

The Status of Vultures in Latin America

Marsha A. Schlee

ABSTRACT

Conservation status, habitat requirements, and problems affecting the American Black Vulture, Turkey Vulture, Lesser and Greater Yellow-headed Vultures, King Vulture, and Andean Condor are presented as well as the management plans and recovery programmes underway for the Andean Condor. Cathartid populations are mainly affected by habitat alteration, persecution, hunting pressure, and pesticides. Improved livestock management also contributes to a decline in the food supply in many areas. The numerical status of most of the species needs to be evaluated and studies are also needed on their biology and ecology. At the present time, the Andean Condor is on CITES I, and the King Vulture has been placed on CITES III only for Honduras. The author strongly recommends placing *Sarcoramphus papa*, *Cathartes burrovianus* and *Cathartes melambrotus* on CITES II.

INTRODUCTION

Six vulture species are found in Latin America: American Black Vulture *Coragyps atratus*, Turkey Vulture *Cathartes aura*, Lesser Yellow-headed Vulture *Cathartes burrovianus*, Greater Yellow-headed Vulture *Cathartes melambrotus*, King Vulture *Sarcoramphus papa*, and Andean Condor *Vultur gryphus*. All are members of the family Cathartidae, shown by DNA sequencing and hybridization (Sibley & Ahlquist 1990; Keyser *et al.* 1996), as well as by myological, osteological and behavioural features (for reviews, see Rea 1983 and del Hoyo *et al.* 1994), to be more closely allied to storks (Ciconiidae) than to the Old World accipitrid vultures; however, more recent findings indicate that even a close relationship with storks appears unlikely (Wink *et al.* 1998). The two groups of vultures are phylogenetically distinct but have highly convergent life styles, although evolution of the tongue and bill specializations in the cathartids may not have been related to carrion-eating (Ladyguin 1996).

Previous reports on the conservation status of the New World vultures were given in 1979 at the 1st International Symposium on Vultures, Santa Barbara, U.S.A. (Wilbur 1983), and in 1982 at the 2nd World Conference on Birds of Prey, Thessaloniki, Greece (for a summary of the workshop proceedings, see Mundy 1985). This paper will update the situation for the cathartids found in Latin America and will be based on data from published and unpublished reports, general avifauna surveys and other scientific studies as well as country or species reports prepared specifically for the 5th World Conference by field workers and ornithological organizations. A latitude of approximately 20°N was used as a cut-off for separating the area covered in this paper (Neotropical region) from that to the north (Nearctic).

SPECIES ACCOUNTS

American Black Vulture *Coragyps atratus*

Found throughout most of Latin America (Ellis *et al.* 1983), this conspicuous and very common species has become known as the “town scavenger,” feeding in markets, at rubbish dumps, in the streets (del Hoyo *et al.* 1994), and also from road kills (Houston 1987). Black Vultures are considered to be an “increaser species” (Ellis & Smith 1986), adapting well to habitat modification and whose populations rise in areas where primary forests have undergone agricultural development (Ellis *et al.* 1983; Stiles 1985). Originally, the species was confined to edges of rivers, swamps and wetlands (del Hoyo *et al.* 1994) and its abundance, contrary to that of the *Cathartes* species, is not related to natural mammal density (Houston 1987). In heavily forested areas, Black Vultures are found only along the edges or associated with villages and small isolated settlements, as seen in the Maya/Calakmul Biosphere Reserve Complex, Guatemala/Mexico (Berlanga & Wood 1992; Whitacre *et al.* 1991), and the species is rare in the Brazilian Amazon, its density having been recorded north of Manaus in an area having relatively closed-canopy virgin forest but in the process of being fragmented for cattle ranching (Stotz & Bierregaard 1989). In French Guiana, where the major part of the country consists of primary undisturbed forest, Black Vultures are found along the coast and near some towns, their density being particularly high in the mangroves where they eat the remains of fish (Jullien & Thiollay 1996).

Black Vultures have figured in a number of other avifauna surveys, many of which provide an abundance index. The species is common in the Serra da Capivara National Park in the Brazilian caatinga of southeastern Piauí (Olmos 1993) and in the reserves surveyed in the southeast—Serra do Tingua, Serra dos Orgaos National Park, Sooretama Biological Reserve, Poço das Antas Reserve and the Serra da Siberia (Scott & Brooke 1985); also fairly common in Parque Estadual Intervales in southeastern São Paulo in the Serra do Mar Mountains (Mañosa & Pedrocchi 1997); common along the Paraguay River but more so in the south near human dwellings, sporadic rather than seasonal variations in population numbers being shown (Hayes 1991). The species is very common throughout Argentina, the Ríos Chubut and Negro (M. Nores pers. comm.) and in Patagonia where its highest abundance is reached in the valleys and Andean grassy hills (Donázar *et al.* 1993); common throughout the Chaco (Short 1975) and in northern Bolivia at the Beni Biological Station (Brace *et al.* 1997), but uncommon in the Río Machariapo dry forests of the northern La Paz department (Pearman 1993); common along coastal southern Peru where it feeds on the remains of marine mammals and fish (R. Piana pers. comm.) and also found in the Pacific dry forests of the Bosque Nacional de Tumbes (Parker *et al.* 1995) and in the Northwestern Peru Biosphere Reserve (Cook 1996). In western Ecuador, Black Vultures are abundant at refuse dumps, in the inter-Andean valleys up to 2200-3200 m a.s.l. and in most of the areas impacted by man (Ortiz-Crespo 1986), but less common in the east where there is less deforestation (P. Greenfield pers. comm.); also common in southwestern Colombia in the mosaic of pastures, cultivated fields and disturbed forests surrounding La Planada Reserve on the Pacific slopes of the Andes, the species occurring up to 3300 m a.s.l. and being common in densely populated areas along all gradients down to the coast (Thiollay 1991); common in Venezuela in the western Llanos and in the Andes of Mérida, foraging up to about 3500 m a.s.l. and being sustained almost exclusively by human activities in highly deforested areas (Thiollay 1996). In the western Llanos of Venezuela, Black Vultures are at full carrying capacity (G. Ríos pers. comm.) but in the northern and central Llanos their abundance varies according to the type of habitat and its use (Gómez *et al.* 1989): density is very low (0.13/km²) in the monocultures of rice near Calabozo, rises (1.40/km²) in the areas used for sorghum and cattle near Altagrancia de Orituco where remnants of dry deciduous forest remain, and is highest (6.96/km²) in the state of Apure at Hato El Cedral where cattle are raised and capybara *Hydrochaeris hydrochaeris* are culled annually, the remains of which are left for the scavengers (del Hoyo *et al.* 1994).

Other cathartid species may be adversely affected as Black Vultures become more abundant. In Argentina, for example, the proliferation of garbage dumps and road kills in mountain habitat has brought about an increase in Black Vulture populations which in turn could limit the amount of food

available for Andean Condors since the former detects carcasses sooner and consumes most of the carrion before the condors arrive (Donázar *et al.* 1992). Also, expansion of the species into the Chiquibul Forest Reserve in Belize could limit the amount of food available for juvenile King Vultures since the latter are very slow feeders, requiring a lot of time to fill their crops and being easily supplanted by groups of Black Vultures (J. Clinton-Eitnecar pers. comm.). In general, however, high abundance of *C. atratus* does not seem to create problems for the other vulture species (M. Nores pers. comm.).

Black Vulture populations are reported as decreasing in Mexico, due to habitat availability and pollution (Ramos 1986), high levels of organochlorine residues having been found in Black Vulture body tissues in Chiapas (Albert *et al.* 1989a) and also in egg-shell fragments and in whole eggs in the Tuxtla Valley (Albert *et al.* 1989b). The species is also declining in the deserts and puna of northern Chile where food availability has decreased (Jaksic & Jiménez 1986). The intense aerial spraying of agrochemicals in the plantations of cotton, tobacco, and rice in the Tolima Llanos of Colombia has also been incriminated for having caused declines in Black Vulture numbers in the past (Olivares 1970). Finally, the species has sometimes been persecuted, being accused of spreading disease, killing newborn lambs or calves as well as attacking livestock during parturition when trying to get the placenta (Rio Grande do Sul, Brazil: Belton 1984; western Llanos, Venezuela: G. Ríos pers. comm.).

Turkey Vulture *Cathartes aura*

Four distinct races differing in head colour and in size are recognized. The most widely distributed in South America, and easily distinguished by a large white band on the back of the head, is *ruficollis*. The status of these taxa is questioned; the races may actually be separate species.

