# Brood Parasites in Zoology

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First Edition, 2012

ISBN 978-81-323-4098-0



*Published by:*
**White Word Publications**
4735/22 Prakashdeep Bldg,
Ansari Road, Darya Ganj,
Delhi - 110002
Email: info@wtbooks.com

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# Chapter 1

# Brood Parasite

A Common Cuckoo being raised by a Reed Warbler.

**Brood parasites** are organisms that use the strategy of **brood parasitism**, a kind of kleptoparasitism found among birds, fish or insects, involving the manipulation and use of host individuals either of the same (intraspecific brood-parasitism) or different species (interspecific brood-parasitism) to raise the young of the brood-parasite. This relieves the

parasitic parent from the investment of rearing young or building nests, enabling them to spend more time foraging, producing offspring etc. Additionally, the risk of egg loss to raiders such as raccoons is mitigated, by having distributed the eggs amongst a number of different nests. As this behaviour is damaging to the host, it will often result in an evolutionary arms race between parasite and host.

## *Avian brood parasites*

The Goldeneye duck lays its eggs in the nests of other females.

In many monogamous bird species, there are extra-pair matings resulting in males outside the pair bond siring offspring and used by males to escape from the parental investment in raising their offspring. This form of cuckoldry is taken a step further when females lay their eggs in the nests of other individuals. Intraspecific brood parasitism is seen in a number of duck species with females laying their eggs in the nests of others for example in the Goldeneye, *Bucephala clangula*.

Interspecific brood-parasites include the Old World cuckoos in Eurasia and Australia, cowbirds and Black-headed Ducks in the Americas, and indigobirds, whydahs, and the honeyguides in Africa. Seven independent origins of obligate interspecific brood parasitism in birds have been proposed. While there is still some controversy over when and how many origins of interspecific brood parasitism have occurred, recent phylogenetic analyses suggest two origins in Passeriformes (once in New World cowbirds: Icteridae, and once in African Finches: Viduidae); three origins in Old World and New World cuckoos (once in Cuculinae, Phaenicophaeinae, and in Neomorphinae-Crotophaginae); a single origin in Old World honeyguides (Indicatoridae); and in a single species of waterfowl, the black-headed duck (Heteronetta atricapilla).

Most avian brood parasites are specialists which will only parasitize a single host species or a small group of closely related host species, but four out of the five parasitic cowbirds are generalists, which parasitize a wide variety of hosts; the Brown-headed Cowbird has 221 known hosts. They usually only lay one egg per nest, although in some cases, particularly the cowbirds, several females may use the same host nest.

The Common Cuckoo presents an interesting case in which the species as a whole parasitizes a wide variety of hosts, but individual females specialize in a single species. Genes regulating egg coloration appear to be passed down exclusively along the maternal line, allowing females to lay mimetic eggs in the nest of the species they specialize in. Females are thought to imprint upon the host species which raised them, and subsequently only parasitize nests of that species. Male Common Cuckoos will fertilize females of all lines, maintaining sufficient gene flow among the different maternal lines.

The mechanisms of host selection by female cuckoos are somewhat unclear, though several hypotheses have been suggested in attempt to explain the choice. These include genetic inheritance of host preference, host imprinting on young birds, returning to place of birth and subsequently choosing a host randomly ("natal philopatry"), choice based on preferred nest site (nest-site hypothesis), and choice based on preferred habitat (habitat-selection hypothesis). Of these hypotheses the nest-site selection and habitat selection have been most supported by experimental analysis.

## Common adaptations of avian brood parasites

Among specialist avian brood parasites, mimetic eggs are a nearly universal adaptation. There is even some evidence that the generalist Brown-headed Cowbird may have evolved an egg coloration mimicking a number of their hosts.

Most avian brood parasites will remove a host egg when they lay one of their own in a nest. Depending upon the species, this can happen either in the same visit to the host nest or in a separate visit before or after the parasitism. This both prevents the host species from realizing their nest has been parasitized and reduces competition for the parasitic nestling once it hatches.

A Shiny Cowbird chick being fed by a Rufous-collared Sparrow

Most avian brood parasites have very short egg incubation periods and rapid nestling growth. This gives the parasitic nestling a head start on growth over its nestmates, allowing it to outcompete them. In cases where the host nestlings are significantly smaller than the parasite nestling, the host nestlings will often starve to death. Some brood parasites will eliminate all their nestmates shortly after hatching, either by ejecting them from the nest or killing them with sharp mandible hooks which fall off after a few days.

## "Mafia hypothesis"

It has often been a question why the majority of the hosts of brood parasites care for the nestlings of their parasites. Not only do these brood parasites usually differ significantly in size and appearance, but it is highly probable that they reduce the reproductive success of their hosts. So what possible benefits are gained from providing this parental care? Through studies in an attempt to answer this question evolved the "Mafia hypothesis". This hypothesis revolves around host manipulations induced by behaviors of the brood parasite. Upon the detection and rejection of a brood parasite's egg, the host's nest is depredated upon, its nest destroyed and nestlings injured or killed. This threatening response is indirectly enhancing selective pressures favoring aggressive parasite behavior that may result in positive feedback between Mafia-like parasite and compliant host behaviors.

There are two avian species that have been speculated to portray this mafia-like behavior, the brown-headed cowbird of North America, *Molothrus ater*, and the Great Spotted Cuckoo of Europe, *Clamator glandarius*. The Great Spotted Cuckoo lays the majority of

its eggs in the nests of the European Magpie, *Pica pica*. It has been observed that the Great Spotted Cuckoo repeatedly visits the nests that it has parasitised, a precondition for the Mafia hypothesis. An experiment was run by Soler *et al.* from April to July, 1990–1992 in the high-altitude plateau Hoya de Guadix, Spain. They observed the effects of the removal of cuckoo eggs on the reproductive success of the magpie, and measured the magpie's reaction; the egg was considered accepted if it remained in the nest, ejected if gone in between visits, or abandoned if the eggs were present but cold. If any nest contents were gone between consecutive visits, the nests were considered to have been depredated. The magpie's reproductive success was measured by number of nestlings that survived to their last visit, which was just before the nestling had been predicted to fledge from the nest. The results from these experiments show that after the removal of the parasitic eggs from the Great Spotted Cuckoo, these nests are predated at much higher rates than those where the eggs were not removed. Through the use of plasticine eggs that model those of the magpie, it was confirmed that the nest destruction was caused by the Great Spotted Cuckoo. This destruction benefits the cuckoo, for the possibility of re-nesting by the Magpie allows another chance for the cuckoo egg to be accepted.

Another similar experiment was done in 1996–2002 by Hoover *et al.* on the relationship between the parasitic Brown-headed Cowbird and a host, the Prothonotary Warbler, *Protonotaria citrea*. In their experiment, they manipulated the cowbird egg removal and cowbird access to the predator proof nests of the warbler. They found that 56% of egg ejected nests were depredated upon in comparison to 6% of non-ejected nests when cowbirds were not prevented from getting to the hosts' nest. Of the nests that were rebuilt by hosts that had previously been predated upon, 85% of those were destroyed. The number of young produced by the hosts that ejected eggs dropped 60% compared to those that accepted the cowbird eggs.

## Nest-site hypothesis

In this hypothesis, female cuckoos select a group of host species with similar nest sites and egg characteristics to her own. This population of potential hosts is monitored and a nest is chosen from within this group.

Research of nest collections has illustrated a significant level of similarity between cuckoo eggs and typical eggs of the host species. A low percentage of parasitized nests were shown to contain cuckoo eggs not corresponding to the specific host egg morph. In these mismatched nests a high percent of the cuckoo eggs were shown to correlate to the egg morph of another host species with similar nesting sites. This has been pointed to as evidence for nest- site selection.

A criticism of the hypothesis is that it provides no mechanism by which nests are chosen, or which cues might be used to recognize such a site.

## Host responses

Given the detrimental effects avian brood parasites can have on their hosts' reproductive success, host species have come up with various defenses against this unique threat.

Given that the cost of egg removal concurrent with parasitism is unrecoverable, the best defense for hosts is avoiding parasitism in the first place. This can take several forms, including selecting nest sites which are difficult to parasitize, starting incubation early so they are sitting on the nests when parasites visit them early in the morning, and aggressive territorial defense. Birds nesting in aggregations can also benefit from group defense.

Once parasitism has occurred, the next most optimal defense is to eject the parasitic egg. Recognition of parasitic eggs is based on identifying pattern differences or changes in the number of eggs. This can be done by grasp ejection if the host has a large enough beak, or otherwise by puncture ejection. Ejection behavior has some costs however, especially when host species have to deal with mimetic eggs. In that case, hosts will inevitably mistake one of their own eggs for a parasite egg on occasion and eject it. In any case, hosts will sometimes damage their own eggs while trying to eject a parasite egg.

Among hosts not exhibiting parasitic egg ejection, some will abandon parasitized nests and start over again. However, at high enough parasitism frequencies, this becomes maladaptive as the new nest will most likely become reparasitized.

Other behavior can include modifying the nest to exclude the parasitic egg, either by weaving over the egg or in some cases rebuilding a new nest over the existing one.

## *Insect brood parasites*

A cuckoo bee from the genus *Nomada*.

There are many different types of cuckoo bees, all of which are brood-parasitic insects, laying their eggs in the nest cells of other bees, but they are normally referred to as kleptoparasites, rather than as brood parasites. A family of Cuckoo wasps also exist, many of which lay their eggs in the nests of Potter and Mud dauber wasps, and many other lineages of wasps in various families have evolved similar habits.

# Chapter 2

# Asian Koel

**Asian Koel**

Female (nominate race)

Male (nominate race)

**Conservation status**


Least Concern (IUCN 3.1)

**Scientific classification**

Kingdom: Animalia

Phylum: Chordata

| | |
|---|---|
| Class: | Aves |
| Order: | Cuculiformes |
| Family: | Cuculidae |
| Genus: | *Eudynamys* |
| Species: | ***E. scolopaceus*** |

**Binomial name**

***Eudynamys scolopaceus***
(Linnaeus, 1758)

The distribution of Asian Koel in black

**Synonyms**

*Cuculus scolopaceus*
*Eudynamis honorata*
*Eudynamys scolopacea*

The **Asian Koel** (***Eudynamys scolopaceus***) is a member of the cuckoo order of birds, the Cuculiformes. It is found in South Asia, China, and Southeast Asia. It forms a superspecies with the closely related Black-billed and Pacific Koels which are sometimes treated as subspecies. The Asian Koel is a brood parasite that lays its eggs in the nests of crows and other hosts, who raise its young. They are unusual among the cuckoos in being largely frugivorous as adults. The name *koel* is echoic in origin and the bird is a widely used symbol in Indian poetry.

## *Description*

Adult male of nominate race (West Bengal, India) showing the crimson iris. Young birds have dark irides.

The Asian Koel is a large, long-tailed, cuckoo at 45 cm. The male of the nominate race is glossy bluish-black, with a pale greenish grey bill, the iris is crimson, and it has grey legs and feet. The female of the nominate race is brownish on the crown and has rufous streaks on the head. The back, rump and wing coverts are dark brown with white and buff spots. The underparts are whitish, but is heavily striped. The other subspecies differ in colouration and size. The upper plumage of young birds is more like that of the male and they have a black beak.

They are very vocal during the breeding season (March to August in South Asia), with a range of different calls. The familiar song of the male is a repeated *koo-Ooo*. The female makes a shrill *kik-kik-kik...* call. Calls vary across populations.

They show a pattern of moult that differs from those of other parasitic cuckoos. The outer primaries show a transilient (alternating) ascending moult (P9-7-5-10-8-6) while the inner

primaries are moulted in stepwise descending order (1-2-3-4).(Payne citing Stresemann and Stresemann 1961)

## Taxonomy

The Asian Koel was originally described by Linnaeus as *Cuculus scolopaceus* based on a specimen he received from the Malabar region. The species has variations within its wide range with several island populations and a number of taxonomic variations have been suggested. The Black-billed Koel (*E. melanorhynchus*) of the Sulawesi region and the Pacific Koel (*E. orientalis*) of Australasia are sometimes considered conspecific with the Asian Koel in which case the "combined" species is known as the Common Koel (*E. scolopaceus*). Due to differences in plumage, colour of bill and voice, the three are increasingly treated as separate species. Alternatively, only the Black-billed Koel has been considered as a separate species, or the Asian Koel has included all subspecies otherwise included in the Pacific Koel, except for the subspecies breeding in Australia, which then has the name Australian Koel (*E. cyanocephalus*).

The Asian Koel has several geographic forms that have well marked plumage differences or have been geographically isolated with little gene flow. The following is a list of named subspecies with their distributions and synonyms as given by Payne:

- *Eudynamys scolopaceus scolopaceus* (Linnaeus, 1758). Pakistan, India, Nepal, Bangladesh, Sri Lanka, Laccadives and Maldives.
- *Eudynamys scolopaceus chinensis* (Cabanis and Heine, 1863). Southern China and Indochina, except the Thai-Malay Peninsula.
- *Eudynamys scolopaceus harterti* (Ingram, 1912). Hainan.
- *Eudynamys scolopaceus malayana* (Cabanis and Heine, 1863). Thai-Malay Peninsula, Lesser Sundas and Greater Sundas, except Sulawesi. This may include the race *dolosa* described from the Andaman and Nicobar Islands.
- *Eudynamys scolopaceus mindanensis* (Linnaeus,1766) (includes *E. s. paraguena* (Hachisuka, 1934) from Palawan, and *E. s. corvina* (Stresemann, 1931) from Halmahera, the Philippines (including Palawan and the Babuyan Islands), islands between Mindanao and Sulawesi, and North Maluku, except the Sula Islands.

