WILDLIFE CONSERVATION AND CULTURAL CONSERVATION IN PAPUA NEW GUINEA

DOCUMENTING THE CULTURAL USE OF WILDLIFE IN PAPUA NEW GUINEA AND ITS IMPLICATIONS FOR WILDLIFE CONSERVATION

Wildlife Conservation Society Papua New Guinea programme

WILDLIFE CONSERVATION SOCIETY

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The vision of WCS PNG is "*Gutpela sindaun, gutpela solwara, gutpela bus*"
which translates to "*Empowered people with healthy forests and seas*"

Front Cover Photo: Women from Namta, Eastern Highlands Province, wearing traditional hats made from skins of the endangered Goodfellow's Tree Kangaroo, by Nathan Whitmore.

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For further information contact:

Richard Cuthbert (rcuthbert@wcs.org) or (wcspng@wcs.org)

WCS PNG Programme, PO Box 277,

Goroka, Eastern Highlands Province,

Papua New Guinea

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EXECUTIVE SUMMARY

The interaction between biological diversity and cultural diversity is nowhere more apparent than in Papua New Guinea, where the country's rich diversity of animals and plants – estimated to be around 8% of the world's terrestrial biodiversity – is matched by the extraordinary diversity of cultures with more than 800 languages recognized in the country. These distinct cultures utilize the birds, mammals and plants around them for food, medicines, materials and shelter, but also draw on this biological diversity for the cultural beliefs that underpin the country's diverse cultures. This relationship between nature and culture reaches its visual peak in the traditional costumes and outfits that are worn at cultural events in Papua New Guinea. The extravagant head-dresses and other items made from feathers of various species of parrots, birds of paradise and skins from tree kangaroos and other marsupial mammals are famous throughout Papua New Guinea and beyond, and are strongly identified with the country's image.

While the use of wildlife in outfits (known as "*bilas*" in tok pisin) is well known, the potential impact of this on wildlife populations in the country is virtually unknown and has important implications both for the conservation of Papua New Guinea's unique species as well as for the conservation of the cultural diversity that relies on this biodiversity for *bilas*. In this study we undertook a quantitative survey of the wildlife used in *bilas* through visiting cultural shows around the country over a 15-month period during 2012-2013. These cultural shows attract performers from around the country and the team gathered information from 164 cultural groups and nearly 500 outfits from 16 provinces of the country

The survey revealed broad patterns about the use of wildlife in *bilas* as well as revealing patterns of use for 25 native species, two naturalized species and a number of non-native and artificial items that are used as substitutes for native species in *bilas*. Most of the variation in the use of species could be explained by the location of the cultural group, with broad patterns of use in species occurring at the district or provincial scale. As well as geography the gender of the performer was another important factor for understanding the prevalence of use of different species; with marked differences between men and women for certain items, including the use of substitute species. The relatively large spatial scale of these patterns of species use is surprising given the more than 800 distinct languages in Papua New Guinea with their own cultures and unique *bilas*. However, these patterns of use reflect the underlying biological diversity and the distribution of birds, mammals and other species in the country, with in almost all cases cultural groups' only using species whose spatial distribution overlapped with their own land. The exception to this geographic overlap was in the use of shells of marine molluscs. Shells have traditionally been traded and used all over Papua New Guinea as a currency, for their use in bride price and other ceremonies and as *bilas*, and the study revealed that the highest numbers of shells in *bilas* occurred in the Highlands and Momase regions of the country, with Highland areas obviously being distant from the coast where shells were collected.

As well as revealing information about the use of native species, one of the most striking findings of the study was the number of non-native and artificial items recorded in outfits, with these items being used as substitutes for native species. These items included plastic and cardboard shaped and painted to appear like kina shells (that actually come from the Pearl Oyster *Pinctada maxima*); wire and blue painted plastic shaped in to the antenna like head plumes

of the King of Saxony Bird of Paradise *Pteridophora alberti*; the use of cushion covers and car seat covers and other "fake fur" materials in place of the fur of cuscus (Phalangeridae) and tree kangaroos (Macropodidae); and the use of rubber, plastic and cloth to cover *kundu* drums in place of monitor lizards (Verandidae) and cuscus skins. As well as using artificial items in bilas the study also found that skins and feathers of non-native and domesticated species were also being used as replacements with fur of domestic cats and rabbits used in place of native mammals. The most common species recorded in the whole study was the domestic chicken *Gallus gallus*, with chicken feathers recorded from 36% of outfits. In 6% of instances chicken feathers were dyed red and were used in certain Highland districts as a substitute for the bright scarlet feathers of the increasingly scarce New Guinea Vulturine Parrot *Psittrichas fulgidus*. Chickens are commonly kept throughout Papua New Guinea, but the study also revealed that feathers from the Blue Peacock *Pavo cristatus* and Ring-necked Pheasant *Phasianus colchicus* that are native to Asia. The use of these two species was only observed in Simbu Province and Western Highlands Province and these feathers must have been imported in to the country.

The use of non-native species and artificial substitutes in outfits indicates that *bilas* is not static and that traditional patterns of use of species that have been established for generations are subject to ongoing cultural change. These changes in the use of wildlife in Papua New Guinea may to some degree be due to the rapid modernisation that is happening in the country and whereas in the past items within *bilas* could only be hunted from a clans surrounding land there is now an increasing trend for commoditisation of *bilas,* and items within *bilas* and whole outfits are increasingly purchased or hired for use. As well as modernisation the other factor that may be driving the increasing use of substitutes in bilas is the scarcity of native species. Performers within cultural groups reported that a large number of species were increasingly hard to find in the wild and the reported scarcity of different species was positively correlated with their cost. Using information on a species (or species group) prevalence of use in *bilas* and its conservation threat status (based on the IUCN Red List) the study produced a threat ranking for 29 native species used in outfits in Papua New Guinea. This national threat ranking placed the New Guinea Vulturine Parrot as the top ranked species, followed by Goodfellow's Tree Kangaroo *Dendrolagus goodfellowi*, Central Ranges Tree Kangaroo *Dendrolagus notatus*, three cassowary species *Casuarius* spp. and New Guinea Harpy Eagle *Harpyopsis novaeguinea*. Nine of the top 20 threatened species/species groups were bird of paradise (Paradisaeidae). Based on these results the WCS PNG program has already initiated targeted research and conservation for Goodfellow's Tree Kangaroo and Vulturine Parrots, and as our work expands we will target other priority species.

The rapid modernisation of Papua New Guinea and the country's celebration of its diverse cultures will continue to place ongoing pressures on the natural habitats that support Papua New Guinea's biodiversity as well as on the populations of birds, mammals and other species within them. Understanding how these factors will interact and the potential impact on the conservation status of species within the country is impossible to foresee, other than some degree of change will be inevitable. These changes are already occurring in the selection and use of species in *bilas* and one important aspect of this study is that it has established a baseline for monitoring future changes in the cultural use of wildlife in the country. Ongoing monitoring will be essential for understanding these changes and for prioritizing actions for conserving both the biological and cultural diversity of Papua New Guinea.

ACKNOWLEDGEMENTS

We are very grateful to the chairmen and committees of the cultural shows at Alotau, Balimo, Wabag, Goroka, Kokopo, Lae, Madang, Wewak, Mount Hagen, Kavieng and Wau for their permission to undertake these surveys and support for this work, and to all of the performers within cultural groups who freely gave their time to be interviewed and photographed during the survey. Within WCS PNG we appreciate the work of Arison Arihafa and Sylvia Noble for their assistance in collecting information from the shows and to Ben Ruli and William Tamarua for their help in analysing images of performers. We would also like to thank all of the local field assistants who assisted in data collection at each show. This research was generously funded by a grant from The Christensen Foundation to study "Interactions between Nature and Culture in Papua New Guinea – Grant Reference 2011-4609825" and we are grateful for their support.

INTRODUCTION

Papua New Guinea (PNG) is perhaps the most bio-culturally diverse nation on earth. It includes an estimated 8% of the world's terrestrial biodiversity in less than 1% of the world's land area and 850 languages and associated cultures representing around 12% of the world's languages (Lewis *et al.* 2014). PNG is also unique in that nearly all of its land and reefs remain under customary tenure, so when sufficiently empowered, local people have the ability for determining the future of their lands and the wildlife and cultures it contains. Despite this and since the first contact with outsiders, both biological and cultural diversity have borne the brunt of an onslaught of destructive forces. Industrial logging, mining, and agriculture, as well as a rapidly expanding human population using improved technology, have impacted nature. At the same time, missionaries, migration, education, and commerce have had just as dramatic an impact on the country's unique cultural heritage.

The cultural beliefs of many of the peoples in PNG make no distinction between nature and culture, or land and humans. Past work by WCS suggest that this relationship between people and nature is breaking down, and there is concern about this among performers at cultural shows across the country. Despite the primacy of the relationship between people and nature in PNG, until this current study, little consideration was given to the impacts of hunting for subsistence and cultural use in a rapidly growing and modernizing world, and the effects of the declines of key species on local culture. For instance, the number of animals harvested annually for cultural purposes was unknown, as was basic ecological information about impacted species. In addition, approaches aimed at conserving this rich bio-cultural diversity are scarce. People in many PNG communities in which WCS has worked wish to make informed natural resource management decisions, as do many performers we have spoken to at cultural shows. However, neither currently has access to the necessary information to do so.

This documents reports on a two-year study undertaken by the Wildlife Conservation Society (WCS) in PNG that was established to document the cultural use of wildlife in the country. The study focused on the use wildlife in traditional outfits (a practise known in Tok Pisin as *bilas*). Pilot work undertaken by WCS at the Goroka Cultural Show (the largest such event in the country, that attracts 1,000-1,500 performers from across PNG) suggested that the use of wildlife in *bilas* is significant. Further, both mammal and bird species that are considered at risk of extinction are present in great numbers in traditional costumes at these shows, including for example skins of the globally Endangered Goodfellow's Tree Kangaroo *Dendrolagus goodfellowii* and feathers of the Vulnerable Vulturine Parrot *Psittrichas fulgidus*. Furthermore interviews with performers surveyed at the shows indicated that more than three quarters were concerned about dwindling numbers of wildlife and more than half indicated that they now purchased feathers and skins because they cannot find them on their lands.

In this report we document the use of wildlife in traditional costumes through an extensive survey of performers at cultural shows across PNG, report on broad-scale patterns of the use of wildlife in the country and individual species accounts for the most important species, produce a priority list of at risk species that are likely to be threatened by the use of *bilas*, and report on the key factors that are driving changing patterns of use and scarcity of wildlife.

METHODS

SURVEYS AT CULTURAL SHOWS

In order to sample the use of wildlife in *bilas* decorations we visited 11 cultural shows that were distributed across PNG (Figure 1). These shows were at Alotau, Balimo, Wabag, Goroka (in 2012 and 2013), Kokopo, Lae, Madang, Wewak, Mount Hagen, Kavieng and Wau. Visits were undertaken from July 2012 to September 2013. At each show we undertook structured interviews with performers and surveyed the wildlife used in *bilas* from a sample of cultural groups present. Selection of groups was based on them having wildlife materials in their dress.

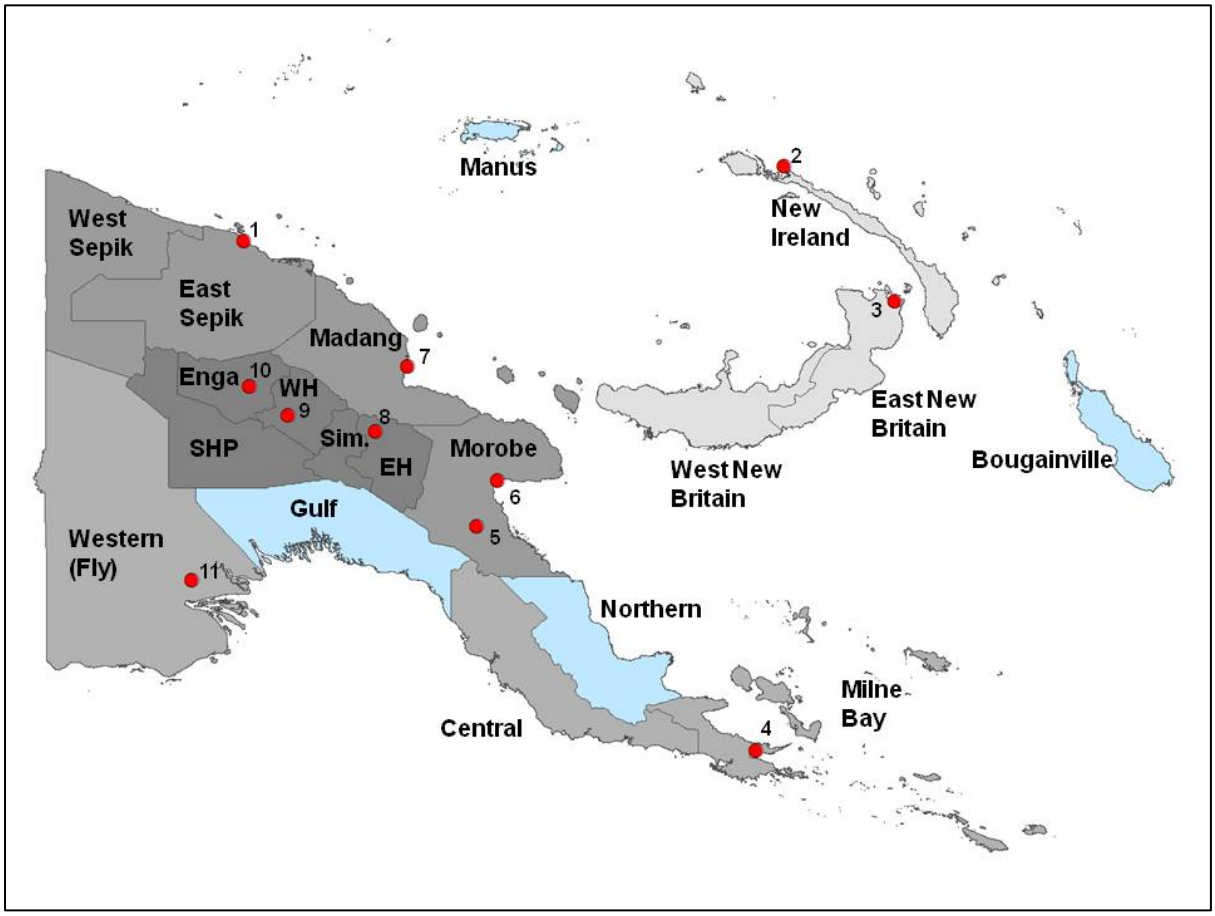

Figure 1. Provinces where information on *bilas* was obtained in this study for the Island (light grey shading), Papua (medium-light), Momase (medium-dark) and Highland (dark grey) regions. No information on *bilas* was obtained from Manus, Bougainville, Gulf and Northern provinces (light blue shading). Abbreviations for - provinces are EH = Eastern Highlands, WH = Western Highlands, Sim. = Simbu. Towns where cultural shows were attended are indicated by red symbols, numbers refer to: 1 = Wewak, 2 = Kavieng, 3 = Kokopo, 4 = Alotau, 5 = Wau, 6 = Lae, 7 = Madang, 8 = Goroka, 9 = Mount Hagan, 10 = Wabag and 11 = Balimo.

Data collection was led by a WCS staff member with the assistance of 3-6 locally recruited assistants, who had completed high school education. Local assistants were recruited 1-2 days before the show and trained and tested in the interview techniques to be used. Both male and female assistants were recruited, with the latter undertaking interviews with female performers if it was culturally sensitive for male staff to undertake these interviews.

For each cultural group we collected information on the name, location (region, province and district), the total number of performers and gender. We enumerated the bilas outfits from individual members of each group from photographic and digital video images (mean 3.3 ± 1.39 outfits per cultural group [± 1 standard deviation], range 1-12 outfits). The species present were identified from reference bird and mammal guides for the region (Beehler et al. 1986; Flannery 1995). If necessary, photos and video materials were reviewed later on to confirm the species identify. As far as possible all *bilas* materials were identified to the species level, although in some instances this was not possible and these items were categorized to the nearest taxonomic grouping (e.g. plumes from the three species of cassowary are almost identical and were classified to the Casauridae family). For each *bilas* species or species group present we counted the total number of individual feathers, skins, shells and other items present. All items were counted with the exception of cassowary plumes and small cowrie shells as discrimination of individual plumes and shells was impossible when these occurred in large numbers. In such situations presence/absence was recorded. Where possible, we also classified feathers as contour, tail or flight feathers and recorded if a whole bird was present. Similarly, we recorded if mammal skins consisted of a tail, pelt or whole pelt. Following data collection on outfits a sub-sample of performers (n = 146) were interviewed to obtain information on the cultural importance of different *bilas* materials, how items were obtained (hunted, traded or purchased), hunting methods and cost (if relevant), the age and replacement frequency of outfits, and performer's views on whether different species were plentiful or hard to find.

ANALYSIS

To investigate patterns of variation in the use of wildlife in cultural decorations we fitted generalized linear models (GLM) on the prevalence of broad species groups and key individual species in *bilas* and also modelled the number of species and number of items within the broad species groups. We constructed ten candidate models based on *a priori* consideration of the factors that may be most significant for explaining patterns of variation in *bilas*. These factors were: Cultural Group, District, Province, Region, Gender, Cultural Group + Gender, District+ Gender, Province+ Gender, Region+ Gender, and one null model with no explanatory variables to represent a baseline poor fitting candidate model. Analyses were undertaken in Program R version 3.0 (R Core Team, 2013) and the suite of models was assessed in an information-theoretic model testing framework (Burnham & Anderson 2002) with the best-fit model determined by the lowest Akaike's Information Criteria (AICc). When there was no clear top model (AICcWt <0.8) we explored the top two or three models, depending on the degree of support from the weighted AICc values. GLMs for the prevalence of each species or species grouping utilized information on the presence/absence of species utilizing data from all 485 outfits surveyed, with presence/absence coded as a binomial distribution in the analysis. GLMs

for the number of items (e.g. feathers or skins) in *bilas* decorations were modelled for outfits where these items were recorded (i.e. the analysis excluded zero counts) with the count of items coded as a Gaussian distribution.