The Turkey Vulture is the most versatile of the cathartids, living in desert habitat, grasslands, temperate and tropical forests as well as in extremely cold conditions in the Falkland Islands and Tierra del Fuego (del Hoyo *et al.* 1994). On the Pacific slopes of the Andes, the species is present up to 2200 m in altitude, occasionally 2600 m, where it is less numerous than Black Vultures (Thiollay 1991). Since Turkey Vultures readily colonize newly deforested areas, their hunting and breeding ranges increase during the early stages of deforestation (Thiollay 1991), and thus the species has suffered less from accelerating habitat changes than its forest dwelling counterparts (Ecuador: Ortiz-Crespo 1986). However, in the Maya/Calakmul Reserves (Guatemala, Mexico), the species is most abundant in the areas least impacted by man, the pattern being the reverse of that of the Black Vultures, possibly suggesting interspecific competition, but habitat preferences may also play a role considering that the forest is lower, drier, and more open in the Guatemalan units (Whitacre *et al.* 1991).

The North American races are migratory. Several hundreds of thousands of Turkey Vultures pass through Panama in October and November to northern South America where they winter with the resident race (Ellis *et al.* 1983; Gale 1986). In Colombia, only a small percentage of the residents are displaced since food competition is limited, the migrants using garbage and refuse around human habitations whereas the residents feed on road kills or small carcasses along the highways (Koester 1982). In the central Llanos of Venezuela, however, the subspecies have the same dietary preferences and when the races are sympatric, the residents shift from foraging over open or semi-open habitats to foraging almost exclusively in gallery forests whereas the migrants forage primarily over the savannas (Kirk & Currall 1994; Kirk & Houston 1995). The physical condition of resident Turkey Vultures also falls below the normal range when migrants are present but returns to above average when they leave (Kirk & Gosler 1994). Since some migrants visit the gallery forests, and win most agonistic encounters, food competition is minimized by the residents finding carcasses first and feeding quickly before the migrants arrive (Kirk & Houston 1995). In other areas the numbers of resident Turkey Vultures have been seen to decrease somewhat in October-November when migrants are present (Guatemala: Vannini 1989).

Turkey Vultures have been included in many avifauna surveys and are considered to be fairly common to abundant when in appropriate habitat (del Hoyo *et al.* 1994; Ellis *et al.* 1990). In French

Guiana, the Turkey Vulture is the least numerous of the smaller vulture species and mixes with the Lesser Yellow-headed Vulture in the coastal savannas and marshes (Jullien & Thiollay 1996; Thiollay 1985a), but density seems to correspond to what would be expected for the species in these habitats (J.-M. Thiollay pers. comm.). Turkey Vultures are fairly common in the Serra da Capivara National Park in the Brazilian caatinga (Olmos 1993) and are seen daily in both the Sooretama and Poço das Antas Biological Reserves in southeastern Brazil, but the species is uncommon in the Serra da Siberia and the Serra do Tingua and absent in the Serra dos Orgaos National Park, all of the latter having large tracts of primary forest (Scott & Brooke 1985). Likewise, Turkey Vultures are at low density in a well-preserved area of Atlantic rainforest in the Parque Estadual Intervales, being seen above the canopy or in small openings next to roads or hamlets (Mañosa & Pedrocchi 1997); also rare in the relatively closed-canopy forests and forest fragments north of Manaus (Stotz & Bierregaard 1989) as well as along the Paraguay River (Hayes 1991).

On the other hand, the species is common over the Argentinean wet forests to the northeast and northwest where food is abundant because of the cattle and horses kept in the clearings (Olrog 1985) and common in the valleys and Andean grassy hills of Patagonia (Donázar *et al.* 1993); common throughout Chile but most abundant in the desert areas of the north and the shrublands of the central zone (Jaksic & Jiménez 1986). In Bolivia, the species is frequently seen at the Beni Biological Station in all zones except the cyperacean swamps and along the banks of the Río Manique (Brace *et al.* 1997); present in the northern La Paz department (Remsen & Parker 1995), but abundance was not quantified; uncommon in the dry forests along the Río Machariapo (Pearman 1993). The species is also present in Peru in the dry forests of the northwestern departments of Tumbes and Piura (Cook 1996; Parker *et al.* 1995) and it figured in a study on the guild of avian scavengers located east of the Sechura Peninsula (Wallace & Temple 1987a). In the western Llanos of Venezuela, the species is widespread and common and populations are stable (G. Ríos pers. comm.); also common in the temperate zone of the Andes of Mérida where it forages in open habitat up to about 2500 m a.s.l. (Thiollay 1996); common in the northern Llanos but replaced by the Lesser Yellow-headed Vulture in the rice fields near Calabozo and at low density at Hato El Cedral in Apure (Gómez *et al.* 1989).

Two threats are listed for the species (del Hoyo *et al.* 1994): getting killed by cars while feeding at road-side carrion and being poisoned by contaminants at rubbish dumps. In the past in southern Rio Grande do Sul, Brazil, the species was affected by poison during the campaign to eradicate the Black Vultures (Belton 1984); in Mexico, the populations of resident Turkey Vultures are declining due to pollution (Ramos 1986) and data on the status of the species are currently being prepared by Pronatura (J. Clinton-Eitnien pers. comm.). Large-scale spraying of agrochemicals has also been incriminated for bringing about local declines in Turkey Vulture populations (Colombia, Tolima Llanos: Olivares 1970).

Lesser Yellow-headed Vulture *Cathartes burrovianus*

This cathartid occurs from Mexico through Central America to northern Argentina and Uruguay; its status, distribution, breeding biology and ecological requirements are poorly known (del Hoyo *et al.* 1994). Two subspecies are sometimes recognized and some of the northern populations appear to be migratory. An influx of Lesser Yellow-heads has been reported in northern Colombia, September-March, where they mix with flocks of migrating Turkey Vultures, and the southern subspecies *urubitinga* has also been seen in Colombia from April to October (Koester 1982).

The Lesser Yellow-headed Vulture is absent in areas where heavy forest habitat predominates, as shown in surveys taken in the Maya/Calakmul Biosphere Reserves, Guatemala/Mexico, (Whitacre *et al.* 1991), French Guiana (Jullien & Thiollay 1996; Thiollay 1985a), and southeastern Brazil in the Serra da Siberia, Sooretama, and Serra do Tingua Reserves and Serra dos Orgaos National Park (Scott & Brooke 1985). The species prefers open habitat/grasslands and savannas (Ellis *et al.* 1983; del Hoyo *et al.* 1994; Kirk & Currall 1994)—and especially moist terrain. In French Guiana it is the most common vulture in the coastal open areas, including mangroves and forest edges, highest abundance being reached in marshes and wet swamps and some overlap occurring with the distribution of Turkey Vultures (Jullien & Thiollay 1996; Thiollay 1985a); often seen in flocks of 10-15 (Thiollay

1985a), density corresponding to what is expected for the species in these habitats (J.-M. Thiollay pers. comm.). The Lesser Yellow-head is common in the Serra da Capivara National Park in the arid caatinga of northeastern Brazil (Olmos 1993); common in southeastern Brazil in the Poço das Antas Biological Reserve which has rolling hills and plains and extensive areas of marshes and swamps within and adjacent to the reserve, but a significant part of the marshes will be destroyed in the future by a dam that is currently under construction (Scott & Brooke 1985); frequently seen soaring low over wet meadows and rice fields in Rio Grande do Sul (Belton 1984). Seasonal abundance is reported along the Paraguay River, highest density of Lesser Yellow-heads occurring in January when water levels are lowest, and the species is most abundant in the northern sector where extensive marshes are found along the margins of the river (Hayes 1991). The species is common in Argentina in the open country and grasslands of the northcentral and northeastern provinces of Formosa, Chaco, Corrientes, and Misiones (M. Nores pers. comm.; Olrog 1985); confined to the moist eastern fringe of the South American Chaco, mainly along the Paraguay River (Short 1975); common in northern Bolivia at the Beni Biological Station in swamp forests, forest islands, seasonally wet former riverbeds, artificially created roadside pools as well as in chaco vegetation and over savannas (Brace *et al.* 1997); listed as a species expected to occur in the projected La Paz Reserve in the northern part of the country, which includes one of the most pristine major areas of grassland on the continent (Remsen & Parker 1995). Lesser Yellow-heads, however, are not common in western Venezuela where they are restricted to the humid and seasonally flooded lowland grasslands of the Llanos (Thiollay 1996); likewise in the north and central Llanos the species is most common in areas where the savanna is seasonally inundated and used for the cultivation of rice (Gómez *et al.* 1989).

In Mexico, the status of the species has been difficult to appraise and some of the Lesser Yellow-heads may only be summer visitors (Ramos 1986). As a coastal swamp resident, the species is particularly vulnerable to pollution from industrial activity, off-shore oil, and some volcanic activity as well as pesticides (Clinton-Eitnietar in Mundy 1985, p. 464), but the effect of the latter is not clear since the same author reports Lesser Yellow-heads as abundant in areas of high potential contamination. At the present time, Lesser Yellow-heads are most numerous in the Yucatán, and even more so in similar habitat in Belize and Honduras, but as Turkey Vultures become more abundant and expand their ranges and as marshes are polluted or drained, *burrovianus* will be placed at risk (J. Clinton-Eitnietar pers. comm.). In addition, the species was locally affected by poison in Brazil at the time Black Vultures were being eradicated from southern Rio Grande do Sul (Belton 1984) and Lesser Yellow-heads have also been affected by large-scale aerial spraying of agrochemicals in plantations in Colombia (Tolima Llanos: Olivares 1970).

