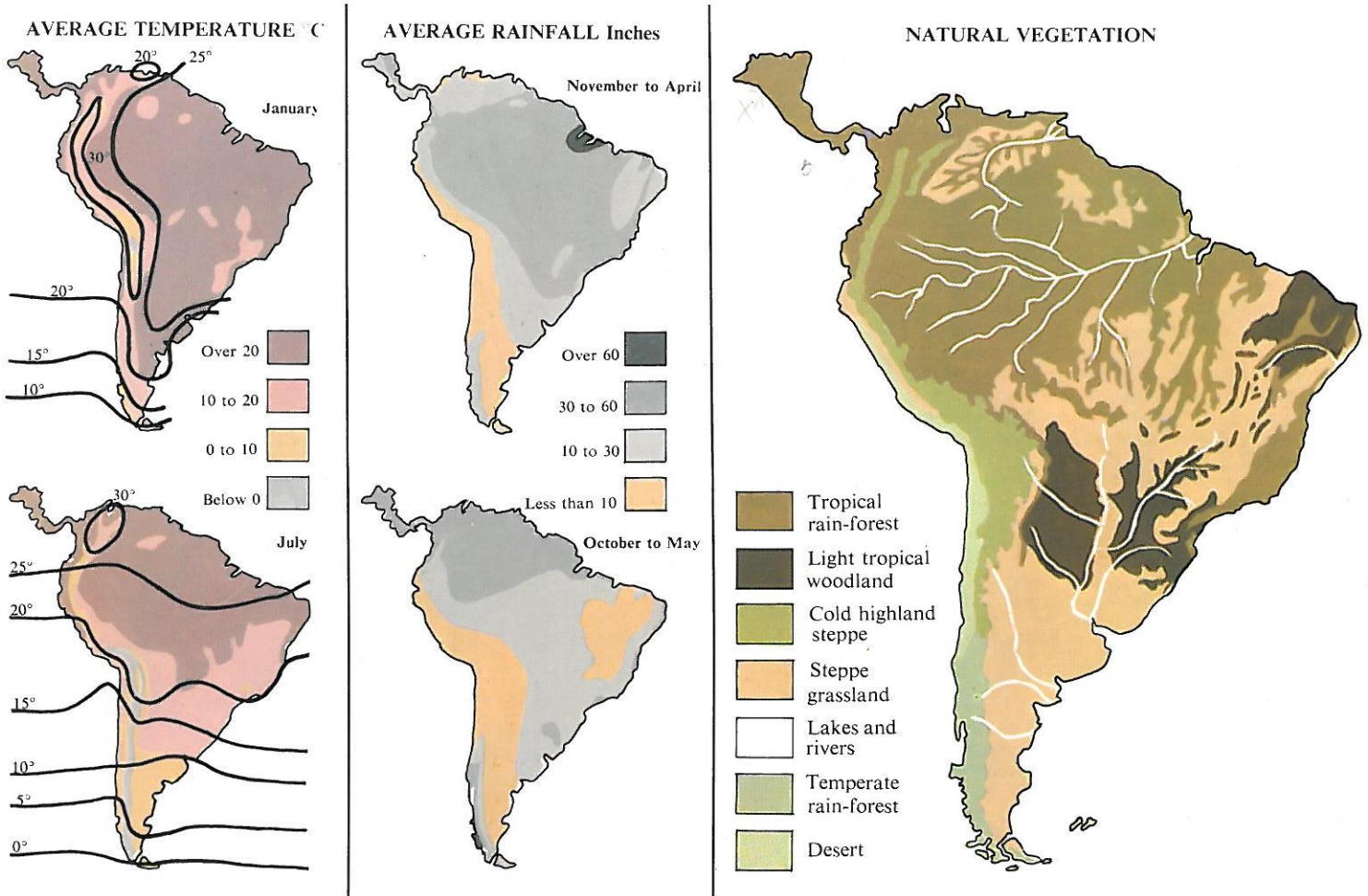
South America

The Neotropical Realm

Except for the intermittent formation and inundation of the fragile Panamanian land-bridge, South America has remained isolated throughout the greater part of its history and has developed an avifauna that reflects both the isolation and the periodic influxes of migrant species from the north. Its geography is a catalogue of superlatives. The rocky spine of the Andes reaches from north of the Equator almost to Antarctica; in the north, tropical forests of unequalled size and luxuriance clothe the heart of the continent, fed by the greatest of all river systems – the Amazon. Vast open grassland regions flank the forests, *llanos* in the north and *pampas* to the south of the Amazon Basin, and, farther south still, the continent tapers to a narrow ice-clad promontory surrounded by the cold waters of the southern oceans.

A wealth of benign lowland habitats supports the world's richest and most varied avifauna. Some 3,000 species are indigenous to the region, a total unequalled on any other continent, and every year the Neotropical realm is host to millions of visitors retreating from the cold winter of the Northern Hemisphere.



BIRDS ILLUSTRATED

1 Scarlet Ibis
Eudocimus ruber

2 Crimson Topaz Hummingbird
Topaza pella

3 Blue-backed Manakin
Chiroxiphia ~~parvola~~

4 Toco Toucan
Ramphastos toco

5 Blue-and-yellow Macaw
Ara ararauna

6 Guanay Cormorant
Phalacrocorax bougainvillii

7 Buffy-browed Guan
Penelope superciliaris

8 Andean Condor
Vultur gryphus

9 Frilled Coquette Hummingbird
Lophornis delattrei

10 Greater Rhea
Rhea americana

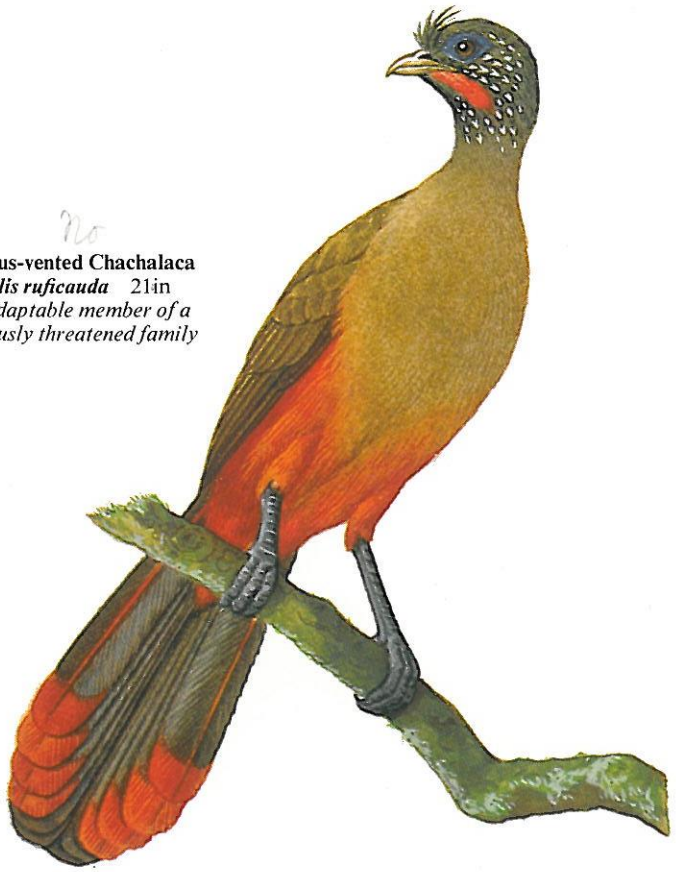
11 Magellanic Penguin
Spheniscus magellanicus

Light Tropical Woodland

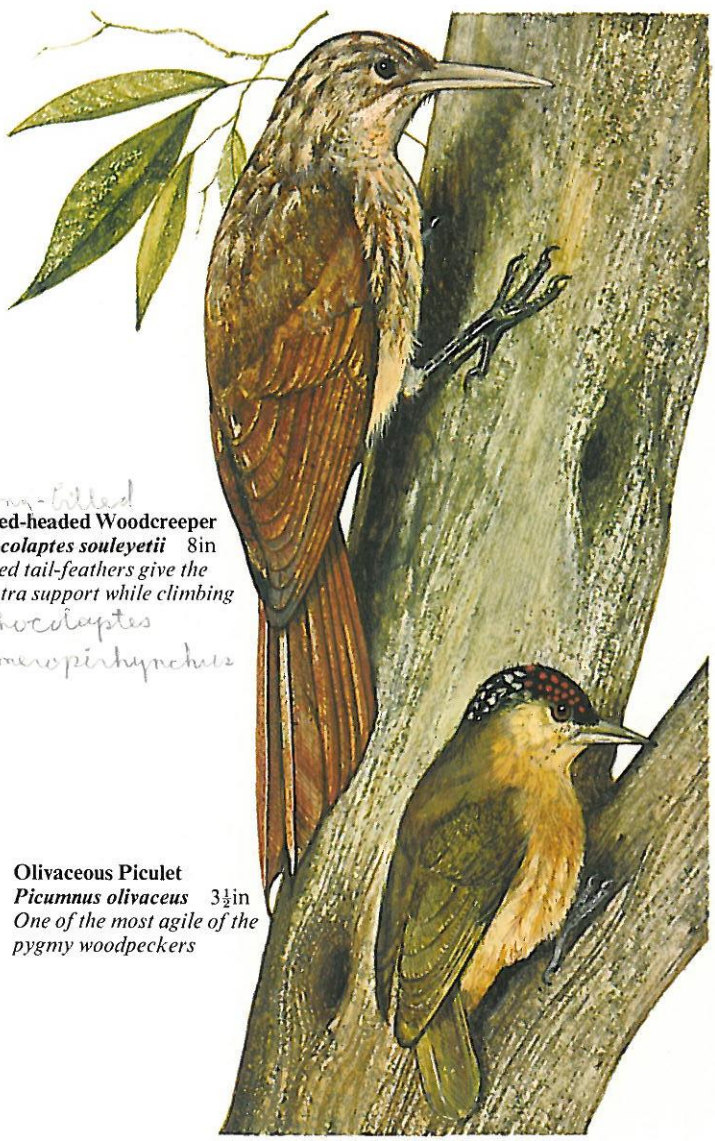
Forming an intermediate zone between the dense tropical rain-forest and the arid wastes of desert and scrub, the light tropical woodlands are characteristic of areas with poor soils and a prolonged dry season. The trees are generally much smaller than those of the rain-forest; the largest, with massive trunks, tending to spread their branches wide instead of soaring upward. Many trees and shrubs, including the abundant short, stout palms, are thorny and the vegetation is typically festooned with straggling shrubbery and slender vines making an impenetrable tangled mass.

Verdant in the rainy season – often a time of frequent deluges – these woods may become almost leafless in the dry season when many of the trees flower – bursting into a colourful profusion of white, yellow, pink and lavender blossom. As the season advances, seedpods burst under the blazing sun and drought-resistant epiphytes proliferate on leafless boughs, which become fantastically draped with long grey streamers of "Spanish moss", *Tillandsia usneoides*.

Although they are easier to observe, and therefore seem more abundant, far fewer birds are found here than in the food-rich rain-forest. Only hardy, catholic feeders can accommodate to a life in these regions of prolonged drought and sparse food supply, and large hunting and scavenging birds such as hawks, caracaras, chachalacas and parrots are the most common species.



Rufous-vented Chachalaca
Ortalis ruficauda 21in
An adaptable member of a seriously threatened family



Streaked-headed Woodcreeper
Lepidocolaptes souleyetii 8in
Stiffened tail-feathers give the bird extra support while climbing

Olivaceous Piculet
Picumnus olivaceus 3½in
One of the most agile of the pygmy woodpeckers

Rufous-vented Chachalaca
Ortalis ruficauda

The loud harsh cries of the Rufous-vented Chachalaca are heard throughout South America's woodlands. Stirring choruses surge back and forth as group after group joins in the cry "guacharaca – guacharaca" – the bird's Venezuelan name.

Chachalacas live in loose flocks, feeding on fruits, tender leaves and shoots which they gather as they walk gracefully among high, thin branches. The bulky, open nest of twigs, grass and sometimes green leaves is usually placed in a bush, and in it the female alone incubates her three white, unusually rough-shelled eggs.

Although many members of the guan family face extinction through hunting and the destruction of their rain-forest habitats, the chachalaca, who thrives in scrub and light woodland, may yet survive, even in agricultural regions, if prompt measures are taken to ensure its protection.

Streaked-headed Woodcreeper
Lepidocolaptes souleyetii

Insects, spiders and occasional small lizards and frogs form the main diet of the 60 species of woodcreeper inhabiting the mainland of tropical America.

Supporting themselves with the sharp, incurved tips of their stiff tail feathers, the woodcreepers run up the trunks of trees and along branches, prying into crevices and lifting up patches of moss or lichen in search of food. Unlike other species that inhabit the dense forests, the Streaked-headed Woodcreeper favours the forest edge, light woodland and scrub regions.

The male and female call to each other with clear musical trills while foraging, but at nightfall each retires alone into a sheltered tree-hole. During the mating season the birds seek out an obscure cranny into which they carry flakes of stiff bark. The female lays two eggs on this mat of bark fragments and incubates them with some, though rather inconsistent, help from her mate. Both parents feed the young, carrying insects one at a time to the ever-hungry nestlings.

Olivaceous Piculet
Picumnus olivaceus

Scampering about among slender dead branches high in the trees, this agile pygmy woodpecker has (unlike its larger relatives) no need to use its tail as additional support as it probes and digs under the bark for the ants that constitute the bulk of its diet.

In the mating season the male and female work in turn to carve out a neat cavity in the soft wood of a decaying tree or fence post, leaving a smoothly rounded doorway less than an inch in diameter. The female lays her two or three tiny, pure-white eggs on a bed of fine wood-chips at the bottom of the chamber and both sexes share the 14-day incubation.

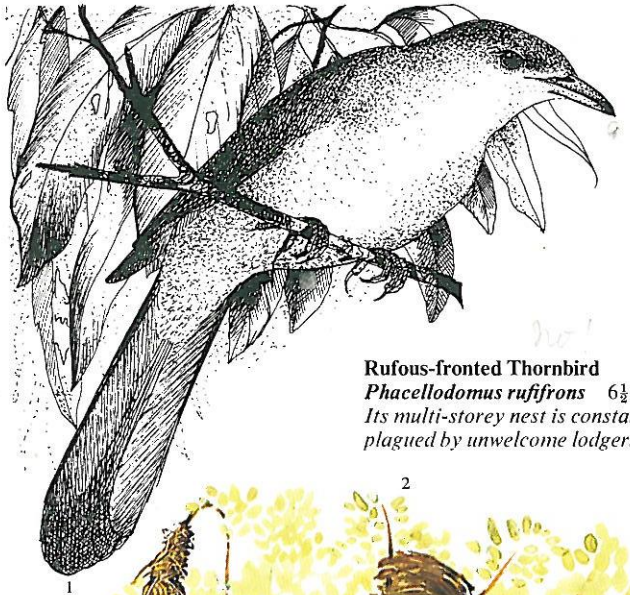
The nestlings are naked and blind at birth and are fed on the larvae and pupae of ants. The young are able to fly after 24 days, but are led back to the nest each night – the whole family remaining together for several months and moving to a larger cavity if overcrowding becomes a problem.

Master-builders of the woodlands

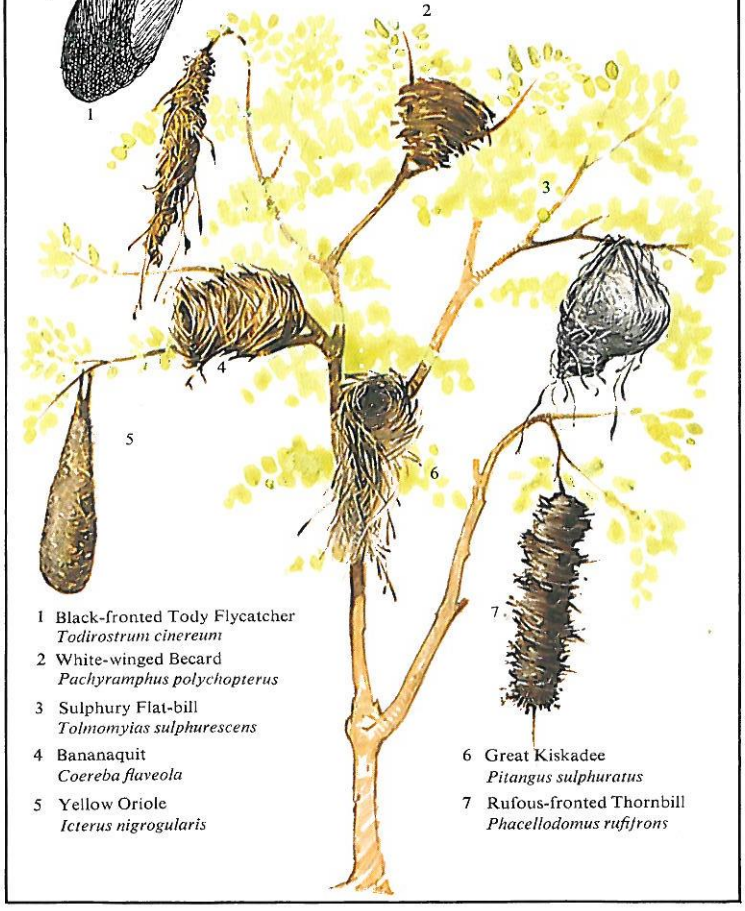
In response to the mild summer climate and the relatively short breeding season available to them, most temperate-zone birds build simple open cup-nests. By contrast, their tropical relatives, who have a much longer breeding season, are able to build elaborate covered and hanging nests that protect their vulnerable eggs and young from the blazing sun and torrential rains.

