Status Survey and Conservation Action Plan for Procyonids and Ailurids

The Red Panda, Olingos, Coatis, Raccoons, and their Relatives

(In English and Spanish)

Compiled by Angela R. Glatston

IUCN/SSC Mustelid, Viverrid, and Procyonid Specialist Group

IUCN
The World Conservation Union

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Contents

Contenidos

Foreword

The IUCN/SSC Action Plan for Procyonids and Ailurids is, as far as I am aware, unique among such documents in that the impetus for its production began in the zoo community, more specifically in the studbook and breeding program activities which stand central to the work of all modern zoos. As we approach the 21st century, the role of zoological gardens is changing—they are emerging from their image as exploiters of wildlife into a major force for nature conservation. This welcome metamorphosis is reflected amply in the links being forged between IUCN and the zoo world. IUCN/SSC's Captive Breeding Specialist Group (CBSG), initiated and funded by zoos, acts as a catalyst in this process by promoting cooperation between *in situ* conservation and *ex situ* breeding programs. The mission of the zoo of the future has been outlined in the *World Zoo Conservation Strategy*, recently published jointly by the IUDZG—The World Zoo Organization and CBSG. This Action Plan for the conservation of procyonids and ailurids demonstrates the realization of this new philosophy, and it is therefore appropriate that it should be published now, shortly after the appearance of the zoo strategy itself.

The procyonids and ailurids, together with mustelids and viverrids, are species which could derive considerable benefit from zoos. Although as a group these small carnivores are not currently well represented in zoological collections around the world, they are nevertheless species which are eminently suitable for captive management and exhibition. In the first place, their physical size means that good quality enclosures can be constructed within the limitations of most budgets. Their relatively limited space requirements mean that the numbers which could be maintained globally would be easily sufficient to form the basis of good breeding programs. Furthermore, they are generally appealing to watch and their behavior is engaging. This means that they should be an ideal attraction for visitors, which in turn arouses the interest and support of the public which can make the difference between the success and failure of a conservation initiative. This is even more important when an initiative is made on behalf of low-profile species, little known to the scientist, let alone to politicians and the general public.

In this Action Plan we read again and again how little is known about most of the procyonid and ailurid species. In some of the species discussed, the majority of the facts available have been gained from captive studies rather than field research. This is understandable given the difficulties in observing such cryptic species in the wild. Zoos are potentially tremendous sources of information, a fact which is only just being realized both by the zoos themselves and the research communities. It is to be hoped that in the future zoos will be more willing to open their doors and encourage the activities of scientists, particularly those interested in small carnivores, and that through their cooperation our knowledge of these species will grow.

I would like to conclude by saying that I hope this Action Plan achieves its objectives and arouses more interest, conservation, and research in this little-known group of species. I hope its message reaches not only field biologists and conservationists, politicians and governments, but also zoo curators and directors and zoo biologists so that we can all work together to ensure the future of this unique group of animals.

Prof. Dr. Gunther Nogge
Director, Cologne Zoo
Chairman, EAZA's EEP Committee
President, IUDZG—The World Zoo Organization

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Introduction

The idea to establish an IUCN/SSC Specialist Group for the procyonids was born out of the research undertaken on the red panda, *Ailurus fulgens*, in various zoos around the world. The red panda is the subject of a well-coordinated captive breeding program centered around an international studbook. In order to establish an effective breeding program, there must be sound scientific understanding of population genetics and of the basic biology of the species concerned. This means that those involved in running such breeding programs must be familiar with the relevant literature and research projects involving their species. In the case of the red panda, it became clear to those involved with the breeding program that the information currently available on this species was almost nonexistent. Nothing was known of its precise distribution, its status in the wild, its ecology, or its normal behavior. It was also apparent that none of the SSC Specialist Groups that were active in the early 1980s dealt with the red panda. It was on the basis of these facts that, during the Fourth Conference on the Breeding of Endangered Species in Captivity in 1984, the idea to establish a new SSC Specialist Group was conceived. It was decided that this new group should concern itself with the procyonids (including the red panda). The group's status was ratified later that same year at the SSC meeting in Madrid and the road to this document was begun. In 1990, the Group became a sub-group of a larger Mustelid, Viverrid, and Procyonid Specialist Group.

At first glance it may seem strange to some readers that a Specialist Group, which is primarily oriented towards conservation in the wild, should be established at the behest of people working in zoos. The role of zoos in conservation as both educators of the public and as breeders of threatened species is now recognized by most of the major conservation organizations. Many of the action plans for endangered species produced by various specialist groups have an element of captive propagation. Nevertheless, it is more usual that these specialist groups are established by conservationists who look to the zoo world as one option in solving their problems. In the case of the Procyonid Specialist Group it is people from within the zoo world who first established an SSC Specialist Group as a result of problems they had encountered within zoos.

Eight years have elapsed since this project was initiated in 1985. This is an inordinately long time for the completion of a slim document covering only the few species represented by this Action Plan. However, in our defense it must be noted that in the procyonids and ailurids (i.e. the red panda) we are generally dealing not only with species of which little is known, but also often with species for which there has been very little interest demonstrated by the scientific and conservation communities. There are few data available from the field and there seem to be even fewer scientists interested in collecting it. This has meant that the chair of the procyonid and ailurid sub-group has had to send a continuous stream of letters to various organizations and individuals associated with nature conservation in those countries where procyonids are endemic, in order to glean scraps of information. The recipients of these letters were only remotely connected with the species of interest and so the information which they were able to supply has been limited. The difficulties of this task are amply reflected in the nature of the information presented in this document and the duration of the task.

The subtitle of this procyonid action plan, "*Status Survey and Conservation Action Plan for Procyonids and Ailurids,*" gives a hint of some of the problems and confusions confronting the compiler while producing this report. Foremost among these is the taxonomic confusion which besets this whole group from the family to subspecies levels. The arguments as to whether the red panda should in fact be classified as a procyonid will be examined later in this document. However, that particular question represents only one example of this type of problem; the status of the various island forms of raccoon and of the five currently recognized species of olingos are other examples. In order to avoid confusion about the red panda (the only Old World member of the Procyonidae according to classical taxonomy), it has been decided to use the term "procyonid," to indicate the New World species covered in this report and the term "ailurid" to denote the red panda.

The procyonids and ailurids are, with the exception of the more common species of raccoons and coatis, a group of species relatively unknown and little studied by the scientific community. The limited nature of our knowledge of these species is one major factor contributing to the fact that, until recently, not one single member of either of these groups was mentioned in the IUCN Red List of Threatened Animals. It has also meant that very few procyonid species or subspecies have been afforded the protection of Appendix II or even Appendix III of CITES. In several instances it can be categorically stated that these omissions have indeed been a reflection of our ignorance of these species rather than a cause for optimism about their future.

The comparative absence of recent field studies or surveys of most of the species discussed in this document has resulted in a dearth of information as to their numbers, actual distribution, habitat requirements, etc. In terms of this report this means that, in many cases, we do not have

direct information regarding the status of, or threats to, the species concerned, but rather that we have had to deduce these from indirect evidence. For example, where high levels of deforestation have been reported in the countries comprising the range of a largely arboreal or forest dwelling species, we assume that the species is threatened, even if direct proof of this fact is not available. In addition, the lack of familiarity with these species has lead to known instances of misidentification by field workers or local informants, which in turn casts doubt on the reliability of some of the data we have received. One example that illustrates this problem is a report from Myanmar (Burma) on the occurrence of the red panda. This report stated that red pandas were still fairly common in some areas, and as proof, the report was accompanied by a photograph of a "red panda" taken during a visit to one such area—the photograph in question depicted a species of civet. Other examples are to be found where field workers in Central America were questioned about the occurrence of the mountain coati, and were uncertain as to whether the animals which they had seen in the field belonged to this species or to that of the more familiar Central American coati. Similarly, reports of the Guadeloupe raccoon are confused by the fact that some respondents indicate that the species they have seen on the island is the crab-eating raccoon rather than the local endemic species.

The collection of data and its evaluation has also been hampered by the taxonomic problems mentioned above which will be covered in detail later. The most surprising of these related to the actual relationship of the red panda to the procyonids: one expert was so adamant that the red panda could not be considered as a procyonid that he refused to work for or with a group called the Procyonid Specialist Group which also dealt with the red panda. Luckily, this only occurred on one occasion, but it serves not only to illustrate the kind of reaction that may be encountered when people's (scientific) beliefs are questioned, but also that taxonomic questions can have far-reaching effects.

The Aims of this Action Plan

The primary aim of this Action Plan is to draw attention to the conservation problems confronting some species of procyonids and ailurids. The animals comprising these two groups are small-bodied, unobtrusive carnivores, little known and little studied. Thus, this document aims to focus the attention of the scientific community on the need for research into the biology of these very interesting species. In the document it is made clear how uncertain we are as to the taxonomic status of many of the species discussed, even to the extent of whether some of these species should be considered as procyonids at all. It is therefore our hope that this document will attract the attention of taxonomists to this group of animals. It is our hope that this document will also stimulate ecologists to work on the habitat requirements of these species and that general surveys will be undertaken to determine their numbers, range, and distribution. In general terms, we hope that this document will arouse the interest of suitably qualified biologists to work with both procyonids and ailurids.

Research on its own is not sufficient to help these species; the interest and support of national and international conservation organizations is needed to ensure that conservation efforts can be promoted and coordinated. To date such organizations have shown little or no interest in the procyonids or ailurids. It is the aim of this document to alter this situation.

Furthermore, conservation efforts need the support of governments and politicians in those lands which are home to the species concerned. It is the aim of this document to demonstrate to people with influence in political circles that procyonids and ailurids are interesting and remarkable creatures in their own right, and to motivate these people to support the required conservation efforts, both politically and financially. In addition to governmental support, we also need support for research activities. This document aims to stimulate the interest of the corporate sector and grant-giving bodies for financing procyonid and ailurid research and to persuade university departments to provide the necessary facilities and academic support. This document is also directed towards the zoo community: zoos need to be stimulated into providing research and facilities for the captive propagation of those species that will benefit from this option.

It is also hoped that this document will influence the plans of industry and multinationals who are considering developments in those regions where the rarer members of the Procyonidae and Ailuridae occur. Finally, it is hoped that this Action Plan will awaken the interest of the general public in this very interesting group of animals, especially in countries where these species occur, for without the interest, sympathy, and support of people we cannot expect conservation efforts to succeed.

Chapter 1

Classification

The animals considered in this report are all small-bodied members of the Order Carnivora: but none of them is truly carnivorous, and the largest species is not much larger than a well-fed domestic cat. The procyonids are confined totally to the New World, where they can be regarded as the local equivalent of the Old World viverrids, which they resemble both in body size and in ecological niches filled. Procyonids comprise a small group of arboreal or semi-arboreal, plantigrade or semi-plantigrade omnivores and frugivores, most of which are totally nocturnal. The distribution of the group encompasses the whole American continent from Palaearctic to tropical regions, from Canada to Argentina. Procyonids have adapted to a wide variety of habitats ranging from tropical rain forest to arid semi-desert regions and chaparral. Nevertheless, there is one factor generally common to all of these species, and this is an affinity for tree cover. All these species climb trees to escape danger, and all, with the exception of prairie-dwelling raccoons, have their young in tree nests. The red panda, as the sole ailurid, is an Old World species, but it resembles the procyonids both ecologically and in its physical appearance.

The Procyonidae comprise five or six genera, depending on the taxonomic acceptance of *Nasuella*. These are: *Procyon*, the raccoons; *Nasua*, the coatis; *Potos*, the kinkajous; *Bassaricyon*, the olingos; *Bassariscus*, the ringtails or cacomistles; and *Nasuella*, the mountain or little coati. This last species is usually placed apart from the other coatis in its own genus, but this view is not shared by all the experts (Poglayen-Neuwall, pers. comm.). As a family, the procyonids demonstrate a variety of feeding adaptations: the raccoons are adapted not only for terrestrial foraging for crustaceans along stream banks but also for arboreal foraging for fruit and small vertebrates; coatis are versatile foragers both on the forest floor and in trees; kinkajous with their prehensile tails are well-adapted for arboreal foraging for fruits and small vertebrates; both the ringtails and the olingos are arboreally adapted but do not possess the prehensile tail. The ringtail (*Bassariscus astutus*), with its semi-retractile claws, is well-adapted to move swiftly through the trees in pursuit of prey.

The animals dealt with in this document are beset with taxonomic confusion. The problem of the taxonomic position of the red panda was alluded to in the introduction to this document. In fact the question of the relationship between the New World procyonids and the Old World giant and red pandas has been vexing taxonomists for many years. According to the classical taxonomy, the family Procyonidae is subdivided into two subfamilies, the Procyoninae, or New World procyonids, and the Ailurinae, or pandas (Walker 1968). However, other studies, in particular the monograph of Davis (1964) and the serological work of Leone & Wiens (1956) have suggested that in fact the giant panda is a highly specialized bear and should be classified accordingly. The more recent work of O'Brien *et al.* (1985) using DNA hybridization techniques also tends to support this hypothesis. However, this view is not unanimously accepted, and, in fact, Ewer (1973) and Corbet and Hill (1986) did not accept the inclusion of the giant panda amongst the bears. In particular Ewer found that Davis had merely brushed aside features that did not support his opinion. Nevertheless, Honacki *et al.* (1982) have followed Davis's hypothesis and have placed the giant panda with the bears, which is why the giant panda was never considered for inclusion in this document (it will be covered in the Action Plan being prepared by the Bear Specialist Group). On the other hand, Honacki *et al.* did include the red panda with the procyonids, which was the principle reason for the inclusion of the red panda in an action plan primarily directed towards procyonids. As yet the taxonomic position of the red panda is far from decided. It has been argued that the inclusion of the red panda in the procyonid family is based on superficial similarities between this genus and the raccoons (i.e. face mask, ringed tail, etc.), as the red panda lacks any derived procyonid features that would support its inclusion in this family (Wozencraft 1989). Nevertheless, the view that the red panda is indeed a procyonid is supported by the DNA hybridization studies of Wayne *et al.* (1989). Other studies using anatomical features (Decker & Wozencraft 1991) and cytogenetics (Wurster & Benirschke 1968) tend to indicate that the red panda may in fact be a very aberrant

F. V. Bommel

Red panda mother and full grown offspring (Rotterdam Zoo).

bear. Given these unresolved differences in opinion, it has been decided to adopt the approach advocated by Eisenberg (1981), as far as the red panda is concerned, and classify it in its own separate family, the Ailuridae. On the basis of the above we have renamed the planned *"Procyonid Action Plan"* as the *"Status Survey and Conservation Action Plan for Procyonids and Ailurids"* and we refer to the red panda as an ailurid throughout the rest of this text.

The taxonomic confusion in the procyonids has been mentioned above. This is not solely confined to the situation of the mountain coati. There is also uncertainty regarding the number of olingo species and the taxonomic status of the various island forms of raccoon and coati. Formerly, there was a dispute regarding the relationship between the Central American and South American coatis. In this latter case, the original taxonomy as indicated in Ewer (1973), where these forms are considered as separate species, has been adopted on the recommendation of Kaufmann (pers. comm.) and Decker (pers. comm.).

For the purpose of this document it has been decided to accept the most conservative taxonomy available, namely that which accords the highest level of taxonomic uniqueness to the animal concerned (i.e. species level classification is given preference over subspecies and genus level over species, etc.). The reason for this approach is that we are confronted with so much uncertainty concerning most of the species in these groups that it is preferable to err in the direction that will lead to a greater degree of effort to protect and conserve than one which will lead to less. In general, animals belonging to groups with a greater degree of taxonomic uniqueness are considered to have a higher conservation rating than those with a lower degree of taxonomic uniqueness. Our approach exploits this consideration.

Given the above, with the notable exceptions of *Ailurus* and *Nasua narica*, the taxonomy of Honacki *et al.* is followed in this document.

Table 1
The Ailurid and Procyonid Species

Family Ailuridae		
Ailurus fulgens	Red or lesser panda	(Cuvier 1825)
Family Procyonidae		
Bassaricyon alleni	Allen's olingo	(Thomas 1880)
Bassaricyon beddardi	Pocock's olingo	(Pocock 1921)
Bassaricyon gabbii	Bushy-tailed or common olingo	(Allen 1876)
Bassaricyon lasius	Harris's olingo	(Harris 1932)
Bassaricyon pauli	Chiriqui olingo	(Enders 1936)

Note: There are five species of *Bassaricyon* recognized by Honacki *et al.* However, some experts consider that all these forms are all conspecific (Emmons 1990), while a second body of opinion recognizes two species, *B. gabii* (including *lasius* and *pauli*) and *B. alleni* (including *beddardi*) (Eisenberg 1989).

Bassariscus astutus	Ringtail	(Lichtenstein 1830)
Bassariscus sumicrasti	Cacomistle	(Saussure 1860)

Note: The genus *Bassariscus* comprises two species according to Honacki *et al.*, although Ewer (1973) considers the cacomistle to belong to a separate genus *Jentinkia*. However, as this nomenclature is not used further, the taxonomy of Honacki *et al.*1982) has been retained here.

