



Jaguar, CBWS (WCS)

**Fauna**

**Cockscomb Basin Wildlife Sanctuary**

**2004**

## 2.3 Fauna

### Introduction

Surprisingly little baseline research is available on the fauna for such a prestigious and high profile reserve. Since the Sanctuary's creation in 1986, the bulk of research effort has been focussed on a small number of keystone species - such as the jaguar and black howler monkey – with no comprehensive baseline species surveys of even the vertebrate groups. Virtually all faunal studies have been undertaken within just a few kilometres of the Sanctuary headquarters, the principle exception being the ongoing camera-trap based research on jaguars. The fauna of the upper elevations, and the more remote areas of East Basin, most of West Basin and of the Maya Mountain extension therefore remain almost unstudied.

Box 13: Vertebrate species breakdown for Cockscomb		
Vertebrate Group	No. Species (CBWS)	No. Species (Belize)
Mammals	96	163
Birds	323	574
Reptiles	53	121
Amphibians	26	40
Freshwater Fish	19	119
<b>References:</b>		
Mammals - Jacobs and Casteneda, 1998		
Birds - Jones and Vallely, 2001		
Reptiles and Amphibians – Paul Walker, 2004; Lee, 2000		
Fish – Greenfield and Thonmerson, 1997		

Despite the limitations of the baseline surveys to date, it is clear that Cockscomb is home to a very significant percentage of the species found in Belize. Over 58% of Belize's mammals, 56% of its birds and 69% of its amphibians have been recorded as present in Cockscomb to date. So far only 42% of Belize's non-marine reptiles have been recorded in the Sanctuary, but this is more an indication of the paucity of data on the snakes of CBWS – once a comprehensive survey has been undertaken, this figure is likely to increase to around 65%.

Fish are another taxon that has received very little attention in Cockscomb. Only 19 species have been recorded to date, though as the upland areas of the

Maya Mountains are recognized as not being species-rich in fish, it is unlikely that this total will increase very significantly in response to further surveys in the way predicted for the snakes.

Of the invertebrates, lepidoptera and odonata are really the only taxa to have received any attention in CBWS. Whilst baseline species lists have been compiled, these are very far from being comprehensive. Higher elevations, and more remote regions of Cockscomb have barely been sampled – and at least for lepidoptera, these are the areas most likely to harbour specialist species with limited distributions in Belize.

Despite the considerable spatial limitations of faunal surveys within Cockscomb and the absence of widespread species surveys across the 'major' taxa, it can be concluded that CBWS harbours a very significant percentage of the species found in Belize. With reportedly very high hunting pressure on game species throughout the adjacent forest reserves (and reportedly seriously depleted game populations and unknown impacts on the faunal communities as a whole), even with the current level of hunting in Cockscomb the Sanctuary remains a critical stronghold for many species – amongst a mosaic of 'paper parks'.

**2.3.1 Mammals of Cockscomb**

With its forested river valleys and rugged landscapes, Cockscomb Basin Wildlife Sanctuary is home to a wide variety of mammal species typical of tropical moist broadleaf forest – of the 163 species recorded within Belize (Jacobs et. al. 1998), and that could therefore potentially be found in the protected area, 96 have been recorded during various surveys conducted in the area over the last 20 years (Table 24).

**Box 14:  
Mammal Species of CBWS of International Concern**

**Endangered:**

Yucatan Black Howler *Alouatta pigra*  
Baird’s Tapir *Tapirus bairdii*

**Vulnerable**

Ghost-faced Bat *Mormoops megaphylla\**  
Shaggy Bat *Centronycteris centralis\**  
Van Gelder’s Bat *Bauerus dubiaquercus\**  
Woolly Opossum *Caluromys derbianus*

**Lower Risk/ Near Threatened**

Cacomistle *Bassiriscus sumichrasti*  
Jaguar *Panthera onca*  
Puma *Puma concolor*  
Underwood’s Mastiff Bat *Eumops underwoodi*  
Water Opossum *Chironectes minimus*

**Data Deficient**

Neotropical River Otter *Lontra longicaudis*  
Red Brocket *Mazama americana*

*IUCN Red List, 2004*

\*Highlighted by IUCN Chiroptera Specialist Group

Survey techniques used within these past studies have included radio tracking of small and large cats (Rabinowitz and Nottingham, 1986), small mammal trapping of rodents and opossums (Kamstra, 1987; Rabinowitz and Nottingham, 1989; Silver et. al. 2001; Foster pers. com., 2004), camera trapping (Silver et. al. 2001; Harmsen, pers. com., 2004), observational records (particularly in black howler monkey studies - Crozier, 1995; Silver, 1997; Ostro, 1998; Ostro et. al. 1999), acoustic monitoring of bat calls (Miller and Miller, 1999) and mist netting of both bats and birds (Kamstra, 1987; Silver et. al., 2001).

Of those recorded within Cockscomb, two species – the Baird’s tapir and reintroduced Yucatan black howler – are considered ‘endangered’ under IUCN classification, whilst four species (three bats and the woolly Opossum) are classified as ‘vulnerable’. Other species of concern include the two largest wild cats (the jaguar and puma), as well as the rarely seen cacomistle. There are also two species considered to be potentially at risk, but for which there is insufficient data on abundance and / or distribution to allow an assessment of its viability – the Neotropical river otter and red brocket deer (Box 14).

**Table 23: Species of Concern in CBWS**

Order	No. Species	Meso-American or Yucatan Endemics	IUCN Red listed
Didelphimorpha	7		2
Chiroptera	47		4
Edentata	3		
Primates	2	1	1
Insectivora	1		
Rodentia	16	4	
Carnivora	15	1	4
Artiodactyla	4		1
Perissodactyla	1		1
<b>Total in CBWS</b>	<b>96</b>	<b>6</b>	<b>13</b>
<b>Total in Belize</b>	<b>163</b>	<b>8</b>	<b>20</b>

Also within Cockscomb are a number of species endemic to the Mesoamerican or Yucatan region – the black howler, Yucatan squirrel, big-eared climbing rat and vesper rat being examples. Other species are highlighted because of their ever-dwindling populations in Central America, as hunting pressure increases and the necessary forested habitat decreases - species such as white-lipped peccary, collared peccary and Baird’s tapir (Table 23).

Seven of the eight species of opossum present in Belize have been recorded within CBWS. The distribution map for the eighth, Alston’s

mouse opossum, suggests that it may also occur in the area, but being highly arboreal, and more insectivorous than the other species, it may be missed in short-term trapping sessions. It has been recorded to the south in the past, within both the Bladen Nature Reserve and Columbia River Forest Reserves (Iremonger and Sayre, 1994).

Of the 96 mammal species present within Cockscomb, the largest order is that of the bats (Chiroptera - 47 species - just under 49% of mammal species listed for the area) - recorded through a series of surveys by Rabinowitz and Nottingham (1989),

Kamstra and McCarthy (in Emmons et al. 1996), Miller and Miller (1999), and Silver et. al. (2001). Survey techniques over the years have included mist netting, harp traps, and through analysis and identification of calls using the acoustic monitoring Anabat II system. Cockscomb Basin Wildlife Sanctuary is thought to be one of the highest species rich areas in Belize in terms of bats, ranking above Rio Bravo, Gallon Jug and Caracol, and is currently the only known location within the Country for Spix's disc-winged bat, *Thyroptera tricolor* (Miller and Miller, 1999).

Three species of Edentata have been identified from the protected area – northern tamandua, silky anteater and the nine-banded armadillo. Whilst the tamandua and armadillo are relatively frequently observed during nocturnal transects, confirmed records of the silky anteater are absent from the literature. However, a dead specimen was recorded within CBWS in 2001/2002, and identification was confirmed (E Saqui, pers. comm.).

Of the smaller, non-volant mammals, a single species of shrew – the least shrew (*Cryptotis parva*) - and 16 species of rodent have been recorded during the WCS small mammal surveying in 1989/2001 (Silver, 2001). This offered confirmation of species from original trapping reports by Rabinowitz and Nottingham (1989), and comparisons between the two data sets suggest that small mammal densities within the East Basin have remained relatively constant (Silver, 2001). These small mammals form an important prey base for Neotropical carnivores, and it would appear that densities are sufficient to support a healthy predator population, particularly of the smaller felids such as the margay and ocelot. In common with other Neotropical sites, there appear to be three locally common rodent species, and a number of less common species. The spiny pocket mouse (*Heteromys desmarestianus*) and two species of climbing rat made up 67% of the species recorded by Rabinowitz and Nottingham in 1989, a pattern supported by data from comparative studies being carried out today, at the same time of the year, though there does appear to be seasonal variation in species proportions trapped (Foster, pers. comm., 2004).

The larger rodents – paca and agouti – are also important prey species for the larger cats (particularly jaguar), and are thought to have increased in numbers since the protection of the area from hunting – at least within the more active East Basin, around the headquarters and trail system. Within the Juan Branch and Trio area, however, hunting pressure both for home consumption and commercial use is thought to have reduced local populations of these species. The Mexican hairy porcupine is also present, but has only been observed infrequently. One species found to be missing in the more recent study, though reported by Rabinowitz and Nottingham in 1989, is the brown rat (*Rattus rattus*), a human commensal. This probably corresponds to the reduction in human activities, both residential and agricultural, in the protected area.

The five cat species present in Belize have all been recorded within the Cockscomb Basin, through both direct sightings and camera trapping. All are relatively difficult to observe, as they are generally nocturnal and elusive, and go to great lengths to avoid contact with humans. Ocelots and margay are both present, though the ocelot appears to be the more abundant. Whether this is an accurate representation, or whether the margay, being more arboreal and reclusive is just harder to observe, is unknown. In the past, both were heavily hunted for their pelts, but numbers are now thought to be recovering, especially within protected areas such as Cockscomb.

Since the protection of the Cockscomb area, sightings of jaguar in particular have become much more frequent. It is thought that jaguar and puma inhabit slightly



different terrain, jaguars preferring the wetter forest areas, in the river valleys, whilst puma are observed more frequently in the drier, pine savanna areas. Whether this is a product of habitat preference or active competition for resources, with the jaguar being the more successful, is unknown.

Jaguars are believed to be abundant within the protected area, with as many as 50 to 60 individuals assumed to be present, following assessment of data collected during camera trapping (Harmsen pers. comm.). Within Cockscomb, they are thought to prefer the lower slopes and valleys, where there is good forest cover, prey species are abundant, and water is easily available. Radio tracking in the mid 1980's provided much data on the life habits of this primarily nocturnal carnivore. The average male territory is thought to be between 25 and 38km<sup>2</sup> – about twice that of the female, with male ranges often overlapping each other (Rabinowitz and Nottingham, 1986). This is further confirmed through more recent camera trapping studies, which show several male jaguars passing a single trapping location (Harmsen, pers. comm.).

Studies by Rabinowitz and Nottingham suggested that jaguar take armadillo in preference, this species accounting for 53% of prey items identified in scats at the time of the study. Remains of paca and anteater were also identified, as were red brocket deer and agouti. Recent observations suggest that there is less evidence of armadillo, with mostly peccary, coati, and brocket deer as the prey base. There are also signs of iguana as an occasional prey item (Harmsen, pers. comm.).

Within the Cockscomb area, camera trap images show that the jaguar populations appear healthy, and reports suggest that there is little conflict between the resident jaguar populations, large cattle farmers, and buffer communities. However, jaguars outside of the protected area are coming into conflict with local communities, targeting livestock such as cattle, pigs, chickens and dogs. Investigations into these attacks indicate that many of the animals responsible are old, injured or sub-adult, and are thought to have been pushed into more marginal habitats by human encroachment of the coastal plain, and by competition from more healthy individuals. (Rabinowitz, 1986; E. Saqui, pers. comm., B. Harmsen, pers. comm.). This is not, however, true in all cases, with more than one healthy adult jaguar being shot in one of the buffer communities in 2003 following depredation problems, and similar reports of healthy animals causing problems near Crooked Tree. Since the passing of an ordinance in 1972 limiting trade in hides, and the initiation of the Wildlife Protection Act in 1981, there have been no reports of trade in jaguar skins, or the pelts of any others of the wild cats (E. Saqui, pers. comm., 2003).

Of the non-Felidae Carnivora present in Cockscomb, the grey fox (*Urocyon cinereoargenteus*) is the most frequently observed, with habituated individuals foraging around the campsite and accommodation areas. Cacomistle have been observed infrequently in Belize, with literature reports of only one sighting of two individuals from Cockscomb – Kamstra (1987) observed two vocalising adults in tall forest on the south slope of the Cockscomb range. Silver (2001) included this species on his list, though notes that neither he nor his associates have recorded it personally, nor are there any authenticated records during the past five years. It was recorded from the more southerly Columbia Forest Reserve during the Conservation International rapid assessment of the area (Parker et. al., 1993), where it was noted as having a very patchy distribution. This species appears to be uncommon throughout its range, and its patchy distribution is leading to declining numbers with increased deforestation. The presence of a similarly scarce species, the grison (*Galictis vittata*) has recently been reconfirmed during the 2000 field season (Silver, 2001). With medium-sized mammals such as these that are so hard

to observe, population numbers and densities remain unknown, and it has to be assumed that protection of sufficient area and habitat to ensure viable populations of key species such as the jaguar will also ensure the survival of these lesser known species.

White-nosed coati, raccoon and kinkajou are all present, though coati numbers in particular appear to be surprisingly low in comparison with some other areas such as Fireburn, in the north east of the country. This apparent low density was also noted in the Bladen area, where the 1987 research team remarked on the lack of observations of this species (Brokaw and Lloyd-Evans, 1987). It was later recorded during the TNC rapid ecological assessment of Bladen in 1994 (Iremonger and Sayer, 1994). Raccoon surprisingly doesn't occur on the Cockscomb species list, though recent camera trapping results have confirmed its presence within the Sanctuary, on two streams on the Victoria Peak trail past 14km, and on the trail to Mitchell Creek (Foster, pers comm.). Kinkajou are seen relatively frequently at night along the trail systems around Quam Bank.

The Mustelidae are well represented within the area, with two species of skunk recorded – the spotted and the hog-nosed skunks – the distinctive tayra, and the Neotropical river otter. The spotted skunk was originally listed by Rabinowitz and Nottingham from successional scrub, but has not been recorded since that time, either by Kamstra or by Silver. However, local staff confirm its presence, though it is unclear whether this is within the protected area or on the access road, closer to Maya Centre (Harmsen, pers. comm.) As much of the successional scrub habitat it prefers has regenerated into secondary forest, and there are no longer agricultural areas or smallholdings within the area, its continued presence within Cockscomb may need to be confirmed. The hog-nosed skunk, however, appears to be relatively abundant.

Tayra and the Neotropical river otter are seen relatively frequently within the East Basin, and two otters were observed in the Mares Nest Branch area of West Basin (Walker, 1990, pers. obs.). They have also been recorded from the more southerly Bladen Nature Reserve (Brokaw and Lloyd-Evans, 1987), suggesting that they should be present within the Maya Mountain Extension.

Both black howler monkeys and spider monkeys are reported to be present within the protected area. Spider monkeys are repeatedly reported as present in the more remote western and southwestern reaches of the Sanctuary by wardens and guides over the last 10 years (Silver, 2001), and have been reported from the adjacent Bladen Nature Reserve (Brokaw and Lloyd-Evans, 1987; Iremonger and Sayre, 1994).

Black howler monkeys, endemic to a small area of the Yucatan Peninsula, Belize and the Peten, were decimated by a yellow fever epidemic in 1956/1957 that swept through the *Alouatta* population throughout most of Belize. Within Cockscomb, this was compounded by the effects of Hurricane Hattie in 1961, and by local hunting pressure, and the local population is thought to have been hunted to the point of local extinction within what is now the protected area, only a few years prior to its establishment in 1986. No howler monkeys are thought to have inhabited the area since 1978 (Horwich et al 1993), and though Rabinowitz and Nottingham include the species within their mammal records for Cockscomb (Kamstra, 1987), neither they nor Kamstra saw signs of them. Kamstra noted that a resident troop was known to have lived adjacent to Quam Bank between 1978 and 1980, but were hunted by people from the logging camp, presumably to the point of local extirpation. The topography of Cockscomb, with its protective mountain ranges on

three sides and citrus farms on the fourth, made it unlikely that howler monkeys would return to the area on their own.

A successful reintroduction programme began in 1992, aimed at repopulating Cockscomb Basin with black howler monkeys from the healthy population of the Community Baboon Sanctuary, 135km north of Cockscomb. Strict guidelines have been developed when investigating the possibilities of species translocation – to decentralize a population, to increase biodiversity, to prevent decimation by disease, and for the benefit of the specific animal (Hawthorn, 1961). The translocation programme of black howler monkeys to Cockscomb fulfilled these criteria, reducing the overall vulnerability of the species to disease and other impacts. Over a three-year period (1992 – 1994), 14 howler monkey troops were translocated to Cockscomb – a total of 62 individual howlers.

Monitoring in subsequent years has shown that the translocation has been successful, with *Alouatta* firmly established within much of the Cockscomb Basin. Not all of the original released individuals have been relocated, however, and at least one is known to have been shot near San Roman, suggesting that there still needs to be greater public awareness within the buffer communities of the vulnerability of this species and the need to protect it. Young have been born to the introduced troops, and troop numbers have been fluid, not necessarily staying constant, but with individuals moving between groups or forming new groups. The population within the Sanctuary is now thought to number over 100 individuals (Salas, pers. comm.).

Large game species recorded within the protected area include the two deer species – white-tailed deer and red brocket. Interestingly, whilst white-tailed deer have been recorded previously (Kamstra, 1987), they have never appeared on camera trap films (Harmsen, pers. comm.) and there is a question as to whether they do still actually occur within Cockscomb Basin, with much of their preferred open habitat regenerating to forest. If they do, they are likely to be recorded from the more open pine forest areas such as Cabbage Haul. The red brocket, however, is frequently seen on the forest trails around the Cockscomb HQ, and appears to have become semi-habituated, moving slowly off the tracks when seen rather than fleeing rapidly.

Both collared and white-lipped peccary populations within Cockscomb are relatively healthy, though persistent hunting pressure throughout East and West Basin is putting pressure on species abundance, as is true of all other game species Staff patrols report hunting trails throughout much of the protected area, and routinely find twenty five to thirty fresh cartridges per patrol (Cockscomb Staff, pers. comm., 2003)). Local reports suggest that game species populations are declining in the East and West Basin, particularly around the Snooks Eddy and Juan Branch areas (E. Saqui, F. Tush pers. comm.), and there are reports of even more serious hunting incursions in the Maya Mountain Extension, originating from Trio and Bladen villages. Unless action is taken to prevent such activities, these species could soon start declining significantly within the area.