Covered nests, supported from below, vary from the neatly woven pockets of the wrens to the massive structures of interlaced twigs built by some of the thornbirds. Pendent nests may be huge, intricately woven pouches suspended high above ground, like those of the New World orioles and their larger relatives the oropendolas. Less beautiful – but probably no less efficient – are the tangled structures built by the American flycatchers, whose short, thick bills are poor instruments for such delicate work as weaving.

The safety of the occupants depends more on inaccessibility than concealment. Tree-snakes have been seen to fall while trying to enter the downward-facing entrances of retort-shaped nests, and many birds build close to a wild wasps' nest for protection. The wasps will attack an intruder but seldom disturb the birds. Yet no bird has discovered an infallible method of protecting its offspring, and even the elaborate thornbirds nests are often plundered.



Rufous-fronted Thornbird
Phacellodomus rufifrons 6½in
Its multi-storey nest is constantly plagued by unwelcome lodgers



1 Black-fronted Tody Flycatcher
Todirostrum cinereum
2 White-winged Becard
Pachyramphus polychopterus
3 Sulphury Flat-bill
Tolmomyias sulphurescens
4 Bananaquit
Coereba flaveola
5 Yellow Oriole
Icterus nigrogularis
6 Great Kiskadee
Pitangus sulphuratus
7 Rufous-fronted Thornbill
Phacellodomus rufifrons

Common Potoo
Nyctibius griseus 15in
Distorts its body as an aid to concealment

Rufous-fronted Thornbird
Phacellodomus rufifrons

Throughout the savannas and light woodlands the conspicuous, bulky nests of the Rufous-fronted Thornbird may be seen hanging from slender branches and vines up to 75 feet above the ground.

Varying from 15 inches to, occasionally, seven feet in height, the complex nest of interlaced twigs may contain up to eight individual chambers, each with its own entrance. Only one resident family breeds in the nest, but unrelated, homeless thornbirds may forcibly intrude as lodgers at nightfall. The commodious structures are coveted by a number of other species, some of which – like the Troupial – will forcibly evict the weaker thornbirds and take over the whole nest.

The female adopts one compartment as a brood-chamber and lays three eggs on a bed of vegetation and rubbish – sharing the 17-day incubation with the male. The young leave the nest after three weeks, but are escorted back each night to roost with the parents. Two broods are raised each season, and the family group usually consists of the parents, young chicks and older siblings.

Common Potoo
Nyctibius griseus

The plaintive cry of this strange relative of the nightjars can be heard on any moonlit night in the woodlands of tropical America.

By day the potoo drowses motionless on an elevated perch, but if an intruder approaches, this remarkable bird is able to elongate and flatten its normally short, stout body to such an extent that, with its great yellow eyes closed, it merges almost invisibly into the branch on which it rests.

The female lays her single large egg in a precariously shallow hollow in the top of a tree-stump or in a knot-hole in a branch. Male and female take turns incubating the egg; one sitting by day, the other by night. The egg is left unattended for only an hour or so each night, when both parents leave the nest to forage for flying insects.

The nestling potoo – hatched with a dense covering of white down – remains in the nest for 50 days and is fed each night on pellets of compressed insects. By the time it is half-grown the chick will adopt the cryptic concealment posture whenever it senses approaching danger.

Tropical Rain-forest

More than two and a half million square miles of South America are clothed by the world's largest, yet least-explored rain-forest, the *hylaea amazonica*.

The characteristic features of the rain-forest are constant; an evergreen canopy more than 100 feet high with scattered giants towering above it; a bewildering number of tree species growing in mixed stands; palms soaring aloft to spread their feathered fronds near the canopy; and everywhere, lianas draped in heavy loops and coiled round branches laden with epiphytic orchids, ferns, bromeliads and lichens. The heavier the forest, the more open is the undergrowth of shrubs, small spiny palms and ferns that thrive in the subdued light of the lower levels.

Brilliantly coloured birds like the tanagers, toucans, honeycreepers and macaws throng the well-lighted upper levels, while the dim, shadowy world at ground level is home to a variety of dull-coloured birds, including the ovenbirds, wrens, antbirds and manakins.

The Amazon forest alone supports more than 600 species of birds, many as yet not studied in detail, but sadly this last great wilderness of majestic trees and rich avian life is being broached as bulldozers carve out the track of the Trans-amazonica Highway – disturbing the ecology of the forest and threatening the extinction of hundreds of species.

Right: The light-dappled canopy of the Amazon rain-forest

Great Tinamou
Tinamus major

One of the most characteristic sounds of the South American rain-forest is the whirr of wingbeats as a large, stout bird, the Great Tinamou, erupts from the undergrowth and shoots out of sight between the tall well-spaced trunks.

As daylight fades this same bird may be heard to utter a deep cry that echoes through the forest like the notes of a great organ.

The Great Tinamou, a quail-like game-bird, is one of 40 members of the family Tinamidae that inhabit forests, thickets and grasslands from Mexico to Patagonia. Ground-dwelling and solitary, the members of this family lay some of the loveliest of all bird-eggs. Those of the Great Tinamou are a glossy bright blue and, like those of several related species, are laid on the ground to be incubated by the male alone.

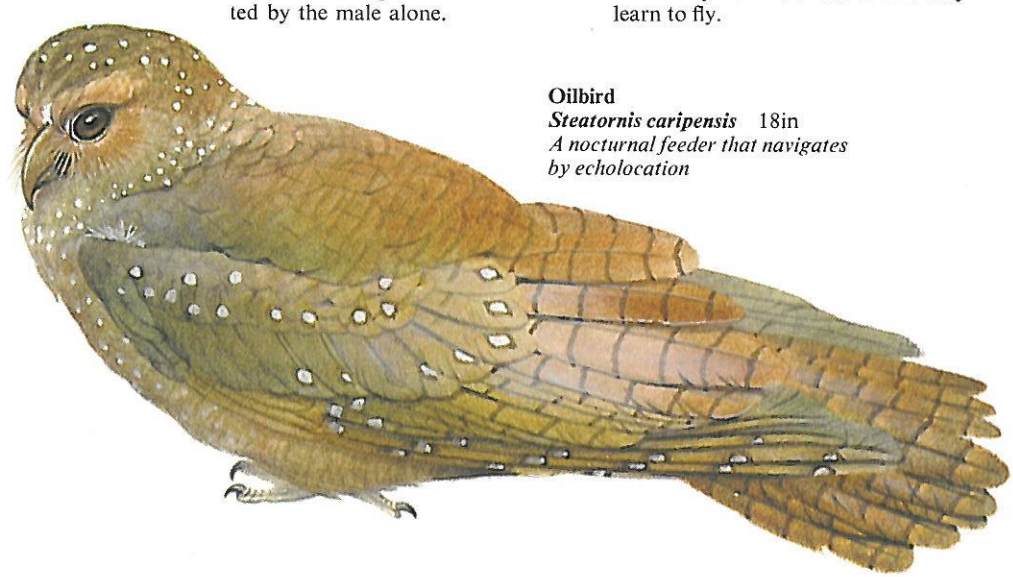
Oilbird
Steatornis caripensis

In the total darkness of a forest cave, a persistent chattering chorus may be the only clue to the presence, high in the cave roof, of a wheeling multitude of large dusky-brown birds.

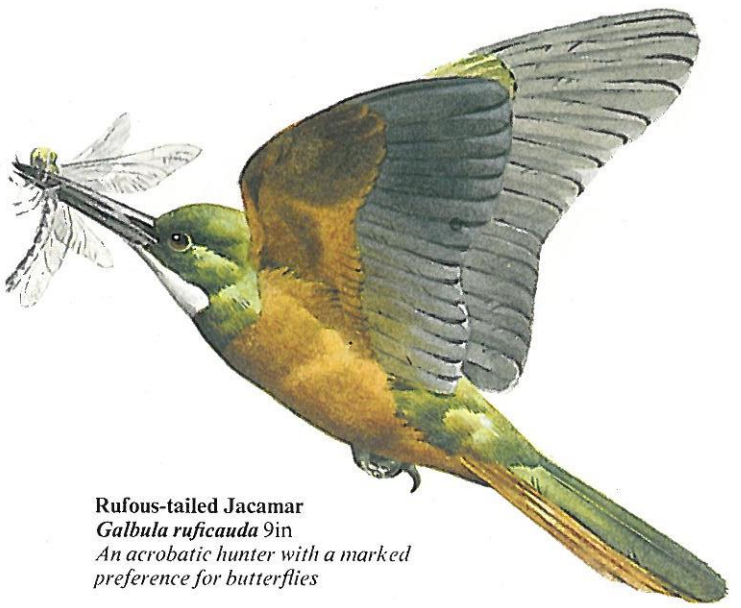
Like bats and some cave-swiftlets, Oilbirds navigate by echolocation, resting by day on ledges high in the cave, then streaming out into the gathering darkness to forage for food. They are superb fliers, "reading" the presence of obstacles from the echoes of their clicking calls. They feed on the single-seeded fruits of forest trees such as palms – plucking the fruit from the tree in mid flight and swallowing it whole.

The young, fed only on oily fruit, soon weigh 50 per cent more than the adults and must lose this excess weight during the three or four months spent in the nest before they learn to fly.

Great Tinamou
Tinamus major 18in
The rain-forest equivalent of the pheasant and partridge



Oilbird
Steatornis caripensis 18in
A nocturnal feeder that navigates by echolocation



Rufous-tailed Jacamar
Galbula ruficauda 9in
An acrobatic hunter with a marked preference for butterflies

Rufous-tailed Jacamar
Galbula ruficauda

The song of the Rufous-tailed Jacamar, long and melodious with ascending trills, is worthy of a true songbird. Reminiscent of a large hummingbird, it is the most widespread and adaptable of the 15 species of jacamar found on the mainland of tropical America.

Either singly or in pairs this species inhabits the more open parts of the rain-forest and the drier woodlands up to 3,000 feet above sea level. Perched on a low, exposed branch, the jacamar turns its head from side to side until it catches sight of a flying insect. Darting swiftly out, it seizes the victim with a snap of its long bill and returns to the perch, where, if the insect is large, the jacamar proceeds to beat it against the branch until the wings break off – a behaviour pattern very like that of some African bee-eaters (see Red-throated Bee-eater illustrated on p157).

Like other jacamars the Rufous-tailed catches many butterflies, including the spectacular tropical swallowtails, in addition to dragonflies and glittering beetles that abound in the forest vegetation.

The Rufous-tailed Jacamar builds its nest in a burrow driven into an earth bank, a large termite mound or into the mound of clay around the roots of a fallen tree. With bills that seem too delicate for such heavy work, both male and female tunnel into the hard clay – the male often singing to, and feeding his mate as they work.

On the bare floor of the burrow the female lays her two plain white eggs and incubates them herself every night. During the day both parents share the task, alternating at intervals of a few hours, throughout the 19- to 23-day incubation period.

The freshly hatched nestlings are totally blind and, surprisingly, are covered with copious long white down. The parents bring them insects one at a time and, as the young mature, they become very loquacious – repeating calls and little songs as they await the next meal. Although the nest is never cleaned, the young birds' plumage is always fresh when they leave the nest after 25 days to begin their independent life.

Blue-and-yellow Macaw
Ara ararauna

Few families can match the dazzling array of colour displayed by the Psittacidae – the 315-strong family of mainly tropical birds that includes the parrots, macaws, parakeets, cockatoos and lories. The largest and most colourful of the 111 South American species are the 14 macaws found in the dense tropical rain-forests.

Like its relatives, the Blue-and-yellow Macaw flies over the forest canopy either in pairs or in large flocks made up of birds flying in pairs. Occasionally trios are observed, consisting of parents and a mature offspring or a pair accompanied by an interloper in search of a mate. Viewed from above, as from an aircraft, they make an impressive sight – their brilliant blue upper plumage contrasting with the dark green backdrop of the forest. Despite their conspicuous vivid colours the birds also advertise their presence with loud, raucous shrieks.

Macaws feed almost exclusively on the fruits of forest trees and show a preference for the nutritious, oil-rich kernels of many of the hard-shelled species. Thick shell-cases and even the toughest skins are no match for the macaw's powerful bill, which is quite capable of clipping through the strong wire mesh of most bird-cages.

Unfortunately, despite the wide range of the Blue-and-yellow Macaw, no detailed studies have been made of its habits or behaviour. Information is scant, but close observation of related species suggests that it probably nests in holes high in the trees, laying a small clutch of white, smooth-shelled eggs.

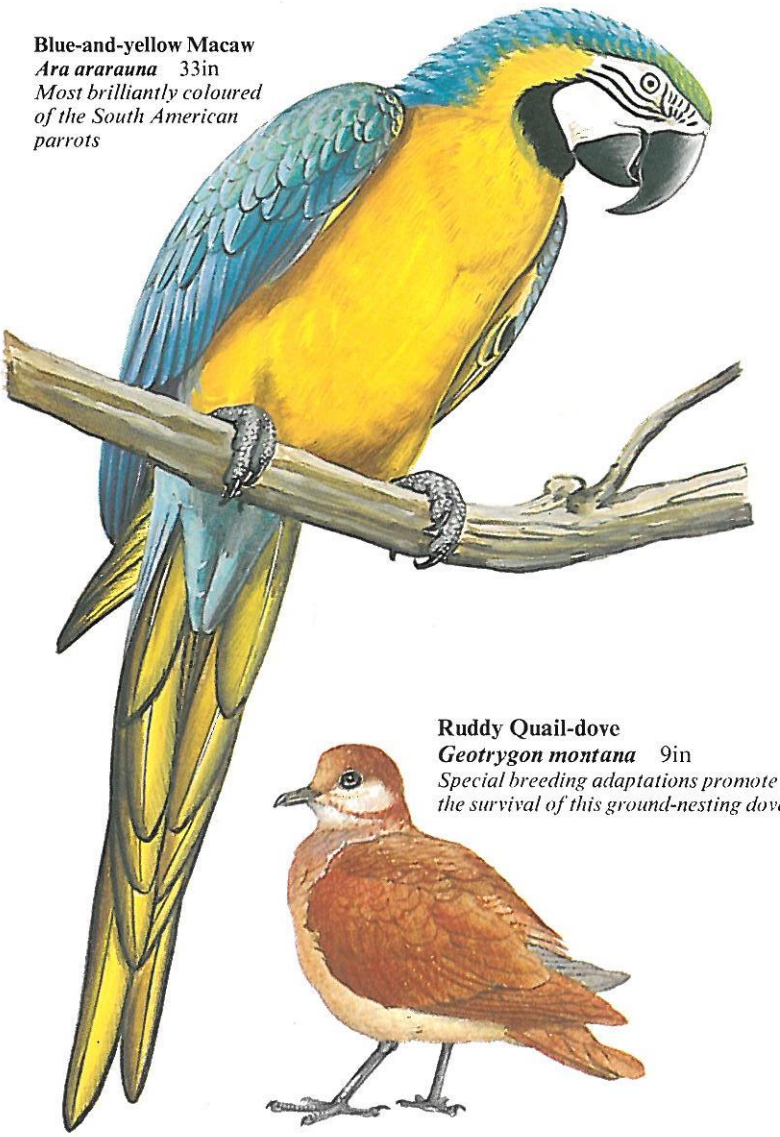
Ruddy Quail-dove
Geotrygon montana

Ranging from northern Argentina to Mexico and the West Indies, the Ruddy Quail-dove is one of the most widespread of South America's 45 pigeons.

With the curious head-bobbing gait characteristic of its family, the quail-dove forages over the leaf-littered forest floor in search of seeds and berries. A mated pair will often forage together – calling to each other intermittently with a low mournful cooing cry.

In contrast to the pure-white eggs of most pigeons, those laid by the Ruddy Quail-dove are a soft buff colour, ideally suited to the dim light of the forest, where egg-eating predators abound. The two inconspicuous eggs are laid in a flimsily built nest of coarse twigs and leaves, hidden low in a bush or on a tree stump amid dense foliage.

In common with all pigeons, the female quail-dove incubates the eggs throughout the night and is relieved by her mate at dawn – the male sitting through the day until late afternoon. The 11-day incubation is remarkably short for a pigeon and the young develop very quickly. The newly hatched nestlings are fed individually at first, but soon learn to feed simultaneously – one chick taking the regurgitated food from each side of the parent's bill. Feeds are quickly reduced from 22 per day to three or four sessions lasting about 25 minutes, and the young are able to walk at eight days old and fly well at ten. The camouflaged eggs, short incubation and rapid development of the young are all "survival" features developed over millions of years.



Blue-and-yellow Macaw
Ara ararauna 33in
Most brilliantly coloured of the South American parrots

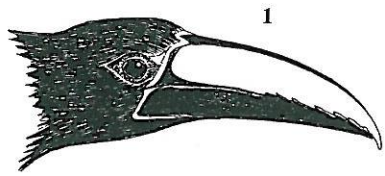
Ruddy Quail-dove
Geotrygon montana 9in
Special breeding adaptations promote the survival of this ground-nesting dove

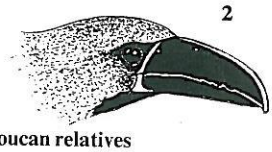
Tropical Rain-forest

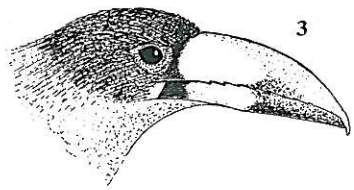
Most nests in the tropical forests of America contain only two eggs. Clutches of three eggs are less common; clutches of four are rare; and clutches of five or six are quite exceptional, even in birds whose young leave the nest and feed independently within a few days of hatching. Yet many of these birds have close relatives beyond the tropics that lay much larger clutches. What causes this "latitude effect" as it is called?

As one moves away from the Equator, the days of spring and summer, when most birds breed, become longer, and with a longer working day parents can bring more food to their young. This explanation assumes that tropical birds can only adequately feed small broods. One would then expect unaided females to raise fewer young than their neighbours whose mates share the task of feeding the young, and yet they successfully raise just as many.