Greater Yellow-headed Vulture *Cathartes melambrotus*

This vulture was described as a species only in 1964 (Wetmore 1964). Little is known of its breeding biology and no nests have yet been reported (del Hoyo *et al.* 1994). The distribution of the Greater Yellow-head is also poorly known and some records from the west-central Amazon (Ellis *et al.* 1990) show it to occur in both very dense forests and agricultural croplands along a road swath farther west than the zone indicated on the distribution map in del Hoyo *et al.* (1994). This vulture was also not indicated as occurring in Argentina, but *melambrotus* would appear to be the yellow-headed species seen in 1981 by Olrog (1985) in the Iguazú National Park in the northeast province of Misiones where the bird was common, and *melambrotus* may also have been the species seen the same year in the rainforests of the Calilegua National Park in the northwestern province of Jujuy (cited in Olrog 1985).

The Greater Yellow-headed Vulture is a true forest vulture, regularly occurring in large tracts of unbroken primary forest (Thiollay 1985a,b), but also being seen over clearings and secondary forest, usually alone or in pairs (Thiollay 1985a). Sometimes Turkey Vultures and Lesser Yellow-headed Vultures co-exist with the Greater Yellow-headed Vulture (Thiollay 1985b). In French Guiana, all three *Cathartes* species overlap in old mangroves and in areas with high forest fragmentation (Jullien & Thiollay 1996). The Greater also slightly overlaps with the Turkey in the coastal forests and in secondary and fragmented forest (Jullien & Thiollay 1996). The most detailed data on the status of

the Greater Yellow-head come from French Guiana, the species being widespread and abundant there (Thiollay 1985a). In the north-central part of the country in an area of unbroken lowland rainforest near the Nouragues field station, the highest recorded concentration of Greater Yellow-heads was 12 individuals, with an estimated average population of 19 individuals/100 km² (Thiollay 1989). Along the Courcibo River at Saint Eugène, Greater Yellow-heads are also very common, seen several times a day, usually solitary, occasionally 2 or 3 together, and once 10 fed upon the carcass of a Brocket deer *Mazama* sp. (O. Claessens pers. comm. and in prep.). In the Brazilian Amazon some 80 km north of Manaus in an area of continuous forest as well as forest fragments and clearings for cattle pastures, the species was recorded as uncommon (Stotz & Bierregaard 1989), but in the pristine forests along the Rio Xingú, 52 km SSW of Altamira, Pará, this species was the most prevalent of the vultures, six together at the most and seen in 31/45 days of field work, data being collected on the Greater Yellow-head's use of olfaction to locate carrion (Graves 1992). At the Beni Biological Station in northern Bolivia, the species was recorded as infrequent, seen over all types of forest (terra firma, seasonally inundated, riverine, swamp, secondary and deciduous) but not over the savannas, chaco, or cyperaceous swamps (Brace *et al.* 1997); also seen in northern La Paz department where the lowland forests of western Amazonia meet the humid montane forests of the eastern slopes of the Andes, but no density index was established (Remsen & Parker 1995). It can still be found in the eastern lowlands of Ecuador, where deforestation has proceeded on a smaller scale than in the western zones (Ortiz-Crespo 1986), and the species seems to be fairly common (P. Greenfield pers. comm.); also recorded in Peruvian rainforests (Tambopata Reserve) but not common (R. Piana pers. comm.); abundant in Colombia in the Amacayacu National Park in the várzea forests of Matamatá and the terra firma forests of Río Cotuhé where the species' olfactory capabilities and its role in the guild of forest scavengers were studied (Gómez *et al.* 1994). The same type of study was also carried out in an area of lowland forest in northern Venezuela near El Callao (Houston 1994), but the density of the species was considerably lower than that recorded in Colombia.

The main threats to the Greater Yellow-headed Vulture are habitat destruction and human exploitation of forest areas, resulting in disturbance and high hunting pressure which cause a radical decline in mammal numbers—and mammal carcasses form the basis of the food supply for all the *Cathartes* species (Houston 1987). In turn, when the density of the *Cathartes* species is low, the vultures are no longer able to exploit carrion efficiently and other cathartids, such as the King Vulture, that greatly depend on the *Cathartes* for locating food in dense forest habitat, are adversely affected (Houston 1987).

King Vulture *Sarcorampus papa*

Found from southern Mexico to northern Argentina, the King Vulture inhabits tropical lowland and montane forests—primary and secondary as well as forest remnants, evergreen and deciduous—but the species can also be seen over adjoining savannas, grasslands and agricultural areas searching for food (del Hoyo *et al.* 1994; Ellis *et al.* 1983; Jullien & Thiollay 1996; Kirk & Currall 1994; Reid 1989; Thiollay 1985c). The species is classified as forest-dependent, requiring sizable patches of primary forest for feeding and nesting (Stiles 1985). Reported as not adapting well to human presence (Clinton-Eitniear 1989), King Vultures are rarely seen feeding on road kills (Clinton-Eitniear 1985; Kirk & Currall 1994) or in cattle slaughter areas (Clinton-Eitniear 1985) and even when in heavily forested habitat, the species is most abundant at sites without permanent human settlement (Whitacre *et al.* 1991), but some surprising exceptions have been reported in the north-central Llanos of Venezuela (Schlee 1995).

In Mesoamerica, the strongholds of the species are in Belize, carcasses at feeding stations in the Mountain Pine Ridge and Chiquibul Forest Reserves having attracted up to 18 Kings at one time (Clinton-Eitniear 1993), and in Guatemala where the species is particularly abundant in the Maya Biosphere Reserve in the northern Petén department (Whitacre *et al.* 1991). Traditionally, however, King Vultures were shot on sight in Belize, having been accused of killing domestic fowl (Matola 1985). In 1984, an educational programme was started at the Belize Zoo to teach school children the natural history of the species and for this purpose a hand-reared juvenile was donated by the Jackson

Zoological Park, Mississippi (U.S.A.) (Matola 1985). The Belize and Jackson Zoos also collaborated in setting up a programme to reintroduce King Vultures into the wild and one juvenile, equipped with a radio transmitter, was released in 1987 and followed for three weeks (J. Clinton-Eitnien pers. comm.); later, the programme was discontinued. In Guatemala, the species is extremely rare on the Pacific versant because of extensive deforestation and scarcity of food arising from improved livestock management (Vannini 1989).

Historically in Mexico, the species was abundant and widespread in the coastal mountains (see map in Clinton-Eitnien 1989) and even in the 1950s, a dead tapir *Tapirus terrestris* could attract more than fifty Kings in the state of Veracruz (Clinton-Eitnien 1985). Now, habitat modification and pollution (Ramos 1986) have caused Mexican King Vulture populations to decrease and the species is extinct in the regions of Catemaco (Aguilar 1989) and Los Tuxtlas (Martínez-Gómez 1992). However, some unexpected sightings have been made recently in the states of Yucatan and Quintana Roo (Clinton-Eitnien & Wood 1995) and the species is frequently seen in the Chimalas region of Oaxaca and the Lacandon in Chiapas (Clinton-Eitnien 1989) as well as in the Calakmul in Campeche (Berlanga & Wood 1992; Whitacre *et al.* 1991). Nonetheless, the Lacandona forest is currently undergoing shifting agriculture, harvesting of timber and cattle raising and the survival of the King Vulture will depend on the amount of shooting in the reserves as well as the attitudes of the locals toward vultures (Clinton-Eitnien 1989). In El Salvador, the species has been extirpated from the eastern and central part of the country where it was previously fairly common (Thurber *et al.* 1987), and a recent study at El Imposible National Park rated the King Vulture as rare and placed it on the list of birds of conservation priority that are probably threatened with extinction at the national level considering the paucity of forest sites in the country (Komar & Herrera 1995). Populations have also declined in Honduras and Nicaragua, mainly because of extensive habitat loss (Clinton-Eitnien 1993), and the King Vulture is listed on CITES III for Honduras. In Costa Rica, King Vultures are known to occur in at least 7/12 of the national parks, where most of the remaining forested areas are located, the species' density being low but stable and at carrying capacity due to a lack of food (Clinton-Eitnien 1987). In the past, nearly all of Costa Rica was covered with forest of one type or another but since 1940 over half the forests have been lost and the remaining unprotected areas are rapidly being cleared for agriculture or pasture (Stiles 1985). In Panama, King Vulture populations also appear to be stable (Clinton-Eitnien 1993), but numerical status has not been evaluated.