Broad categories of wildlife in *bilas* were classified in to four major groups. These were "native birds" (based on information from BirdLife International 2014), "native mammals" (Flannery 1995; IUCN Red List of Threatened Species 2014), "shells" representing a wide variety of marine molluscs used in *bilas*, and "reptiles" mainly consisting of monitor lizards *Varanus* spp. but also including pythons Boidae. We also undertook separate analyses on "naturalized mammals" consisting of feral and domesticated pigs *Sus scrofa* and domestic dogs *Canis familiaris* which have both been present in PNG for thousands of years and are culturally important species. Finally, we included a category of "*bilas* substitutes" consisting of feathers of the domestic chicken *Gallus gallus*, imported feathers from non-native bird species, skins of domestic cats *Felis catus* and artificial substitutes made from plastic, cardboard and other materials used as imitations of native wildlife.

To investigate if there were broad geographic patterns in the species and number of items in *bilas* we undertook a cluster analysis of the data, incorporating all data (i.e. zero counts for species absence and quantitative data on the number of items), and clustering to the province level. Cluster analyses and resulting diagrams were undertaken in Program R. We investigated the factors influencing the prevalence of use of individual species by fitting the same ten candidate models (as described above) to the species presence/absence and undertook this for the 25 most commonly used species recorded from across PNG.

In order to prioritize *bilas* species of conservation concern we calculated the overall prevalence of use for all species or species groups across all shows and assigned a threat status to each species based on the following equation:

$$\text{PNG Threat Score} = GE * \ln(2) + (P_{bilas} * 4/N \text{ species}) * \ln(2)$$

Where GE is the species Red List category (IUCN 2014) on the following linear scale: Least Concern = 0, Near Threatened 1, Vulnerable = 2, Endangered =3, and Critically Endangered = 4, where each increment of the Red List category represents a doubling of extinction risk (following Isaac et al. 2007). P_{bilas} is the species prevalence (from 0 to 1) within all outfits surveyed and was multiplied by 4 to place this on the same linear scale as the GE category (i.e. 0 to 100% prevalence in *bilas* results in a range of scores from 0 to 4). And N species is the number of species present in the *bilas* species category (i.e. N = 3 for the three species of cassowary). For groups that could not be identified to species level (e.g. Cassowaries and Crowned Pigeons) and that consisted of multiple species with varying threat status (the Dwarf Cassowary is ranked as Near Threatened, whereas the Southern and Northern Cassowary are both Vulnerable) we used the higher threat status in the weighting. Naturalized species and introduced species were not included in this process as we were primarily interested in the conservation threat to native species.

SPECIES AND BILAS MAPS

Species distribution maps and maps on the frequency of occurrence of different items were prepared in ArcMap 10.2, with the distribution of birds and mammals in PNG downloaded from BirdLife International and NatureServe (2013) and IUCN Red List of Threatened Species (2014), respectively. The distribution of species within PNG is indicated by red shading, with species absent in areas of grey shading (see Figure 2). For species groups where species could not be separated to the individual level (e.g. cassowaries) we mapped the distribution of all species contributing species

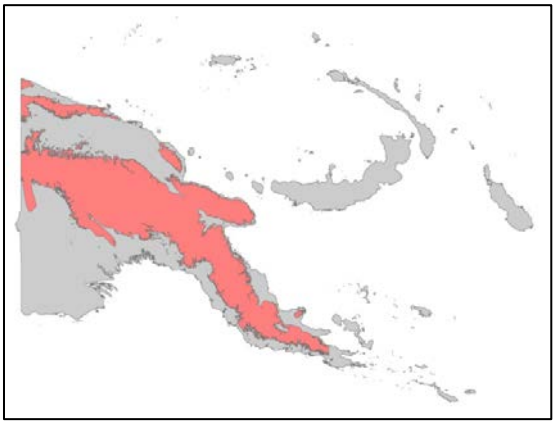

Figure 2. Example map indicating a species distribution (shaded red) in PNG.

The prevalence of species in *bilas* outfits was mapped against the regional, provincial or district boundaries (depending on the model selection as detailed above). Provinces or districts that were not surveyed are indicated by light blue shading in all maps. The prevalence of species within each region, province or district is indicated by grey shading (absent) and red graduated shading in four categories (see Figure 3). Two new provinces (Hela and Jiwaka) were created in PNG in 2012 at the time of the surveys. To avoid any confusion on the location of cultural groups we assigned all information to the older 20 province structure of PNG, with Hela and Jiwaka being listed under their former geographic groupings of Southern Highlands and Western Highlands, respectively.

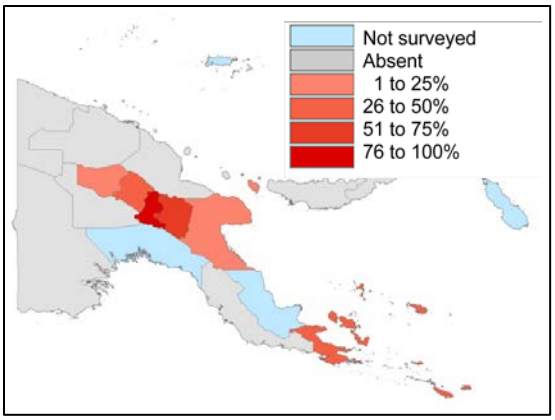

Figure 3 Example map for the prevalence of a species use in *bilas* mapped at the province level.

RESULTS

In total we surveyed 164 cultural dance groups from 16 provinces and 46 districts, with information collected on the *bilas* present in 485 outfits. Detailed interviews on the origin and status of *bilas* were undertaken with 146 performers. Outfits and performers came from across PNG, although more information was collected from the Highlands and Momase regions in comparison to Papua and the Islands regions (Table 1).

SPECIES PRESENT IN BILAS

Feathers were the most common item found in *bilas* materials, being present in 97% of all decorations (Table 2). Of these, 90% of avian materials were from native species, with 40% of the remainder comprising three non-native species within the Phasianidae family (Domestic Chicken *Gallus gallus*, Blue Peacock *Pavo cristatus* and Ring-necked Pheasant *Phasianus colchicus*). The majority of native birds used in *bilas* came from just five families, these being in decreasing order of prevalence the Psittacidae (recorded in 69% of decorations), Paradisaeidae (53%, including feathers from 12 species of Birds of Paradise), Casauriidae (30% of decorations and likely to represent all three cassowary species in PNG), Accipitridae (13%, with the New Guinea Harpy-Eagle *Harpyopsis novaeguineae* the most commonly recorded species), Tytonidae (6%, potentially including feathers from four *Tyto* owl species present in PNG) and Columbidae (2%, only represented by Southern Crowned Pigeon *Goura scheepmakeri* and Victoria Crowned Pigeon *Goura victoria*). The Psittacidae were the most common group of birds, however feathers came from just six species: Sulphur-crested Cockatoo *Cacatua gallerita* (35%), Vulturine Parrot *Psittrichas fulgidus* (33%), Eclectus Parrot *Eclectus roratus* (6%) and a minimum of three species of Lorikeet and Lory (totalling 31%). Other birds that were only rarely recorded (<0.5%) included members of the Laridae (gulls and terns) and Alcedinidae (kingfishers) families. Overall 37 native bird species were recorded as present in *bilas* decorations, comprising 5.3% of the 702 bird species present in PNG.

Skins, pelts, tusks and teeth from mammals were found in 51% of outfits (Table 2), with the majority of these (32%) comprising Phalangeridae (Cuscus species) including the Mountain Cuscus *Phalanger carmelitae*, Ground Cuscus *Phalanger gumnotis*, Silky Cuscus *Phalanger sericeus* and Common Spotted Cuscus *Spilocuscus maculatus*. Tree kangaroos (Macropodidae) were found in 8.2% of decorations, with Goodfellow's Tree Kangaroo *Dendrolagus goodfellowi* identified with certainty and based on the distribution and fur the Central Ranges Tree Kangaroo *Dendrolagus notatus*. The only other native mammals recorded in *bilas* were the black and white striped Petauridae possums and most likely to be represented by the Long-fingered Triok *Dactylopsila palpator* and/or the Striped Possum *Dactylopsila trivirgata*. Tusks of wild boar *Sus scrofa* were commonly used and present in 27% of *bilas*. Other non-native species used in *bilas* included teeth from domestic dogs *Canis familiaris* (3%) and skins from domestic cats *Felis catus* (1%).

Table 1. Number of outfits surveyed and performers interviewed by region and province.

Regions	Outfits	Interviews	Provinces	Outfits	Interviews
Highlands	288	82	Eastern Highlands	78	21
			Enga	27	13
			Simbu (Chimbu)	81	16
			Southern Highlands	12	3
			Western Highlands	90	20
Islands	24	21	East New Britain	15	11
			New Ireland	6	7
			West New Britain	3	3
Momase	128	25	East Sepik	25	9
			Madang	39	9
			Morobe	61	6
			West Sepik	3	1
Papua	45	18	Central	3	-
			Milne Bay	15	8
			Western (Fly)	27	10
Total	485	146	-	485	146

Shells of marine molluscs were the second most common *bilas* item after bird feathers and were found in 64% of all decorations. Shells mainly consisted of Pearl Oyters (Pteriidae family) that are commonly known as kina shells, as well as a large range of smaller shells from at least eight other mollusc families (see section on cowries and other shells in the individual species accounts. Reptile species, primarily monitor lizards *Varanus* spp., were found in 17% of *bilas* and were mainly used as the covering for kundu drums. Interviews with performers and photographs indicated that snake skins were also used in addition to monitor lizards, with these most likely consisting of skins from the ten species of pythons (Boidae family) found in PNG (O'Shea 1996). The only insects recorded in *bilas* were scarab beetles (Scarabaeidae) and were observed on 2% of outfits.

Table 2. Major species groups, number of species recorded in outfits (if known, estimated (~) or unknown) and percentage occurrence in *bilas* outfits.

Group	Species	Occurrence
Birds	36	97%
Casauridae (cassowary spp.)	3	30%
Accipitridae (birds of prey)	2+	13%
Bucerotidae (hornbill)	1	0.5%
Psittacidae (parrot spp.)	~6	69%
Paradisaeidae (birds of paradise)	12	53%
Phasianidae (chicken, pheasant, peacock)	3	40%
Tytonidae ("barn" owls)	~1	6%
Columbidae (pigeon/dove spp.)	2	2%
Other birds	2+	3%
Molluscs	6+	64%
Cowrie and other smaller shells	8+	49%
Pteriidae (kina shells)	1	33%
Mammals	8	51%
Phalangeridae (cuscus)	4	32%
Macropodidae (tree kangaroo)	2	8%
Petauridae (triok/stripped possum)	~2	4%
Canidae (domestic dog)	1	3%
Felidae (domestic cat)	1	1%
Suiidae (domesticated and wild pigs)	1	27%
Reptiles (monitor lizards and pythons)	Unknown	17%
Insects (scarab beetles)	Unknown	2%

BROAD PATTERNS OF SPECIES USE IN BILAS

In order to assess broad scale patterns of species use in *bilas* we analysed the prevalence of native birds, native mammals, shells and reptiles in *bilas* outfits as well as the number of bird items (feathers and whole birds), number of mammal and reptile skins, and number of larger shells in *bilas*. The analysis of each group indicated that the prevalence of these items was best explained at the province level for shells and reptiles, whereas the prevalence of native birds and native mammals was best explained at the district level (Table 3). Shells most frequently occurred in outfits in the island provinces of New Ireland, East and West New Britain and in the coastal province of Madang. The prevalence of native birds in *bilas* showed no clear pattern, with wide variation at the district level across the country. In contrast, the highest prevalence of native

mammals was clustered in districts within the highlands region. The prevalence of reptiles in *bilas* was best explained at the provincial level and the use of reptiles was broadly distributed across most provinces of the country.

Variation in the number of feathers or whole birds was best explained by District + Gender, whereas variation in the number of mammals and was best explained by Province or Gender. There was no clear pattern for the number of bird feathers or whole birds within *bilas* with districts in all four regions of Papua New Guinea showing wide variation. In contrast, there was a clear indication that the highest number of mammals items was from the Simbu and the Eastern Highlands. Less information was available for the number of shells, as shells were not counted in outfits from the islands region. For the number of shells in *bilas* there was roughly equal support for Region + Gender and Province + Gender as the model with the best explanatory power (Table 3). For the "mainland" of Papua New Guinea there was a higher number of shells in outfits from the Highlands and Momase region, and lower usage in Papua. There was very little variation in the number of reptile skins in outfits, with typically skins from monitor lizard and snakes being used on a single *kundu* drum. The fit of the models to the number of reptile skins was generally poor, but best explained by Cultural Group. The geographic variation in these broad patterns of species use can be seen in the distribution maps in Figure 4 and Figure 5.

Gender was an important factor in explaining the prevalence of species use or number of items for all four of these broad groups of wildlife. There was a general tendency for female performers to more frequently have shells (women 79% of outfits versus men 52%), native mammal species (women 56% versus men 18%), and native birds (women 96% versus men 87%). In contrast men were more likely to have reptiles skins (primarily used on *kundu* drums), with reptiles found in 24% of men's *bilas* in comparison to 10% of female's *bilas*. Variation in the number of items was less clear cut, with the exception of the number of native mammal skins where women had an average of 2.2 ± 1.3 skins per outfit (± one standard deviation) in comparison to men who had an average of 1.6 ± 1.1 skins per outfit, and the number of native birds where men wore an average of 64 ± 71 feathers and whole birds in outfits versus 43 ± 44 feathers and whole birds on women. Both sexes used very similar numbers of shells (on average women 69, men 63). However the variation in shell numbers was heavily skewed with some participants have many hundreds and in one instance more than a thousand shells in their *bilas*. Both sexes had similar number of reptile skins (women 1.4 ± 1.2, men 1 ± 0). With the exception of the number of native mammal skins in outfits (where variation in numbers was equally well explained by Gender and Province; Table 3) the variation in prevalence and number was best fitted by models with Gender as an additive term to Cultural Group, District, Province or Region (Table 3).

Table 3. Top models for main categories of *bilas* indicating the type of analysis (presence/absence or quantitative), model selected, number of parameters (K), Akaike's Information Criterion with a small sample correction (AICc, difference between current and top model (Delta AICc), the relative likelihood of the model (Mod Weight), cumulative model weight (Cum Weight) and maximised value of the log-likelihood function (LL).

Bilas category	Analysis type	Model	K	AICc	Delta AICc	Mod Weight	Cum Weight	LL
Shells	Presence/Absence	Province	15	461.41	0.00	0.49	0.49	-215.19
		Province + Gender	16	462.04	0.63	0.34	0.85	-214.44
	Quantitative	Region + Gender	6	3872.89	0.00	0.31	0.31	-1930.30
		Province + Gender	15	3873.40	0.51	0.24	0.55	-1920.86
		Region	5	3873.92	1.03	0.18	0.73	-1931.86
Native birds	Presence/Absence	District	46	368.27	0.00	0.72	0.72	-133.20
		District + Gender	47	370.18	1.91	0.28	1.00	-132.93
	Quantitative	District + Gender	45	4332.57	0.00	0.66	0.66	-2115.49
		District	44	4333.94	1.37	0.34	1.00	-2117.44
Native mammals	Presence/Absence	District	46	417.82	0.00	0.53	0.53	-157.98
		District + Gender	47	418.88	1.05	0.31	0.84	-157.28
	Quantitative	Province	8	557.61	0.00	0.30	0.30	-270.35
		Gender	4	557.66	0.05	0.30	0.60	-270.71
		Province + Gender	9	557.71	0.10	0.29	0.89	-269.29
Reptiles	Presence/Absence	Province + Gender	16	412.26	0.00	0.92	0.92	-189.55
	Quantitative	Group + Gender	4	-5542.27	0.00	1.00	1.00	2775.40

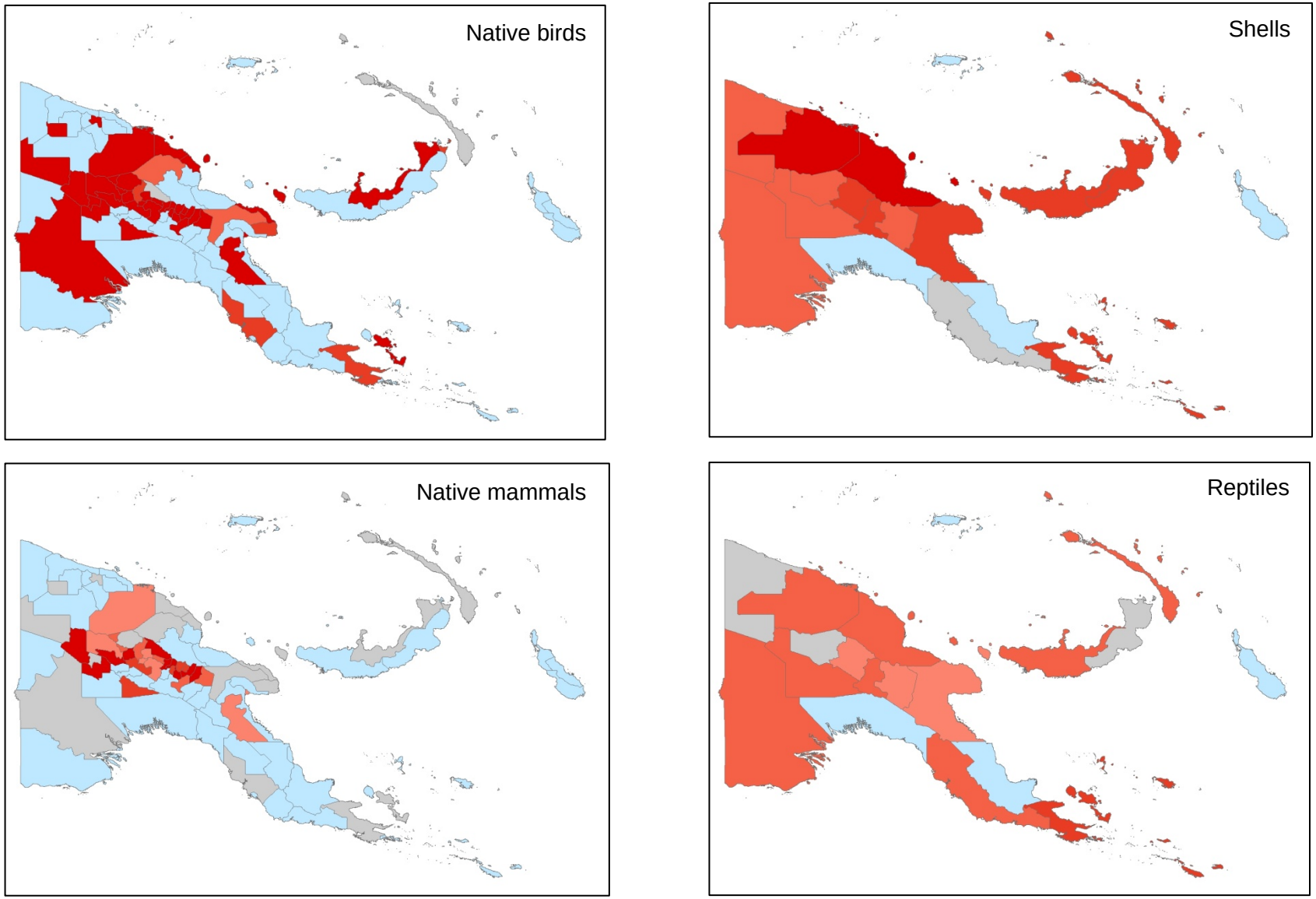

Figure 4. Distribution maps for the prevalence of occurrence of native birds, native mammals, shells and reptiles in *bilas*