Nasua narica	Central American coati	(Linnaeus 1766)
Nasua nasua	South American or ring-tailed coati	(Linnaeus 1766)
Nasua nelsoni	Cozumel Island coati	(Merriam 1901)

Note: Honacki *et al.* have included the Central American and ringtailed coati in the same species, *Nasua nasua*. However, this classification in not generally accepted any longer and the original, Linnaean classification is more usually employed.

Nasuella olivacea	Little or mountain coati	(Gray 1865)

Note: Eisenberg (1989) indicates that some people consider *Nasuella* should more properly be incorporated in the genus *Nasua*.

Potos flavus	Kinkajou	(Schreber 1774)

Procyon cancrivorus	Crab-eating raccoon	(Cuvier 1798)
Procyon gloveralleni	Barbados racoon	(Nelson & Goldman 1930)
Procyon insularis	Tres Marias Islands raccoon	(Merriam 1898)
Procyon lotor	Common raccoon	(Linnaeus 1758)
Procyon maynardi	Bahaman raccoon	(Bangs 1889)
Procyon minor	Guadeloupe raccoon	(Miller 1911)
Procyon pygmaeus	Cozumel raccoon	(Merriam 1901)

Note: There is a considerable body of opinion which considers that the various island forms of *Procyon* are indeed conspecific. While *P. lotor* and *P. cancrivorus* do occur sympatrically and are quite clearly distinguished by a number of qualitative characteristics, the other island forms of *Procyon* are more similar. It is thought that they are relatively recent arrivals on the islands, having arrived by human introduction or rafting. However, some difference of opinion exists regarding whether this is true of all forms; some authors consider that *P. insularis* and *P. pygmaeus* are true species even if the other island forms are not.

Overview of the Ailurid and Procyonid Genera

Family Ailuridae

Genus *Ailurus*

The genus *Ailurus* contains a single species, the red panda. This on its own confers a high degree of taxonomic uniqueness on the red panda. If the taxonomy used in this document is accepted, not only the genus, *Ailurus,* but also the family, Ailuridae, is monospecific. This approach renders the red panda an especially distinct taxon.

The genus *Ailurus* is confined entirely to the Old World. It is believed to have evolved from the late Miocene European fossil genus *Sivanasua* (Roberts & Gittleman 1984). The Pliocene genus, *Parailurus,* had a Holarctic distribution occurring in Europe and North America (Tedford & Gustafson 1977). This distribution, coupled with the present distribution of the red panda, suggests an Asiatic place of origin for the Ailurids (Martin 1989). There is no evidence to support a westward migration of a New World procyonid species to found the Ailurid stock. The roots of *Ailurus* seem to be entirely separate from those of the procyonids.

The range of the genus, indeed of the family, coincides with that of the present day red pandas and is confined to the Himalayas. It stretches from Nepal in the west through to Szechuan and Tibet in the People's Republic of China in the east. The distribution is also restricted to a limited altitude range, between 1,500 and 4,000 m. In China, the red panda's range overlaps with that of the giant panda, and both utilize the same habitats.

To date there has been little field data collected on the red panda. One field study has been undertaken in the Langtang National Park in Nepal (Yonzon & Hunter 1989 and Yonzon 1989), and some preliminary data are available from the Wolong reserve in China (Johnson *et al.* 1988, Reid *et al.* 1991). It is known that they are solitary, sparsely distributed and that their natural diet is limited essentially to bamboo. However, unlike the giant panda, which eats both the leaves and stems of the bamboo, the red panda is a selective feeder choosing to feed on only the bamboo leaves. Its habitat is confined to mixed spruce-fir forest and it is highly arboreal spending most of its non-feeding hours above ground. As with its New World cousins, the ailurid family is primarily threatened through deforestation and other human activities.

Family Procyonidae

Genus *Bassaricyon*

The number of species comprising the genus *Bassaricyon*

Poglayen-Neuwall

Bushy-tailed or common olingo, *Bassaricyon gabii,* Colombia.

is uncertain. Some taxonomists recognize five separate species of olingos (see Table 1, taken from taxonomy of Honacki *et al.* 1982) while others lump them into just two species: Allen's olingo and the common olingo (Macdonald 1988; Eisenberg 1989). A third viewpoint considers that there is a single olingo species (Bixler, unpubl. citing Decker; Emmons 1990). The question of species is most significant here because of the limited range of two possible species, the Chiriqui olingo and Harris' olingo.

Olingos occur in Central and South America. Their range extends from southern Nicaragua west of the Andes to northern Ecuador. East of the Andes they are said to be found from Venezuela to Bolivia, but reports are confused. They are absent from the llanos of Colombia and Venezuela but are said to be present in the western, and possibly the northern, areas of the Amazon basin where the tributaries of the Amazon are most concentrated. Except for a single record from Bolivar in Venezuela, the genus seems to be absent from the eastern portion of northern south America. Olingos exist inland west of the Panama canal zone. In general they appear to be confined

to multi-strata tropical evergreen forests below 1,600-2,000 m. They do not seem to adapt readily to disturbed or secondary forests, nor to plantations and gardens (Eisenberg 1989; Emmons 1990). The precise density of olingos throughout their range is unknown, but at one frequently baited site in mountainous Costa Rica, four different individuals came to feed on a regular basis (Brookes, unpubl. data).

The olingos are nocturnal arboreal species that have been little studied in the wild. Studies in captivity are also limited (Poglayen-Neuwall & Poglayen-Neuwall 1965). They are believed to feed on fruits, invertebrates, and small vertebrates. There is a suggestion that they may be more carnivorous than kinkajous. Adult olingos seem to forage singly, although foraging has been reported in association with kinkajous, and it is believed that they are less social than kinkajous. Data from surveys of Costa Rica in 1989 indicate that individuals are monogamous and feed diurnally at baited stations (Brookes, unpubl. data).

Olingos are primarily arboreal and are highly dependent upon intact tropical humid forest (mostly rain forest). They are therefore very vulnerable to deforestation.

Genus *Bassariscus*

The genus *Bassariscus,* which comprises only two species, is regarded together with *Bassaricyon* as one of the most primitive procyonid genera (Wozencroft 1989). It is also one of the two procyonid genera not confounded with taxonomic problems.

The range of *Bassariscus* extends from the western United States through Central America to Panama. The ringtail (or ring-tailed cat), *B. astutus,* is the more northern of the two species. Its range extends from the western United States from southwestern Oregon and Colorado southwards to the provinces of Guerrero, Oaxaca, and Veracruz in central Mexico, where its range overlaps with that of the other species in this genus (Kaufmann 1982, 1987; Poglayen-Neuwall & Toweill 1988). The other species, the cacomistle, *B. sumichrasti,* has the more southerly range and is found east of the Sierra Madres in central Mexico and south of the Sierra Madres in southern Mexico; its range extends southward to extreme western Panama. South of Guatemala, this species occurs inland.

Of the two species, the ringtail has been studied in some detail (Trapp 1972; 1978). This species is known to be nocturnal and solitary in its habits. It inhabits a variety of habitats including rocky or cliff areas, areas of dense riparian or evergreen forest, scrub, and desert. It is restricted to altitudes of less than 2,800 m. Its diet consists of small vertebrates, fruits, and insects. Much of the food is succulent, and ringtails are able to produce highly concentrated urine (Richards 1976), and so can live in fairly arid habitats (Kaufmann 1982). The cacomistle is much less well-known than the ringtail but the information available indicates that it inhabits wetter forests than the ringtail and that it is highly arboreal and nocturnal. It is solitary outside of the breeding season (Poglayen-Neuwall & Toweill 1988). It forages alone and emits a high-pitched long call which apparently serves a spacing function (Coates-Estrada & Estrada 1986). However, it is not yet certain whether its behavior and ecology are similar to those of the ringtail.

Threats to the ringtail include automobiles and trappers. Threats to the cacomistle include habitat disturbance, deforestation, and fragmentation of populations.

Genus *Potos*

Potos, or the kinkajou, forms a monospecific genus which is not confronted with any taxonomic confusion, although Segall (1943) suggested that it should be regarded as a marginal member of the mustelid stock.

The kinkajou is found throughout the neotropics, from Mexico to Bolivia. Its range extends from Mexico to the east and south of the Sierra Madres, along the central and southern Mexican coasts, southward through Beni, Bolivia (east of the Andes), and deep into Brazil (into the Mato Grosso). Throughout much of Central America its inland distribution is limited and it is historically rare in other parts of its range. Furthermore, the kinkajou is well-adapted to arboreal life and requires closed-canopy forest such as that found in Central America and the Amazon basin. Further to the south and east of its range the habitat becomes much drier and more open. Kinkajous are not found in these regions. It is also doubtful whether they occur in the savannah of Venezuela as indicated on distribution maps Bixler (unpubl.).

Little is known about the natural history of the kinkajou. It is highly arboreal, as indicated by its prehensile tail. It is the only carnivore, with the exception of the binturong (*Arctictis binturong*), to possess such an appendage. Its diet consists essentially of fruit supplemented by insects (Bisbal 1987). Charles-Dominique *et al.* (1981) state that kinkajous play an important role in dispersing the seeds of some plant species. Their social behavior has been little studied. Apart from observations of females with their young, kinkajous are normally seen singly, although several may feed together in fruiting trees (Ewer 1973). They have been observed with olingos, and the two species can be confused by some observers.

As this is a highly arboreal species, even though we have no evidence that it is becoming threatened, it must be presumed that its numbers decrease with extensive human disturbance. Threats include extensive human disturbance, deforestation and the pet trade.

Genus *Procyon*

In this document seven different species of raccoon are considered. However, there is considerable dispute as to whether the various island forms can be considered true species. Several authors consider that these forms are recent arrivals to the islands due to rafting or human introduction (Bixler, unpubl.).

Raccoons have the widest range of all procyonids, stretching from Canada in the north to Argentina in the south. However, of the seven species of raccoon, only two, the crab-eating and the common raccoon, are widely distributed, the other five being confined to islands. The common raccoon, *P. lotor,* is the northern form; its range extends across Canada from Nova Scotia to British Columbia, throughout the United States, except for portions of the Rocky Mountains and the Great Basin, and south through Mexico and Central America (Kaufmann 1982). It is very adaptable and is found almost anywhere water is available. In some areas it has adapted to city life and is commensal with the human population. However, raccoons are most abundant in hardwood swamps, mangroves, flood forests, and marshes. With the exception of some subspecies, this species is not threatened. The common raccoon is a nocturnal omnivore which forages either singly or in groups. Unlike other members of this family, the nominate form has been widely studied (see Kaufmann 1982 for references).

The crab-eating raccoon, *P. cancrivorus,* is distributed from southern Costa Rica to northern Argentina (east border of the Andes), on Trinidad (Bacon 1970, pers. comm.), and possibly on a number of other Caribbean islands. Some reports indicate that this species occurs on Guadeloupe, where it may have replaced the indigenous island form. However, this report may be due to the misidentification of the local species. Within Costa Rica and immediately east of the border (i.e. Panama), it is sympatric with the common raccoon. In the Paraguayan chaco, its density in secondary growth cattle land is estimated not to exceed 6.7 km^2/raccoon; one individual's tracks extended for more than 4 km along an unused dirt road. This species is nocturnal, terrestrial and solitary. Its diet consists of molluscs, fish, crabs, insects, and amphibians (Emmons 1990). Very little is known about its ecology or behavior, although limited information is available from captive studies (Eisenberg 1989). It is often believed to be limited to coastline and riverbank habitats, but it has also been recorded in non-aquatic habitats at certain times of the year. It is a species rarely seen deep in the rain forest, but it is found in llanos and evergreen forest. In the zone of geographic overlap with the common raccoon, the common raccoon is found in mangrove swamps while the crab-eating raccoon is found on inland rivers (Emmons 1990).

The crab-eating raccoon is naturally rare in some areas of its range and it does not seem as adaptable to human activity as the common raccoon, although it is probably stable throughout South America where viable areas exist. Threats to this species include overhunting for pelts, use for target practice, the pet trade, and, in some areas, habitat destruction (being a rain forest species).

Little is known of any of the island forms of raccoon, either as regards distribution or natural history. However, they have probably never been very numerous, given the small size of their island ranges and the undoubted negative influence of tourism. Their habitats are probably diminishing, and one form, the Barbados raccoon, *P. gloverallenis,* is probably extinct. The last sighting occurred in the early 1960s. The status of the rest is indeterminate at present.

Genus *Nasua*

The genus *Nasua* is considered here to comprise three species. There is some debate as to whether the island form is a true species in its own right, and some authorities consider the Central American coati to be conspecific with the South American form (Honacki *et al.* 1982).

Coatis are found in forested habitats ranging from tropical rain forest and gallery forest to chaco, cerrado, and dry scrub. Their range extends from Arizona and Texas south through Central and South America to Argentina and Uruguay, although they appear to be absent from the llanos of Venezuela. The range of the northern form, the Central American or white-nosed coati (*Nasua narica*) extends from Arizona and Texas south through all of Central America to the west coasts of Colombia, Ecuador, and Peru. The range of the South American or ring-tailed coati (*Nasua nasua*) comprises South America east of the Andes in all countries from Colombia and Venezuela to the southernmost extent of the genus' range. The last species, *Nasua nelsoni,* is found solely on Cozumel Island, off the Yucatan Peninsula in Mexico. As stated above it is considered by some sources as a subspecies of the mainland form. It has been suggested that these animals were introduced to Cozumel by the Maya (Bixler, unpubl.).

Coatis are highly adaptable animals. They are essentially diurnal in their activities and can be both terrestrial and arboreal. They are also very variable in their social groupings, being either solitary or living in groups of up to 30 individuals; the females live in groups while the adult males are solitary. The term coatimundi, which is often used in the literature to refer to the coati, actually refers to a solitary adult male coati. Coatis are omnivorous, feeding on fruit, invertebrates, and small animals. They will search for fruit high in the forest canopy or forage on the forest floor for animal prey, poking their long noses into crevices, pushing over rocks, or ripping apart dead logs with their claws. When they are alarmed, they seek refuge

in trees and at night sleep at the tops of trees.

As with the rest of the animals considered in this document, the prime threat to coatis is habitat loss due to deforestation.

Genus *Nasuella*

Nasuella is the last genus to be considered in this document, and we treat it as a separate genus comprising a single species, the mountain coati. However, it must be mentioned that in common with many of the other genera considered here, *Nasuella* is also the subject of taxonomic debate, as some authorities consider that it should be more properly included in the genus *Nasua*.

The genus *Nasuella* has the most restricted range of all procyonid genera. The mountain coati is found in the Andes, where its range extends from Ecuador north and eastward to western Venezuela. It is a high altitude specialist and is found in montane forest at elevations over 2,000 m. Little is known of its ecology or behavior as there have been no studies conducted on this species.

The mountain coati differs morphologically from the other coati species in several ways. It is smaller and thinner than the other species (characteristics which are often found in animals adapted to high altitudes, Bixler, unpubl.) and its dentition indicates that it is possibly more insectivorous than the other coatis.

We know nothing of the status of this species in the wild; however, much of the north Andean habitat is in jeopardy, due to the deep-rooted problem of the rapidly expanding human population. Threats to this species, which include habitat alteration and destruction and human disturbance, are exacerbated by its naturally restricted range.

Chapter 2

Cultural, Economic, and Scientific Values of Procyonids and Ailurids

The Procyonidae and Ailuridae represent extremely limited families, comprising in total a maximum of seven genera and between ten and twenty-one species (depending on which taxonomic definitions are accepted). In as far as we can ascertain, they have played a limited role in human culture and religion. Some species do play a limited role in the economy as fur-bearers, but the fur itself is not a highly valued or prized commodity. Some species are hunted as food to a limited extent by some indigenous tribal peoples and some species are persecuted for crop-raiding and chicken-killing. However, in general, the interest and importance of these animals lies in their value to science rather than their cultural or economic roles.