In South America, the status of the species varies geographically from fairly common and widespread to rare and threatened with extinction. In French Guiana, which has about 70,000 km² of humid tropical lowland forest that has never been logged or touched by shifting cultivation, King Vultures can be seen daily throughout the forest, alone or in pairs flying high over the canopy (Thiollay 1985a), but density is much lower than that of the smaller cathartids (Jullien & Thiollay 1996). In the north-central part of the country in an area of unbroken rainforest near the Nouragues field station, seven Kings was the highest concentration recorded, the population for 100 km² being estimated at nine individuals and including two resident pairs (Thiollay 1989). Near Saint Eugène, however, in an area along the Courcibo River that was inundated when the Petit Saut Dam was put into operation, King Vultures are much less numerous—only 54 sightings in 21 months—but six adults comprised the highest concentration recorded (O. Claessen, pers. comm. and in prep.). In Brazil, *Sarcoramphus* is rare or absent throughout the northeast, only one or two pairs living in the Serra da Capivara National Park, where hunting and fires are commonplace, and the species has been placed on the list of birds of conservation concern (Olmos 1993). The species is also rare in the central Amazon basin as shown in an intense 7-year study of the avifauna of the forests and clearings north of Manaus (Stotz & Bierregaard 1989), in roadside counts (Ellis *et al.* 1990) as well as in a study along the Rio Xingú, 52 km SSW of Altamira (Graves 1992). In the southeast, King Vultures are listed as rare in the Serra do Tingua and the Sooretama Biological Reserve, and absent in the Serra dos Orgaos National Park, Poço das Antas Biological Reserve, and the Serra da Siberia (Scott & Brooke 1985). In fact, the species is now considered as threatened with extinction in the state of Rio de Janeiro where it has been conferred the IUCN conservation status of "Vulnerable" (Alves *et*

al., in press). The species is also absent in Parque Estadual Intervalles, a well-preserved area of Atlantic rainforest in the Serra do Mar Mountains (Mañosa & Pedrocchi 1997), and rarely seen on the slopes in Catarina or in the Aparados da Serra National Park in Rio Grande do Sul (Belton 1984); also rare in the Iguazú National Park in the Misiones forest along the Paraná River on both the Brazilian and Argentinian sides (Albuquerque 1986). The latter populations are separated from each other by extensive soyabean agriculture that forms an open corridor, several hundred kilometres wide (Albuquerque 1986). In Argentina, the species appears regularly in the wet forests of Misiones in the northeast and of Jujuy in the northwest and up to 2300 m in the mountains, the population possibly being as low as 10-15 pairs (Olrog 1985) but stable, and individuals having been seen as far south as Santiago del Estero, La Rioja, San Juan and Córdoba (M. Nores pers. comm.); rare in Paraguay (M. Nores pers. comm.); uncommon to rare in the Chaco (Short 1975); reported in Bolivia in the lowland and montane forests of northern La Paz department (Remsen & Parker 1995) but status not determined, and uncommon in the "Man and Biosphere" Beni Biological Station (Brace *et al.* 1997). In Peru, King Vultures are known to breed in the southeastern rainforests along the Tambopata River near Puerto Maldonado (T. de Roy and R. Piana pers. comm.) and the species is present in the Sechura Peninsula and nearby Andean foothills where carcasses have attracted up to eight Kings (Wallace & Temple 1987a). The species is also present in the Pacific dry forests of the North-western Peru Biosphere Reserve located in the departments of Tumbes and Piura and encompassing the Bosque Nacional de Tumbes, but abundance was not determined (Cook 1996; Parker *et al.* 1995). Unfortunately, over the past 30 years, the unbroken expanses of dry forest, which formerly extended from the Cordillera de Chongón in Ecuador south to the west slope of the Andes east of Chiclayo in Peru, have been reduced to scattered small fragments of heavily exploited forest surrounded by croplands and pastures (Parker *et al.* 1995). In western Ecuador the King Vulture is very rare due to extensive deforestation (Ortiz-Crespo 1986) and only a small number remain in the dry deciduous forests west of Guayaquil (P. Greenfield pers. comm.); also uncommon in the Amazonian lowlands of eastern Ecuador (C. Canaday pers. comm.) but scattered throughout except in the oil-producing zones (Ortiz-Crespo 1986). In Colombia, deforestation has also taken its toll, the King Vulture having been eliminated from the Valle del Cauca plateau over 30 years ago when the area was cleared of its forests to make way for pastures and finally for cereal, cotton, or sugar-cane fields (Lehmann 1970). In the Amacayacu National Park in the extreme south of the country, King Vultures accounted for only 6-7% of the four vulture species present at carcasses in the várzea forests of Matamatá where human exploitation has caused the density of wild mammals to decline, but the proportion of Kings rose four-fold at Río Cotuhé, an area of terra firma forest having undisturbed mammal populations (Gómez *et al.* 1994).

King Vulture density in the Llanos of Venezuela is low (Ellis *et al.* 1983, 1990; Gómez Carredano 1994; Gómez *et al.* 1989; Gómez *et al.* 1994; Kirk & Currall 1994; Thiollay 1996), and near Guanare in the western Llanos, the species is thought to be declining because of decreasing food availability due to more efficient livestock management (G. Ríos pers. comm.). In the western Orinoco basin, King Vultures are mainly seen as scattered pairs or individuals flying over montane forests with agricultural clearings, gallery or flooded forests as well as savanna/forest mosaic dominated by forest (Reid 1989) and the species can be found up to elevations of 1000 m in the Andes of Mérida (Thiollay 1996). In Venezuela, large sections of savanna are set on fire every year (J.L. Gómez Carredano pers. comm.; pers. obs.), adjacent areas and even the fringes of very humid forest being consumed (Phelps 1970), and this takes place during the King Vulture nesting period in the Llanos (Gómez Carredano 1994; Ramo & Busto 1988; Schlee 1995). In one instance, a nest in a samán tree *Pithcellobium saman* in the dry deciduous forests of the Andean piedmont in the state of Portuguesa was affected; after the discovery of the nestling, a fire left the nest tree burning at the base and one of the branches close to the nest cavity 10 m from the ground had also burned, the tree finally falling about the time the chick fledged (Ramo & Busto 1988). Also in the Llanos, nestlings are sometimes taken home and kept as pets until they become unmanageable (J.L. Gómez Carredano pers. comm.; Schlee 1995). On the other hand, in the Valley of Las Nieves (Estado Bolívar) located in the northwest uplands of the Venezuelan Guayana, 20-43 King Vultures (adults and young) regularly gather to eat

domestic carrion, the highest concentration being 68 Kings (adults and young of all plumage classes except downy or partly downy) seen at a dead horse in August 1997 (Schlee 1998); however, the foraging range of these birds is not known and many may have travelled considerable distances in search of food. Although relatively untouched at the present time, the area is slowly being developed (Huber 1995a, b): an asphalt road from Caicara to Puerto Ayacucho was completed in 1989 as well as the opening of one of the world's largest bauxite mines at Los Pijiguaos, west-southwest of Las Nieves; diamonds and gold have long been mined to the east along Río Guaniamo, and the Parguaza Forest Lot to the southwest was opened for commercial logging concessions in the early 1990s, although the latter has not yet been exploited (Huber 1995b). The burning of large tracts of land in the Venezuelan Guayana is also a problem, the savannas, shrublands, and dry forests of the northern and northwestern lowlands in Bolívar state being among the areas most heavily affected (Huber 1995b).

Andean Condor *Vultur gryphus*

This species is found among the highest peaks of the Andes from Venezuela to Tierra del Fuego and Isla Grande (Ellis *et al.* 1983), but it also descends to shrubsteppe and valleys (Donazar *et al.* 1993), to coastal areas to feed on stranded marine animals and to surrounding desert grasslands to feed on carcasses of livestock (Wallace & Temple 1987a). The Andean Condor was placed on CITES I to protect it from pressure from live animal trade, but its status varies geographically from abundant in southern Latin America to locally threatened or having become extinct or nearly so in its northern range (del Hoyo *et al.* 1994).

In Argentina, condor populations are considered to be healthy (M. Nores and L. Sympton pers. comm.) and in some areas of the Sierras Pampeanas the species may even be more numerous than before due to an increasing food supply from livestock (M. Nores pers. comm.). Some threats, however, do exist. Condors have been shot by hunters or poisoned from baits set out for foxes *Dusicyon* sp. (Jácome 1996/97), and the population in the easternmost breeding grounds of the species—the Quebrada de los Condoritos in the Achala Pampa of the Cordovan Mountains—had seriously declined by the late 1980s due to decreasing food supplies as well as constant disturbance from visitors, mineral-exploitation activities, and airforce manoeuvres (Ramallo 1990). A programme for reinforcing the population was successfully undertaken and the Quebrada was finally declared a national park (M. Terrasse, pers. comm. from F. Ramallo). Also, the Buenos Aires, Chaco and La Plata Zoological Parks drew up an agreement in 1996, later extended to two other facilities, to send Andean Condor eggs to the Buenos Aires Zoo where the young would be hand-reared and released into an established population (Jácome 1996/97). The following year, five juveniles were released in Valle Encontado, located between Río Negro and Neuquén in the Andes, the goal being to study their adaptation to conditions in the wild (L. Sympton pers. comm.). An inventory of condor roosting sites is also underway but it will take several years to determine the numerical status of the species in Argentina (L. Sympton pers. comm.).