## Distribution and habitat

The Asian Koel is a bird of light woodland and cultivation. It is a mainly resident breeder in tropical southern Asia from India and Sri Lanka to south China and the Greater Sundas. They have great potential in colonizing new areas, and were among the pioneer birds to colonize the volcanic island of Krakatau. They first arrived in Singapore in the 1980s and became very common birds.

Some populations may make long distance movements.

## *Behaviour*


Male and Female Asian Koel feeding on papaya (Colombo, Sri Lanka)

The Asian Koel is a brood parasite, and lays its single egg in the nests of a variety of birds, including the Jungle Crow, and House Crow. In Sri Lanka it was known to parasitize only the Jungle Crow until the 1880 and later shifted to the House Crow. A study in India found 5% of *Corvus splendens* and 0.5% of *Corvus macrorhynchos* nests parasitized. In Southern Thailand and the Malay Peninsula, Koels have shifted host from crows to mynas (*Acridotheres* sp.) as the latter became more common in the late 1900s. In South Asia they have sometimes been found to parasitize the Black Drongo, the European Magpie and possibly the Black-headed Oriole. Males may distract the hosts so that the female gets a chance to lay an egg in the nest. More often however, the female visits the nest of the host alone. The Koel is not known to lay eggs in an empty host nest and a study in Pakistan found that the first Koel eggs were laid, on average, within one and half days of the laying of the host's first egg. The chicks of the Koel hatched about 3 days ahead of the host chicks. Koels usually lay only an egg or two in a single nest but as many as seven to eleven eggs have been reported from some host nests. A female may remove a host egg before laying. Eggs hatch in 12 to 14 days. The young Koel does not always push out eggs or evict the host chicks, and initially calls like a crow. The young fledge in 20 to 28 days. Unlike as in some other cuckoos, the young do not attempt to kill the host chicks, a trait that is shared with the Channel-billed Cuckoos which are also largely frugivorous as adults. It has been suggested that Koels, like some other brood

parasites do not evict the host chicks due presumably due to the higher cost of evicting nestmates. A small parasite may not be able to evict large host eggs or chicks from a deep Corvid nest without risking starvation and possibly accidental self-eviction. An alternate hypothesis that retaining host chicks might benefit the Koel chicks did not gain much support. Adult female koels have been known to feed young koels in the nests of the hosts, Adult males have however not been noted to feed fledglings. a behaviour known in some other brood parasitic species as well.

The Asian Koel is omnivorous, consuming a variety of insects, caterpillars, eggs and small vertebrates. Adults feed mainly on fruit. They will sometimes defend fruiting trees that they forage in and chase away other frugivores. They have been noted to be especially important in the dispersal of the sandalwood tree (*Santalum album*) in India. Large seeded fruits are sometimes quickly regurgitated near the parent tree while small seeded fruits are ingested and are likely to be deposited at greater distances from the parent tree. They have a large gape and are capable of swallowing large fruits including the hard fruit of palms such as *Arenga* and *Livistona*. They have occasionally been known to take eggs of small birds.

They feed on the fruits of *Thevetia peruviana* which are known to be toxic to mammals.

A number of parasites have been described from the species including malaria-like protozoa, lice and nematodes.

Chapter 3

# Black-headed Duck and Bronzed Cowbird

## Black-headed Duck

**Black-headed Duck**

**Conservation status**


Least Concern (IUCN 3.1)

**Scientific classification**

| | |
|---|---|
| Kingdom: | Animalia |
| Phylum: | Chordata |
| Class: | Aves |
| Subclass: | Neornithes |
| Infraclass: | Neognathae |
| (unranked): | Galloanserae |
| Order: | Anseriformes |
| Family: | Anatidae |
| Subfamily: | Oxyurinae |

| | |
|---|---|
| Genus: | ***Heteronetta***<br>Salvadori, 1865 |
| Species: | ***H. atricapilla*** |

**Binomial name**

***Heteronetta atricapilla***
(Merrem, 1841)

The **Black-headed Duck** (***Heteronetta atricapilla***) is a South American duck allied to the stiff-tailed ducks in the subfamily Oxyurinae of the family Anatidae. It is the only member of the genus ***Heteronetta***.

This is the most basal living member of its subfamily, and it lacks the stiff tail and swollen bill of its relatives. Overall much resembling a fairly typical diving duck, its plumage and other peculiarities give away that it is not a very close relative of these, but rather the product of convergent evolution in the ancestors of the stiff-tailed ducks. It is a small dark duck, the male with a black head and mantle and a paler flank and belly, and the female pale brown overall.

They live in swamps lakes and marshes in North Chile, Paraguay, and North Argentina, feeding by dabbling on water plants and insects. The Black-headed Duck is of interest as an obligate brood parasite because the females never nest and lay their eggs in the nests of other birds instead, earning it the nickname *Cuckoo Duck*. The hosts are particularly the Rosybill (*Netta peposaca*), but also other ducks, coots (*Fulica* species), and occasionally even gulls (such as the Brown-hooded) and birds of prey. Unlike for example certain cuckoos, neither the chicks nor adults destroy the eggs or kill the chicks of the host. Instead, after a 21-day incubation, the ducklings fledge after a few hours and are completely independent, leaving their broodmates and fending for themselves.

The Black-headed Duck is not considered threatened by the IUCN.

# Bronzed Cowbird

**Bronzed Cowbird**

In Tucson, Arizona, USA

**Conservation status**


Least Concern (IUCN 3.1)

**Scientific classification**

| | |
|---|---|
| Kingdom: | Animalia |
| Phylum: | Chordata |
| Class: | Aves |
| Order: | Passeriformes |
| Family: | Icteridae |
| Genus: | *Molothrus* |
| Species: | ***M. aeneus*** |

**Binomial name**

***Molothrus aeneus***
(Wagler, 1829)

The **Bronzed Cowbird** (once known as the **Red-eyed Cowbird**), *Molothrus aeneus*, is a small icterid.

It breeds from the southern U.S. states of California, Arizona, New Mexico, Texas, and Louisiana south through Central America to Panama.

The male Bronzed Cowbird is 20 cm long and weighs 68 g, with green-bronze glossed black plumage and red eyes. The female is 18.5 cm long and weighs 56 g. She is duller black above and browner below. Young birds are like the female but have grey feather fringes.

Like all cowbirds, this bird is a brood parasite: it lays its eggs in the nests of other birds. The young cowbird is fed by the host parents at the expense of their own young. Hosts include Prevost's Ground-Sparrow and Yellow-throated Brush Finch

# Chapter 4

# Common Cuckoo

| Common Cuckoo |
|---|
|  |
| **Conservation status** |
|   |
| Least Concern (IUCN 3.1) |
| **Scientific classification** |
| Kingdom: Animalia |
| Phylum: Chordata |
| Class: Aves |
| Order: Cuculiformes |
| Family: Cuculidae |
| Genus: *Cuculus* |
| Species: ***C. canorus*** |
| **Binomial name** |
| ***Cuculus canorus*** Linnaeus, 1758 |

The **Common Cuckoo** (*Cuculus canorus*) (formerly European Cuckoo) is a member of the cuckoo order of birds, the Cuculiformes, which also includes the roadrunners, the anis and the coucals.

This species is a widespread summer migrant to Europe and Asia, and winters in Africa. It is a brood parasite, which lays its eggs in the nests of other bird species, particularly of Dunnocks, Meadow Pipits, and Eurasian Reed Warblers.

## *Description*

*C. canorus*

The Common Cuckoo is a dove-sized bird, 32–34 centimetres (13–13 in) long (tail 13–15 cm) and wingspan 55–60 cm. It is greyish with a slender body and long tail and could be mistaken as a falcon in flight. There is also a rufous colour phase which occurs occasionally in adult females but more often in juveniles.

The cuckoo family gets its common name and genus name by onomatopoeia for the call of the male Common Cuckoo, usually given from an open perch, *goo-ko*. During the breeding season the male typically gives this call with intervals of 1–1.5 seconds, in groups of 10–20 with a rest of a few seconds between groups. The female has a loud bubbling call.

## *Distribution and habitat*

A bird of open land. The cuckoo is a widespread summer migrant to Europe and Asia, and winters in Africa.

## *Taxonomy*

The Common Cuckoo (formerly European Cuckoo) is a member of the cuckoo order of birds, the Cuculiformes, which also includes the roadrunners, the anis and the coucals.

## *Behaviour*

### Food and feeding

Its food is insects, with hairy caterpillars, which are distasteful to many birds, being a speciality. It also occasionally eats eggs and chicks.

## Breeding

This Reed Warbler is raising the young of a Common Cuckoo

It is a brood parasite, which lays its eggs in the nests of other bird species, particularly of Dunnocks, Meadow Pipits, and Eurasian Reed Warblers.

At the appropriate moment, the hen cuckoo flies down to the Reed Warblers' nest, pushes one Reed Warbler egg out of the nest, lays an egg and flies off. The whole process is achieved in only about 10 seconds.

Cuckoo chicks methodically evict all host progeny from host nests. It is a much larger bird than its hosts, and needs to monopolise the food supplied by the parents. The Cuckoo chick will roll the other eggs out of the nest by pushing them with its back over the edge.

If the Reed Warbler's eggs hatch before the Cuckoo's egg, the Cuckoo chick will push the other chicks out of the nest in a similar way.

At 14 days old, the Cuckoo chicks are about three times the size of the adult Reed Warblers. The numerous and rapid hunger calls of the single cuckoo chick (which perfectly mimic the cries of a whole brood of warbler chicks), and to a lesser extent its coloured gape, encourage the host parents to bring more food.

Cuckoo chicks fledge after about 20–21 days after hatching, which is about twice as long as for Reed Warblers. If the hen cuckoo is out-of-phase with a clutch of Reed Warbler eggs, she will eat them all so that the hosts are forced to start another brood.

This behaviour was firstly observed and described by Aristotle and the combination of behaviour and anatomical adaptation by Edward Jenner, who was elected as Fellow of the Royal Society in 1788 for this work. It was first documented on film in 1922, by Edgar Chance and Oliver G Pike, in their film 'The Cuckoo's Secret'.

Female Cuckoos are divided into gentes - populations favouring a particular host species' nest and laying eggs which match those of that species in colour and pattern. The colour pattern is inherited from the female only, suggesting that it is carried on the sex-determining W chromosome (females are WZ, males ZZ). It is notable that most non-parasitic cuckoos lay white eggs, like most non-passerines other than ground nesters. The exception is in the case of the Dunnock, where the Common Cuckoo's egg has no resemblance to its hosts' blue eggs. This is thought to be because the Dunnock is a recent host, and has not yet acquired the ability to distinguish eggs. Male Cuckoos breed with females without regard to gens. This results in gene flow between the gentes and maintains a common gene pool for the species (except for the genes on the W chromosome).

## Chapter 5

# Cowbird and Brown-headed Cowbird

# Cowbird

| Cowbirds |
|---|

Female Brown-headed Cowbird

| Scientific classification | |
|---|---|
| Kingdom: | Animalia |
| Phylum: | Chordata |
| Class: | Aves |
| Order: | Passeriformes |
| Family: | Icteridae |
| Genus: | ***Molothrus*** Swainson, 1832 |

**Species**

- *M. rufoaxillaris*
- *M. oryzivorus*
- *M.s aeneus*
- *M. bonariensis*
- *M. ater*

**Cowbirds** are birds belonging to the genus ***Molothrus*** in the family Icteridae. They are brood parasitic New World birds which are unrelated to the Old World cuckoos, one of which, the Common Cuckoo, is the best-known brood parasitic bird.

This family includes five species of cowbirds that form the natural genus *Molothrus*. This has been determined by phylogenetic analyses of mitochondrial DNA sequences (Lanyon 1992, Johnson and Lanyon 1999, Lanyon and Omland 1999, in Lowther, 2004).

The genus *Molothrus* contains:

- Screaming Cowbird, *Molothrus rufoaxillaris*
- Giant Cowbird, *Molothrus oryzivorus* (formerly in *Scaphidura*)
- Bronzed Cowbird, *Molothrus aeneus*
- Shiny Cowbird, *Molothrus bonariensis*
- Brown-headed Cowbird, *Molothrus ater*

The non-brood parasitic Bay-winged Cowbird was formerly placed in this genus; it is now *Agelaioides badius*.

These birds feed on insects, including the large numbers that may be stirred up by cattle. In order for the birds to remain mobile and stay with the herd, they have adapted by laying their eggs in other birds' nests. The cowbird will watch for when its host lays eggs, and when the nest is left unattended, the female will come in and lay its own eggs. The female cowbird may continue to observe the nest after laying her eggs. If the cowbird egg is removed, the female cowbird may destroy the host's eggs.

The Brown-headed Cowbird has over 220 hosts. The other cowbird species have fewer known hosts, but all the species are generalists when it comes to choosing a host. This means that the eggs may look different from the hosts' eggs. The cowbird chicks grow quickly, and may consume most of the food the host brings. Starvation will often kill the host's chicks. In some species the cowbird chick will use its large size to push the other chicks out of the nest. The Giant Cowbird does not appear to harm its host oropendola or cacique chicks.