Cultural and Economic Significance

Despite the fact that procyonids and ailurids comprise a small number of very cryptic species in the procyonid and ailurid genera, they have achieved a small degree of cultural, if not economic significance. However, neither of these groups can be said to play a major role in mankind's culture or economy. In the case of the procyonids there is little information available on any cultural significance of these groups. There does not appear to be any appreciable folklore associated with any species, although it is possible that there may be some references to these species in the folklore of current Amerindians or in those of past cultures such as the Toltecs, Aztecs, Incas, or Mayas. For example, the coati is thought to have been a fertility symbol for the Maya and was also used as a pet and a source of food (possibly eaten only by the women, Hamblin 1984). Indeed, Bixler (unpubl.) speculates that the Cozumel coati may have been brought to that island by the Maya, as Cozumel was an important center for the worship of Ix Chel, the goddess of fertility. Other indications of the interest that some procyonid species may have held for the indigenous people of the Americas is to be found in their local names. The name cacomistle is derived from the Mexican Nathuatl Indian word, "Tlacomiztli" meaning "half mountain lion;" coati is derived from the name "Kuati" used by the indigenous Guarani Indians, while raccoon comes from the word "Aroughcoune," used by the Algonquin Indians of Virginia to mean "he scratches with his hands." Further information regarding what, if anything, these animals meant to the tribes concerned is unknown. On the subject of names, the cacomistle (or ringtail) has also been known as the "miner's cat," a name earned because ringtails were placed in frontier mines to control rodents as they were supposed to be better mousers than cats (Poglayen-Neuwall & Toweill 1988; Whitaker 1988). Otherwise, cultural interest in procyonids only involves their use as companion animals or as sport. Some procyonid species, notably coatis and kinkajous, are kept as pets in various countries throughout Central and South America today. Some species, again notably the kinkajou and coati, are also hunted for their meat by the indigenous peoples of Mexico and Central America. However, this kind of hunting activity is strictly limited. On the other hand, in the United States, "coon hunting" is a popular sport in late autumn when the raccoons are actively fattening themselves for the winter. Special dogs are bred for hunting raccoons in some states. The sport is meant to lie in listening to the hounds and observing their performance. Nevertheless, raccoon meat is edible and the pelts can be sold.

A similar situation also prevails with *Ailurus*. Although the red panda has recently been acknowledged as the national animal of Sikkim, and was the mascot of the International Tea Festival in Darjeeling, there is no mention of it in the culture or folklore of Nepal, and as yet information on this aspect has not been obtained for the other countries within its range. However, the red panda has been recognized in eastern cultures for much longer than in those of the west. For example, a red panda appears to be depicted on a 13th century Chinese pen and ink scroll showing a hunting scene (Roberts 1983), so it may be that there is still information on cultural traditions associated with this species which has yet to be found. *Ailurus* is not commonly kept as a household pet, although Hodgson (1847), one of the early observers of the red

panda, did note that they would make "charming pets for ladies." Nobody seems to have adopted his advice, although it has been said that Mrs. Indira Ghandi did keep red pandas as pets when she was a child.

The New World procyonids, with the exception of raccoons and ringtails in the United States (see below), have no commercial value except for occasional sales to zoos or the pet trade. As only the common species are normally caught and sold, this commercial traffic probably has no major importance except possibly for rare insular forms. Red pandas again do not seem to be traded commercially on a large scale, although their skins can still be found in local markets. Formerly, red panda skins were much more readily available, and were used either as hats or their tails as dusters. In addition, in China, a red panda skin may be worn by the bridegroom in the wedding ceremonies of one of the local indigenous peoples.

The trade of live red pandas to zoos was formerly very prevalent. However, legislation has probably limited this practice in more recent years (further discussion on this point below).

Procyonids as Pests

The common and crab-eating raccoons are accused of damaging agricultural crops and of killing domestic poultry, as are coatis. Raccoons may also cause local declines in wild species such as muskrats, waterfowl, shore birds and sea turtles (eggs and hatchlings). However, such damage to crops and wildlife species is usually temporary and local. In addition, raccoons in North America are carriers of rabies.

Procyonids and the Fur Trade (From Kaufmann 1982, 1987; Sanderson 1987)

The common raccoon is the most important wild, fur animal in North America in terms of revenue, which reached a peak of about $100 million in 1982 when over five million raccoons were killed for their fur, and pelts brought an average of $20 each. As the price declined to less than $10, the number killed declined to approximately three million by the mid-1980s. Most raccoon pelts were exported to Europe, especially West Germany, where they are often sheared, dyed and sold as imitation mink, otter and seal. Despite the large numbers killed for fur and for other reasons, raccoons in North America have expanded their range over the past 50 years and have maintained fairly high overall population levels.

Raccoons were introduced to Russia in 1934 and are harvested there for fur. They were also introduced into

K. Johnson

Jiao Jiao, the first red panda studied in the field.

Germany in 1934 where they are now perceived as a threat to native species of wildlife.

The ringtail is legally trapped for fur in Arizona, New Mexico, Colorado, and Texas, where it is also caught incidentally in traps set for valuable fur-bearers such as foxes and raccoons. In recent years about 4,000 have been taken annually in Arizona, and about 1,000 in New Mexico. In Texas 45,000-50,000 ringtails were trapped each year from 1979-1985. As in the case with raccoons, the number of ringtails trapped for fur has declined since a peak in 1979, when approximately 135,000 pelts were sold. Ringtail fur is of poor quality (thin, non-durable, and subject to fading), and pelts have usually sold for less than $5 each although they have brought as much as $12. The justification for trapping ringtails for fur is weak, especially since in none of the states where trapping is legal is there sufficient knowledge of population levels and trends on which to base valid harvest regulations.

Although their fur is commercially worthless, coatis in Arizona are also caught accidentally in traps set for other fur-bearers. Such coatis are legally required to be released, but they are frequently killed and discarded by the trappers for no apparent reason. Given the small unstable coati populations in the United States, such otiose and illegal killing should be vigorously discouraged.

Scientific Value of Procyonids and Ailurids

The importance of both Procyonids and Ailurids to the scientific community rests on two factors: firstly on the information they can provide on evolution in the Carnivora; and secondly on the fact that so little is known about them. It would seem that the procyonids and ailurids hold a central position in the evolutionary radiation of the dog-like carnivores. Therefore, a thorough understanding of their behavior, ecology, and adaptations could clarify many issues of interest, such as the relationship between the red panda and the bears on the one hand and that between the mustelids and procyonids on the other. This means that an increase in our knowledge of the procyonids and ailurids should provide an insight into the evolution of the entire carnivore order.

In the case of the ailurids, their interest to science is enhanced by the problems raised by the uncertainty regarding their taxonomic position in general and their possible relationship to the giant panda (*Ailuropoda melanoleuca*) in particular. As indicated earlier (see Chapter 1, Classification), there is considerable confusion regarding the taxonomic relationships of the red panda. To date this has proved a very fruitful field of research. There have been a variety of techniques employed to investigate this problem including examination of skull and dental characteristics, searching for genetic and biochemical affinities, and simple phenetic or phylogenetic studies. The results have so far been equivocal at best and in fact are often contradictory. They have variously indicated that the red panda is allied to the procyonids, or to the bears or again that it should be classified on its own in a sister group to the bears. Some other authors have placed both pandas together in their own separate family or sub-family. Whichever interpretation of the red panda's taxonomic position is eventually accepted, the situation will remain that the red panda is a unique species in its own right and thus a very interesting and important subject for scientific study.

There is also room for discussion regarding questions of taxonomy within the procyonids as we saw in the previous section. However, the taxonomic interest is not solely confined to questions of species and subspecies but also reflects on the evolution of the procyonids as a group. Some authors group the procyonids together with the mustelids in a Parvorder Mustelida, and it is certain that some early procyonids exploited musteliform habitats during the early Miocene before they diversified into the more typical arboreal, omnivorous forms. These forms were all North American, although the center of procyonid radiation is believed to be Central America by some authors (as opposed to the Asian origins of the ailurids).

It is generally accepted that the ringtail genus is the most primitive member of today's procyonids; remains of ringtail-like animals have been found in the early and middle Miocene fossil fauna of northern Nebraska. The coati/mountain coati/raccoon group is considered as a more derived monophyletic group and is related to the fossil species *Paranasua*. However, Decker & Wozencraft (1991) suggest that the ringtail is not the most primitive clade but rather the one with the fewest derived states. The relationship between the olingos and kinkajous to either the coatis or the ringtail groups remains unclear (Wozencraft 1989); olingos have some affinities to the fossil *Lichnocyon*, while the fossil relationships of the kinkajou are unknown. Decker & Wozencraft (1991) suggest that the olingos are a very primitive version of the kinkajous and that these two species should form a separate subfamily, the Potosinae, within the procyonids. Furthermore, other authors (Segall 1943) have suggested that kinkajous should be regarded as marginal members of the mustelid stock.

All these problems combined should make the procyonids and ailurids very attractive groups for scientific study, and it is hoped that, in the near future, scientists will accept the challenge that these species pose and begin to study them in greater depth.

Chapter 3

Threats to Procyonids and Ailurids

The threats currently facing procyonids are essentially those facing most wildlife today: hunting, trapping, and trading; habitat loss; and fragmentation of their range.

Hunting, Trapping, and Trading

Hunting, trapping, and trading are covered first although they are not the prime problems encountered by these species. They form a separate issue, while the other two problems are essentially interrelated.

Raccoons and ringtails are hunted for their fur in the United States (see previous chapter). Coatis are sometimes trapped and killed in traps set for ringtails. Elsewhere, coatis, ringtails, raccoons, and possibly cacomistles are killed to prevent crop raiding. Kinkajous, olingos, raccoons, and coatis are also killed for food and/or skins in various parts of their ranges (Emmons, pers. comm.; Cuaron, pers. comm.; Janson 1981). In Peru, parts of the coati are eaten for their supposed aphrodisiac powers (Grimwood 1968) and the skins of kinkajous are used for drum skins by some tribal peoples. Both coatis and kinkajous are sometimes trapped and kept as pets (Cuaron, pers. comm.; Sormani, pers. comm.). There is no clear evidence to suggest that these direct uses are having an impact on numbers, and in the case of the raccoon in the United States, it seems able to withstand heavy hunting pressure (though the ringtail harvest needs to be examined more closely).

The red panda is not an important game species. However, some authors say they have been invited to participate in red panda hunts (Roberts 1982). Furthermore, red panda skins are found quite commonly in local markets in China, although it must be noted that the age of these skins is unknown, and they could have originated from animals killed some time ago. In addition, it is almost certain that pandas are collected in traps set for other species, and this problem is likely to increase in line with the level of trapping for musk deer. Until comparatively recently, red pandas were regularly trapped for sale to zoological collections; for example, in an article appearing in the International Zoo News, Munro (1969) reported he personally had handled 350 red pandas in seventeen years. However, these numbers have declined substantially in recent years, and in the case of the Nepalese red panda, the last legal export of wild-caught specimens occurred in 1984. CITES has certainly curtailed the international trade in red pandas. However, some animals have been trapped

R. de Bruin

Red panda skin on sale in a local market.

and offered for sale illegally in recent years; instances have been reported of trappers who have offered red pandas to zoos and, on being denied a quick sale, have clubbed the animals to death and skinned them on the basis that skins are easier to carry and sell than living animals (Walker, pers. comm.). In addition, the occasional panda from dubious sources is still offered by some of the less reputable animal dealers (e.g. in the spring of 1990, one such dealer was offering a pair of red pandas for sale which were reputedly born in captivity in Bangladesh. To date no one knows of a zoo in Bangladesh breeding with this species). There also appears to be some illegal trading of red pandas between China and Taiwan. A survey undertaken by TRAFFIC in 1990 (IUCN/WWF 1991) reports both live red pandas as well as museum specimens being traded across the Taiwan Straits. However, the greatest cause of concern is the increasing number of "legal" red pandas arriving in western zoos from China (Glatston 1990; Lu *et al.* 1992). These animals are often reputed to be captive-born in Chinese zoos, but in view of the numbers arriving, the apparent age of some individuals and the known difficulties of captive breeding this species, it seems unlikely that all specimens are indeed of captive origin. Furthermore, TRAFFIC records indicate that permits have been given for more animals to be exported from China than are known to have arrived in zoological collections. Where these animals eventually go is uncertain. It is also uncertain to what extent direct offtake is affecting red panda numbers.

Habitat Loss and Fragmentation of Habitat

These two factors are interrelated. As both procyonids and ailurids are essentially arboreal, or at least forest-dwellers, one of the main conservation concerns, deforestation, relates directly to these species. In the first instance it leads directly to habitat loss, but it also leads to habitat fragmentation, as explained below.

Habitat Loss

As mentioned previously, most of the species we are dealing with are forest-living creatures, and so loss of forest, either for conversion to agricultural land, for timber, or for firewood or charcoal, is bound to have an adverse effect on procyonids and ailurids. The rapid rates at which deforestation is occurring, particularly in Central America, will be discussed later. Unfortunately, many of the rarer species of procyonids are confined to these countries. This loss, combined with the possible further habitat destruction or degradation due to armed conflict, means that procyonid species found only in Central America should be the subject of concern.

Similarly, deforestation is a problem confronting the red panda through most of its range. This is due not only to the expansion of agricultural land and the use of wood and timber by local peoples, but also to overgrazing (Yonzon & Hunter 1991) and tourism. A western trekker uses more firewood in one week than a local person does in one year. The loss of forest has a still greater influence on the red panda than on some other species, since deforestation can also lead to the loss of bamboo, the red panda's staple diet. Studies in China have indicated that where areas of forest are clear-cut, later forest regeneration leads to conditions which are not conducive to bamboo seedlings (Taylor *et al.* 1991). Thus, after a bamboo die-off, bamboo will not regrow in previously clear cut forest. This is a long-term problem confronting the red panda.

Fragmentation of Habitat

Habitat fragmentation often goes hand-in-hand with deforestation. Areas of trees are felled in such a way that the remaining areas of forest have no connection with each other. Animals inhabiting these forested "islands" are effectively isolated from each other. The isolation of patches of forest is known to be a problem in Costa Rica, and thus is important in the consideration of the procyonids there. Habitat fragmentation is also known to affect the giant panda in China and is undoubtedly also a problem for the red panda. Yonzon's study in the Langtang National Park in Nepal has indicated that the red pandas within the park are effectively subdivided into four separate populations (Yonzon & Hunter 1991). If populations of animals are isolated from each other, they will suffer from inbreeding and loss of genetic variation due to genetic drift. This renders them vulnerable to extirpation through demographic instability, catastrophic events (such as disease or fire), and lack adaptability. In the case of a food specialist such as the red panda, fragmentation can also lead to starvation by preventing the pandas from migrating to new areas when their local food source is lost, as in the case of bamboo die-off. This problem has also been documented in giant pandas (Reid & Jinchu 1991).

Human Factors Affecting the Conservation of Procyonids and Ailurids

Specific problems, where known, confronting each species of procyonid or ailurid in its habitat are discussed later.

Poglayen-Neuwall

Montane forest on flank of Volcan Tacana, elevation 1,900 m, north of Union Juarez, southeast Chiapas, at border of Guatemala.

However, it is also appropriate to say a few words in general about the conservation situation in the range countries of the various procyonid and ailurid species. Table 2 gives the occurrence of procyonid and ailurid species by country. Table 2 can be compared with Tables 3, 4, and 5 to evaluate how different species might be affected by the general environmental situation in each country.

Needs of the Human Population

Many of the countries from which procyonids and ailurids originate have either large or rapidly growing human populations. This is particularly true in Central America, Nepal, and China. This means that land is at a premium, both as living space and for growing crops or raising stock. Wood is of great importance to these human populations, either as fuel for heating and cooking or for constructing housing. In those areas where the human populations are growing, it is likely that additional areas will be deforested for settlements and agriculture. Because procyonids and ailurids are largely arboreal or forest-dwelling species, their numbers are bound to be adversely affected by such human activities. Increasing human standards of living can also have a negative impact on natural habitats, as natural resource consumption per person grows. This is particularly a problem in parts of Asia. However, it is not only to service direct human needs that forests are being lost. The external debts of many of these countries, particularly those in Central America, are currently so high that many governments have been driven to exploit their natural resources to raise capital. In general, increased debt leads to unsustainable exploitation of natural resources. Table 3 shows the percentage decrease in forested areas in those countries where procyonids and ailurids occur. Some of these countries have taken measures to conserve their natural heritage by the establishment of National Parks and protected areas. Table 4 provides an indication of the numbers of protected areas established in each country. Table 5 provides an overview of the environmental situation in the various countries.