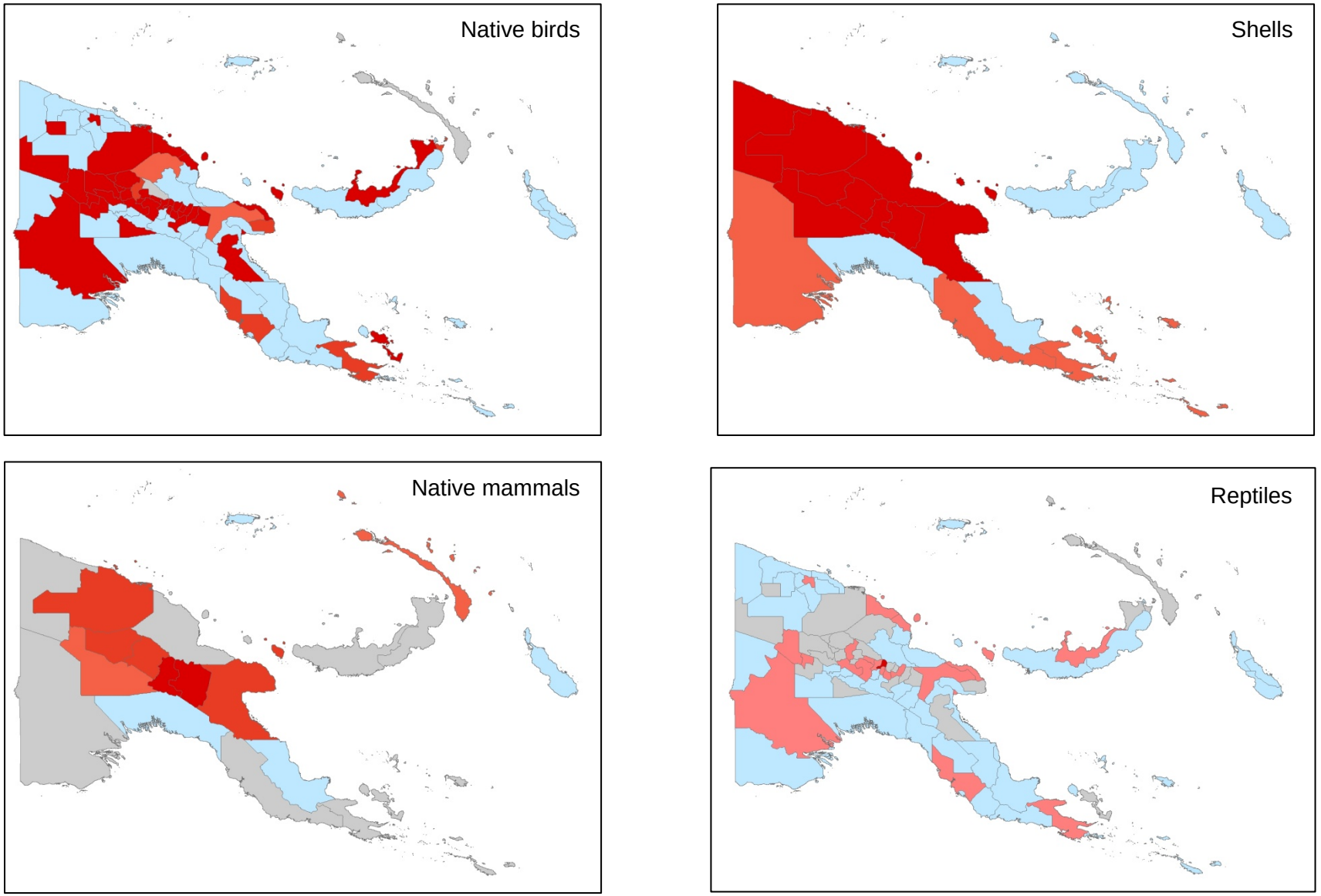

Figure 5 Distribution maps for the number of native birds (feathers and whole birds), native mammals, larger shells and reptiles in *bilas*.

NATURALIZED MAMMAL SPECIES IN BILAS

Wild and domesticated pigs have long been important in Papua New Guinea and the keeping of pigs as a mark of wealth and their presentation at wedding ceremonies and other culturally important occasions is widespread across the country. Domesticated dogs are widespread in Papua New Guinea and are used for multiple purposes: for hunting of prey, companionship, food and bilas (especially teeth). Pigs and dogs ranked numbers 8 and 26 in their prevalence of use in *bilas*, occurring in 27% and 3% of outfits, respectively. Pig tusks were the most frequently worn item from this species, although the use of hair and bristles was also recorded.

On average performers wore 4.2 ± 9.8 sets of pig tusks, but there was a wide variation in numbers used, ranging from a single set of tusks up to 98 tusks seen on one man from Madang Province. Pig tusks were usually worn as a necklace containing one set to multiple tusks (Figure 6). Variation in the use of pig tusks in *bilas* was best explained by a model that included District + Gender as factors (AICcWt = 0.96). Men were more likely to wear pig tusks than women (31% versus 21% of *bilas*, respectively). There was wide variation in the prevalence of use across Districts, with *bilas* from districts in West New Britain, Milne Bay, Southern Highlands and Western Highlands having the highest prevalence of this species (Figure 7). There were too few records of dogs in *bilas* to analyse the spatial distribution of this species. Dog teeth were worn by both men (8 records) and women (6 records), and were typically worn as a necklace containing an average of 24.1 ± 20.7 teeth (range 5 to 78).

necklace in *bilas*.

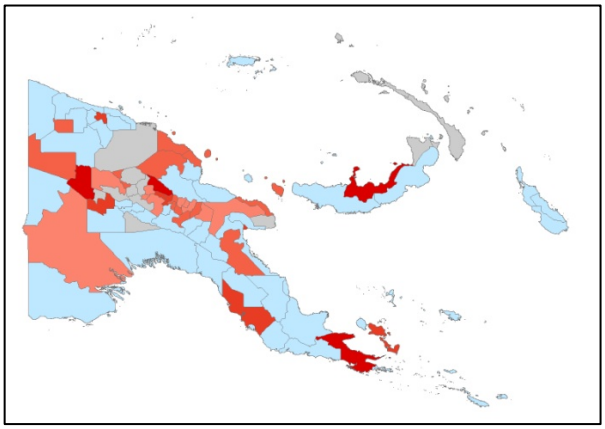

Figure 7. District variation in the prevalence of use of pig tusks in *bilas*.

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USE OF BILAS SUBSTITUTES

A wide variety of natural and artificial substitutes were seen in *bilas*, with 40% of outfits containing feathers from the Phasianidae family (chickens and pheasants) and outfits containing items of plastic, cardboard and wood shaped and in some instances coloured to look like natural items. Widely used artificial items included the use of cut plastic glued to wires to look like the head plumes of the King of Saxony Bird of Paradise *Pteridophora alberti*. More infrequent and bizarre items artificial items included the use of cushion covers and car seat covers as substitutes for the fur of cuscus and other mammals, as well as the use of cat skins and domesticated rabbit skins as substitutes for native mammals.

Detailed information was collected on the presence of chicken feathers in *bilas* and overall feathers from this species were seen in over a third (36%) of outfits. White chicken feathers (28% of outfits) and black chicken feathers (13%) were both used in *bilas*. In addition, red-dyed chicken feathers were also used and found in 6% of outfits and appeared to be used as a substitute for the bright scarlet feathers of the Vulturine Parrot. While the chicken is not a native species it is domesticated and kept throughout the country. In contrast, the Blue Peacock and Ring-necked Pheasant do not occur in Papua New Guinea and these species naturally occur in Asia (although have been introduced to many countries around the world as ornamental and game birds). Feathers from these two species must have been bought or brought in to the country and they were found in 14% (peacock) and 5% (pheasant) of outfits.

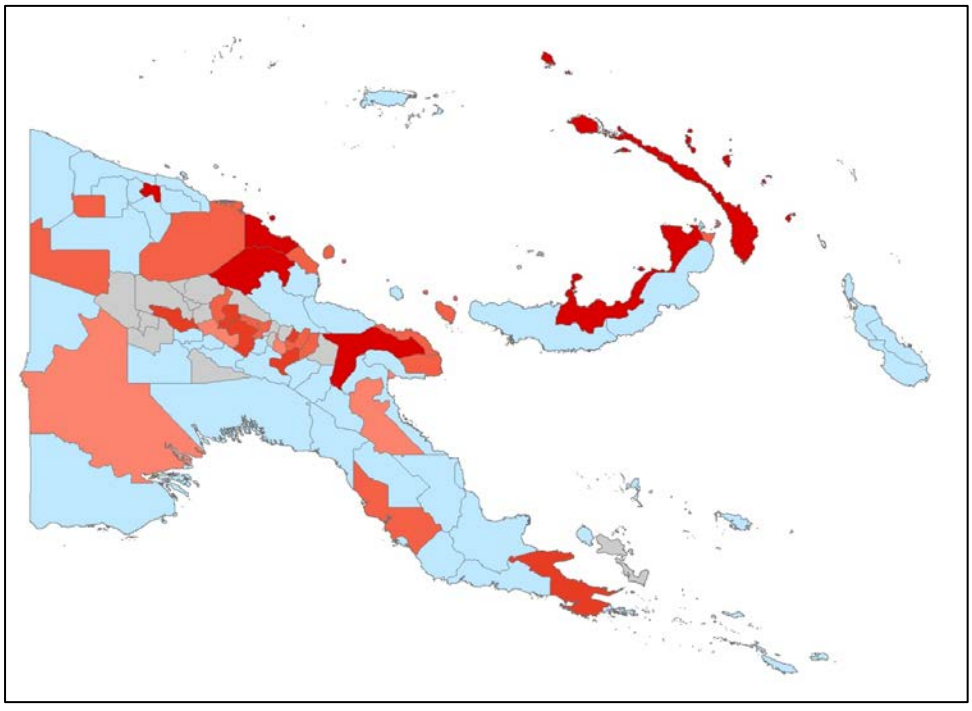


Figure 7. Prevalence of use of all chicken feathers (main map) at the District level and prevalence of use of red chicken feathers (insert) mapped at the Province level.

Geographic variation in the use of all chicken feathers were best explained by models that included District as a single factor (AICcWt = 0.59), or District + Gender as factors (AICcWt = 0.41), with the highest prevalence of use in districts in Madang, Morobe, West New Britain, New

Ireland and Milne Bay provinces (Figure 8). In contrast the use of red chicken feathers was best explained by models that included Province + Gender as factors (AICcWt = 0.52) or just Gender as a factor (AICcWt = 0.21). Red chicken feathers were most frequently recorded from the Western Highlands (21% of outfits), but also occurred at a relative low frequency (4 to 8%) in *bilas* from the Eastern Highlands, Simbu, East Sepik and Madang Provinces (see insert Figure 8). The use of chicken feathers (all colours) was relatively evenly distributed between the outfits of male and female performers, with chicken feathers recorded from 41% of men and 37% of women. In contrast women were more than six times more likely to wear red chicken feathers (12% of outfits) than men (2%): this pattern matches the use of Vulturine Parrot feathers where women were again more likely to wear feathers of this species (see individual species accounts).

The use of non-native Blue Peacock feathers and Ring-necked Pheasant feathers in *bilas* was only seen in the highlands provinces, with the Blue Peacock found in the Western Highlands and Simbu and Ring-necked Pheasant recorded only from the Western Highlands. Both peacock and pheasant feathers were used in the head dresses of performers (Figure 9), replacing the use of the long tail feathers and plumes of birds of paradise species that traditionally are used in head dresses (see species accounts). Outfits containing these species typically had 4.7 ± 2.8 peacock feathers and 13.8 ± 16.3 pheasant feathers.

Artificial substitutes for the plumes of the King of Saxony Bird of Paradise were seen in Simbu, South Highlands and the Western Highlands, broadly matching the distribution of use of real plumes in the country (see separate species account). Women were far more likely to be wear substitute plumes (16% of outfits) in comparison to men (1%).

Figure 9. The use of non-native peacock and pheasant feathers in head dresses is becoming common in some highlands provinces.

NUMBER OF SPECIES IN BILAS

The best-fitting models to explain patterns of variation in the total number of species (native and non-native) in outfits were with District (AICcWt = 0.59) or District and Gender (AICcWt = 0.41) as factors. The distribution map for the number of species indicated that the highest diversity of species in *bilas* outfits was found within two districts within the highland region (Figure 10). On average female performers had a greater number of species in their outfits than men (women 5.7 ± 3.2 species (range 1-16); men 4.0 ± 2.3 species (range 1-13).

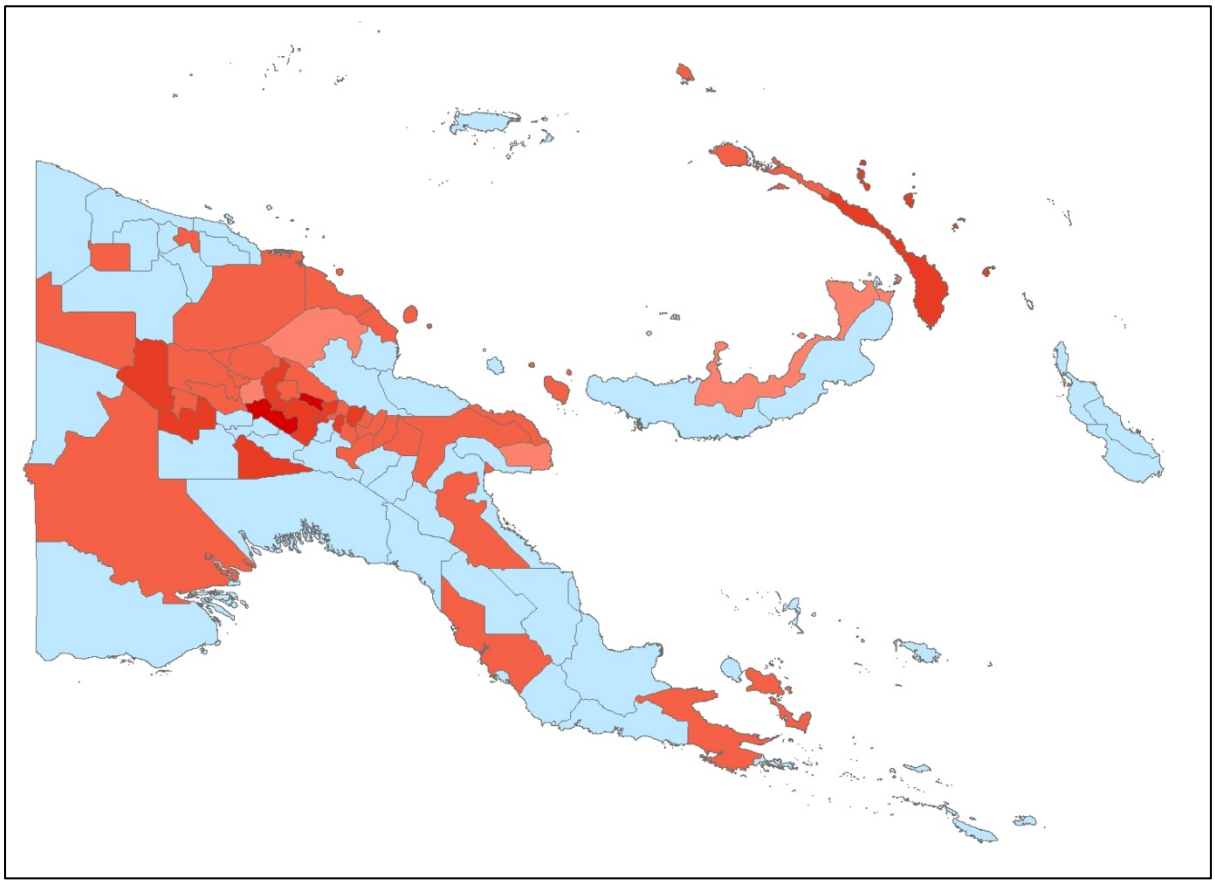


Figure 10. Distribution map of the average number of species in performer's outfits.