Evidently the size of the brood has been adjusted by complex evolutionary processes, not to the ability of parents to feed their young, but to the need to replace natural losses. Recent studies show that small birds living in the tropics live very much longer than their relatives in higher latitudes who must undertake long and dangerous migrations every year to avoid the rigours and deprivations of winter and who must therefore raise large broods in order to maintain their numbers.







Toucan relatives

1 Black-necked Aracari
Pteroglossus aracari

2 Emerald Toucanet
Aulacorhynchus prasinus

3 Grey-breasted Mountain Toucan
Andigena hypoglauca

Keel-billed Toucan
Ramphastos sulfuratus 15in
Despite its size, the bill is light and capable of delicate manipulation

Golden-collared Manakin
Manacus vitellinus 4in
Gaudy bachelor with an impressive display

Bicoloured Antbird
Gymnopithys bicolor 5½in
Hunts in the wake of marching army ants

Golden-collared Manakin
Manacus vitellinus

The contrast between the rich and varied colours of the male manakin birds and their dull olive and green female counterparts plays a vitally important role in their breeding behaviour.

As far as is known, manakins never form pairs but in several species the males gather together in "leks", or courtship assemblies, in order to attract the females to mate.

The male Golden-collared Manakin chooses a spot among light undergrowth and, with meticulous care, removes all leaves and litter from a patch of ground between two or more slender upright stems. Above this display "court" he leaps back and forth between the uprights and with each jump makes a loud sharp *snap* with his modified wing-feathers. Several males may display in close proximity without interfering or intruding on each other's "courts".

An interested female will come and join one of the males in his dance – the two birds passing in mid-air as they leap back and forth. If copulation occurs, the female leaves to build a small, open nest, lay her two eggs, incubate them and raise the young all by herself.

The 60 or so species of manakins are all small, stout berry- and insect-eating birds and are found only in tropical America and the nearby offshore islands.

Keel-billed Toucan
Ramphastos sulfuratus

The 43 species of the toucan family (Ramphastidae) inhabit the woodlands of America from Mexico to northern Argentina. Most of them, including the larger toucans, *Ramphastos* sp, and the medium-sized aracaris, *Pteroglossus* sp, inhabit the warm lowland forests but the small green toucanets, *aulacorhynchus* sp, and the montane *Andigena* species range into the cooler heights of the temperate hill zones.

Their huge, brightly-coloured bills are remarkably light in construction but little is understood of their significance. They may serve as recognition symbols between members of the various species and probably play some part in courtship display. The length of the bill does help the toucan when reaching out for the fruits that form a major part of its diet, but this alone would not account for its size and bright colour. Nor does the bill function as a weapon, although it is used to intimidate smaller birds whose nests the toucan sometimes plunders.

Both parents share the 16-day incubation of their two to four white eggs. The naked, pink-skinned nestlings develop very slowly and do not leave the nest until they are six or seven weeks old.

Bicoloured Antbird
Gymnopithys bicolor

Though they lack the brilliant colours of many tropical species, the 231 members of the antbird family are among the most attractive forest birds – their subtle plumage of black, white, brown, olive and rufous tones fitting them perfectly for a life spent foraging in the dim, twilight interior of the tropical rain-forest.

Antbirds are gregarious by nature and members of several species may gather together in mixed flocks – wandering through the lower levels of the forest in search of food. In any such gathering the Bicoloured Antbird is the most voluble and conspicuous member – its enthusiastic, if hardly musical, song often disclosing the presence of an otherwise quiet and unobtrusive flock. All antbirds live on a diet of insects and other small invertebrates and only very rarely is the diet supplemented with fruit.

The Bicoloured Antbird is one of a small group of species that have developed a highly refined hunting technique. Following in the track of a moving swarm of army ants, they prey on the insects, beetles and other small creatures driven out of the leaf-litter by the passage of the marching column. In common with many other antbirds, the male *G. bicolor* often presents his mate with a particularly choice insect – a behaviour pattern that probably serves to strengthen the pair-bond between the two birds.

The nest is usually built in the hollow, broken-off stump of a fallen palm, rarely more than a few feet above ground level and unobstructed by vegetation. Here, on a pad of leaf-fragments, the female lays the two heavily-marked eggs that are characteristic of all members of the family.

Harpy Eagle
Harpia harpyja

The handsomely barred and crested Harpy Eagle occupies the highest position in the forest food-chain, preying on all other birds and a wide variety of mammals including monkeys, sloths, agoutis, coatimundis and porcupines.

Weighing up to 16 pounds, the Harpy is one of the most powerful of all eagles and, like any large predator, it requires a large territory in which to hunt. Its population density is so low that nests are seldom seen and few have been studied in detail. The huge, untidy construction is usually placed high in the fork of a giant silk-cotton tree projecting above the level of the forest canopy.

A single chick is raised in alternate years and the young eagle is fed by the parents until it is at least nine months old and able to fly well.

White-fronted Nunbird
Monasa morphoeus 11½in

Aerobatic hunters

The sombre plumage of the White-fronted Nunbird is relieved only by the white facial ruff at the base of its vivid orange-red bill. Like the 31 other species of the tropical American puffbird family, the Nunbird appears to take only animal food – chiefly insects and other small invertebrates with occasional frogs and lizards.

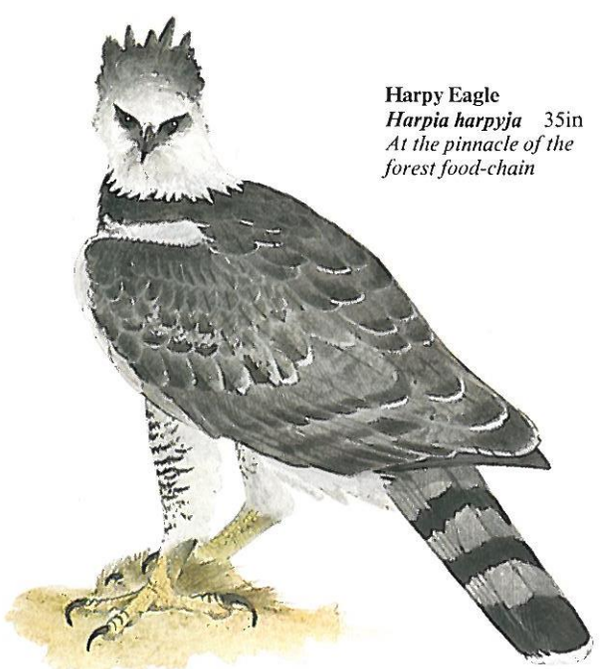
Confined to the warm and humid lowland forests, the White-fronted Nunbird hunts by perching in apparent lethargy until its acute sight detects a suitable target – perhaps a green insect amid green foliage more than 20 yards away. The prey is snatched from its perch in a darting flight that carries the Nunbird back to its own perch without pause.

The Nunbird nests in a long tunnel driven into level or gently sloping ground. The entrance is disguised by a collar of dead leaves and twigs and the nest chamber at the inner end is thickly lined with a carpet of dead leaves. The eggs have never been seen, but are probably white and unmarked as in other closely related species. Up to three nestlings are hatched – blind and completely naked and with prominent callous pads on the heels which are thought to protect the young bird's feet from chaffing against the lining of the nest-chamber.

Each nest is attended by three or four adult birds, the parents and the mature young of the previous brood, but food is seldom taken into the nest. Instead, the adult alights at the entrance to the nest and gives a characteristic call at which the young, even though blind and barely able to move, will grope their way along the five-foot burrow to seize the food from the donor's bill.

Sometimes the nest is found and totally destroyed by a powerfully-clawed mammal such as the tayra, but the attendant adults will continue to bring food for days – plaintively calling at the mouth of the shattered nest.

If all goes well the young fly from the nest when four weeks old, soaring instinctively upwards to perch high in the forest canopy. The young birds soon learn to take their food in a far more spectacular manner that prepares them for adult life. Instead of carrying food to the young, the adult perches up to 100 feet away, holding an insect or lizard in its bill and uttering the feeding call. The young bird swoops from its perch and snatches the food from the parent's bill, without alighting, in a perfect rehearsal of the adult hunting flight.



Harpy Eagle
Harpia harpyja 35in
At the pinnacle of the forest food-chain

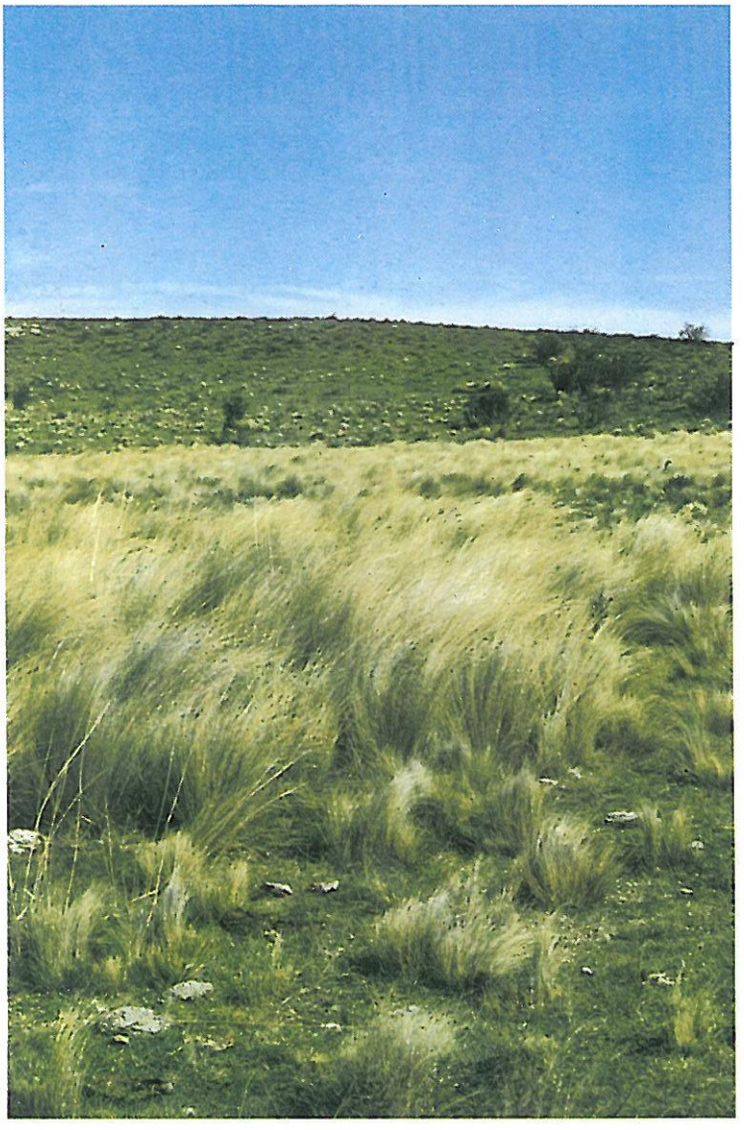
Pampas and Llanos

Despite the ravages of modern farming and large-scale cattle ranching, the vast, seemingly endless, expanse of the Argentinian *pampas* remains one of the most impressive sights in this continent of extremes. Alternately parched by drought and flooded by torrential rains, swept by dust-storms in summer and cold gales in winter, the *pampas* is an inhospitable landscape – yet it supports a multitude of birds including the Greater Rhea, the Maguari Stork, the Southern Screamer and the Red-winged Tinamou.

Scarcely less famous are the *llanos* of Venezuela, which are also subject to extremes of climate as the stiflingly hot dry season alternates with the violent tropical thunderstorms of the wet. The *llanos* are less uniformly treeless than the older *pampas* regions and were the first vegetation zones to be called "savanna". The term is now used widely to describe any natural region of grassland diversified by scattered shrubs and deciduous trees growing singly or in open groves.

The savanna regions and the heavier gallery forest of the *caños* and water-courses are also home to many of South America's large and impressive birds. Buff-necked Ibises, Southern Lapwings, Caracaras and Great Black Hawks range the open grasslands while the wetter areas teem with flocks of Black-bellied Tree-ducks and stalking Jabiru.

Below: Scrub grassland of the Patagonian steppe



Least Seedsnipe
Thinocorus rumicivorus 7½in
The tidy hen removes every shell-fragment from the nest to avoid attracting predators

Least Seedsnipe
Thinocorus rumicivorus

The four seedsnipe species of the Neotropical Realm are relatives of the plovers and sandpipers and share with them an erratic, zigzag climbing flight and rasping cry. Confined to South America, but ranging throughout its length, the seedsnipes are partly migratory – flocking down from the bleak Andean heights in Ecuador and moving north from chilly Tierra del Fuego to Argentina as winter sets in.

The Least Seedsnipe is a bird of the open country, preferring dry barren ground which it covers swiftly despite its short legs. It is exclusively vegetarian. Sparsely covered *pampas*, the fleshy plants of semi-desert areas, and the pickings of stubble fields provide the buds and leaves, shoots and seeds on which the bird depends for both solid food and water.

The nest is a shallow ground-scrape amid stunted plants or on completely barren ground and in it the female lays her four eggs – their soft colours camouflaged against the nest lining of vegetation and dry dung. Despite this protection, every time the female leaves the nest during the 26-day incubation she swiftly covers the eggs with the lining materials. This obsession does not end when the eggs hatch. Removing all trace of the broken shells (a habit shared with the sandpipers and other relatives), the female continues to try to cover the active young with grass or dust whenever danger threatens. An adult bird will leave the nest, feigning weakness or an injury such as a damaged wing, in order to distract an approaching predator.

Southern Screamer
Chauna torquata

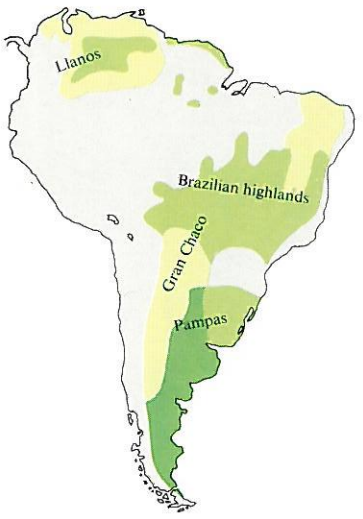
Well adapted to a life in open wet grasslands and marshes, the Screamer picks its way across floating vegetation on long, slightly webbed toes, feeding exclusively on aquatic plants, grasses and seeds.

This large goose-like bird has a laborious take-off that belies its aerial proficiency. Screamers will circle for hours, barely visible against the sky but easily identified by their strident calls, so well described by the "cha-ha" pronunciation of their American Indian name *cha-ja*. Though flocks combine in deafening chorus all year round, by day or night, grounded or airborne, pairs mate for life, and mated birds perform their own loud, ringing duets which carry for miles.

The three species of screamer are distinguished from all other birds by their pneumatic bones, long sharp spurs on the leading edge of each wing and the layer of tiny air cells underlying the whole skin surface. None of these peculiarities is fully understood, but the air-sacs and light bones may aid their soaring flight.

For all its community singing and gregarious behaviour the Screamer nests in isolation. The nest is a great pile of sticks and aquatic weeds standing a foot above the water of the marsh, or even afloat. A clutch of four to six white eggs is laid and the 42-day incubation is shared by both parents.

Easily tamed if taken from the nest when young, screamers become strongly attached to their "adopted" family and, because of their strident alarm calls, are frequently used as "watch-dogs" for domestic fowl.



Grassland and scrub

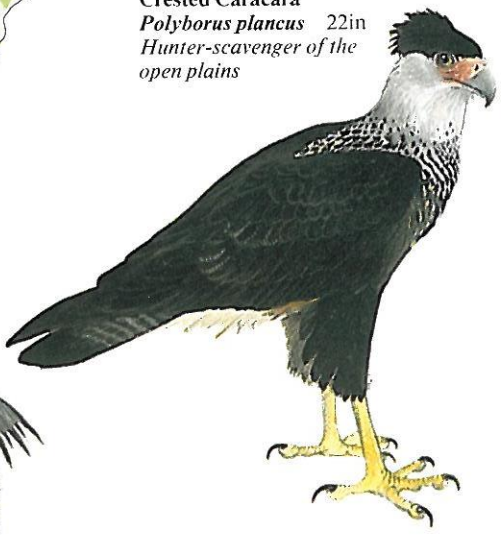
Types of grassland

Grassland

Savanna

Deciduous forest and scrub

Crested Caracara
Polyborus plancus 22in
Hunter-scavenger of the open plains



Southern Screamer
Chauna torquata 34in
A goose-like bird with surprising aerial skills

Crested Caracara
Polyborus plancus

Part predator and part scavenger this carrion-eating falcon pursues its distasteful life-style from southern Texas and Florida south to Tierra del Fuego.

Constantly on the lookout for sick or wounded birds and mammals, of any size, the Crested Caracara will operate either individually or as one of a group. Young sheep and goats are taken as soon as the adult's back is turned. Birds as large as the Great Egret, the White Ibis and the Southern Lapwing may be harassed over long distances by marauding caracaras, and flying pelicans are mobbed until they drop the food they are carrying. Lizards and snakes, young alligators and turtles, crabs, fishes, insects and palm-fruit – all form a part of the caracara's diet.

Avoiding rain-forest areas even when extensively cleared and cultivated, the Crested Caracara frequents more arid country, ranging across the savanna grasslands and treeless *pampas* with its characteristic head-bobbing walk. When foraging, the Caracara gives a dull, grunting call but, if the nest of a brooding pair is approached, the adults vibrate their bills to produce a loud rattle.

A favourite site for the large, untidy nest of coarse sticks and scavenged rubbish is the crown of a solitary palm, though any tall tree will suffice. On treeless *pampas* the Caracara builds its nest on the bare ground or chooses a mound rising above marshland.

The clutch of two or three variably-marked brown eggs is laid in the nest with little or no lining material and the 28-day incubation is shared by both the parents.