Unfortunately, it is difficult to ascertain the extent to which these parks and protected areas actually help those species covered by this action plan. This is particularly

Table 2
The Occurrence of Procyonid and Ailurid Species by Country

Country	*Bassariscus*	*Bassaricyon*	*Nasua*	*Nasuella*	*Potos*	*Procyon*	*Ailurid*
North America							
Canada						common raccoon	
U.S.A.	ringtail		white-nosed coati			common raccoon	
Carribean							
Bahamas						Bahaman raccoon	
Barbados						Barbados raccoon	
Guadeloupe						Guadeloupe raccoon	
Trinidad & Tobago						crab-eating raccoon (?)	
Central America							
Mexico	ringtail cacomistle		white-nosed coati Cozumel coati		kinkajou	common raccoon Cozumel raccoon Tres Marias Islands raccoon	
Belize	cacomistle		white-nosed coati		kinkajou	common raccoon	
Guatemala	cacomistle		white-nosed coati		kinkajou	common raccoon	
Nicaragua	cacomistle	bushy-tailed olingo	white-nosed coati		kinkajou	common raccoon	
El Salvador	cacomistle		white-nosed coati		kinkajou	common raccoon	
Costa Rica	cacomistle	bushy-tailed olingo Harris's olingo	white-nosed coati		kinkajou	common raccoon crab-eating raccoon	
Honduras	cacomistle		white-nosed coati		kinkajou	common raccoon crab-eating raccoon	
Panama	cacomistle	bushy-tailed olingo Chiriqui olingo	white-nosed coati		kinkajou	common raccoon crab-eating raccoon	

Country	*Bassariscus*	*Bassaricyon*	*Nasua*	*Nasuella*	*Potos*	*Procyon*	*Ailurid*
South America							
Colombia		bushy-tailed olingo	ring-tailed coati	mountain coati	kinkajou	crab-eating raccoon	
Brazil		Pocock's olingo	ring-tailed coati		kinkajou	crab-eating raccoon	
Venezuela		Allen's olingo? Pocock's olingo	ring-tailed coati	mountain coati	kinkajou	crab-eating raccoon	
Peru		Allen's olingo	ring-tailed coati	mountain coati	kinkajou	crab-eating raccoon	
Ecuador		bushy-tailed olingo Allen's olingo	ring-tailed coati	mountain coati	kinkajou	crab-eating raccoon	
French Guiana			ring-tailed coati		kinkajou	crab-eating raccoon	
Guyana		Pocock's olingo[1]	ring-tailed coati		kinkajou	crab-eating raccoon	
Suriname			ring-tailed coati		kinkajou	crab-eating raccoon	
Bolivia		Allen's olingo	ring-tailed coati		kinkajou	crab-eating raccoon	
Uruguay			ring-tailed coati				
Paraguay			ring-tailed coati			crab-eating raccoon	
Argentina			ring-tailed coati			crab-eating raccoon	
Chile			ring-tailed coati[2]				
Asia							
Nepal							red panda
Bhutan							red panda
India (Sikkim, Arunchal Pradesh, West Bengal)							red panda
Myanmar							red panda
China							red panda

[1] Undoubtedly incorrect provenance
[2] Coatis have been introduced into Chile

Table 3
Change in Percent of Forest Cover by Countries in which Procyonids and Ailurids Occurs

Country	% Forest Cover 1966-1968	% Forest Cover 1986-1988	Losses
Central America			
Mexico	29	23	5.9%
Belize	46	44	2.0%
Guatemala	48	37	11.1%
El Salvador	9	5	4.0%
Honduras	46	31	14.5%
Nicaragua	50	31	18.9%
Costa Rica	55	32	22.6%
Panama	60	52	7.9%
Carribean			
Bahamas	32	32	no change
Barbados	0	0	no change
Guadeloupe	35	42	7.3% increase
Trinidad & Tobago	47	43	-3.9%
South America			
Colombia	55	49	5.8%
Venezuela	42	35	6.6%
Guyana	92	83	9.3%
Suriname	96	95	1.0%
French Guiana	94	83	11.3%
Ecuador	61	43	18.3%
Peru	58	54	3.9%
Brazil	71	66	4.7%
Bolivia	54	51	3.0%
Paraguay	53	39	14.2%
Uruguay	3	4	1.0% increase
Argentina	22	22	no change
Asia			
Nepal	17	17	no change
Bhutan	51	55	3.7% increase
India[1] (Sikkim, Arunchal Pradesh, West Bengal)	21	22	1% increase
Myanmar	49	49	no change
China	16	14	2.0%

[1] Figures given are for the whole of India

Table 4
National Parks and Protected Areas in Procyonid and Ailurid Range States

Country	*Nationally Protected*			*World Heritage*	*Biosphere Reserve*	
	Number	**Area (Ha)**	**% Land Area**	**Number**	**Number**	**Area (Ha)**
Central America						
Mexico	61	9,419,669	4.8	1	6	1,288,454
Belize	8	74,314	3.2			
Guatemala	9	88,272	0.8	1		
El Salvador	9	26,152	1.2			
Honduras	34	709,369	6.3	1	1	500,000
Nicaragua	6	43,300	0.3			
Costa Rica	28	606,000	11.9	1	2	728,955
Panama	16	1,326,140	16.9	1	1	597,000
Carribean						
Bahamas	5	123,390	8.9			
Barbados	0					
Guadeloupe	2	21,200	11.9			
Trinidad & Tobago	6	15,278	3.0			
South America						
Colombia	42	9,301,690	8.2		3	2,514,375
Venezuela	74	20,265,362	22.2		1	9,698
Guyana	1	11,655	0.1			
Suriname	14	762,970	4.7			
French Guiana	0					
Ecuador	14	10,685,664	5.8	2	2	1,446,244
Peru	24	5,517,835	4.3	3	3	2,506,739
Brazil	162	20,525,324	2.4	1		
Bolivia	23	6,744,165	6.2		3	435,000
Paraguay	12	1,185,7315	2.9			
Uruguay	8	31,726	0.2		1	200,000
Argentina	113	12,638,733	4.5	2	5	2,409,980
Asian Countries Inhabited by Ailurids						
Nepal	11	958,500	6.8	2		
Bhutan	7	924,314	19.8			
India[1] (Sikkim, Arunchal Pradesh, West Bengal)	359	13,481,148	4.3	5		
Myanmar	2	173,271	0.3			
China	394	22,235,681	10.3		7	1,819,305

[1] These data are for the whole of India

true in the case of the procyonid species; these species are rarely mentioned in the faunal listings of national parks and protected areas. It is difficult to determine whether this is a reflection of reality or merely an indication of the importance accorded to these species by scientists and park managers. Table 6 indicates those parks where procyonids are recorded in the faunal lists.

Warfare (Extracted from Vaughan 1990 & Imbach 1991)

Given that Central America is the focal area for the threatened procyonids, it is worth dwelling on the problems of warfare.

In addition to the problems of forest loss, armed conflict is or has been occurring in Peru and in several countries in Central America (Panama, Nicaragua, Guatemala, and El Salvador) and has undoubtedly had repercussions for wildlife.

Apart from the brief "soccer war" between Honduras and El Salvador in 1969, Central America has not seen a formally declared war for several decades. Nevertheless, the region has an estimated three million refugees, comprising 10% of the population. This is the result of a series of ruthless internal wars between government forces and guerrilla movements and is just as disastrous as a formally declared war. Wars affect wildlife conservation directly through destruction of the environment and indirectly due to the repercussions on national policy and people.

The direct effects of war include deforestation, killing of wildlife, destruction of habitat, and pollution of land and water by chemicals. The damage in Central America is exacerbated by the vulnerability of the environment where much of the fighting is taking place. For example, the already endangered dry forests of El Salvador have been threatened by fires touched off by napalm and white phosphorus bombs used in the civil war. Scorched earth policies have been implemented by government forces in Guatemala and El Salvador (Seager 1990). Agent Orange and Round Up have reportedly been used to defoliate vegetation in Guatemala. Over 3,000 tons of bombs were dropped by the Salvadorean Air Force on El Salvador between 1980 and 1985. Up to 10% of the coniferous forests in southern Honduras were destroyed as a result of joint maneuvers between Honduras and the United States.

The impact of war is apparent in national policy changes, blocking conservation activities, reducing outside funding for projects, and diverting funds from social to military activities. For example, more than 40% of the Nicaraguan budget was reportedly allocated to defense during the Contra war. This necessarily reduces the funds available for other activities such as wildlife conservation and agricultural and forest services. In other words, the state's ability to protect the environment diminishes. In addition, park wardens and other conservation officers can become a target for one or other side. Even in peaceful Costa Rica, access to protected areas in the northern region was restricted during Nicaragua's Contra war because rebels were using the territory. This in turn affected tourism and foreign investment in Costa Rica.

Leaving aside the obvious destruction of human lives, the effects of war on people have also lead to increased degradation of the environment. The Contra war has lead to between 250,000 and 300,000 people having to flee their homes in Nicaragua as well as people from southeastern Honduras and northern Costa Rica. These people are forced to deforest for firewood, to hunt, and to exploit the environment in other ways. Further populations have been displaced from the highlands, the northern lowlands and parts of Peten in Guatemala, and from almost all of El Salvador with similar effects.

Pollution

Other environmental problems confronting procyonids and many other species are pollution and acid rain. Given that the procyonids and ailurids are essentially forest-dwellers, anything that destroys the forests has an impact on their numbers. Acid rain can affect forest cover. This problem already affects the eastern seaboard of the United States, and early signs of acid rain pollution can be found around Mexico City, along the coast of Venezuela, and in São Paulo state in Brazil (Seager 1990).

Further pollution can also occur in association with hydroelectric power. In order to supply the power necessary for the space launch station at Kourou in French Guiana, the French government is resorting to hydroelectric power. A dam planned on the Sinnamary River will flood an area of 310 square kilometers. The authorities have decided not to harvest the timber from the forest before flooding it. Instead they will risk the pollution that the rotting vegetation will create. Production of methane, hydrogen sulphide, carbon dioxide, and ammonia can all be anticipated. In a similar project 20 years ago in Suriname, workers on the site had to wear masks because of the hydrogen sulphide in the air (Pearce 1991).

However, the direct effects of pollution are not the major problems confronting wildlife in the Americas. The indirect effect, global warming, could have even more profound implications. A computer simulation of the effects of a further doubling of carbon dioxide in the atmosphere indicates that the climate of Central America would be wetter than today, whereas that of the Amazon basin would be drier (Seager 1990). Such climatic changes in a short time-scale could have a dramatic effect on wildlife all over the world.

Threatened Species

In this section we provide more detailed information on the individual species which we believe, on the basis of the data presented in the previous section, could be threatened.

At this stage we have not concerned ourselves with the situation of the numerous subspecies belonging to this family. This is not because we feel that these subspecies have no intrinsic conservation value. On the contrary, for example in the ailurid group there are many arguments to support separate conservation initiatives directed towards each of the subspecies of red panda (the nominate form and Styan's panda). Such arguments will also undoubtedly apply to the conservation of some of the procyonid subspecies. However, in the procyonid group as a whole, there is so much confusion regarding taxonomy at the species and genus levels that we felt it would be advisable for some of these problems to be resolved before the question of subspecies conservation was addressed.

How the Selected Species were Chosen

The basis for considering these particular species as subjects for our prime concern are:

1. The species concerned has a restricted distribution such as the case with island species; and the habitat in that area is being destroyed;
2. The species concerned is the sole representative of a genus and there are indications that it is losing habitat or suffering from fragmentation;
3. The major part of the species' natural range is disrupted due to warfare, deforestation, etc.;
4. The species is so little known that it would seem advisable to undertake research to determine its status as habitat destruction is believed to be occurring.

The species which fulfill at least one of these criteria are discussed more fully in the following section. They are:

- **Red panda:** taxonomically highly distinct, field studies indicate a cause for concern;
- **Bushy-tailed olingo:** occurrence of this species within its range is not well known, and its habitat is certainly subject to disturbance over much of its range;
- **Allen's olingo:** distribution large but includes areas under severe environmental pressure;
- **Pocock's olingo:** numbers unknown, limited distribution;
- **Harris' olingo:** very limited distribution;
- **Chiriqui olingo:** very limited distribution;
- **Cacomistle:** found only in Central America, where its habitat is under considerable pressure;
- **White-nosed coati:** discontinuous distribution through the southern United States and Central America. Much habitat loss and under pressure from trappers;
- **Cozumel Island coati:** limited distribution, island form, tourist development;
- **Mountain coati:** taxonomically distinct, highly limited distribution, totally unknown;
- **Guadeloupe raccoon, Bahaman raccoon, Cozumel raccoon, and Tres Marias Islands raccoon:** all are island forms with strictly limited distribution. Several of these islands are being extensively developed for tourism;
- **Barbados raccoon:** also included, but it would appear to be extinct.

The data sheets on these species provide summary information, including the subspecies recognized, distribution, population size, habitat type and ecology where known, the threats presumed to affect the species, information on legal protection, occurrence in national parks and protected areas, and the prospects for captive breeding as support for the wild population. At the end of each sheet a summary is given of possible actions which should be taken. The suggested actions are collated and prioritized in a later section.

As regards the other procyonid species, our causes for optimism may not be well-founded. Although these species all have relatively large distributions, several are locally threatened or rare (Emmons, pers. comm.). According to Janson, (1981) all species of procyonid are threatened in Central America, including the kinkajou and the raccoon. Certainly some subspecies of the common raccoon are believed to be declining, for example *P. l. auspicatus* and *P. l. incautus* of the lower Florida Keys (Nowak, pers. comm.). In the long term, we may do well to survey all procyonid species over their ranges to assess whether they are, in the face of deforestation and other human activities, as secure as we currently assume.

Data Sheets for Threatened Species

The Red or Lesser Panda (*Ailurus fulgens*)

Subspecies: There are two recognized subspecies of red panda, *A. f. fulgens*, the nominate race, and *A. f. styani*, the Chinese or Styan's red panda. The Chinese subspecies

is supposedly larger and darker than the nominate form. However, in practice there is apparently considerable variation in both color and size in both recognized subspecies in the wild, with some specimens being brown or yellowish-brown rather than red. Furthermore, some authorities consider there may be even more subspecies.

Distribution: The red panda inhabits the slopes of the Himalayas at heights of between 1,500 m and 4,000 m. It is found in Nepal, northern Bhutan, Sikkim, northern India, Kachin State, Myanmar (26°-28° N and 95°-98° E at altitudes above 2,000 m), the Chankan Pass area northwest of Putao, and in the People's Republic of China into Tibet. The actual occurrence of the red pandas within this range is unclear. It is known to occur in the Langtang National Park in Nepal and in Wolong reservation in China where they have been studied. However, the distribution of the species outside of these sites is uncertain. The former assumption that the range stretches as far west as Rara is questionable (see Fig. 1, Appendix 1).

Population: Actual numbers unknown, but it seems to be rare and patchily distributed in those areas studied: Langtang and Wolong. Population estimate on the basis of the Langtang study suggest there may be as few as 300 red pandas in Nepal. On the other hand, some authorities consider this result may be biased by the location of the study area and have suggested that red pandas may be fairly common in eastern Nepal at altitudes between 2,500 and 4,000 meters where it is damper and more attractive to bamboo. In Myanmar its status is unknown but there are no recorded sightings by members of the Forest Department in recent years. No recent data are yet available for red pandas from Bhutan, or Himalayan India (including Sikkim). Preliminary field work in China indicates that they are not common there either.

Habitat/Ecology: Red pandas inhabit a mixed forest habitat with a dense understorey of bamboo. They subsist on a diet of bamboo leaves supplemented by fruit. The study in Langtang indicated that they have home ranges of between 1.02 and 9.62 km^2. Those of the males are larger and overlap, during the breeding season, with those of several females. Home ranges were larger in marginal habitat areas than in optimal habitat areas. Other than the presence of bamboo, another factor of importance in red panda habitat is hollow trees, which are used as maternity dens.

Threats: The major threats confronting red pandas are direct harvest from the wild (live or dead), competition from domestic livestock (resulting in habitat degradation), and deforestation. The relative importance of these different factors varies between the regions and is improperly understood. Deforestation can have a variety of effects:

A. Glatston

Red panda, *Ailurus fulgens fulgens*.

loss of forest to agriculture may inhibit dispersal and result in fragmented distribution, and clear-cutting reduces habitat quality by removing maternal den trees and decreases the ability of some bamboos to regenerate following a bamboo die-off. However, in some areas forest cutting may enhance habitat quality because fruiting shrub density increases and bamboo growth can be stunted, providing easier access for red pandas. The key to understanding the various threats lies in estimating the effects which the different factors have on the panda's ability to harvest sufficient bamboo leaves for its needs.

Protection: The red panda is listed in Appendix II of CITES and is afforded legal protection in Nepal and China. In Myanmar it is covered by the Forest Act, which means that it is protected in the same way all forest products are protected, but it is not covered by the more stringent protection of the Wildlife Protection Act. The situation in the remaining countries where it is found is

unclear. In China it benefits from the system of parks established for the giant panda. However, whether these parks hold viable populations is, at present, unknown.

Occurrence in Protected Areas: In Nepal, the red panda occurs in the Langtang National Park, the Dhorpan hunting reserve, where it is said to be common in the upper forests of the lower Seng and Bakre Valleys (Wegge 1976; Fox 1985) and the Sagamartha National park. It also occurs in two areas proposed for protection, the Makulu Barun National Park and the Annapurna conservation area. It is also reported in the Rara National Park, although its presence here is questionable (Yonzon, pers. comm.). The Shey Phoksundo Park, which lies between the Annapurna and Dhorpan areas and Rara National Park, has no red pandas (thus making it less likely that the species occurs in Rara). In Sikkim, the Khangchandzonga National Park lists red pandas. In Arunachal Pradesh they are listed in the Namdapha National Park. They are also believed to occur in the recently gazetted Singlila Park in West Bengal, (Bahaguna, pers. comm.). In Bhutan, no red pandas are listed in the Jigme Dorji Wildlife Sanctuary, nor in the Thrumsing La National Forest in the proposed Black Mountain Park. Myanmar has no protected areas in the Himalayan region. In China, red pandas have been studied in the Wolong National Park and they are listed as occurring in the Tangjiahe Reserve, the Medog Nature Reserve and the Wanglang Park. The actual numbers and situation of the red pandas in these protected areas is unknown. However, the activities of the cattle herders within the Langtang National Park boundaries have an adverse effect on the red panda population.