Brown-headed Cowbird, adult male

Brown-headed Cowbird, courtship behavior

# Brown-headed Cowbird

**Brown-headed Cowbird**

Adult male

**Conservation status**

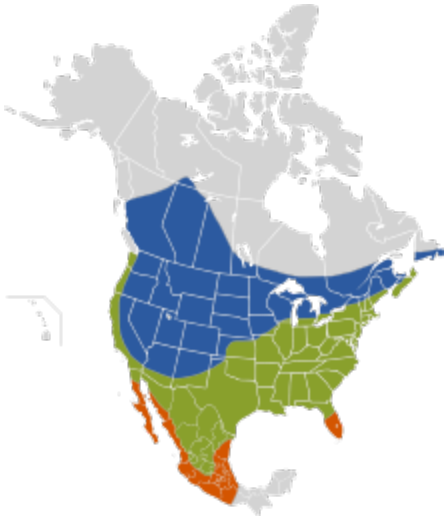

Least Concern (IUCN 3.1)

**Scientific classification**

| | |
|---|---|
| Kingdom: | Animalia |
| Phylum: | Chordata |
| Class: | Aves |
| Order: | Passeriformes |
| Family: | Icteridae |
| Genus: | *Molothrus* |
| Species: | ***M. ater*** |

**Binomial name**

***Molothrus ater***
(Boddaert, 1783)



blue: breeding; green: year-round;
ochre: nonbreeding

Adult female

The **Brown-headed Cowbird** (***Molothrus ater***) is a small brood parasitic icterid of temperate to subtropical North America. They are permanent residents in the southern parts of their range; northern birds migrate to the southern United States and Mexico in winter, returning to their summer habitat about March/April.

They resemble New World orioles in general shape but have a finch-like head and beak. Adults have a short finch-like bill and dark eyes. The adult male is mainly iridescent black with a brown head. The adult female is grey with a pale throat and fine streaking on the underparts.

## *Ecology*

Brown-headed Cowbird male (right) courting female

### Habitat

They occur in open or semi-open country and often travel in flocks, sometimes mixed with Red-winged Blackbirds (particularly in spring) and Bobolinks (particularly in fall), as well as Common Grackle or European Starlings. These birds forage on the ground, often following grazing animals such as horses and cows to catch insects stirred up by the larger animals. They mainly eat seeds and insects.

Before European settlement, the Brown-headed Cowbird followed bison herds across the prairies. Their parasitic nesting behaviour complemented this nomadic lifestyle. Their numbers expanded with the clearing of forested areas and the introduction of new grazing animals by settlers across North America. Brown-headed Cowbirds are now commonly seen at suburban birdfeeders.

## Reproduction

Males; one is displaying

Eastern Phoebe nest with one Brown-headed Cowbird egg

This bird is a brood parasite: it lays its eggs in the nests of other small passerines (perching birds), particularly those that build cup-like nests. The Brown-headed Cowbird eggs have been documented in nests of at least 220 host species, including hummingbirds and raptors. (Ortega 1998) The young cowbird is fed by the host parents at the expense of their own young. Brown-headed Cowbird females can lay 36 eggs in a season. More than 140 different species of birds are known to have raised young cowbirds.

Unlike the Common Cuckoo, it has no gentes whose eggs imitate those of a particular host.

## *Host-parasite interactions*

### Egg rejection

Host parents may sometimes easily notice the cowbird egg, to which different host species react in different ways. Rejection manifests in three forms: nest desertion (e.g., Blue-gray Gnatcatcher), burying of the egg under nest material (e.g., Yellow Warbler), and physical ejection of the egg from the nest (e.g., Brown Thrasher). Brown-headed cowbird nestlings are sometimes expelled from the nest.

### Unsuitable diet

The House Finch feeds its young a vegetarian diet, which is unsuitable for young Brown-headed Cowbirds. Although the Brown-headed Cowbird eggs laid in a House Finch nest will hatch, almost none survive to fledge.

### Parasite response

It seems that Brown-headed Cowbirds periodically check on their eggs and young after they have deposited them. Removal of the parasitic egg may trigger a retaliatory reaction termed "mafia behavior". According to a study by the Florida Museum of Natural History published in 1983, the cowbird returned to ransack the nests of a range of host species 56% of the time when their egg was removed. In addition, the cowbird also destroyed nests in a type of "farming behavior" to force the hosts to build new ones. The cowbirds then laid their eggs in the new nests 85% of the time.

Chapter 6

# Shiny Cowbird and Cuckoo Bee

## Shiny Cowbird

**Shiny Cowbird**

Shiny Cowbird (male)

**Conservation status**


Least Concern (IUCN 3.1)

**Scientific classification**

| | |
|---|---|
| Kingdom: | Animalia |
| Phylum: | Chordata |
| Class: | Aves |
| Order: | Passeriformes |
| Family: | Icteridae |
| Genus: | ***Molothrus*** |
| Species: | ***M. bonariensis*** |

**Binomial name**

***Molothrus bonariensis***
(Gmelin, 1788)

The **Shiny Cowbird**, *Molothrus bonariensis*, is a passerine bird in the New World family Icteridae. It breeds in most of South America apart from the most dense jungles, mountains and deserts (although spreading into these habitats as they are modified by humans), the coldest southernmost regions (e.g. Tierra del Fuego), and on Trinidad and Tobago. It has relatively recently colonised Chile and many Caribbean islands, and has reached the USA, where it is probably breeding in southern Florida. Northern and southernmost populations are partially migratory.

It is a bird associated with open woodland and cultivation. The male's song is a purr and whistle, *purr purr purrte-tseeeee*. The male's call is a sharp whistled *tsee-tsee*, but the female makes a harsh rattle.

Like most other cowbirds, it is a brood parasite, laying its eggs in the nests of many other bird species, such as (in Brazil) the Rufous-collared Sparrow and the Masked Water-tyrant. The eggs are of two types, either whitish and unspotted, or pale blue or green with dark spots and blotches. The host's eggs are sometimes removed, and if food is short their chicks may starve, but larger host species are less affected. The incubation period of 11–12 days is shorter than that of most hosts. Extermination of the Shiny Cowbird within the tiny range of the Pale-headed Brush-finch has resulted in a population increase in this critically endangered species.

The male Shiny Cowbird is 20.3 cm long, weighs 45 g and is all black with an iridescent purple-blue gloss. The smaller female is 19 cm long and weighs 31 g. Her plumage is dark brown, paler on the underparts. She can be distinguished from the female Brown-headed Cowbird by her longer, finer bill, pale superciilium and stronger face pattern. There is an all-black plumage variation, and the northern subspecies *M. b. cabanisii* of Panama and northern Colombia is paler than the nominate *M. b. bonariensis*. Juveniles are like the female but more streaked below.

This abundant and gregarious bird feeds mainly on insects and some seeds, including rice, and forages on the ground or perches on cattle.

Shiny Cowbird (female)

A juvenile being fed by a Rufous-collared Sparrow

# Cuckoo bee

A cuckoo bee from the genus *Nomada*.

The term **cuckoo bee** is used for a variety of different bee lineages which have evolved the kleptoparasitic habit of laying their eggs in the nests of other bees, reminiscent of the behavior of cuckoo birds. The name is technically best applied to the apid subfamily Nomadinae. Females of cuckoo bees can be easily recognized in almost all cases, as they lack pollen collecting structures (the scopa) and do not construct their own nests. They often have reduced body hair, abnormally thick and/or heavily sculptured exoskeleton, and saber-like mandibles, though this is not universally true, and other less visible changes are common, as well.

They typically enter the nests of pollen-collecting species, and lay their eggs in cells provisioned by the host bee. When the cuckoo bee larva hatches it consumes the host larva's pollen ball, and, if the female cleptoparasite has not already done so, kills and eats the host larva. In a few cases where the hosts are social species (e.g., the subgenus *Psithyrus* of the genus *Bombus*, which are parasitic bumble bees that infiltrate nests of non-parasitic species of *Bombus*), the cleptoparasite remains in the host nest and lays many eggs, sometimes even killing the host queen and replacing her - such species are

often called **social parasites**, though a few of them are also what are referred to as "brood parasites."

Many cuckoo bees are closely related to their hosts, and may bear similarities in appearance reflecting this relationship. This common pattern gave rise to the ecological principle known as "Emery's Rule". Others parasitize bees in different families, like *Townsendiella*, a nomadine apid, one species of which is a cleptoparasite of the melittid genus *Hesperapis*, while the other species in the same genus attack halictid bees.

The number of times cleptoparasitic behavior has independently evolved within the bees is remarkable; C. D. Michener (2000) lists 16 lineages in which parasitism of social species has evolved (mostly in the family Apidae), and 31 lineages parasitizing solitary hosts (mostly in Apidae, Megachilidae, and Halictidae), collectively representing several thousand species, and therefore a very large proportion of overall bee diversity. There are no cuckoo bees in the families Andrenidae, Melittidae, or Stenotritidae, and possibly the Colletidae (there are only unconfirmed suspicions that one group of Hawaiian hylaeine species may be parasitic).

## Chapter 7

# Cuckoo Finch and Dideric Cuckoo

# Cuckoo Finch

**Cuckoo Finch**

Midmar Game Reserve, KwaZulu-Natal, South Africa.

**Conservation status**


Least Concern (IUCN 3.1)

**Scientific classification**

| | |
|---|---|
| Kingdom: | Animalia |
| Phylum: | Chordata |
| Class: | Aves |
| Order: | Passeriformes |
| Family: | Viduidae |
| Genus: | ***Anomalospiza*** Shelly, 1901 |
| Species: | ***A. imberbis*** |

**Binomial name**

***Anomalospiza imberbis***
(Cabanis, 1868)

**Synonyms**

*Crithagra imberbis* Cabanis, 1868

The **Cuckoo Finch** (*Anomalospiza imberbis*), also known as the **Parasitic Weaver** or **Cuckoo Weaver**, is a small passerine bird now placed in the family Viduidae with the indigobirds and whydahs. It occurs in grassland in Africa south of the Sahara. The male is mainly yellow and green while the female is buff with dark streaks. The eggs are laid in the nests of other birds.

## Description

It is a small finch-like bird, about 11–13 cm long. It has a short tail, large legs and feet, and a large, deep, conical bill. The adult male has a black bill and a yellow head and underparts. The upperparts are olive-green with black streaks. The yellow areas become increasingly bright prior to the breeding season as the feathers become worn. The adult female is buff with heavy black streaking above and light streaks on the flanks; its face is largely plain buff and the throat is buff-white.

It has various chattering calls. Displaying males have a nasal song.

## Taxonomy

The species was described in 1868 by the German ornithologist Jean Cabanis based on a specimen from East Africa, probably from the coast opposite Zanzibar. It was initially placed in the genus *Crithagra* but later moved to a genus of its own *Anomalospiza*. The name of the genus means "anomalous finch" with *spiza* being a Greek word for finch. The specific name *imberbis* comes from Latin and means "beardless".

Its closest relatives are thought to be the indigobirds and whydahs of the genus *Vidua*. These birds are now usually considered to form a family, Viduidae. Previously they were treated as a subfamily, Viduinae, within either the estrildid finch family, Estrildidae, or the weaver family, Ploceidae.

## Distribution and habitat

It has a scattered distribution across sub-Saharan Africa where it occurs in open or lightly wooded grassland, especially near damp areas.

In West Africa, it occurs in Guinea, Sierra Leone, the Ivory Coast, Ghana, Togo, Benin, eastern Nigeria and north-west Cameroon with vagrant records from the Gambia and Mali. Further east it is found in southern Sudan, Ethiopia, Uganda, Kenya, Tanzania, Rwanda, Burundi, southern and eastern parts of the Democratic Republic of the Congo

and locally in the Republic of the Congo. In southern Africa, it occurs in Malawi, Zambia, southern and eastern Angola, north-east Namibia, northern and eastern Botswana, Zimbabwe, Mozambique, eastern South Africa and Swaziland.

It has a large range and an apparently stable population and so is classified as Least Concern by BirdLife International.

### *Behaviour*

It typically occurs in pairs or small flocks during the breeding season and larger flocks outside the breeding season. It forages on the ground or perched on the flower heads of grasses or herbs. It feeds mainly on grass seeds.

It is a brood parasite, laying its eggs in the nests of cisticolas and prinias. The eggs are white, pale blue or pink with brown, reddish or violet markings. They are 17–17.3 mm long and 12.5–13 mm wide. The eggs are incubated for 14 days. The young bird fledges after 18 days and remains dependent on its hosts for another 10–40 days. The young of the host bird usually disappear although there have been records of the host's nestlings surviving alongside the young Cuckoo Finch. Sometimes two Cuckoo Finch chicks have been found in the same nest.

# Dideric Cuckoo

**Dideric Cuckoo**

**Conservation status**


Least Concern (IUCN 3.1)

**Scientific classification**

Kingdom: Animalia

Phylum: Chordata

| | |
|---|---|
| Class: | Aves |
| Order: | Cuculiformes |
| Family: | Cuculidae |
| Genus: | *Chrysococcyx* |
| Species: | ***C. caprius*** |

**Binomial name**

***Chrysococcyx caprius***
Boddaert, 1783

Photographed at Lake Mburo, Uganda

The **Dideric Cuckoo** or **Didric Cuckoo**, *Chrysococcyx caprius*, is a member of the cuckoo order of birds, the Cuculiformes, which also includes the roadrunners, the anis, and the Hoatzin.

It is a very common resident breeder in Africa south of the Sahara Desert. It is a short-distance seasonal migrant, moving with the rains. It is a solitary bird, found in open woodland, savanna and riverside bushes. Has occurred as far north as Cyprus (1982).