In Chile, condors can be found throughout and in large concentrations in areas with cattle ranching (Pávez & Tala 1991), but populations are stable only in the south (Jaksic & Jiménez 1986). The species is mainly threatened by the lack of food resulting from declines in marine mammal populations and from improved husbandry conditions for livestock, but sometimes condors are shot by farmers or used for target practice by city-dwellers on the weekends (Jaksic & Jiménez 1986). In the basin of Río Blanco, condors gather in large numbers at a garbage dumping area some 17 km long, and in 1991 a project was drawn up to evaluate the condor's use of the refuse, to collect data on roosting and nesting sites, flight paths, etc., and to set up an artificial feeding station (Pávez & Tala 1991). A preliminary study (Anonymous 1992) proposed La Vega Piuquenes as the best site for the operations but the outcome of the project is not known.

In Bolivia (L. Jammes pers. comm.), no censuses have been taken but condors are regularly seen by plane along the east side of the Andes from the latitude of Santa Cruz to Río Pilcomaya. The species, however, seems to be slowly declining, especially in the altiplano, and is not seen as often in the dry valleys southeast of Cochabamba, droughts and desert expansion probably being

contributing factors. Several studies have taken place in Peru in the Cerro Illescas on the Sechura peninsula, the Olmos and Ñaupe regions in the western Andean foothills and in the Pampa Galeras in the high Andes. The species' reproductive cycle is closely tied to El Niño events affecting the availability of carrion, and thus coastal- and foothill-dwelling populations breed irregularly (Wallace & Temple 1988) and would have difficulties maintaining population size if human-induced activities should increase mortality (Temple & Wallace 1989). High-elevation populations, on the contrary, are probably more than able to maintain their numbers (Wallace & Temple 1988). Studies have also been made on feeding and foraging behaviour (Wallace & Temple 1987a) and hand-reared condors, released on the Sechura Peninsula, were used as surrogates to develop release procedures for the California Condor *Gymnogyps californianus* (Wallace & Temple 1987b). Andean Condors are still used in some folk festivals, serve as targets for hunters or are shot by farmers for having "stolen" domestic animals, and in the past they were shot on the guano islands by the guards (L. Paz Soldan pers. comm.).

In Ecuador (Mauricio Guerrero, national coordinator of the Save the Condor Campaign, pers. comm.; C. Canaday pers. comm.), the Andean Condor is considered as endangered, the population comprising an estimated 70-100 individuals and declining because of human persecution as well as a lack of food, native animals being replaced by domestic ones for which management practices have improved. The "Save the Condor Campaign" was started after seven condors were poisoned in the Antisa Volcano area; ranchers claimed that condors attack newborn calves but this has never been demonstrated scientifically. Also, fires are regularly started in the páramos "to ensure the rains will come" or "to have better grass" and they play a role in displacing the condors, one roost being affected in 1996. Several programmes have been implemented by CECIA, the Ecuadorian ornithological foundation, with partial financial support from either the Wildlife Conservation Society, USAid, Peace Corps or U.S. Fish and Wildlife Service. A national education campaign was started with the general public in 1991-92 to foster greater awareness of the biology of the condors and July 7 was declared National Andean Condor Day. Other programmes focus on environmental education and ecotourism, especially in buffer zones around reserves that harbour the species. A major monitoring project using aerial photography was initiated to determine the status of the populations in several areas, and the availability of food and the threats to survival are also being investigated.

In Colombia, the Condor Recovery Program went into effect in 1989, at which time the Colombian Andean Condor population numbered about 10 pairs found mainly in the Sierra Nevada de Santa Marta Mountains (Lieberman *et al.* 1993). One of the major factors contributing to the species' radical decline was the destruction of the higher altitude forests for the cultivation of potatoes, wheat, and barley, which resulted in an insufficient supply of food for the condors (Olivares 1970). A special report on the project was provided for the 5th World Conference by the programme director Alan Lieberman (pers. comm.), with additional details coming from Lieberman *et al.* (1993). In 1991, a formal Memorandum of Understanding was drawn up between the Instituto Nacional de Desarrollo de los Recursos Naturales Renovables (INDERENA) and the Zoological Society of San Diego, the latter having now provided over \$100,000 in financial support. From 1989 to 1991, captive-reared condors were released in the Chingaza and Puracé National Parks and in the Chiles Indian Reserve, the number of sites later being increased to include Parque Los Nevados as well as a future site in the Sierra Nevada de Cocuy in the northeast; the recovery programme also includes a site in Venezuela (see below). All of the release sites are in the páramo zone (>3000 m a.s.l.), characterized by alpine vegetation, heavy fogs, rolling mists, gusty winds and an average temperature of 10°C. Eighteen facilities in the U.S. as well as the Cali Zoological Park in Colombia have contributed young condors for the reintroduction programme. Each bird has to be hand-carried over the high-altitude páramo to a specially prepared housing structure, releases having taken place as early as 17 days or as late as 103 days after arrival of the birds. From 1989 through 1997, 49 birds were released and 35 survived. Pairs have been formed and eggs laid and hatched. At Chiles, the six surviving birds formed a common flock with a group of wild condors from Ecuador. A recent field census in the Santa Marta shows a wild population of 32 condors consisting of various age classes

from fledgling to adult.

Although the status of the condor as a former breeding species in Venezuela remains speculative, specimens have occasionally been seen in the Mérida Cordillera (Zonfrillo 1977), but they were usually thought to be transients from the neighbouring Colombian Andes or the Sierra de Santa Marta (for a review of documented sightings, see Calchi & Vilorio 1991). The condor was officially declared extinct in Venezuela in 1960 and 31 years later a programme aimed at the recovery of endangered species—Andean Condor and Spectacled Bear *Oso frontino*—was started by the Banco Andino Venezolano (Fundandinos) in conjunction with the Instituto Nacional de Parques (INPARQUES), the release site for the condors being set up in the Valley of Mifaff in the Páramo de la Culata National Park (Celis Parra 1992). The project was carried out in collaboration with Inderena, in charge of the Condor Recovery Program in Colombia, and the Venezuelan staff were trained at the Chingaza release site. Most of the information available can be found in the annual reports compiled by the general programme coordinator, María Rosa Cuesta (see Cuesta 1993–96). Her texts provide an excellent analysis of the housing facilities, maintenance and release procedures; feeding, foraging, and social behaviours; the association of wild condors with the released juveniles; and interactions with humans. Prior to releasing the birds, a massive educational programme was launched in the schools of Mérida, Trujillo and Táchira and a live condor mascot, donated by the Havana Zoological Park, Cuba, was used to educate the public. In 1994, the Murcunturia Visitors Center was set up in Mifaff, an area already known for its tourist attractions.

Young hand-reared or parent-reared Andean Condors were received from the Los Angeles and San Diego Zoos. Five juveniles were released in 1993, one of which was shot at in July 1994 but not seriously wounded, the act being carried out by an inebriated local. Five more young were released in 1995, but in May of the following year, two out of the first group and two from the second were shot down by the locals. An international appeal launched by the Venezuelan Audubon Society indicated the shootings were instigated by the Mayor of Mucuchíes whose political affiliates were attacking the national parks and the condor project, seeing them as a threat to the farmers' rights to use the land as well as to the development of "mass tourism" as opposed to small-scale nature tourism. The condor project having thus been turned into a political issue, a campaign was launched by its opponents to have the two Andean national parks—the Sierra Nevada created in 1952 and the Páramo de la Culata created in 1990—closed down, even though most of the lands are situated above the tree line where agriculture would have a devastating effect on the fragile soils and vegetation. These parks are part of the new Birdlife "Biodiversity Priority Areas for Conservation" programme. According to Alan Lieberman (pers. comm.), the situation has since been resolved and the condor recovery team, in collaboration with the Cleveland Zoo (U.S.A.), is planning new releases.