Greater Rhea
Rhea americana

Standing five feet tall and weighing more than 50 pounds, the flightless Greater Rhea ranges from the Brazilian *campo* south through *chaco* and steppe to the *pampas* of Argentina.

Although it may squat motionless when disturbed, the Greater Rhea can outrun a galloping horse. Sprinting on powerful, three-toed legs, the rhea flees with its neck outstretched and one wing raised high over its back like a small sail – twisting and turning abruptly to elude its pursuer.

Non-breeding rheas live in flocks of up to 30 birds, foraging over the open ground for roots, tender leaves, insects and occasionally small animals. The cock's loud, bellowing call heralds the start of the mating season. Rivals fight furiously with their necks entwined – circling round and round, biting and kicking until a trench is worn in the earth. After winning a harem of females, the cock selects a dry, sheltered spot and uproots the vegetation to create a depression. Lining the hollow with dry grass he repeatedly leads five or six chosen hens to the nest where they lay from 12 to 60 golden-yellow eggs measuring more than five inches long by three and a half in diameter.

The cock incubates the 20-ounce eggs alone for 35 to 40 days – repulsing even his own hens – and zealously guards the plaintively-whistling chicks throughout their growing period.

After five months' rapid growth the chicks attain adult size, but do not become sexually mature until they are two years old.

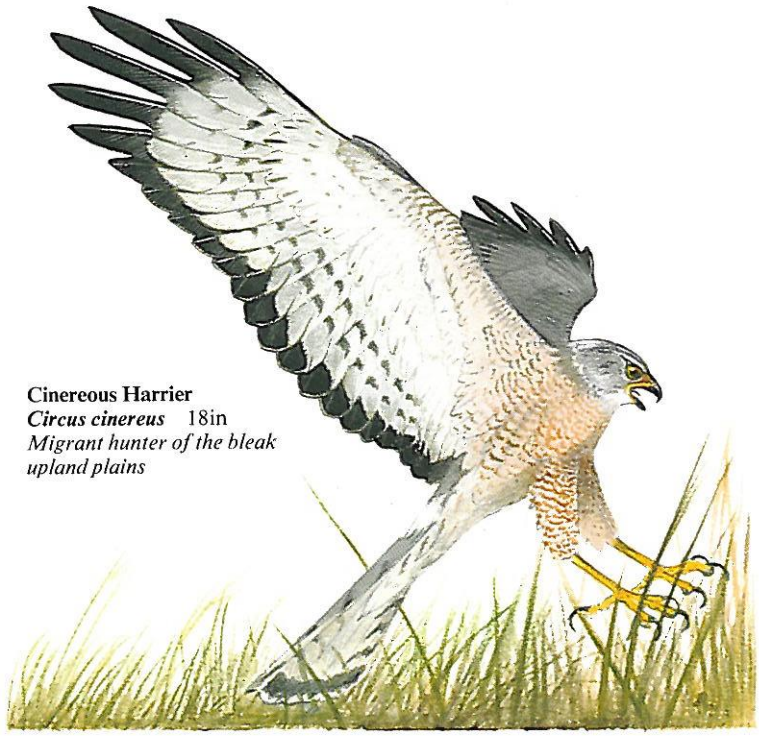
Greater Rhea
Rhea americana 52in
Flightless heavyweight that can outrun a galloping horse

Pampas and Llanos

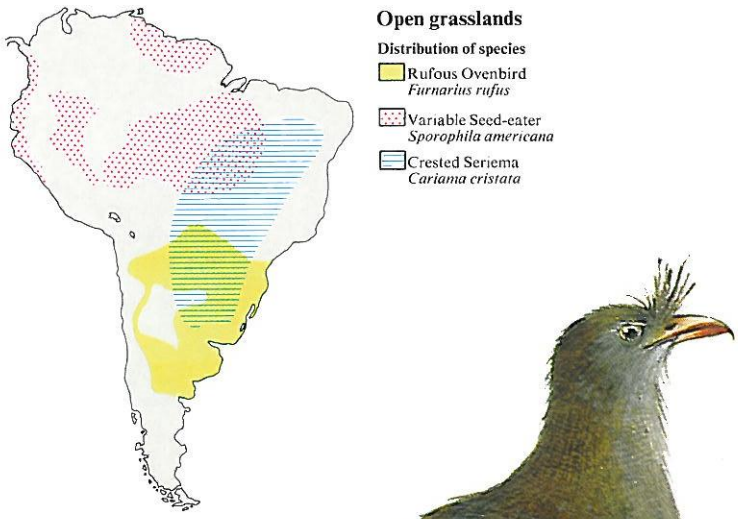
Many plants openly display brightly coloured fruits and berries as an inducement to animals and birds to eat them and so disseminate the seeds. Insects and other animals, by contrast, have no wish to be eaten and try to escape predation by means of camouflage, poisonous secretions, defensive armament or flight. Accordingly, even when the food of an insectivorous bird is abundant, it may still be hard to catch – or even to find.

Some birds overcome this difficulty by employing other animals to drive their prey out into the open. In addition to the Cattle Tyrant, both the Smooth-billed and the Groove-billed Anis follow grazing animals in order to catch grasshoppers and the thousands of small insects disturbed from the ground vegetation. The Cattle Egret, a bird of Old World origin which appeared in the Americas late in the last century, also forages in the company of herbivores. In woodland, where grazing animals are rare or absent, army ants perform the same service – their swarming legions attended by a motley crowd of birds, including manakins, woodcreepers, tinamous and occasionally hawks on the alert for small rodents and mammals.

Nor have birds been slow to benefit from man's labours. Swallows follow the tractor-drawn weed-cutters used to clear tropical pasture; gulls flock behind the plough, and urban birds reap the harvest exposed by lawn-mowers.



Cinereous Harrier
Circus cinereus 18in
Migrant hunter of the bleak upland plains



Crested Seriema
Cariama cristata 30in
Its line can be traced back more than 25 million years

Cinereous Harrier
Circus cinereus

The range of the Cinereous Harrier extends north from the bleak and windswept Falkland Islands to Paraguay and Brazil in the east and to the high, treeless regions of Ecuador and Colombia on the north-west coast. In the extreme south of its range this harrier is partly migratory – retreating northwards as the bitter cold of the sub-Antarctic winter grips the southern tip of the continent.

In Patagonia, the Cinereous Harrier is second only to the Chimango Caracara, *Milvago chimango*, in abundance and is a familiar resident of marshes and wet grassland regions. Soaring aloft with wings held in a characteristic deep "vee" configuration, *C. cinereus* sometimes takes small birds on the wing – a marked departure from the usual harrier hunting technique of an untidy attack on prey on the ground.

Crested Seriema
Cariama cristata

Seriemas are the sole survivors of a primitive group of giant ground-dwelling predatory birds that inhabited South America more than 25 million years ago. The two present-day species, related to the bustard family, are found only in the dry scrub grasslands between the Amazon rain-forest and the *pampas* of Argentina. Foraging in pairs or small groups, the Crested Seriema feeds on worms, snails, insects, fruit and small snakes, though, to its cost, it seems unable to distinguish between poisonous and harmless species.

When approached, the seriema ceases its usual loud calling and, if danger threatens, takes to its heels in a precipitate head-down scamper, bounding over the ground on its long legs and only taking to the air if hard-pressed.

After an energetic, bustard-like courtship display accompanied by shrill yelping calls, the birds construct a compact nest of sticks anywhere from ground level to ten feet up in a tree. The two white eggs, irregularly streaked with brown, are incubated for 26 days and the downy chicks remain in the nest until well advanced.

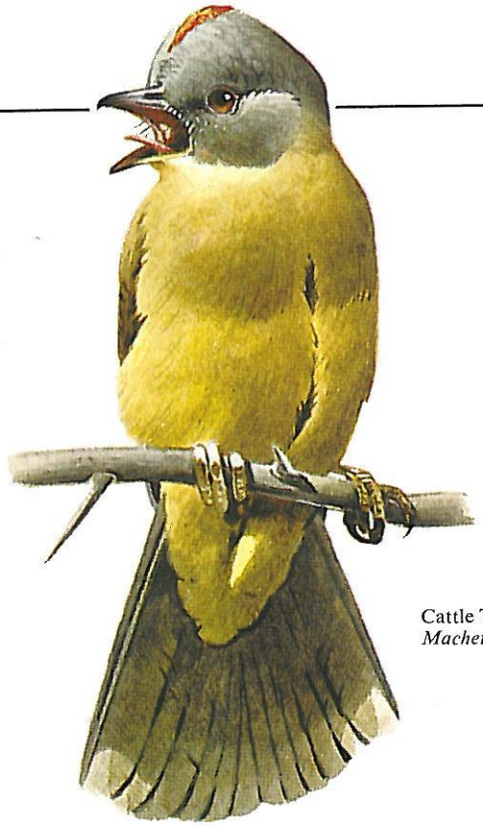
When raised with domestic fowl, seriemas make efficient guardians – screaming at the approach of danger and even killing intruding snakes.

Rufous Ovenbird
Furnarius rufus

Few families can boast the remarkable variety of nest architecture displayed by the 215 members of the Furnariidae. The nests range from bank burrows and tree-holes to elaborate stick mansions (see Rufous-fronted Thornbird), and from mossy globes suspended in trees to clay fortresses shaped like the traditional earthen baking oven.

The six species of ovenbirds, or horneros, are widespread in South America – in habitats as varied as tropical rain-forest and *pampas*.

Nest building begins in autumn and continues into the mild, wet days of winter when mud is readily available. Perched on a firm, exposed foundation such as a fencepost or horizontal tree-limb, the nine-pound nest – a foot or more in diameter – is built up of mud strengthened with



Cattle Tyrant
Machetornis rixosus 8in

Opportunist "horsemen" of the plains

More than 370 species, differing widely in appearance and behaviour, make up the flycatcher family Tyrannidae – the largest of the avian families confined to the New World. Minute or thrush-sized; aerial or ground-dwelling; migratory or sedentary – the flycatchers have a representative in virtually every lifestyle available to an insectivorous bird.

It is almost impossible to choose a "typical" flycatcher, but one of the most interesting is the Cattle Tyrant *Machetornis rixosus*, known in Venezuela as the Jinete, or "Horseman", because of its curious habit of riding all day on the back of a large quadruped. Throughout its vast range from the Caribbean to Argentina the Cattle Tyrant patronizes pigs, horses, cattle and even dogs – ever alert for flying insects and hopping from its perch when hungry to forage in the grass for insects disturbed by the grazing animal.

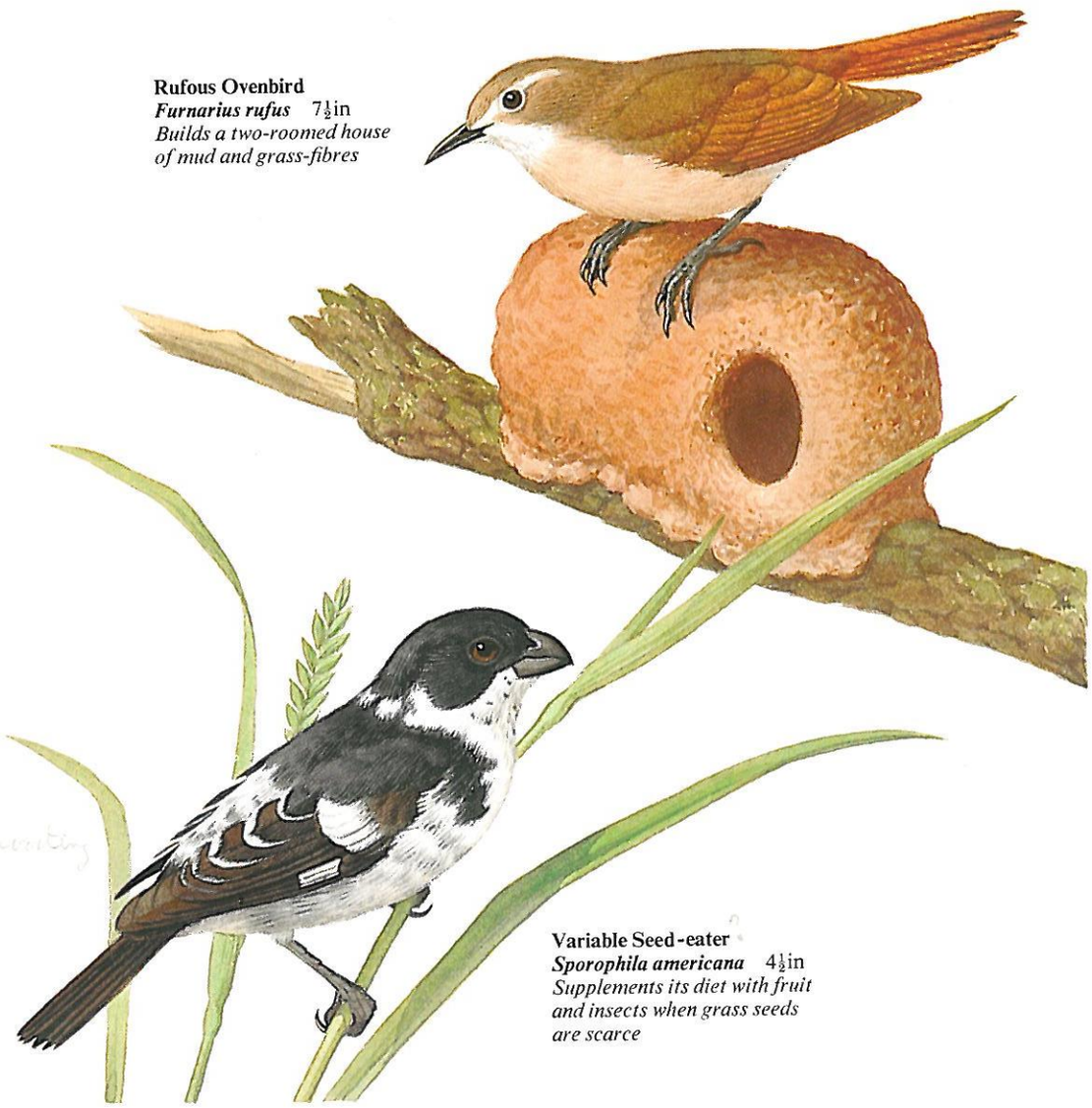
The Cattle Tyrant is a born opportunist. It has learned to follow men mowing the lawns of Venezuelan oil camps; to glean dead and injured insects from the windscreens of cars and to gather those attracted by house-lights at night. Its nesting habits are no less versatile. In Venezuela the Cattle Tyrant will place its bulky nest of woven grass under the eaves of a house. In Argentina it builds a nest of slender twigs and leaves in a tree-hole, or builds its nest into that of a larger bird. The great woven twig edifices of some of the horneros are often found to contain flycatcher "lodgers". The nest of Rufous-fronted Thornbirds and Firewood Gatherers are also favoured, and the Cattle Tyrant will fight fiercely against other species with similar nesting habits in order to secure a prime site.

The Cattle Tyrant is sedentary throughout its range, even as far south as Buenos Aires where many birds are at least partially migratory. Once mated, pairs of tyrants remain together for the whole year – their union strengthened by their frequent duets of loud, shrill, rapidly repeated song.

Like many other flycatchers, the Cattle Tyrant has an erectile crest of brilliantly coloured crown feathers which, when raised in the excitement of courtship, or in a dispute over food, flash their message in a brilliant burst of orange-crimson colour.

fibrous vegetation and animal hairs. A side entrance gives access to a small antechamber from which a narrow passage curves round the inner wall to the grass-lined nest-chamber in which the female lays her five small white eggs.

Rufous Ovenbird
Furnarius rufus 7½in
Builds a two-roomed house of mud and grass-fibres



Variable Seed-eater
Sporophila americana 4½in
Supplements its diet with fruit and insects when grass seeds are scarce

Variable Seed-eater
Sporophila americana

The aptly named Variable Seed-eater is one of 30 distinctive finches inhabiting grasslands and fields from southern Texas to Argentina. The males of this varied genus are clad in black and white, grey, rufous and chestnut plumage, but the females, in tones of olive and buff, are difficult to identify.

Perched on a swaying grass-stem the Variable Seed-eater grasps the ear with one foot and strips the seeds with the strong, short bill characteristic of seed-eating birds. When ripe grass-seeds are scarce it will turn to mistletoes and small-fruited shrubs – supplementing its diet with insects.

Food supply governs the breeding season and in Costa Rica the Variable Seed-eater nests much later than most passerines in order to coincide with the rains.

Variable Seed-eaters are gregarious birds, nesting close together in dense stands of sugar-cane or grass – often in the company of other small birds. The female alone builds the slight, though strong, cup-nest of dark fibres and incubates her clutch of two or three pale- or blue-grey speckled eggs. The male, characterized by his enthusiastic and richly varied song, helps to feed the nestlings on regurgitated seeds until they leave the nest at 14 days old.

The Food-web of the Forest

No habitat on earth has greater complexity than the tropical rain-forest. Trees exist in a great profusion of species, soaring upwards in their struggle for life-giving sunlight. Festooned in lianas, mosses, fungi and epiphytic plants whose air-roots require no soil, they provide a rich and varied source of food unaffected by seasonal change.

The dense and continuous mass of the forest canopy acts as a great collector of energy, absorbing the sun's radiation and fixing it, by photosynthesis, in leaves, flowers and fruits. Green plants are thus the prime producers of energy – the basic resource on which the whole interlocking structure of the forest ecosystem depends.

Countless millions of insects feed on the juices, stems and leaves of the forest. With fruit-eating birds like the macaws, pigeons, tanagers and wood-quail, and the nectar-sipping hummingbirds, they form the primary level of consumers – those wholly dependent on plant food. These in turn provide food for a second rank of consumers, the insectivores and other small predators. While many are indiscriminate in their choice of food, others are highly specialized. The swifts take insects in flight, high above the canopy; woodpeckers and scythebills feed on bark-insects; cuckoos take caterpillars, while the jacamars feed on venomous wasps. Hawks and owls patrol the forest by day and night, preying on reptiles, small birds and mammals of the primary level.