Baird's tapir is the largest herbivore present in the Cockscomb Basin, and is associated with the riverine areas, where this large herbivore grazes on the herbaceous vegetation. It is shy, and seen infrequently, though tracks can be commonly found. Listed as an endangered species on the IUCN Red List, this species is generally thought to be common and widespread throughout Belize, and is seldom hunted for its meat. However, it is threatened by increasing destruction of its habitat, and in most areas, numbers are thought to be decreasing as they get pushed back into marginal habitats. The protection of significant tracts of riparian

vegetation and other suitable habitats for tapir within Cockscomb is therefore a significant contribution in the preservation of this species.

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**Table 24: Mammals of Cockscomb Basin Wildlife Sanctuary**

Common Name	Scientific Name	Status
<b>Didelphimorphia</b>		
<b>Didelphidae</b>		
Common Opossum	<i>Didelphis marsupialis</i>	
Virginia Opossum	<i>Didelphis virginiana</i>	
Grey Four-eyed Opossum	<i>Philander opossum</i>	1
Water Opossum	<i>Chironectes minimus</i>	1, 2(Lr)
Mexican Mouse Opossum	<i>Marmosa mexicana</i>	
Robinson's Mouse Opossum	<i>Marmosa robinsoni</i>	
Woolly Opossum	<i>Caluromys derbianus</i>	2(V)
<b>Edentata</b>		
<b>Myrmecophagidae</b>		
Northern Tamandua	<i>Tamandua mexicana</i>	1
Silky Anteater	<i>Cyclopes didactylus</i>	
<b>Dasypodidae</b>		
Nine-banded Armadillo	<i>Dasypus novemcinctus</i>	1
<b>Insectivora</b>		
<b>Soricidae</b>		
Least Shrew	<i>Cryptotis parva</i>	
<b>Chiroptera</b>		
<b>Emballonuridae</b>		
Proboscis Bat	<i>Rhynchonycteris naso</i>	
Greater White-lined Bat	<i>Saccopteryx bilineata</i>	
Lesser White-lined Bat	<i>Saccopteryx leptura</i>	
Shaggy Bat	<i>Centronycteris centralis</i>	1, 2(V)
Lesser Dog-like Bat	<i>Peropteryx macrotis</i>	1
Greater Dog-like Bat	<i>Peropteryx kappleri</i>	
Northern Ghost Bat	<i>Diclidurus albus</i>	
<b>Noctilionidae</b>		
Greater Fishing Bat	<i>Noctilio leporinus</i>	
<b>Mormoopidae</b>		
Ghost-faced Bat	<i>Mormoops megalophylla</i>	2(V)
Common Mustached Bat	<i>Pteronotus pamellii</i>	
Lesser Mustached Bat	<i>Pteronotus personatus</i>	
Davy's Naked-backed Bat	<i>Pteronotus davyi</i>	
<b>Phyllostomidae</b>		
Common Big-eared Bat	<i>Micronycteris microtis</i>	
Schmidt's Big-eared Bat	<i>Micronycteris schmidtorum</i>	
Common Sword-nosed Bat	<i>Lonchorhina aurita</i>	1
Pale Spear-nosed Bat	<i>Phyllostoma discolor</i>	
Fringe-lipped Bat	<i>Trachops cirrhosus</i>	
Woolly False Vampire Bat	<i>Chrotopterus auritus</i>	
<b>Status:</b>		
1. <b>Species of Concern (Rare or Hunted throughout range):</b> NARMAP (1995), citing Emmons, 1990)		
2. <b>IUCN listing:</b> Lr/Nt (Lower risk, Near threatened), V (Vulnerable), E (Endangered), DD (Data deficient). IUCN Red List of threatened species (2004)		
3. <b>CITES listed</b>		

Common Name	Scientific Name	
<b>Chiroptera (cont.)</b>		
<b>Phyllostomidae (cont.)</b>		
Common Long-tongued Bat	<i>Glossophaga soricina</i>	
Brown Long-tongued Bat	<i>Glossophaga commissarisi</i>	
Silky Short-tailed Bat	<i>Carollia brevicauda</i>	
Seba's Short-tailed Bat	<i>Carollia perspicillata</i>	
Little Yellow-shouldered Bat	<i>Sturnira lilium</i>	
Great Fruit-eating Bat	<i>Artibeus lituratus</i>	
Intermediate Fruit-eating Bat	<i>Artibeus intermedius</i>	
Jamaican Fruit-eating Bat	<i>Artibeus jamaicensis</i>	
Toltec Fruit-eating Bat	<i>Artibeus toltecus</i>	
Pygmy Fruit-eating Bat	<i>Artibeus phaeotis</i>	
Thomas' Fruit-eating Bat	<i>Artibeus watsoni</i>	
Common Tent-making Bat	<i>Uroderma bilobatum</i>	
Heller's Broad-nosed Bat	<i>Platyrrhinus helleri</i>	
Little Yellow-eared Bat	<i>Vampyressa pusilla</i>	
Common Vampire Bat	<i>Desmodus rotundus</i>	
<b>Natalidae</b>		
Mexican Funnel-eared Bat	<i>Natalus stramineus</i>	
<b>Thyropteridae</b>		
Spix's Disc-winged Bat	<i>Thyroptera tricolor</i>	
<b>Vespertilionidae</b>		
Hairy-legged Myotis	<i>Myotis keaysi</i>	
Argentine Brown Bat	<i>Eptesicus furinalis</i>	
Van Gelder's Bat	<i>Bauerus dubiaquercus</i>	2(V)
Western Red Bat	<i>Lasiurus blossevillii</i>	
Southern Yellow Bat	<i>Lasiurus ega</i>	
<b>Molossidae</b>		
Broad-eared Bat	<i>Nyctinomops laticaudatus</i>	
Black Bonneted Bat	<i>Eumops auripendulus</i>	1
Underwood's Mastiff Bat	<i>Eumops underwoodi</i>	1, 2(Lr)
Greenhall's Dog-faced Bat	<i>Cynomops greenhalli</i>	
Black Mastiff Bat	<i>Molossus rufus</i>	
Sinaloan Mastiff Bat	<i>Molossus sinaloae</i>	
Little Mastiff Bat	<i>Molossus molossus</i>	
<b>Primates</b>		
<b>Cebidae</b>		
Yucatan Black Howler	<i>Alouatta pigra</i>	1, 2(E), 3
Central American Spider Monkey	<i>Ateles geoffroyi</i>	1
<b>Status:</b>		
1. <b>Species of Concern (Rare or Hunted throughout range):</b> NARMAP (1995), citing Emmons, 1990)		
2. <b>IUCN listing:</b> Lr/Nt (Lower risk, Near threatened), V (Vulnerable), E (Endangered), DD (Data deficient). IUCN Red List of threatened species (2004)		

Common Name	Scientific Name	
<b>Rodentia</b>		
<b>Sciuridae</b>		
Yucatan Squirrel	<i>Sciurus yucatanensis</i>	
Deppe's Squirrel	<i>Sciurus deppei</i>	1
<b>Goemyidae</b>		
Hispid Pocket Gopher	<i>Orthogeomys hispidus</i>	
<b>Heteromyidae</b>		
Forest Spiny Pocket Mouse	<i>Heteromys desmarestianus</i>	
<b>Muridae</b>		
Coues' Rice Rat	<i>Oryzomys couesi</i>	
Alfaro's Rice Rat	<i>Oryzomys alfaro</i>	
Rusty Rice Rat	<i>Oryzomys rostratus</i>	
Hispid Cotton Rat	<i>Sigmodon hispidus</i>	
Northern Climbing Rat	<i>Tylomys nudicaudis</i>	
<b>Muridae</b>		
Big-eared Climbing Rat	<i>Ototylomys phyllotis</i>	
Vesper Rat	<i>Nyctomys sumichrasti</i>	
Slender Harvest Mouse	<i>Reithrodontomys gracilius</i>	
Brown Rat / Roof Rat	<i>Rattus rattus</i>	Possibly no longer present
<b>Erethizontidae</b>		
Mexican Porcupine	<i>Coendou mexicanus</i>	1
<b>Dasyproctidae</b>		
Central American Agouti	<i>Dasyprocta punctata</i>	1
<b>Agoutidae</b>		
Paca	<i>Agouti paca</i>	1
<b>Carnivora</b>		
<b>Canidae</b>		
Grey Fox	<i>Urocyon cinereoargenteus</i>	
<b>Procyonidae</b>		
Cacomistle	<i>Bassariscus sumichrasti</i>	2(Lr/Nt)
Northern Raccoon	<i>Procyon lotor</i>	
White-nosed Coati	<i>Nasua narica</i>	
Kinkajou	<i>Potos flavus</i>	
<b>Mustelidae</b>		
Grison	<i>Galictis vittata</i>	1
Tayra	<i>Eira barbara</i>	
Spotted Skunk	<i>Conepatus putorius</i>	1 (Needs to be confirmed)
Striped Hog-nosed Skunk	<i>Conepatus semistriatus</i>	1
Neotropical River Otter	<i>Lutra longicaudis</i>	1, 2(DD), 3
<b>Felidae</b>		
Ocelot	<i>Leopardus pardalis</i>	1, 3
Margay	<i>Leopardus wiedii</i>	1, 3
Jaguarundi	<i>Herpailurus yagouaroundi</i>	1, 3
Puma	<i>Puma concolor</i>	1, 2(Lr/Nt), 3
Jaguar	<i>Panthera onca</i>	1, 2(Lr/Nt), 3
<b>Status:</b>		
1. <b>Species of Concern (Rare or Hunted throughout range):</b> NARMAP (1995), citing Emmons, 1990)		
2. <b>IUCN listing:</b> Lr/Nt (Lower risk, Near threatened), V (Vulnerable), E (Endangered), DD (Data deficient). IUCN Red List of threatened species (2004)		
3. <b>CITES Listed</b>		

Common Name	Scientific Name	
<b>Perissodactyla</b>		
<b>Tapiridae</b>		
Baird's tapir	<i>Tapirus bairdii</i>	1, 2(E), 3
<b>Artiodactyla</b>		
<b>Tayassuidae</b>		
Collard Peccary	<i>Tayassu tajacu</i>	1, 3
White-lipped Peccary	<i>Dicotyles pecari</i>	1, 3
<b>Artiodactyla (cont.)</b>		
<b>Cervidae</b>		
White-tailed Deer	<i>Odocoileus virginianus</i>	1
Red brocket Deer	<i>Mazama americana</i>	1, 2(DD)
<b>Status:</b>		
1. <b>Species of Concern (Rare or Hunted throughout range):</b> NARMAP (1995), citing Emmons, 1990)		
2. <b>IUCN listing:</b> Lr/Nt (Lower risk, Near threatened), V (Vulnerable), E (Endangered), DD (Data deficient). IUCN Red List of threatened species (2004)		
3. <b>CITES Listed</b>		

**Reference sources for species list:**

**Kamstra (1987)**, Ecological Survey of Cockscomb.

**Rabinowitz A. and B. Nottingham (1986)** Mammal Species Richness and Relative Abundance of Small Mammals in a Sub-tropical Wet Forest of Central America.

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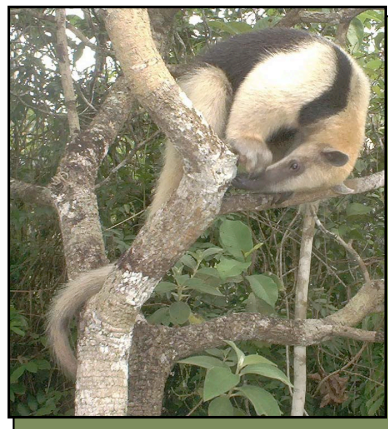
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**Foster R. 2003/2004. pers. comm.**

**Cockscomb Basin Wildlife Sanctuary Staff 2003/2004. pers.comm.**



**Right:**  
Northern Tamandua  
(*Tamandua mexicana*)





Keel-billed Toucan

## **Fauna - Birds**

### **Cockscomb Basin Wildlife Sanctuary**

**2004**

**Birds of Cockscomb Basin Wildlife Sanctuary****Co-Author: Lee Jones****Box 15: Characteristic Bird Species of the CBWS Forest**

Great Tinamou  
 Slaty-breasted Tinamou  
 Double-toothed Kite  
 White Hawk  
 Black-and-White Hawk-Eagle  
 Ornate Hawk-Eagle  
 Barred Forest-Falcon  
 Great Curassow  
 Spotted Wood-Quail  
 Short-billed Pigeon  
 Gray-chested Dove  
 Mealy Parrot  
 Spectacled Owl  
 Central American Pygmy-Owl  
 Violet Sabrewing  
 Collared Trogon  
 Slaty-tailed Trogon  
 Tody Motmot  
 White-whiskered Puffbird  
 Chestnut-colored Woodpecker  
 Scaly-throated Leaf-tosser  
 Black-faced Antthrush  
 Sepia-capped Flycatcher  
 Eye-ringed Flatbill  
 Ruddy-tailed Flycatcher  
 Sulphur-rumped Flycatcher  
 Rufous Mourner  
 Thrush-like Schiffornis  
 Rufous Piha  
 Lovely Cotinga  
 Red-capped Manakin  
 Tawny-crowned Greenlet  
 Green Shrike-Vireo  
 White-breasted Wood-Wren  
 Nightingale Wren  
 Golden-crowned Warbler  
 Black-throated Shrike-Tanager  
 Green Honeycreeper  
 Orange-billed Sparrow

Belize has 574 species of birds (Jones, 2003), of which 323 (56%) have been recorded within the Cockscomb Basin Wildlife Sanctuary (Table 25). Of these 323 species, 45 are endemic to the Middle America region, with four of these being limited, or nearly limited, to the Yucatan Peninsula (which includes Belize). The many ecosystems of Cockscomb have led to a rich and varied bird fauna - forest species, pine woodland and savanna species, species restricted to riverine areas, and birds associated with higher elevations, and others. They also provide important protection for game species, such as the great curassow and crested guan, as well as other species of conservation concern such as the ornate hawk-eagle, keel-billed motmot, seasonally the scarlet macaw, and potentially the yellow-headed parrot.

Around the Headquarters site, maintenance of secondary scrub habitat has ensured the continued presence of many species of birds that favour such disturbed habitats – blue-gray, yellow-winged, crimson-collared, and Passerini's tanagers, white-collared and variable seedeaters, and grayish, buff-throated, and black-headed saltators are but a few examples that can be found throughout Belize in similar habitats. In areas where forest regeneration is underway, there is a gradual shifting of species composition towards those species that prefer higher second-growth forest or, further from the Headquarters, deep forest habitat (Box 15).

The pine woodland and associated grasslands and savannas to the east, in the Ben's Bluff and Cabbage Haul area, are relatively species poor (Box 16).

In contrast, the floodplains of the major creeks attract many of the riverine, forest edge, and gallery forest species, such as the bare-throated tiger-heron, gray-headed kite, gray-necked wood-rail, white-necked jacobin, and yellow-tailed oriole. Whilst Cockscomb does

not have many permanent ponds, lakes or swamps, there are semi-permanent ponds, and slow moving pools in the wider sections of creeks, that attract waterbirds such as the least grebe, anhinga, several species of herons and egrets, muscovy duck, sungrebe, spotted sandpiper, the various kingfishers, and northern and Louisiana waterthrushes.

**Box 17: Higher Elevation Species of CBWS**

Brown Violet-ear  
 Stripe-tailed Hummingbird  
 Keel-billed Motmot  
 Emerald Toucanet  
 Plain Antvireo  
 Slate-colored Solitaire  
 White-throated Robin  
 Common Bush-Tanager  
 White-winged Tanager  
 Elegant Euphonia  
 White-vented Euphonia  
 Shining Honeycreeper

The higher elevations of the Maya Mountains in the western portion of the Cockscomb Basin have a few species typically not found at lower elevations, although some of these may wander down into the foothills during the non-breeding season (Box 17).

Of particular note is the presence of a number of species in the protected area considered endangered or vulnerable, and in need of protection within Belize (Box 18). These include one of the two large game species (the great curassow), the keel-billed Motmot, and the yellow headed parrot, which is potentially present in the pine savanna areas. Other birds highlighted as being of concern include the second large game species (the crested guan),

**Box 16: Characteristic Pine Woodland Bird Species of CBWS**

Black-throated Bobwhite  
 Yellow-headed Parrot  
 Azure-crowned Hummingbird  
 Vermilion Flycatcher  
 Plumbeous Vireo  
 Blue-gray Gnatcatcher  
 Grace's Warbler  
 Gray-crowned Yellowthroat  
 Rufous-capped Warbler  
 Hepatic Tanager  
 Rusty Sparrow  
 Yellow-backed Oriole

**Box 18:  
IUCN Bird Species of  
International Concern**

**Endangered:**

**Yellow-headed Parrot**

*Amazona oratrix*\*

**Cerulean Warbler**

*Dendroica cerulea*

**Vulnerable**

**Keel-billed Motmot**

*Electron carinatum*

**Lower Risk/ Near Threatened**

**Great Curassow**

*Crax rubra*

**Solitary Eagle**

*Harpyhaliaetus solitarius*

**Painted Bunting**

*Passerina ciris*

**Golden-winged Warbler**

*Vermivora chrysoptera*

*IUCN Red List, 2004*

\*Presence in CBWS still to be confirmed

the ornate hawk-eagle, and seasonally, the regionally endangered subspecies of the scarlet macaw. The very rare solitary eagle may also be seen occasionally in Cockscomb.

In the eastern-most reaches of Cockscomb, in pine woodland and savanna areas of Cabbage Haul and Ben's Bluff, there are unconfirmed reports of the presence of the yellow-headed parrot. This parrot species qualifies as 'endangered' under the BirdLife International (2000) criteria following a very rapid 90% population decline throughout its range since the 1970's, to an estimated 7,000 individuals in 1994. In the last ten years alone, the population has declined by 68%, and significant rates of decline are expected in the future with increased habitat destruction for development, increased man-made fires over the pine savanna areas, and the theft of nestlings for the pet trade. Fortunately, the rate of decline of this species has not been as severe in Belize as in other parts of its range, and Belize is now its last remaining stronghold. Although its preferred pine woodland and savanna habitat is only marginally present within Cockscomb East Basin, it is still relatively common in the extensive tracts of suitable habitat east and south of the Basin, where it breeds. Some of this land is already under protection, and the Belize Audubon Society is actively engaged in the conservation of this species and its habitat countrywide.