CONCLUDING REMARKS

Habitat modification, particularly deforestation, is the main factor affecting cathartid populations in Latin America, as has been pointed out in the past vulture symposia (Mundy 1985; Wilbur 1983). An estimated 200,000 ha of forest cover are lost every year, mainly for the expansion of agriculture—pastures for cattle ranching or fields for the production of soya-bean forage for the livestock industry (Tole 1998). The Atlantic rainforest of Brazil, for example, has been shattered into tens of thousands of forest fragments covering only 8% of the pre-Columbian area (Ranta *et al.* 1998). All of the primary forest of the coastal plains has been cleared in the state of Rio de Janeiro and many of the larger mammals, birds, and reptiles have become exceedingly rare if not extinct, partially due to illegal hunting in the reserves (Scott & Brooke 1985). Thus, it is not surprising to find the King Vulture, for example, listed as threatened with extinction in the area (Alves *et al.*, in press). As was pointed out in the 1982 Vulture Symposium, the survival of the King Vulture is contingent upon the rate of deforestation (Clinton-Eitnien in Mundy 1985, p. 463). The same could be said for *Cathartes melambrotus*, a species confined to undisturbed tropical lowland forest, although the latter would appear to be fairly abundant at the present time but becoming less frequent in areas where the food supply has been impoverished by heavy hunting pressure (del Hoyo *et al.* 1994). The drainage of

swamps and marshes is also of concern and would put the Lesser Yellow-headed Vulture at risk. On the other hand, Black Vultures and Turkey Vultures seem to thrive with deforestation and agricultural development, although in some areas they are sustained almost entirely by human-related activities (Thiollay 1996), Black Vultures not becoming a problem when refuse is limited (Vaninni 1989).

Food availability is a problem in many areas, local mammal populations having been reduced or extirpated by habitat alteration, high hunting pressure, and disturbance (Olmos 1993; Ortiz-Crespo 1986; Jaksic & Jiménez 1986); and in areas where habitat has been converted to pastures, the food supply is often further reduced by improved livestock management (Clinton-Eitnien 1987; Jaksic & Jiménez 1986; Vannini 1986). In some instances, however, the scarcity of natural food is partially alleviated by the proliferation of refuse dumps (Jaksic & Jiménez 1986), although the nutritional value of such a food source can be questioned, and the vultures are also exposed to contaminants (Páez & Tala 1991). Human persecution exists: Andean Condors and King Vultures have been shot for target practice, for trophies, or to eliminate them as a potential "threat" to livestock; condors and some of the smaller cathartids have been poisoned.

Another important threat to raptors in Latin America is pesticide contamination (Ellis & Smith 1986; Martínez-Sánchez 1986). Organochlorines are still being used by many low-income farmers (Albuquerque 1986; Jaksic & Jiménez 1986) and have directly affected some Black Vulture populations (Albert *et al.* 1989a, b). Although the use of the principal organochlorine biocides was ended by decree in 1984 in Venezuela, for example, DDT is still widely used in anti-malarial campaigns in the Amazonian region and organochlorines have been detected in the eggs of several raptor species in the Llanos (Basili *et al.* 1994). Large-scale aerial spraying of agrochemicals in plantations of cotton, sugar-cane, and rice caused local declines in *Coragyps atratus*, *Cathartes aura* and *C. burrovianus* in Colombia (Olivares 1970) and this claim has recently been made by some locals in the western Llanos of Venezuela in relation to King Vultures (unpubl. information). Aerial spraying of pesticides has also been incriminated for leading to the recent extinction or decline of several raptor species in parts of Ecuador (Ortiz-Crespo 1986) and for provoking symptoms of poisoning in others in Nicaragua (Martínez-Sánchez 1986), although the impact on vultures was not determined. At the last vulture symposium, one Andean Condor was reported to have been heavily contaminated from pesticides in coastal Peru but the extent of the contamination in the population as a whole was not known (S.A. Temple in Mundy 1985, p.462) and Lesser Yellow-headed Vultures are vulnerable to pollution and pesticides in coastal areas (J. Clinton-Eitnien in Mundy 1985, p. 464). Some of the above examples involve either direct or secondary contamination whereas in others, a species may have declined because of a loss or reduction in its food base. Data concerning the effects of pesticides and other environmental contaminants on vultures are extremely scarce and further study of this problem is needed throughout Latin America.

Finally, detailed studies are needed on the biology and ecology of all the cathartid species in Latin America; even the distribution of both yellow-headed species is poorly known. The populations of Andean Condors and King Vultures in high risk areas need to be numerically evaluated. At the present time, the California Condor and the Andean Condor are on CITES I and the King Vulture is on CITES III, but only for Honduras. Although the author feels that all cathartid species should as a matter of principle be placed on CITES II along with the other Falconiformes, based on the information compiled in this report, at least *Sarcoramphus papa*, *Cathartes burrovianus* and *Cathartes melambrotus* should certainly be placed on CITES II. Should the Cathartidae in the future be removed from the diurnal birds of prey and placed with the Ciconiiformes or be treated as a separate order—the Cathartiformes—all national and international legislation concerning these taxa will need to undergo the appropriate changes.

ACKNOWLEDGEMENTS

Sincere gratitude is extended to the following people who kindly made available unpublished data or provided reports for their countries: Mauricio Guerrero and Chris Canaday (Fundación Ornitológica del Ecuador—CECIA), Olivier Claessens (Muséum National d'Histoire Naturelle,

France), Maria Rosa Cuesta (Condor Recovery Program, Venezuela), Tui de Roy (The Roving Tortoise, New Zealand), Jack Clinton-Eitnienar (Center for the Study of Tropical Birds, U.S.A.), Paul Greenfield (ornithologist, Ecuador), Lois Jammes (ARMONIA/Birdlife, Bolivia), Alan Lieberman (The Peregrine Fund, U.S.A.), Manuel Nores (Centro de Zoología Aplicada, Córdoba, Argentina), Luis Paz Soldan (Asociación Peruana para la Conservación de la Naturaleza), Renzo Piana (researcher, Harpy Eagle Project, Tambopata Reserve, Peru), Guilberto Ríos (Universidad Nacional Experimental de los Llanos Occidentales Ezequiel Zamora, Venezuela), Lorenzo Sympson (Sociedad Naturalista Andino Patagónica, Argentina), and Jean-Marc Thiollay (Ecole Normale Supérieure, France).

For their efforts in helping establish contact with contributors, special thanks are due to Lloyd Kiff (The Peregrine Fund, U.S.A.), Clemencia Rodner (Sociedad Conservacionista Audubon, Venezuela), and Michel Terrasse (Fonds d'Intervention pour les Rapaces, France).

REFERENCES

- AGUILAR, S. 1989. Las rapaces diurnas de Catemaco, Veracruz. *2nd Western Hemisphere Meeting, WWGBP and Raptor Research Foundation*, 10-14 October, Veracruz, Mexico: Abstract No. 4.
- ALBERT, L., C. BARCENAS & A. MARTINEZ 1989a. Distribución de plaguicidas organoclorados en organismos de Zopilote común (*Coragyps atratus*). *2nd Western Hemisphere Meeting, WWGBP and Raptor Research Foundation*, 10-14 October, Veracruz, Mexico: Abstract No. 5.
- ALBERT, L.A., C. BARCENAS, M. RAMOS & E. IÑIGO 1989b. Organochlorine pesticides and reduction of eggshell thickness in a Black Vulture *Coragyps atratus* population of the Tuxtla Valley, Chiapas, Mexico. Pp. 473-475 in B.-U. Meyburg & R.D. Chancellor (Eds.), *Raptors in the Modern World*. WWGBP: Berlin, London, Paris.
- ALBUQUERQUE, J.L.B. 1986. Conservation and status of raptors in Southern Brazil. *Birds of Prey Bull.* 3: 88-94. WWGBP: Berlin.
- ALVES, M.A.S., J.F. PACHECO, L.P. GONZAGA, R.B. CAVALCANTI, M. RAPOSO, C. YAMASHITA, N.C. MACIEL & M. CASTANHEIRA in press. Aves. In H.G. Bergallo, C.F.D. Rocha, M.A.S. Alves & M. Van Sluys (Eds.), *A Fauna ameaçada de extinção do Estado do Rio de Janeiro*. Editora URJ: Rio de Janeiro.
- ANONYMOUS 1992. *Informe comederos artificiales para Cóndores*. Consultores Proyecto Cóndor, División Andina: Chile.
- BASIL, G., P. CARDINALE-PIZANI & R.W. RISEBROUGH 1994. Organochlorines in Venezuelan raptor eggs. Pp. 693-696, in B.-U. Meyburg & R.D. Chancellor (Eds.), *Raptor Conservation Today*. WWGBP, Pica Press: Berlin.
- BELTON, W. 1984. Birds of Rio Grande do Sul, Brazil. Part 1. Rheidae through Furnariidae. *Bull. Am. Mus. Nat. Hist.* 178: 369-636.
- BERLANGA, M. & P. WOOD 1992. Observations on the King Vulture *Sarcoramphus papa* in the Calakmul Biosphere Reserve, Campeche, Mexico. *Vulture News* 26: 15-21.
- BRACE, R.C., J. HORNBuckle & J.W. PEARCE-HIGGINS 1997. The avifauna of the Beni Biological Station, Bolivia. *Bird Conserv. Internat.* 7: 117-159.
- CALCHI, R. & A.L. VILORIA 1991. Occurrence of the Andean Condor in the Perijá Mountains of Venezuela. *Wilson Bull.* 103: 720-722.
- CELIS PARRA, B. 1992. *El regreso del Cóndor*. Publiandina C.A.: Mérida, Venezuela.
- CLAESSENS, O. in prep. Effets de la fragmentation forestière en milieu tropical sur les peuplements et les populations d'Oiseaux: le cas de la mise en eau du Barrage de Petit Saut (Guyane française). Doctoral dissertation, Muséum National d'Histoire Naturelle, Paris, France.
- CLINTON-EITNIEAR, J. 1985. King Vulture conservation and research program. *Wild Things* Sept.-Oct.: 1-3.
- CLINTON-EITNIEAR, J. 1987. The King Vulture in Costa Rica. *Vulture News* 17: 21-24.
- CLINTON-EITNIEAR, J. 1989. Habitat loss among hazards facing the King Vulture in Mexico. *Eyas* 12(2): 9-11.
- CLINTON-EITNIEAR, J. 1993. The King Vulture in Mesoamerica: an uncertain future. *V Simposium Internacional de Fauna Silvestre, Memoria*: 44-47. Universidad Autonoma de Tamaulipas, CD.: Victoria, Mexico.
- CLINTON-EITNIEAR, J. & P. WOOD 1995. Recent noteworthy sightings of King Vultures in Mexico. *Vulture News* 32: 23-25.
- COOK, H.G. 1996. Avifauna of North-western Peru Biosphere Reserve and its environs. *Bird Conserv. Internat.* 6: 139-165.
- CUESTA, M.R. 1993-96. *Reportes Cóndores*. Reports, Fundandino: Mérida, Venezuela.
- DEL HOYO, J., A. ELLIOTT & J. SARGATAL 1994. *Handbook of the Birds of the World*. Vol. 2: New World Vultures to Guineafowl. Lynx Edicions: Barcelona.