Dominating the food-web are the elite hunters of the tertiary level. Few in number and requiring vast areas over which to hunt, the major predators, like the Ornate Hawk Eagle, prey on all below them in the forest hierarchy.

In a severe habitat such as desert or tundra, feeding relationships often take the form of a simple chain (say, hawk-lizard-spider-ant), a vulnerable situation in which a shortage of one link-member may drastically upset the whole structure. No such danger threatens the forest residents: food is so abundant that every bird and mammal is presented with a wide choice of foods, transforming the simple vulnerable chain into a complex and flexible food-web.

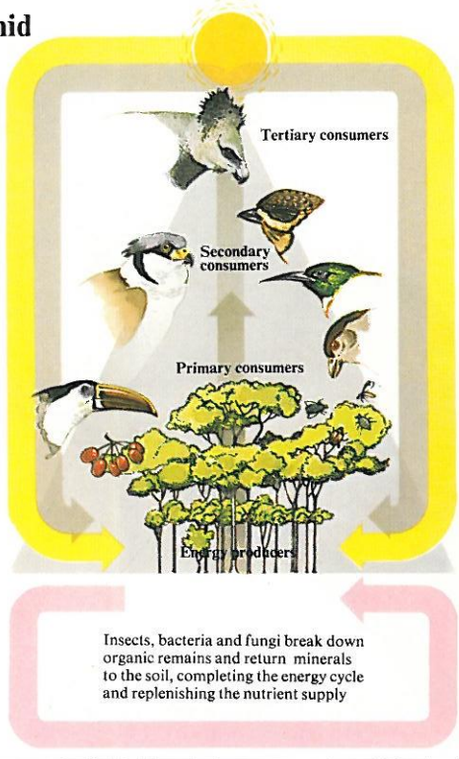
The energy pyramid

Tertiary consumers
Major predators occupy the highest level in the food-chain, taking their energy requirements from vegetarians and smaller carnivores alike

Secondary consumers
Insectivorous birds, omnivores and small predators like the Collared Falcon, form the middle links of the forest food-chain

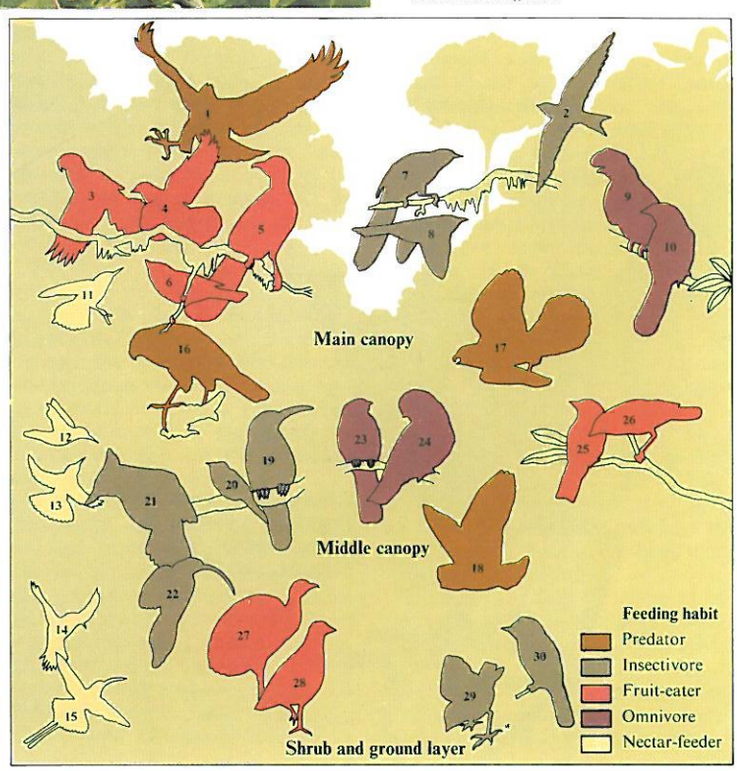
Primary consumers
Energy is first converted from plant to animal matter by the fruit and seed eaters that form the broad base of the food pyramid

Producers
All energy is initially derived from sunlight – converted into usable food by photosynthesis. On the huge mass of the forest vegetation depends the structure of one of natures most complex biomes



Birds illustrated

1 Crested Eagle
Morphnus guianensis
2 White-collared Swift
Streptoprocne zonaris
3 Hyacinth Macaw
Anodorhynchus hyacinthinus
4 Short-billed Pigeon
Columba nigrirostris
5 Blue-throated Piping Guan
Pipile pipile
6 Silver-throated Tanager
Tangara icterocephala
7 Squirrel Cuckoo
Piaya cayana
8 Rufous-browed Pepper-shrike
Cyclarhis gujanensis
9 Ornate Umbrella-bird
Cephalopterus ornatus
10 Cayanne Jay
Cyanocorax affinis
11 Black-eared Fairy
Heliothryx aurita
12 Fork-tailed Woodnymph
Thalurania furcata
13 Bronze-tailed Plumeleteer
Chalybura urochrysia
14 Band-tailed Barb-throat
Threnetes ruckeri
15 Long-tailed Hermit
Phaethornis superciliosus
16 Semicollared Hawk
Accipiter collaris
17 Collared Forest Falcon
Micrastur semitorquatus
18 Spectacled Owl
Pulsatrix perspicillata
19 Great Jacamar
Jacamerops aurea
20 Chestnut Woodpecker
21 *Celeus elegans*
22 Rufous-capped Spinetail
Synallaxis ruficapilla
23 Red-billed Scythebill
Campylorhamphus trochilirostris
24 Black-throated Trogon
Trogon rufus
25 Cock-of-the-rock
Rupicola rupicola
26 Red-capped Cardinal
Paroaria gularis
27 Brazilian Tanager
Ramphocelus bresilius
28 Grey-winged Trumpeter
Psophia crepitans
29 Marbled Wood-quail
Odontophorus gujanensis
30 Black-bellied Gnateater
Conopophaga melanogaster
Grey-throated Leaf-scraper
Sclerurus albigularis

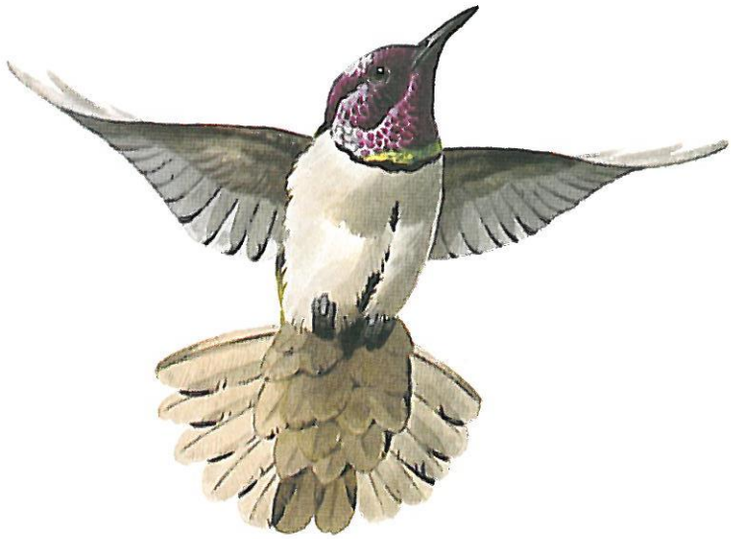


Puna and Páramo

To mention the mountains of South America is to evoke visions of the Andes – that towering rampart of rock stretching from the Equator to the icy waters of Cape Horn. Apart from the short Santa Marta range in Colombia, only the Andes have large areas of life-supporting land above the tree-line, which, in the equatorial Andes, varies from 10,500 to 12,500 feet above sea-level. Above the tree-line vast open spaces slope upwards to meet the perennially snow-capped peaks – high moorlands that are deceptively mild in fair weather but bleak and desolate when shrouded in chilling cloud and mist.

From Ecuador north to Costa Rica these high treeless solitudes are known as *páramos*, characterized by the hardy Frailjón, *Espeletia*, standing amid grasses and the colourful blooms of cushion plants and shrubs. Farther south, in Peru, the *páramo* gives way to the drier *puna* – open tussock-grass moorland that provides grazing for llama and alpaca. The tallest of the *puna* plants, up to 30 feet high, is the bromeliad *Puya raimondii*, whose sword-like leaves are armed with cruel spines.

Many birds are well adapted to withstand the harsh climate and restricted food supply of the cold montane regions, and the Andean lakes and torrents provide an isolated and protected home to some of the world's most beautiful and fascinating water-birds.



Andean Hillstar
Oreotrochilus estella 4½in
The high-altitude humming-bird of páramo and puna

Backbone of a continent

1 Cordillera Occidental
2 Cordillera Oriental
3 Sierra de Perija
4 Sierra de Merida
5 Pakaraima Mountains
6 Tumuc Mountains
7 Sierra Geral de Goias
8 Sierra do Espinhaco
9 Sierra do Mar

Unicoloured Tapaculo
Scytalopus unicolor 6in
Called "gallito" from its strutting cock-like walk

Unicoloured Tapaculo
Scytalopus unicolor

The Tapaculo is an exasperatingly elusive bird inhabiting the thorny scrub, cool mossy highlands and dank forests of southern Chile. A reluctant flier, it prefers to run or walk over the ground with its tail held high over its back – a habit that has earned some species the local name "gallito" or "little cock". Even the loud cry of this dull-coloured bird gives little clue to its whereabouts when it is foraging in dense cover.

The family name of the 29 species of tapaculo, *Rhinocryptidae*, refers to the peculiar flap of movable skin covering the bird's nostrils. Wren-sized to thrush-sized, they are found in montane habitats from Costa Rica to Cape Horn, some species occasionally venturing down into the warm lowland forest. Their food consists of larvae, mature insects and spiders gathered from the ground and from the scrub vegetation.

Tapaculos build a wide variety of nests. Some nest in burrows and others, more rarely, make use of hollow logs. Some species construct a domed nest of grass or twigs in the base of a thorn bush.

Two to four plain white eggs are laid, but little is known in detail of the Tapaculo's breeding behaviour. One authority was able to observe a nest of *S. unicolor* on the volcano Volcan Tungurahua in Ecuador. Both parents were seen carrying insects to the nest which consisted of a black ball of finely-woven moss-stems hidden in a narrow cleft in an earth bank and screened by a protective curtain of moss and *Selaginella* plants.

Andean Hillstar
Oreotrochilus estella

The hardy Andean Hillstar exhibits the perfect mastery of flight, the tiny body and the lavish ornamentation characteristic of the humming-bird family, Trochilidae.

Most of the 320 species of humming-birds are resident in the tropics – from lowland rainforest and desert to the high reaches of the snow-capped Andean peaks. The hillstar is well adapted to the harsh climate of *páramo* and *puna*, and is found up to 15,000 feet above sea level. Like other humming-birds the hillstar feeds largely on nectar sucked from flowers with its tubular tongue, but unlike many of its relatives it supplements this diet with insects and small spiders caught in or near the blooms of montane flowers.

To conserve energy on cold nights the hillstar allows its body temperature to fall to that of the surrounding air. To avoid excessive cooling it roosts in caves and mine-shafts where the night temperature remains a few degrees above that outside.

With no help from the male the female hillstar builds a large, well insulated nest, sometimes fastening it with nectar to a cliff face where it can catch the first warming rays of the morning sun yet be protected from the harsh rays of midday, which could easily prove fatal to the naked nestlings.

Although nesting humming-birds are usually solitary, high on Volcán Cotopaxi another hillstar race has adopted a colonial habit with as many as five nests closely grouped in a sheltering cave.

Masked Flower-piercer
Diglossa cyanea

The soberly clad flower-piercers of the mountains and *páramos* are the most highly specialized of the 39 honeycreepers inhabiting tropical America.

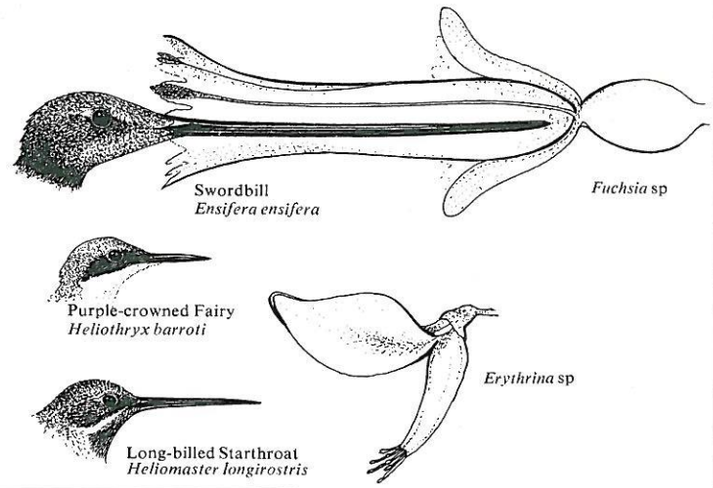
The Masked Flower-piercer alights near the head of a mountain flower and, holding the base of the bloom with the finely hooked tip of its upper bill, drives the sharp lower mandible through the petals. In a raid lasting only a second, the bird extracts the flower's store of nectar through the tiny hole with darting movements of its slender, brush-like tongue.

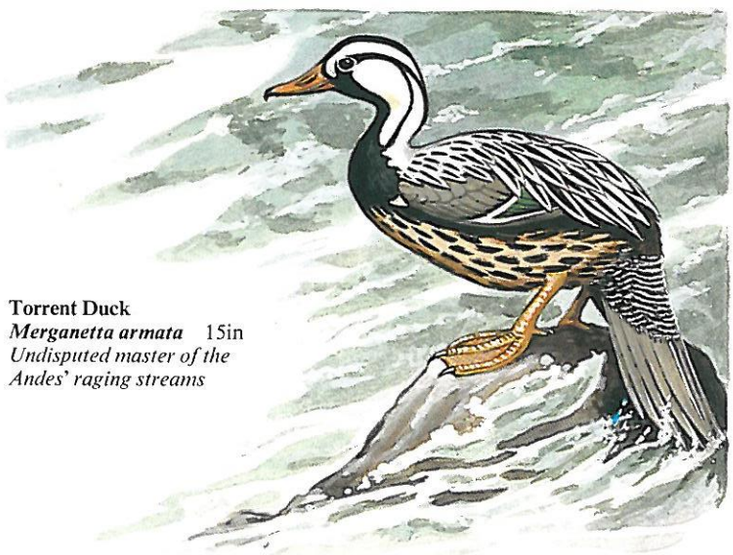
The flower receives nothing in return. No part of the bird ever comes near to the pollen-bearing stamens and so, unlike most nectar-feeding birds and insects, the flower-piercer cannot pay for its bounty by pollinating the flowers it visits in search of food.

The flower-piercers are similar in many ways to the unrelated hummingbirds. Both species obtain their protein requirements from insects caught on the wing and both nest when flowers are most abundant – often at a time of year when few other small birds are nesting. Two eggs are laid in the small, compact open cup-nest and the young are fed on partly digested food regurgitated by the parents.

The flower-raiders

The luxuriant flowering plants of tropical America provide a rich food-source for nectar-feeders. *Salvia*, *Fuchsia*, *Centropogon* and *Cestrum* are all visited by hummingbirds, and flower-piercers will feed on any species having a tubular flower not too thick to be pierced. Tightly closed flowers like those of *Erythrina berteroana* and the huge pendent bells of daturas are available only to long-billed species like the Long-billed Starthroat, *Heliomaster longirostris*, and the Swordbill, *Ensifera ensifera*.





Torrent Duck
Merganetta armata 15in
Undisputed master of the Andes' raging streams

Andean Flicker
Colaptes rupicola 14in
A woodpecker marooned in a treeless land

Torrent Duck
Merganetta armata

Fast-flowing, rock-strewn torrents in the high Andes provide a home for one of the world's most highly specialized water-birds. The Andean Torrent Duck has become adapted to feed on minute aquatic organisms, such as stonefly larvae, which are found only in the oxygen-rich conditions of turbulent water.

Swimming with apparent impunity only inches from the brink of a raging waterfall, the Torrent Duck dives in search of its food – probing among the rocks of the stream bed with its slender, flexible bill. The duck's streamlined body, unusually large feet and stiff, powerful tail enable it to swim submerged against strong currents, but it more often chooses to swim upstream on the surface, taking advantage of the relatively slack water near the bank or in the lee of boulders.

Each pair of birds will defend about half a mile of river as its territory. The female nests in an old kingfisher burrow or a cavity between the roots of a riverside tree and lays from three to five large eggs at intervals of up to a week. When the set is complete the female incubates the eggs for the unusually long period of 43 to 44 days.

The newly hatched young take to the water immediately, plunging unaided from a nest 60 feet above the water at the sound of the mother's call, protected only by their lightness and buoyant down. With remarkable stamina the young skitter over the turbulent water, scrambling over rocks with help from the drake, who, unlike most ducks, remains attentive to his mate and young throughout.

Andean Flicker
Colaptes rupicola

It is difficult to imagine woodpeckers in a land without trees, but the high montane areas of South America boast two species that have adapted to a life in open grassland. Both are flickers of the genus *Colaptes*. The Campo Woodpecker, *C. campestris*, inhabits the grasslands of the eastern lowlands, while the Andean Flicker is found throughout the bleak *puna* zone from 10,000 to 16,000 feet above sea level.

The Andean Flicker forages on stony slopes and level grassy areas, usually near a cliff or rocky outcrop which serves as a lookout post. Unlike most woodpeckers they are gregarious birds, sometimes gathering in parties of up to 30 as they move across the slopes digging up beetle larvae and plucking moth larvae from the tussock-grass.