The Dideric Cuckoo is a brood parasite. It lays its single egg mostly in the nests of weaver, especially Village Weaver and the bishops in the genus *Euplectes*.

The Dideric Cuckoo is a smallish cuckoo at 18 to 20 cm. Adult males are green above with copper-sheened areas on the back and whitish underparts. They have a broken white eyestripe, a green moustauchial stripe, and green outer tail feathers with small white spots.

Females show more copper above, and have coppery barring on the flanks. The underparts are often washed brownish. Juveniles are more copper-coloured above and browner below than the females, and the flank markings are brown blotches.

The Dideric Cuckoo takes a variety of insects and caterpillars. It is a noisy species, with the persistent and loud *deed-deed-deed-deed-er-ick* call from which it gets its name. Usually four clear, roughly identical, notes followed by a little twitter.

Chapter 8

# Giant Cowbird and Great Spotted Cuckoo

## Giant Cowbird

| Giant Cowbird | |
|---|---|
| **Scientific classification** | |
| Kingdom: | Animalia |
| Phylum: | Chordata |
| Class: | Aves |
| Order: | Passeriformes |
| Family: | Icteridae |
| Genus: | *Molothrus* |
| Species: | ***M. oryzivorus*** |
| **Binomial name** | |
| ***Molothrus oryzivorus*** (Gmelin, 1788) | |
| **Synonyms** | |
| *Scaphidura oryzivora* | |

The **Giant Cowbird**, *Molothrus oryzivorus*, is a large passerine bird in the New World family Icteridae. It breeds from southern Mexico south to northern Argentina, and on Trinidad and Tobago. It may have relatively recently colonised the latter island.

It is associated with open woodland and cultivation with large trees, but is also the only cowbird that is found in deep forest. It is a quiet bird, particularly for an icterid, but the male has an unpleasant screeched whistle, *shweeaa-tpic-tpic*. The call is a sharp *chek-chik*. They are also very adept mimics.

Like other cowbirds, it is a brood parasite, laying its eggs in the nests of oropendolas and caciques. The eggs are of two types, either whitish and unspotted, or pale blue or green with dark spots and blotches. The host's eggs and chicks are not destroyed, but there is considerable doubt about the theory that the young Giant Cowbirds benefit the host's chick by removing and eating parasitic flies.

Their icterid hosts breed colonially, and defend their nests vigorously, so even a large, bold and aggressive species like the Giant Cowbird has to cover an extensive territory to find sufficient egg-laying opportunities. Several Giant Cowbird eggs may be laid in one host nest.

The male Giant Cowbird is 36 cm (14 in) long, weighs 180 g (6.3 oz) and is iridescent black, with a long tail, long bill, small head, and a neck ruff which is expanded in display. The female is smaller, averaging 28 cm (11 in) long and weighing 135 g (4.8 oz). She is less iridescent than the male, and the absence of the neck ruff makes her look less small-headed. Juvenile males are similar to the adult male, but browner, and with a pale, not black, bill.

This gregarious bird feeds mainly on insects, and some seeds, including rice, and forages on the ground or in trees. It rarely perches on cattle, unlike some of its relatives, but in Brazil it will ride on Capybaras as it removes horse flies.

# Great Spotted Cuckoo

**Great Spotted Cuckoo**

adult and juvenile

| Conservation status |
|---|


Least Concern (IUCN 3.1)

| Scientific classification | |
|---|---|
| Kingdom: | Animalia |
| Phylum: | Chordata |
| Class: | Aves |
| Order: | Cuculiformes |
| Family: | Cuculidae |
| Genus: | *Clamator* |
| Species: | ***C. glandarius*** |

| Binomial name |
|---|

***Clamator glandarius***
(Linnaeus, 1758)

The **Great Spotted Cuckoo**, *Clamator glandarius*, is a member of the cuckoo order of birds, the Cuculiformes, which also includes the roadrunners, the anis, the coucals, and the Hoatzin.

It is a widespread summer migrant to southeast and southwest Europe and western Asia, and winters in Africa. It is a brood parasite, which lays its eggs in the nests of corvids (especially magpies), and starlings.

This species is slightly larger than the Common Cuckoo at 35-39 cm length, but looks much larger with its broad wings and long narrow tail.

Unlike the Common Cuckoo, neither the hen nor the hatched chick of this species evict the host's eggs, but the young magpies often die because they cannot compete successfully with the cuckoo for food.

The adult is grey above with a slender body, long tail and strong legs. It has a grey cap, grey wings, a yellowish face and upper breast, and white underparts. Sexes are similar. The juveniles have blackish upperparts and cap, and chestnut primary wing feathers. This species has a magpie-like flight.

It is a bird of warm open country with trees. Its food is insects, with hairy caterpillars, which are distasteful to many birds, being a speciality.

The Great Spotted Cuckoo's call is a loud *cher-cher-kri-kri* and variations

# Chapter 9

# Honeyguide

| Honeyguides |
|---|
|  |
| Wahlberg's Honeyguide |
| **Scientific classification** |
| Kingdom: Animalia |
| Phylum: Chordata |
| Class: Aves |
| Order: Piciformes |
| Family: **Indicatoridae** Swainson, 1837 |
| **Genera** |
| *Indicator* |
| *Melichneutes* |
| *Melignomon* |
| *Prodotiscus* |

**Honeyguides**, (family **Indicatoridae**), are near passerine bird species of the order Piciformes. They are also known as **indicator birds**, or **honey birds**, although the latter term is also used more narrowly to refer to species of the genus *Prodotiscus*. They have

an Old World tropical distribution, with the greatest number of species in Africa and two in Asia.

Honeyguides are noted and named for one or two species that will deliberately lead humans directly to bee colonies, so that they can feast on the grubs that are left behind.

## *Description*

Wahlberg's Honeyguide juvenile fed by host parent, a Lazy Cisticola.

Most honeyguides are dull-colored, though a few have bright yellow in the plumage. All have light outer tail feathers, which are white in all the African species.

They are among the few birds that feed regularly on wax—beeswax in most species, and presumably the waxy secretions of scale insects in the genus *Prodotiscus* and to a lesser extent in *Melignomon* and the smaller species of *Indicator*. They also feed on the larvae and on waxworms (caterpillars of *Galleria mellonella*) in bee colonies, and on flying and

crawling insects, spiders, and occasional fruits. Many species join mixed-species feeding flocks.

Honeyguides are named for a remarkable habit seen in one or two species: they guide humans, and possibly other large mammals (such as the Honey Badger) to bee colonies. Once the mammal opens the hive and takes the honey, the bird feeds on the remaining wax and larvae. This behavior is well studied in the Greater Honeyguide; some authorities (following Friedmann, 1955) state that it also occurs in the Scaly-throated Honeyguide, while others disagree (Short and Horne, 2002). One researcher found use of honeyguides by the Boran people of East Africa reduces the search time of people for honey by approximately two-thirds. Because of this benefit, the Boran use a specific loud whistle, known as the "Fuulido", when a search for honey is about to begin. The "Fuulido" doubles the encounter rate with honeyguides.

Although most members of the family are not known to recruit "followers" in their quest for wax, they are also referred to as "honeyguides" by linguistic extrapolation.

The breeding behavior of eight species in *Indicator* and *Prodotiscus* is known. They are all brood parasites that lay one egg in a nest of another species, laying eggs in series of about five during five to seven days. Most favor hole-nesting species, often the related barbets and woodpeckers, but *Prodotiscus* parasitizes cup-nesters such as white-eyes and warblers. Honeyguide nestlings have been known to physically eject their host's chicks from the nest and they have hooks on their beaks with which they puncture the hosts' eggs or kill the nestlings.

## *Species*

Seventeen species in four genera compose the Indicatoridae.

**FAMILY: INDICATORIDAE**

- **Genus: *Indicator***
  - Spotted Honeyguide, *Indicator maculatus*
  - Scaly-throated Honeyguide, *Indicator variegatus*
  - Greater Honeyguide, *Indicator indicator*
  - Malaysian Honeyguide, *Indicator archipelagicus*
  - Lesser Honeyguide, *Indicator minor*
  - Thick-billed Honeyguide, *Indicator conirostris*
  - Willcocks's Honeyguide, *Indicator willcocksi*
  - Least Honeyguide, *Indicator exilis*
  - Dwarf Honeyguide, *Indicator pumilio*
  - Pallid Honeyguide, *Indicator meliphilus*
  - Yellow-rumped Honeyguide, *Indicator xanthonotus*
- **Genus: *Melichneutes***
  - Lyre-tailed Honeyguide, *Melichneutes robustus*
- **Genus: *Melignomon***

    - Yellow-footed Honeyguide, *Melignomon eisentrauti*
    - Zenker's Honeyguide, *Melignomon zenkeri*
- **Genus: *Prodotiscus***
    - Cassin's Honeyguide, *Prodotiscus insignis*
    - Green-backed Honeyguide, *Prodotiscus zambesiae*
    - Wahlberg's Honeyguide, *Prodotiscus regulus*

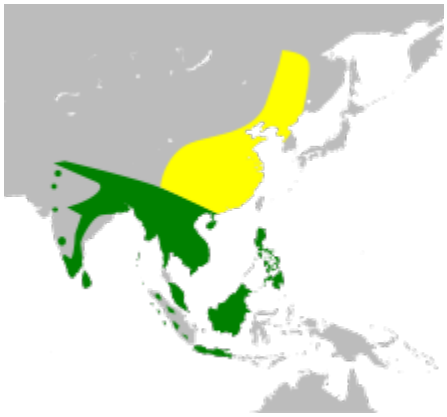
Chapter 10

# Indian Cuckoo and Jacobin Cuckoo

## Indian Cuckoo

| Indian Cuckoo |
|---|
|  |
| *A juvenile, Kerala.* |
| **Conservation status** |
|   |
| Least Concern (IUCN 3.1) |
| **Scientific classification** |
| Kingdom: Animalia |
| Phylum: Chordata |
| Class: Aves |
| Order: Cuculiformes |
| Family: Cuculidae |
| Genus: *Cuculus* |
| Species: ***C. micropterus*** |
| **Binomial name** |
| ***Cuculus micropterus*** |

Gould, 1837



The **Indian Cuckoo**, *Cuculus micropterus*, is a member of the cuckoo order of birds, the Cuculiformes, that is found in Asia from Pakistan and India, Sri Lanka east to Indonesia and north to China and Russia. It is a solitary and shy bird, found in forests and open woodland at up to 3,600 m.

## *Description*

This is a medium sized cuckoo with both sexes alike. It has grey upperparts while the underside has broad black barring. The tail is barred with a broad subterminal dark band and a white tip. Young birds have white markings on the crown and white chin and throat contrasting with a dark face. Juveniles are browner and have broad white tips to the head and wing feathers. The eye-ring is gray to yellow (a feature shared with the Common Hawk-cuckoo). The iris is light brown to reddish. The female differs from the male in being slightly paler grey on the throat and in having more brown on the breast and tail. The barring on the belly is narrower than in the male. Nestlings have an orange-red mouth and yellow flanges to the gape.

The call is loud with four notes. They have been transcribed as "orange-pekoe", "bo-ko-ta-ko", "crossword puzzle" or "one more bottle". Very little variation is noted between regions although the song in China is said to rise at the end. In the Kangra Valley of India, the call is interpreted as the soul of the dead shepherd uttering "where is my sheep". In China, one of the names (simplified Chinese: 四声杜鹃; traditional Chinese: 四聲杜鵑; pinyin: sìshēngdùjuān) means "four-note cuckoo". They are locally common in the breeding season with as many as a calling bird for every 2 square km in northern India.

They feed on hairy caterpillars and other insects but sometimes take fruits. They usually feed on the upper canopy, gleaning insects, sometimes making aerial sallies for flying termites or rarely even by hovering lower near the ground.

## Taxonomy and systematics

Two subspecies are generally recognized. The nominate form is found in much of continental Asia, while *concretus* S. Müller, 1845 which is smaller and darker is known from the Malay Peninsula, Java, Sumatra and Borneo. The birds in the Amur region are larger and Swinhoe described a form from northern China as *Cuculus michieanus* while Walter Norman Koelz described a form *fatidicus* from northeastern India.

## Distribution and habitat

The species is found widely distributed across Asia. The preferred habitat is deciduous and evergreen forests but also occur in garden lands and thick scrub.

Some populations appear to migrate south in winter, although there are breeding populations in the southern areas as well, with specimens netted at night or recorded at lighthouses.

## Behaviour and ecology

The Indian Cuckoo is a brood parasite. It lays its single egg mostly in the nests of drongos and crows. It removes and eats an egg from the host nest before laying its own. The breeding season varies from May to July in northern China, March to August in India, January to June in Burma and January to August in the Malay Peninsula.

The host species include *Lanius cristatus* in the Amur region, Black Drongo and *Pica cyanea* in China. In India, they have been found to be fed by Black Drongos and Ashy Drongo. Other hosts that have been recorded include Black-headed Oriole, Streaked Spiderhunter, *Eurylaimus ochromalus* and *Dicrurus paradiseus*.

The eggs of the cuckoo hatch in 12 days while those of the Brown Shrike in the Amur region take 14 days. During the third of fourth day, the young bird bends its back when touched and heaves out other eggs or nestlings. This instinct is lost soon after.