Another parrot found in Cockscomb at least seasonally is the scarlet macaw, the largest of the parrots in Belize, with a population countrywide thought to number fewer than 200 individuals. Whilst it was apparently once seen flying over much of the central forested areas of Belize, it is now restricted to the Chiquibul/Maya Mountain area. Its nesting range is thought to be confined to the Raspaculo River area due west of the Cockscomb Basin, on the other side of the Maya Mountain Divide. This species favours nesting in dead Quamwood trees with hollow centres sufficiently large to allow for the entrance of the adult, found in close proximity to a river. Such areas exist only within the more remote areas of the Chiquibul region, and their scarcity appears to be the major limiting factor to scarlet macaw distribution in Belize. Some local guides have reported that they have seen nests in the West Basin (E. Pop and M. Meadows, pers. comm.), but these reports have yet to be confirmed. If this is so, the area will become increasingly important for the survival of the Belize population, as the Upper Macal/Raspaculo River nesting grounds are now under major assault with the impending construction of Chalillo Dam and its subsequent reservoir, which will flood most or all of the species' presently known nesting areas in Belize.

Small groups of between 6 and 10 macaws are seen flying over Cockscomb from time to time, particularly in the more remote Mexican Branch area, but they are also seen occasionally over the Headquarters site, especially during the months of January, February, and March. At this time of year, when the wild annatto and polewood trees are in fruit, it is thought that these birds fly from their principal nesting area in the Raspaculo River valley through passes in the Maya Mountains to the hillslopes above Red Bank and San Pablo, where as many as 60 have been observed at one time (P. Balderamas, observed in 1997, pers. comm.). This is when they are also typically recorded foraging in Cockscomb in the Sale-si-Puede and Mares Nest Branch areas.

The scarlet macaw feeding grounds above Red Bank and San Pablo have, over the last ten years, become recognized for their importance, and have been highlighted as a major birding venue. This has brought awareness of the touristic value of this species, especially in the Red Bank area, resulting in the people there no longer killing the birds for meat. However, there is still apparently a market for

macaw feathers among the Garifuna communities, for their cultural festivities, and there are reports of some scarlet macaw kills for this purpose. Whilst these actions are not occurring within the CBWS boundaries, this species is one of the two focal species of the Reserve, and those individuals shot do pass through the protected area (and may potentially even be nesting there). As such, active measures towards their conservation should be considered a priority.

Although the scarlet macaw is found throughout Central America and much of northern South America, where it is still common in many places, the distinctive subspecies (*Ara macao cyanoptera*) is found only in Belize, adjacent northern Guatemala, and a tiny portion of southeastern Mexico, where it is believed that fewer than 2,000 individuals remain in the wild (Matola and Sho, 2002). This has caused concern internationally and has led to the establishment of 'Guacamayas Sin Fronteras' – scarlet macaws Without Borders – a tri-national coalition working toward the conservation of this geographically restricted subspecies. CITES lists the species (as a whole) under CITES Appendix I, and BirdLife International classifies it as 'Least Threatened', while recognizing that the Central American subspecies can be considered 'endangered', and that any further fragmentation of its nesting habitat could elevate it to the status of 'critically endangered', with the possibility of the remaining population disappearing in the next 10 years outside of highly protected areas.

Cockscomb has two large resident game bird species, the great curassow and crested guan. In areas where hunting pressure has been removed, the guan adapts readily to the presence of humans, and can now be commonly seen in the protected area around the Headquarters site and nearby trails. The great curassow, on the other hand, does not adapt so readily to humans, remaining shy and reclusive. Therefore, it is encountered much less often, but is not necessarily less common than the guan – just less conspicuous. Both these species, along with their more common relative, the plain chachalaca, are representatives of the Cracidae family – the most threatened of the Neotropical bird families. Cracids are important seed dispersers and are a major protein source for local communities. As these birds are large, visible, showy, and charismatic, their harvesting for food can result in conflict with tourism interests.

Within Belize, both the curassow and the guan are locally common, and outside of protected areas such as Cockscomb Basin Wildlife Sanctuary, they are legal game species for those with hunting permits. However, the increase in agricultural colonists and seasonal Central American workers near and adjacent to the Sanctuary has led to increased illegal hunting within the Sanctuary, with populations of both species now considered to be lower than previously in the majority of the affected areas. In Juan Branch, in particular, reports from Maya Mopan residents suggest that numbers of both curassows and guans have declined significantly, even though hunting itself in the general area is thought to have declined since the establishment of CBWS. This pronounced negative response to hunting pressure makes these two species especially valuable as indicator species in areas where hunting still occurs.

The keel-billed motmot, another species of significant conservation concern, is listed as 'vulnerable' by both IUCN and BirdLife International. It is limited geographically to Central America, where it was found historically from southeastern Mexico to western Costa Rica. It is now very rare or absent within most of its historic range, with remaining populations concentrated in Belize and Nicaragua. It occurs in relatively low densities, even within optimal habitat, and requires large expanses of undisturbed habitat to ensure viable populations. In Belize it appears to be associated with areas of steep terrain intersected by



streams, the banks of which are excavated for nest sites. Within Cockscomb, it has been observed at higher elevations, along the Victoria Peak trail. It is thought that there may be fewer than 10,000 individuals remaining in the wild, with some estimates placing this figure at closer to 2,500 (BirdLife International, 2000). The population is facing a continuing decline as its forest habitat continues to be fragmented and destroyed, and is reliant on connectivity of protected areas, such as those of the Bladen River Nature Reserve, Chiquibul Forest Reserve, and Cockscomb Basin, for its survival. As with the yellow-headed parrot, Belize appears to be the last stronghold of this species.

The ornate hawk-eagle, the rarest of the three hawk-eagles found in Belize, is found in very low densities and requires vast areas of unbroken forest in order to survive. It is thought that a few pairs of solitary eagles also may nest in Belize in the Maya Mountains and Mountain Pine Ridge, although this has not been confirmed. Both it and the ornate hawk-eagle are considered locally threatened. From a global perspective, neither is threatened or endangered at present, although with continued forest clearance, they may become globally threatened in the future. Ornate hawk-eagles have been well studied in the neighbouring Selva Maya area of Guatemala under The Peregrine Fund's Maya Project. During these studies, extensive data was collected on prey items and territory size, demonstrating that this species preys on both mammals and birds in an almost 1:1 ratio (44:56); however, when comparing biomass, birds made up 70% of the diet. Prey species taken ranged from toucans to the much larger guans, curassows and even ocellated turkeys. The majority of mammals caught were squirrels, though opossums, young coati and agouti were also recorded. Territorial density was estimated through radio tracking, with the average territory within suitable forest habitat being between 10 and 12 km<sup>2</sup>. Nests were placed an average of 3 km apart.

The larger, and exceptionally rare harpy eagle (*Harpia harpyja*) and its cousin, the equally endangered crested eagle (*Morphnus guianensis*), have not been recorded within the Cockscomb Basin, although there have been recent sightings of the former in Cayo and Toledo districts, and the latter in these two districts and westernmost Orange Walk District. As both eagles are very scarce and almost never fly above the forest canopy where they would be more readily seen, the potential exists that one or both of these species may yet be found in the Cockscomb Basin. There is serious concern over the continued survival of both of these species at the northern extreme of their ranges (Belize, Guatemala, and possibly southern Mexico), as their numbers have been declining rapidly over the last two decades with increased deforestation and forest fragmentation.

Gaining a broader knowledge of the numbers, abundance, and habitat requirements of the larger raptors of Cockscomb would be an important step towards being able to monitor the ecological health of the Sanctuary, as top predators such as the ornate hawk-eagle require large home ranges of undisturbed forest for their survival. It is hoped and expected that as the Cockscomb East Basin forest continues to regenerate with minimal disturbance, the numbers of these indicator species will increase within this area, as will the number of sightings of other, more wary species. Protocols have been developed within the region (for example, the Maya Project conducted at Tikal under The Peregrine Fund) for the monitoring of raptor populations using high points such as Ben's Bluff or Cabbage Haul Lookout as vantage points.

A number of species are expected to occur within Cockscomb Basin Wildlife Reserve, but have not yet been recorded (Table 26). These include species that may occur within the more remote forested reaches of the protected area, in the

mid- and higher elevations where visitation is very low, or may drift inland from coastal areas. A number of migrants, too, can be expected to be added in the future. There are other questions to be investigated as well: Are scarlet macaws breeding within Cockscomb? Are yellow-headed parrots present and breeding within the Sanctuary? How healthy are the keel-billed motmot populations in the protected area? Without knowledge of the endangered species present within Cockscomb, planning viable land use options will be difficult. For example, which areas should be developed as trekking routes in the future, and which areas need to be left completely undisturbed?

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**For their input into this section**

**Table 25: Birds of Cockscomb Basin Wildlife Sanctuary**

Species		Status	Habitats	Endemism
Great Tinamou	<i>Tinamus major</i>	fP	BFM,BFL	
Little Tinamou	<i>Crypturellus soui</i>	fP	SC	MA
Slaty-breasted Tinamou	<i>Crypturellus boucardi</i>	fP	BFM,BFL	MA
Least Grebe	<i>Tachybaptus dominicus</i>	IP	WL,LA	
Neotropic Cormorant	<i>Phalacrocorax brasilianus</i>	oV	LA	
Anhinga	<i>Anhinga anhinga</i>	oV	LA	
Magnificent Frigatebird	<i>Fregata magnificens</i>	rV	O	
Bare-throated Tiger-Heron	<i>Tigrisoma mexicanum</i>	uP	WL,LA	
Great Blue Heron	<i>Ardea herodias</i>	oV	WL,LA	
Great Egret	<i>Ardea alba</i>	oV	WL,LA	
Snowy Egret	<i>Egretta thula</i>	oV	WL,LA	
Little Blue Heron	<i>Egretta caerulea</i>	oV	WL,LA	
Cattle Egret	<i>Bubulcus ibis</i>	fV	SC	
Green Heron	<i>Butorides virescens</i>	fV	LA	
Agami Heron	<i>Agamia agami</i>	uV	LA	
Yellow-crowned Night-Heron	<i>Nyctanassa violacea</i>	IP	LA	
Boat-billed Heron	<i>Cochlearius cochlearius</i>	IP	LA	
Wood Stork	<i>Mycteria americana</i>	oV	LA	
Black Vulture	<i>Coragyps atratus</i>	cP	SA,O	
Turkey Vulture	<i>Cathartes aura</i>	cP	SA,O	
King Vulture	<i>Sarcorampus papa</i>	uP	BFM,BFL	
Muscovy Duck	<i>Cairina moschata</i>	oV	LA	
Blue-winged Teal	<i>Anas discors</i>	oV	WL,LA	
Osprey	<i>Pandion haliaetus</i>	oV	LA,O	
Gray-headed Kite	<i>Leptodon cayanensis</i>	uP	BFM,BFL	
Hook-billed Kite	<i>Chondrohierax uncinatus</i>	uP	BFM,BFL	
Swallow-tailed Kite	<i>Elanoides forficatus</i>	uS	BFM,BFL,O	
White-tailed Kite	<i>Elanus leucurus</i>	uP	WL,SC	
Double-toothed Kite	<i>Harpagus bidentatus</i>	uP	BFM,BFL	
Plumbeous Kite	<i>Ictinia plumbea</i>	uS	BFM,BFL,O	
White Hawk	<i>Leucopternis albicollis</i>	uP	BFL,O	
Gray Hawk	<i>Asturina nitida</i>	fP	BFL,SC,O	
Common Black-Hawk	<i>Buteogallus anthracinus</i>	uP	SC,O	
Great Black-Hawk	<i>Buteogallus urubitinga</i>	uP	BFM,BFL,O	
Solitary Eagle	<i>Harpyhaliaetus solitarius</i>	rV	BFM,O	

**Status****Legend**

v = very common  
c = common  
f = fairly common  
u = uncommon  
o = occasional  
l = local

**Regional Endemics****Legend (L. Jones)**

MA Middle America Endemic  
NMA Northern Middle America Endemic

P = permanent resident  
S = seasonal resident  
V = visitor  
T = transient (migrant)  
W = winter resident  
X = one or two records only

**Habitat Preferences within CBWS****Legend (Adapted from Jones and Vallely, 2001)**

BFM Submontane broadleaf forest  
BFL Lowland broadleaf forest  
PFM Submontane pine forest  
PFL Lowland pine forest  
SC Scrub, low second growth  
SA Savanna  
WL Wetland habitats with emergent vegetation  
LA Lagoons, ponds, rivers, streams  
O Overhead/aerial

Cockscomb Basin Wildlife Sanctuary Management Plan 2005– 20 10

Species		Status	Habitats	Endemism
Roadside Hawk	<i>Buteo magnirostris</i>	fP	SC,SA,O	
Short-tailed Hawk	<i>Buteo brachyurus</i>	fP	BFM,BFL,O	
Red-tailed Hawk	<i>Buteo jamaicensis</i>	rV	O	
Black-and-white Hawk-Eagle	<i>Spizastur melanoleucus</i>	uP	BFM,BFL,O	
Black Hawk-Eagle	<i>Spizaetus tyrannus</i>	uP	BFM,BFL,O	
Ornate Hawk-Eagle	<i>Spizaetus ornatus</i>	rP	BFM,BFL,O	
Barred Forest-Falcon	<i>Micrastur ruficollis</i>	uP	BFM,BFL	
Collared Forest-Falcom	<i>Micrastur semitorquatus</i>	uP	BFM,BFL	
Laughing Falcon	<i>Herpetotheres cachinnans</i>	fP	PW,SC,SA	
American Kestrel	<i>Falco sparverius</i>	oW	SA,O	
Bat Falcon	<i>Falco rufigularis</i>	uP	SC,O	
Peregrine Falcon	<i>Falco peregrinus</i>	oW	LA,O	
Plain Chachalaca	<i>Ortalis vetula</i>	cP	BFL,BFM,SC	
Crested Guan	<i>Penelope purpurascens</i>	cP	BFM,BFL	
Great Curassow	<i>Crax rubra</i>	uP	BFM,BFL	
Black-throated Bobwhite	<i>Colinus nigrogularis</i>	IP	PW,SA	MA
Spotted Wood-Quail	<i>Odontophorus guttatus</i>	uP	BFM,BFL	MA
Ruddy Crake	<i>Laterallus ruber</i>	IP	SC	MA
Gray-necked Wood-Rail	<i>Aramides cajanea</i>	uP	WL	
Uniform Crake	<i>Amaurolimnas concolor</i>	rP	BFL	
Sungrebe	<i>Heliornis fulica</i>	IP	LA	
Limpkin	<i>Aramus guarauna</i>	IP	WL,LA	
Solitary Sandpiper	<i>Tringa solitaria</i>	oT	WL	
Spotted Sandpiper	<i>Actitis macularia</i>	fW	LA	
Pale-vented Pigeon	<i>Columba cayennensis</i>	cP	BFL,PW,SC	
Scaled Pigeon	<i>Columba speciosa</i>	fP	BFM,BFL	
Red-billed Pigeon	<i>Columba flavirostris</i>	oV	BFL,PW	
Short-billed Pigeon	<i>Columba nigrirostris</i>	cP	BFM,BFL	
Ruddy Ground-Dove	<i>Columbina talpacoti</i>	cP	SC	
Blue Ground-Dove	<i>Claravis pretiosa</i>	cP	BFM,BFL	
White-tipped Dove	<i>Leptotila verreauxi</i>	IP	BFM,BFL	
Gray-fronted Dove	<i>Leptotila rufaxilla</i>	cP	BFM,BFL	
Gray-chested Dove	<i>Leptotila cassini</i>	cP	BFM,BFL	
Ruddy Quail-Dove	<i>Geotrygon montana</i>	uP	BFM,BFL	
Olive-throated Parakeet	<i>Aratinga nana</i>	cP	BFM,BFL,SC	MA
Scarlet Macaw	<i>Ara macao</i>	oV	BFL	
Brown-hooded Parrot	<i>Pionopsitta haematotis</i>	cP	BFM,BF	
<b>Status Legend</b>		<b>Habitat Preferences within CBWS Legend (Adapted from Jones and Vallely, 2001)</b>		
v = very common	P = permanent resident	BFM Submontane broadleaf forest		
c = common	S = seasonal resident	BFL Lowland broadleaf forest		
f = fairly common	V = visitor	PFM Submontane pine forest		
u = uncommon	T = transient (migrant)	PFL Lowland pine forest		
o = occasional	W = winter resident	SC Scrub, low second growth		
l = local	X = one or two records only	SA Savanna		
<b>Regional Endemics Legend (L. Jones)</b>		WL Wetland habitats with emergent vegetation		
MA Middle America Endemic		LA Lagoons, ponds, rivers, streams		
NMA Northern Middle America Endemic		O Overhead/aerial		