PATTERNS OF BILAS USE IN PROVINCES

A cluster analysis undertaken at the province scale and based on the number of items of each species or species group in *bilas* (and that included zero counts in the data) indicated groupings in the cultural use of wildlife in *bilas* that broadly followed regional geographic patterns. The cluster dendogram (Figure 11) grouped all of the highland provinces of Simbu, Eastern Highlands, Western Highlands, Southern Highlands and Enga together, indicating broad similarities between outfits from this region. West Sepik is also grouped with these highland provinces and closer inspection of the data revealed that data from this province was only obtained from the highland district of Telefomin, suggesting that the cluster analysis correctly grouped this

province with other highland areas. For the highland provinces and West Sepik the analysis indicates that outfits within Enga, Southern Highlands and West Sepik were more similar to each other in comparison to *bilas* within Western Highlands, Simbu and Eastern Highlands: a pattern that matches the geography of these provinces in the highlands (Figure 1). The cluster analysis grouped the majority of the Island, Papua and Momase provinces together, with there being more similarity within *bilas* outfits of Western (Fly), Central, Morobe, Milne Bay, East New Britain and Madang provinces, than between the Highland region. The apparent close grouping of East Sepik and West New Britain appears to be anomalous based on the geography of PNG. Only a low number of outfits were sampled from both these provinces (Table 1) and it is likely that the small sample size confounded the analysis.

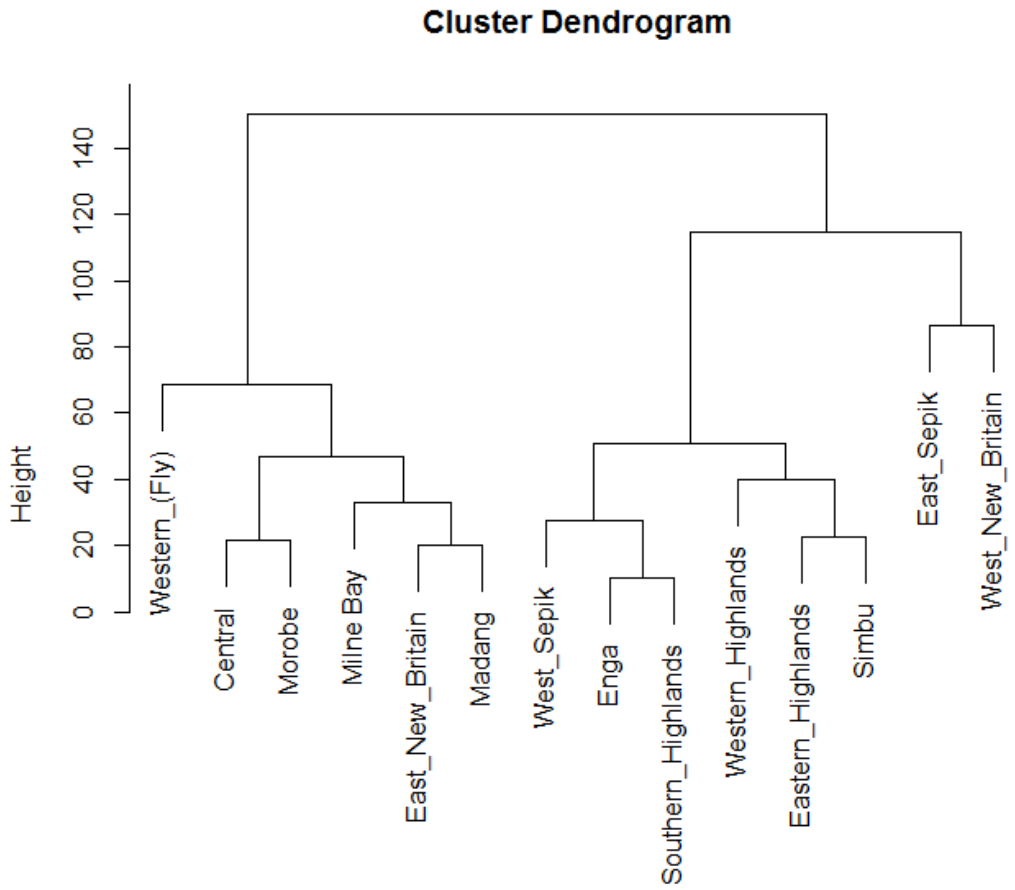


Figure 11. Cluster dendogram on the number and species of bilas present in outfits within provinces. The cluster tree indicates the similarity between provinces.

INTERVIEW DATA

Methods of obtaining bilas

Interviews with performers indicated that hunting was still the main method for obtaining *bilas* materials with 58% of feathers, skins and shells reported as hunted. The other main method for obtaining *bilas* was through purchasing and 27% of performers obtained *bilas* in this manner. The remaining proportion of *bilas* was reported to be "given", with in many instances *bilas* being handed down from parents to their children. Interviews with 146 performers, who indicated that hunting was a method for obtaining *bilas*, revealed that traditional hunting methods such as using a bow and arrow and traditional traps were still the main way of obtaining animals (59% and 50% of respondents, respectively). Other methods listed included the use of guns (24%), hunting dogs (15%), sling-shots (14%), catching by hand (8%) and felling trees to obtain arboreal mammals (2%). While guns were listed by 24% of respondents, close to a quarter of these respondents indicated that guns had only recently become used for hunting wildlife for *bilas*. Summary information on the hunting methods for individual species are detailed in some of the species accounts below.

Performer's perception of scarcity

Performers were asked to categorize the difficulty of finding each of the species in their *bilas*, classifying them either as "plentiful" or "hard to find". Interviewees did not classify all of their *bilas* to the species level and consequently most data was categorized in to families or broader species groups. Performers expressed the highest concern for Paradisaeidae (birds of paradise), followed by Macropodidae (tree kangaroos), Phalangeridae (cuscus), reptiles (primarily monitor lizards and Casauridae (cassowaries) (Table 4).

Species that should be easy to find (such as chickens and plant materials) were classified as hard to find by a small proportion of performers (18% and 8% respectively), suggesting that performer's perception of scarcity among the wild native species are likely to reflect their scarcity. Plants that performers indicated were scarce were usually specific flowers or specific species and widely distributed and likely to be abundant species such as grasses, sago and tree bark were not reported as hard to find.

The order of performers concern for individual species (where these were reported to the species level) are ranked and listed in Table 5 and provide broader support for the family level classification in Table 4. Four of the five highest ranked species were Birds of Paradise, and the Eclectus Parrot and Vulturine Parrot were second and sixth on this list. Both Tables 4 and 5 are relatively crude estimates of scarcity, as the indices will depend on the relative importance of different species for *bilas*, which varies among and between cultural groups and geographic regions (see individual species accounts). Nonetheless the ranking of Table 4 and Table 5 broadly reflect the PNG Threat Ranking as determined by their prevalence of use in *bilas* and IUCN threat status.

Table 4. Species family or larger group, total number of respondents from the surveys and percentage reporting the group as "hard to find".

Group	*N* total respondents	Hard to find
Birds		
Casauridae (cassowary spp.)	56	38%
Accipitridae (birds of prey)	27	26%
Psittacidae (parrot spp.)	133	33%
Paradisaeidae (birds of paradise)	160	49%
Phasianidae (chicken, pheasant, peacock)	28	11%
Columbidae (pigeon/dove spp.)	11	18%
Mammals		
Phalangeridae (cuscus)	62	42%
Macropodidae (tree kangaroo)	7	43%
Suiidae (pigs)	16	31%
Reptiles (monitor lizards and pythons)	40	43%
Molluscs (kina, cowrie and other shells)	39	21%
Plants (tree bark, sago leaves, grasses etc)	36	8%

Table 5. Individual species or species group, total number of respondents from the surveys and percentage reporting the species as "hard to find". Individual species with <8 respondents were not included in this table.

Species or species grouping	*N* total respondents	Hard to find
Stephanie's/Huon Astrapia	11	73%
Eclectus Parrot	13	69%
Twelve-wired Bird of Paradise	8	63%
Brown/Black Sicklebill	33	58%
Raggiana Bird of Paradise	50	50%
Vulturine Parrot	27	48%
Spotted Cuscus	29	48%
Cassowaries	56	38%
Monitor Lizards	21	38%
New Guinea Harpy Eagle	12	33%
Lorys and Lorikeets	12	25%
Ground Cuscus	8	25%
Superb Bird of Paradise	12	25%
King of Saxony Bird of Paradise	13	23%
Sulphur-crested Cockatoo	45	20%
Crowned Pigeons	10	10%

Cost of bilas

All interviewees were asked to list the cost of the different species within their outfits, with in most instances performers providing cost for an individual feather or skin, although for certain species (such as cassowaries) the cost refers to the whole item that utilized this species. In addition, most performers provided costs estimates for broader groups of species such as "birds of paradise", rather than to individual species. The average prices of species varied between families, with feathers from cassowaries and birds of paradise being the most expensive items (Table 6) and (unsurprisingly) chicken feathers having the lowest reported value. The reported prices ranged widely (Table 6), either due to the methodology of the survey and interviewees reporting for different items (i.e. a single feather versus a head dress made from multiple feathers), or because the large range truly reflects variation in price due to local differences in the abundance and availability of species. Evidence that these average prices do reflect real differences in value comes from the positive relationship (Pearson's $r = 0.722$, $n = 9$ groups, 95% CI = 0.11 to 0.94) between the average price of *bilas* from different families and the reported average scarcity (Figure 12). When the three groups of mammals are removed, the relationship among bird families between average price and average scarcity is even stronger (Pearson's $r = 0.790$, $n = 9$, 95% CI = 0.26 to 0.95).

Table 6. Average price of *bilas* items for families of birds and mammals. Prices are in PNG Kina with the mean, ± 1 standard deviation and range reported.

Group	Mean cost ± 1 SD	Range
Birds		
Casauridae (cassowary spp.)	107 ± 123	10 – 450
Accipitridae (birds of prey)	55 ± 58	9 – 200
Psittacidae (parrot spp.)	78 ± 85	2 – 450
Paradisaeidae (birds of paradise)	91 ± 88	5 – 500
Phasianidae (chicken)	13 ± 8	1 – 20
Columbidae (pigeon/dove spp.)	54 ± 39	15 – 100
Mammals		
Phalangeridae (cuscus)	55 ± 58	9 – 200
Suiidae (pigs)	50 ± 20	25 – 75

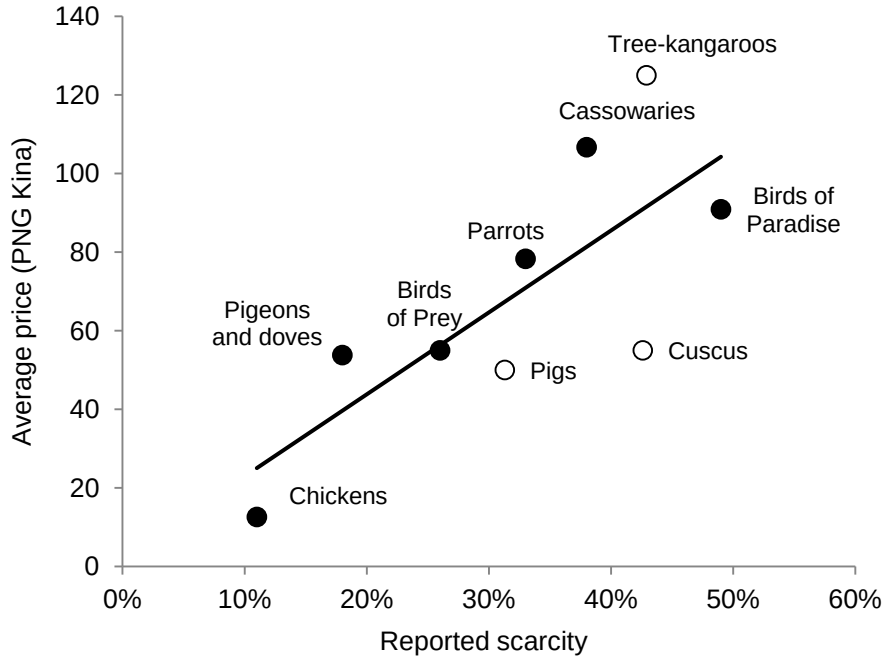


Figure 12. Relationship between reported scarcity and the average reported price for different families of birds (filled symbols) and mammals (unfilled symbols).

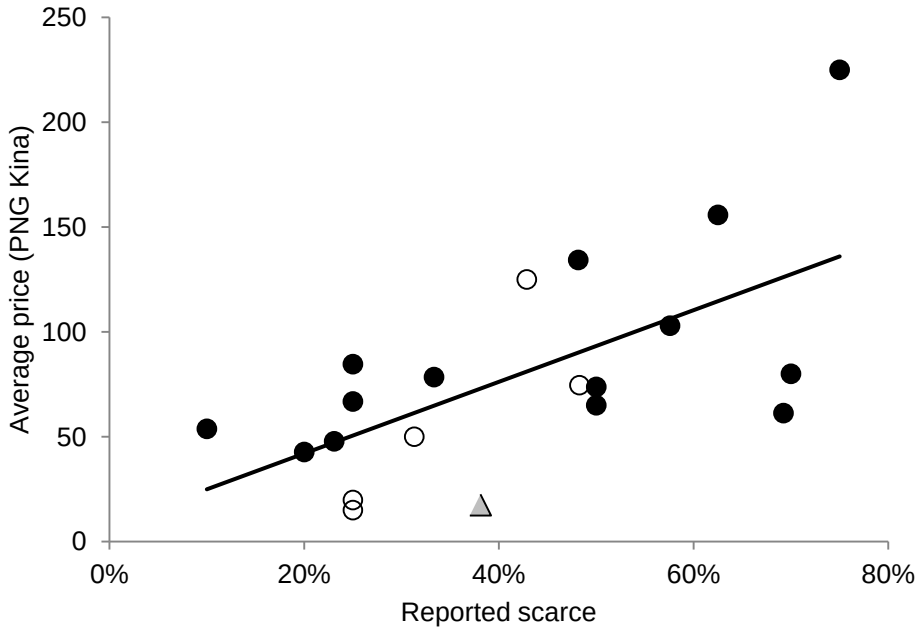


Figure 13. Relationship between reported scarcity and the average reported price for individual species of birds (filled round symbols), mammals (unfilled round symbols) and monitor lizards (grey filled triangle symbol)

The same relationship between reported scarcity and average price is broadly found if this is examined at the species level (Figure 13), although there is more variation in the relationship and there is a small chance the relationship maybe negative (Pearson's $r = 0.402$, $n = 20$ species, 95% CI = 0.05 to 0.72). A broadly positive relationship is also present among birds (Pearson's $r = 0.376$, $n = 14$ species, 95% CI = -0.20 to 0.76) but is equivocal for mammals (Pearson's $r = 0.686$, $n = 5$ species, 95% CI = -0.50 to 0.98) due to small sample size. The highest value species which corresponds to the highest reported scarcity (75%) was the Blue Bird of Paradise, which had an average reported value of PNG Kina 225 ($n = 3$).

PNG THREAT RANKING

The calculated PNG threat scores places New Guinea Vulturine Parrot as the top ranked species that is used in *bilas*, followed by the Goodfellow's Tree Kangaroo, Central Ranges Tree Kangaroo, cassowary species and New Guinea Harpy Eagle (Table 7). Nine of the top 20 threatened species/species groups are bird of paradise (Table 7) and whose prevalence of use ranges from 3.1% for the Blue Bird of Paradise (IUCN Vulnerable) up to 18.1% for the Raggiana Bird of Paradise (IUCN Least Concern). More detailed information is provided in the individual species accounts for the top 25 ranked species.

Table 7. Threat ranking for native species indicating number of species, prevalence in *bilas* and prevalence rank, IUCN Red List status, calculated PNG Threat score and Threat rank.

Species	N species	Prev. %	Prev. rank	Red List status	Threat score	Threat rank
NG Vulturine Parrot	1	33.2%	3	VU	2.31	1
Goodfellow's Tree Kangaroo	1	6.4%	18	EN	2.26	2
Central Ranges Tree Kangaroo	1	1.9%	23	EN	2.13	3
Cassowary spp.	3	30.1%	6	VU/NT/VU	1.66	4
NG Harpy Eagle	1	7.0%	17	VU	1.58	5
Brown/Black Sicklebill	2	11.5%	15	LC/VU	1.55	6
Blue Bird of Paradise	1	3.1%	21	VU	1.47	7
Crowned Pigeon spp.	2	1.9%	24	VU/VU/NT	1.41	8
Sulphur-crested Cockatoo	1	33.8%	2	LC	0.94	9
Pearl Oyster (kina shell)	1	32.8%	4	LC	0.91	10
Ribbon-tailed Astrapia	1	0.4%	26	NT	0.70	11
Emperor Bird of Paradise	1	0.4%	27	NT	0.70	12
Raggiana Bird of Paradise	1	18.1%	9	LC	0.50	13
Spotted Cuscus	1	17.9%	10	LC	0.50	14
King of Saxony Bird of Paradise	1	14.8%	12	LC	0.41	15
Superb Bird of Paradise	1	14.8%	13	LC	0.41	16
Ground Cuscus	1	14.8%	14	LC	0.41	17
Greater/Lesser Bird of Paradise	2	24.7%	7	LC	0.34	18
Stephanie's/Huon Bird of Paradise	2	20.8%	8	LC	0.29	19
Cowrie and other shells	8	48.5%	1	LC	0.22	20
Lory and Lorikeets	4	31.5%	5	LC	0.17	21
Eclectus Parrot	1	6.2%	19	LC	0.17	22
Monitor Lizard spp.	4	17.9%	11	LC	0.12	23
Mountain/Silky Cuscus	2	7.6%	16	LC	0.11	24
Tyto owl spp.	2	5.8%	20	LC	0.08	25
Scarab beetle spp.	1+	2.3%	22	LC	0.06	26
Triok Possum spp.	2	0.6%	25	LC	0.01	27
Gull sp.	1	0.2%	28	LC	0.01	28
Kingfisher sp.	1	0.2%	29	LC	0.01	29

INDIVIDUAL SPECIES ACCOUNTS

The occurrence and use of individual species and its relationship with a species distribution is detailed in the following section, with individual species account listed in order of the PNG threat ranking. Naturalized and non-native species are not included in these accounts and descriptions of their use are included in the following section. The factors that best-explained the use of species are detailed within each species' account, however ranking the best-fitting models indicates that most variation was explained by a combination of Province + Gender or by District + Gender, and with Province or Region (on their own) as the third and fourth most selected top models (Figure 14). These results indicate that relatively broad-scale (district or above) geographic factors along with the gender of performers are most important for explaining the pattern of use in the prevalence of different species, lending further support to the geographic groupings found in the cluster analysis which accounted for species and number of items in *bilas* (Figure 11). Gender was an important factor in 18 of the top-selected models and in most cases women were more likely to be utilizing species than men (see details in the individual species accounts).