# Jacobin Cuckoo

**Jacobin Cuckoo**

Feeding on a hairy caterpillar

**Conservation status**

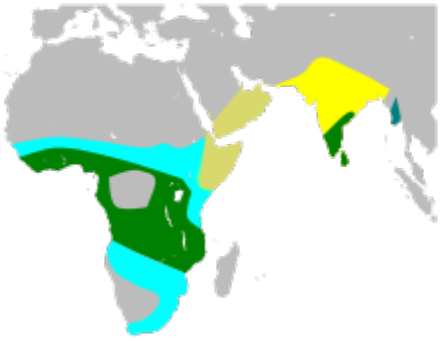

Least Concern (IUCN 3.1)

**Scientific classification**

| | |
|---|---|
| Kingdom: | Animalia |
| Phylum: | Chordata |
| Class: | Aves |
| Order: | Cuculiformes |
| Family: | Cuculidae |
| Genus: | *Clamator* |
| Species: | ***C. jacobinus*** |

**Binomial name**

***Clamator jacobinus***
Boddaert, 1783



dark green - year round

yellow - summer only
blue - winter
cream - passage only

**Synonyms**

*Oxylophus jacobinus*
*Coccystes melanoleucos*
*Coccystes hypopinarius*

The **Jacobin Cuckoo**, **Pied Cuckoo**, or **Pied Crested Cuckoo** (*Clamator jacobinus*) is a member of the cuckoo order of birds that is found in Africa and Asia. It is partially migratory and in India, it has been considered a harbinger of the Monsoon rains due to the timing of its arrival. It has been associated with a bird in Indian mythology and poetry, known as the *Chatak* and represented as a bird with a beak on its head that waits for rains to quench its thirst.

## *Description*

Near Kolleru Lake, India.

This medium sized, slim black and white cuckoo with a crest is distinctive. The white wing patch on the black wing and the pattern make it unmistakable even in flight. They are very vocal during the breeding season. The call is a ringing series of whistling notes "skleer-skleer-eer, skleeur,skleeur" with the calls of the nominate form more rapid and slightly mellower.

In India the subspecies *serratus* (Sparrman, 1786) is a summer breeding visitor to northern India and is believed to migrate to southern Africa. This is larger and longer winged than the nominate subspecies found in the southern peninsular region and Sri

Lanka is said to be a local migrant. No ringing evidence exists to support the actual migration to Africa.

In Africa, subspecies *serratus* and *pica* (Hemprich & Ehrenberg, 1833) show two phases, a pied phase with white or whitish below and a black phase where the only white is on the wing patch. Mating appears to be assortative, with pied phase males pairing with pied phase females. An all-rufous color phase has been noted in Central Africa. Subspecies *pica* has been said to be the form that migrates between Africa and India however Rasmussen & Anderton (2005) suggest *serratus* as being the form that is likely to constitute the Afro-Indian migrants.

In the past some other African subspecies have been suggested such as *hypopinarus* from South Africa and *caroli* from the Gabon.

## Distribution and habitat

The species is distributed south of the Sahara in Africa and south of the Himalayas in India. Also found in Sri Lanka and parts of Myanmar. Within Africa, there are movements of the species although they are resident in tropical Africa. The east African population is migratory and moves over southern Arabia into India during April. The habitat of the species is mainly in thorny, dry scrub or open woodland avoiding areas of dense forest or extremely dry environments.

## Behaviour and ecology

In the breeding season, birds call from prominent perches and chase each other with slow wing-beats and pigeon like clapping flight. Courtship feeding has been observed in Africa. The species is a brood parasite and in India the host is mainly species of babblers in the genus *Turdoides*. The colour of the eggs matches those of the host, typically turquoise blue. The eggs are slightly larger than those of the Common Babbler *T. caudatus* or the Jungle Babbler *T. striata*. Other hosts include the Red-vented Bulbul, and the eggs laid are then mostly white. Eggs are laid hurriedly in the morning into the nest of the host often dropped from while the bird perches on the rim of the nest and over the host eggs often resulting in the cracking of one or more host eggs. In Africa, the males distract the host while the female lays the egg. Multiple eggs may be laid in the nest of a host and two young cuckoos were found to fledge successfully in several occasions. In Africa, the hosts include *Pycnonotus barbatus*, *P. capensis*, *Turdoides fulvus*, *Turdoides rubiginosus*, *Lanius collaris*, *Andropadus importunus*, *Terpsiphone viridis*, *Dicrurus adsimilis* and a few other species.

The skin of young birds darkens form pink to purplish brown within two days of hatching. The mouth linking is red with yellow gape flanges. Unlike some cuckoos, nestlings do not evict the eggs of the host from the nest although they claim most of the parental attention and food resulting sometimes, in the starvation of host nestlings.

These cuckoos feed on insects including hairy caterpillars that are picked up from near or on the ground. Caterpillars are pressed from end to end to remove the guts before they are swallowed. They sometimes feed on fruits.

## Chapter 11

# Phengaris Rebeli and Striped Cuckoo

# Phengaris rebeli

| *Phengaris rebeli* | |
|---|---|
| **Conservation status** | |
|  | |
| Vulnerable (IUCN 2.3) | |
| **Scientific classification** | |
| Kingdom: | Animalia |
| Phylum: | Arthropoda |
| Class: | Insecta |
| Order: | Lepidoptera |
| Superfamily: | Papilionoidea |
| Family: | Lycaenidae |
| Genus: | *Phengaris* |
| Species: | ***P. rebeli*** |
| **Binomial name** | |
| ***Phengaris rebeli*** (Hirschke, 1904) | |
| **Synonyms** | |
| • *Glaucopsyche rebeli*<br>• *Maculinea rebeli* (Hirschke, 1904) | |

***Phengaris rebeli*** (formerly ***Maculinea rebeli***), common name **Mountain Alcon Blue**, is a species of butterfly in the Lycaenidae family. It is found in Andorra, Austria, Belgium,

Bulgaria, Croatia, Czech Republic, France, Germany, Hungary, Italy, Liechtenstein, Poland, Russia, Slovakia, Slovenia, Spain, and Switzerland. Its natural habitat is temperate grassland. It is threatened by habitat loss.

### *Brood parasitism*

*Phengaris rebeli* engage in reproduction through brood parasitism. Larval *P. rebeli* are capable of reproducing the scent emitted by red ant larvae, among which they are raised and fed. Research has shown they also imitate the noises emitted by queen ants, which can command additional attention and favor, such as being rescued first if the nest is attacked. In one experiment, queen ants attacked the impostor larvae, only for the workers to intervene on the behalf of the larvae, removing them to safety while fighting off the queens.

### Vestigial mutualism

*P. rebeli* pupae prey upon their broodmates, while producing sugar-rich secretions which worker ants imbibe. In one experiment, *P. rebeli* specimens which consumed ant larvae developed more quickly than those who did not. However, despite their nourishing offering to the community, they invariably imposed a net loss in the survival rates of workers and broodmates, demonstrating that the species is parasitic (rather than mutualistic) at all stages in its host colony.

# Striped Cuckoo

| **Striped Cuckoo** | |
|---|---|
| **Conservation status** | |
|  | |
| Least Concern (IUCN 3.1) | |
| **Scientific classification** | |
| Kingdom: | Animalia |
| Phylum: | Chordata |
| Class: | Aves |
| Order: | Cuculiformes |
| Family: | Cuculidae |
| Subfamily: | Neomorphinae |
| Genus: | ***Tapera*** |

Species: ***T. naevia***

**Binomial name**

***Tapera naevia***
(Linnaeus, 1766)

The **Striped Cuckoo**, *Tapera naevia*, is a near-passerine bird, the only member of the genus *Tapera* (Thunberg, 1819). This cuckoo is a resident breeding bird from Mexico and Trinidad south to Bolivia and Argentina.

The Striped Cuckoo is found in open country with trees or shrubs, and the edges of mangrove forests. This species is a brood parasite usually on spinetails, but often also wrens, and other species with domed nests. The female cuckoo lays one, sometimes two, white or bluish eggs in the host's large stick nest. The eggs hatch in 15 days, with a further 18 days until the cuckoo fledges. The young spinetails disappear.

This species is about 27 cm long and weighs 40 g. The adult is mainly grey-brown above, streaked with black and buff. It has a pale supercilium and a chestnut and black crest which is raised as part of its display. The underparts are off-white, and the tail is long and graduated. Immature birds are spotted with buff and are more rufous on the back and wings.

The Striped Cuckoo eats large insects, often taken off the ground. This is a solitary and fairly shy species which tends to keep to the cover of bushes, although it will sing from more open perches. It has a whistled call usually of two or three notes, *wu-weee* or *wu-wu-wee*, and can be attracted by imitations of this.

## *Brazilian folklore*

This bird is very important in Brazilian folklore, being related to the legend of the saci, or matita-perê. Other than the name saci, the bird is also known as matinta-pereira, pitica (Pará), crispim, fenfém, martim-pererê, matimpererê, matintapereira, matintaperera, matitaperê, peitica, peito-ferido, roceiro-planta, seco-fico, sede-sede, saci-do-campo, sem-fim, fém-fém, tempo-quente, peixe-frito (Bahia), e peixe-frito-seu-veríssimo.

Chapter 12

# Synodontis Multipunctata, Thick-billed Honeyguide and Viduidae

## Synodontis multipunctata

| Cuckoo catfish |
|---|
|  |
| **Scientific classification** |
| Kingdom: Animalia |
| Phylum: Chordata |
| Class: Actinopterygii |
| Order: Siluriformes |
| Family: Mochokidae<br>Jordan, 1923 |
| Genus: *Synodontis* |
| Species: ***S. multipunctata*** |
| **Binomial name** |
| ***Synodontis multipunctata*** |

***Synodontis multipunctata***, also known as the **cuckoo catfish**, **cuckoo squeaker**, or **multipunk**, is a small catfish from Lake Tanganyika, one of the lakes in the Great Rift Valley system in Africa. It is a brood parasite upon mouthbrooding cichlids.

### General

*Synodontis multipunctata* is one of a number of members of the Mochokidae family of catfish in Lake Tanganyika, which is more famous for its cichlids. It gathers in large schools at depths of about 40 metres (130 ft) in the lake.

*S. multipunctata* is notable for its breeding behaviour - it is a brood parasite, similar to the cuckoo from which it takes its common name. Lake Tanganyika is home to a number of mouthbrooding cichlids, which care for their eggs and young by carrying them in their mouth. *S. multipunctata* uses these, particularly *Ctenochromis horei* and *Simochromis babaulti*, as unwitting caretakers for their children.

The smell of spawning cichlids excites *S. multipunctata* into spawning, and as the cichlids lay their eggs the catfish will quickly slip in and eat its eggs before they can be collected by the mother. While doing so they also release and fertilise their own eggs. The female cichlid will hastily attempt to scoop up her eggs and, in doing so, will also collect eggs from *S. multipunctata*. These eggs will then hatch inside the unwilling adoptive mother's mouth, and proceed to eat the cichlid eggs present before being released by the cichlid. This technique removes the burden of parental care from the *S. multipunctata*, and allows them to breed again sooner.

### *In the aquarium*

*Synodontis multipunctatii* are a popular addition to cichlid aquariums. They grow to about 15 cm, and can be bred in captivity provided suitable hosts are present. Some aquarists have had success with host cichlids from Lake Malawi and Lake Victoria as well as those from Lake Tanganyika. They can be very aggressive and territorial towards other synodontis species, they should be kept in groups over 3 to avoid competition between two, and proper cover and cave like structures should be provided. They seem to be active in the day as much as the night and can prove quite lively. If kept in larger groups territorial issues are less likely.

# Thick-billed Honeyguide

| **Thick-billed Honeyguide** | |
|---|---|
| **Conservation status** | |
| NR | |
| **Scientific classification** | |
| Kingdom: | Animalia |
| Phylum: | Chordata |
| Class: | Aves |
| Order: | Piciformes |
| Family: | Indicatoridae |
| Genus: | *Indicator* |
| Species: | ***I. conirostris*** |
| **Binomial name** | |

***Indicator conirostris***
(Cassin, 1856)

**Synonyms**

*Indicator minor conirostris*

The **Thick-billed Honeyguide** (*Indicator conirostris*) is a bird of the honeyguide family Indicatoridae. It has been reported interbreeding with the related Lesser Honeyguide (*I. minor*) and the two are sometimes treated as a single species.

It is 14-15 centimetres long and has a heavy black bill. The upperparts are yellow-green with dark streaking while the head and underparts are dark greyish, sometimes with faint streaking. The outer tail-feathers are mostly white and there may be a pale spot on the lores. Juvenile birds are similar to adults but are darker and greener. The Lesser Honeyguide is smaller with a less heavy bill. It has a paler head and underparts, less-streaked upperparts and a more conspicuous patch on the lores.

The calls of the Thick-billed Honeyguide include a repeated "frip" which is similar to the call of the Lesser Honeyguide but deeper.

It occurs in parts of West, Central and East Africa. The nominate subspecies is found from southern Nigeria south to north-west Angola and east to Uganda and western Kenya. The form *cassini* occurs in eastern Sierra Leone, Liberia and southern parts of Guinea, Côte d'Ivoire and Ghana. The species inhabits the interior of dense forest. Where its habitat becomes fragmented it may be replaced by the Lesser Honeyguide which favours more open habitats.

Like other honeyguides, it is a brood parasite laying its eggs in the nests of other birds. The Grey-throated Barbet (*Gymnobucco bonapartei*) is known to be a host species and other *Gymnobucco* barbets are probably parasitized as well.