Cockscomb Basin Wildlife Sanctuary Management Plan 2005– 20 10

Species	Status	Habitats	Endemism
White-crowned Parrot	<i>Pionus senilis</i>	cP	BFM,BFL MA
White-fronted Parrot	<i>Amazona albifrons</i>	rV	BFL,SA MA
Red-lored Parrot	<i>Amazona autumnalis</i>	cP	BFL
Mealy Parrot	<i>Amazona farinosa</i>	cP	BFM,BFL
Yellow-headed Parrot	<i>Amazona oratrix</i>	fP	PW
Squirrel Cuckoo	<i>Piaya cayana</i>	cP	BFM,BFL
Striped Cuckoo	<i>Tapera naevia</i>	uP	SC
Pheasant Cuckoo	<i>Dromococcyx phasianellus</i>	rP	BFM,BFL,SC
Groove-billed Ani	<i>Crotophaga sulcirostris</i>	cP	SC
Barn Owl	<i>Tyto alba</i>	uP	SC
Vermiculated Screech-Owl	<i>Otus guatemalae</i>	uP	BFM,BFL
Crested Owl	<i>Lophotrix cristata</i>	rP	BFM,BFL
Spectacled Owl	<i>Pulsatrix perspicillata</i>	uP	BFM,BFL
Central American Pygmy-Owl	<i>Glauclidium griseiceps</i>	uP	BFM,BFL
Ferruginous Pygmy-Owl	<i>Glauclidium brasilianum</i>	IP	BFM,BFL,SC
Mottled Owl	<i>Ciccaba virgata</i>	cP	BFM,BFL
Black-and-white Owl	<i>Ciccaba nigrolineata</i>	uP	BFL
Striped Owl	<i>Pseudoscops clamator</i>	uP	SA
Short-tailed Nighthawk	<i>Lurocalis semitorquatus</i>	X	LA
Lesser Nighthawk	<i>Chordeiles acutipennis</i>	fW	SA,O
Common Nighthawk	<i>Chordeiles minor</i>	oT	SA,O
Common Pauraque	<i>Nyctidromus albicollis</i>	cP	BFM,BFL
Northern Potoo	<i>Nyctibius jamaicensis</i>	uP	SA
Chestnut-collared Swift	<i>Streptoprocne rutila</i>	X	O
White-collared Swift	<i>Streptoprocne zonaris</i>	fP	O
Vaux's Swift	<i>Chaetura vauxi</i>	cP	O
Lesser Swallow-tailed Swift	<i>Panyptila cayennensis</i>	fP	O
Band-tailed Barbthroat	<i>Threnetes ruckeri</i>	rP	BFL
Long-billed Hermit	<i>Phaethornis longirostris</i>	cP	
Stripe-throated Hermit	<i>Phaethornis strigularis</i>	cP	
Scaly-breasted Hummingbird	<i>Phaeochroa cuvieri</i>	uP	BFM,BFL
Wedge-tailed Sabrewing	<i>Campylopterus curvipennis</i>	cP	BFM,BFL NMA
Violet Sabrewing	<i>Campylopterus hemileucurus</i>	uP	BFM MA
White-necked Jacobin	<i>Florisuga mellivora</i>	fP	BFM,BFL,LA
Brown Violet-ear	<i>Colibri delphinae</i>	uP	BFM
Green-breasted Mango	<i>Anthracothorax prevostii</i>	uP	SC
Canivet's Emerald	<i>Chlorostilbon canivetii</i>	uP	SA,SC NMA
White-bellied Emerald	<i>Amazilia candida</i>	cP	BFM,BFL MA
<b>Status Legend</b>		<b>Habitat Preferences within CBWS Legend (Adapted from Jones and Valley, 2001)</b>	
v = very common	P = permanent resident	BFM	Submontane broadleaf forest
c = common	S = seasonal resident	BFL	Lowland broadleaf forest
f = fairly common	V = visitor	PFM	Submontane pine forest
u = uncommon	T = transient (migrant)	PFL	Lowland pine forest
o = occasional	W = winter resident	SC	Scrub, low second growth
l = local	X = one or two records only	SA	Savanna
<b>Regional Endemics (L. Jones)</b>		WL	Wetland habitats with emergent vegetation
MA Middle America Endemic		LA	Lagoons, ponds, rivers, streams
NMA Northern Middle America Endemic		O	Overhead/aerial

Cockscomb Basin Wildlife Sanctuary Management Plan 2005– 20 10

Species	Status	Habitats	Endemism
Azure-crowned Hummingbird	IP	PW	MA
Rufous-tailed Hummingbird	cP	SC,SA	
Buff-bellied Hummingbird	IP	SC,SA	
Stripe-tailed Hummingbird	cP	BFM	MA
Ruby-throated Hummingbird	uW	SC	
Black-headed Trogon	cP	BFL,BFM,PW	MA
Violaceous Trogon	cP	BFM,BFL	
Collared Trogon	fP	BFM,BFL	
Slaty-tailed Trogon	cP	BFM,BFL	
Tody Motmot	fP	BFM,BFL	
Blue-crowned Motmot	cP	BFM,BFL	
Keel-billed Motmot	IP	BFM,BFL	MA
Ringed Kingfisher	IP	LA	
Belted Kingfisher	fW	LA	
Amazon Kingfisher	IP	LA	
Green Kingfisher	cP	LA	
American Pygmy Kingfisher	uP	LA	
White-necked Puffbird	uP	SC	
White-whiskered Puffbird	uP	BFM,BFL	
Rufous-tailed Jacamar	fP	BFM,BFL	
Emerald Toucanet	fP	BFM	
Collared Aracari	cP	BFM,BFL	
Keel-billed Toucan	cP	BFM,BFL	
Black-cheeked Woodpecker	cP	BFM,BFL	
Golden-fronted Woodpecker	cP	SC	
Yellow-bellied Sapsucker	uW	BFM,BFL	
Smoky-brown Woodpecker	fP	BFM,BFL	
Golden-olive Woodpecker	fP	BFM,BFL	
Chestnut-colored Woodpecker	uP	BFM,BFL	MA
Lineated Woodpecker	cP	BFM,BFL	
Pale-billed Woodpecker	cP	BFM,BFL	MA
Rufous-breasted Spinetail	fP	SC	MA
Buff-throated Foliage-gleaner	fP	BFM,BFL	
Plain Xenops	cP	BFM,BFL	
Scaly-throated Leaf-tosser	uP	FM,BFL	
Tawny-winged Woodcreeper	fP	BFM,BFL	MA
Ruddy Woodcreeper	fP	BFM,BFL	

<p><b>Status Legend</b></p> <p>v = very common  c = common  f = fairly common  u = uncommon  o = occasional  l = local</p> <p><b>Regional Endemics Legend (L. Jones)</b></p> <p>MA Middle America Endemic  NMA Northern Middle America Endemic</p>	<p>P = permanent resident  S = seasonal resident  V = visitor  T = transient (migrant)  W = winter resident  X = one or two records only</p>	<p><b>Habitat Preferences within CBWS Legend (Adapted from Jones and Vallely, 2001)</b></p> <p>BFM Submontane broadleaf forest  BFL Lowland broadleaf forest  PFM Submontane pine forest  PFL Lowland pine forest  SC Scrub, low second growth  SA Savanna  WL Wetland habitats with emergent vegetation  LA Lagoons, ponds, rivers, streams  O Overhead/aerial</p>
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Cockscomb Basin Wildlife Sanctuary Management Plan 2005– 20 10

Species	Status	Habitats	Endemism
Olivaceous Woodcreeper	<i>Sittasomus griseicapillus</i>	fP	BFM,BFL
Wedge-billed Woodcreeper	<i>Glyphorhynchus spirurus</i>	fP	BFM,BFL
Northern Barred-Woodcreeper	<i>Dendrocolaptes sanctihomae</i>	fP	BFM,BFL,PW
Ivory-billed Woodcreeper	<i>Xiphorhynchus flavigaster</i>	cP	BFM,BFL MA
Streak-headed Woodcreeper	<i>Lepidocolaptes souleyetii</i>	uP	BFM,BFL
Great Antshrike	<i>Taraba major</i>	IP	SC
Barred Antshrike	<i>Thamnophilus doliatus</i>	cP	SC
Plain Antvireo	<i>Dysithamnus mentalis</i>	fP	BFM,BFL
Dot-winged Antwren	<i>Microrhopias quixensis</i>	cP	BFL
Dusky Antbird	<i>Cercomacra tyrannina</i>	cP	SC
Bare-crowned Antbird	<i>Gymnocichla nudiceps</i>	rP	SC
Black-faced Antthrush	<i>Formicarius analis</i>	cP	BFM,BFL
Yellow-bellied Tyrannulet	<i>Ornithion semiflavum</i>	fP	BFM,BFL MA
Greenish Elaenia	<i>Myiopagis viridicata</i>	fP	BFM,BFL
Yellow-bellied Elaenia	<i>Elaenia flavogaster</i>	cP	PW,SA
Ochre-bellied Flycatcher	<i>Mionectes oleagineus</i>	cP	BFM,BFL
Sepia-capped Flycatcher	<i>Leptopogon amaurocephalus</i>	fP	BFM,BFL
Northern Bentbill	<i>Oncostoma cinereigulare</i>	cP	BFM,BFL MA
Slate-headed Tody-Flycatcher	<i>Poecilatriccus sylvia</i>	uP	SC
Common Tody-Flycatcher	<i>Todirostrum cinereum</i>	cP	SC,SA
Eye-ringed Flatbill	<i>Rhynchocyclus brevirostris</i>	uP	BFM,BFL MA
Yellow-olive Flycatcher	<i>Tolmomyias sulphurescens</i>	cP	BFM,BFL
Stub-tailed Spadebill	<i>Platyrinchus canrominus</i>	cP	BFM,BFL MA
Royal Flycatcher	<i>Onychorhynchus coronatus</i>	uP	BFM,BFL
Ruddy-tailed Flycatcher	<i>Terentotriccus erythrurus</i>	uP	BFM,BFL
Sulphur-rumped Flycatcher	<i>Myiobius sulphureipygius</i>	cP	BFM,BFL
Olive-sided Flycatcher	<i>Contopus cooperi</i>	uT	BFM,BFL
Eastern Wood-Pewee	<i>Contopus virens</i>	cT	BFM,BFL
Tropical Pewee	<i>Contopus cinereus</i>	fP	BFM,BFL
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	fW	BFM,BFL
Acadian Flycatcher	<i>Empidonax virescens</i>	oT	SC
Willow Flycatcer	<i>Empidonax traillii</i>	oT	SC
Least Flycatcher	<i>Empidonax minimus</i>	fW	SC
Black Phoebe	<i>Sayornis nigricans</i>	IP	LA
Vermilion Flycatcher	<i>Pyrocephalus rubinus</i>	IP	SA,SC
Bright-rumped Attila	<i>Attila spadiceus</i>	cP	BFM,BFL
Rufous Mourner	<i>Rhytipterna holerythra</i>	uP	BFM,BFL

<p><b>Status Legend</b></p> <p>v = very common  c = common  f = fairly common  u = uncommon  o = occasional  l = local</p> <p><b>Regional Endemics Legend (L. Jones)</b></p> <p>MA Middle America Endemic  NMA Northern Middle America Endemic</p>	<p>P = permanent resident  S = seasonal resident  V = visitor  T = transient (migrant)  W = winter resident  X = one or two records only</p>	<p><b>Habitat Preferences within CBWS Legend (Adapted from Jones and Vallely, 2001)</b></p> <p>BFM Submontane broadleaf forest  BFL Lowland broadleaf forest  PFM Submontane pine forest  PFL Lowland pine forest  SC Scrub, low second growth  SA Savanna  WL Wetland habitats with emergent vegetation  LA Lagoons, ponds, rivers, streams  O Overhead/aerial</p>
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Cockscomb Basin Wildlife Sanctuary Management Plan 2005– 20 10

Species		Status	Habitats	Endemism
Dusky-capped Flycatcher	<i>Myiarchus tuberculifer</i>	cP	BFM,BFL	
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	fW	BFM,BFL	
Brown-crested Flycatcher	<i>Myiarchus tyrannulus</i>	cS	BFL,PW	
Great Kiskadee	<i>Pitangus sulphuratus</i>	cP	SC	
Boat-billed Flycatcher	<i>Megarynchus pitangua</i>	cP	BFM,BFL	
Social Flycatcher	<i>Myiozetetes similis</i>	vP	SC	
Streaked Flycatcher	<i>Myiodynastes maculatus</i>	uS	BFM,BFL	
Sulphur-bellied Flycatcher	<i>Myiodynastes luteiventris</i>	cS	BFM,BFL	
Piratic Flycatcher	<i>Legatus leucophaeus</i>	cS	BFL	
Tropical Kingbird	<i>Tyrannus melancholicus</i>	cP	PW,SA	
Couch's Kingbird	<i>Tyrannus couchii</i>	cP	PW,SA	
Eastern Kingbird	<i>Tyrannus tyrannus</i>	fT	BFL	
Thrush-like Schiffornis	<i>Schiffornis turdinus</i>	cP	BFM,BFL	
Rufous Piha	<i>Lipaugus unirufus</i>	uP	BFM,BFL	
Cinnamon Becard	<i>Pachyramphus cinnamomeus</i>	fP	BFM,BFL	
White-winged Becard	<i>Pachyramphus polychopterus</i>	uP	SC	
Rose-throated Becard	<i>Pachyramphus aglaiae</i>	uP	BFL,PW	
Masked Tityra	<i>Tityra semifasciata</i>	cP	BFM,BFL	
Black-crowned Tityra	<i>Tityra inquisitor</i>	uP	BFL	
Lovely Cotinga	<i>Cotinga amabilis</i>	rP	BFM,BFL	MA
White-collared Manakin	<i>Manacus candei</i>	cP	BFL	MA
Red-capped Manakin	<i>Pipra mentalis</i>	cP	BFM,BFL	
White-eyed Vireo	<i>Vireo griseus</i>	cW	SC	
Mangrove Vireo	<i>Vireo pallens</i>	cP	SC	MA
Yellow-throated Vireo	<i>Vireo flavifrons</i>	cW	BFM,BFL	
Plumbeous Vireo	<i>Vireo plumbeus</i>	IP	PW	
Philadelphia Vireo	<i>Vireo philadelphicus</i>	uT	BFL	
Red-eyed Vireo	<i>Vireo olivaceus</i>	cT	BFM,BFL	
Yellow-green Vireo	<i>Vireo flavoviridis</i>	cS	BFM,BFL	
Tawny-crowned Greenlet	<i>Hylophilus ochraceiceps</i>	cP	BFM,BFL	
Lesser Greenlet	<i>Hylophilus decurtatus</i>	vP	BFM,BFL	
Green Shrike-Vireo	<i>Vireolanius pulchellus</i>	fP	BFM,BFL	MA
Green Jay	<i>Cyanocorax yncas</i>	uP	BFL,PW	
Brown Jay	<i>Cyanocorax morio</i>	cP	BFL,PW	MA
Purple Martin	<i>Progne subis</i>	cT	O	
Gray-breasted Martin	<i>Progne chalybea</i>	cS	O	
Tree Swallow	<i>Tachycineta bicolor</i>	oW	LA	
<b>Status Legend</b>		<b>Habitat Preferences within CBWS Legend (Adapted from Jones and Vallely, 2001)</b>		
v = very common	P = permanent resident	BFM	Submontane broadleaf forest	
c = common	S = seasonal resident	BFL	Lowland broadleaf forest	
f = fairly common	V = visitor	PFM	Submontane pine forest	
u = uncommon	T = transient (migrant)	PFL	Lowland pine forest	
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l = local	X = one or two records only	SA	Savanna	
<b>Regional Endemics Legend (L. Jones)</b>		WL	Wetland habitats with emergent vegetation	
MA Middle America Endemic		LA	Lagoons, ponds, rivers, streams	
NMA Northern Middle America Endemic		O	Overhead/aerial	

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Species		Status	Habitats	Endemism
Mangrove Swallow	<i>Tachycineta albilinea</i>	IP	LA	
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	fP	BFM,BFL	
Barn Swallow	<i>Hirundo rustica</i>	fT	SA	
Band-backed Wren	<i>Campylorhynchus zonatus</i>	IP	BFM,BFL	
Spot-breasted Wren	<i>Thryothorus maculipectus</i>	vP	BFM,BFL	MA
House Wren	<i>Troglodytes aedon</i>	cP	SC	
White-breasted Wood-Wren	<i>Henicorhina leucosticta</i>	vP	BFM,BFL	
Long-billed Gnatwren	<i>Ramphocaenus melanurus</i>	cP	BFM,BFL	
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>	IP	PW	
Tropical Gnatcatcher	<i>Polioptila plumbea</i>	fP	BFM,BFL	
Slate-colored Solitaire	<i>Myadestes unicolor</i>	cP	BFM	MA
Veery	<i>Catharus fuscescens</i>	oT	BFM,BFL	
Swainson's Thrush	<i>Catharus ustulatus</i>	uT	BFM,BFL	
Wood Thrush	<i>Hylocichla mustelina</i>	cW	BFM,BFL	
Clay-colored Robin	<i>Turdus grayi</i>	cP	BFL,SC	
White-throated Robin	<i>Turdus assimilis</i>	cP	BFM	
Gray Catbird	<i>Dumetella carolinensis</i>	cW	BFM,BFL	
Cedar Waxwing	<i>Bombycilla cedrorum</i>	oW	SC	
Blue-winged Warbler	<i>Vermivora pinus</i>	uW	BFM,BFL,SC	
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	uT	BFM,BFL,SC	
Tennessee Warbler	<i>Vermivora peregrina</i>	cT	BFM,BFL,SC	
Northern Parula	<i>Parula americana</i>	oT	BFL,PW	
Yellow Warbler	<i>Dendroica petechia</i>	cW	SC	
Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>	cW	BFM,BFL,SC	
Magnolia Warbler	<i>Dendroica magnolia</i>	cW	BFM,BFL,SC	
Yellow-rumped Warbler	<i>Dendroica coronata</i>	uW	PW,SA	
Black-throated Green Warbler	<i>Dendroica virens</i>	fW	PW,SC	
Blackburnian Warbler	<i>Dendroica fusca</i>	uT	BFM,BFL	
Yellow-throated Warbler	<i>Dendroica dominica</i>	fW	BFL,PW	
Grace's Warbler	<i>Dendroica graciae</i>	IP	PW	
Palm Warbler	<i>Dendroica palmarum</i>	oW	PW,SA	
Bay-breasted Warbler	<i>Dendroica castanea</i>	uT	BFM,BFL	
Cerulean Warbler	<i>Dendroica cerulea</i>	uT	BFM,BFL	
Black-and-white Warbler	<i>Mniotilta varia</i>	cW	BFM,BFL	
American Redstart	<i>Setophaga ruticilla</i>	cW	BFM,BFL	
Prothonotary Warbler	<i>Protonotaria citrea</i>	uT	BFL,LA	
Worm-eating Warbler	<i>Helmitheros vermivorus</i>	uW	BFM,BFL	

Status		Habitat Preferences within CBWS
<b>Legend</b>		<b>Legend (Adapted from Jones and Vallely, 2001)</b>
v = very common	P = permanent resident	BFM Submontane broadleaf forest
c = common	S = seasonal resident	BFL Lowland broadleaf forest
f = fairly common	V = visitor	PFM Submontane pine forest
u = uncommon	T = transient (migrant)	PFL Lowland pine forest
o = occasional	W = winter resident	SC Scrub, low second growth
l = local	X = one or two records only	SA Savanna
<b>Regional Endemics</b>		WL Wetland habitats with emergent vegetation
<b>Legend (L. Jones)</b>		LA Lagoons, ponds, rivers, streams
MA Middle America Endemic		O Overhead/aerial
NMA Northern Middle America Endemic		