Captive Breeding: The red panda breeds in captivity with reasonable success as long as a number of simple husbandry and management guidelines are followed. There are several successful regional breeding programs for this species (one in North America, one in Europe, one in Australia, one in Japan, and one just starting in China) which are currently being coordinated into a global management program under the auspices of the international studbook and the International Red Panda Management Group. Thus, there is a very real possibility that a viable population of red pandas can be maintained in zoological gardens.

Suggested Actions: Define the actual distribution of the red panda. We need to locate suitable occupied and unoccupied habitats from satellite imagery. From these data we need to identify possible locations for new protected areas based on large contiguous habitat size and minimal disturbance. We need to quantify the extent and intensity of present threats such as forest cutting, agricultural land development, and livestock grazing. We need to define the limits of red panda tolerance to human activity.

The transfer of red pandas from habitat countries to zoos needs to be controlled so as to ensure that only captive-born animals are involved (this could be accomplished by upgrading the red panda to Appendix I of CITES). However, we must ensure that this control does not interfere with the legitimate exchange of animals between zoos for captive breeding purposes.

Research is needed to determine the degree of genetic variation within red pandas throughout their range to ascertain the number of distinct groupings/subspecies.

Action needs to be taken to limit deforestation: clear-cutting should be reduced or eliminated; low elevation habitat corridors need to be established to join areas fragmented by agricultural clearing; and research is needed into the dynamics of the bamboo-forest system and the effects of different cutting regimes on forest growth.

The Bushy-tailed Olingo (*Bassaricyon gabbii*)

Subspecies: There are three subspecies, *B. g. gabbii, B. g. orinomus, B. g. richardson.*

Distribution: Central Nicaragua, Costa Rica, Panama, western Columbia, western Ecuador. Actual occurrence within this range is not well known (see Fig. 2, Appendix 1).

Population: Generally unknown, possibly rare depending on the authority. Is said to be quite rare in Ecuador (Albuja, pers. comm.). Some people maintain that olingos are not threatened but are common throughout western Amazonia (Emmons, pers. comm.). However, confusion with kinkajous makes local anecdotes unreliable.

Habitat/Ecology: The bushy-tailed olingo inhabits evergreen forests and primary tropical forest near water. Some authorities maintain that it is almost never encountered where there is human development, while other reports indicate the bushy-tailed olingo can adapt to secondary vegetation or plantations in much the same way as kinkajous. Olingos mingle with kinkajous in feeding aggregations in fruiting trees. However, they travel separately and den individually (Poglayen-Neuwall, pers. comm.).

Threats: Deforestation is a major threat; for example, former habitat in Nicaragua has been cleared for agriculture. In the early 1960s, the forests of northern Nicaragua resounded with the calls of olingos. In areas where there was rain forest as recently as 30 years ago, today there is only agricultural and grazing land. Forest is confined to mountain tops where agriculture and logging are too difficult. Some of these montane forests still contain small populations of olin-

Table 5
Summary of Situation in Habitat Countries

Country	Situation Summary
Central America	
Mexico	Rich in biodiversity. Deforestation rife in the past, currently running at a level about 1.3% closed forest lost to deforestation per year. City development and tourism problem in some areas. Population growth decreasing substantially.
Belize	Forests of Belize largely untouched by logging, more than 70% still forested. Economic pressures likely to conflict with national parks in the future.
Guatemala	Suffered from armed conflict. Substantial areas of forest. Work needed to reinforce habitat protection. Government has made initiative for wildlife system but no resources. Large national parks are often environmentally degraded.
El Salvador	Suffered from armed conflict. Great loss of forest, formerly 90% forested. Losing forest at a rate of 3.2% per year. Two of four national parks are known to be disturbed.
Honduras	Losing forests at a rate of 2.8% per year. National parks often suffer from human depredation including colonization and slash and burn agriculture.
Nicaragua	Suffered from armed conflict. Losing forests at a rate of 2.7% per year. National parks suffer from human activities; farmers, Pan American Highway.
Costa Rica	Only 32% of Costa Rica is forested. This forest is now all protected, and there are also plans to reforest 1.8 million hectares. Comprehensive conservation policy.
Panama	Suffered from armed conflict. Deforestation rates around 0.9% per year. There are a number of protected areas but several of the national parks are suffering from human activities, e.g. encroached on by campesinos, illegal hunting.
Carribean	
Bahamas	Influenced by tourist development. Limited protected areas available.
Barbados	Influenced by tourist development. No registered protected areas.
Guadeloupe	Forest cover on Guadeloupe has increased. There are two nationally protected areas on the island.
Trinidad & Tobago	Influenced by tourism and suffering from some deforestation. Forests are being lost at a rate of 0.4% per year. There are six nationally protected areas.
South America	
Colombia	Suffering from deforestation at a rate of 1.8% per year. There are a number of nationally protected areas. Unfortunately these are under threat from colonization, narcotics cultivation, mining, traffic, hunting, and logging.
Venezuela	Losing forests at a rate of 0.4% per year. There are a number of nationally protected areas. Unfortunately, these are under pressure from poaching, agriculture, illegal mining, cattle ranching, and tourism.
Guyana	Little current deforestation but only one nationally protected area.
Suriname	Little current deforestation and a number of nationally protected areas.

Country	Situation Summary
French Guiana	Current levels of deforestation unknown; however areas are threatened by the space launch center at Kourou. No nationally protected areas.
Ecuador	Deforestation occurring at a rate of 2.4% per year. However, there are a number of nationally protected areas.
Peru	Current situation in the country, civil strife, migrations of people, and cocaine production are leading to heavy pressure on the forests and non-sustainable use of forest resources. Deforestation is occurring at a rate of 0.4% per year. There are a number of nationally protected areas; however 14 of these are under pressure from illegal logging, poaching, cattle grazing, and colonization.
Brazil	Brazil is losing its forests at a rate of 0.7% per year. However, there are a number of nationally protected areas.
Bolivia	Bolivia is losing forests at a rate of 0.2% per year. It has a number of protected areas, some of which are unfortunately under threat from colonization, poaching, logging, and grazing.
Paraguay	Losing forests at the rapid rate of 4.7% per year. However, it does have a number of protected areas
Uruguay	Has eight nationally protected areas.
Argentina	Has a large number of nationally and regionally protected areas
Asian Countries Inhabited by Ailurids	
Nepal	Has one of the most rapid rates of population growth in Asia accompanied by one of the highest rates of deforestation. There are a number of nationally protected areas; however, some of these are suffering from human incursions and grazing.
Bhutan	Probably one of the most untouched countries in Asia. Still largely forested. Has two nationally protected areas.
India (Sikkim, Arunchal Pradesh, West Bengal)	There are a number of nationally protected areas and a coordinated conservation policy including the establishment of "green corridors" linking forested areas.
Myanmar	Losing forests at a rate of 2.1% per year. Has two nationally protected areas but neither is in the Himalayan region.
China	There are a number of nationally protected areas, including a number that have been established for the giant panda.

All figures relating to deforestation refer to the loss of closed forest, as this is more relevant to procyonids and ailurids.

Poglayen-Neuwall

Bushy-tailed or common olingo, *Bassaricyon gabii*, Iquitis, Mazonia, Colombia.

gos. It is possible that the major rainforest area near Rama still has a viable population. In addition to deforestation, the recent armed conflict undoubtedly took its toll on olingos, as well as many other species. An additional threat comes from hunting. Although adult olingos are rarely hunted, the young are caught for pets.

Protection: Olingos are included on Appendix III of CITES by Costa Rica. They have no specific protection in Nicaragua or Panama but they are protected under Colombian legislation. The situation in Ecuador is unclear.

Occurrence in Protected Areas: Olingos undoubtedly occur in some protected areas, but they do not seem to be included in the species listings of protected areas. These omissions may be due to the inability most laymen to recognize this species or it may be due to a perceived lack of their importance. Nevertheless, olingos are rain-forest animals and there are a number of areas of protected rain forest within their range. In Nicaragua, the Saslaya area may well contain olingos. In Costa Rica, the Tortuguero National Park names the kinkajou on its species lists, and therefore may also hold olingos. This is also true of the proposed Baru National Park in Panama. Elsewhere in Panama, olingos might be found in the Darien, Soberania, and Portobelo Parks. However, the latter two of these protected areas suffer from human activities. Olingos may also be found in protected rain forest parks in western Colombia and Ecuador.

Captive Breeding: There has been some limited success in the captive breeding of olingos. Kilverstone (Great Britain) repeatedly bred from one pair (reported as *B. alleni*) and Poglayen-Neuwall (pers. comm.) reported that he had a pair which had produced ten young. These two pairs seem to have been the exceptions. Poglayen-Neuwall reports that other pairings have proved unsuccessful and even in the case of the two "successful" pairs the young had to be removed for hand-rearing otherwise they were killed immediately post-partum by their dam. Poglayen-Neuwall suggests that olingos are more difficult to breed than other procyonids. To date, relatively few pairs are known to have been maintained in captivity.

Suggested Actions: A survey of this species throughout its range is urgently required. In particular it is necessary to have an estimate of its occurrence in protected areas, and to ensure that National Park authorities are encouraged to register this species if it occurs in their park. National Park officials need to be trained in the identification of this species.

An effort needs to be made to ascertain the impact of human activities on the olingo and the extent to which olingos can adapt and survive in disturbed and secondary forest.

Taxonomic research is needed to determine the species and subspecies in this genus.

Allen's olingo (*B. allenl*)

Subspecies: None.

Distribution: Ecuador, to the east of the Andes, and Peru through to Cuzco province in Bolivia, possibly also in Venezuela (see Fig. 3, Appendix 1).

Population: Numbers are unknown but it is reported as rare in Bolivia.

Habitat/Ecology: As far as is known this is the same as for *B. gabii.*

Threats: Deforestation is probably the major problem.

Protection: There is no specific protection for any procyonid in Bolivia, and the situation is unclear in Peru and Ecuador.

Occurrence in Protected Areas: Allen's olingos are reported in the Tambopata Reserve, and possibly in the Manu National Park in Peru. No further reports in other protected areas are known but as in the case of the bushy-tailed olingo this may be the result of ignorance or lack of interest on the part of the park authorities. In Ecuador, Allen's olingo may occur in the Yasuni National Park, though this area is under threat from land tenure problems, colonization, poaching, mining, and timber extraction. There may be many other protected areas which provide suitable habitat for olingos. However, 14 of the protected areas in Peru are under pressure from illegal timber extraction, poaching, cattle grazing and colonization. This situation is exacerbated by the civil strife in the country. In Bolivia, there a number of protected areas but many are outside the range of Allen's olingo. However, kinkajous are reported at the Beni Biological Station, so it is probable that olingos occur here also. Unfortunately, Beni is under threat from colonization and poaching.

Captive Breeding and Suggested Action: See data sheet for the bushy-tailed olingo.

Pocock's Olingo (*B. beddardi*)

Subspecies: None.

Distribution: In the literature this species has been reported in Guyana, Venezuela, and Brazil. However, the Guyana record is probably erroneous (see Fig. 4, Appendix 1).

Population: Totally unknown.

Habitat/Ecology: This is presumed to be the same as that described for (*B. gabbii*).

Threats: Most of the presumed range for this species is affected by deforestation.

Protection: No protection is offered to olingos in Venezuela and the situation in Brazil is unclear.

Occurrence In Protected Areas: In Brazil, olingos could occur in any of the protected areas in the Amazon basin. However, there are no reports of their occurrence in these areas. The same is also true in Venezuela. In this latter country, several of the protected areas are under pressure from hunting, agriculture, and illegal mining.

Captive Breeding and Suggested Action: No specimens are known in captivity. See the data sheet for *B. gabbii.*

Harris's Olingo (*B. lasius*)

Subspecies: None known.

Distribution: This species has a very limited distribution in Costa Rica, near the source of the Rio Estrella in southern Cartago, at an altitude of approximately 1,500 m (see Fig. 5, Appendix 1).

Population: Totally unknown.

Habitat/Ecology: Nothing is known about this species. Habitat and ecology assumed to be the same as for the bushy-tailed olingo.

Threats: Deforestation and a very limited distribution.

Protection: This species is listed on Appendix III of CITES by Costa Rica.

Occurrence in Protected Areas: Is not known to occur in any protected area in Costa Rica although its range may be covered by the Area de Concervacion Cordillera Volcanica Central or the Area de Concervacion Amistad.

Captive Breeding and Suggested Action: No specimens in captivity. See the data sheet for *B. gabbii.* A survey is needed to establish whether or not the species occurs in existing protected areas in Costa Rica.

Chiriqui Olingo (*B. pauli*)

Subspecies: None.

Distribution: This species has a very limited distribution between Rio Chiriqui Viejo and Rio Colorado in the Chiriqui area of Panama.

Population: Totally unknown.

Habitat/Ecology: Unknown, assumed to be the same as *B. gabbii.*

Threats: An extremely limited distribution in combination with deforestation and the recent armed conflict have probably adversely affected this species.

Protection: Olingos are not protected by law in Panama.

Occurrence in Protected Areas: This species is not reported to occur in any protected area.

Captive Breeding and Suggested Action: No specimens of the Chiriqui olingo are known in captivity. See the data sheet for the bushy-tailed olingo. A survey is needed to determine whether this species occurs in any protected areas in Panama or whether a new protected area might be needed.

Cacomistle (*Bassariscus sumichrasti*)

Subspecies: There are five subspecies of cacomistle: *B. s. campechensis, B. s. notinus, B. s. saxacensis, B. s. sumichrasti,* and *B. s. variabilis.*

Distribution: This species formerly occurred from Guerrero and south Veracruz in Mexico through to west Panama. Now it is probably extinct in west Panama and seems to have gone from much of the Costa Rican Plateau. Its occurrence is unknown in Nicaragua, but it is believed to be fairly common in Honduras and patchily distributed in Guatemala and Mexico (Poglayen-Neuwall, pers. comm.) (see Fig. 6, Appendix 1).

Population: Unknown, but it has always been uncommon over much of its range, and now as a result of human activity it is probably threatened. It is not yet endangered in Mexico, where it is common in the remnant forests of Veracruz, but it is rare in Panama (Emmons 1990).

Habitat/Ecology: The cacomistle is nocturnal, arboreal, and solitary. It feeds on fruits, insects, and probably small vertebrates. Cacomistles use the middle and upper levels of tropical forests. It is found in both montane and lowland rain forest, in wet evergreen forest as well as seasonally dry forest, scrub, and secondary forest.

Threats: Loss of habitat due to deforestation. Much of the range has been in war zones over the past decade. It is vulnerable in Mexico as the ecosystem is in peril: the rate of forest clearance is tremendously high and forest fragmentation is also a major problem. In addition, it is hunted in Honduras and Mexico for its fur, for meat by indigenous people (the Lacandones), and for killing chickens. However, it is unlikely that cacomistles are responsible for killing chickens. Observations of newly-caught individuals as well as long-term captive animals have indicated that cacomistles are afraid of birds larger than a dove (Poglayen-Neuwall, pers. comm.). The scale of this hunting is unclear.

Protection: The cacomistle is listed in CITES Appendix III by Costa Rica, and it is also listed as an endangered species in Decree no. 18595-MAG. of that country. In Belize it is covered by the Wildlife Protection Act. It is not protected by law in Panama. Elsewhere the situation is unknown.

Occurrence in Protected Areas: Cacomistles are known to occur in the proposed Volcano Baro National Park in Panama, in the Monte Cristo National Park in El Salvador and in the Cockscomb Basin Reserve in Belize. However, they are reportedly rare in this last region. As with the olingos, cacomistles are rarely named on the lists of mammals occurring in protected areas. Again this may be the result of their perceived lack of importance. However they may be living in a number of protected areas where there is suitable habitat. Cuaron (pers. comm.) indicates that they occur in several protected areas in southern Mexico. Mora (1984) reports that they occurred in the Guanacoste region of Costa Rica. This area is now protected in the Guanacoste Conservation Area. Nevertheless, a number of the protected regions in Central America are under pressure from human activities.

Captive Breeding: This species is not generally main-

Poglayen-Neuwall

Cacomistle, *Bassariscus sumichrasti variabilis*, northwest Honduras.

tained in captivity. Captive breeding has occurred but it is relatively rare; cacomistles bred once in the old zoo of Tuxtla Gutierrez in Chiapas, Mexico. They have bred several times in Autosafari Chapin in Guatemala and several times in the collection of Poylayen-Neuwall (Poglayen-Neuwall, pers. comm.). It is difficult to determine how successfully this species could be maintained in zoos. The limited experience that zoos have had with the ringtail is of no assistance as the physiology of this species is very different from that of the cacomistle (Poglayen-Neuwall, pers. comm.).