Up to a dozen pairs may nest together as a colony in tunnels driven into a stream bank. To build each nest the birds loosen the earth with their bills, using their feet to kick the earth backwards and outwards. Male and female take turns digging the upward-sloping shaft three or four feet into the bank, widening the inner end into a simple, unlined nest-chamber. Andean Flickers are also known to burrow into the adobe walls of local buildings to roost but they have never been seen to breed in this situation.

In the harsh, cold environment of the *puna* many species, including ducks, hawks, parakeets, ovenbirds and flycatchers, find it to their advantage to raise their young in the shelter of burrows protected from extremes of wind and temperature.

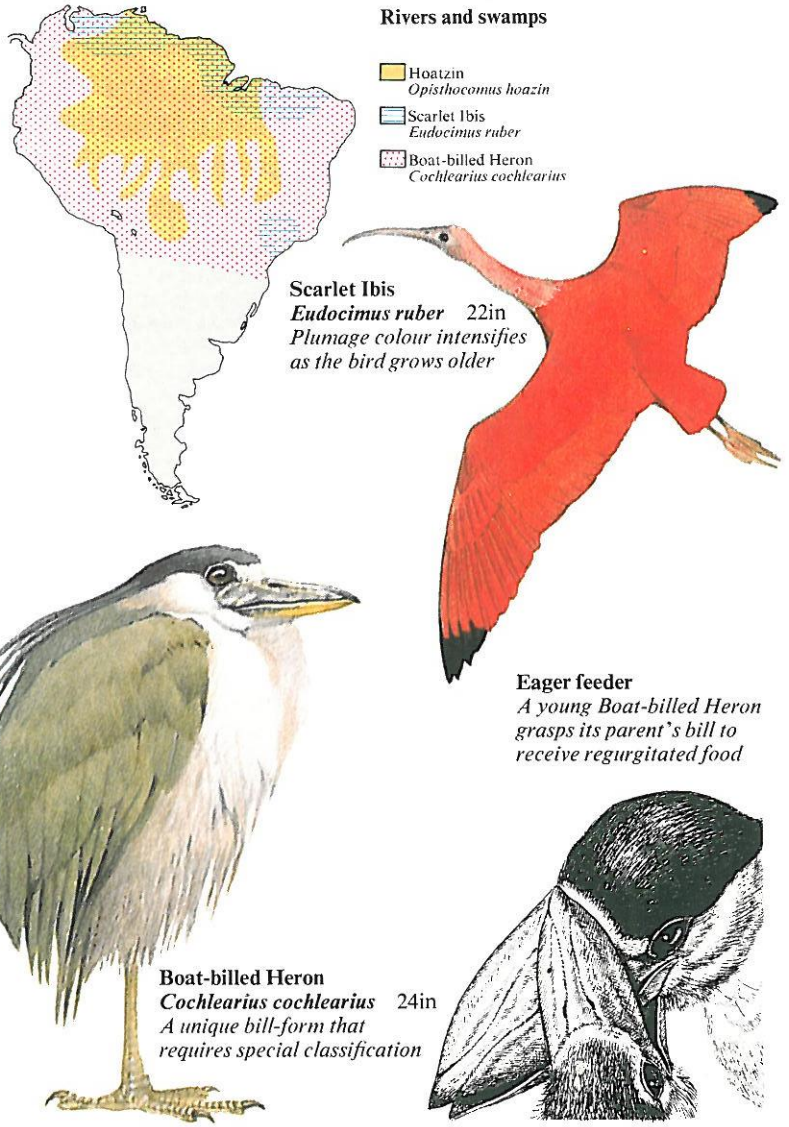
Lakes, Rivers and Swamps

The varied aquatic habitats of South America range over the entire continent. High in the Andes, tumbling streams and still lakes are inhabited by Torrent Ducks, coots and gulls, while the shallow, saline lagoons, far above the tree line, are nesting refuges for the world's rarest flamingos.

Fed by the mountain torrents, broad rivers wind through the forested heart of the continent. Horned Screamers stalk in pairs through grassy tropical marshlands and, in the *pampas* regions of Argentina, dense stands of tule and sawgrass alternate with duckweed-covered pools to create an ideal habitat for multitudes of grebes, herons, ducks, storks and gallinules. Even the Venezuelan *llanos*, parched throughout the long dry season, is transformed into an aquatic environment by the torrential rains of the wet season.

Throughout tropical South America, low coastlines and river estuaries are blanketed by dense forests of red mangroves soaring to heights of a hundred feet or more above the impenetrable maze of their arched stilt-roots. Innumerable crabs scurry over the thick mud surrounding the roots, sharing with frogs, snakes and countless insects a dark world of brackish water inundated by each high tide. Pygmy Kingfishers and Yellow Mangrove Warblers hunt across the mud flats, and herons, ibises and spoonbills nest in the tangled mass of roots and branches.

Right: Adult Buff-necked Ibis feeding in fresh-water marsh



Scarlet Ibis
Eudocimus ruber

The uniformly bright-red plumage of the Scarlet Ibis is one of the most striking sights in the world of birds, and a flock, flying across desolate coastal mudflats against a lowering sky, attracts the eye like a beacon.

Leaving their crowded roosts early in the morning, the birds spread out across the exposed mudflats at low tide or among the tangled vegetation of the mangroves at high tide, probing into the deep mud in their search for crabs and molluscs, small fishes and invertebrates.

The Scarlet Ibis is found far inland among the swamp regions of northern South America, but their known breeding colonies are nearly always among the great natural fortresses of the coastal mangrove swamps – remote and difficult to approach. In contrast to other colonial nesters they vary the site of the breeding colony year by year, but the reasons for this variation are not yet understood.

On a shallow nest of coarse sticks, from four to 40 feet above the high-water level, the female ibis lays two or three, rarely four, dull olive-green or buff eggs streaked with brown. The young hatch, nearly naked, after 23 days' incubation, but long before they are able to fly they leave the nest and scramble among the mangrove vegetation, using their bills and wings as well as feet in their ungainly but determined explorations. They fly at four weeks, but the dull grey juvenile plumage persists for several years. The scarlet adult plumage is acquired over a number of seasons and becomes progressively more intense as the bird gets older.

Boat-billed Heron
Cochlearius cochlearius

The grotesque, broad bill of the Boat-billed Heron is so different from the slender spear of typical herons that this odd bird has been placed in a family of its own – the Cochlearidae. The single species is found from southern Mexico to Peru and southern Brazil.

By day, the Boat-billed Heron rests quietly in coastal mangroves or in trees lining the banks of inland swamps. If a human should intrude among their perches, they flap about reluctantly – gazing apathetically down and emitting low, hoarse, croaking cries. By night, when they do most of their foraging, they are far more wary – flying off with deep "quok quok" calls the moment a beam of light disturbs them.

The birds have been observed standing or walking slowly through shallow water, scooping up their prey, which consists of swamp fishes and shrimps, rather than spearing it in the manner of true herons. In inland localities ants and other ground-swarming insects form a major part of the diet.

Boat-billed Herons nest in small colonies, sometimes in the company of ibises and other herons. Their crude, shallow nests of sticks are built in trees, and the female lays a clutch of two to four lightly spotted blue-white eggs. In large aviaries, where the birds have been successfully bred, both sexes have shared the incubation, turning the eggs frequently during the day. The young birds take their regurgitated meals by reaching up and grasping the parent's bill firmly between their own mandibles.

Hoatzin
Opisthocomus hoazin

Recently shown to be a highly aberrant cuckoo, this strange bird inhabits the shores of the great rivers of South America – the Amazon and the Orinoco.

Its food consists almost entirely of leaves, particularly those of the tall, cane-like water-arum *Montrichardia*, and, after a prolonged period of feeding, the Hoatzin's crop is so distended and heavy that the bird must rest with its breast supported against a branch, protected from abrasion by a callous pad.

Hoatzins live in sociable parties of between 10 and 30, which split into smaller groups at the approach of the breeding season. The female lays her eggs in an open stick nest placed in branches overhanging the river and the young are attended by up to four adult helpers as well as the parents.

If alarmed, the flightless young instinctively drop into the water to escape and then scramble back to the nest using their feet, bills and the sharp claws on the leading edges of their wings.

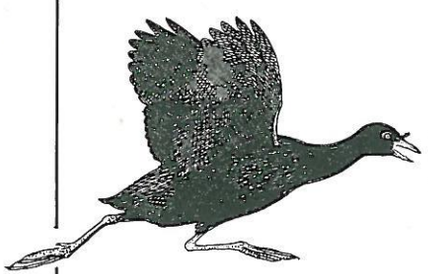
Black-headed Duck
Heteronetta atricapilla

Living amid dense marsh vegetation on both sides of the southern Andes, the Black-headed Duck dabbles and dives for seeds, duckweed and, occasionally, snails.

Although many ducks lay their eggs more or less frequently in the nests of other ducks, only the Black-headed species is totally parasitic in its breeding habits. After the spring mating the females lay their eggs in the nests of a variety of marsh-dwelling birds, particularly those of coots, pochards and ibises. Occasionally they will parasitize the nests of birds as different as Southern Screamers, Coscoroba Swans, Limpkins and even Chimango Caracaras.

The young hatch after about 25 days' incubation with the host's eggs, but remain with the foster-parents for only a few days before wandering from the nest to face the world alone. The young Black-headed Ducks make so few demands on their foster-parents that the species has been described as "the most perfect of all avian parasites".

The island-builders



Horned Coot
Fulica cornuta 24in

Eggs, nestlings and immature birds are a favourite prey of many predators, and the nesting habits of many species show a direct response to this ever-present threat.

To increase their chances of success, many inland water-birds build solitary nests on islets or hummocks surrounded by shallow water, but, despite the safety that an island home gives to a bird, only one species, the Horned Coot, *Fulica cornuta*, is known to build its own island.

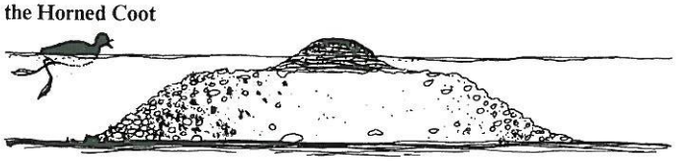
A slaty black bird, and one of the largest members of its family, the Horned Coot is characterized by the forward-pointing horn on its forehead. In most coots the forehead is adorned by a frontal shield of flabby wattle, but in the Horned Coot this curious decoration is a muscular organ of unknown significance.

In the bleak, arid upland wastes where Chile, Argentina and Bolivia meet, the Horned Coot makes its home in shallow lakes 12,000 to 14,000 feet above sea level. Because these lakes are so poor in water-plants, this coot has abandoned the floating nest typical of its relatives in favour of a huge platform of stones two or three feet high and up to 13 feet in diameter – a remarkable island of stones built up over a number of years and sometimes containing several tons of rock. The top of the platform is always just below water-level and on it the birds build a nest of aquatic plants gathered from the bed of the lake.

Farther north, where Andean lakes support a richer vegetation, the Horned Coot builds its island of plant materials instead of stones, but nowhere does it revert to the floating nest typical of its family.

Coots, grebes, inland terns and gulls all build floating nests and all face a common problem – that of keeping their eggs dry while incubating. As the nest-materials become waterlogged and sink, the birds must keep adding new material to keep the vulnerable eggs above the water. The Pheasant-tailed Jacana of Asia has a different solution. If the lily-pad supporting its nest rots, or if flood waters threaten the nest, this jacana simply rolls its egg across the lily-pads to a safe site and builds a new nest.

Artificial island of the Horned Coot



Hoatzin
Opisthocomus hoazin 25in
Primitive wing-claws enable the young to regain the nest after a fall

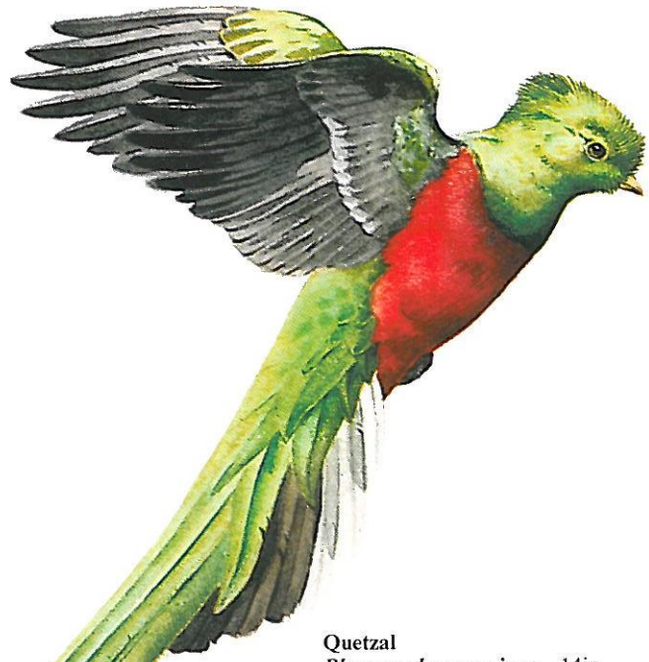
Black-headed Duck
Heteronetta atricapilla 14½in
The only totally parasitic member of the duck family

Central America: The Tenuous Link

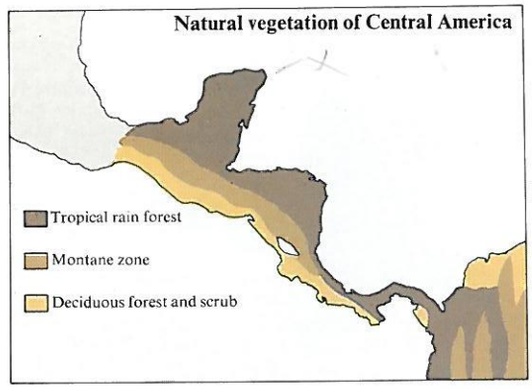
As a biological province, Central America stretches for 1,400 miles from the Isthmus of Tehuantepec to eastern Panama. The varied topography, and its unique situation between two great landmasses, have given Central America a rich and diverse bird fauna containing species from both north and south.

Of its major natural habitats, the warm, moist Caribbean lowlands are the richest in species – particularly in puffbirds, manakins, woodcreepers, cotingas and tanagers. They are all families of South American origin which spread northward through a once-continuous belt of tropical rain-forest. The Pacific slopes north of the Gulf of Nicoya, and the dry inland valleys lying in the rain-shadow area facing the Caribbean Sea, are rich in dry-country species, many of which originated in the arid regions of southern North America.

Two vast highland regions guard the narrow land-bridge between the two Americas. The largest, centred on Guatemala, has extensive plateau-regions 10,000 feet above sea level with volcanic peaks rising to nearly 14,000 feet. Here, where the winter nights are cold, many northern species reach their southernmost limit. Beyond the lowlands of southern Nicaragua the land rises again to form the 12,500-foot Cordillera de Talamanca – a mountain barrier extending into western Panama and rich in Andean birds – notably many members of the ovenbird family.



Quetzal
Pharomachrus mocinno 14in
The magnificent 24-inch courtship train is battered by the rigours of parenthood



Blue-diademed Motmot
Momotus momota 15in
Long-term planning solves a nesting problem

Blue-diademed Motmot
Momotus momota

Central America was probably the cradle of the motmot family, and eight of the nine known species are found in this region. The Blue-diademed Motmot is the most widespread and familiar species – a resident of clearings, secondary forest and even suburban gardens.

The long central tail-feathers are fully vaned when they first form, but the vanes are restricted near the tip and readily fall away to leave a length of naked shaft terminating in the "racquet" adornment common to six of the nine species.

Motmots feed on insects, small lizards and fruit, the Blue-diademed Motmot showing a marked preference for bananas. Male and female work together during the wet season to dig a long tunnel into a soft earth bank. The burrow is then abandoned until the following dry season when the female returns to lay her three white eggs. In physiology and behaviour the motmots closely resemble their near relatives, the kingfishers.

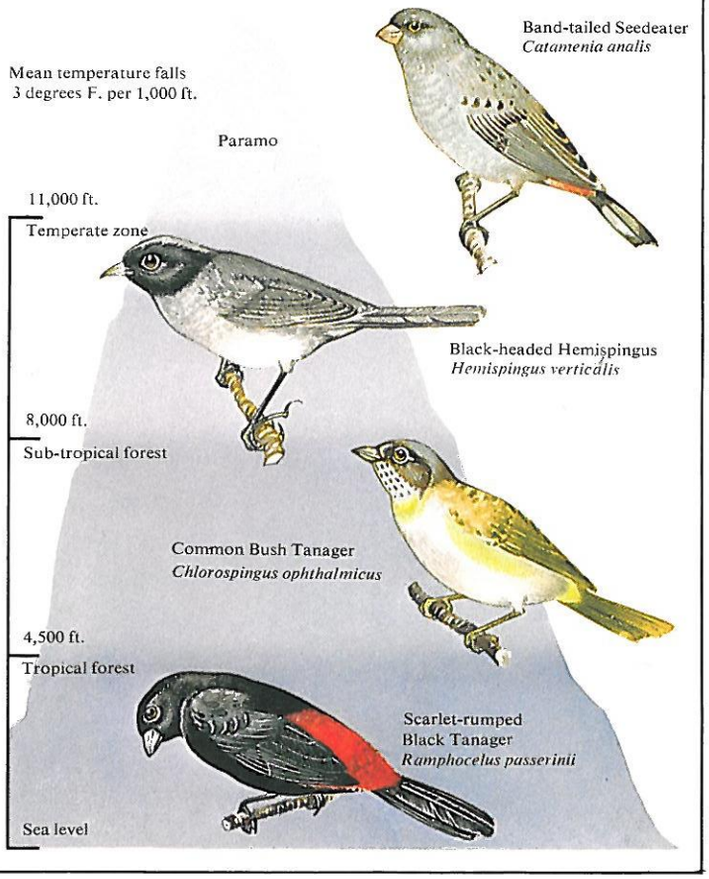
Quetzal
Pharomachrus mocinno

With its long tail-coverts streaming behind, the beautiful Quetzal darts through the forest plucking small fruits from the trees and occasionally pausing to pounce on an unwary frog or lizard. This national symbol of Guatemala ranges through cool highland forests 4,000 to 10,000 feet high, from Chiapas in Mexico to western Panama.