- DONÁZAR, J.A., F. HIRALDO, O. CEBALLOS, A. TRAVAINI, A. RODRIGUEZ & M. FUNES 1992.** Black Vulture *Coragyps atratus* population increase can reduce food availability for Andean Condors *Vultur gryphus* in Patagonia. *IVth World Conference on Birds of Prey*, Berlin, 10-17 May. Abstracts: 17.
- DONÁZAR, J.A., O. CEBALLOS, A. TRAVAINI & F. HIRALDO 1993.** Roadside raptor surveys in the Argentinean Patagonia. *J. Raptor Res.* 27: 106-110.
- ELLIS, D.H., R.L. GLINSKI, J.G. GOODWIN, Jr. & W.H. WHALEY 1983.** New World vulture counts in Mexico, Central America, and South America. Pp. 124-132 in S.R. Wilbur & J.A. Jackson (Eds.), *Vulture Biology and Management*. University of California Press: Berkeley.
- ELLIS, D.H., R.L. GLINSKI & D.W. SMITH 1990.** Raptor road surveys in South America. *J. Raptor Res.* 24: 98-106.
- ELLIS, D.H. & D.G. SMITH 1986.** An overview of raptor conservation in Latin America. *Birds of Prey Bull.* 3: 21-25. WWGBP, Berlin.
- GALE, N.B. 1986.** Status of raptors in Panama. *Birds of Prey Bull.* 3: 48-50. WWGBP, Berlin.
- GÓMEZ CARREDANO, J.L. 1994.** *Las aves de presa de Los Llanos venezolanos*. Lagoven S.A., Petróleos de Venezuela, S.A.: Caracas.
- GÓMEZ, J.L., Y. CARBONELL & G. MEDINA 1989.** Comparación de la densidad, diversidad y hábitos de nidificación de los Falconiformes en tres localidades de los Llanos de Venezuela. Unpubl. Report, Fundación para la Defensa de la Naturaleza: Caracas.
- GÓMEZ, L.G., D.C. HOUSTON, P. COTTON & A. TYE 1994.** The role of Greater Yellow-headed Vultures *Cathartes melambrotus* as scavengers in neotropical forest. *Ibis* 136: 193-196
- GRAVES, G.R. 1992.** Greater Yellow-headed Vulture (*Cathartes melambrotus*) locates food by olfaction. *J. Raptor Res.* 26: 38-39.
- HAYES, F.E. 1991.** Raptor densities along the Paraguay River: seasonal, geographical and time of day variation. *J. Raptor Res.* 25: 101-108.
- HOUSTON, D.C. 1987.** The effect of reduced mammal numbers on *Cathartes* vultures in neotropical forests. *Biol. Conserv.* 41: 91-98.
- HOUSTON, D.C. 1994.** Observations on Greater Yellow-headed Vultures *Cathartes melambrotus* and other *Cathartes* species as scavengers in forest in Venezuela. Pp. 265-268 in B.-U. Meyburg & R.D. Chancellor (Eds.), *Raptor Conservation Today*. WWGBP, Pica Press: Berlin.
- HUBER, O. 1995a.** Vegetation. Pp. 97-160 in P.E. Berry, B.K. Holst & K. Yatskievych (Eds.), *Flora of the Venezuelan Guayana*, Vol. 1. Timber Press, Inc.: Portland, Oregon.
- HUBER O. 1995b.** Conservation of the Venezuelan Guayana. Pp. 193-218 in P.E. Berry, B.K. Holst & K. Yatskievych (Eds.), *Flora of the Venezuelan Guayana*, Vol. 1. Timber Press, Inc.: Portland, Oregon.
- JÁCOME, N.L. 1996/97.** *Registro nacional de Cóndor Andino en cautiverio*, No. 5. Jardín Zoológico de la Ciudad de Buenos Aires S.A.: Buenos Aires.
- JAKSÍČ, F.M. & J.E. JIMÉNEZ 1986.** The conservation status of raptors in Chile. *Birds of Prey Bull.* 3: 95-104. WWGBP, Berlin.
- JULLIEN, M. & J.-M. THIOLLAY 1996.** Effects of rainforest disturbance and fragmentation: comparative changes of the raptor community along natural and human-made gradients in French Guiana. *J. Biogeogr.* 23: 7-25.
- KEYSER, C., D. MONTAGNON, M. SCHLEE, B. LUDES, H. PFITZINGER & P. MANGIN 1996.** First isolation of tandemly repeated DNA sequences in New World Vultures and phylogenetic implications. *Genome* 39: 31-39.
- KIRK, D.A. & J.E.P. CURRALL 1994.** Habitat associations of migrant and resident vultures in central Venezuela. *J. Avian Biol.* 25: 327-337.
- KIRK, D.A. & A.G. GOSLER 1994.** Body condition varies with migration and competition in migrant and resident South American vultures. *Auk* 111: 933-944.
- KIRK, D.A. & D.C. HOUSTON 1995.** Social dominance in migrant and resident Turkey Vultures at carcasses: evidence for a despotic distribution? *Behav. Ecol. Sociobiol.* 36: 323-332.
- KOESTER, F. 1982.** Observations on migratory Turkey Vultures and Lesser Yellow-headed Vultures in northern Colombia. *Auk* 99: 372-375.
- KOMAR, O. & N. HERRERA 1995.** Avian inventory of El Imposible National Park, San Benito and Río Guayapo sectors. Pp. 6-32 in O. Komar & N. Herrera (Eds.), *Avian Diversity at El Imposible National Park and San Marcelino Wildlife Refuge, El Salvador*. WSC Working Paper No. 4: Bronx, New York.
- LADYGUIN, A.V. 1996.** Vulture assemblages in Old and New World: Are they ecological analogs? *First Joint Annual Meeting, American Ornithologists' Union and Raptor Research Foundation*, 13-17 August, Boise, Idaho: Abstract No. 271.
- LEHMANN, F.C. 1970.** Avifauna in Colombia. *Smithsonian Contrib. Zool.* 26: 88-92.