Suggested Actions: Censuses are needed to ascertain the numbers and exact occurrence of this species. In particular we need to establish their occurrence in protected areas. The authorities of these areas need to be encouraged to list cacomistles where they occur.

Areas suitable for possible new reserves need to be gazetted and protection in existing reserves needs to be reinforced.

The extent of hunting needs to be determined and, if necessary, the sale of skins should be limited.

Education of local people may be needed to reduce killing of these animals as a result of the loss of domestic fowl.

White-nosed Coati (*Nasua narica*)

Subspecies: There are two subspecies, *N. n. molaris* and *N. n. narica.*

Distribution: The range of the white-nosed coati extends from Arizona and parts of southern New Mexico in the United States through Mexico (except the Baja peninsula) and Central America to Panama and into South America in areas west of the Andes. Occasional solitary male coatis have been seen in southwest Texas (Poglayen-Neuwall, pers. comm.) but there are no known breeding records from there (Kaufmann, pers. comm.) (see Fig. 7, Appendix 1).

Population: The numbers of this species are unknown. It is rare in the United States and scarce in Central America where its status is not well known, but indications are that

Poglayen-Neuwall

Seasonally dry deciduous forest (elevation 70 m), Campeche, Mexico. Also the habitat of the white-nosed coati, *Nasua narica*.

its numbers have been greatly reduced (Janson 1981). The Mexican population has probably been severely reduced and it may even be extirpated in certain areas.

Habitat/Ecology: White-nosed coatis inhabit woodland and open forests; in the United States, 54% of sightings in one study were in oak woodlands and 30% in oak-pine woodland. Coatis are rarely seen in open grassland or desert. Their distribution in Arizona and New Mexico corresponds to that of Encinal and Mexican pine-oak woodland. In the southwestern U.S.A., they are found in oak woodlands or hardwood riparian canyons from 1,400-2,300 m. They are also occasionally seen in chaparral conifers. Many sightings have occurred in small isolated mountain ranges such as the Sierra Madre in Mexico and the Chiricahuas and Huachucas in the United States.

Coatis are more active by day than by night. They run in bands of up to 12 individuals, but adult males are typically solitary. They are highly adaptable but are basically tropical woodland and forest animals. They are good climbers although they are essentially terrestrial in their habits. Their diet is omnivorous and they search for food both on the ground and in the forest canopy.

Threats: The coati population in the United States is gradually becoming genetically isolated from populations further south as a result of the situation in Mexico. This in turn could lead to local extirpation of the coati in the United States.

A further problem confronting the coati, in addition to the ongoing habitat loss, is hunting. Coatis are hunted throughout their range either for their skin or for food. In the United States they are occasionally caught in traps set for other species (see earlier), killed by hunters ostensibly looking for other species, or they fall victim to "predator" control campaigns. They apparently disappeared from the Burro Mountains in New Mexico at about the same time as a coyote poisoning campaign (Kaufmann *et al.* 1976). In addition, coatis are susceptible to canine distemper and rabies (Kaufmann *et al.* 1976).

Protection: White-nosed coatis are classified as an endangered species in New Mexico and they are given total legal protection there. However, in Arizona, where most of the coatis in the United States live, they are subject to year-round hunting. Coatis are listed in Appendix III of CITES by Honduras. Elsewhere in their range they do not appear to be afforded any official protection.

Occurrence in Protected Areas: The white-nosed coati appears on the species lists of the following National Parks: Volcano Baro in Panama (proposed), Guanacoste and Corcovado National Parks in Costa Rica, the Tikal National Park in Guatemala, and the Rio Platano in Honduras. It may be present in a number of other protected areas but has been omitted from the species lists.

Captive Breeding: The white-nosed coati is a fairly common species in zoos and it breeds well in captivity. The possibilities of establishing a viable captive population are good if such action is required. Nevertheless, many of the individuals maintained in zoos are of unknown origin. It is therefore possible that many zoos are holding and breeding coatis in groups containing a mixture of subspecies. For a good captive breeding program to be established with a view to possible reintroduction at some future date, these animals would have to be held in single subspecies groups.

Suggested Actions: A survey needs to be undertaken of this species throughout its range. In particular the situation in northern Mexico needs to be looked at in detail to establish whether genetic isolation of the North American population has occurred. Further action would depend on the outcome of this survey. One possibility would be to establish new protected areas in northern Mexico to prevent further isolation of the more northern populations.

Unnecessary deaths through accidental trapping or the illegal actions of hunters in the United States should be better controlled. If hunting continues in Arizona, a quota system should be established.

Cozumel Island Coati (*N. nelsoni*)

Subspecies: None.

Population: Unknown.

Distribution: Found throughout the interior of Cozumel Island which lies off the coast of the Yucatan peninsula, Mexico (see Fig. 8, Appendix 1).

Habitat/Ecology: The Cozumel coati has not yet been studied but is assumed to be similar to the white-nosed coati.

Threats: The island has been substantially developed for tourism. In 1976, the environmental situation was reported to be not too bad, as the inland areas were relatively well conserved. However, Cozumel is a very popular resort and development plans threaten the areas where the coatis live. Tourist development of the island is expected to double over the next 10 years (Bixler, pers. comm.).

Coatis are popular pets in Central America, so it is possible that such "pets," brought from the mainland, could escape and contaminate the gene pool of the Cozumel coati.

Protection: None.

Occurrence in Protected Areas: There are no legally protected areas on Cozumel.

Captive Breeding: No specimens are in captivity except perhaps on the island itself, and these animals are pets. However, a captive breeding program may be possible if required assuming that this species does not differ substantially in its requirements from the white-nosed coati.

Suggested Actions: It is of primary importance to establish the taxonomic status of these animals, to see if they represent a valid species. Attempts must be made to prohibit the import of pet white-nosed coatis to the island, and any that are brought in should be sterilized.

A survey should be conducted on the island to determine the numbers and distribution of the Cozumel coati and to assess the degree of threat faced by the species.

Little or Mountain Coati (*Nasuella olivacea*)

Subspecies: None known.

Distribution: The mountain coati is found in the Andes in Colombia, western Venezuela, Ecuador, and northern Peru (see Fig. 9, Appendix 1).

Population: The population of the mountain coati is unknown but it is believed that it is not common.

Habitat/Ecology: Very little is known of the ecology of this species. It is known to be a high altitude specialist living in the cloud forest and paramo of the Andes. It is assumed that it is similar to other procyonids in that it is somewhat arboreal and omnivorous. It may be that this species does not survive well at lower altitudes, where it is replaced by the ring-tailed coati.

Threats: This species has limited distribution and is undoubtedly affected by deforestation. In many parts of the Andes the cloud forest is being converted to agriculture and the paramo is being planted with pine forest (Bisbal 1987).

Protection: The mountain coati is protected by game species resolution MAG-RNR in Venezuela but is not protected in Ecuador or Colombia.

Occurrence in Protected Areas: The mountain coati is not included in the species lists of any protected area. However, field workers and parks officials may not know of the existence of this species, and hence fail to record it. Bisbal (1987) states that its range coincides with the protected areas of the Andes in Venezuela. It could occur in the Sangay National Park in Ecuador.

Captive Breeding: There are no specimens in zoos and nothing is known of the biology of this species. It is therefore difficult to assess whether captive breeding would be a viable option.

Suggested Actions: A survey is urgently needed to ascertain numbers and the current distribution of this species. It would be particularly useful to know whether it occurs in any protected areas. To assist with this, the personnel of national parks need to be alerted to the existence of this species and taught how to distinguish it from the ring-tailed coati. Further action depends on the survey results.

The ecology of this species needs to be studied and its habitat requirements need to be ascertained.

Further taxonomic research should also be undertaken to establish whether the species belongs in its own genus, separate from the other coatis.

Tres Marias Islands Raccoon (*Procyon insularis*)

Subspecies: Two subspecies of the Tres Marias Islands raccoon are recognized: on Maria Madre (*P. i. insularis*) and on Maria Magdalena (*P. i. vicinus*).

Table 6
National Parks Reported to Contain Procyonids or Ailurids

Country	National Park	Species
Central America		
Mexico	Canon de Manejo	ringtail, raccoon
	Isla Salamanca N.P.	raccoon
	Tarrona N.P.	raccoon
Belize	Cockscomb Basin Reserve	cacomistle
Guatemala	Volcan Pacaya N.M.	kinkajou
	Tikal N.P.	kinkajou, raccoon, Central American coati
	Rio Dulce N.P.	raccoon
	Univ. Biotope for Conservation of Quetzal	cacomistle
El Salvador	Montecristo N.P.	cacomistle
Honduras	Lake Yojoa	kinkajou
	Rio Platano	kinkajou, Central American coati
Nicaragua		
Costa Rica	Tortuguero N.P.	kinkajou
	Corcovado N.P.	raccoon, coati, kinkajou
	Rincon de la Vieja	coati, raccoon
	Paos Volcano	kinkajou, coati
	Brantio Carillo N.P.	raccoon, coati, kinkajou
	Hitoy Cerere Biol. Res.	raccoon, coati, kinkajou
Panama	Volcano Baru	Central American coati, kinkajou, cacomistle, olingo, raccoon
Carribean		
Bahamas		
Barbados		
Guadeloupe	P.N. de la Guadeloupe	Guadeloupe raccoon
Trinidad & Tobago		
South America		
Colombia	P.N. Naturale Purace	coati
	P.N. Chingaza	coati
	P.N. Cocuy	coati
	La Macarena N.R.	raccoon
Venezuela	Guatapo Park	kinkajou
Guyana		
Suriname		
French Guiana		

Country	National Park	Species
Ecuador	Machalilla	coati
	Cayambe	South American coati
Peru	Manu N.P.	crab eating raccoon, South American coati, kinkajou, olingo
	Tambopata	South American coati, kinkajou, olingo
Brazil		
Bolivia	Cerro Amboro	crab eating raccoon, South American coati, olingo
Paraguay	Caaguazu	South American coati
	Ibycui	Crab-eating raccoon
Uruguay		
Argentina		
Asian Countries Inhabited by Ailurids		
Nepal	Sagamartha N.P.	red panda
	Annapurna N.P.	red panda
	Dhorpan H.R.	red panda
	Lake Rara	red panda?
	Langtang	red panda
	Makalu Barun N.P.	red pandas
Bhutan		
India[1] (Sikkim, Arunchal Pradesh, West Bengal)	Namdapha N.P.	red panda
	Khangchendzonga N.P.	red panda
Myanmar		
China	Medog N.R.	red panda
	Tangjiahe reserve	red panda
	Wanglang	red panda
	Wolong	red panda

[1] Figures given are for the whole of India.

Distribution: This species is confined to the Tres Marias Islands lying off western Mexico: Maria Madre Island, Maria Magdalene Island (see Fig. 8, Appendix 1).

Population: This species is not common and has probably never been numerous.

Habitat/Ecology: No studies of this species have been undertaken but it is presumed to be similar to the mainland common raccoon.

Threats: The major threats confronting this species are its limited distribution, hunting, and capture as pets by local people.

Protection: No legal protection is given to this species.

Occurrence in Protected Areas: There are no reserves on these islands.

Captive Breeding: This is a viable possibility assuming that they adapt as well to captivity as the common raccoon. However, except for a few pets, there are no specimens known in captivity.

Suggested Actions: Taxonomic study is needed to determine whether this is a true species. The planned follow-up of the Oxford University expedition to the Tres Marias Islands of 1988 should be implemented to evaluate the situation on these islands in detail. If necessary, a protected area should be established.

Bahamian Raccoon (*P. maynardi*)

Subspecies: None.

Distribution: This species is confined to the Bahamas (see Fig. 10, Appendix 1).

Population: There are no data available on its numbers but it was formerly rare and is believed by some now to be in danger of extinction (Bogan, pers. comm.).

Habitat/Ecology: There have been no studies conducted on this species, but it is presumed similar to the mainland common raccoon.

Threats: The development of these islands for tourism has undoubtedly had an impact on raccoon numbers.

Protection: This species is not legally protected.

Occurrence in Protected Areas: There are no protected areas in the Bahamas known to include this species.

Captive Breeding: There are currently no specimens known in captivity, but captive breeding is a realistic possibility given the success with breeding the common raccoon.

Suggested Actions: The taxonomic status of the Bahaman raccoon needs to be determined, as this will undoubtedly have some impact on future policy.

A survey needs to be undertaken to determine the numbers and distribution of this raccoon throughout the Bahamas with a view to establishing a protected area if this is deemed necessary.

Guadeloupe Raccoon (*P. minor*)

Subspecies: None.

Distribution: This species is confined to the island of Guadeloupe (administered by France) (see Fig. 10, Appendix 1).

Population: The numbers of the Guadeloupe raccoon are unknown. It was formerly rare, and numbers are probably dwindling due to changes in land use. Some sources believe that it may be in danger of extinction (Bogan, pers. comm.).

Habitat/Ecology: Nothing is known of the Guadeloupe raccoon except that it is found in rain forests and mangroves (Pinchon 1971). It is assumed that its ecology is similar to one of the two mainland forms.

Threats: In addition to its limited distribution, the Guadeloupe raccoon is subject to hunting pressure—raccoons are killed for food on Guadeloupe. Loss of habitat is another important factor—changes in land-use are destroying habitat.

The crab-eating raccoon may be establishing itself as a result of human introduction.

Protection: This species is not legally protected.

Occurrence in Protected Areas: The Guadeloupe raccoon is reported to occur in the Parc National de Guadeloupe.

Captive Breeding: The only known specimens in captivity are in the zoo in Guadeloupe, if these are indeed the endemic form. If the Guadeloupe raccoon adapts as eas-

ily to zoo life as the common raccoon, captive breeding prospects could be good.

Suggested Actions: The taxonomic status of this raccoon needs to be determined, since its conservation priority will increase if it is shown to be a valid species.

A survey should be undertaken to ascertain numbers and distribution of the raccoon throughout Guadeloupe but most particularly within the national park.

The possible invasion of the crab-eating raccoon and its impact should be evaluated.

Further action will to some extent depend on the results of the above.

Cozumel Raccoon (*P. pygmaeus*)

Subspecies: None.

Distribution: This species is confined to Cozumel Island off the coast of the Yucatan Peninsula, Mexico (see Fig. 8, Appendix 1).

Population: The numbers of the Cozumel raccoon are currently unknown but it was formerly said to be rare, and the development of the island for tourism is likely to have had an impact.

Habitat/Ecology: The Cozumel raccoon lives in the mangrove swamps on the island.

Threats: Cozumel Island has been substantially developed for tourism. In 1976 Cozumel was still relatively well-conserved, but the situation has changed rapidly. The interior of the island is least developed but raccoons are apparently rare or absent there. They live in the mangrove swamps at northern and southern tips of the island. This suggests that there is only a very small area of suitable raccoon habitat and this is on the coast where most of the tourist development is taking place. The remaining raccoon habitat is threatened with destruction to make way for tourist developments.

Protection: The Cozumel raccoon is not legally protected.

Occurrence in Protected Areas: There are no protected areas on the island.

Captive Breeding: There are no Cozumel raccoons in captivity except, perhaps, on island itself as pets. However, captive breeding could be a viable option if this species breeds as readily in captivity as the common raccoon.

Suggested Actions: Research is needed to determine the taxonomic status of the Cozumel raccoon, in particular whether or not it is a valid species.

A survey should be conducted on the island to determine the numbers and occurrence of the raccoon with a view to establishing reserves in mangrove areas.

A study is needed to determine how this species can best coexist with tourism.

Barbados Raccoon (*P. gloveralleni*)

This species was formerly confined to Barbados. However, the last living specimen was seen in 1964, and this species is now believed to be extinct. A pair of common raccoons has been established in former Bahaman raccoon habitat.

Chapter 4

Recommendations

One of the main problems encountered by the Specialist Group during the compilation of this document is the paucity of information available on most of the species. To date, detailed research has been undertaken on only the more common species of raccoon and coati, as well as the ringtail. However, pilot studies have now been undertaken, or are planned, on a few of the less well-known species: the red panda, the Cozumel Island raccoon and coati, and the Tres Marias Islands raccoon. It is important that similar studies on the other little-known procyonid species follow soon.

Taxonomic Research

As emphasized in the earlier chapters of this report, the taxonomic confusion encountered in some of the genera adds to the problems faced in designing an action plan: it is uncertain in many cases whether we are dealing with species or subspecies and the generic as well as the familial status of some species, notably *Nasuella olivacea* and *Ailurus fulgens*, needs confirmation. Thus, a systematic review of the procyonid and ailurid taxa is of prime importance and in many cases is a prerequisite to establishing a priority rating for conservation action for the various species.

Ailurids

While taxonomic research would seem to be desirable to establish the status of the red panda, such research is not of immediate concern because, whatever the outcome, this species remains unique. However, taxonomic study is also required within the genus to examine the question of validity of the two described subspecies. This could have implications not only for the captive breeding program but also for possible future reintroduction, and therefore has a higher degree of priority.