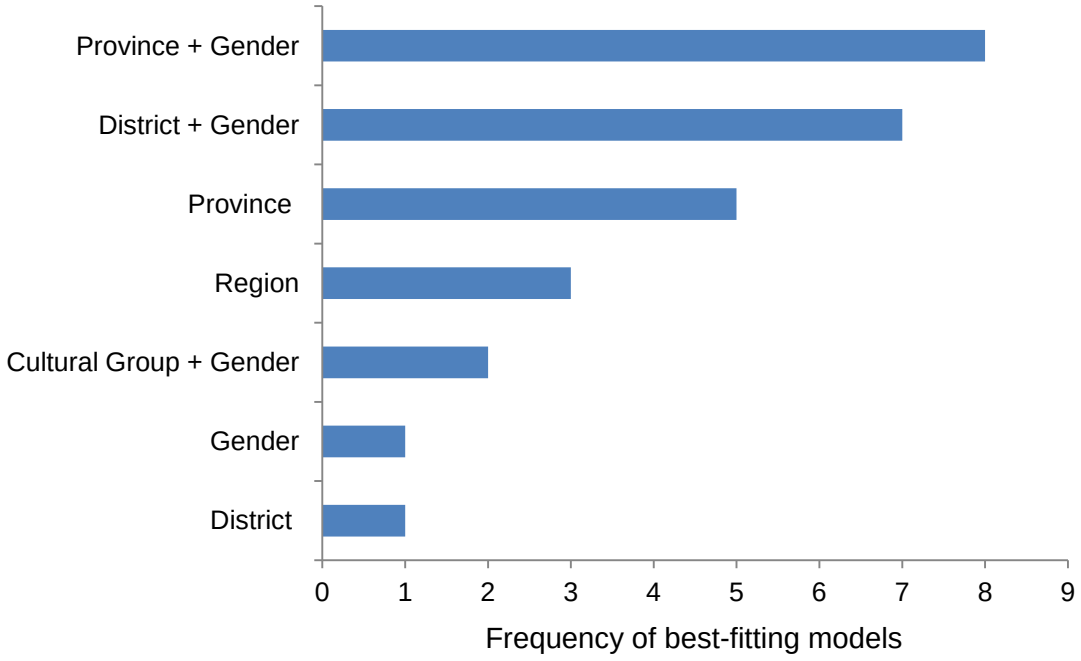


Figure 14. Frequency of top-selected models for 27 species recorded in *bilas*

The following individual species accounts follow the same format (see right): including images of the live animal (top left) and images of its typical use in *bilas* (top right), as well as maps of species range (bottom left) and the species occurrence and prevalence of use in *bilas* (bottom right) mapped at a district, provincial or regional scale depending upon the model-selection. The grey text box details key facts about the species including the overall prevalence of use in *bilas*, the average number (± one standard deviation and range) of feathers, skins or whole animals used in *bilas*; its IUCN Red List Threat Status, *bilas* ranking and PNG threat ranking. The text includes brief description on the species habitat and ecology, hunting methods (if detailed by performers), its use in *bilas* and details on the best-fitting model for its distribution and use. Information on a species altitudinal range and broad habitat preferences are taken for the main from Flannery (1995), Beehler *et al.* (1986) and Pratt and Beehler (2015). Other references are inserted in the text.

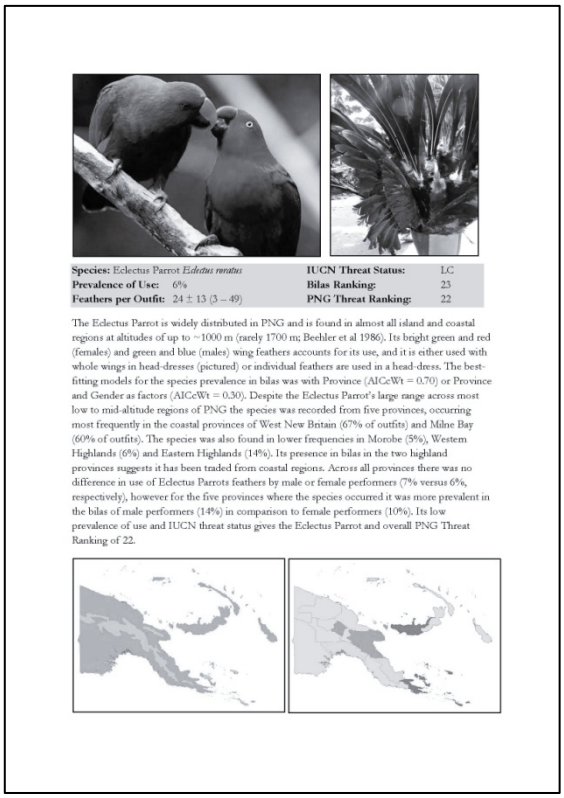
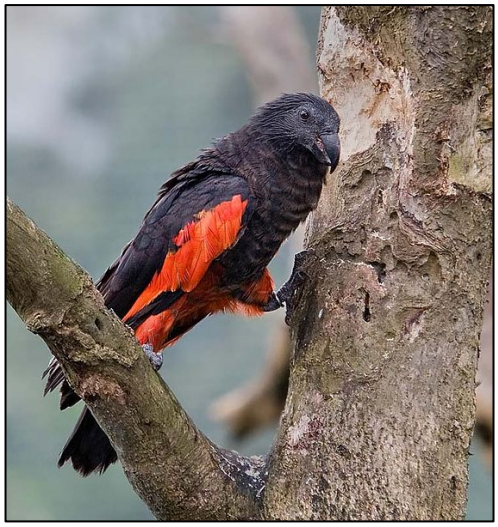
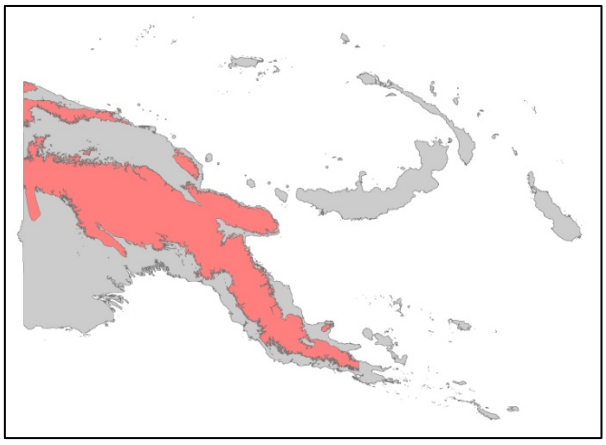


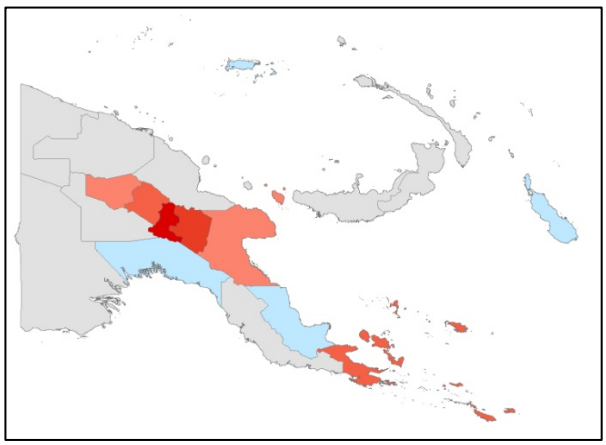
Figure 14. Example individual species account, see text to the left for details.



Species: New Guinea Vulturine Parrot		**IUCN Threat Status:**	VU
Prevalence of Use:	33%	**Bilas Ranking:**	3
Feathers per Outfit:	44 ± 31 (1 – 80)	**PNG Threat Ranking:**	1

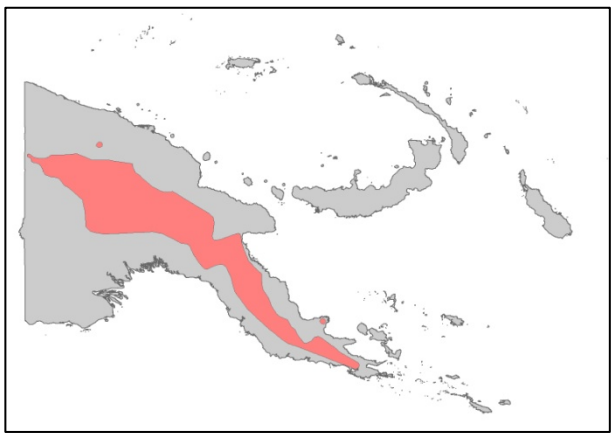
The bright red colouration of the New Guinea Vulturine Parrot *Psittrichas fulgidus* feathers provides prestige to individuals wearing them and their use often demonstrates the high status of an individual. Few other species match its scarlet colouration, although red-dyed chicken feathers are sometimes used as a substitute. In Simbu and the Eastern Highlands Vulturine Parrot feathers are used as the lower layer of a head dress worn over the forehead, and/or as a head dress stretched over the top of the head (pictured). Vulturine Parrots are mainly hunted with bow and arrows, with a hunter often building a small hide close to fruiting trees where parrots feed. Noose traps are also placed in fruiting trees. Vulturine Parrots are widely distributed, but despite its wide range it is a scarce species and has an estimated population size of around 21,000 pairs across the whole of New Guinea (Mack and Wright 1998). The best-fitting models for the species prevalence in *bilas* were with Province (AICcWt = 0.72), or Province + Gender (AICcWt = 0.28) as explanatory variables. The use of Vulturine Parrots was most prevalent in Simbu Province (78% of outfits), followed by the Eastern and Western Highlands (59% and 50% of outfits, respectively), and with women more likely to wear the species than men (53% versus 17%). Overall, the species was found in 33% of all outfits and was the fourth most commonly used species in *bilas*. Its high prevalence of use and IUCN Red List status of Vulnerable gives the Vulturine Parrot the highest PNG threat ranking.

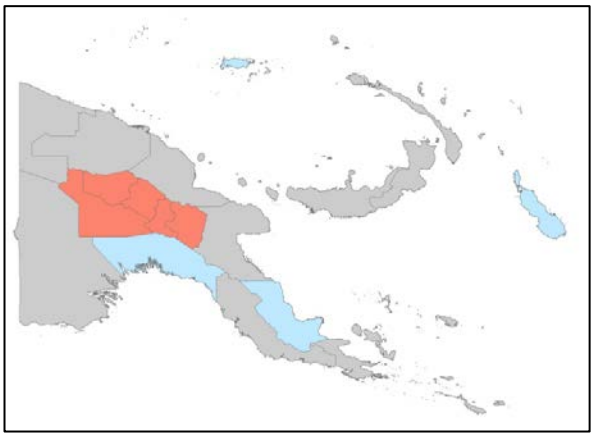




Species: Goodfellow's Tree Kangaroo		**IUCN Threat Status:**	EN
Prevalence of Use:	6%	**Bilas Ranking:**	22
Skins per Outfit:	1.1 ± 0.2 (1 – 2)	**PNG Threat Ranking:**	2

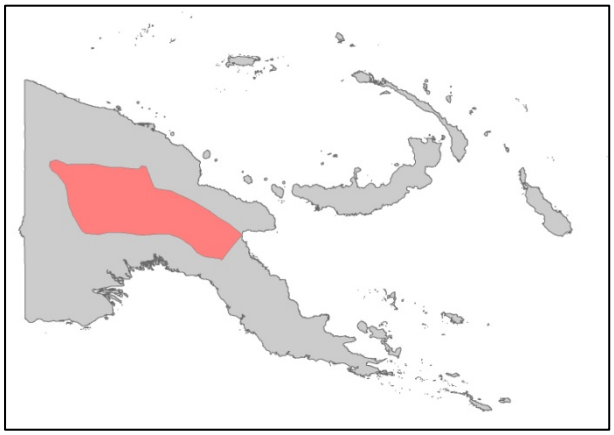
Goodfellow's Tree Kangaroo *Dendrolagus goodfellowi* are distributed across mid to upper-montane forest regions of the country. Tree kangaroos are among the largest of New Guinea's mammal species and Goodfellow's are highly sought after for their meat and as a prestigious item of trade in bride price and other ceremonies. As well as being an important food item Goodfellow's Tree Kangaroo is also used for *bilas*, and their skins are used as hats and head-dresses in certain highland cultures (see picture). Their skins are also worn as a cloak, extending from the wearer's neck to waist. Tails of Goodfellow's Tree Kangaroo are also worn on their own as a necklace. The species is typically hunted with the aid of dogs, that can find their scent on the forest floor, and the animal is then shot with a bow and arrow or gun. The species is rare and hard to find, and their use in *bilas* marks out individuals with status. In areas where the species is no longer present skins of Spotted Cuscus and Domestic Cats are used as a replacement. The best-fitting models for the species prevalence in *bilas* were with Region (AICcWt = 0.53), or Region + Gender (AICcWt = 0.46) as explanatory variables, with the species use restricted to the Highlands. Goodfellow's Tree Kangaroo items were worn more frequently by female (11% of outfits) than male (2%) performers. Tree kangaroos occur at low population densities and breed slowly and vulnerable to over-hunting (Cuthbert 201). Their IUCN Red List status of Endangered and prevalence of use give this species the second highest PNG threat ranking

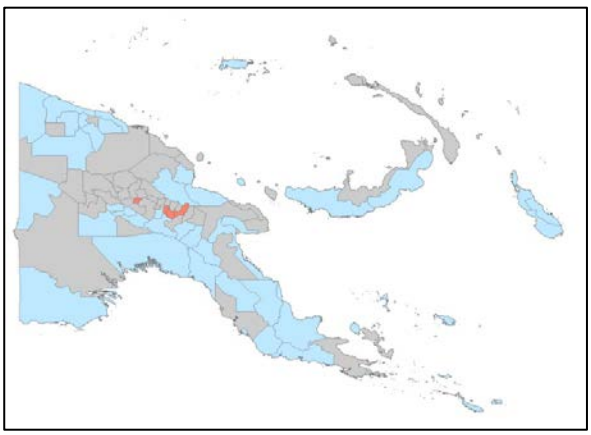


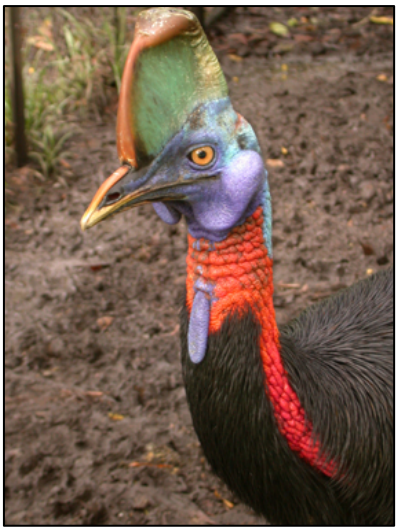


Species: Central Ranges Tree Kangaroo		**IUCN Threat Status:**	EN
Prevalence of Use:	2%	**Bilas Ranking:**	29
Skins per Outfit:	1.1 ± 0.3 (1 – 2)	**PNG Threat Ranking:**	3

The Central Ranges Tree Kangaroo *Dendrolagus notatus* is endemic to Papua New Guinea, where it is found in high elevations of the central mountains at altitudes of between 900 and 3,100 m, and where it is restricted to mossy primary montane forest. The key threats to the Central Ranges Tree Kangaroo are similar to the threats faced by the lower altitude dwelling Goodfellow's Tree Kangaroo, and both species heavily hunted with the use of dogs. The species is also threatened by habitat loss from deforestation due to logging and forest clearance for agriculture. The use of skins and fur of the Central Ranges Tree Kangaroo in *bilas* places a further threat to the population, although it is unknown if the species is specifically targeted for *bilas*, or if use of its fur and skin is a by product from hunting for food. The Central Ranges Tree Kangaroo and models for the species prevalence suggest that its use in *bilas* was best explained by the Cultural Group + Gender (AICcWt = 0.77), with a tendency for female performers to more frequently wear this species (3% of performers) than men (1%). Mapping of its distribution in *bilas* indicates the species was used in four highland districts: Chauve and Sina-Yonggomugl in Simbu Province, Unggai-Benna in Eastern Highlands Province, and Mount Hagen in Western Highlands Province. These districts overlap with the species range. The low prevalence of use but high IUCN threat status makes this species third on the PNG Threat Ranking.