# Viduidae

| Viduidae |
|---|

*Vidua interjecta*

| Scientific classification | |
|---|---|
| Kingdom: | Animalia |
| Phylum: | Chordata |
| Class: | Aves |
| Order: | Passeriformes |
| Suborder: | Passeri |
| Family: | **Viduidae** |

| Genera |
|---|

*Vidua*
*Anomalospiza*

The **indigobirds** and **whydahs**, are a family, **Viduidae**, of small passerine birds native to Africa.

These are finch-like species which usually have black or indigo predominating in their plumage. The birds named "whydahs" have long or very long tails in the breeding male.

All are brood parasites, which lay their eggs in the nests of estrildid finch species; most indigobirds use fire-finches as hosts, whereas the paradise whydahs chose pytilias.

Unlike the cuckoo, the indigobirds and whydahs do not destroy the host's eggs. Typically, they lay 2–4 eggs in with those already present. The eggs of both the host and the victim are white, although the indigobird's are slightly larger.

Many of the indigo-plumaged species named "indigobirds" are very similar in appearance, with the males difficult to separate in the field, and the young and females near impossible. The best guide is often the estrildid finch with which they are associating, since each indigobird parasitises a different host species. For example, the Village Indigobird is usually found with Red-billed Fire-finches.

Indigobirds and whydahs imitate their host's song, which the males learn in the nest. Although females do not sing, they also learn to recognise the song, and chose males with the same song, thus perpetuating the link between each species of indigobird and firefinch.

The nestling indigobirds mimic the unique gape pattern of the fledglings of the host species.

The matching with the host is the driving force behind speciation in this family, but the close genetic and morphological similarities among species suggest that they are of recent origin.

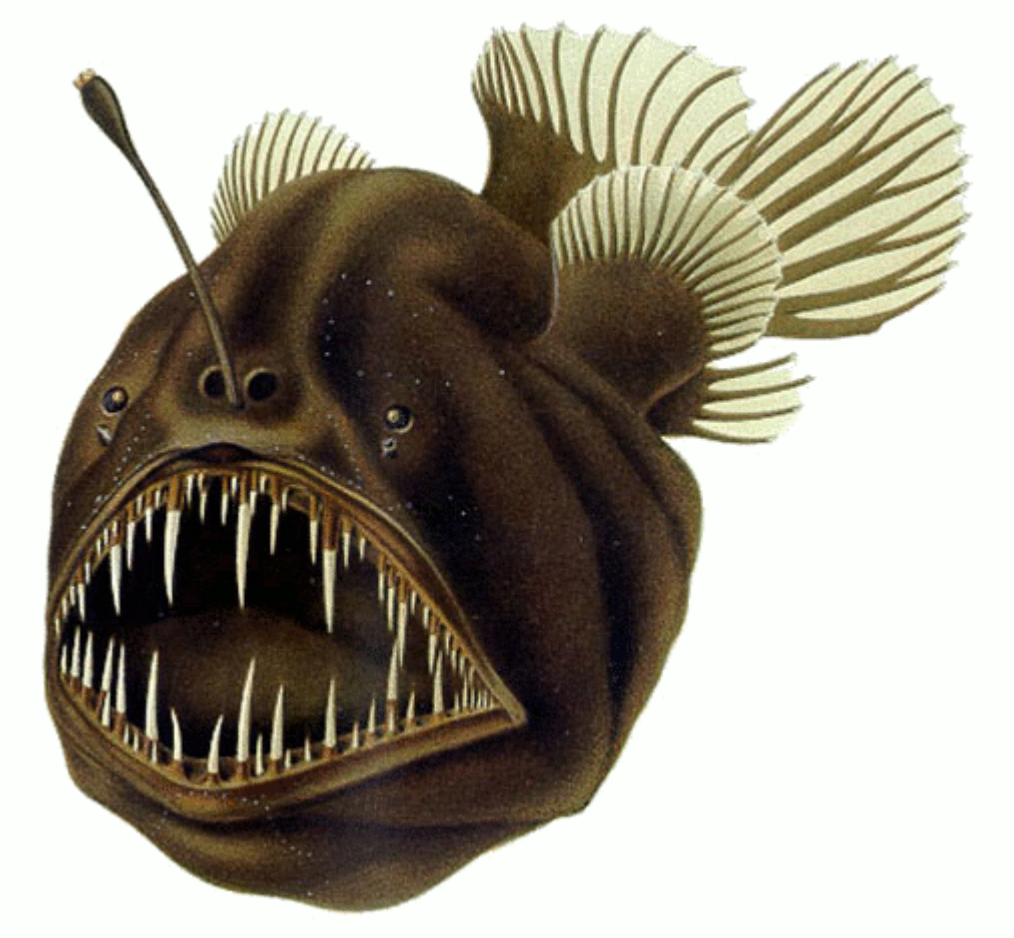
## *Species*

- Genus *Vidua*
  - Village Indigobird, *Vidua chalybeata*
  - Jambandu Indigobird, *Vidua raricola*
  - Barka Indigobird, *Vidua larvaticola*
  - Jos Plateau Indigobird, *Vidua maryae*
  - Quailfinch Indigobird, *Vidua nigeriae*
  - Dusky Indigobird or Variable Indigobird, *Vidua funerea*
  - Zambezi Indigobird or Green Indigobird, *Vidua codringtoni*
  - Purple Indigobird or Dusky Indigobird, *Vidua purpurascens*
  - Wilson's Indigobird or Pale-winged Indigobird, *Vidua wilsoni*
  - Cameroon Indigobird, *Vidua camerunensis*
  - Steel-blue Whydah, *Vidua hypocherina*
  - Straw-tailed Whydah, *Vidua fischeri*
  - Shaft-tailed Whydah, *Vidua regia*
  - Pin-tailed Whydah, *Vidua macroura*
  - Togo Paradise Whydah, *Vidua togoensis*
  - Exclamatory Paradise Whydah or Long-tailed Paradise Whydah, *Vidua interjecta*
  - Long-tailed Paradise Whydah or Eastern Paradise Whydah, *Vidua paradisaea*
  - Sahel Paradise Whydah or Northern Paradise Whydah, *Vidua orientalis*
  - Broad-tailed Paradise Whydah, *Vidua obtusa*

- Genus *Anamalospiza*
    - Cuckoo Finch or Parasitic Weaver, *Anomalospiza imberbis*

## Chapter 13

# Aggressive Mimicry



The Humpback anglerfish uses a modified dorsal spine as a bioluminescent 'fishing rod' to capture prey.

**Aggressive mimicry** is a form of mimicry where predators, parasites or parasitoids share similar signals with a harmless model, allowing them to avoid being correctly identified

by their prey or host. In its broadest sense, it involves any type of exploitation, such as an orchid exploiting a male insect by mimicking a sexually receptive female, but will here be restricted to forms of exploitation involving feeding. The alternative term **Peckhamian mimicry** (after George and Elizabeth Peckham) has also been suggested, but it is seldom used. The metaphor of a wolf in sheep's clothing can be used as an analogy, but with the caveat that mimics are not intentionally deceiving their prey. For example, indigenous Australians who dress up as and imitate kangaroos when hunting would not be considered aggressive mimics, nor would a human angler. Treated separately is molecular mimicry, which also shares some similarity; for instance a virus may mimic the molecular properties of its host, allowing it access to its cells.

Aggressive mimicry is opposite in principle to defensive mimicry, where the mimic generally benefits from being treated as harmful. The mimic may resemble its own prey, or some other organism which is beneficial or at least not harmful to the prey. The model, i.e. the organism being 'imitated', may experience increased or reduced fitness, or may not be affected at all by the relationship. On the other hand, the signal receiver inevitably suffers from being tricked, as is the case in most mimicry complexes.

Aggressive mimicry often involves the predator employing signals which draw its potential prey towards it, a strategy which allows predators to simply sit and wait for prey to come to them. The promise of food or sex are most commonly used as lures. However, this need not be the case; as long as the predator's true identity is concealed, it may be able to approach prey more easily than would otherwise be the case. In terms of species involved, systems may be composed of two or three species; in two-species systems the signal receiver, or "dupe", is the model.

In terms of the visual dimension, distinction between aggressive mimicry and camouflage is not always clear. Authors such as Wickler have emphasized the significance of the signal to its receiver as delineating mimicry from camouflage. However, it is not easy to assess how 'significant' a signal may be for the dupe, and the distinction between the two can thus be rather fuzzy. Mixed signals may also be employed. Aggressive mimics often have a specific part of the body sending a deceptive signal, with the rest being hidden or camouflaged.

### *Comparison with other forms of mimicry*

Batesian mimics, like this bumblebee-mimicking hoverfly, are the antithesis of aggressive mimics.

Mimicry that is aggressive stands in semantic contrast with *defensive mimicry*, forms of mimicry where it is the *prey* that acts as a mimic, with predators being duped. Defensive mimicry includes the well-known Batesian and Müllerian forms of mimicry, where the mimic shares outward characteristics with an aposematic or harmful model. In Batesian mimicry, the mimic is modeled on a dangerous (usually unpalatable) species, while in Müllerian mimicry both species are harmful, and act as comimics, converging on a common set of signals and sharing the burden of 'educating' their predators. Also included in defensive mimicry is the lesser known Mertensian mimicry, where the mimic is *more* harmful than the model, and Vavilovian mimicry, where weeds come to mimic crops through unintentional artificial selection. In defensive mimicry, the mimic benefits by avoiding a harmful interaction with another organism that would be more likely to take place without the deceptive signals employed. Harmful interactions might involve being eaten, or pulled out of the ground as a weed. In contrast, the aggressive mimic benefits from an interaction that would be less likely to take place without the deception, at the expense of its target. However, it is important to note that there are other forms of mimicry that are described by the previous sentence, which are *not* aggressive mimicry—flowers exploiting a pollinator with deceptive signals, for example. There is no analogous word that encompasses all such cases of mimicry, however.

## *Classification*

### Luring prey

In some cases the signal receiver is lured toward the mimic. This involves mimicry of a resource that is often vital to the prey's survival (or more precisely, the survival of its genes) such as nutrition or a mate. If the bait offered is of little value to prey they would not be expected to take such a risk. For example in all known cases of sexual signal mimicry it is always the male sex that is deceived (in fact, it has been suggested that females of some species have evolved mimicry as a strategy to avoid unwanted matings). In these cases the predator need not move about foraging for prey, but may simply stay still and allow prey to come to it.

Some studies suggest that the Northern Shrikes (*Lanius excubitor*) sings in winter often imitating small passerines that may be preyed upon when lured within reach.

There has been one report of a margay using mimicry of the cry of an infant pied tamarin to try to lure an adult tamarin within striking distance.

### Food as an attractant

The Alligator Snapping Turtle uses its tongue to lure fish.

Many aggressive mimics use the promise of nourishment as a way of attracting prey. Though apparent to observers, the irony of falling prey when trying to capture its own is certainly lost on the deceived animal. The Alligator Snapping Turtle (*Macrochelys temminckii*) is a well-camouflaged ambush predator. Its tongue bears a conspicuous pink extension that resembles a worm and can be wriggled around; fish that try to eat the "worm" are themselves eaten by the turtle. Similarly, some snakes employ caudal luring (tail luring) to entice small vertebrates into striking range.

*Argiope argentata* and its web.

Aggressive mimicry is also common amongst spiders, both in luring prey and stealthily approaching predators. One case is the Golden Orb Weaver (*Nephila clavipes*), which spins a conspicuous golden colored web in well-lit areas. Experiments show that bees are

able to associate the webs with danger when the yellow pigment is not present, as occurs in less well-lit areas where the web is much harder to see. Other colors were also learned and avoided, but bees seemed least able to effectively associate yellow pigmented webs with danger. Yellow is the color of many nectar bearing flowers, however, so perhaps avoiding yellow is not worth while. Another form of mimicry is based not on color but pattern. Species such as *Argiope argentata* employ prominent patterns in the middle of their webs, such as zigzags. These may reflect ultraviolet light, and mimic the pattern seen in many flowers known as nectar guides. Spiders change their web day to day, which can be explained by bee's ability to remember web patterns. Bees are able to associate a certain pattern with a spatial location, meaning the spider must spin a new pattern regularly or suffer diminishing prey capture.

Spiders can also be the prey of aggressive mimics. The assassin bug *Stenolemus bituberus* preys on spiders, entering their web and plucking its silk threads until the spider approaches. This vibrational aggressive mimicry matches a general pattern of vibrations which spiders treat as prey, having a similar temporal structre and amplitude to leg and body movements of typical prey caught in the web.

The bright leaves of the venus flytrap (*Dionaea muscipula*) attract insects in the same way as flowers.

Although plants are better known for defensive mimicry, there are exceptions. For example, many flowers use mimicry to attract pollinators, while others may trick insects into dispersing their seeds. Nonetheless, most mimicry occurring in plants would not be classified as aggressive, as although luring pollinators etc. is similar to cases above, they are certainly not eaten by the plant. However some carnivorous plants may be able to increase their rate of capture through mimicry. For example, some have patterns in the ultraviolet region of the electromagnetic spectrum, much like the spider webs described above.

## Aggressive mimicry involving two species

Mimicry systems involving only two species are known as *bipolar*. Only one bipolar arrangement is possible here: that where the dupe is itself the model. There are two such variants on this arrangement of mimic imitating its target, in the first case, termed *Batesian-Wallacian mimicry* after Henry Walter Bates and Alfred Russell Wallace, the model is the prey species. Similarly, the model is the host of a brood parasite in the second such case.