Cockscomb Basin Wildlife Sanctuary Management Plan 2005– 20 10

Species		Status	Habitats	Endemism
Swainson's Warbler	<i>Limnothlypis swainsonii</i>	rW	BFL	
Ovenbird	<i>Seiurus aurocapillus</i>	fW	BFM,BFL	
Northern Waterthrush	<i>Seiurus noveboracensis</i>	cW	LA	
Louisiana Waterthrush	<i>Seiurus motacilla</i>	uW	LA	
Kentucky Warbler	<i>Oporornis formosus</i>	cW	BFM,BFL	
Common Yellowthroat	<i>Geothlypis trichas</i>	cW	SC	
Gray-crowned Yellowthroat	<i>Geothlypis poliocephala</i>	IP	PW,SA	MA
Hooded Warbler	<i>Wilsonia citrina</i>	cW	BFM,BFL	
Wilson's Warbler	<i>Wilsonia pusilla</i>	uW	BFM,BFL	
Golden-crowned Warbler	<i>Basileuterus culicivorus</i>	cP	BFM,BFL	
Rufous-capped Warbler	<i>Basileuterus rufifrons</i>	IP	PW	
Yellow-breasted Chat	<i>Icteria virens</i>	uW	SC	
Bananaquit	<i>Coereba flaveola</i>	cP	BFM,BFL	
Common Bush-Tanager	<i>Chlorospingus ophthalmicus</i>	cP	BFM	
Gray-headed Tanager	<i>Eucometis penicillata</i>	fP	BFM,BFL	
Black-throated Shrike-Tanager	<i>Lanio aurantius</i>	uP	BFM,BFL	NMA
Red-crowned Ant-Tanager	<i>Habia rubica</i>	cP	BFM,BFL	
Red-throated Ant-Tanager	<i>Habia fuscicauda</i>	vP	BFM,BFL	
Hepatic Tanager	<i>Piranga flava</i>	IP	PW	
Summer Tanager	<i>Piranga rubra</i>	cW	BFM,BFL	
Scarlet Tanager	<i>Piranga olivacea</i>	fT	BFM,BFL	
White-winged Tanager	<i>Piranga leucoptera</i>	uP	BFM	
Crimson-collared Tanager	<i>Ramphocelus sanguinolentus</i>	fP	SC	MA
Passerini's Tanager	<i>Ramphocelus passerinii</i>	fP	SC	MA
Blue-gray Tanager	<i>Thraupis episcopus</i>	cP	BFL,PW	
Yellow-winged Tanager	<i>Thraupis abbas</i>	cP	BFM,BFL	MA
Scrub Euphonia	<i>Euphonia affinis</i>	fP	SC,SA	MA
Yellow-throated Euphonia	<i>Euphonia hirundinacea</i>	cP	BFM,BFL	MA
Elegant Euphonia	<i>Euphonia elegantissima</i>	rP	BFM	MA
Olive-backed Euphonia	<i>Euphonia gouldi</i>	cP	BFM,BFL	MA
White-vented Euphonia	<i>Euphonia minuta</i>	uP	BFM,BFL	
Golden-hooded Tanager	<i>Tangara larvata</i>	cP	BFL,PW	
Green Honeycreeper	<i>Chlorophanes spiza</i>	fP	BFM,BFL	
Shining Honeycreeper	<i>Cyanerpes lucidus</i>	uP	BFM	
Red-legged Honeycreeper	<i>Cyanerpes cyaneus</i>	cP	BFM,BFL	
Blue-black Grassquit	<i>Volatinia jacarina</i>	cP	SC	
Variable Seedeater	<i>Sporophila americana</i>	cP	SC,SA	

Status Legend	Habitat Preferences within CBWS Legend (Adapted from Jones and Vallely, 2001)
<b>v</b> = very common <b>c</b> = common <b>f</b> = fairly common <b>u</b> = uncommon <b>o</b> = occasional <b>l</b> = local <b>Regional Endemics Legend (L. Jones)</b> <b>MA</b> Middle America Endemic <b>NMA</b> Northern Middle America Endemic	<b>P</b> = permanent resident <b>S</b> = seasonal resident <b>V</b> = visitor <b>T</b> = transient (migrant) <b>W</b> = winter resident <b>X</b> = one or two records only <b>BFM</b> Submontane broadleaf forest <b>BFL</b> Lowland broadleaf forest <b>PFM</b> Submontane pine forest <b>PFL</b> Lowland pine forest <b>SC</b> Scrub, low second growth <b>SA</b> Savanna <b>WL</b> Wetland habitats with emergent vegetation <b>LA</b> Lagoons, ponds, rivers, streams <b>O</b> Overhead/aerial

Species		Status	Habitats	Endemism
White-collared Seedeater	<i>Sporophila torqueola</i>	vP	SC,SA	MA
Thick-billed Seed-Finch	<i>Oryzoborus funereus</i>	fP	PW,SC,SA	
Yellow-faced Grassquit	<i>Tiaris olivacea</i>	IP	SC	
Orange-billed Sparrow	<i>Arremon aurantiirostris</i>	cP	BFM,BFL	
Green-backed Sparrow	<i>Arremonops chloronotus</i>	cP	BFL,SC	NMA
Rusty Sparrow	<i>Aimophila rufescens</i>	IP	PW	MA
Grayish Saltator	<i>Saltator coerulescens</i>	fP	SC	
Buff-throated Saltator	<i>Saltator maximus</i>	cP	BFL	
Black-headed Saltator	<i>Saltator atriceps</i>	cP	BFL	MA
Black-faced Grosbeak	<i>Caryothraustes poliogaster</i>	cP	BFM,BFL	MA
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	cT	BFM,BFL	
Blue-black Grosbeak	<i>Cyanocompsa cyanooides</i>	cP	BFM,BFL	
Blue Grosbeak	<i>Passerina caerulea</i>	cT	SC	
Indigo Bunting	<i>Passerina cyanea</i>	cT	SC	
Painted Bunting	<i>Passerina ciris</i>	oT	SC	
Dickcissel	<i>Spiza americana</i>	uT	SC,WL	
Melodious Blackbird	<i>Dives dives</i>	vP	SC	MA
Great-tailed Grackle	<i>Quiscalus mexicanus</i>	oV	SC	
Bronzed Cowbird	<i>Molothrus aeneus</i>	uP	SC	
Giant Cowbird	<i>Molothrus oryzivorus</i>	uP	SC	
Black-cowled Oriole	<i>Icterus prothemelas</i>	cP	BFL,PW,SA	MA
Orchard Oriole	<i>Icterus spurius</i>	cW	SC	
Yellow-backed Oriole	<i>Icterus chrysater</i>	IP	PW	
Yellow-tailed Oriole	<i>Icterus mesomelas</i>	cP	SC,LA	
Baltimore Oriole	<i>Icterus galbula</i>	cW	BFM,BFL	
Yellow-billed Caticue	<i>Amblycercus holosericeus</i>	cP	BFL,PW	
Chestnut-headed Oropendola	<i>Psarocolius wagleri</i>	IP	BFL	
Montezuma Oropendola	<i>Psarocolius montezuma</i>	cP	BFL	MA

<b>Status Legend</b>	<b>Habitat Preferences within CBWS Legend (Adapted from Jones and Valley, 2001)</b>
v = very common	<b>BFM</b> Submontane broadleaf forest
c = common	<b>BFL</b> Lowland broadleaf forest
f = fairly common	<b>PFM</b> Submontane pine forest
u = uncommon	<b>PFL</b> Lowland pine forest
o = occasional	<b>SC</b> Scrub, low second growth
l = local	<b>SA</b> Savanna
<b>Regional Endemics Legend (L. Jones)</b>	<b>WL</b> Wetland habitats with emergent vegetation
<b>MA</b> Middle America Endemic	<b>LA</b> Lagoons, ponds, rivers, streams
<b>NMA</b> Northern Middle America Endemic	<b>O</b> Overhead/aerial

**Reference Sources for Species List:**

- Emmons et. al. (1996).** Cockscomb Basin Wildlife Sanctuary.
- Kamstra (1987):** Ecological Survey of Cockscomb, Kamstra (1987)
- Meadows et. al. (1990).** The Cockscomb Basin Expedition Report.
- Jones L. and A. Valley (2001).** An annotated checklist of the Birds of Belize.
- BBIS:** Belize Biodiversity Information System.
- Cockscomb Basin Wildlife Sanctuary Staff 2003/2004.** pers.comm.

**Table 26: Species expected to occur within CBWS but not yet recorded**

Species	Scientific Name	Notes
Brown Pelican	<i>Pelecanus occidentalis</i>	Occasional flyovers possible
Lesser-Yellow-headed Vulture	<i>Cathartes burrovianus</i>	Should occur to the east, over pine savanna (Cabbage Haul area)
Northern Harrier	<i>Circus cyaneus</i>	Open areas during migration
Sharp-shinned Hawk	<i>Accipiter striatus</i>	Possibly an occasional migrant
Cooper's Hawk	<i>Accipiter cooperii</i>	Should be a rare migrant
Bicolored Hawk	<i>Accipiter bicolor</i>	May be resident; a rare forest species easily overlooked
Crane Hawk	<i>Geranospiza caerulescens</i>	Rare and easily overlooked. May be resident
Broad-winged Hawk	<i>Buteo platypterus</i>	Possibly an occasional migrant
White-tailed Hawk	<i>Buteo albicaudatus</i>	May occur occasionally over pine savanna areas to the east (Cabbage Haul area)
Zone-tailed Hawk	<i>Buteo albonotatus</i>	Possibly a rare winter visitor
Crested Eagle	<i>Morphnus guianensis</i>	May be a very rare resident in deep forest
Merlin	<i>Falco columbarius</i>	Possibly an occasional migrant or winter visitor
Aplomado Falcon	<i>Falco femoralis</i>	Should occur in the pine savanna areas to the east
Sora	<i>Porzana carolina</i>	May be heard in marshy areas during migration
Killdeer	<i>Charadrius vociferus</i>	May be heard flying over during migration
Greater Yellowlegs	<i>Tringa melanoleuca</i>	May be heard flying over during migration
Least Sandpiper	<i>Calidris minutilla</i>	Possibly found around edges of seasonally ponded areas
White-winged Dove	<i>Zenaida asiatica</i>	Might be seen as an occasional fall transient in open areas
Mourning Dove	<i>Zenaida macroura</i>	Might be seen as an occasional fall transient in open areas
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	Should be an occasional transient, but is secretive and easily overlooked
Chimney Swift	<i>Chaetura pelagica</i>	May occur in fall migrations (but easily confused with Vaux's Swift).
Black-crested Croquette	<i>Lophornis helenae</i>	May be a rare resident or visitor
Purple-crowned Fairy	<i>Heliodytes barroti</i>	May be a rare or local resident
Acorn Woodpecker	<i>Melanerpes formicivorus</i>	Should be found in eastern pine areas
Tawny-throated Leaf-tosser	<i>Sclerurus mexicanus</i>	May occur above 2500ft (750m)
Spotted Woodcreeper	<i>Xiphorhynchus erythropygius</i>	May occur above 2300ft (700m)
Russet Antshrike	<i>Thamnistes anabatinus</i>	May occur at mid-and higher elevations
Northern Beardless-Tyrannulet	<i>Camptostoma imberbe</i>	May be a rare resident to the eastern side of CBWS
Fork-tailed Flycatcher	<i>Tyrannus savanna</i>	Should occur in pine areas
Speckled Mourner	<i>Laniocera rufescens</i>	Possibly a rare resident
Gray-collared Becard	<i>Pachyrhamphus major</i>	Possibly a rare resident
Bank Swallow	<i>Riparia riparia</i>	Should occur during migration
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	Should occur during migration
Nightingale Wren	<i>Microcerculus philomela</i>	Possibly resident at higher elevations
Gray-cheeked Thrush	<i>Catharus minimus</i>	Look for during migration
Mourning Warbler	<i>Oporornis philadelphia</i>	Look for, especially in spring migration
Chipping Sparrow	<i>Spizella passerina</i>	May be resident in pine woodland



Green Vine Snake (Paul Edgar)

## **Fauna – Reptiles and Amphibians**

### **Cockscomb Basin Wildlife Sanctuary**

**2004**

### The Herpetofauna of Cockscomb

The Cockscomb Basin Wildlife Sanctuary harbours a rich herpetofauna, with a total of 80 species of reptiles and amphibians recorded to date (Table 28), of which nine are species of concern. Herpetological species surveys within Cockscomb have by

#### Box 19: Herpetofauna Species Breakdown for Cockscomb

	No. Species
Salamanders	3
Anurans (frogs and toads)	24
Turtles	4
Crocodylians	1
Lizards	23
Snakes	25

no means been exhaustive, sampling periods generally having been quite brief and of very limited geographical extent, with much of the protected area remaining unstudied. Analysis of known species distributions and habitat requirements indicates that a further 33 to 35 species of herpetofauna are likely to occur within the Sanctuary (Table 29).

Stafford & Meyer (2000) analyzed Belize's reptilian herpetofauna in terms of three physiographic regions – the Northern, the Southern Lowlands and the Southern uplands. Cockscomb

straddles the latter two regions, which have 87% of their reptile species in common. In fact, Stafford's analysis indicated that the three regions share sufficient commonality not to be considered as separate faunal areas. However, they also noted that the reptile fauna of two of the upland habitat zones (above 460m) are less well known than those of the lowlands, and "remain almost completely unknown" in the case of the Elfin forest.

In terms of herpetofauna species conservation, Cockscomb plays a major role – with the likely total species tally being 112 to 114, Cockscomb harbours approximately 70% of all the reptile and amphibian species in the country. Species 'discovery' has not been uniform, with the turtles and snakes being the most under-represented taxa on the existing reserve species list – only 50% and 53% respectively of the likely totals having yet been recorded, as compared with 79% of the lizards and 90% of the amphibians. Within Cockscomb, as in many other parts of the Country, snakes are the most species rich taxon – with a further 20 to 22 possible species yet to be recorded. Thus, whilst Cockscomb covers only 2.2% of the total area of mainland Belize, it helps protect a disproportionately high percentage of the Country's herpetofauna. This very high diversity reflects the broad array of habitats and elevations within the Reserve, from the relatively tall lowland and swamp forests to the dwarfed ridge-top elfin forest in the uppermost elevations, from seasonally mesic areas to those that are permanently wet.

The amphibian community is notable for its good representation of Eleutherodactylid "rain" frogs – a genus of ground nesting frogs that are characteristic of the more humid Neotropical forests (with their damp leaf litter for much of the year), and which are absent from the less humid broadleaf forests of northern Belize. Four out of the seven species of *Eleutherodactylus* recorded in Belize have already been identified within Cockscomb, with good likelihood of two, if not all three, of the remaining species being recorded in the western portions of the Sanctuary in the future. Several charismatic amphibians are found within the Sanctuary, including the red-eyed tree frog, the glass frog and several of the other hylids, along with the Mexican burrowing toad - unfortunately in terms of visitor appeal, few of these species can regularly be observed outside of the breeding periods. The massive breeding congregations observed at the ridge-top swamp in West Basin (P. Walker, in Rath et. al. 1990) would be of tremendous appeal to visitors, but is far too remote a location to be accessible. Smaller (but still very impressive) breeding aggregations are likely to occur at small to medium sized seasonal swamp pools within a couple of kilometers of the park headquarters, and could be utilized as a focus for night tours during periods of peak breeding activity. One such breeding pool, just 10m from the Access Road, was observed during this survey – a good location for a wooden boardwalk for nocturnal guided walks.



Kamstra (1987) cited historical records of Morelet's crocodiles in the vicinity of East Basin, but concluded that they were no longer present there, but were probably still present in low numbers in the West Basin. Since then, sporadic reports of crocodiles in East Basin have been considered by the wardens to be erroneous, until they were recently (2003) able to confirm sightings in the kaway swamp on the Wari Loop Trail (E. Saqui, pers. comm.). Evidently the species has gradually been recolonizing its historical range, and is likely to re-establish a breeding population within the Sanctuary. Crocodile surveys in Stann Creek District have indicated the occurrence of hybridization between Morelet's crocodile and the American crocodile (Platt, pers. comm.) - it would be of conservation relevance to establish whether there is any genetic contamination of the Morelet's crocodile population that is currently repopulating Cockscomb. The species has high touristic appeal and could become a regular feature of a walk along that particular trail if they are not too disturbed by visitors. Whilst in recent history there have been very few instances of the species being a threat to humans, their gradual population recovery and the increased occurrence of large adult specimens (in response to many years of legal protection) could potentially shift this balance. It might be prudent to discontinue the practices of bathing and tubing in the South Stann Creek River within the Sanctuary if crocodiles of more than 1.5m in length take up residence there. Whilst adults are likely to be especially shy, the occurrence of more easily seen hatchlings (pre-dispersal) up to 0.35m in length is generally indicative of the close presence of the mother. Certainly the repopulation of the Sanctuary by crocodiles, within the Recreation Zone, should be monitored and recorded by the wardens so that possible future management / administrative actions to reduce potential risk to visitors can be based on meaningful data.

Of the various species of lizards occurring within the Sanctuary, three are more commonly seen than most others, they being two anoles and the basilisk. The basilisk is most easily recognized by the creamy yellow stripe running from the head down either side of the body, and by the large somewhat pointed crest in subadult and adult males, which may reach over 0.75m from snout to tip of tail. Females are smaller and lack the prominent crest. Anoles are relatively small lizards, commonly seen running across the leaf litter, and hopping from twig to twig in the lower shrub layer; they may also be seen motionless in a vertical position (upright or upside down) on tree trunks. Adult males can be observed bobbing their heads with their colourful dewlaps extended. The most commonly seen around the park headquarters is *Anolis lemurinus* – which rarely exceeds 0.18 – 0.20m in total length. It is most easily recognized by the dark band between the eyes, with a lighter hourglass pattern immediately behind. In the taller, more mature forest of the Antelope and Outlier trails, *Anolis uniformis* is the most commonly encountered.

To date the basic species surveys have not done justice to the Sanctuary's rich snake fauna - probably only half of the snake species within the area have yet been recorded. Of these, a diverse assemblage of colubrids is the most abundant taxon, ranging from the diminutive coffee snake to the impressive black-tailed indigo. All three species of Belize's coral snakes are present, brightly coloured specimens sometimes being seen around the park headquarters facilities; though highly venomous they are inoffensive. The fer-de-lance, whilst not uncommonly seen within the Sanctuary, does not appear to be as abundant as in the mid-late 1980's – at that stage the Sanctuary's first Manager instigated a policy of killing specimens on the main tracks close to the HQ, as he felt that their abundance posed a real threat to visitors (Taylor, pers. comm.). Whilst that policy is unlikely to have impacted the population of this species at all (Edgar, pers. comm.), the apparently somewhat reduced number of sightings in recent years is more likely to reflect the reported decrease in brown rats – following the closure of the sawmill, and abandonment of the community based at Quam Bank. In general, fer-de-lance



also tend to be found at higher densities in secondary forests and regenerating farmlands than in more mature forest, the apparent decrease in fer-de-lance sightings around the HQ in recent years could be a reflection of the maturation of this forested area. Despite various reports, the fer-de-lance is generally not aggressive – relying upon its very effective camouflage for protection. However, if injured or annoyed this snake will readily become aggressive in self-defense, and is capable of inflicting a life-threatening bite. The Sanctuary policy of ongoing trail maintenance (raking of leaf-litter, etc.), and of advising visitors of the need to keep to the paths and be on the lookout for resting snakes is the most sound approach to minimizing the risk of bites. The most commonly observed snakes, however, tend to be harmless species such as the speckled racer – a fast moving, rear-fanged snake that feeds primarily on frogs and lizards.