Action Point:

1. A study is required to determine genetic variation in red pandas throughout their range. This will reveal how many different subspecies or genetically unique populations exist.

Procyonids

Determination of the taxonomic status of the mountain coati would have direct implications for its conservation rating and is therefore of immediate concern. Other projects of importance relate to the species or subspecies status of the various taxa. In principle, this entire family would benefit from a taxonomic review.

Action Points:

1. A study is required to determine the validity of the genus *Nasuella*.
2. Taxonomic research is required to determine the specific/subspecific status of the various forms of olingo.
3. Taxonomic study is required to determine the specific/subspecific status of the island forms of raccoon.
4. Taxonomic study is required to determine the specific/subspecific status of the island forms of coati.

Ecological and Ethological Research

Most of the species discussed in this document would benefit from detailed ecological studies to determine, among other things, their precise habitat requirements. Knowledge of the distribution and availability of preferred habitats is important because it would make it possible to design optimum conservation strategies. These species could also benefit from behavioral research to help improve captive breeding success.

Action Points:

1. Detailed ecological studies are required for all the

R. Belterman

Even in zoos red pandas show a preference for feeding on bamboo.

species listed in the data sheets, with the possible exception of the white-nosed coati (for which substantial information is already available). Preliminary information is available on the cacomistle and the red panda, so studies on these species should be directed towards filling gaps in our knowledge.

2. A study, based on satellite imagery, should be carried out to determine the area and distribution of suitable habitat for species with limited geographical distributions, such as the red panda, the olingos, the cacomistle, and the white-nosed and mountain coatis.

3. Population estimation techniques for these species need to be developed, even if they are only approximate indices of abundance, so that population trends can be monitored.

4. The constraints on coexistence between these species and their human neighbors need to be investigated. This is of particular importance in some of the island species and for the red panda. The study of the latter species in the Langtang National Park indicates that human impacts have resulted in a population decline. (Yonzon & Hunter 1989; 1991)

Captive Breeding

Several of the species of concern among the procyonids and ailurids could benefit from a captive breeding program to ensure that part of the natural gene pool is preserved (with a view to future reintroduction or providing a reserve population which could from time to time be used to improve the genetic stock in the wild). Some of these species are already breeding well in captivity, others are likely to breed well, while some will need research into their basic natural history and physiology before it is known how to breed them successfully.

In all cases, such captive breeding programs should require that some of the animals be maintained and bred in countries of origin. The possibilities for this are examined in a later section.

The White-nosed Coati

The possibility of establishing a captive population of this species needs to be considered. It is maintained and bred with success in a number of zoos and the basis of a breeding population in captivity already exists. However, many of these animals are likely to represent unknown or hybridized subspecies.

Action Point:

1. A survey needs to be undertaken of the numbers, origins, and subspecies of white-nosed coatis maintained in zoos, to determine the viability of establishing a captive-breeding program from existing zoo stock.

   The need to augment this population with wild-caught individuals would depend on the results of the survey. It would seem essential that a good breeding nucleus of these animals be kept in North American zoos with a view to reintroduction so as to alleviate the possible negative effects of genetic isolation of the North American coati population.

The Cozumel Coati

An attempt should be made to evaluate the possibility of establishing a captive breeding group of this (sub)species. Given the success zoos enjoy with breeding both the white-nosed and ring-tailed coatis, the chances of establishing a successful program with this species seem good. There are apparently a number of coatis in captivity on Cozumel itself (as pets), although it is not clear whether they are from the island population or from the mainland.

Action Point:

1. An inventory of the pet coatis held on Cozumel should be carried out. Those belonging to the island form should be collected to form the nucleus of the breeding group on the island. There is no zoo on the island, but it would be most appropriate if a facility were available to breed these animals on the island.

The Mountain Coati

Nothing is known about this species, nor are there any mountain coatis reported in zoological collections. Some serious research should be undertaken on the behavior and ecology of this species before any attempt is made to establish a captive breeding program for this animal.

The Cacomistle

The need for a captive-breeding program for the cacomistle is uncertain, and should be assessed. However, before such a program is established, research will be required on the husbandry requirements of this species since breeding success so far in captivity has been very limited.

The Olingos

Breeding success with olingos in zoos has been very limited. Although this is partly due to the small number of specimens in captivity, the data we do have indicate that they might be difficult to breed in zoo conditions. It would therefore be unwise to take any of the rarer forms of olingo into captivity until some degree of success has been achieved in holding and breeding the most common form in zoos.

Action Point:

1. A detailed study of the bushy-tailed olingo in captivity is required. If possible, this should be undertaken on animals that are already in captivity. To this end an inventory of captive olingos is required. On the basis of this, a program may be required to concentrate these animals in a limited number of institutions.

The Island Forms of Raccoons

Zoos have had good success with holding and breeding the common raccoon. It is therefore reasonable to assume that the techniques that have met with success will be effective for the management of island forms. In the cases of the Tres Marias Islands raccoon and the Cozumel Island raccoon, there are known to be a number of specimens (presumed to be the indigenous forms) kept as pets on the islands. This may also be true for the Guadeloupe and Bahamian raccoons.

Action Points:

1. Inventories should be made of all raccoons held as pets on these islands. It may later be deemed necessary to collect animals together to form the nucleus of a captive breeding program. It would be advantageous if breeding centers for these animals could be set up on the islands on which they occur.

2. In the case of the Guadeloupe raccoon, there are supposedly individuals of this form held in the zoo in Guadeloupe itself. This claim needs to be investigated.

If this is the case, the possibility of establishing a breeding group of these animals in this zoo should be pursued.

The Red Panda

There is an active and well-coordinated captive breeding program for the red panda in the zoos of Europe, North America, Japan, Australia, and most recently China. This should be continued.

Education

Education is required through many of the range states of the procyonids to make people aware of these species. While racoons, coatis, and kinkajous are often included in the species lists of the various protected areas, olingos, cacomistles, and mountain coatis are usually not mentioned. The local people and the national parks personnel should be made aware of these species and their conservation needs.

Conservation Recommendations by Country

Bahamas

Surveys: A survey is required to determine the distribution and status of the Bahaman raccoon.

Habitat Protection: No protected significant areas are present on the Bahamas. Given the tourist and other development on these islands, a protected area is undoubtedly necessary to ensure the continued survival of this species.

Research: Taxonomic research is required to determine the status of the Bahamian racoon. Ecological research is required to determine the habitat requirements of this animal.

Captive Breeding: Whether this is needed depends on the results of the survey; there is a zoo on the islands which could possibly function as a captive-breeding center, if required.

Belize

Surveys: are needed of the cacomistle and the white-nosed coati in Belize. It is possible that Belize may have the most stable populations of these species in Central America.

Habitat Protection: The forests of Belize are largely untouched by logging, with more than 70% of the land still forested. However, economic pressures are likely to conflict with conservation in the future. Since 1981, five national parks have been established and more are planned. Although it has not been reported that the cacomistle and coati occur in these parks, this seems highly likely. At present the situation as regards procyonid habitat in Belize does not give cause for concern. Nevertheless, given mounting economic pressures and the numbers of refugees living in the country, it would be wise to review this situation continually.

Captive Breeding: The Belize Zoo should become a participant in a program for both species.

Bhutan

Surveys: At present there is no information on the number of red pandas in Bhutan. Survey work is necessary and is currently underway to estimate the numbers of red pandas and the extent of appropriate habitat.

Habitat Protection: There are currently two protected areas in Bhutan and one proposed area. None of these areas list bamboo among the vegetation or red pandas among the mammals. These areas need to be surveyed for red pandas. The results will indicate whether other areas need to be protected specifically for red pandas.

Captive Breeding: There is currently a well established captive breeding program for this species in western zoos. In the future it will be desirable to expand this program into zoos in range states. However to date there appear to be no suitable zoos in Bhutan.

Bolivia

Surveys: are needed of the occurrence of Allen's olingo in Bolivia (where it is reported to be rare).

Habitat Protection: There are 13 national parks, 11 national reserves, 4 wildlife refuges, 2 regional parks, 5 forest reserves, and 2 permanent protected forests. However, many of these are outside of the range of the Allen's olingo, which is only found in the Amazonian region. The presence of procyonids is noted at the Beni Biological Station; kinkajous and coatis are noted although olingos probably also occur. Depending on the numbers of

olingos at Beni and their occurrence in other protected regions, it is difficult to establish whether protection is sufficient. Beni itself is under severe threat (colonization, poaching, grazing and tree felling) and an effort is needed to strengthen protection in this area.

Captive Breeding: There are four zoos in the country which could possibly be recruited to join in a captive-breeding program for olingos if required.

Brazil

Surveys: are required to ascertain the status and distribution of Pocock's olingo.

Habitat Protection: The range of the olingo group just stretches into the Amazonian basin region. It has not been determined whether Pocock's olingo occurs in any of the protected areas. Depending on the results of the surveys and of taxonomic studies it must be determined whether areas of its habitat need to be protected.

Research: The taxonomic status of the olingos in Brazil should be determined. According to the literature, Pocock's olingo occurs in this country, but it needs to be determined whether this is a valid species.

China

Surveys: At present these is no indication on the number of red pandas in China. However, some preliminary survey work is now being undertaken in some areas within the red panda's range. This work needs to be expanded to cover other areas of possible panda habitat.

Habitat Protection: The red panda benefits from the parks established to protect the giant panda in those areas where their ranges overlap. There may also be a need to create reserves to protect red pandas outside the areas where the giant panda occurs. The necessity for this will be clarified by the survey work. In addition, areas of suitable habitat between existing reserves need to be protected to establish corridors for gene flow between reserves.

Research: The strategy for the protection of red pandas is to some extent dependent on the subspecies question. Clearer indications are required as to whether one or more different subspecies occur. This is particularly true in the case of Chinese red pandas, which seem to be more variable in size and coloration than the pandas from Nepal.

Trade: A number of red pandas are being exported

WWF/Don Reid

Bamboo alive at head of Zhong Gang.

legally and illegally from China to zoos and animal dealers around the world. Some of these are being taken from mainstream zoos in China and are therefore being lost from breeding programs. A number of red pandas are also being smuggled into Taiwan. Better estimates and controls of this trade are needed, and the effect this has on the wild population needs to be evaluated. The desirability of transferring the red panda to Appendix I of CITES should be considered.

Captive Breeding: The red panda is one of the key species within China for which breeding centers and a breeding program are established. This work should continue to receive support.

Colombia

Surveys: Colombia is home to several procyonid species. Surveys are urgently required on the occurrence of the mountain coati and the bushy-tailed olingo.

Habitat Protection: There are a number of protected areas in Colombia, some within the areas where mountain coatis and olingos are presumed to occur. However, these species are not mentioned in protected area faunal lists. Therefore, the need for further habitat protection for procyonids can only be assessed on the results of survey work. Unfortunately, a number of the current protected areas are under threat due to colonization, narcotics cultivation and traffic, mining, hunting, logging, highway construction

and guerrilla combat. It is not known whether any of these activities influence procyonids but they probably do. However, habitat protection recommendations can only be made on the basis of further knowledge.

Research: One of the least known procyonid species, the mountain coati, is supposed to live in Colombia. Research is urgently needed into the habitat requirements of this species.

Captive Breeding: There are seven zoos in the country. Depending on the outcome of the survey work and research, it may be advisable to establish a captive nucleus of the mountain coati.

Costa Rica

Surveys: are needed of the occurrence of both Harris's and bushy-tailed olingos as well as the white-nosed coati and the cacomistle. Priority should be given to locating Harris's olingos beyond the only known site for the species.

Habitat Protection: Harris's olingo is reported to occur in a limited area around the source of the Rio Estrella and this area needs immediate protection. Habitat protection is also critical for the bushy-tailed olingo. Only 32% of Costa Rica is forested, though this is protected. Habitat protection is essential if the wild animals living in these forest refuges are to survive. Furthermore, there are plans to reforest some 1.8 million hectares. Half of this area will be commercial plantation and the other half an attempt to restore natural habitats. Areas of natural forest should be planted in such a way as to link the current forest refuges to allow migration of the animals between refugia.

Research: is needed to determine the taxonomic status of Harris's olingo; this is particularly urgent as the taxon purportedly has a very limited distribution. Research is also needed on the effects of deforestation on the viability of populations of olingos, cacomistles, and coatis living in forest refugia.

Captive Breeding: Possible facilities for captive breeding within country should be investigated.

Ecuador

Surveys: Ecuador is home to a number of procyonid species. Surveys are needed on the status and distribution of both the bushy tailed and Allen's olingo and, more urgently, on the mountain coati.

Habitat Protection: Ecuador has six national parks, three ecological reserves, one biological reserve, one geo-botanical reserve and two national recreation areas. It is unclear which of these protected areas hold which species of procyonids. The Yasuni National park may be home to the bushy-tailed olingo and the Sangay National Park may hold mountain coatis, but this is uncertain. The need for further habitat protection can only be evaluated on the basis of surveys conducted inside and outside the current protected areas and on the basis of taxonomic research. However, both the Yasuni and the Sangay National parks are currently under threat from land tenure, human colonization, poaching, mining, and timber extraction. If these areas do hold the rarer procyonids, protection needs to be strengthened.

Research: Two areas of research are important to the procyonids in Ecuador: firstly, taxonomic research on the two forms of olingo, as this will form the basis of any further conservation strategy; and secondly, ecological research of the requirements of the mountain coati.

El Salvador

Surveys: are required for the cacomistle and the white-nosed coati. Given the very severe habitat loss and environmental disturbance, it is uncertain where or in what numbers these species survive.

Habitat Protection: Virtually no undisturbed forest survives. There are four national parks, of which two are known to be very disturbed and only the Montecristo National Park is reported to have primary forest. The cacomistle is reported as occurring in this latter park, but this needs to be confirmed together with the occurrence of procyonid species in the other parks. If suitable populations of procyonids do not occur in these areas it will be important to create new reserves for these and other species.

Guadeloupe

Surveys: A survey is required to determine the distribution and status of the Guadeloupe raccoon. The occurrence of the raccoon in the Guadeloupe National Park needs to be established and an estimate of numbers is needed to see whether the park has a viable population.

Habitat Protection: There is a national park on the island which is said to include the Guadeloupe raccoon. It must be decided on the basis of the surveys and the taxonomic research whether this park is sufficient in size and whether the degree of protection offered is adequate for these raccoons.

Research: Research is needed to establish the taxonomic validity of the "species".

Captive Breeding: There is a zoo on the island which could possibly function as a center for captive breeding if required. The zoo claims (or claimed) to have this species in captivity.

Guatemala

Surveys: are required on the cacomistle and the white-nosed coati. Little is known of the status of threatened species in this country. Studies have been carried out in the past but recent deforestation has rendered some of the data obsolete.

Habitat Protection: Work is needed to reinforce habitat protection in this country. The government has made an initiative for a wildlands system but has insufficient resources to implement it. There are still substantial areas of forest in Guatemala (37%). There are 52 conservation areas, 26 of which have legal status, but many have no personnel. The Tikal National Park is reported as having the white-nosed coati as well as the common raccoon. However, some illegal hunting is known to occur within its boundaries. The Rio Dulce National Park is reported as having raccoons, but the presence of coatis or cacomistles is not indicated. However within this park there are small human settlements, deforestation, and nickel mining. The Pacaya Vulcano National Monument is known to have kinkajous, but there are people farming within the park boundaries. An effort is needed to reinforce the existing protected areas, and to review them and other potential protected areas for the occurrence of procyonids.

Captive Breeding: Guatemala has its own zoo which could function as a regional base for captive-breeding programs. However, investment in the zoo will be necessary to provide the necessary equipment and staff. Currently the Aurora National Zoo lacks sufficient space and material resources and does not have adequate programs for captive-breeding or reintroductions.

Guyana

Surveys: are needed to ascertain whether or not olingos occur in this country.

Habitat Protection: is probably not required for procyonids unless (Pocock's) olingo is found.

Honduras

Surveys: are required of the cacomistle and the white-nosed coati. In particular, we need to ascertain the occurrence of these species within the protected areas.

Habitat Protection: There are a number of protected areas in Honduras that are likely to include procyonids. However, procyonid species are rarely included in protected area species lists. Many reserves are inadequately protected. La Tigra has been encroached upon, Olancho suffers from large-scale colonization by local people, the Cusco National Park is used in some areas for slash and burn agriculture, while the Lake Yojoa multiple use area suffers from pesticide water pollution and settlement. The large Rio Platano Biosphere Reserve is suffering from illegal hunting and the felling of trees. Protection of the existing reserve areas needs to be strengthened and the need for other protected areas should be evaluated.

India

Surveys: At present there is no information on the number of red pandas living in India (Sikkim and Arunachal Pradesh, West Bengal). Survey work is necessary to estimate the numbers of red pandas and the extent of suitable habitat.