## Batesian-Wallacian

In some cases of Batesian-Wallacian mimicry, the model is a sexually receptive female, which provides a strong attractive effect on males. Some spiders use chemical rather than visual means to ensnare prey. Female bolas spiders of the genus *Mastophora* allure male moths by producing analogues of the moth species' sex pheromones. Each species of spider appears to specialize in a particular species of prey in the family Psychodidae. Juveniles use their front pair of legs to capture prey, such as flies. Older spiders use a different strategy however, swinging a sticky ball known as a *bolas* suspended by a silk thread at moths. But both old and juvenile are able to lure prey items via this olfactory signal; even young spiderlings have been shown to attract prey species.

Beginning in the 1960s, James E. Lloyd's investigation of female fireflies of the genus *Photuris* revealed they emit the same light signals that females of the genus *Photinus* use as a mating signal. Further research showed male fireflies from several different genera are attracted to these mimics, and are subsequently captured and eaten. Female signals are based on that received from the male, each female having a repertoire of signals matching the delay and duration of the female of the corresponding species. This mimicry may have evolved from non-mating signals that have become modified for predation.

The Spotted Predatory Katydid (*Chlorobalius leucoviridis*) is an acoustic aggressive mimic of cicadas.

The listroscelidine katydid *Chlorobalius leucoviridis* of inland Australia is capable of attracting male cicadas of the Tribe Cicadettini by imitating the species-specific reply clicks of sexually receptive female cicadas. This example of acoustic aggressive mimicry is similar to the *Photuris* firefly case in that the predator's mimicry is remarkably versatile – playback experiments show that *C. leucoviridis* is able to attract males of many cicada species, including Cicadettine cicadas from other continents, even though cicada mating signals are species-specific. The evolution of versatile mimicry in *C. leucoviridis* may have been facilitated by constraints on song evolution in duetting communication systems in which reply signals are recognizable only by their precise timing in relation to the male song (<< 100 ms reply latency).

## Host mimicry by brood parasites

Though less than obvious here, brood parasites mimic certain qualities of their host species.

*Host-parasite mimicry* is a situation where a parasite mimics its own host. As with mimicry of the female sex outlined previously, only two species are involved, the model and mimic being of the same species. Brood parasitism, a form of kleptoparasitism where the mother has its offspring raised by another unwitting organism, is one such situation where host-parasite mimicry has evolved. Pasteur terms this form of aggressive-reproductive mimicry *Kerbyan mimicry*, after the English entomologist William Kirby.

## Mimicry of mutualistic species

Two Bluestreak cleaner wrasse cleaning a Potato grouper, *Epinephelus tukula*

Attraction of the target toward the mimic is not seen in all aggressive mimicry systems. The predator will still have a significant advantage by simply not being identified as such. Such mimics may resemble a mutualistic ally, or a species of little significance to the prey.

The former situation has been termed *Wicklerian-Eisnerian mimicry*. This involves the mimic resembling a species that is an important partner of the dupe, whether they live together or not. A case of the latter situation is a species of cleaner fish and its mimic, though in this example the model is greatly disadvantaged by the presence of the mimic. Cleaner fish are the allies of many other species, which allow them to eat their parasites and dead skin. Some allow the cleaner to venture inside their body to hunt these parasites. However, one species of cleaner, the Bluestreak cleaner wrasse (*Labroides dimidiatus*), is the unknowing model of a mimetic species, the Sabre-toothed blenny (*Aspidontus taeniatus*). This wrasse, shown to the left cleaning a grouper of the genus *Epinephelus*, resides in coral reefs in the Indian and the Pacific Oceans, and is recognized by other fishes who then allow it to clean them. Its imposter, a species of blenny, lives in the Indian Ocean and not only looks like it in terms of size and coloration, but even mimics the cleaner's 'dance'. Having fooled its prey into letting its guard down, it then bites it, tearing off a piece of its fin before fleeing the scene. Fish grazed upon in this fashion

soon learn to distinguish mimic from model, but because the similarity is close between the two they become much more cautious of the model as well, such that both are affected. Due to victim's ability to discriminate between foe and helper, the blennies have evolved close similarity, right down to the regional level.

## Cryptic aggressive mimicry

The Zone-tailed Hawk resembles the Turkey Vulture in flight.

Another case is cryptic mimicry, where the predator mimics an organism that its prey is indifferent to. Unlike in all cases above, the host is ignored by prey, allowing it to avoid detection until prey are close enough to strike. This is in principle very similar to camouflage, and is known as *mimesis*. The Zone-tailed Hawk (*Buteo albonotatus*), which resembles the Turkey Vulture (*Cathartes aura*), may provide one such example. It flies amongst them, suddenly breaking from the formation and ambushing its prey. Here the hawk's presence is of no evident significance to the vultures, affecting them neither negatively or positively. There is some controversy over whether this is a true case of mimicry.

## Parasites mimicking host prey

Some of the predators described above have a feature that lures prey, and likewise some parasites mimic their host's natural prey, but in this case the roles are reversed; the parasite gets eaten by the host. This deception provides the parasite easy entry into the host, which they can then feed upon, allowing them to continue their life cycle.

Researchers may be able to predict the host of such parasites based on their appearance and behavior.

One such case is a genus of shellfish, *Lampsilis*, which feeds on the gills of fish in the larval stage of their development. Once they mature, they leave the fish as adult mollusc. Gaining entry into the host is not an easy task though, despite the fact that several hundred thousand larvae are released at once. This is especially the case in flowing water bodies such as streams, where they cannot lie on the substrate and wait to be taken up in the course of foraging. Female shellfish have evolved a special technique for delivering their offspring into a suitable host, however. Structures on the edge of the mantle are able to capture the interest of fish. Some resemble small fish themselves, with eye spots, a 'tail' and horizontal stripes, and may even move in a similar fashion, as if facing the current (rheotaxis). When overshadowed by a fish, the larvae are forcefully expelled, becoming ectoparasites on their unsuspecting host.

*Cercaria mirabilis*, a trematode, has an especially large larval stage (known as a cercaria) which looks much like a small crustacean or mosquito larva. It also mimics the locomotory behavior of such animals, allowing it to be eaten by predaceous fish.

Another parasitic trematode example is seen in a terrestrial setting. *Leucochloridium* is a genus of flatworm (phylum Platyhelminthes) which matures in the intestine of songbirds. Their eggs pass out of the bird in the feces and are then taken in by *Succinea*, a terrestrial snail that lives in moist environments. The eggs develop into larvae inside this intermediate host, and then must find their way into the digestive system of a suitable bird. The problem here is that these birds do not eat snails, so the sporocyst must find some way of manipulating its future host into eating it. Unlike related species, these parasites are brightly colored and able to move in a pulsating manner. A sporocyst sac forces its way into the snail's eye stalks, and pulsates at high speed, enlarging the tentacle in the process. It also affects the host's behavior: the snail moves towards light, which it usually avoids. These combined factors make the sporocysts highly conspicuous, such that they are soon eaten by a hungry songbird. The snail then regenerates its tentacles, and *Leucochloridium* carries on with its life cycle.

# Chapter 14

# Cuckoo

| Cuckoos |
|---|
|  |
| Yellow-billed Cuckoo (*Coccyzus americanus*) |

| Scientific classification | |
|---|---|
| Kingdom: | Animalia |
| Phylum: | Chordata |
| Class: | Aves |
| Order: | Cuculiformes |
| Family: | **Cuculidae**<br>Vigors, 1825 |

The **cuckoos** are a family, **Cuculidae**, of near passerine birds. The order Cuculiformes, in addition to the cuckoos, also includes the turacos (family Musophagidae, sometimes treated as a separate order, Musophagiformes). Some zoologists and taxonomists have also included the unique Hoatzin in the Cuculiformes, but its taxonomy remains in dispute. The cuckoo family, in addition to those species named as such, also includes the roadrunners, koels, malkohas, couas, coucals and anis. The coucals and anis are

sometimes separated as distinct families, the Centropodidae and Crotophagidae respectively.

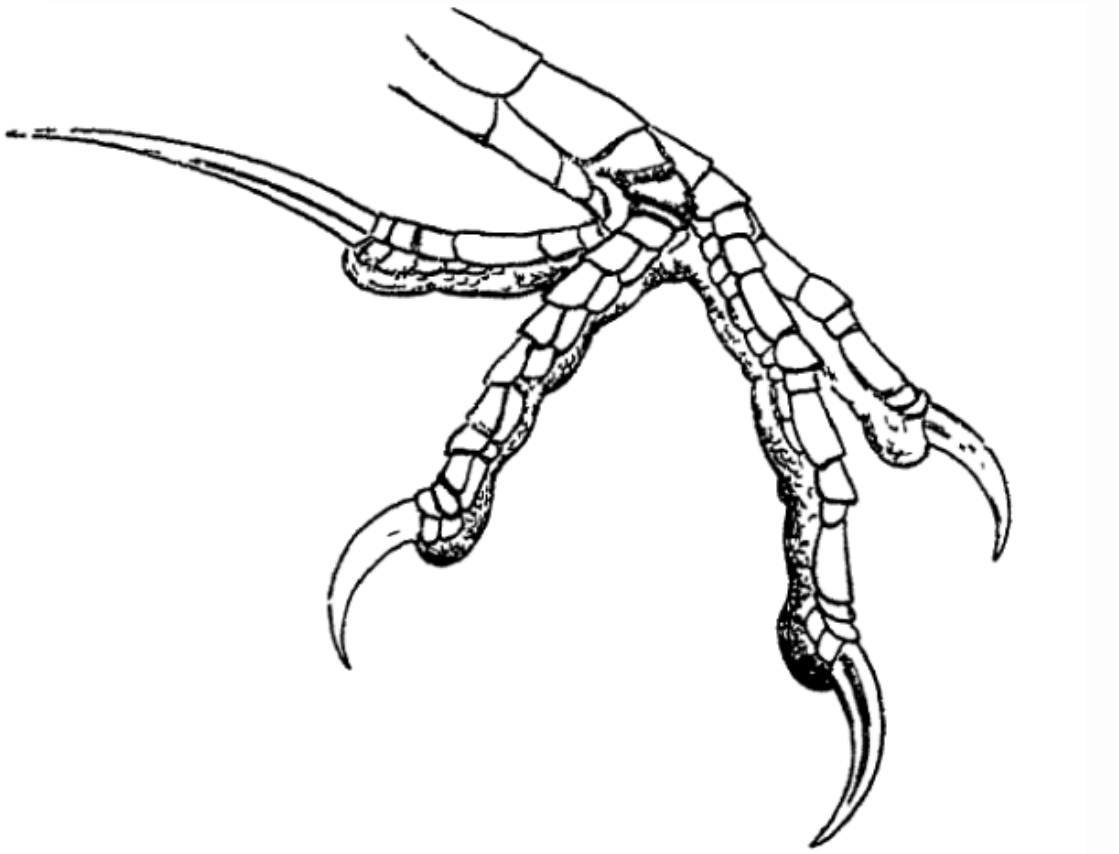
The cuckoos are generally medium sized slender birds. The majority are arboreal, with a sizeable minority that are terrestrial. The family has a cosmopolitan distribution, with the majority of species being tropical. The temperate species are migratory. The cuckoos feed on insects, insect larvae and a variety of other animals, as well as fruit. Many species are brood parasites, laying their eggs in the nests of other species, but the majority of species raise their own young.

## *Morphology*

The Chestnut-breasted Malkoha is typical of the Phaenicophaeinae in having brightly coloured skin around the eye.

Cuckoos are medium sized birds that range in size from the Little Bronze Cuckoo, at 17 g and 15 cm (6 inches), to the Channel-billed Cuckoo, at 630 g (1.4 lbs) and 63 cm (25 inches). There is generally little sexual dimorphism in size, but where it exists, it can be either the male or the female that is larger. One of the most important distinguishing features of the family are the feet, which are zygodactyl, meaning that the two inner toes pointed forward and the two outer backward. There are two basic body forms, arboreal species (like the Common Cuckoo) which are slender and have short tarsi, and terrestrial species (like the roadrunners) which are more heavy set and have long tarsi. Almost all species have long tails which are used for steering in terrestrial species and as a rudder during flight in the arboreal species. The wing shape also varies with lifestyle, with the more migratory species like the Black-billed Cuckoo possessing long narrow wings capable of strong direct flight, and the more terrestrial and sedentary cuckoos like the coucals and malkohas having shorter rounded wings and a more laboured gliding flight.

The subfamily Cuculinae are the brood-parasitic cuckoos of the Old World. They tend to conform to the classic shape, with (usually) long tails, short legs, long narrow wings and an arboreal lifestyle. The largest species, the Channel-billed Cuckoo, also has the most outsized bill in the family, resembling that of a hornbill. The subfamily Phaenicophaeinae are the non-parasitic cuckoos of the Old World, and include the couas, malkohas, and ground-cuckoos. They are more terrestrial cuckoos, with strong and often long legs and short rounded wings. The subfamily typically has brighter plumage and brightly coloured bare skin around the eye. The coucals are another terrestrial subfamily of long tailed long legged and short winged cuckoos. They are large heavyset birds with the largest, the Greater Black Coucal, being around the same size as the Channel-billed Cuckoo. The subfamily Coccyzinae are arboreal and long tailed as well, with a number of large insular forms. The New World ground-cuckoos are similar to the Asian ground-cuckoos in being long legged and terrestrial, and includes the long billed roadrunner, which can reach speeds of 30 km/h when chasing prey. The final subfamily are the atypical anis, which include the small clumsy anis and the larger Guira Cuckoo. The anis have massive bills and smooth glossy feathers.