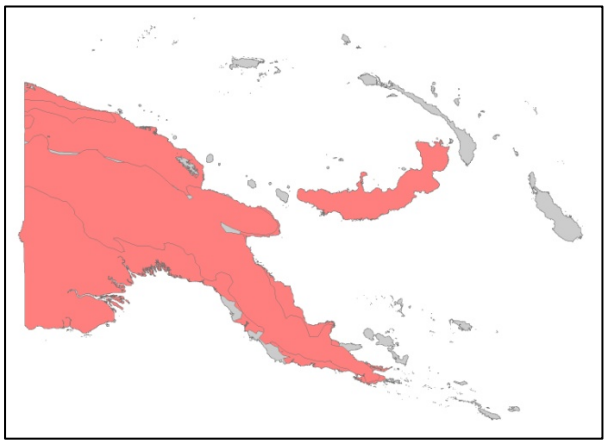


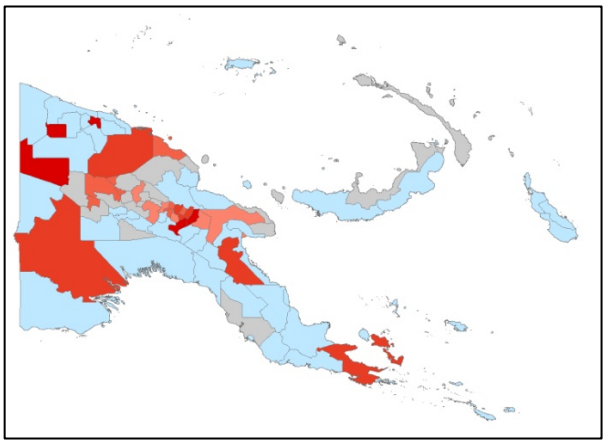




Species: Cassowaries	.	**IUCN Threat Status:**	VU/NT
Prevalence of Use:	30%	**Bilas Ranking:**	7
Feathers per Outfit:	(not recorded)	**PNG Threat Ranking:**	4

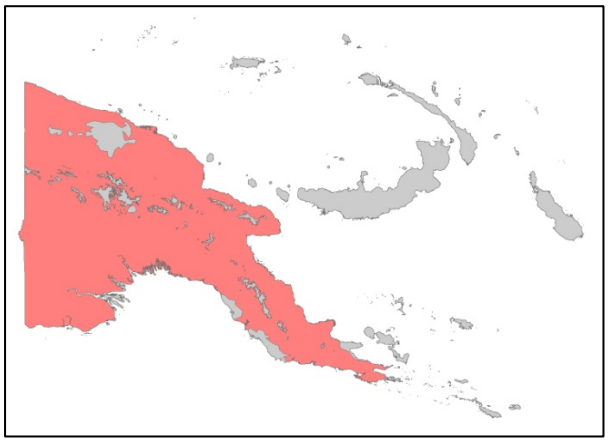
Three species of Cassowary occur in PNG, the Northern Cassowary *Casuarius unappendiculatus*, Dwarf Cassowary *Casuarius bennetti* and Southern Cassowary *Casuarius casuarius*. They are present across the "mainland" of PNG, with the Dwarf Cassowary also occurring in New Britain. Cassowaries are an important food item and their feathers and bones are also used in *bilas*. Due to the species relative abundance there use in *bilas* is often widespread among less wealthy performers. Cassowary feathers are typically used in head-dresses, as well as being attached to spears, kundu drums and bilums (string bags). Cassowary breast bones are used in Western province as an ornament and their quills are also used here as a nasal piercing. The tarsal bone is used as a dagger in parts of the Southern Highlands and Western Highlands. Cassowaries are most frequently hunted with snares made from rangtan cane, strong wire, or nylon string. They are also hunted with shotguns. The best-fitting models for the species prevalence had District + Gender (AICcWt = 0.76) or just District as factors (AICcWt = 0.24). Cassowary items were more frequently worn by male (34% of outfits) than female (27%) performers. The pattern of use across districts was highly variable (see map), with its prevalence varying from 0% to 100% of outfits. The Northern and Southern Cassowary have an IUCN Threat Status of Vulnerable and the Dwarf Cassowary is Near Threatened. These threat statuses, along with the species high prevalence of use gives this species group the fourth highest PNG threat ranking.

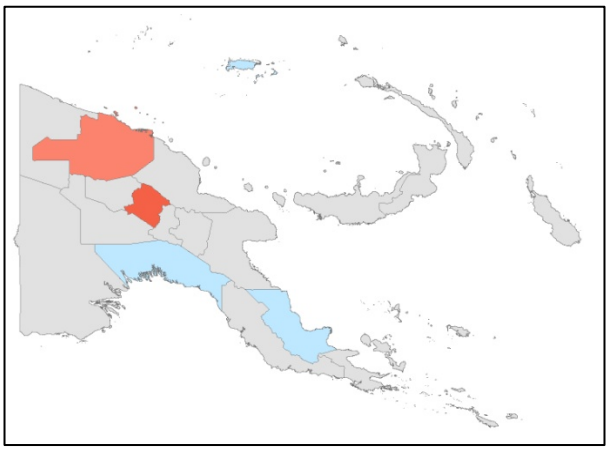


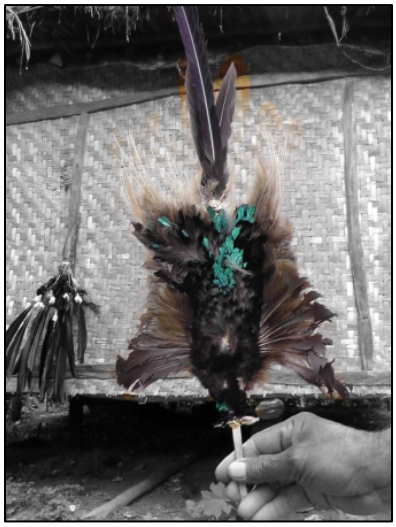


Species: New Guinea Harpy Eagle		**IUCN Threat Status:**	VU
Prevalence of Use:	7%	**Bilas Ranking:**	21
Feathers per Outfit:	18 ± 12 (3 – 45)	**PNG Threat Ranking:**	5

The New Guinea Harpy Eagle *Harpyopsis novaeguinea* is widely distributed throughout the "mainland" of PNG and is not found in the island regions. While Harpy Eagles are widespread, the species is restricted to undisturbed primary forest areas and as an apex predator the species only occurs at very low population densities. Methods of hunting Harpy Eagles were not revealed during the surveys, but given the species ecology and habitat and hunting methods for other species it is likely that they are hunted with bow and arrows and shot from hides situated within or close to nesting trees. The New Guinea Harpy Eagle was found in 7% of *bilas* outfits with an average of 18 ± 12 feathers in each outfit where the species occurred. The best-fitting models for the species prevalence in *bilas* was with Province + Gender as factors (AICcWt = 1.0). The species was only recorded in performer's outfits from two provinces, occurring most frequently in the Western Highlands (37% of outfits) and also in East Sepik (4% of outfits). Harpy Eagle feathers were almost exclusively worn by female performers occurring in 33 outfits (15% of outfits). In contrast the species was only recorded in the *bilas* of one male performer (0.4% of outfits). Harpy Eagle feathers were the 21st ranked item in *bilas* use, but their low population density and restriction to primary forest gives them an IUCN threat status of Vulnerable and an overall PNG Threat Ranking of five for its use in *bilas*.

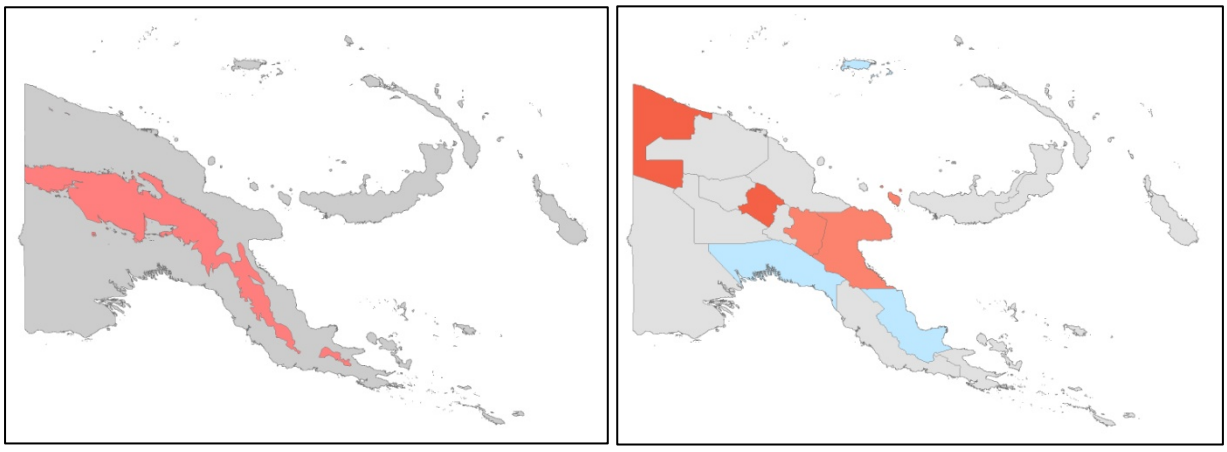






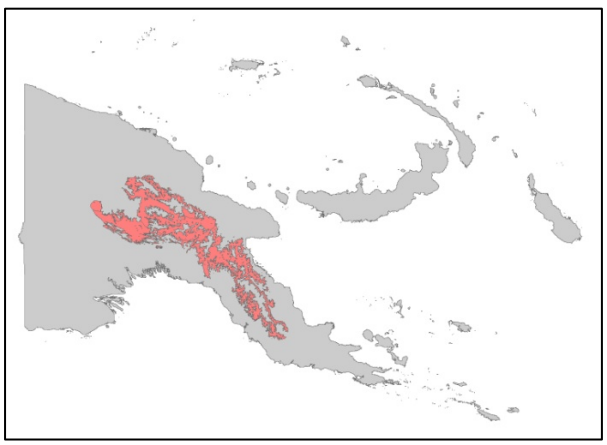
Species: Black and Brown Sicklebills.		**IUCN Threat Status:**	VU/LC
Prevalence of Use:	12%	**Bilas Ranking:**	18
Feathers per Outfit:	1.6 ± 0.6 (1 – 3)	**PNG Threat Ranking:**	6

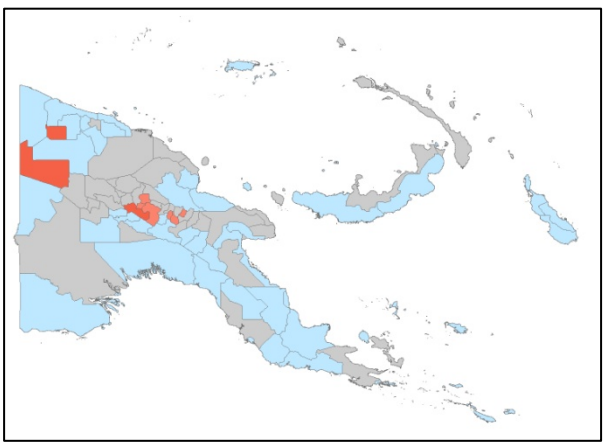
The Black Sicklebill *Epimachus fastosus* and Brown Sicklebill *Epimachus meyeri* are distributed from mid-montane forest to cloud forest along the central mountain ranges of Papua New Guinea, occurring at altitudes of 1800-2200 m and 1900-2900 m, respectively. The long tail feathers of both Sicklebill species are worn as the pinnacle of a performer's decoration, with one to three feathers typically worn on the crown of a head-dresses. Their use symbolizes wealth, prestige, authority and status for performers who are using these species in their *bilas*. The best-fitting models for the species prevalence in *bilas* was with Province + Gender as factors (AICcWt = 1.0). Brown and Black Sicklebill feathers were worn more frequently by female (21% of outfits) than male (4%) performers. The species were recorded from only four provinces, occurring most frequently in the Western Highlands (50% of outfits), West Sepik (33%), Eastern Highlands (9%) and Morobe (5%). The two species are usually hunted with a bow and arrow or rifle. The Brown Sicklebill is relatively common and has an IUCN status of Least Concern, whereas the Black Sicklebill has a smaller range, is often rare and localised in distribution, and has an IUCN threat status of Vulnerable. Because of the species relatively high prevalence of use (12% of outfits) and the high threat status of the Black Sicklebill the two species are six in the PNG Threat Ranking.



Species: Blue Bird of Paradise		**IUCN Threat Status:**	VU
Prevalence of Use:	3%	**Bilas Ranking:**	26
Birds per Outfit:	1.7 ± 0.5 (1 – 2)	**PNG Threat Ranking:**	7

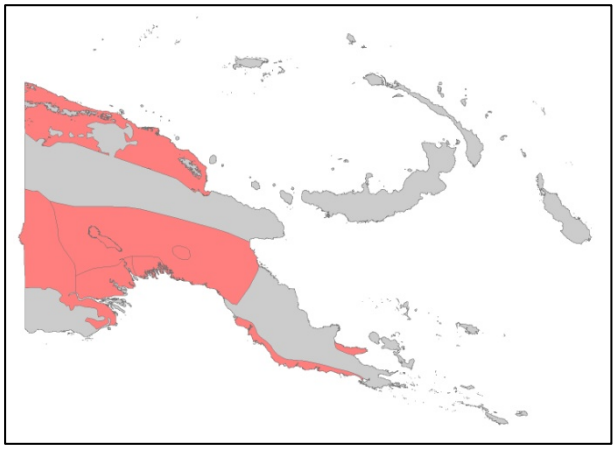
The blue feathers of the Blue Bird of Paradise *Paradisaea rudolphi* are unique to this species and no substitute species are used as a replacement. Its limited range within the eastern portion of the Central Ranges at altitudes of 1,300-1,800 m and its relative scarcity in these areas makes this species highly valuable in *bilas* and its use distinguishes individuals and provides prestige to performers with plumes in their bilas. The Blue Bird of Paradise is typically hunted with a bow and arrow, or from traps made from line or vines that are placed at drinking holes and fruiting trees. The best-fitting models for the species prevalence in *bilas* were with Province + Gender (AICcWt = 0.50) or District + Gender as factors (AICcWt = 0.48) (mapped below). Plumes and wing feathers of the Blue Bird of Paradise were more prevalent in the outfits of male performers (5% of outfits) in comparison to female (1%) performers. The species was found in the highland provinces of the Western Highlands (12% of outfits), Simbu (2%), Eastern Highlands (1%) and was also found in one of three outfits in West Sepik province. The latter record is a long way from the species' range, indicating that it had likely been bought or traded to this province. Despite its relatively low prevalence of use (3%) and overall bilas ranking (26), the species scarcity and limited range gives it an IUCN status of Vulnerable and an overall PNG Threat Rank of seven.

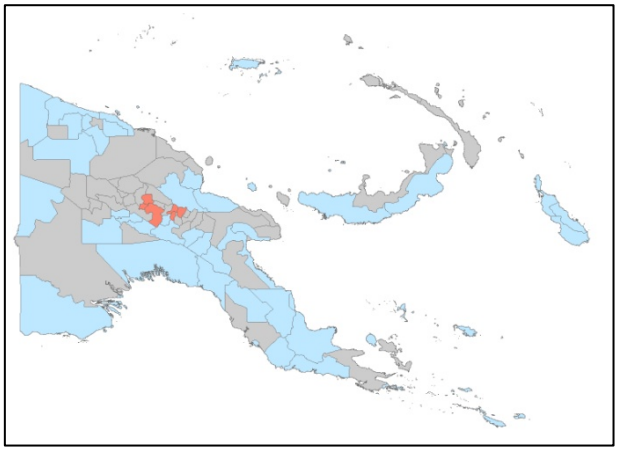




Species: Crowned Pigeons		**IUCN Threat Status:**	VU/NT
Prevalence of Use:	2%	**Bilas Ranking:**	28
Feathers per Outfit:	20 ± 13 (1 – 40)	**PNG Threat Ranking:**	8

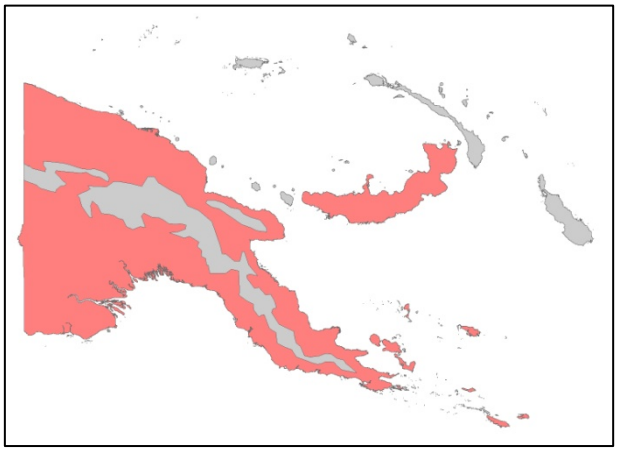
Two species of crowned pigeons occur in PNG, with the Victoria Crowned Pigeon *Goura victoria* occurring in lowland areas on the north coast and with a further small population in the northern part of Milne Bay. The Southern Crowned Pigeon *Goura scheepmakeri* is found in southern regions of the country including lower altitude regions of the highland provinces. Both species are rare and are often hunted out near human settlements. The Southern Crowned Pigeon is classified as Vulnerable by the IUCN and the Victoria Crowned Pigeon is Near Threatened. The best-fitting models for the species prevalence in *bilas* were with just Gender (AICcWt = 0.37) as a factor, or with Cultural Group + Gender as factors (AICcWt = 0.34). Women were more likely to wear Crowned Pigeons in their *bilas* (4% of outfits) in comparison to men (<0.5%). The support for the second model with Cultural Group + Gender over other models indicates that there was no broader geographic classification that better explained the distribution of this species in *bilas* and that its occurrence is patchily distributed. Mapping the species occurrence in *bilas* at the district level indicated that it was only recorded from the highland region and its occurrence here suggests that plume were traded or bought from lower altitude areas. The scarcity of both species, the fact that they are often targeted for food and hunted out near inhabited areas, and their use in *bilas* ranks these two species at number eight in the PNG Threat Ranking.