Contrary to a persistent myth, the Quetzal's nest-hole in a rotting tree-trunk has only a single entrance – like that of a woodpecker. Like other trogons, the elegantly-attired male incubates the two blue eggs throughout the day – his presence often being betrayed by the tail-feathers projecting from the nest and waving in the breeze. If the female deserts the nest, the male will continue and successfully raise the nestlings alone, but usually a pair of adults will raise two broods in each season. By the time the second brood is fledged, the once-glorious train of the courting male is reduced to a frayed remnant.

Life-zones of the mountains

From luxuriantly forested foothills to barren rocky peaks, the vegetation zones of a mountain follow the same clear order as do the major zones encircling the earth between Equator and poles. Each zone supports its own characteristic suite of plants, birds, mammals and insects, the more adaptable perhaps spanning two or more zones while the most specialized species are quite rigidly confined to their own particular habitats. The diagram illustrates four Andean species that have adapted to specific altitude bands.



Montezuma Oropendola
Gymnostinops montezuma 15in
Isolated trees are festooned with their woven nest-pouches

Ornate Hawk Eagle
Spizaetus ornatus 24in
One of the least-known South American raptors

Long-tailed Silky Flycatcher
Ptilogonys caudatus 9¾in
Undaunted by the gales of its mountain habitat

Montezuma Oropendola
Gymnostinops montezuma

The 88 species making up the New World oriole family, Icteridae, occupy a wide range of habitats and life-styles. Some are terrestrial, others highly arboreal; some are social parasites that build no nests of their own, while others are among the most skilful of nest weavers. Among the latter are the dozen species of oropendolas, whose long, pear-shaped pouches may be seen hanging in clusters high in isolated trees.

A colony of Montezuma Oropendolas may contain more than 100 nests, each two to four feet long and up to nine inches wide at the base. The female alone weaves the pouch of fibrous plant materials, filling the bottom of the nest with a loose litter of leaf fragments which protect her eggs when the nest is buffeted by strong winds. The young oropendolas remain in the nest for a month after hatching – attended by the hen alone.

Ornate Hawk Eagle
Spizaetus ornatus

Despite its great range, this strikingly coloured raptor remains one of the least known of all South America's birds of prey. It inhabits the dense belts of tropical forest from Mexico to Argentina and has been observed to attack curassows and a number of other large, slow-moving ground-birds. Other observations suggest that the Ornate Hawk Eagle may also hunt over small lakes and rivers – swooping to snatch water-snakes from the shallows.

The Ornate Hawk Eagle will occasionally take possession of a nest deserted by another member of the hawk family but, to date, the details of this handsome bird's breeding habits are a mystery.

Long-tailed Silky Flycatcher
Ptilogonys caudatus

Confined to the high mountains of Costa Rica and western Panama, the Long-tailed Silky Flycatcher weaves its way in straggling flocks across the top of the forest canopy, occasionally venturing forth into the more open wooded grasslands of the foothills.

Perching upright in the topmost branches of tall trees, quite undaunted by the fierce gales that sweep the exposed mountain ridges, the Silky Flycatcher launches itself into the air on long aerial sorties in search of the insects and berries that constitute the bulk of its diet.

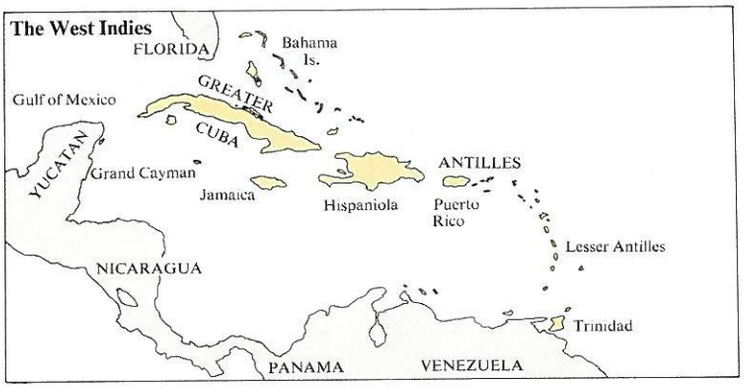
Male and female work together to build a bulky, woven nest of finely branched mosses and lichens in which the two lightly marked grey eggs are laid. Although he takes no part in the 17-day incubation of the eggs, the male remains in close attendance and often brings food to the brooding female.

The Caribbean Islands

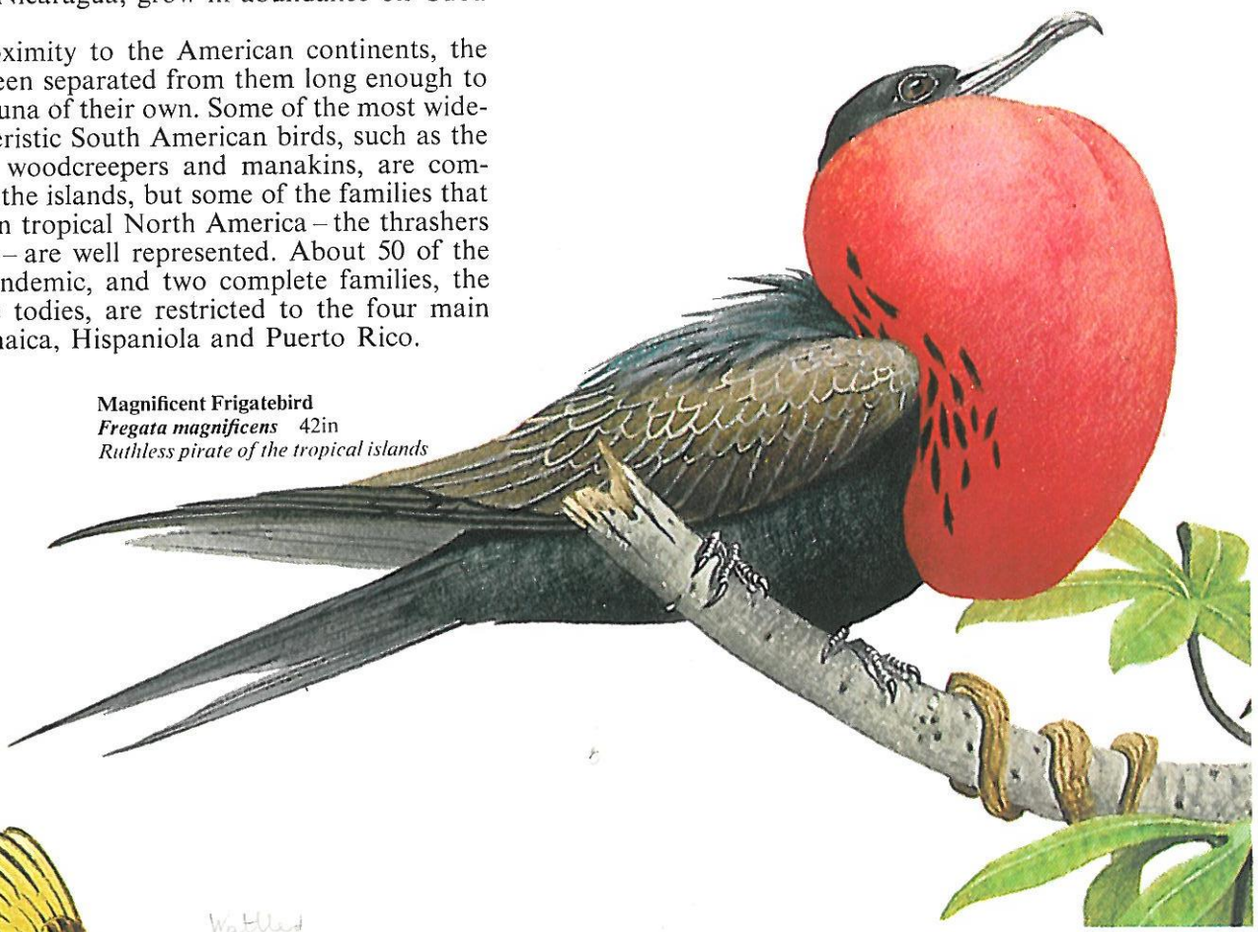
The great arc of the West Indian archipelago stretches for more than 2,000 miles from Florida and Yucatan to the northernmost fringe of the South American landmass.

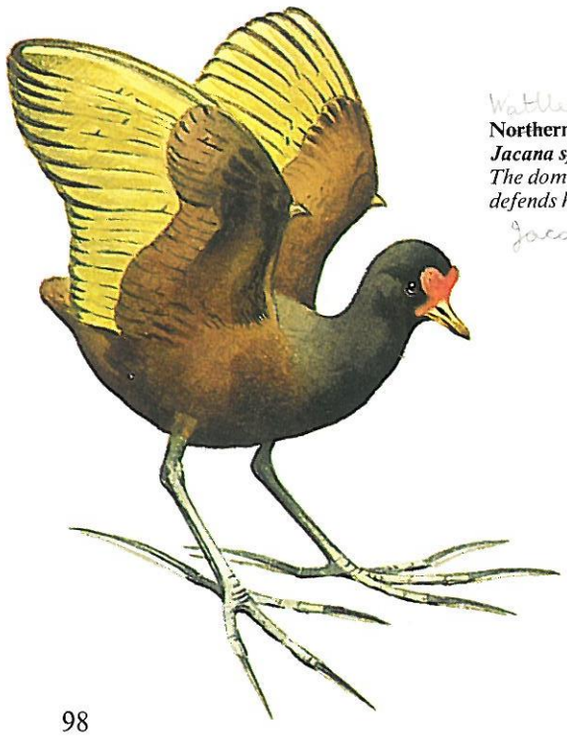
This chain of islands, enclosing the Caribbean Sea, supports nearly every type of tropical vegetation with the exception of *páramo* and *puna*. Mangrove swamps line the island shores; marshes and tropical rain-forests clothe the wet windward slopes of forest-capped mountains and, in the dry rain-shadow of the higher ranges, the slopes are covered with drought-resistant xerophytic vegetation rich in cacti. Palms, including the stately Royal Palm, are common throughout the islands and true pines, absent from the continent south of Nicaragua, grow in abundance on Cuba and Hispaniola.

Despite their proximity to the American continents, the West Indies have been separated from them long enough to have developed a fauna of their own. Some of the most widespread and characteristic South American birds, such as the toucans, puffbirds, woodcreepers and manakins, are completely absent from the islands, but some of the families that have their origins in tropical North America – the thrashers and wood-warblers – are well represented. About 50 of the island genera are endemic, and two complete families, the palm-chats and the todies, are restricted to the four main islands – Cuba, Jamaica, Hispaniola and Puerto Rico.



Magnificent Frigatebird
Fregata magnificens 42in
Ruthless pirate of the tropical islands





Northern Jacana
Jacana spinosa 8in
The dominant female fiercely defends her weaker "husbands"

Northern Jacana
Jacana spinosa

Ruling the roost over as many as four "husbands" at once, the polyandrous female Northern Jacana helps each of her much lighter mates to defend his personal breeding territory within her own overall domain. For each she will lay four dull brown eggs, delicately marked with fine black lines, in a flimsy nest built on floating plants. The male incubates the eggs alone, and in order to keep the eggs dry as well as warm probably pushes his wing feathers beneath them – a behaviour pattern common to other members of the jacana family.

As soon as the downy chicks are able to use their long-toed feet well enough to pick their way across floating vegetation, they are led on foraging expeditions in search of food. Jacanas feed mainly on insects gleaned from the ponds, lagoons and marshes they inhabit and the birds are most often seen picking their way delicately over the floating plants – at times seeming to walk on the surface of the water. However, the jacana does occasionally leave its aquatic home to forage in grassland where insects are abundant.

Despite their rapid physical development, the young birds retain their dull juvenile plumage until well grown – perhaps as a partial defence against would-be predators. The adult bird is predominantly reddish-brown, but the briefly held statuesque pose adopted on landing, with the wings stretched almost vertically above the back, reveals the bright yellow-green flight feathers and the sharp yellow spur on each wing.

Smooth-billed Ani
Crotophaga ani 14in
Communal living

Smooth-billed Ani
Crotophaga ani

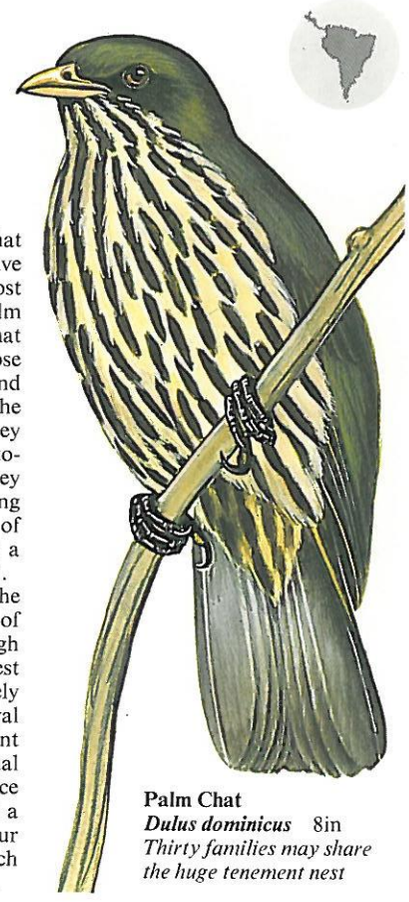
Belying the parasitic reputation of their family, these black cuckoos lead a closely knit, highly co-operative life. In groups of six or eight they build a bulky communal nest of coarse sticks in the middle of a jointly defended territory – roosting together in a compact huddle at night.

Each female contributes between four and seven eggs to a communal clutch of up to 30 eggs laid on a thick lining of green leaves that is constantly replenished throughout the nesting period. The eggs have an unusual chalky white covering over the blue inner shell and are incubated for 13 days by members of both sexes. A single male is left to stand guard over the clutch at night. The young are hatched black and naked but are able to leave the nest within five or six days if alarmed. Insects form the bulk of the ani's diet, and the whole group, including juvéniles of an earlier brood, will forage together – often in the company of grazing animals. When insects are scarce the Ani will feed on berries and lizards.

Palm Chat
Dulus dominicus

The single species of Palm Chat lives only on the islands of Gonave and Hispaniola, where it is the most conspicuously abundant bird. Palm Chats are highly sociable birds that move through the forest in loose flocks in search of seeds, berries and flowers – sometimes plucking the fruit from the tree in full flight. They are often seen perching close together high in the trees, where they compensate for their lack of song with an enthusiastic repertoire of squeaks and buzzes, deepening to a mournful "cher – cher" at nightfall.

The huge communal nests of the Palm Chat are a prominent feature of the landscape. Up to ten feet high and four feet in diameter, the nest of interlaced twigs may completely enclose the main shaft of a Royal Palm. Each nest is an apartment block containing up to 30 individual chambers, each with its own entrance tunnel and each one the home of a mated pair. Between two and four spotted white eggs are laid in each nest, on a lining of shredded bark.



Palm Chat
Dulus dominicus 8in
Thirty families may share the huge tenement nest

Magnificent Frigatebird
Fregata magnificens

Easily recognized at any height by its deeply forked tail and narrow, angled wings, the frigatebird uses its superb manoeuvrability to harass boobies and other birds until they drop the food they are carrying. The pirate then swoops to catch its booty in mid-air – perhaps only to be forced to relinquish it to another of its kind. The frigatebird does forage for itself as well, deftly snatching flying fish from above the waves or taking squid and jellyfish from the surface-waters.

The birds breed in huge island colonies, building crude platforms of sticks and straws in low bushes or, occasionally, in mangrove trees or on the ground. Males display to cruising females by inflating their brilliant-scarlet throat-sacs while vibrating their outstretched wings and uttering guttural cries. Attracted by this bizarre display a female will respond by nibbling the male's feathers and rubbing her head across his pouch.

The single young must be guarded at all times, as unprotected nests are torn apart by other adults in search of nesting materials, and nestlings are ruthlessly savaged by cannibalistic neighbours.

The young remain in the nest for five months and even after learning to fly they return to the nest to be fed until nearly a year old. During the final months the chicks are fed by the female alone as the males withdraw from the colony. This prolonged burden of parental care restricts the females to breeding in alternate years while the less busy males are free to take a new mate each season and so breed annually.

Bananaquit
Coereba flaveola 4½in
Separate nests for male and female

Puerto Rican Tody
Todus mexicanus 4¼in
Each to its island

Bananaquit
Coereba flaveola

A bold and indiscriminate feeder and a tireless nest-builder, the self-sufficient Bananaquit is one of tropical America's most widespread songbirds.

Each adult builds a separate tightly woven globular nest in which it roosts alone throughout the year – excluding even its mate. The male does assist the female in building the slightly larger breeding nest and helps her to feed the young on regurgitated food, but the task of incubating the three spotted white eggs is left entirely to the female.

When the young fly, at about 19 days, they are rudely excluded from the nest and must immediately embark on their life-long career of nest-building.