Habitat Protection: Red pandas are mentioned as part of the fauna in the national park in Sikkim and in one in Arunachal Pradesh. The forest department in Arunachal Pradesh has a policy of maintaining corridors of forest between protected areas. However, the value of the parks and the corridor policy to the red panda have yet to be established. Further survey work within the protected areas is needed to establish whether additional habitat protection is necessary.

Research: Clearer indications are required as to whether one or more different subspecies occur in India.

Captive Breeding: India has several zoological gardens that could participate in a captive breeding program, and encouragement should be given to expand the red panda breeding program to include these zoos.

Mexico

Surveys: are required of the cacomistle, the Tres Marias Islands raccoon, the Cozumel raccoon, the Cozumel coati, and the white-nosed coati.

Poglayen-Neuwall

View of rain forest north of Ocote, northwest of Tuxtla Gutierrez, Chiapas, elevation 700-1,800 m. Tree with hollow frequented by a cacomistle, *Bassariscus sumichrasti*.

Habitat Protection: There are a number of protected areas in Mexico, many of which could be inhabited by cacomistles and white-nosed coatis. The problem is that these areas are often isolated from each other, preventing dispersal of animals. This problem is particularly relevant for the white-nosed coati. The possibility of establishing habitat corridors needs to be examined. Depending on the results of the surveys and the taxonomic research, it may prove necessary to establish protected areas for the Cozumel raccoon and coati and the Tres Marias Islands raccoon.

Research: The need to establish the taxonomic status of the various island forms has already been discussed.

Captive Breeding: There are a number of zoos in Mexico, so the possibility of establishing in-country breeding programs is considerable. In the case of the island forms, on-site captive breeding centers should probably be established.

Myanmar (Burma)

Surveys: At present these is no indication on the number of red pandas in Myanmar. Survey work is necessary to estimate the numbers of red pandas and the extent of appropriate habitat.

Habitat Protection: There are no protected areas in the Himalayan region of this country. Establishing adequate protected areas in red panda habitat is a very high priority. The location of such parks would depend in part on the results of the survey work.

Research: Clearer indications are required as to whether one or more different subspecies occur in Myanmar.

Captive Breeding: There is currently a well-established captive breeding program for this species in western zoos. In the future it will be desirable to expand this program into zoos in range states. However, to date there appear to be no suitable zoos in Myanmar.

Nepal

Surveys: Some survey work has been undertaken in the Langtang National Park. This work is currently being expanded to cover the rest of Nepal, since we have no reliable information on the number of red pandas living in the country nor on the availability of suitable habitat.

Habitat Protection: Red pandas are reported as occurring in some of the country's protected areas. However, areas conserved for red pandas should not be accessible to yaks and dogs. The establishment and maintenance of forest corridors between these protected areas is essential to allow for gene flow between reserves. (Otherwise the small populations of red pandas within areas such as Langtang could be lost due to inbreeding or demographic stochasticity).

Research: The subspecific identity of Nepalese red pandas needs to be ascertained (it is possible that these animals represent the rarest form of the species).

Captive Breeding: In the future it will be desirable to expand the red panda breeding program into zoos in Nepal should suitable facilities become available.

Nicaragua

Surveys: are required of the cacomistle, bushy-tailed olingo, and the white-nosed coati.

Habitat Protection: Increased protection of procyonid habitat is desirable. There is only one significant protected area in the country, the Saslaya National Park. Procyonids have not been specifically reported as occurring in this park and in addition, the degree of protection afforded is limited (threats include encroachment by farmers plus the park being in close proximity to the Pan American Highway).

Panama

Surveys: are required of the cacomistle, bushy-tailed olingo, the Chiriqui olingo, and the white-nosed coati. Priority should be given to locating the Chiriqui olingo beyond the only known site for the species.

Habitat Protection: The Chiriqui olingo is reported to occur in a limited area between the Rio Chiriquí Viejo and the Rio Colorado, and this area needs immediate protection. Habitat protection is also critical for the bushy-tailed olingo.

There are three existing parks and one proposed park in Panama. Of these, only the proposed park, the Baru Volcano National Park, lists kinkajous and coatis among its inhabitants. The other three parks do not list any procyonids and two of them do not seem well protected. The Soberania National Park has been encroached upon by local people and illegal hunters, and is subject to slash-and-burn agriculture. The Portobelo National Park has 5,000 people living within its boundaries who are both

farming the land and hunting. The third park, Darien, is positioned around the only gap in the Pan American Highway; if this gap is to be breached then the park must be bisected. An effort should be made to support the Baru Volcano National Park and ensure it has adequate protection as it contains coatis and kinkajous. Olingos may be present as these often associate with kinkajous. Protection of the other three parks should be reinforced especially if they are found to contain procyonids.

Research: Research is needed to determine the taxonomic status of the Chiriqui olingo. This is particularly urgent as this taxon purportedly has a very limited distribution. Research is also needed to evaluate the impact of the possible completion of the Pan American Highway on the fauna of the Darien National Park.

Captive Breeding: Depending on the results of the taxonomic review of the status of the Chiriqui olingo and of the surveys regarding its status in the wild, it may be necessary to establish a suitable facility for breeding these animals in Panama.

Peru

Surveys: are needed on the status and distribution of both Allen's olingo and the mountain coati. Some sources indicate that the bushy-tailed olingo may also occur, and surveys are required to confirm this.

Habitat Protection: There are a number of parks and protected areas in the country, many in regions suitable for the rarer procyonids. However, they are not generally included in park faunal lists. The occurrence in parts of the country of civil strife, human migrations, and cocaine production results in heavy pressure on the forests leading to unsustainable use of natural resources. At least 14 of the existing protected areas are under pressure from illegal timber extraction, poaching, cattle grazing and human colonization. The status of procyonids in the various protected areas needs to be established and, if necessary, new protected areas should be established. For the procyonids, particularly the mountain coati, protection needs to be strengthened in the parks where they occur.

Research: Two areas of research are important for the procyonids in Peru: firstly, taxonomic research into the two forms of olingo (as this will form the basis of any further conservation strategy); and secondly, ecological research into the mountain coati.

Trade: Kinkajou fur has been exported in the past. The status of this trade is currently unknown, but given the confusion that often occurs between kinkajous and olingos, it is important that this trade be evaluated on the basis of its effect on olingo numbers.

Captive Breeding: There are two zoos in the country that could be used in a captive breeding program should one be required for either the mountain coati or the olingos.

United States

Surveys: are needed of the occurrence of the white-nosed coati.

Habitat Protection: Habitat protection and regulation of hunting and accidental trapping may need to be considered, depending on the results of the survey and research work.

Research: needs to be conducted into the viability of the coati population.

Venezuela

Surveys: Venezuela is home to several procyonid species. Of these, surveys are required of the mountain coati and Allen's and Pocock's olingos.

Habitat Protection: There are many protected areas in the country. The occurrence of the rarer species of procyonid in these areas is not recorded. Also a number of the existing protected areas are under pressure from poaching, agriculture, illegal mining, cattle-ranching, and pressure from tourism. It is not possible to evaluate further conservation requirements until the status of the key species has been clarified.

Research: Two areas of research are important for the procyonids in Venezuela: firstly, taxonomic research on the two endemic forms of olingo (as this will form the basis of any further conservation strategy); and secondly, ecological research on the requirements of the mountain coati.

Captive Breeding: There are several zoos in the country and a national association of zoological gardens is interested in captive-breeding and reintroduction of native fauna. This organization could be used to coordinate any captive breeding efforts deemed necessary on the basis of survey and other work.

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Appendix 1

Distribution Maps

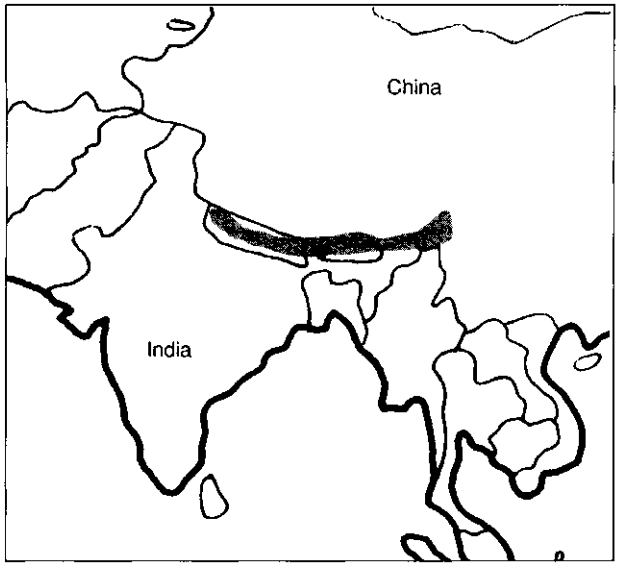

Figure 1. Distribution of the red or lesser panda (*Ailurus fulgens*).

Figure 2. Distribution of bushy-tailed olingo (*Bassaricyon gabbii*).

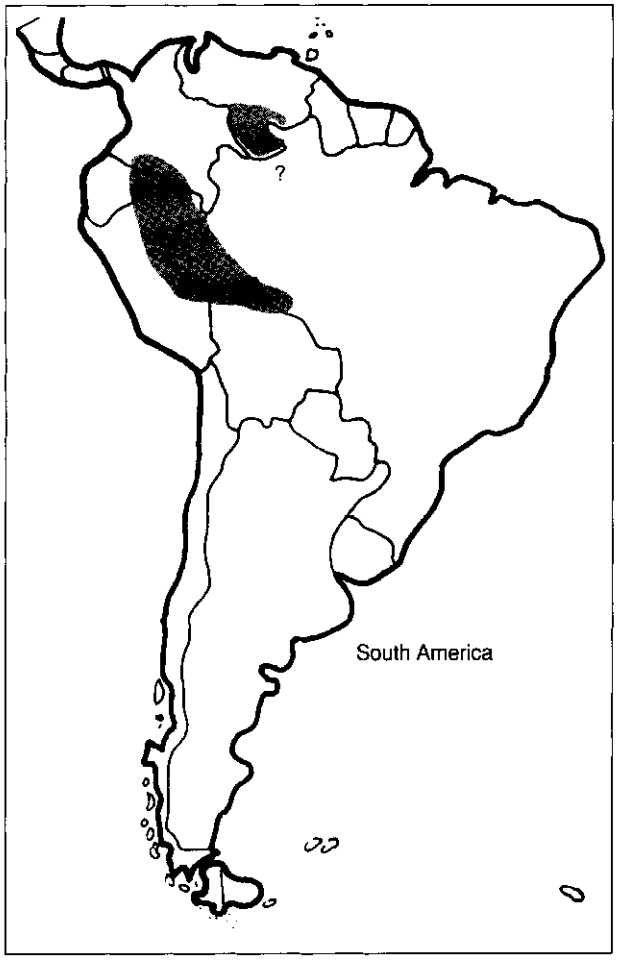

Figure 3. Distribution of Allen's olingo (*Bassaricyon alleni*).

Figure 4. Distribution of Pocock's olingo (*Bassaricyon beddardi*).

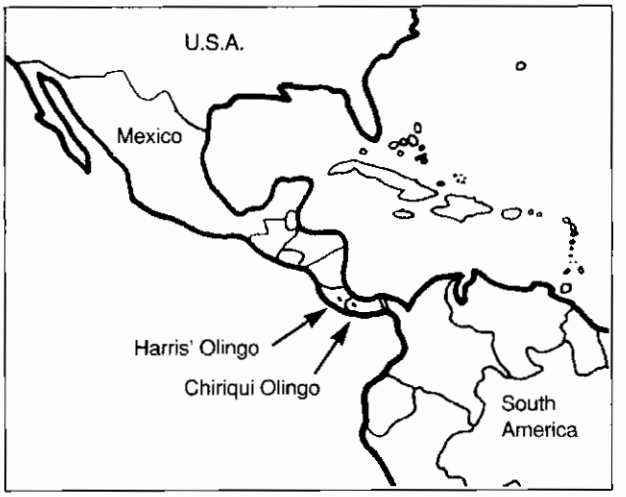

Figure 5. Distribution of Harris' olingo (*Bassaricyon lasius*) and the Chiriqui olingo (*Bassaricyon pauli*).

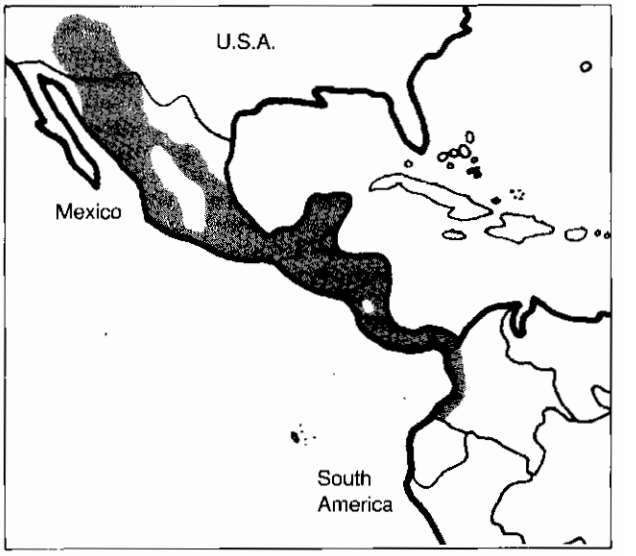

Figure 7. Distribution of the white-nosed coati (*Nasua narica*).

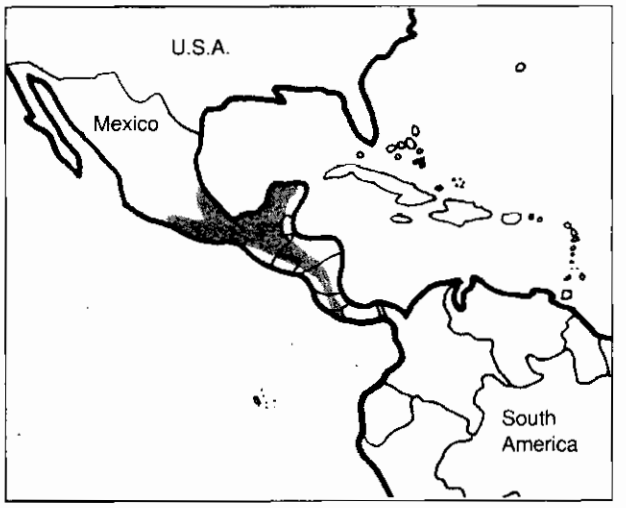

Figure 6. Distribution of the cacomistle (*Bassariscus sumichrasti*).

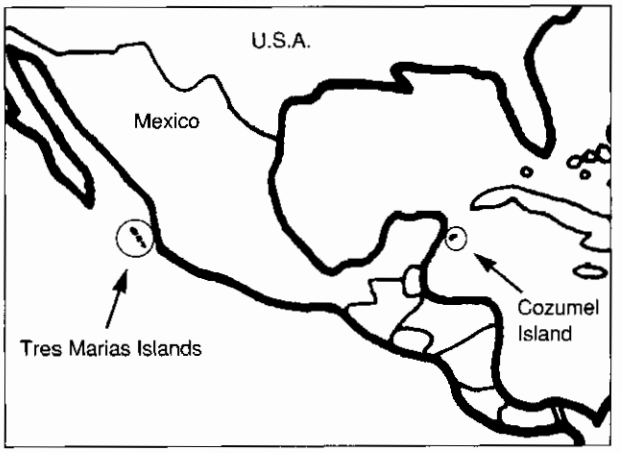

Figure 8. Distribution of the Cozumel Island raccoon (*Procyon pygmaeus*) and coati (*Nasua nelsoni*) and the Tres Marias Island raccoon (*Procyon insularis*).

Figure 9. Distribution of the Mountain coati (*Nasuella olivacea*).

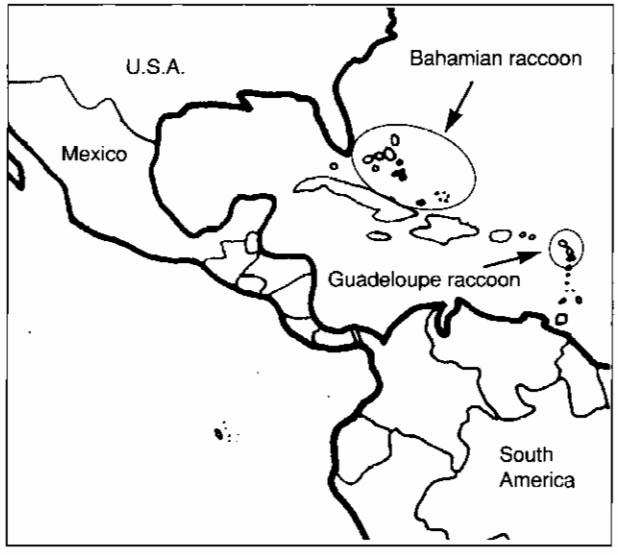

Figure 10. Distribution of the Bahamian raccoon (*Procyon maynardi*) and the Guadeloupe raccoon (*Procyon minor*).

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