Table 27: Herptile Species of Concern		IUCN Criteria
Sabrinus Rain Frog	<i>Eleutherodactylus sabrinus</i>	EN
Lepus Chirping Rain Frog	<i>Eleutherodactylus leprus</i>	VU
Rainforest Toad	<i>Bufo campbelli</i>	NT
Maya Rain Frog	<i>Eleutherodactylus chac</i>	NT
Maya Mountain Frog	<i>Rana juliana</i>	NT
Blue-spotted Tree frog	<i>Smilisca cyanosticta</i>	NT
Morelet's Crocodile	<i>Crocodylus moreleti</i>	LR/cd
Tabasco Mud Turtle	<i>Kinosternon acutum</i>	LR/nt
Red-eared Slider	<i>Trachemys scripta</i>	LR/nt
EN - Endangered VU - Vulnerable LR - Lower Risk cd - Conservation Dependent nt - Near Threatened NT - Near Threatened <b>IUCN Red List of Threatened Species (2004)</b>		

In terms of species conservation for the herpetofauna of Cockscomb, most species are likely to thrive as long as their habitats are maintained. Whilst *Kinosternon acutum* is listed by the IUCN as a threatened species (lower risk – near threatened), Cockscomb is likely to continue protecting a healthy population without any specific conservation programme, in simply protecting extensive tracts of suitable habitat. In Belize, in areas surveyed, this species appears to have healthy populations in appropriate habitat and is not exposed to human hunting pressure (Edgar, pers. comm., Walker, pers. obs.).

Possible exceptions to this general rule - of habitat protection maintaining healthy herpetofauna populations - include some of the freshwater turtles – in particular two species that have not yet been recorded there, *Dermatemys mawii* (the hicatee) and *Staurotypus triporcatus* (the loggerhead). Both are species that face heavy hunting pressure throughout much of their range. *Staurotypus* will almost certainly be found to persist within some of the large swamps such as the one encountered in West Basin by the 1990 REA team. Historically, *Dermatemys* is likely to have occurred within some of the aquatic habitats within the protected area (there are unconfirmed reports of its presence in the Bladen area of the Maya Mountain extension, and in the Swasey Branch (Sho, pers. comm.)), but might well have been wiped out by past hunting pressure. *Dermatemys* in particular is especially vulnerable to illegal fishing with seine nets – such as those reportedly used by poachers entering the Snooks Eddy area and elsewhere. Greater enforcement of the no-hunting regulations of the protected area is likely to benefit both these species, assuming they do occur there. If it is confirmed to have been present in Cockscomb, the feasibility and possible justification for the re-introduction of *Dermatemys* could perhaps be explored in the future, once fishing within the reserve has effectively been stopped, and if it is not subsequently located within the appropriate habitats.

The upland amphibians are another group of herpetofauna for which simple habitat preservation might not be sufficient to maintain healthy populations. Whilst the devastating amphibian species declines and losses noted worldwide are generally taking place at elevations over 1000m (i.e. above all but the highest points in Belize), it is generally anticipated that the elevation at which these species declines

occur will decrease. Whilst there is general agreement that these declines are associated with global warming, some researchers (Gunther Kohler, pers. comm.) maintain that the fatal chytrid infections associated with these losses are symptomatic rather than causal, and in fact result from impaired amphibian immune systems caused by pesticide precipitation at higher elevations. This theory certainly has its merits, and could have relevance to the upland amphibian fauna of Cockscomb, which could indeed be susceptible to precipitated pesticide drift from the extensively farmed coastal lowlands.

**Table 28: Reptiles and Amphibians of Cockscomb Basin Wildlife Sanctuary**

Species		Kamstra 1987	Walker W. Basin 1990	Reynolds 1995	Emmons et. al. 1996	BAS BBIS
Salamander	<i>Bolitoglossa mexicana</i>				x	x
Rufescent salamander	<i>Bolitoglossa rufescens</i>			x	x	x
Salamander	<i>Oedipina elongata</i>				x	x
Rainforest toad	<i>Bufo campbelli</i>			x	x	
Marine toad	<i>Bufo marinus</i>	x	x	x	x	x
Gulf Coast toad	<i>Bufo valliceps</i>	x			x	x
Mexican burrowing toad	<i>Rhinophrynus dorsalis</i>		x	x	x	x
Maya rain frog	<i>Eleutherodactylus chac</i>			x	x	x
Leprus chirping rain frog	<i>Eleutherodactylus leprus</i>			x		
Lowland rain frog	<i>Eleutherodactylus rhodopis</i>		x		x	
Central American rain frog	<i>Eleutherodactylus rugulosus</i>				x	
Sabrinus rain frog	<i>Eleutherodactylus sabrinus</i>			x		
White-lipped frog	<i>Leptodactylus labialis</i>				x	x
Red-eyed treefrog	<i>Agalychnis callidryas</i>		x		x	x
Variegated treefrog	<i>Hyla ebraccata</i>		x		x	x
Red-footed treefrog	<i>Hyla loquax</i>				x	x
Yellow treefrog	<i>Hyla microcephala</i>		x		x	x
Cricket treefrog	<i>Hyla picta</i>		x		x	x
Stauffer's treefrog	<i>Scinax staufferi</i>				x	
Mexican treefrog	<i>Smilisca baudinii</i>		x	x	x	x
Blue-spotted treefrog	<i>Smilisca cyanosticta</i>		x		x	x
Narrowmouth frog	<i>Gastrophryne elegans</i>		x		x	x
Glass frog	<i>Hyalinobatrachium fleischmanni</i>				x	x
Sheep frog	<i>Hypopachus variolosus</i>		x		x	x
Rio Grande leopard frog	<i>Rana berlandieri</i>	x		x	x	
Maya Mountain frog	<i>Rana juliani (maculata)</i>		x		x	x
Rainforest frog	<i>Rana vaillanti (palmipes)</i>	x	x	x	x	x

**References:**

**Kamstra (1987):** An Ecological Survey of the Cockscomb Basin

**Walker (1990):** In: The Cockscomb Basin Expedition Report (Rath)

**Reynolds (1995):** In: Maya Mountain Archaeological Project (Dunham)

**Emmons et. al (1996):** Cockscomb Basin Wildlife Sanctuary

**BBIS:** Belize Biodiversity Information System

**Table 28: Reptiles and Amphibians of Cockscomb Basin Wildlife Sanctuary (cont.)**

Species		Kamstra 1987	Walker W. Basin 1990	Reynolds 1995	Emmons et. al. 1996	BAS BBIS
Tabasco mud turtle	<i>Kinosternon acutum</i>				X	X
White-lipped mud turtle	<i>Kinosternon leucostomum</i>			X	X	X
Black-bellied turtle	<i>Rhinoclemmys areolata</i>				X	
Red-eared slider	<i>Trachemys scripta</i>				X	
Morelet's crocodile	<i>Crocodylus moreleti</i>				X	
Banded gecko	<i>Coleonyx elegans</i>	X	X	X	X	X
Spotted gecko	<i>Sphaerodactylus millepunctatus</i>				X	X
Dwarf gecko	<i>Sphaerodactylus glaucus</i>	X			X	
Turnip-tail gecko	<i>Thecadactylus rapicauda</i>			X		X
Big-headed anole	<i>Anolis capito</i>		X		X	X
Ghost Anole	<i>Anolis lemurinus</i>		X	X	X	X
Smooth anole	<i>Anolis rodriguezii</i>	X				
Silky anole	<i>Anolis sericeus</i>		X		X	X
Greater scaly anole	<i>Anolis tropidonotus</i>	X			X	
Lesser scaly anole	<i>Anolis uniformis</i>		X	X	X	X
Striped basilisk	<i>Basiliscus vittatus</i>	X	X	X	X	X
Old man lizard	<i>Corytophanes cristatus</i>	X	X	X	X	X
Spiny-tailed iguana	<i>Ctenosaura similis</i>				X	
Green iguana	<i>Iguana iguana</i>	X	X		X	X
Casque-headed iguana	<i>Laemantus longipes</i>				X	
Spiny lizard	<i>Sceloporus chrysostictus</i>	X			X	
Sumichrast's skink	<i>Eumeces sumichrasti</i>	X			X	
Bronze skink	<i>Mabuya unimarginata (brachypoda)</i>		X		X	X
Cherrie's skink	<i>Sphenomorphus cherriei</i>	X		X	X	X
Central American whiptail	<i>Ameiva festiva</i>	X	X	X	X	X
Barred whiptail	<i>Ameiva undulata</i>	X	X		X	X
Yellow-spotted night lizard	<i>Lepidophyma flavimaculatum</i>		X		X	X
Alligator lizard	<i>Celestus rozellae</i>			X	X	X
Boa constrictor	<i>Boa constrictor</i>	X			X	
Crowned snake	<i>Coniophanes bipunctatus</i>				X	X
Black-striped snake	<i>Coniophanes imperialis</i>				X	X

**References:****Kamstra (1987):** An Ecological Survey of the Cockscomb Basin**Walker (1990):** In: The Cockscomb Basin Expedition Report (Rath)**Reynolds (1995):** In: Maya Mountain Archaeological Project (Dunham).**Emmons et. al (1996):** Cockscomb Basin Wildlife Sanctuary**BBIS:** Belize Biodiversity Information System

**Table 28: Reptiles and Amphibians of Cockscomb Basin Wildlife Sanctuary (cont.)**

Species		Kamstra 1987	Walker W. Basin 1990	Reynolds 1995	Emmons et. al. 1996	BAS BBIS
Black-tailed indigo snake	<i>Drymarchon corais</i>	x	x		x	x
Speckled racer	<i>Drymobius margaritiferus</i>	x			x	x
Blunt-headed tree snake	<i>Imantodes cenchoa</i>		x	x	x	x
Tropical kingsnake	<i>Lampropeltis triangulum</i>				x	
Cat-eyed snake	<i>Leptodeira frenata</i>				x	x
Cat-eyed snake	<i>Leptodeira septentrionalis</i>		x		x	x
Green tree snake	<i>Leptophis ahaetulla</i>				x	x
Green-headed tree snake	<i>Leptophis mexicanus</i>			x	x	x
Coach whip	<i>Masticophis mentovarius</i>				x	
Red coffee snake	<i>Ninia sebae</i>	x			x	x
Grey vine snake	<i>Oxybelis aeneus</i>		x		x	x
Green vine snake	<i>Oxybelis fulgidus</i>	x			x	
Puffing snake	<i>Pseustes poecilonotus</i>				x	x
Shovel-toothed snake	<i>Scaphiodontophis annulatus</i>				x	x
Snail-eating snake	<i>Sibon nebulata</i>		x		x	x
Spotted rat snake	<i>Spilotes pullatus</i>	x	x	x	x	x
False coral snake	<i>Urotheca elapoides</i>				x	
Coral snake	<i>Micrurus diastema</i>				x	
Coral snake	<i>Micrurus hippocrepis</i>		x		x	x
Coral snake	<i>Micrurus nigrocinctus</i>	x			x	
Fer-de-Lance	<i>Bothrops asper</i>	x	x	x	x	x
Jumping Viper	<i>Atropoides nummifer</i>				x	

**References:****Kamstra (1987):** An Ecological Survey of the Cockscomb Basin**Walker (1990):** In: The Cockscomb Basin Expedition Report (Rath)**Reynolds (1995):** In: Maya Mountain Archaeological Project (Dunham)**Emmons et. al (1996):** Cockscomb Basin Wildlife Sanctuary**BBIS:** Belize Biodiversity Information System**NB:** Walker's 1990 record for *Eleutherodactylus rostralis* ammended to *E. rhodopis*Reynolds' record of *Anolis bourgeaei* is considered a race of *A. lemurinus* (Lee, 1996)Kamstra's 1987 record of *Anolis limifrons* is accepted as *A. rodriguezii*

**Table 29: Herpetofauna potentially occurring within Cockscomb, but not yet recorded**

Species		Likelihood of presence and additional notes	
The following additional species of herpetofauna are thought likely, or at least possibly, to occur within Cockscomb – based largely upon known geographic ranges		?	Indicates a species which may occur there
		I	Indicates those likely to occur there
		II	Indicates those which almost definitely occur there
<b>Amphibia</b>			
Broad-headed Rainfrog	<i>Eleutherodactylus laticeps</i>	II	
Black-backed Frog	<i>Leptodactylus melanonotus</i>	II	
Veined Treefrog	<i>Phrynohyas venulosa</i>	I	
<b>Reptilia</b>			
Central American river turtle (Hickatee)	<i>Dermatemys mawii</i>	I	Could have been hunted out from lower river reaches
Narrow-bridged musk turtle	<i>Claudius angustatus</i>	I	Likely to be found in large swamps, - eg in West Basin
Mexican giant musk turtle	<i>Staurotypus triporcatus</i>	I	Likely to be found in large swamps, - eg in West Basin
Scorpion mud turtle	<i>Kinosternon scorpioides</i>	I	Likely to be found in small to medium sized swamps
Helmeted basilisk	<i>Corytophanes hernandezii</i>	II	
Rose-bellied lizard	<i>Sceloporus variabilis</i>	I	Should occur in more open, upland pine habitats
Green anole	<i>Anolis biporcatus</i>	II	
Lichen anole	<i>Anolis pentaprinon</i>	I	
Brown anole	<i>Anolis sagrei</i>	I	Likely to be found around HQ, as facilities are extended
Zacatera snake	<i>Adelphicos quadrivirgatus</i>	I	
Rusty-headed snake	<i>Amastridium veliferum</i>	II	
Mussurana	<i>Clelia clelia</i>	?	
Culebra panza amarilla	<i>Coniophanes fissidens</i>	I	
Schmidt's striped snake	<i>Coniophanes schmidti</i>	I	
Black-naped forest racer	<i>Dendrophidion nuchale</i>	I	
Dryad snake	<i>Dryadophis melanolomus</i>	II	
Tropical rat snake	<i>Elaphe flavirufa</i>	I	
Yucatan hook-nosed snake	<i>Ficimia publia</i>	?	
Red-banded snake	<i>Oxyrhopus petola</i>	I	
Neotropical rat snake	<i>Senticolis triaspis</i>	II	
Pygmy snail sucker	<i>Sibon sanniola</i>	I	
Sartorius's snail sucker	<i>Sibon sartorii</i>	I	
	<i>Tantilla schistosa</i>	I	
Yucatan dwarf short-tailed snake	<i>Tantillita canula</i>	I	
Central American ribbon snake	<i>Thamnophis proximus</i>	I	Likely to be found in large swamps.
Black water snake	<i>Tretanorhinus nigroluteus</i>	I	Likely to be found in streams and large swamps.
False coral	<i>Urotheca elapoides</i>	I	
False fer-de-lance	<i>Xenodon rhabdocephalus</i>	I	
Eyelash viper	<i>Bothriechis schlegelii</i>	II	Recorded in Maya Mountain Reserve, Reynolds, 1995.
Tropical rattlesnake	<i>Crotalus durissus</i>	I	Likely to be found in more disturbed & open habitats.
Rainforest hognosed Pit-Viper	<i>Porthidium nasutum</i>	I	

### Fish of Cockscomb Basin Wildlife Sanctuary

A total of nineteen fish species have been recorded to date within Cockscomb Basin Wildlife Sanctuary, from eight different families (Table 30). Whilst the fish of Cockscomb have not yet been studied in detail, two of the river systems - Swasey and Trio Branches (both tributaries of Monkey River) – have been investigated in some depth, in terms of water parameters and fish fauna (Esselman, 2001). For the purpose of this report, data from Esselman has been supplemented with observations of fish fauna from the South Stann Creek and tributaries within the protected area, and from data collected by the Maya Mountain Archaeological Project, working in Trio Branch/Swasey areas (1992) and East Basin (1995) (MMAAP, Dunham). The most extensive fish species distribution study within Belize, by Greenfield and Thomerson (1997), concentrated on the coastal zone areas, with no monitoring points in the Cockscomb/Maya Mountain extension areas, and therefore provides little information on the fish fauna of the protected area.

Central America is in a relatively unique position with regards its fish fauna. It was an island prior to the late Pliocene, isolated from the north and south American landmasses by seawater. The freshwater bodies within the area were colonized by

only those fish species able to disperse through the surrounding saltwater barrier (Greenfield and Thomerson, 1997). It was only after Central America became attached to the two larger landmasses that other freshwater species were able to colonize the area from north and south. As this was a relatively recent event (2 to 5 million years ago), the primary freshwater species - those species with no salt tolerance - are poorly represented within the Central American land bridge, and account for only 16% of the fish species within Cockscomb. The majority of families recorded within the area are secondary and peripheral freshwater fish, both being tolerant to a certain degree of salinity - 22% of the fish are secondary freshwater species, whilst the majority (62%) belong to the peripheral freshwater fish group. This is the opposite pattern to that of all other

landmasses except Australia.

Of the nineteen species recorded within the protected area, three are Characidae species (*Astyanax aeneus*, *Brycon guatemalensis* and *Hyphessobrycon compressus*) - primary freshwater fish originally radiating northwards into Belize from South America following the formation of the land bridge. Three families represent the secondary freshwater fish recorded within Cockscomb Basin – Poeciliidae (represented by five species), Synbranchidae (one species) and Cichlidae (six species). Of the peripheral freshwater fish, four species from three families have been recorded – Haemulidae (one species), Mugilidae (two species) and Eleotridae (one species).

Dependent on the geology of the area, the river systems of Cockscomb can be divided into two different categories - those rivers that drain granite and Santa Rosa Group metasediments (tributaries of South Stann Creek, Swasey Branch and Trio), and those that drain the Bladen volcanic rock and surrounding limestone (Richardson Creek and other southern tributaries of Bladen Branch). The water of rivers draining the granite and metasediments is rich in phosphorus, though with low nitrogen levels, low conductivity and a basic pH. Conversely those rivers draining the volcanic rock and adjacent limestone are low in phosphorus, but have a higher level of nitrogen, high conductivity, and a neutral pH (Esselman, 2001).

