the world

Other Names None
Length 56cm
Weight Range 250–350g
Breeding Age in Captivity Second and subsequent generation offspring have now been produced. It appears that sexual maturity occurs between 4–6 years of age.
Clutch Size 2–4 eggs
Incubation Period 26 days
Fledging Age 12–16 weeks

DESCRIPTION

The Spix's Macaw is a small bird, approximately the same size as the Illiger's Macaw, but with a longer, more pointed tail. The wings and the back of the tail are dark blue. The head is grey, fading to powder blue on the shoulders and chest area. The beak is black and marked with grey and the facial skin patch is grey and darker in juveniles. The eyes are yellow and legs are dark grey.

The Spix's Macaw is a small bird of similar size to the Illiger's Macaw

IN THE WILD

This species was originally found in the State of Bahia, in the dry northeastern regions of Brazil. The Bahia area is marked by extreme poverty and many species are now becoming threatened by local agriculture and inhabitation of the land by native people. A release effort was attempted in 2001, where a single Spix's Macaw female was released to join the only known wild bird (a single male), but she disappeared some time later, as did the last remaining male.

Never common or widespread, this species was almost certainly rare in the wild for many decades. It is now believed to be extinct in the wild.

IN CAPTIVITY

The Spix's Macaw is one of the rarest captive-held species in the world. However, in the past 20 or 30 years, this species has reproduced to three generations. Only a few breeders maintain the Spix's Macaw and most are part of a worldwide effort to save it from complete extinction.

Today the Spix's Macaw survives and has thwarted extinction thanks to a few dedicated aviculturists around the world. The late Sheikh Saoud Bin Mohammed Bin Ali Al Thani, founder

Spix's Macaw juvenile

of the Al Wabra Wildlife Preservation in Qatar, took an interest in this species and gathered up available birds. Mr Martin Guth of Germany did the same, and between the two facilities the Spix's Macaw now numbers over 100 individuals. Sheikh Thani also made arrangements to purchase land in Brazil (the last known area where wild Spix's flew) and plan a breeding and reintroduction of the species back into the wild. The holders of Spix's Macaws are not amateurs—they have genetically sequenced their birds, established relatedness data and set up a studbook to manage the species as it recovers from very near extinction.

Spix's Macaw eggs

Spix's Macaw chick at 34 days old

Spix's Macaw chick at 66 days old

MUTATIONS

None recorded.

Comment

The Spix's Macaw is a story that was made possible only by aviculture. If it were not for the dedicated captive holders and breeders of this species, it would certainly be extinct. The original pressures on the species may have included collection for the trade, but certainly the population had already declined to an unrecoverable threshold.

We have been involved with the conservation efforts of this species in that we were invited participants of the Brazilian government's conservation committee in the early 2000s. Having had firsthand knowledge of the effort, it is clear that politics cannot save a species. The plight of this bird demonstrated that amnesty, cooperation and money go a long way to saving a species on the brink of extinction. We are sure that Sheikh Thani's people will not give up until there are, once again, Spix's Macaws flying free in Brazil—an honourable effort by all involved.

EXTINCT SPECIES

GLAUCOUS MACAW

Anodorhynchus glaucus

The Glaucous Macaw was once found in Uruguay, Paraguay, Brazil and possibly northern Argentina. Logging, deforestation and loss of food sources are blamed for its demise. There have been no reliable recorded sightings since the late 1800s.

Preserved museum skins indicate that this species appears closely related to the Hyacinth and Lear's Macaws. The beak may have been more brownish and the head area strongly suffused with grey. The size was similar to the Lear's Macaw.

This species is listed as possibly extinct by CITES.

CUBAN MACAW

Ara tricolor

The Cuban Macaw, also known as the Cuban Red Macaw, was endemic to the island of Cuba, and possibly a nearby island, Isla de la Juventud. Last reports of its existence were in the 1850s in the Zapata swamp area of Cuba.

Very little is known of this species and only about 12 skins are now preserved in museums across the world. From these skins it is evident that this species was a small macaw—about the size of the Severe Macaw, with a longer tail. The colouration was predominantly red-orange with blue primary wing feathers.

The Cuban Macaw was last recorded in the mid-1850s. This species is mentioned in historical records from traders and Cuban settlers indicating it was common in the 1400s. Later in history, probably the 1800s, it was traded in Europe and was on display in the Berlin Zoo and possibly the Amsterdam Zoo. Anecdotal information implies that this species may have been common—several references record that it was shot for food and feathers. It supposedly nested in the hollows of palm trees and some were kept as pet birds (Forshaw, 1989).

This species is listed as Extinct by CITES.

Above and below: Cuban Macaw taxidermy at the Smithsonian Institute

Blue-headed Macaw

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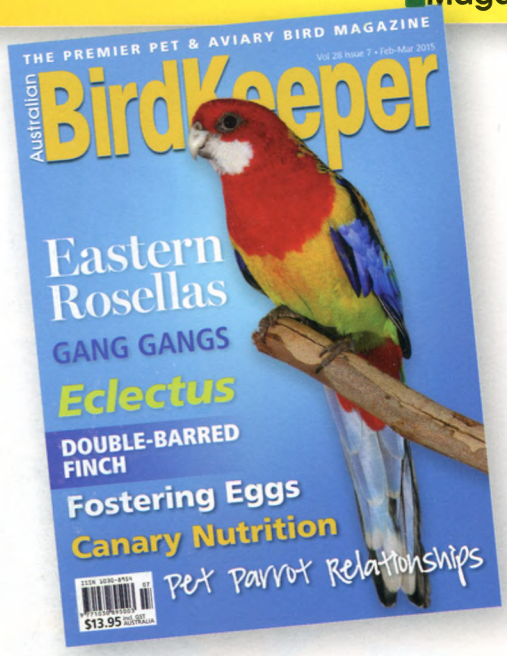

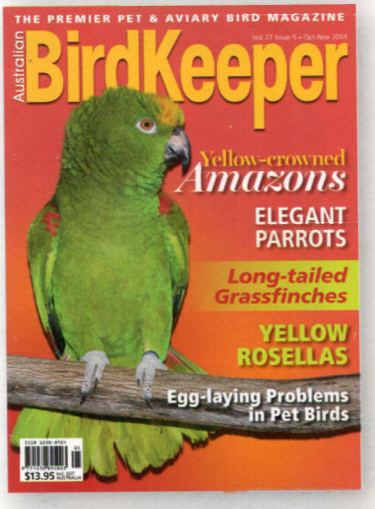

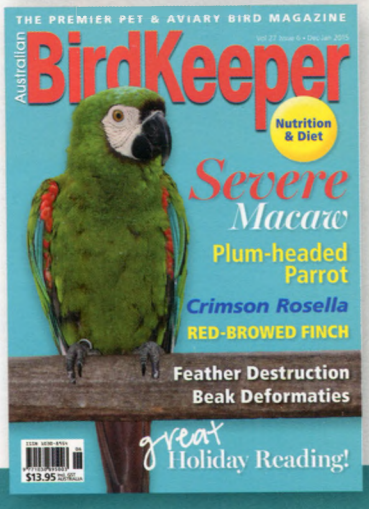

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