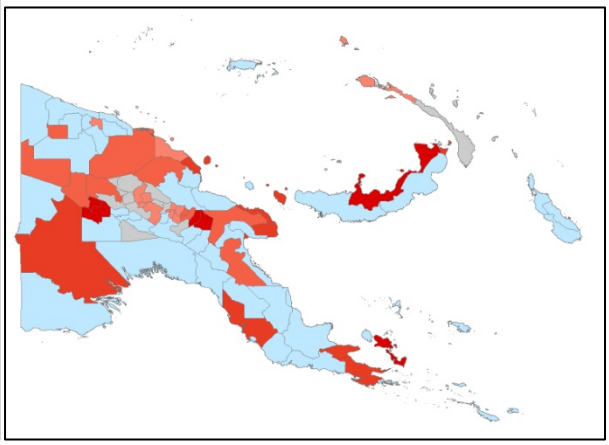




Species: Cockatoo *Cacatua galerita*		**IUCN Threat Status:**	LC
Prevalence of Use:	34%	**Bilas Ranking:**	2
Feathers per Outfit:	76 ± 71 (1 – 291)	**PNG Threat Ranking:**	9

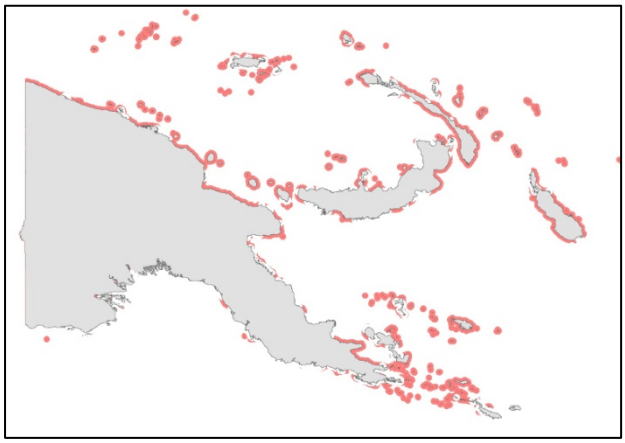
The Sulphur-crested Cockatoo is widely distributed throughout PNG occurring in all regions of the country, with the exception of the central mountain ranges above 1500 m in altitude. The Sulphur-crested Cockatoo is the most commonly used bird species in *bilas*, occurring in 34% of outfits, and with large numbers of feathers used in outfits (maximum observed 291 feathers). In many instances the yellow crest of the species is used in outfits and a single head-dress may hold 30 or more crests (pictured), representing the use of 15 or more birds. The bright white colour and the yellow-topped crest of the bird are often associated with the belief that the dancer will be attractive to members of the opposite sex. Where the species is absent, white chicken feathers are used as a replacement. Hunting of the species is typically undertaken with bow and arrows, but firearms were also reported as used. The best-fitting model for the species prevalence in *bilas* were District + Gender (AICcWt = 0.89) as explanatory variables. The use of Sulphur-crested Cockatoo was far more prevalent in the outfits of male performers (48% of outfits) than female performers (17%), and their use was widespread through all four regions of PNG, including districts in the Highlands where the species is absent. Sulphur-crested Cockatoos are IUCN Least Concern, however, its high prevalence of use and large number of feathers in outfits makes this species nine on PNG Threat Rank.

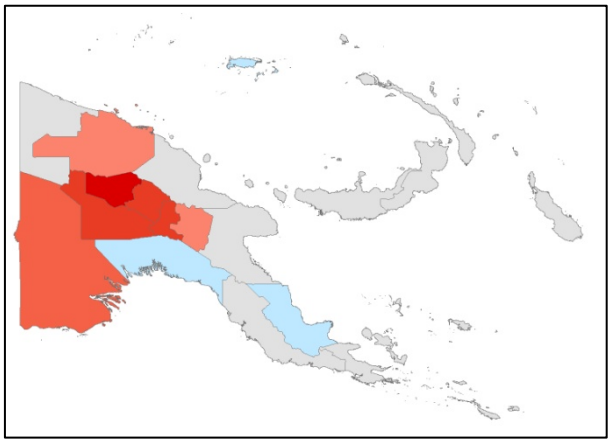




Species: Kina Shells		**IUCN Threat Status:**	LC
Prevalence of Use:	33%	**Bilas Ranking:**	5
Shells per Outfit:	1.8 ± 1.5 (1 – 8)	**PNG Threat Ranking:**	10

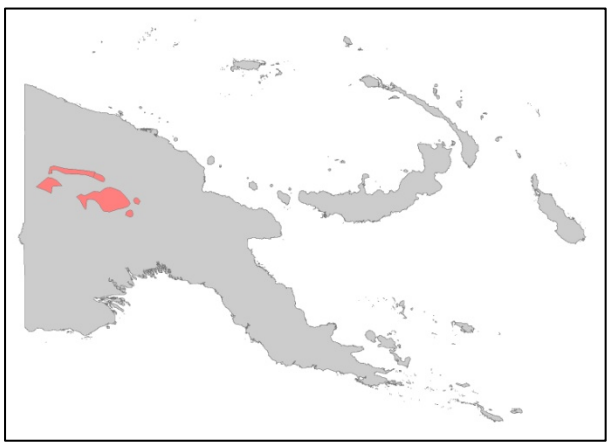
Kina shells have long been used as an ornament and currency in PNG and the nation's currency is named after this shell. The kina shells worn in *bilas* are from the gold-lipped variety of the Pearl Oyster *Pinctada maxima*, a species that is widely distributed throughout Melanesia and the Pacific and famed for the pearls they produce. The polished 'mother of pearl' of kina shells are typically worn as a necklace, with several Kina shells worn in Simbu Province (pictured) and a single shell worn in the Western Highlands and Enga provinces that is often painted red and sewn on to a bark backing. A number of different substitutes are used for kina shells, with white and red-pained "shells" being made from thin plywood, cardboard and plastic materials. The best-fitting models for the species prevalence in *bilas* were with Province + Gender (AICcWt = 0.50) or just Province (AICcWt = 0.49) as explanatory variables. Despite the species being restricted to coastal areas Kina shells were most frequently worn in the highland provinces, with the highest prevalence of use observed in Enga where kina shells occurred in 85% of outfits. Their use was also high in the Western Highlands (67%), Southern Highlands (58%) and Simbu (58%) provinces, and with use across all Provinces occurring more frequently in the outfits of female (44% of outfits) than male (24%) performers. Overall, the species was found in 33% of outfit, was the fifth most commonly used species in *bilas* and has a PNG threat Rank of ten.

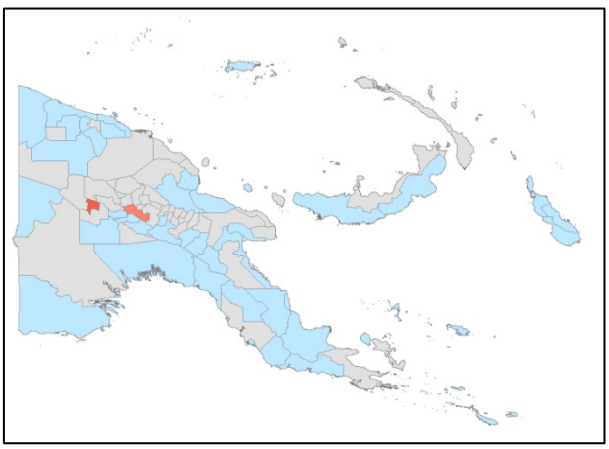




Species: Ribbon-tailed Astrapia		**IUCN Threat Status:**	NT
Prevalence of Use:	0.5%	**Bilas Ranking:**	32
Feathers per Outfit:	5.0 ± 1.4 (4 – 6)	**PNG Threat Ranking:**	11

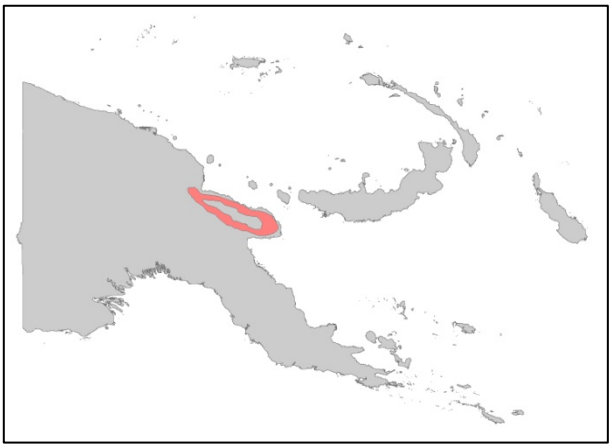
The Ribbon-tailed Astrapia *Astrapia mayeri* is only found in the higher mountain ranges of PNG occurring at altitudes of 2,400 to 3,400 m. In comparison to many other bird and mammal species in New Guinea the Ribbon-tailed Astrapia has a very small range and this small range and the species preference upper montane forest has resulted in an IUCN Threat Status of Near Threatened. Traditional hunting methods for the species include using bows and arrows, setting small traps made from small sticks and string alongside ripe fruit in trees, and in some instances using firearms. The Ribbon-tailed Astrapia's long white and black tipped tail plumes are used as the central decoration in head dresses in cultural groups. The species was only found in the outfits from Tari-Pori District in Southern Highlands Province and in Tambul-Nebilyer in Western Highlands Province, districts that overlap with the species range. Due to its low frequency of occurrence no statistical analysis was possible on the species prevalence. The use of Ribbon-tailed Astrapia plumes was rare in *bilas* outfits, being found in less than 1% of outfits. Where it occurred it was also used in small numbers, with between four and six feathers in outfits. Despite the species low prevalence of use, its' very small range, lack of substitutes that can be used as replacements and its' IUCN Status of Near Threatened status give this species a PNG Threat Rank of 11.

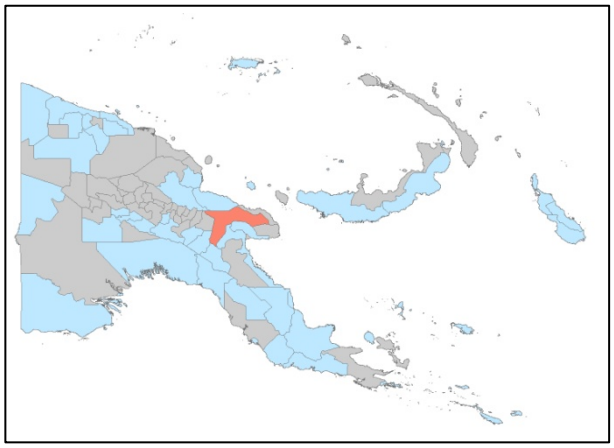




Species: Emperor Bird of Paradise		**IUCN Threat Status:**	NT
Prevalence of Use:	0.5%	**Bilas Ranking:**	32
Birds per Outfit:	1 (1)	**PNG Threat Ranking:**	12

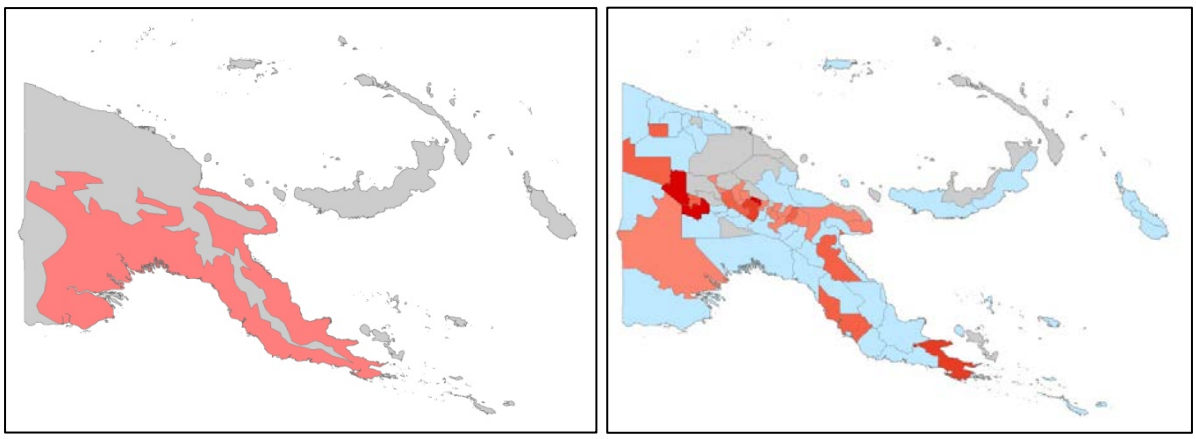
The Emperor Bird of Paradise *Paradisaea guilielmi* is endemic to the mid-montane forest areas on the Huon Peninsula. The species is threatened due to its small range and population size and ongoing clearance of forest from commercial logging and cultivation for the rapidly increasing population in this part of Papua New Guinea. Degradation of its forest habitat may also be bringing the species in to contact with the competitively dominant Raggiana Bird of Paradise, which replaces it in areas where the latter species moves in to. Hunting methods for the Emperor Bird of Paradise were not recorded during the surveys, but as for other species it is likely to be mainly hunted with the use of bow and arrows and guns. The species was only recorded from two outfits and from within the same cultural group. This group was from the Markham District of Morobe Province and which overlaps with the species range in the country. Due to its low frequency of occurrence in *bilas* outfits (only recorded on two occasions) no statistical analysis was possible on the species prevalence. While the use of Emperor Bird of Paradise was rare, on both occasions where it was seen a whole bird was used in the decoration, rather than individual feathers. Despite the species low prevalence of use, its' small range, use of whole birds in *bilas* and the IUCN Status of Near Threatened status give the Emperor Bird of Paradise a PNG Threat Rank of 12.





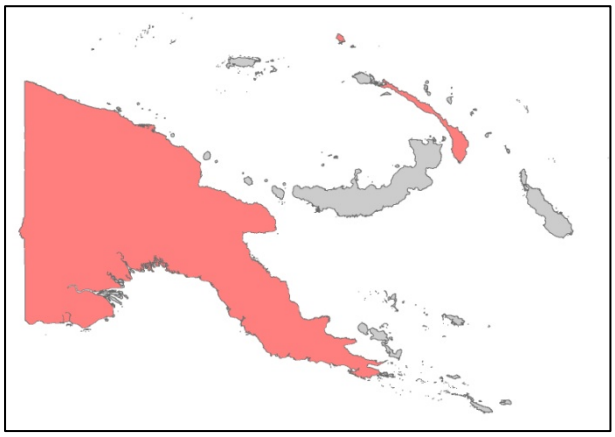
Species: Raggiana Bird of Paradise		**IUCN Threat Status:**	LC
Prevalence of Use:	18%	**Bilas Ranking:**	11
Plumes per Outfit:	1.8 ± 0.7 (1 – 4)	**PNG Threat Ranking:**	13

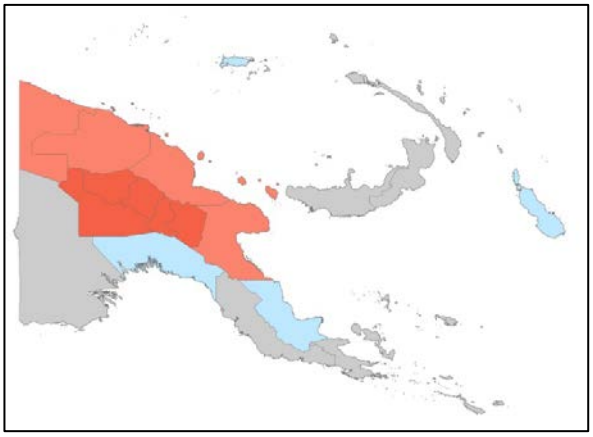
The Raggiana Bird of Paradise *Paradisaea raggiana* is the national bird of PNG and its image is widely used in the country from the national flag to the country's national airline. The species is also widely used in *bilas* occurring in 18% of outfits. The species is widely distributed in PNG mainly occurring along and to the south of the central range as well as in the Huon Peninsula and south-eastern regions of the country. The Raggiana Bird of Paradise are present in lowland to mid-montane forests and occur in a wide variety of habitats from undisturbed forest to coffee gardens. As for the Greater and Lesser Birds of Paradise the red tail plumes of the Raggiana Bird of Paradise are typically worn in pairs on either side of the head. In some cultures the red plumes of the Raggiana Bird of Paradise are the only wildlife item in *bilas*. The best-fitting models for the species prevalence in *bilas* were with District + Gender (AICcWt = 0.56), or just District (AICcWt = 0.22) as explanatory variables. Plumes of the species were more common in outfits of male performers (22%) than females (14%). The distribution of the Raggiana Bird of Paradise was widely scattered across the country but with a highest prevalence in districts with the Southern Highlands as well as Milne Bay. While use of the Raggiana Bird of Paradise in *bilas* is widespread, the distribution of use still broadly follows the species distribution, suggesting that there is little trade in its plumes.



Species: Common Spotted Cuscus		**IUCN Threat Status:**	LC
Prevalence of Use:	18%	**Bilas Ranking:**	12
Skins per Outfit:	1.1 ± 0.3 (1 – 2)	**PNG Threat Ranking:**	14

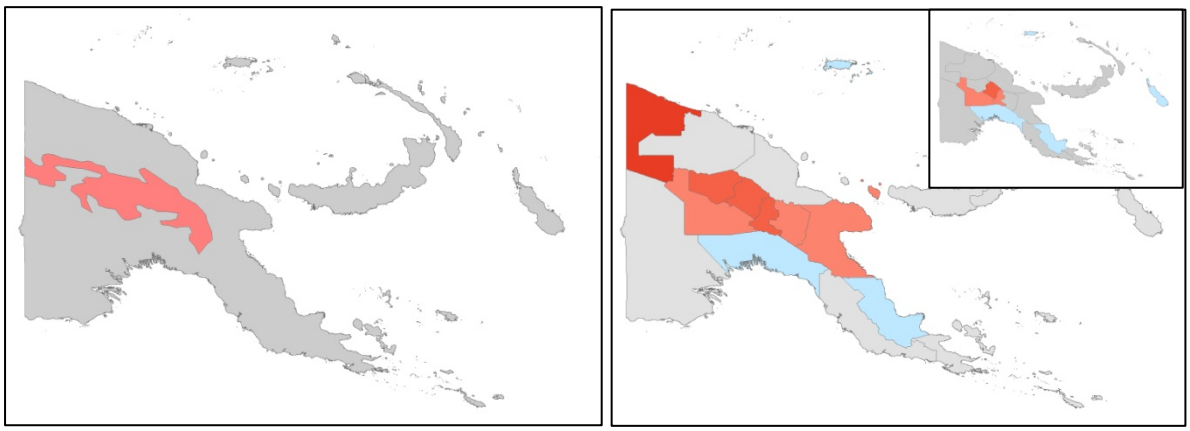
The Common Spotted Cuscus *Spilocuscus maculatus* is widely distributed in Papua New Guinea occurring in primary and secondary forest from sea level to 1200 m. The Spotted Cuscus is an important source of food for many communities and the species is hunted with dogs and bow and arrows, as well as the use of traps and snares. Snares used to be made from vines and rattan, but are now more frequently made from wire or nylon line. The skin of the Spotted Cuscus is often worn by women and girls, and its whole skin is often used to cover the body (pictured) or as a head dress, or else it is cut in to strips and used as armlets, bracelets and head bands. The best-fitting model for the presence of the Common Spotted Cuscus in *bilas* was with Region (AICcWt = 0.48), or Region + Gender as factors (AICcWt = 0.35), as factors. The species was most frequently seen used in *bilas* in the Highlands (31% of outfits), but also occurred infrequently in the Momase region (3% of outfits). It was not seen in *bilas* from the Papua or Islands regions. It was more than three times more likely to be worn by female performers (28% of outfits) than male performers (9%). The species is IUCN Least Concern and ranks 14 on the PNG Threat Ranking. However, the use of cat skins, rabbit skins and even cushion covers and car seat covers as substitutes suggest it can be locally scarce and that local hunting pressure (for food or as *bilas*) can threaten this species.