The differing phosphorus levels have a very strong bearing on the flora and fauna found within these rivers. Phosphorus is particularly important as a plant growth

#### Box 20

##### Primary Freshwater Fish –

Freshwater species with no salt tolerance

##### Secondary Freshwater Fish –

Freshwater species only able to cope to a certain degree with saline conditions

##### Peripheral Freshwater Fish –

Species with a greater salt tolerance, capable of moving between fresh and salt water



promoter in freshwater systems, resulting in more abundant aquatic plant life (especially *Marathrum oxycarpum*), providing greater shelter and food resources, enabling greater aquatic invertebrate abundance and biomass – which can be expected to result in an increased abundances and biomass of fish. *M. oxycarpum* is present at elevated levels in South Stann Creek, Swasey Branch and Trio Branch, all of which drain areas of granite and metasediments, and can be expected to show far greater abundance of plant life than the phosphorus-poor Richardson Creek.

This is supported by studies in the area showing that pool habitats in granite areas supported significantly greater densities of fish (Esselman, 2001), with fish such as *Xiphophorus helleri* - species that prefer densely vegetated habitat - expected to be present. Those rivers draining the volcanic porphyrite – Richardson Creek and Bladen Branch – are nitrogen rich but low in phosphorus, and as a result, have little macrophytic growth, and can therefore be expected to have lower abundances of fish, although richness has been shown to be similar between stream types (Esselman 2001).

### Box 21: Water System Categories within Cockscomb

#### Upper Reaches/Headwaters

Fast moving creeks and streams, with waterfalls, pools and riffles, draining steeper slopes. Vegetation often meeting overhead.

#### Middle Reaches

Slower moving, wider creeks and rivers meandering along the valley bottom. Some wider, faster flowing riffles in places, but no waterfalls. Little gradient. Open to sun.

Of the three water system categories – upper reaches (headwaters), middle reaches, and lower reaches (estuarine) (Box 21) - only two (upper and middle reaches) are represented within Cockscomb, as the protected area has no direct contact with the coastal areas. The majority of the streams and creeks within Cockscomb fall within the upper, or 'headwaters' category, characterized by fast running streams, waterfalls, pools and riffles, often carved deep into the bedrock, with tropical broadleaf forest on either bank, branches meeting overhead and shading the water. It has been shown that there is decreasing species richness and diversity with increasing distance from the sea (Esselman, 2001), with this being further reduced on entering the upper reaches, with increasing number of waterfalls and riffles effectively blocking movement of fish upstream. The

headwaters areas do, indeed, appear to be species depauperate - in the waterfall pools of Tiger Fern and Ben's Bluff, for example, the only species observed was the twospot livebearer (*Heterandria bimaculata*). *Agonostomus monticola* is reported to be present in some of the fast flowing upper reach streams of Juan Branch and Sale-si-Puede areas, where it is sought by fishermen (G. Sho, pers. comm.), though its presence in these streams is yet to be confirmed.

Moving downstream, to the middle reaches of the river systems, water flows through the floodplains, with little variation in gradient. The character of the waterway changes from the fast moving streams of the headwaters to slower, wider, deeper, meandering rivers, interspersed in places with shallower riffles, as seen in the South Stann Creek as it flows past the River Walk in East Basin. *Heterandria* is joined by a number of the Poeciliidae species, and *Astyanax aeneus*, this latter being the most abundant fish observed within the protected area. Schooling *Agonostomus monticola* were observed gathering in groups of between ten and fifteen in the deeper pools. The cichlidae and species such as *Poecilia mexicana*, appear to be confined to the middle reaches within Cockscomb, before the first of the major waterfalls that impede movement up-stream.

Nine kilometers to the east of Cockscomb, the Access Road passes through an adjacent watershed area (Cabbage Haul Watershed), crossing Cabbage Haul Creek. Whilst this entire watershed is outside of the Cockscomb area, it is interesting to note that as well as observing several species recorded within the protected area (*A. aeneus* and *C. salvini* among them), two further species were

recorded here that have not yet been recorded for Cockscomb – *Cichlasoma octofasciatum* and a *Rhamdia* sp. (*laticauda* or *guatemalensis*), possibly the same species as was identified to genus in Trio Branch by the MMAP (1992). As Cabbage Haul Creek runs parallel with South Stann Creek, and lies only 10km north, flowing over similar terrain, it would seem likely that these species may also occur within South Stann Creek, dependent on the ability of these species to move beyond Bull Reef Falls, as the river passes through the Cabbage Haul Ridge.

One species of cichlid requires further investigation. It was observed but not caught in South Stann Creek at the end of the River Path, where it appeared to be abundant, and is thought to be *Vieja synspilum*, in a particularly golden-yellow form. This species was also recorded from upper Swasey Branch (G. Sho pers. comm.) and from Trio/Swasey area during the MMAP, being referred to by the local name 'tuba' (MMAP, 1992). Esselman, however, saw no sign of this species whilst working in Trio Branch, and Greenfield and Thomerson (1997) show the range as extending only as far south as North Stann Creek valley. It therefore requires confirmation before being added to the species list.

There is pressure on the fish populations of Cockscomb, with numbers decreasing with increasing fishing with gillnets (Sho, pers. comm.; E Saqui pers. comm.; J Saqui pers. comm.). This activity is particularly prevalent in the Snooks Eddy area (and west along South Stann Creek, further into Cockscomb), Double Falls area, Juan Branch, and Sale-si-Puede in the north, and Trio and Bladen Branches in the south, with people fishing for *Agonostomum monticola*, *Brycon guatemalensis* and the larger cichlids (*Petenia splendida* and *V. maculicauda*) in particular. The presence of *Joturus pichardi*, previously recorded only as far north as Honduras (Greenfield and Thomerson, 1997), is a definite attraction to the local fishermen, being one of the most coveted mullet species in the region, and therefore encouraging greater up river incursions (Esselman, pers. comm.). The fish fauna of Belize is insufficiently studied for an evaluation of the importance of Cockscomb to be made, in terms of conservation of fish species. However, there are increasing indications that throughout Belize, populations of the larger fish species – those caught for food – are declining, a problem facing Cockscomb, with the present levels of fishing within the protected area. If this illegal fishing can be halted by effective wardening, Cockscomb does indeed have an important role to play in the conservation of fish within Belize in the future.

Table 30: Fish of Cockscomb Basin Wildlife Sanctuary

Characidae	
<p><b>Central Tetra, Bilum</b> <i>Astyanax aeneus</i> Trio Branch (Esselman, 2001) South Stann Creek and middle reach tributaries (Walker, 2004) Trio Branch/Swasey (MMAP, 1992) East Basin (MMAP, 1995)</p>	<p>Widespread and ubiquitous in Belize Observed schooling in the majority of streams and creeks within the floodplain of East Basin. Presumed to be in rivers and stream of West Basin and Maya Mountain Extension as well. Is thought to be found as high as 1,000m in its range, but at Cockscomb does not appear to be present in the upper headwaters, beyond the first major waterfalls (not observed in waterfall pools of Ben's Bluff or Tiger Fern, for example), though it was observed in Juan Branch. It feeds on algae, seeds, leaves, aquatic and terrestrial insects and fish fry of any species, and is itself an important food source for larger fish.</p>
<p><b>Machaca</b> <i>Brycon guatemalensis</i> Trio Branch (Esselman, 2001) Trio Branch/Swasey (MMAP, 1992) East Basin (MMAP, 1995)</p>	<p>In Belize Greenfield and Thomerson (1997) found South Stann Creek to be the northern extent of this species within Belize, though the Central American range does extend into Mexico. Fished by buffer community members from the middle reaches of rivers and streams within Cockscomb, below the first major waterfall barriers. The young are thought to feed on terrestrial and aquatic insects, leaves, fruits and seeds but become mainly herbivorous when adult.</p>
<p><b>Mayan Tetra</b> <i>Hypessobrycon compressus</i> Trio Branch/Swasey (MMAP, 1992) East Basin (MMAP, 1995)</p>	<p>Found throughout Belize, particularly in lowland areas. Esselman only reported this from the middle reaches of the Monkey River, which would have been outside the protected area. However, MMAP recorded this species from both Trio Branch/Swasey Branch, and from East Basin.</p>
Poeciliidae	
<p><b>Pike Killifish</b> <i>Belonesox belizanus</i> Trio Branch/Swasey (MMAP, 1992) East Basin (MMAP, 1995)</p>	<p>Found throughout Belize, particularly in areas of heavy vegetation, where it lives as a predator, preying on smaller Poeciliidae and fish fry.</p>
<p><b>Sleek Mosquitofish</b> <i>Gambusia luma</i> Trio Branch (Esselman, 2001) East Basin (MMAP, 1995)</p>	<p>This species is most common in southern Belize, though it has been recorded from the New River and the River Hondo (Greenfield and Thomerson, 1997). This is, to date, the only mosquitofish recorded within Cockscomb, being observed by Esselman (2001) in the Trio area, and in East Basin (MMAP).</p>
<p><b>Twospot Livebearer</b> <i>Heterandria bimaculata</i> Trio Branch (Esselman, 2001) South Stann Creek tributaries (Walker) Trio Branch/Swasey (MMAP, 1992) East Basin (MMAP, 1995)</p>	<p>Widespread in Belize, and the only species to be observed in the waterfall pools in the headwaters of streams within the protected area (eg. Ben's Bluff and Tiger Fern waterfalls). It is also seen downstream in the middle reaches of the East Basin floodplain, and can be expected to occur under similar conditions in all other river systems within Cockscomb.</p>
<p><b>Shortfin Molly</b> <i>Poecilia mexicana</i> Trio Branch (Esselman, 2001) Trio Branch/Swasey (MMAP, 1992) East Basin (MMAP, 1995)</p>	<p>Widespread in Belize, and within Cockscomb is noted as preferring standing or slow moving water, though this species can also be observed in faster flowing streams. Greenfield and Thomerson (1997) observe that this species tends to occur in vegetated pools, so can be expected to occur in greater abundance in those streams and rivers that drain the granite and metasediments, and therefore have higher phosphorus levels, leading to greater abundance of aquatic vegetation – South Stann Creek, Swasey Branch and Trio Branch.</p>
<p><b>Green Swordtail</b> <i>Xiphophorus hellerii</i> Trio Branch (Esselman, 2001) Trio Branch/Swasey (MMAP, 1992) East Basin (MMAP, 1995)</p>	<p>Has been recorded within Belize from Gallon Jug southwards (Greenfield and Thomerson, 1997), preferring a slightly basic pH range. It is reported to favour rapidly flowing streams and rivers in heavily vegetated habitats, and is recorded by Esselman from the more southern areas of Cockscomb, such as Trio Branch. And by the MMAP in East Basin, where it is thought to occur within the South Stann Creek and Swasey Branch river systems, below the major waterfalls.</p>
Synbranchidae	
<p><b>Obscure Swamp Eel</b> <i>Ophisternon aenigmaticum</i> Trio Branch (Esselman, 2001)</p>	<p>Found in a variety of habitats from standing water in small muddy pools to clear running water in streams and larger bodies of water such as lakes. Air breathing and sometimes found crossing land or burrowed into mud. To date, only recorded from the Trio Branch area (Esselman).</p>

Table 30: Fish of Cockscomb Basin Wildlife Sanctuary (cont.)

Haemulidae	
<b>Burro Grunt</b> <b><i>Pomadasys crocro</i></b> Trio Branch (Esselman, 2001)	Greenfield and Thomerson (1997) have observed this species in Belize, in fast flowing water, feeding over gravel in the company of shortfin mollies and mountain mullet. Esselman, too, recorded this species during his studies in 2001. Inhabits rivers and creeks of low to high current velocity. Found along sandy shores and over mud bottoms in shallow water, quite common in brackish mangrove-lined lagoons. Often ascends rivers more than 100 miles from the sea. Feeds on crustaceans and small fishes.
Cichlidae	
<b>Bay Snook</b> <b><i>Petenia splendida</i></b> South Stann Creek and tributaries (Walker)	Found in middle and lower sections of rivers, and is therefore not expected to occur above the first major waterfall barrier. A pair with newly hatched young observed in the slow moving edge waters of South Stann Creek at the end of the River Walk (April, 2004). Reported to be under pressure from fishermen in the majority of the middle and lower river areas throughout Belize.
<b>False Firemouth Cichlid</b> <b><i>Amphilophus robertsoni</i></b> Trio Branch (Esselman, 2001)	In Belize, this species is widely distributed but seldom found in large numbers. Recorded from Trio Branch, but not yet observed in South Stann Creek, this species inhabits lower and middle sections of rivers in slower moving waters, preferring a soft substrate of sand, mud and small stones, where it feeds by sifting bottom sand and mud.
<b>Blue-eye Cichlid</b> <b><i>Archocentrus spilurum</i></b> Trio Branch (Esselman, 2001)	Found throughout Belize, occurring in a range of habitats, from lowland swamps to clear, cool mountain streams. Observed in South Stann Creek, and recorded from Trio Branch (Esselman, 2001). It prefers the slower moving waters of the lower river valleys.
<b>Blackbelt Cichlid</b> <b><i>Vieja maculicauda</i></b> Trio Branch (Esselman, 2001)	Recorded in clear, slow-flowing, freshwater waters at Trio Branch (Esselman, 2001). Within Cockscomb East and West Basins, it should be found particularly in the slower moving sections of the rivers where they pass through a flat floodplain area, preferring shady bank areas with a muddy or sandy substrate, and with submerged trees and logs for protection.
<b>Yellow belly Cichlid</b> <b><i>Cichlasoma salvini</i></b> Trio Branch (Esselman, 2001) South Stann Creek and tributaries (Walker) East Basin (MMAP, 1995)	Prefers moderate to fast flowing waters of the lower and middle river valleys. It was observed in Trio Branch (Esselman, 2001), at the end of River Walk in the South Stann Creek, and also at the bridge on the Access Road, outside the protected area.
Mugilidae	
<b>Mountain Mullet</b> <b><i>Agonostomus monitcola</i></b> Trio Branch (Esselman, 2001) South Stann Creek and tributaries (Walker) Trio Branch/Swasey (MMAP, 1992)	Adults live in the freshwater rivers and streams of Cockscomb, in rapid flowing water of the riffles as well as quieter pools and slower flowing water. Young grow at sea, then ascend far inland up the Monkey River and South Stann Creek, to spend all their adult life in tributaries of these rivers. They tend to be few and solitary in upper streams, but form uneven schools in larger streams at lower elevations, as seen at the end of River Walk. Feeds on crustaceans, a variety of insects. Heavily impacted by fishing activities of the buffer communities. Dunham (1995) reports that fish caught locally weigh up to 7kg or more.
<b>Bobo Mullet</b> <b><i>Joturus pichardi</i></b> Trio Branch (Esselman, 2001)	Adults inhabit the upper reaches of rivers such as Monkey River, Swasey and South Stann Creek, but seasonally move downriver to brackish waters where spawning is thought to occur. An important food-fish that is impacted by local illegal fishing activities within the protected area. This herbivorous fish primarily scrapes algae from stones on the bottom with its fleshy lips, though will sometimes eat prawns.
Eleotridae	
<b>Bigmouth Sleeper</b> <b><i>Gobiomorus dormitory</i></b> Trio Branch (Esselman, 2001) Trio Branch/Swasey (MMAP, 1992)	A large, nocturnal, carnivorous and benthic fish that inhabits larger free flowing clear water streams. Recorded in Trio Branch (Esselman, 2001). It is generally recorded lying on the bottom in slower moving part of streams, sometimes on logs or large stones and on leaf debris or gravel.
Gobidae	
<b>River Goby</b> <b><i>Awaous banana</i></b> Trio Branch (Esselman, 2001)	Recorded at Trio Branch (Esselman 2001). This species prefers clear, fast flowing, well oxygenated streams.

**Table 31: Fish Species requiring verification**

<p><b>Jack Dempsey</b>  <i>Cichlasoma octofasciatum</i>                  Cabbage Haul Creek (Walker, pers. obs.)</p>	<p>Widespread in Belize, but normally preferring pools and swamps in the middle and lower reaches of rivers. Breeding pairs observed in the slow flowing pools of Cabbage Haul Creek at the point where it is crossed by the Access Road.</p>
<p><b>Redhead Cichlid</b>  <i>Vieja synspilum</i>                  South Stann Creek and tributaries? (Walker)                  East Basin (MMAP)</p>	<p>Observed in South Stann Creek, at the end of River Walk...however identification not yet confirmed. If confirmed, this would be a range extension to the south for this species.</p>
<p><b><i>Atherinella sp.</i></b>                  Trio Branch/Swasey (MMAP, 1992)</p>	<p>Recorded by MMAP from Trio Branch/Swasey Branch</p>
<p><b><i>Rhamdia sp.</i></b>                  Trio Branch/Swasey (MMAP, 1992)                  Cabbage Haul Creek (Walker, pers. obs.)</p>	<p>A small, shoaling catfish observed in the fast flowing riffles of Cabbage Haul Creek. Probably <i>Rhamdia laticauda</i></p>

**Many thanks to:**  
 Peter Esselman  
 Ed Boles  
 Geronimo Sho

**For their input into this section**

### Lepidoptera of Cockscomb Basin

To date, a total of 162 species of butterflies and 26 moth species have been recorded within Cockscomb Basin Wildlife Sanctuary, ranging from the miniature beauty of the Lycaenidae to the metallic blue of the *Morpho* species.

#### Box 22: Breakdown of Butterfly Families at CBWS

Family	No. of Species
Hesperiidae	44
Lycaenidae	17
Nymphalidae	82
Papilionidae	10
Pieridae	9
<b>Total</b>	<b>161</b>

**Butterflies:** A number of researchers have studied the butterflies of the Wildlife Sanctuary over the years, starting with Godman and Salvin (1901), Boomsma and Measey (1992), J. Young (2003, 2004), J. Shuey (1988, 1999) and most recently C. Schutte (2004) on behalf of Shuey (pers.com.). Sampling techniques used within the Sanctuary for butterfly species have focused on two techniques – collecting with a net, and using fruit-baited traps in both open and forest environment. Much of the work has concentrated around the headquarters and trails close by which, over the timeframe of the more recent work, has been in a state of

regeneration since the closure of the sawmill and the move of the Quam Bank community to Maya Centre in 1985.

This updated species list includes several range extensions, such as *Heliconius sapho*, recorded for the first time in Stann Creek (Meerman, 2001), and *Remalia vopiscus*, *Memphis proserpina* and *Agrias aedon* all being new additions to the overall Belize species inventory, from data collected during the most recent survey (Schutte /Shuey, pers.com., 2004). *Agrias aedon rodriguezii*, the sub-species found within Belize, is recorded from Mexico south to Costa Rica, and is highlighted as particularly rare within the region (Shuey, pers. com., 2004). Before 1980, this species was known only from a single specimen from Guatemala, and references from Costa Rica suggest that it is only known from two localities, both above 600m (DeVries, 1987).