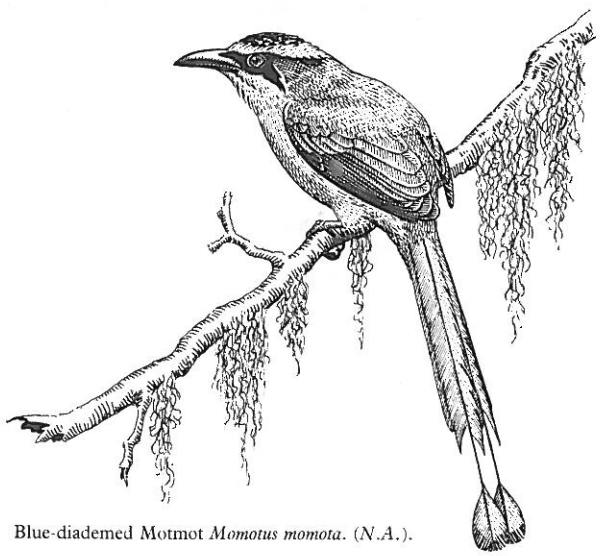
Puerto Rican Tody
Todus mexicanus

The five species of tody (relatives of the motmots) are all confined to islands, though their habitats may be as diverse as rain-forest and desert scrub. Two are found on Hispaniola, one on Puerto Rico, one on Jamaica and one on Cuba and the neighbouring Isle of Pines.

Todies are identified by their harsh "cherek" cries, the rattling sound sometimes made by their primary feathers in flight, and by their habit of hunting on the wing – snatching small insects from the foliage without alighting.

They lay two to four pure-white eggs in a foot-long earth burrow, and, after hatching, the young are fed for 20 days in the nest-chamber.

MOTMOT: substantive name of species of Momotidae (Coraciiformes, suborder Alcedines); in the plural, general term for the family. The motmots are allied to the kingfishers (Alcedinidae) and even more closely to the todies (Todidae). The 6 genera and 9 species of motmots (*Momotus*, *Electron*, and *Baryphthengus* have 2 each) are confined to continental tropical America, chiefly at low altitudes; but the family was once far more widely distributed, as the fossil bird *Protornis glarniensis* from the lower Oligocene of Switzerland is now ascribed to it.



Blue-diademed Motmot *Momotus momota*. (*N.A.*).

Characteristics, distribution and habitat. At the present time, the Momotidae are best represented in northern Central America and southern Mexico, where in certain regions of lighter vegetation these birds are abundant and conspicuous. Among the noteworthy structural peculiarities of the motmots are the serrated edges of their broad bills, which are about as long as their heads and downcurved at the end, and their feet, of which the outer toe is united to the middle one for most of its length and only one toe is directed backward, as in kingfishers.

These beautiful birds (16–50 cm in total length) are clad in softly blended shades of green, olive-green, and rufous rather than in brilliant spectral colours; although the head is often adorned with bright blue, and a black patch is usually present on the chest or throat. The most arresting feature of motmots is the tail, which is long and strongly graduated. In typical motmots, the central rectrices far exceed the others in length, and, when they first expand, the vanes may be narrower in the subterminal region than elsewhere. In this subterminal portion the barbs are loosely attached and fall away as the bird preens, and probably also in consequence of rubbing against the vegetation through which it moves, leaving a length of naked shaft which supports a spatulate or raquetlike tip where the vanes remain intact. The length of denuded shaft varies considerably from genus to genus, and in some genera it is lacking. While perching, motmots often swing their tails, pendulum-wise, from side to side, and sometimes hold them tilted sideways. When they about-face on a perch, they lift the tail over it with a graceful flourish.

One of the most beautiful members of the family is the Turquoise-browed Motmot *Eumomota superciliosa*, which is found from southern Mexico to northern Costa Rica in semi-arid country and in clearings in rain forest. Well over half of its 35 cm is accounted for by its long tail. As in other motmots, the sexes are alike in coloration. The upper plumage is largely bright olive-green, with a patch of cinnamon-rufous in the centre of the back. Above each eye is a broad band of pale turquoise, the bird's brightest colour. The lores and ear tufts are black; and on the throat is an elongated, wedge-shaped patch of black, bordered on each side with turquoise. The remaining under plumage is greenish olive and cinnamon-rufous. The middle feathers of the greenish-blue tail have a much greater length of denuded shaft than in other motmots, so that the spatulate, blue and black ends hardly appear to be connected with the rest of the bird. This makes the Turquoise-browed Motmot more airily graceful than its relatives.

The largest member of the family is the Rufous Motmot *Baryphthengus martii*, which inhabits heavy forests from Nicaragua to Amazonia and western Ecuador. This 46-cm bird has the head, neck, and most of the underparts tawny, the back and rump and undertail coverts green. There is a black patch on each side of the head and one in the centre of the chest. Each of the central tail feathers has a short length of naked shaft. At the other extreme of size is the Tody Motmot *Hylomanes momotula*, an elusive, little-known inhabitant of forests from southern Mexico to northwestern Colombia. About 17 cm long, clad in dull green and rufous, with black ear-tufts, this small motmot has a short tail without racquet tips.

An aberrant member of the family is the Blue-throated Motmot *Aspatha gularis*, which in northern Central America and extreme southern Mexico inhabits forests of oaks, pines, and cypress from about 1,200 to 3,000 m above sea level. Here it resides throughout the year, despite the severe frosts of the winter months. About 28 cm long, this motmot is almost wholly clad in green, with a blue throat, black ear-tufts, and a black patch on the foreneck. The feathers of the long tail are strongly graduated, but the central ones have continuous webs rather than racquet tips.

Habits and food. When foraging, motmots perch motionless until their keen eyes detect a beetle, caterpillar, spider, butterfly, cicada, small frog, lizard, or snake, on foliage, on the ground, or in the air. Then they dart swiftly, seize the victim, and carry it to a perch, against which, if large, they beat it before gulping it down. Small fruits, including those of palms, plucked while the bird hovers, enter conspicuously into the diets of some of the bigger motmots. These large species often forage with the mixed flocks that follow the army ants *Eciton*, catching small fugitive insects and other creatures rather than the ants themselves.

Voice. Although the utterances of motmots are all structurally simple, they vary immensely in tone from species to species. The Turquoise-browed Motmot voices a dull, wooden *cawaak cawaak*. The call of the

widespread Blue-diademed Motmot *Motmotus momota* is a full, froglike, not unmelodious *coot coot*. At dawn, the rain-forest of southern Caribbean Central America is filled with the hollow hooting of the Rufous Motmot, a mysterious sound often difficult to trace to its source, for these motmots stay high in trees. The most melodious of the motmots is the Blue-throated, whose delightfully clear and mellow notes are heard chiefly at dawn, when the members of a pair often sing in unison just after they emerge from the burrow where they slept.

Behaviour. In courtship, two or more motmots call back and forth, often continuing for surprisingly long intervals. Sometimes, while so engaged, they hold pieces of green leaf or other fragments of vegetation in their bills—a puzzling habit, since such material is not carried into the nest burrow. The Blue-diademed, or Blue-crowned Motmot dust-bathes, sometimes on roadways in the evening twilight.

Breeding. Motmots nest chiefly in burrows, which are dug by both sexes of the species for which information is available. They loosen the earth with their bills and remove it by kicking backward with their feet each time they enter to resume digging. The female Turquoise-browed Motmot seems to do the greater share of the work, but her mate sometimes gives her an insect. Often the burrow is in the vertical bank of a watercourse or road; but the Blue-diademed Motmot may dig its tunnel in the side of a mammal's burrow or a narrow pit in level ground, which makes its nests very difficult to find. In this species, as in the Blue-throated Motmot, the burrow may be crooked, with one or several sharp turns; but that of the Turquoise-browed Motmot is often only slightly curved. Motmots' tunnels up to 4.3 m long have been recorded, but most are much shorter. Along the bottom of an occupied tunnel are two distinct parallel grooves, made by the birds' short legs as they shuffle in and out. In limestone regions, motmots sometimes nest in caverns or in niches in the sides of wells.

Two to 4, rarely more, broad, roundish, pure white eggs are laid on the bare floor of the enlarged chamber at the end of the burrow. They are incubated by both parents. One member of a pair of Blue-diademed or Broad-billed Motmots enters the burrow early in the morning and sits for 6–8 hours, rarely longer. At midday or later, the other replaces it and remains in the burrow until the following dawn. While incubating, motmots regurgitate many chitinous fragments from their insect food and an occasional seed, all of which are trampled into the floor of their chamber. The incubation period of the Blue-throated Motmot is 21–22 days; that of the Turquoise-browed Motmot, 15–19 days.

Nestling motmots, hatched blind and with no trace of down on their pink skins, are brooded and fed by both parents, who do not try to keep the nest clean. Young Blue-throated and Turquoise-browed Motmots leave the burrow at 28–31 days of age, and young Blue-diademed Motmots at 29–38 days, but those of the small Broad-billed Motmot fly when only 24–25 days old. They remain in the nest until they are well feathered, much in the pattern of the adults, and fly well. Their stubby tails, of course, still lack the racquet tips. Blue-diademed Motmots and Turquoise-browed Motmots are single-brooded.

Turqoise-browed Motmots start to dig their burrows as the spring or early summer breeding season approaches. Blue-diademed Motmots often begin in the autumn to dig burrows in which they will breed 4 or 5 months later. Blue-throated Motmots dig their burrows even earlier, in June or July, soon after their young are fledged. These tunnels are soon finished, and are then used as dormitories by the constantly mated pair throughout the winter months, when nights are cold and frosty. Even after eggs are laid in these old burrows in the following spring, both parents continue to sleep in them, as they do with the nestlings. After the latter emerge, they do not return to sleep in the burrow; but the parents sometimes continue to lodge in it until a new burrow is completed nearby. The motmots of the lowlands, however, appear not to use their burrows as dormitories, and only one parent sleeps with the eggs and young, until the latter are about 5 days old. A.F.S.

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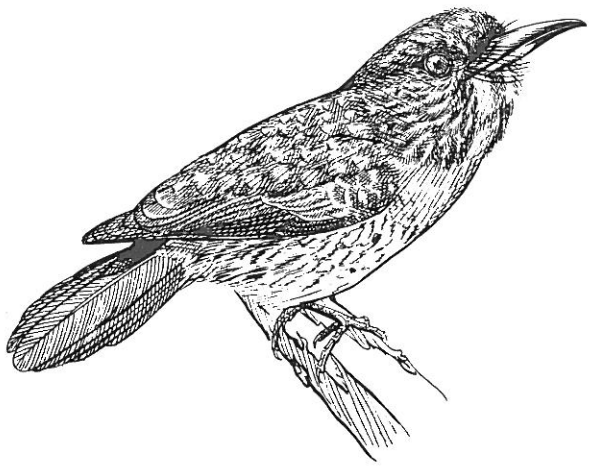

White-whiskered Puffbird *Malacoptila panamensis*. (*C.E.T.K.*).

PUFFBIRD: substantive name of some species of Bucconidae (Piciformes, suborder Galbulae); in the plural, general term for the family. This consists of 10 genera and 33 species of small or medium-sized arboreal birds (14–29 cm long) confined to continental tropical America.

Characteristics, distribution and behaviour. The puffbirds are closely related to the jacamars (Galbulidae). Their large heads, abundant, lax, often dull-coloured plumage, and short tails make them appear stout and 'puffy', whence their name. The bill, of short or medium length, often notably stout, is decurved or hooked at the tip. The feet are zygodactylous, with two toes directed backward. The family is best represented in the Amazon Valley and Colombia, and is largely confined to warm lowlands. Its ancestors appear to have been much more widely distributed, and may have been the dominant small perching birds during the Eocene in North America, where at least 5 genera of the fossil family Primobucconidae have been found in deposits of this age in Wyoming.

One of the largest and most widespread extant members of the Bucconidae is the handsome, 25 cm long White-necked Puffbird *Notharchus macrorhynchus*, which ranges from southern Mexico to north-eastern Argentina. Both sexes are largely black on the dorsal surface. The forehead, nuchal collar, sides of the head, and under parts are white, with a broad black band across the breast. The thick, tapering bill is black.

Slightly smaller is the White-whiskered Puffbird, or Softwing, *Malacoptila panamensis*, which is found from southern Mexico to western Ecuador. The male is largely chestnut-brown and cinnamon, with the posterior under parts pale buff or whitish. Both above and below the female is more olive and greyish. Both sexes are liberally spotted and streaked with tawny and buff on the upper parts and streaked with brown and dusky on the breast and sides. Both sexes wear the long, slender, slightly curved, white malar tufts which are indicated by their name. Their large eyes are dull red.

Both the White-necked Puffbird and the White-whiskered Puffbird are found singly or in pairs, or sometimes in family groups of 3 or 4, but never in flocks. They rest motionless for long periods on a more or less exposed lookout perch at no great height, apparently lethargic but actually keeping a sharp watch for suitable food. By means of a surprisingly sudden dart, they snatch a caterpillar, winged insect, spider, or small lizard from a neighbouring bough, or sometimes they drop down to seize it amid low herbage. Then they carry it back to a perch and devour it at leisure.

A very different type of puffbird is the Swallow-wing *Chelidoptera tenebrosa*, widespread in tropical South America. This is a stout, large-headed bird about 15 cm in length. When folded, its long wings reach almost to the end of its short tail. Both sexes are largely blackish, with a patch of white on the lower back and rump. The abdomen is rufous-chestnut, which pales to white on the under tail coverts. The voyager along the Amazon and its great tributaries often sees these graceful birds perching in pairs on the topmost naked twigs of tall riverside trees, whence they make long, spectacular darts to snatch insects (including many winged ants) from the air, much in the fashion of some of the bigger American flycatchers (Tyrannidae).

Because of their very plain attire, the 4 species of the genus *Monasa* are called 'nunbirds'. The Black-fronted Nunbird *M. nigrifrons* of the Amazon valley is about 29 cm long. In both sexes, the upper plumage, wings, and tail are dull black and the ventral surface is dark grey. The bill, which tapers from a broad base to a sharp point, is bright orange—whence the name 'pico de lacre' ('sealingwax bill') sometimes applied to birds of this genus. More gregarious than other puffbirds, nunbirds travel in small flocks, and at least one species breeds co-operatively.

The 6 small species of the genus *Nonnula* are known as 'nunlets'. Both sexes of the 14-cm-long Grey-cheeked Nunlet *N. frontalis* are plain brown above and ochraceous or tawny below. This species is found in the lowlands of Colombia and eastern Panama, and little is known of its habits.

Voice. Puffbirds show the same contrasts in voice as in plumage. The loudest utterance of the White-whiskered Puffbird is a high, thin whistle or 'peep'. The Swallow-wing has a weak, appealing whistle. The sociable nunbirds have a surprising range of utterances from soft, musical murmurs to far-carrying shouts. From 3 to 10 White-fronted Nunbirds *Monasa morphoeus*, often perching in a row on a high, horizontal branch or liana, join their almost soprano voices in a chorus that rings through the rain forest for 15–20 min. While calling, puffbirds often twitch their tails from side to side.

Breeding. The breeding habits of puffbirds are poorly known, but two main types of nests have been discovered: cavities which they carve in the hard, black, arboreal nests of termites, and burrows in the ground. Less frequent sites include hollow trees, holes made by woodpeckers, burrows made by small mammals, and oven-shaped nests of clay built by the Pale-legged Hornero *Furnarius leucopus*. Both sexes of the Black-breasted Puffbird *Notharchus pectoralis* take turns at digging with their bills into the side of a large, roughly globular termitary. Their narrow, horizontal tunnel expands at its inner end into a neatly rounded chamber, on the hard floor of which the eggs rest.

Burrows of the White-whiskered Puffbird have been found in the gently or at times steeply sloping, leaf-strewn ground in rain forest. From a round opening, the tunnel descends with a slight inclination for about 50 cm. At the lower end it widens into a chamber, which is lined on the bottom and sides with brown dead leaves. Around the opening of the burrow, which is flush with the ground, the birds arrange twigs, petioles, and the like to form a low collar, through which they enter and leave, and which makes the aperture less conspicuous. This feature is far more strongly developed in the Black Nunbird *Monasa atra* of northern South America, which above the entrance to its descending burrow in level ground raises a large pile of coarse dead sticks; the birds reach their burrow through a rounded tunnel that runs along the surface of the

ground beneath the heap of sticks. Probably the chamber at the inner end is lined with dead leaves, like that of the White-fronted Nunbird, which, however, arranges only a low collar around the mouth of its 100–125 cm long burrow. The Swallow-wing, however, places no sticks or other material around the entrance to its burrow, which may be in a bank or in level ground. Like the tunnels of other puffbirds, those of the Swallow-wing are downwardly inclined and straight, but they are longer than those of other species, up to 200 cm in length. The eggs rest on a slight lining of dry grass.

Puffbirds lay 2 or 3, rarely 4, white, glossy eggs that resemble the eggs of woodpeckers. These are incubated by both parents, at least in the Black-breasted and the White-whiskered Puffbird. The latter incubates according to a simple but unusual schedule; the male sits continuously from early afternoon to the following dawn, then the female takes one long session of 5–8 h. The eggs are unattended for a half hour or more between these sessions. Black-breasted Puffbirds take shorter sessions, entering and leaving the nest a number of times in a day. The incubation period is unknown.

Newly hatched puffbirds are blind and perfectly naked, without natal down. The prominent callous pads on their heels are smooth, as in jacamars and motmots. The male White-whiskered Puffbird does all the brooding and his duller mate nearly all the feeding, an arrangement that may have some slight protective value. When only a day or two old, the blind nestlings move up the tunnel to take food from their mother at the burrow's mouth. This consists of large, badly mangled insects, with an occasional spider or small lizard, carried in the parent's bill, one item at a time. Waste is not removed from the burrow. After the father ceases to brood them by night, the nestlings, now with open eyes and becoming feathered, at nightfall somehow raise up the fragmented leaves from the bottom of the chamber to form a screen between themselves and the entrance tunnel. They leave the burrow at the age of 20–21 days, when they are well feathered and have 'whiskers' like their parents. Blind, naked nestlings of the White-fronted Nunbird toddle up to the mouth of their longer burrow to receive food from the 3 or 4 adults—parents plus helpers—who often attend them. After emerging at the age of about 30 days, juvenile nunbirds rise high into the trees. Soon they take their food in a spectacular manner, flying up from a distance to snatch it from an attendant's bill as they shoot past. This provides practice for nunbirds' habitual mode of foraging. A.F.S.

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