- LIEBERMAN, A., J.V. RODRIGUEZ, J.M. PÁEZ & J. WILEY 1993. The reintroduction of the Andean Condor into Colombia, South America: 1989-1991. *Oryx* 27: 83-90.
- MAÑOSA, S. & V. PEDROCCHI 1997. A raptor survey in the Brazilian Atlantic rainforest. *J. Raptor Res.* 31: 203-207.
- MARTÍNEZ-GÓMEZ, J.E. 1992. Raptor conservation in Veracruz, Mexico. *J. Raptor Res.* 26: 184-188.
- MARTÍNEZ-SÁNCHEZ, J. 1986. Causes affecting the survival of birds of prey in Nicaragua. *Birds of Prey Bull.* 3: 43-47. WWGBP: Berlin.
- MATOLA, S. 1985. JZP vulture to Belize Zoo. *Wild Things*, Sept.-Oct.: 3-4.
- MUNDY, P.J. 1985. The biology of vultures: a summary of the workshop proceedings. Pp. 457-482 in I. Newton & R.D. Chancellor (Eds.), *Conservation Studies on Raptors*. ICBP Tech. Publ. No. 5: Cambridge.
- OLIVARES, A. 1970. Effects of the environmental changes on the avifauna of the Republic of Colombia. *Smithsonian Contrib. Zool.* 26: 77-87.
- OLMOS, F. 1993. Birds of Serra da Capivara National Park in the "caatinga" of north-eastern Brazil. *Bird Conserv. Internat.* 3: 21-36.
- OLROG, C.C. 1985. Status of wet forest raptors in northern Argentina. Pp. 191-197 in I. Newton & R.D. Chancellor (Eds.), *Conservation Studies on Raptors*. ICBP Tech. Publ. No. 5: Cambridge.
- ORTIZ-CRESPO, F.I. 1986. Notes on the status of diurnal raptor populations in Ecuador. *Birds of Prey Bull.* 3: 71-79. WWGBP: Berlin.
- PARKER, T.A., T.S. SCHULENBERG, M. KESSLER & W.H. WUST 1995. Natural history and conservation of the endemic avifauna in north-west Peru. *Bird Conserv. Internat.* 5: 201-231.
- PÁVEZ, E. & C. TALA 1991. *Proyecto Cóndor*. Unpubl. Report, 17 pp.: Chile.
- PEARMAN, M. 1993. The avifauna of the Río Machariapo dry forest, northern La Paz department, Bolivia: a preliminary investigation. *Bird Conserv. Internat.* 3: 105-117.
- PHELPS, Jr., W.H. 1970. Avifauna in Venezuela. *Smithsonian Contrib. Zool.* 26: 75-76.
- RAMALLO, C.F. 1990. *El Cóndor en Córdoba*. Editorial La Canada: Córdoba.
- RAMO, C. & B. BUSTO 1988. Observations at a King Vulture (*Sarcoramphus papa*) nest in Venezuela. *Auk* 105: 195-196.
- RAMOS, M.A. 1986. Birds in peril in Mexico: the diurnal raptors. *Birds of Prey Bull.* 3: 26-42. WWGBP: Berlin.
- RANTA, P., T. BLOM, J. NIEMELÄ, E. JOENSUU & M. SIITONEN 1998. The fragmented Atlantic rainforest of Brazil: size, shape and distribution of forest fragments. *Biodiv. Conserv.* 7: 385-403.
- REA, A.M. 1983. Cathartid affinities: a brief overview. Pp. 26-54 in S.R. Wilbur & J.A. Jackson (Eds.), *Vulture Biology and Management*. University of California Press: Berkeley.
- REID, S.B. 1989. Flying behaviour and habitat preferences of the King Vulture *Sarcoramphus papa* in the western Orinoco Basin of Venezuela. *Ibis* 131: 301-303.
- REMSEN, J.V. & T.A. PARKER 1995. Bolivia has the opportunity to create the planet's richest park for terrestrial biota. *Conserv. Internat.* 5: 181-199.
- SCHLEE, M.A. 1995. Nest records for the King Vulture (*Sarcoramphus papa*) in Venezuela. *J. Raptor Res.* 29: 269-272.
- SCHLEE, M.A. 1998. Observations on the King Vulture *Sarcoramphus papa* in the Valley of Las Nieves (Sabana Nueva), Estado Bolívar, Venezuela. *5th World Conference on Birds of Prey and Owls*, 4-11 August, Midrand, South Africa. *Abstracts*: 13.
- SCOTT, D.A. & M. de L. BROOKE 1985. The endangered avifauna of southeastern Brazil: a report on the BOU/WWF expeditions of 1980/81 and 1981/82. Pp. 115-139 in A.W. Diamond & T.E. Lovejoy (Eds.), *Conservation of Tropical Forest Birds*. ICBP Tech. Publ. No. 4: Cambridge.
- SHORT, L.L. 1975. A zoogeographic analysis of the South American Chaco avifauna. *Bull. Am. Mus. Nat. Hist.* 154: 1-352.
- SIBLEY, C.G. & J.E. AHLQUIST 1990. *Phylogeny and Classification of Birds*. Yale University Press: New Haven.
- STILES, F.G. 1985. Conservation of forest birds in Costa Rica: problems and perspectives. Pp. 141-168 in A.W. Diamond & T.E. Lovejoy (Eds.), *Conservation of Tropical Forest Birds*. ICBP Tech. Publ. No. 4: Cambridge.
- STOTZ, D.F. & R.O. BIERREGAARD, Jr. 1989. The birds of the Fazendas Porto Alegre, Esteio and Dimoma north of Manaus, Amazonas, Brazil. *Rev. Brasil. Biol.* 49: 861-872.
- TEMPLE, S.A. & M.P. WALLACE 1989. Survivorship patterns in a population of Andean Condors *Vultur gryphus*. Pp. 247-251 in B.-U. Meyburg & R.D. Chancellor (Eds.), *Raptors in the Modern World*. WWGBP: Berlin, London, Paris.
- THOLLAY, J.-M. 1985a. Birds of prey in French Guiana, a preliminary survey. *Birds of Prey Bull.* 2: 11-15. WWGBP: Berlin.

- THIOLLAY, J.-M. 1985b.** Falconiforms of tropical rainforests: a review. Pp. 155-165 in I. Newton & R.D. Chancellor (Eds.), *Conservation Studies on Raptors*. ICBP Tech. Publ. No. 5: Cambridge.
- THIOLLAY, J.-M. 1985c.** Composition of Falconiform communities along successional gradients from primary rainforest to secondary habitats. Pp. 181-190 in I. Newton & R.D. Chancellor (Eds.), *Conservation Studies on Raptors*. ICBP Tech. Publ. No. 5: Cambridge.
- THIOLLAY, J.-M. 1989.** Censusing of diurnal raptors in a primary rainforest: comparative methods and species detectability. *J. Raptor Res.* 23: 72-84.
- THIOLLAY, J.-M. 1991.** Altitudinal distribution and conservation of raptors in southwestern Colombia. *J. Raptor Res.* 25: 1-8.
- THIOLLAY, J.-M. 1996.** Distributional patterns of raptors along altitudinal gradients in the northern Andes and effects of forest fragmentation. *J. Tropical Ecol.* 12: 535-560.
- THURBER, W.A., J.F. SERRANO, A. SERMENO & M. BENITEZ 1987.** Status of uncommon and previously unreported birds of El Salvador. *Proc. West. Found. Vert. Zool.* 3: 109-293.
- TOLE, L. 1998.** Sources of deforestation in tropical developing countries. *Environ. Manage.* 22: 19-33.
- VANNINI, J.P. 1989.** Neotropical raptors and deforestation: notes on diurnal raptors at Finca El Faro, Quetzaltenango, Guatemala. *J. Raptor Res.* 23: 27-38.
- WALLACE, M.P. & S.A. TEMPLE 1987a.** Competitive interactions within and between species in a guild of avian scavengers. *Auk* 104: 290-295.
- WALLACE, M.P. & S.A. TEMPLE 1987b.** Releasing captive-reared Andean Condors to the wild. *J. Wildl. Manage.* 51: 541-550.
- WALLACE, M.P. & S.A. TEMPLE 1988.** Impacts of the 1982-1983 El Niño on population dynamics of Andean Condors in Peru. *Biotropica* 20: 144-150.
- WETMORE, A. 1964.** A revision of the American vultures of the genus *Cathartes*. *Smithsonian Misc. Coll.* 146: 1-48.
- WHITACRE, D.F., A.J. BAKER, L.E. JONES, R.V. PATRACA, J. SUTTER & C.M. SWARTZ 1991.** Results of census efforts in three units of the Maya Biosphere Reserve/Calakmul Biosphere Reserve Complex. Pp. 43-58 in D.F. Whitacre, W.A. Burnham & J.P. Jenny (Eds.), *Maya Progress Report 4*. The Peregrine Fund, Inc.: Boise, Idaho.
- WILBUR, S.R. 1983.** The status of vultures in the western hemisphere. Pp. 113-123 in S.R. Wilbur & J.A. Jackson (Eds.), *Vulture Biology and Management*. University of California Press: Berkeley.
- WINK, M., I. SIEBOLD, F. LOTFIKHAN & W. BEDNAREK 1998.** Molecular systematics of holarctic raptors (Order Falconiformes). Pp. 29-48 in R.D. Chancellor, B.-U. Meyburg & J.J. Ferrero (Eds.), *Holarctic Birds of Prey*. ADENEX-WWGBP: Calamonte, Spain.
- ZONFRILLO, B. 1977.** Re-discovery of the Andean Condor *Vultur gryphus* in Venezuela. *Bull. B.O.C.* 97: 17-18.

Marsha A. Schlee
Muséum National d'Histoire Naturelle
Ménagerie du Jardin des Plantes
57 rue Cuvier
75005 Paris
France