Indicator species of disturbed and forest edge habitats – *Agraulis vanillae*, *Mestra amymone* and *Anartia fatima*, for example – are present in the maintained open areas and trails of the Headquarters site (Walker, pers. obs.). Studies in the Amazon show that butterflies such as these can be a good indicator of edge effect, penetrating into the first 250m or more of forest habitat (Brown and Hutchings, 1997). This can provide a useful means of monitoring disturbance levels along roads, trails or clearings, and should be borne in mind when allocating areas for research of designating transect routes for monitoring butterfly distribution or abundance.

A number of forest obligate species have also been recorded from the area, both from the secondary regenerating forest, and the more remote, more pristine forested trails further from the Headquarters - though in both they were observed in very low numbers (Boomsma and Measey, 1992). One of these, *Fountainea euryple*, is identified in the Selva Maya monitoring protocol (Pozo de la Tijera, 1999) as an important indicator of primary forest habitat throughout the Selva Maya region, though this species can be lured into small clearings, having been recorded from fruit traps set in the CBWS HQ clearing, and along forest edges. Other species indicative of these habitats include the clearwing *Aeria eurimedia*, the Heliconiinae *Heliconius sapho* (noted as intolerant of disturbance by DeVries, 1987), and *Euptychia mollis*, a Satyrinae that seldom leave the shade of the forest.

Also recorded from Cockscomb is the flamboyant *Morpho peleides*, which shows a preference for the forest trails, being observed frequently on the River Path and Victoria Peak Trail (Walker, pers. obs.). A second species of *Morpho* – *Morpho theseus* – was also recorded at the Headquarters (Shuey, pers. comm., from a



record by Andrew Neild, 1997), though this species is more commonly associated with upland areas of forest, where they typically fly high over the forest canopy (DeVries, 1987).

At present the species list for Cockscomb is incomplete, with the majority of the research work being located in East Basin. Since the establishment of the protected area, it appears that no survey work has been done in the less disturbed, more mature forest of West Basin, in the limestone hills of the southern parts of the Maya Mountain Extension, nor in the Elfin ecosystem of higher elevations. This latter ecosystem, in particular, should yield some interesting, highly specialised species - it is expected that a greater proportion of the lepidoptera of these upland areas will feed primarily on nectar (as fruit is a relatively scarce resource in these upper elevations), compared with the many primarily fruit feeding species of the lowland forests recorded to date.

Butterflies have great visitor appeal, whether they are rare forest species or the common 'weed species' found in disturbed areas. Actions within the management plan deal with ways in which these species can be encouraged within the landscaping of the Cockscomb Headquarters site.

**Many thanks to:**

John Shuey

**For his input into this section**

**Table 32: Butterfly Species of Cockscomb Basin Wildlife Sanctuary**  
**J. Shuey (pers. comm. 2004)**

Systematics follows P. Ackery (1984)

Hesperiidae		Hesperiidae (cont.)	
<b>Pyrrhopyginae</b>	Elbella scylla	<b>Hesperiinae</b>	Pompeius pompeius
	Jemadia hospita		Conga chydaea
	Pyrrhopyge zenodorus		Anthoptus epictetus
	Pyrrhopyge erythrosticta		Corticea corticea
<b>Pyrginae</b>	Heliopetes arsalte	<b>Papilionidae</b>	
	Pyrgus adeptus	<b>Papilioninae</b>	Eurytide ilus
	Pyrgus oileus		Eurytides phaon
	Aguna aurunce		Parides eurimedes
	Astraptes aulestes		Parides sesostris
	Astraptes phalaecus		Parides panares
	Astraptes fulgerator		Parides erithalion
	Autochton neis		Battus laodamas
	Autochton zarex		Battus chalceus
	Autochton longipennis		Papilio thoas
	Autochton bipunctatus		Papilio cresphontes
	Epargyreus exadeus	<b>Pieriidae</b>	
	Polygonus manueli	<b>Coliadinae</b>	Anteos maerula
	Urbanus tanna		Eurema albula
	Urbanus pronta		Eurema nise
	Urbanus albimargo		Eurema lisa
	Udranomia kikkawai		Eurema दौरा
	Eantis thraso		Phoebis argante
	Grais stigmaticus		Phoebis agarithe
	Helias cama		Aphrissa statira
	Antigonus nearchus		Aphrissa boisduvalii
	Carrhenes fuscensens	<b>Lycaenidae</b>	
	Mylon pelopidas	<b>Riodininae</b>	Leucochimona nivalis
	Nisoniades godma		Mesosemia lamachus
	Pachyneuria licisca		Eurybia lycisca
	Paches loxus		Lyropteryx lyra
	Ouleus fridericus		Charis gynaea
	Spathilepia clonius		Charis velutina
<b>Hesperiinae</b>	Callimormus saturnus		Thisbe irenea
	Remella vopiscus		Juditha molpe
	Remella remus		Menander purpurata
	Vehilius illudens		Argyrogrammana holosticta
	Lerema accius	<b>Lycaeninae</b>	Zizula cyna
	Panoquina evansi		Arawacus togarna
	Damas clavus		Eumaeus toxea
	Perichares philetus		Pseudolycaena damo

Based on fieldwork by:

Godman and Salvin (1901); J. Shuey (1988, 1999); Boomsma (1992);  
 Meerman (2001); Young (2003, 2004); Schutte (2004)

Lycaenidae (cont.)		Nymphalidae (cont.)	
<b>Lycaeninae</b>	Strymon mulucha	<b>Charaxinae</b>	Archaeoprepona demophon
	Celmia celmus		Archaeoprepona demophoon
	Mercedes demonassa		Archaeoprepona amphimachus
<b>Nymphalidae</b>			Prepona dexamenus
<b>Heliconiinae</b>	Actinote guatemalena		Prepona omphale
	Dione juno		Agrias aedon
	Agraulis vanillae		Siderone galanthus
	Dryadula phaetusa		Fountainea euryppyle
	Dryas iulia		Memphis oenomais
	Eueides aliphera		Memphis herbaceae
	Eueides Isabella		Memphis pithyusa
	Heliconius charithonia		Memphis proserpina
	Heliconius erato	<b>Morphinae</b>	Antirrhoea miliades
	Heliconius ismenius		Morpho theseus
	Heliconius sapho*		Morpho peleides
<b>Nymphalinae</b>	Historis odius	<b>Brassolinae</b>	Opsiphanes boisduvalii
	Historis acherronta		Opsiphanes tamarindi
	Smyrna blomfieldia		Opsiphanes quiteria
	Colobura dirce		Opsiphanes cassina
	Anartia fatima		Caligo illioneus
	Junonia genoveva		Caligo memnon
	Chlosyne janais		Caligo uranus
	Anthanassa tulcis	<b>Satyrinae</b>	Pierella luna
	Tegosa guatemalena		Cissia pseudoconfusa
	Eresia clara		Cissia labe
	Mestra amymone		Cissia libyoidea
	Myscelia cyaniris		Cissia renata
	Myscelia ethusa		Euptychia westwoodi
	Catonephele mexicana		Euptychia mollis
	Catonephele numilia		Hermeuptychia hermes
	Hamadryas februa		Pareuptychia metaleuca
	Hamadryas feronia		Pareuptychia ocirrhoe
	Hamadryas guatemalena		Taygetis andromeda
	Hamadryas iphime	<b>Ithomiinae</b>	Aeria eurimedia
	Hamadryas amphinome		Mechanitis lysimnia
	Hamadryas laodamia		Mechanitis polymnia
	Temenis laothoe		Ithomia patilla
	Nica flavilla		Episcada salvinia
	Dynamine mylitta		Pteronymia cotyto
	Callicore patelina		Greta oto
	Adelpha cytherea		Greta anette
	Adelpha basiloides		Hypoleria cassotis
	Adelpha iphicus	* <i>Heliconius sapho</i> recorded by Meerman (2001)	
	Marpesia Chiron	Based on fieldwork by: Godman and Salvin (1901); J. Shuey (1988, 1999); Boomsma (1992); Meerman (2001); Young (2003, 2004); Schutte (2004)	

**Table 33: Moth Species recorded for CBWS**  
Boomsma (1992)

<b>Sphingidae</b>	
<i>Sphinginae</i>	<i>Macroglossinae</i>
Agrias cingulatus	Isognathus rimosa
Cocytius duponchel	Erinnys alope
Neococytius cluentius	Erinnys ello
Manduca hannibal	Xylophanes chiron
Manduca rustica	Xylophanes tersa
Manduca corallina	Xylophanes libya
Protambulyx strigilis	Xylophanes neoptolemus
	Xylophanes undata
<b>Saturniidae</b>	
<i>Arsenurinae</i>	<i>Hemileucinae</i>
Rhescyntis hippodamia	Automeris zozine
<i>Ceratocampinae</i>	Automeris rubescens
Eacles ormondei	Periphoba arcae
Adeloneivaia jason	<i>Saturniinae</i>
Syssphinx quadrilineata	Copaxa escalantei
Syssphinx molina	Copaxa rufinans
	Xylophanes undata

**Moths:** The only survey of the moths known to have been conducted to date within the Wildlife Sanctuary focused on Saturniidae and Sphingidae – the Silkmoths and the Hawkmoths – in 1992, using blacklights over a five-night period (Boomsma and Measey, 1992). This resulted in the identification of a total of 26 species – 10 Saturniidae and 15 Sphingidae (of 27 Saturniidae and 106 Sphingidae listed for the country, Meerman, 1999). This suggests that further Sphingidae can be expected to be added to the species list through a more intensive survey.

### 2.3.4 Past and Present Research and Monitoring of Biodiversity

Cockscomb Basin Wildlife Sanctuary has hosted a number of research studies and biodiversity inventories since first highlighted as a potential conservation area, following research into jaguar populations by Rabinowitz (1983). The majority of these studies have focused on two key mammal species – the jaguar and black howler monkey.

**Table 34: Mammal Research within Cockscomb Basin Wildlife Sanctuary**

Year	Subject	Author
1983	A preliminary jaguar survey in Belize	A. Rabinowitz
1986	Ecology and behaviour of the jaguar ( <i>Panthera onca</i> ) in Belize, Central America	A. Rabinowitz and B. Nottingham
1987	An ecological survey of the Cockscomb Basin, Belize	J. Kamstra
1989	Movement patterns and food habits of four sympatric carnivore species in Belize, Central America.	M.J. Konecny et. al.
1989	Mammal species richness and relative abundance of small mammals in a subtropical wet forest in Central America	A. Rabinowitz and B. Nottingham
1990	The Cockscomb Basin Expedition, 11-17 <sup>th</sup> June, 1990: Final Report	Rath et. al.
1992	Cockscomb Basin Wildlife Sanctuary Lepidoptera and Odonata Survey	T. Boomsma and G. Measey
1992	Maya Mountain Archaeological Project - 1992	Dunham et. al.
1993	A reintroduction program for the conservation of the black howler monkey in Belize	Horwich et. al.
1994	Reintroduction of black howler monkeys ( <i>Alouatta pigra</i> ) into the Cockscomb Basin Wildlife Sanctuary, Belize.	Koontz F. W. et. al.
1994	The conservation status of <i>Schippia concolor</i> in Belize.	Balick, M.J. & D. Johnson
1995	Black Howler Monkey survey in Cockscomb Basin	M. Crozier
1995	Maya Mountain Archaeological Project	Dunham et. al.
1997	The feeding of translocated howler monkeys ( <i>Alouatta pigra</i> ) in Belize, Central America	S.C. Silver
1998	The spatial ecology of translocated Black Howler Monkeys in Belize	L.E.T. Ostro
1999	Ranging behaviour of translocated and established groups of Black Howler Monkeys <i>Alouatta pigra</i> in Belize, Central America	L.E.T. Ostro et al.
1999	Results of a survey of the bats of Cockscomb Basin Wildlife Sanctuary	B. Miller and C. Miller
2001	Victoria Peak National Monument – Rapid Management Appraisal	Meerman, J.C. & Minty, C.
2001	The Monkey River Baseline Study: Basic and applied research for monitoring and assessment in southern Belize	Esselman, P.
2001	Cockscomb Basin Mammal Survey	S.C. Silver et. al.
2002	Hematological responses to hematozoa in North American and neotropical songbirds	Booth, C.E. & P. F. Elliott.
2004	Survey of CBWS butterfly fauna (in prep.)	C. Schutte & J. Shuey

The World Conservation Society (WCS) has supported Cockscomb since its inception, particularly with long-term involvement in studies on jaguar. The present Camera Trap Project is utilizing Cockscomb as one of five pilot sites to develop quick and relatively cheap, non-intervention techniques for estimating numbers of jaguars within an area (Harmsen, pers comm. 2004), and is having some success in being able to identify individuals from photographs, enabling the project to build up a picture of how many jaguars live within Cockscomb, and how they utilize the area (Silver et. al., 2004). Current studies are also commencing into jaguar depredation in adjacent large cattle farms (Foster, pers. comm.).

Following the initial reintroduction of black howler monkeys into Cockscomb (Horwich et al., 1993), studies into the behaviour and progress of the translocated groups resulted in several papers, providing feedback on the success of the initial WCS

release project (Crozier, 1995; Silver, 1997; Ostro, 1998; Ostro et. al., 1999).

A 1999 survey into the bat species of the protected area developed the baseline data for this group of mammals (Miller and Miller, 1999), as did the subsequent small mammal survey (Silver et. al., 2001), which covered a wider array of mammal species, building on the original biodiversity data collected by Kamstra (1987), and Rabinowitz and B. Nottingham (1989).

WCS also established two 2km transects within Cockscomb East Basin – a transect in disturbed habitat on the Access Road, and a transect in relatively undisturbed forest on the Outlier Trail - for continuous monitoring of mammals as part of the regional network of Mesoamerican sites using the Selva Maya protocol. These transects have subsequently been relocated for easier access, and staff training for monitoring of mammals and birds is presently underway.

Stephen Russell collected birds within the Cockscomb area in 1958/1959 (Emmons et. al. 1996), but the bird species of the Sanctuary were first formally inventoried by Kamstra (1987), with a number of ornithologists visiting the area since then, adding to the species list. However apart from a single research project into hematzoan parasites of birds (Booth, 2002), no serious research studies appear to have taken place on this vertebrate group, with no development of knowledge in the distribution and densities of species of concern within the protected area.

For the other vertebrate groups - the reptiles, amphibians and fish - no in-depth surveys have taken place, though a number of rapid assessments have provided some data. By necessity, much of the work has been conducted within the more accessible East Basin, with only an initial survey of West Basin, conducted in 1990, including preliminary surveys of the herpetofauna (Walker) and plants (Meadows). Balick conducted a more general survey into the conservation status of a specific palm species, *Schippia concolor*, within Belize. The New York Botanical Gardens compiled a preliminary list of plants identified within the Sanctuary, which has been extended within this report. The present development of the Juan Branch site makes the practicalities of investigating wildlife populations in the West Basin area far more feasible.

Very little work has been conducted within the Maya Mountain extension in the southern end of the Sanctuary. The Maya Mountain Archaeological Project worked within the Trio Branch and Swasey Branch areas in 1992, looking primarily at the archaeological sites within the area, but also including baseline observation on wildlife species. This long-term study also investigated the sites of East Basin in 1995. The Trio and Swasey Branch areas were also incorporated into a study on the freshwater ecology and fish communities of Monkey River and its tributaries (Esselman, 2001).

Invertebrates have not been studied in depth – an initial report on the lepidoptera and odonata of the area (Boomsma and Measey, 1992) provide an inventory of these species observed on trails and along streams near the Cockscomb HQ. Further research on lepidoptera within the protected area is currently underway (J. Shuey, 2004, pers. com.), and has updated and enlarged the species list for this group, as well as adding several new records for Belize.

At present there is no cohesive outline under which research can be conducted, and there are problems with the submission, storage and retrieval of reports – both through non-submittal by researchers, and through a lack of a dedicated storage system, making access to past work difficult. This should be partially resolved in terms of species presence data through the Belize Biodiversity Information System, once it has been updated, but access to research reports would be facilitated by their digitization, making them more readily available, and more reliably stored.



### 2.3.5 Archaeological Interest

Belize was settled extensively by the Maya, with a civilization that expanded from 2,000BC to 900 AD before declining prior to the arrival of the Spanish. This is seen within Cockscomb, with the presence of a number of sites, all of potential interest to visitors. However at present, visitation to these sites is non-existent except by illegal looters.

#### Box 23: Notable Maya Structures within CBWS

##### Pearce Ruins

Ballcourt  
4 major courtyards  
Main plaza larger than a football field  
At least 6 reservoirs  
9 plain granite monuments  
1 egg shaped monolith  
Monument workshop

##### Huntul Mo ('One Macaw')

Terraced hillside  
Circular alter stone with 2 Oval monuments at base  
Large plaza  
Several plain granite monument slabs

##### Xa'ayilha ('Many Waters')

Large plaza  
3 Plain granite monuments  
Ball court

The Maya favoured the lowland areas, with settlements focused on river trade routes and good farming land. For this reason, little attention has been paid to the Maya Mountains in the past, until the 1990's, when a series of archaeological explorations were carried out in the area under the Maya Mountains Archaeological Project (MMAP, Dunham). Both Cockscomb Basin and Trio Branch were explored, and evidence of Maya settlement was confirmed, with numerous small sites scattered throughout the lower lying areas. Six larger sites were also located and mapped, three being within Cockscomb Basin itself, and a further three on Trio Branch, all dating from the Late or Terminal Classic (AD700 – 900).

The most important of the sites are the Pearce Ruins, which were first recorded in 1931 by Lee Pearce, whilst searching for mahogany in the area. Following their initial discovery, they then faded into legend until being rediscovered in 1995 under the MMAP. This ceremonial site (one of the largest in southern Belize) is thought to have been the most important settlement in Eastern Cockscomb, and is situated at the junction of the main tributaries. This gave it control of the surrounding area, and of movement of natural resources such as granite and trade goods in and out of the South Stann Creek watershed. All other sites within the protected area are considered to be satellites of the Pearce Ruins (MMAP 1995).

Huntul Mo ('One Macaw') is a smaller ceremonial centre located on Sittee Branch. There is some debate as to whether this site may include Kuchil Balum, originally highlighted by Rabinowitz (1986), though descriptions of the two appear to differ in some respects. A third site, Xa'ayilha ('Many Waters') is found at the junction of the major feeder creeks of the upper Swasey Branch – again, located close to the river system that was so essential for trade links.

These three sites, and many of the smaller sites of lesser complexity, have signs of looting – some just with minor damage, whilst others have whole buildings destroyed, as seen at the Pearce Ruins and Xa'ayilha. This looting activity is continuing at present, with hunters and fishermen regularly passing the sites as they move through the Sanctuary, using South Stann Creek and Juan Branch, some stopping to dig for artifacts.