Foot of *C. sinensis*

Zygodactyl arrangement of toes in the family

Cuckoos, like this Lesser Ground-cuckoo, often sun themselves in order to dry themselves and warm up.

The feathers of the cuckoos are generally soft, and often become waterlogged in heavy rain. Cuckoos will often sun themselves after rain, and the anis will hold their wings open in the manner of a vulture or cormorant while drying. There is considerable variation in the plumage exhibited by the family. Some species, particularly the brood parasites have cryptic plumage, whereas others have bright and elaborate plumage. This is particularly true of the *Chrysococcyx* or glossy cuckoos, which have iridescent plumage. Some cuckoos have a resemblance to hawks with barring on the underside; this apparently alarms potential hosts, allowing the female to access a host nest. The young of some brood parasites are coloured so as to resemble the young of the host. For example, the Asian Koels breeding in India have black offspring to resemble their crow hosts, whereas in the Australian Koels the chicks are brown like the honeyeater hosts. Sexual dimorphism in plumage is uncommon in the cuckoos, being most common in the parasitic Old World species.

Cuckoo genera differ in the number of primary wing feathers as below.

- *Coccycua, Coccyzus, Phaenicophaeus, Piaya* – 9
- *Cuculus* – 9 or 10
- *Pachycoccyx*, *Clamator levaillantii*, *Centropus* – 10
- *Microdynamis*, *Eudynamys*, *Clamator glandarius* – 11
- Some coucals – 12
- *Scythrops novaehollandiae* – 13

### *Distribution and habitat*

The Great Lizard-cuckoo is a large insular cuckoo of the Caribbean

The cuckoos have a cosmopolitan distribution, ranging across all the world's continents except Antarctica. They are absent from the south west of South America, the far north and north west of North America, and the driest areas of the Middle East and North Africa (although they occur there as passage migrants). They generally only occur as vagrants in the oceanic islands of the Atlantic and Indian Oceans, but one species breeds on a number of Pacific islands and another is a winter migrant across much of the Pacific.

The Cuculinae is the most widespread subfamily of cuckoos, and is distributed across Europe, Asia, Africa, Australia and Oceania. Amongst the Phaenicophaeinae cuckoos the

malkohas and Asian ground-cuckoos are restricted to southern Asia, the couas are endemic to Madagascar and the Yellowbill widespread across Africa. The coucals are distributed from Africa through tropical Asia down into Australia and the Solomon Islands. The remaining three subfamilies have a New World distribution, all three are found in both North and South America. The Coccyzinae reaches the furthest north of the three subfamilies, breeding in Canada, whereas the anis reach as far north as Florida and the typical ground-cuckoos the south west United States.

For the cuckoos suitable habitat provides a source of food (principally insects and especially caterpillars) and a place to breed, for brood parasites the need is for suitable habitat for the host species. Cuckoos occur in a wide variety of habitats. The majority of species occur in forests and woodland, principally in the evergreen rainforests of the tropics. Some species inhabit or are even restricted to mangrove forests; these include the Little Bronze Cuckoo of Australia, some malkohas, coucals, and the aptly named mangrove Cuckoo of the New World. In addition to forests come species of cuckoo occupy more open environments; this can include even arid areas like deserts in the case of the Greater Roadrunner or the Pallid Cuckoo. Temperate migratory species like the Common Cuckoo inhabit a wide range of habitats in order to make maximum use of the potential brood hosts, from reed beds (where they parasitise Reed Warblers) to treeless moors (where they parasitise Meadow Pipits).

## Migration

Most species of cuckoo are sedentary, and some species of cuckoo undertake regular seasonal migrations, and several more undertake partial migrations over part of their range. The migration is Diurnal, as in the Channel-billed Cuckoo, or nocturnal, as in the Yellow-billed Cuckoo. For species breeding at higher latitudes, food availability means that they migrate to warmer climates during the winter, and all do so. The Long-tailed Koel, which breeds in New Zealand, flies to its wintering grounds in Polynesia, Micronesia, and Melanesia, a feat described as "perhaps the most remarkable overwater migration of any land bird." The Yellow-billed Cuckoo and Black-billed Cuckoo breed in North America and fly across the Caribbean Sea, a non-stop flight of 4000 km. Other long migration flights include the Lesser Cuckoo, which flies from Africa to India, and the Common Cuckoos of Europe, which fly non-stop over the Mediterranean Sea and Sahara Desert on their voyage to southern Africa. Within Africa 10 species make regular intra-continental migrations that are described as polarised, that is they spend the non-breeding season in the tropical centre of the continent and move north and south to breed in the more arid and open savannah and deserts. This is the same as the situation in the Neotropics, where no species have this migration pattern, or tropical Asia, where a single species does. 83% of the Australian species are partial migrants within Australia or travel to New Guinea and Indonesia after the breeding season.

## *Behaviour*

The cuckoos are for the most part solitary birds that seldom occur in pairs or groups. The biggest exception to this are the anis of the Americas which have evolved cooperative

breeding and other social behaviours. For the most part the cuckoos are also diurnal as opposed to nocturnal, but many species will call at night (see below). The cuckoos are also generally a shy and retiring family, more often heard than seen. The exception to this are again the anis, which are often extremely confiding towards humans and other species.

## Feeding

Unlike most cuckoos, the Asian Koel is mostly frugivorous.

Most cuckoos are insectivorous, and in particular are specialised in eating larger insects and caterpillars, including noxious hairy types avoided by other birds. They are unusual among birds in processing their prey prior to swallowing, rubbing it back and forth on hard objects such as branches and then crushing it with special bony plates in the back of the mouth. They will also take a wide range of other insects and animal prey. The lizard-cuckoos of the Caribbean have, in the relative absence of birds of prey, specialised in taking lizards. Larger, ground types such as coucals and roadrunners also feed variously on snakes, lizards, small rodents, and other birds, which they bludgeon with their strong bills. Ground species may employ different techniques to catch prey. A study of two coua species in Madagascar found that the Coquerel's Coua obtained prey by walking and gleaning on the forest floor, whereas the Red-capped Coua ran and pounced on prey. Both species also showed seasonal flexibility in prey and foraging techniques. The parasitic cuckoos are generally not recorded as participating in mixed-species feeding

flocks, although some studies in eastern Australia found several species would participate in the non-breeding season, but were mobbed and unable to do so in the breeding season. Ground-cuckoos of the genus *Neomorphus* are sometimes seen feeding in association with army ant swarms, although they are not obligate ant-followers as are some antbirds. The anis are ground feeders that follow cattle and other large mammals when foraging; in a similar fashion to Cattle Egrets they snatch prey flushed by the cattle and enjoy higher foraging success rates in this way.

Several koels, couas, and the Channel-billed Cuckoo feed mainly on fruit, but they are not exclusively frugivores. The parasitic koels and Channel-billed Cuckoo in particular consume mainly fruit when raised by frugivore hosts such as the Australasian Figbird and Pied Currawong. Other species will occasionally take fruit as well. Couas consume fruit in the dry season when prey is harder to find.

## Breeding

The cuckoos are an extremely diverse group of birds with regards to breeding systems. The majority of species are monogamous, but there are exceptions. The anis and the Guira Cuckoo lay their eggs in communal nests, although this behaviour is not completely cooperative; a female may remove others' eggs when laying hers. Polyandry has been confirmed in the African Black Coucal and is suspected to occur in the other coucals, perhaps explaining the reversed sexual dimorphism in the group. The majority of cuckoo species, including malkohas, couas, coucals, and roadrunners and most other American cuckoos, build their own nests, although a large minority engage in brood parasitism (see below). Most of these species nest in trees or bushes, but the coucals lay their eggs in nests on the ground or in low shrubs. Though on some occasions non-parasitic cuckoos parasitize other species, the parent still helps feed the chick.

Non-parasitic cuckoos, like most other non-passerines, lay white eggs, but many of the parasitic species lay coloured eggs to match those of their passerine hosts.

The young of all species are altricial. Non-parasitic cuckoos leave the nest before they can fly, and some New World species have the shortest incubation periods among birds.

## Brood parasitism

This Reed Warbler is raising the young of a Common Cuckoo, the best-known cuckoo.

Shows individual Pallid Cuckoo Juvenile being fed by 3 separate foster-parent species

About 56 of the Old World species and 3 of the New World species are brood parasites, laying their eggs in the nests of other birds. These species are obligate brood parasites, meaning that they only reproduce in this fashion. In addition to the above noted species, yet others sometimes engage in non-obligate brood parasitism, laying their eggs in the nests of members of their own species in addition to raising their own young. The best-known example is the European Common Cuckoo. The shells of the eggs of brood-parasites is usually thick. They have two distinct layers with an outer chalky layer that is believed to provide resistance to cracking when the eggs are dropped in the host nest. The cuckoo egg hatches earlier than the host's, and the cuckoo chick grows faster; in most cases the chick evicts the eggs or young of the host species. The chick has no time to learn this behavior, so it must be an instinct passed on genetically. The chick encourages the host to keep pace with its high growth rate with its rapid begging call and the chick's open mouth which serves as a sign stimulus.

Female parasitic cuckoos specialize and lay eggs that closely resemble the eggs of their chosen host. This has been produced by natural selection, as some birds are able to distinguish cuckoo eggs from their own, leading to those eggs least like the host's being thrown out of the nest. Host species may engage in more direct action to prevent cuckoos laying eggs in their nest in the first place – birds whose nests are at high risk of cuckoo-contamination are known to mob cuckoos to drive them out of the area. Parasitic cuckoos are grouped into gentes, with each gens specializing in a particular host. There is some evidence that the gentes are genetically different from one another. Host specificity is enhanced by the need to imitate the eggs of the host.

**Calls**

Brush Cuckoo

Horsfield's Bronze Cuckoo, *Chrysococcyx basalis*

Common Hawk Cuckoo *Cuculus varius*- Immature in Hyderabad, India.

Channel-billed Cuckoo

Squirrel Cuckoo, *Piaya cayana*

Cuckoos are often highly secretive and in many cases best known for their wide repertoire of calls. Calls are usually relatively simple, resembling whistles, flutes, or hiccups. The calls are used in order to demonstrate ownership of a territory and to attract a mate. Within a species the calls are remarkably consistent across the range, even in species with very large ranges. This suggests, along with the fact that many species are not raised by their true parents, that the calls of cuckoos are innate and not learnt. Although cuckoos are diurnal, many species call at night. The cuckoo family gets its English and scientific names from the call of the Common Cuckoo, which is also familiar from cuckoo clocks. Some of the names of other species and genera are also derived from their calls, for example the koels of Asia and Australasia. In most cuckoos the calls are

distinctive to particular species, and are useful for identification. Several cryptic species are best identified on the basis of their calls.

## *Systematics*

**FAMILY CUCULIDAE**

- **Unassigned**
  - Genus *Dynamopterus* (fossil: Late Eocene/Early Oligocene of Caylus, Tarn-et-Garonne, France)
  - Genus *Cursoricoccyx* (fossil: Early Miocene of Logan County, USA) – Neomorphinae?
  - Cuculidae gen. et sp. indet. (fossil: Early Pliocene of Lee Creek Mine, USA
  - Genus *Nannococcyx* – Saint Helena Cuckoo (extinct)

- **Subfamily Cuculinae** – Brood-parasitic cuckoos
  - Genus *Eocuculus* (fossil: Late Eocene of Teller County, USA)
  - Genus *Clamator* (4 species)
  - Genus *Pachycoccyx* – Thick-billed Cuckoo
  - Genus *Cuculus* – typical cuckoos (some 15 species)
  - Genus *Cercococcyx* – long-tailed cuckoos (3 species)
  - Genus *Cacomantis* (8 species)
  - Genus *Chrysococcyx* – bronze cuckoos (12 species)
  - Genus *Rhamphomantis* – Long-billed Cuckoo
  - Genus *Surniculus* – drongo-cuckoos (2 species)
  - Genus *Caliechthrus* – White-crowned Koel
  - Genus *Microdynamis* – Dwarf Koel
  - Genus *Eudynamys* – typical koels (2–5 species, one prehistoric)
  - Genus *Scythrops* – Channel-billed Cuckoo

- **Subfamily Phaenicophaeinae** – Malkohas and couas
  - Genus *Ceuthmochares*– Yellowbill
  - Genus *Phaenicophaeus* – malkohas (12 species)
  - Genus *Carpococcyx* – Asian ground-cuckoos (3 species)
  - Genus *Coua* – couas (9 living species, 1 recently extinct)

- **Subfamily Coccyzinae** – American cuckoos
  - Genus *Coccyzus* – includes *Saurothera* and *Hyetornis* (13 species)
  - Genus *Coccycua* – formerly in *Coccyzus* and *Piaya*, includes *Micrococcyx* (3 species)
  - Genus *Piaya* (2 species)

- **Subfamily Neomorphinae** – New World ground-cuckoos
  - Genus *Neococcyx* (fossil: Early Oligocene of Central North America)
  - Genus *Tapera* – Striped Cuckoo

    - Genus *Dromococcyx* (2 species)
    - Genus *Morococcyx* – Lesser Ground-cuckoo
    - Genus *Geococcyx* – roadrunners (2 species)
    - Genus *Neomorphus* – Neotropical ground-cuckoos (5 species)

- **Subfamily Centropodinae** – Coucals
    - Genus *Centropus* (some 30 species)

- **Subfamily Crotophaginae** – Anis
    - Genus *Crotophaga* – true anis (3 species)
    - Genus *Guira* – Guira Cuckoo