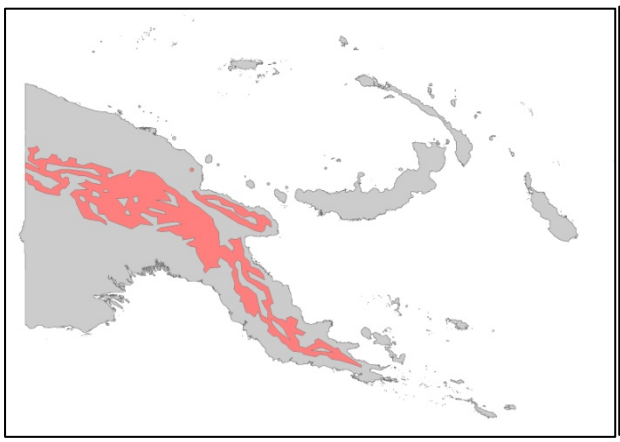
Species: King of Saxony Bird of Paradise		**IUCN Threat Status:**	LC
Prevalence of Use:	15%	**Bilas Ranking:**	14
Feathers per Outfit:	4.2 ± 2.5 (1 – 14)	**PNG Threat Ranking:**	15

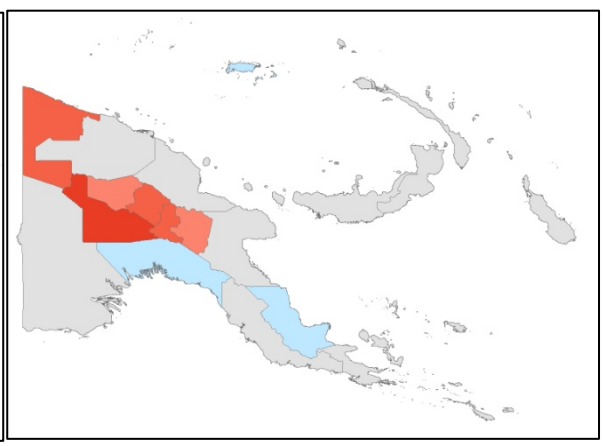
The King of Saxony Bird of Paradise *Pteridophora alberti* is a small and uncommon bird that inhabits high altitude cloud forest (1800 – 2500 m) in the Central Ranges of New Guinea. The unique sky blue head plumes, that can be moved back and forwards, mark out this species. The head plumes are used in *bilas* in Highland regions of Papua New Guinea. In Simbu the feathers are often used as facial decoration, passing through the septum of the nose and forming a circle that is attached to the forehead (pictured). In other highland provinces the plumes are worn with other feathers in headdresses. Wearing plumes of the King of Saxony Bird of Paradise provides status to individuals and in Simbu only initiated men can wear this species. The best-fitting model for the presence of the species in *bilas* was with Province as a factor (AICcWt = 1.0). The highest prevalence of use was seen in West Sepik Province where two of three outfits from the highland district of Telefomin contained this species. The species was also frequently worn in the Western Highlands (34% of outfits), Enga (30%), Simbu (27%) and Southern Highlands (25%). Substitute plumes of this species were frequently seen in *bilas* (8% of all outfits) and are often made from plastic that is shaped and painted blue and affixed to a wire to resemble the real plumes. Substitutes were seen used in Simbu, South Highlands and Western Highlands (see insert map) and women were far more likely to be wear substitute (16%) than men (1%).



Species: Superb Bird of Paradise		**IUCN Threat Status:**	LC
Prevalence of Use:	15%	**Bilas Ranking:**	13
Birds per Outfit:	1.2 ± 0.5 (1 – 3)	**PNG Threat Ranking:**	16

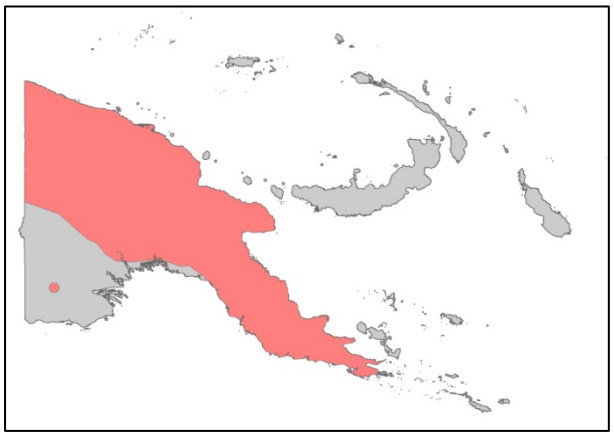
The Superb Bird of Paradise *Lophorina superba* is relatively common within the mid-mountain forests that it occurs and is found in disturbed areas as well as primary forests, even using casuarinas and oak copses in highland valleys. The species is distributed along the Central Range of New Guinea, mainly between 1,500 to 1,900 m in altitude, but occasionally from 1,000 to 2,300 m. The male Superb Bird of Paradise is unique for the bright iridescent blue breast shield that is shaped like an additional pair of wings on the bird's front. The whole bird is typically used in *bilas* and is most typically worn as the central point on the forehead of a performer's head dress (pictured). The use of the species in *bilas* was best explained by models with Province as a factor (AICcWt = 0.56) or with Province + Gender as factors (AICcWt = 0.44). The species used was restricted to the highland provinces and overlapping with its range. The highest frequency of use occurred in the Southern Highlands (75% of outfits), with less use in Simbu (33%), highland areas of West Sepik (33%), Western Highlands (27%), Eastern Highlands (13%) and Enga (4%). The Superb Bird of Paradise was more frequently found in the head dresses of female performers (21% of outfits) than male performers (10%). The species is classified as Least Concern on the IUCN Red List, however its' relatively high frequency of use and the use of whole birds in *bilas* places Superb Bird of Paradise at 16 on the PNG Threat Rank.

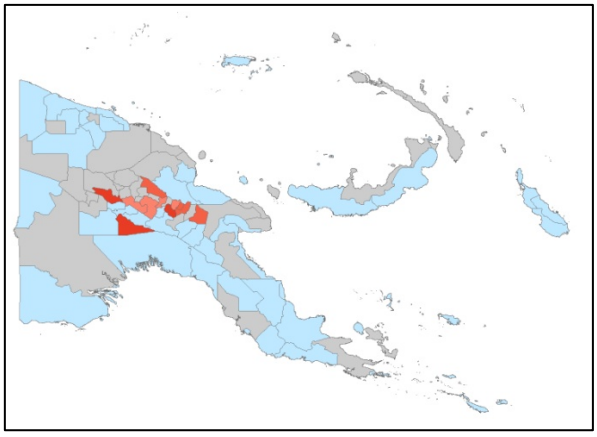




Species: Ground Cuscus		**IUCN Threat Status:**	LC
Prevalence of Use:	15%	**Bilas Ranking:**	14
Skins per Outfit:	2.0 ± 0.9 (1 – 4)	**PNG Threat Ranking:**	17

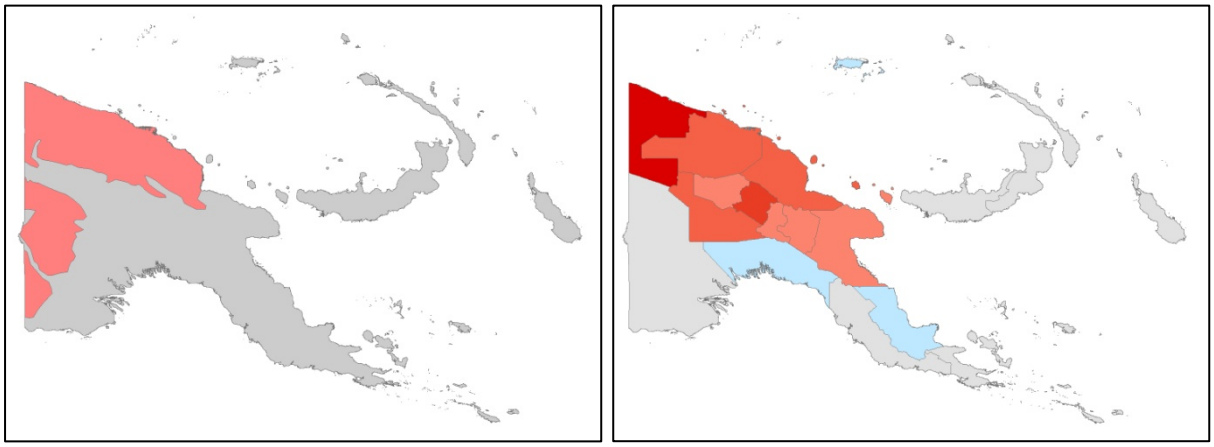
The Ground Cuscus *Phalanger gymnotis* is one of the most widely distributed cuscus species in New Guinea, occurring from sea level to 2,700 m in altitude and occurring at relatively high densities in primary and secondary forest. Unlike all other cuscus species the Ground Cuscus rests by day in holes on the ground and this behaviour, along with its relative abundance, makes it one of the most commonly captured phalangerid species and an important source of game (Cuthbert 2010). The Ground Cuscus is most commonly caught with the use of dogs that flush them or capture them in their lairs. Like the Spotted Cuscus, Silky Cuscus and Mountain Cuscus, the fur of the Ground Cuscus is used as an apron/vest to cover the front of performers, particularly of women. Fur of the species is also used as bracelets and wristlets. Rabbit skins and cotton and other cloth are becoming used as replacements for the fur of the Ground Cuscus. The best-fitting model for the presence of the species in *bilas* was with District + Gender as factors (AICcWt = 0.70). Inspection of the district map of use indicates that the species is most frequently captured in the Highland regions, but with wide variation in the prevalence of use among districts. Like the three other cuscus species recorded in *bilas* the Ground Cuscus was more frequently used by women than men, and overall women were five times more likely to utilize this species (27% of outfits) than men (5%).





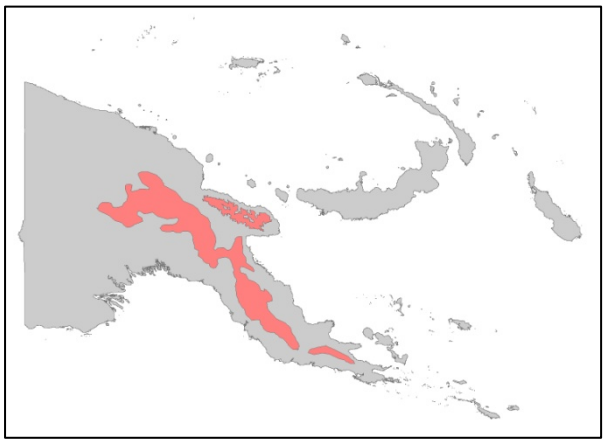
Species: Greater and Lesser BoP		**IUCN Threat Status:**	LC
Prevalence of Use:	25%	**Bilas Ranking:**	9
Plumes per Outfit:	1.7 ± 0.6 (1 – 4)	**PNG Threat Ranking:**	18

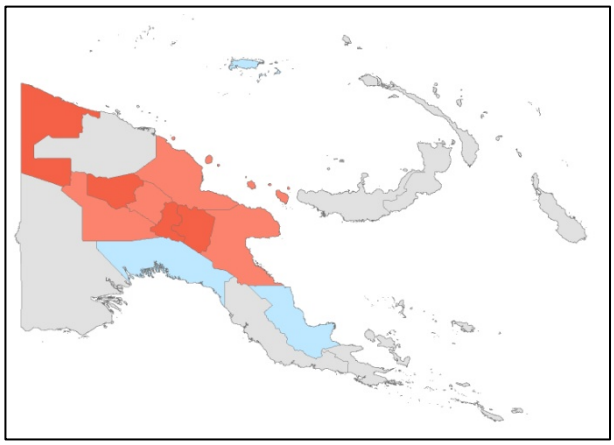
The bright yellow and white tail plumes of the Greater Bird of Paradise *Paradisaea apoda* and Lesser Bird of Paradise *Paradisaea minor* are highly sought after for *bilas* and were recorded in 25% of outfits. The Greater Bird of Paradise occurs in the east of PNG to the south of the central ranges. The Lesser Bird of Paradise is distributed to the north of the central ranges, occurring across West Sepik, East Sepik and Madang Provinces. Both species occur in lowland and lower montane forest, utilizing forest areas, regrowth and even garden habitats. In Simbu and the Southern Highlands the tail plumes of both species are typically worn in pairs on either side of the head to mimic the wings of the bird. In other cultures, the plumes are used to adorn masks (see image), as well on the tips of bows, edges of shield and as an armlet. No substitutes are available for these two birds. There was almost equal support for two models, with Province + Gender (AICcWt = 0.50), or District + Gender (AICcWt = 0.48) being the two top models. The species were most frequently recorded in *bilas* from provinces and districts to the north of the Central Ranges from West Sepik to Morobe, as well as being present in provinces in the Highland region. The distribution in *bilas* suggests that most plumes are from the Lesser Bird of Paradise and that plumes of this, or both species, are also traded in to the Highlands. Plumes of species were more frequently found in outfits of female (35%) than male (15%) performers.



Species: Stephanie's and Huon Astrapia		**IUCN Threat Status:**	LC
Prevalence of Use:	21%	**Bilas Ranking:**	10
Feathers per Outfit:	9.2 ± 7.8 (1 – 28)	**PNG Threat Ranking:**	19

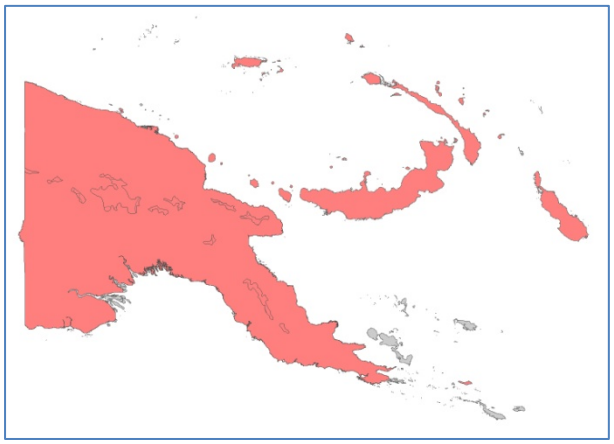
The black and purple sheen of the wide "streamer" like tail feathers of Stephanie's Astrapia *Astrapia stephaniae* and the Huon Astrapia *Astrapia rothschildi* were recorded from 21% of outfits where they are typically worn in the head dresses of performer's outfits. The use of these feathers is the pinnacle of many outfits in the highland regions with an average of 9 and as many as 28 feathers used in head dresses. Both species have relatively small ranges, with Stephanie's Astrapia occurring in mountain ranges in the Central Highlands, Eastern Highlands and mountains of the southeast. As its name implies the Huon Astrapia is only found on the Huon Peninsula. Hunting methods recorded for the species include the use of bows and arrows and fire arms, as well as the apparent use blow pipes at drinking holes. Most variation in the distribution of the two species was found in models with Province (AICcWt = 0.52), Province + Gender (AICcWt = 0.20), or District (AICcWt = 0.16) as explanatory variables. The highest prevalence of use of the two species was within the highland provinces of Simbu (42% of outfits), Enga (33%) and Eastern Highlands (32%). The species apparent high prevalence of use in West Sepik (33%) is slightly misleading, as very few outfits were sampled in this district and one of three outfits recorded these species as present. The species also occurred at a lower frequency in Madang, Morobe, Southern Highland and Western Highlands.

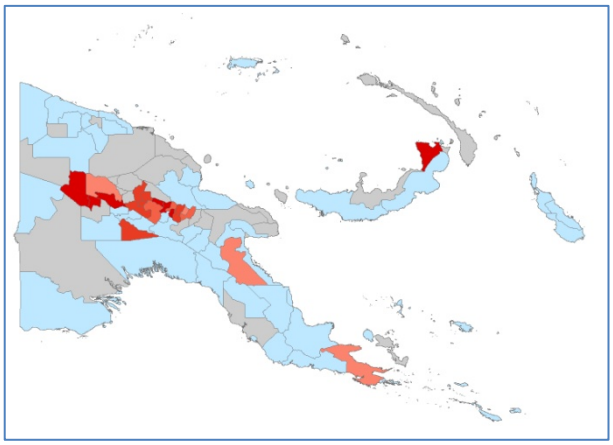


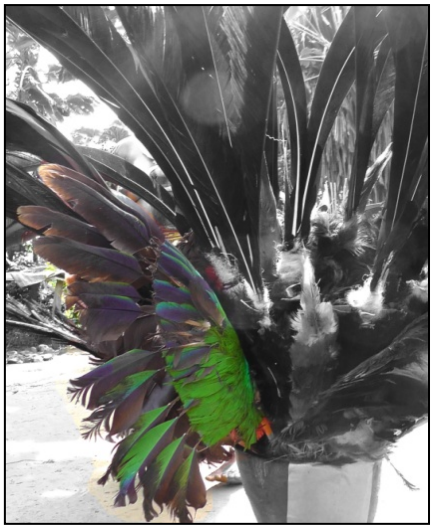


Species: Lorys and Lorikeets		**IUCN Threat Status:**	LC
Prevalence of Use:	32%	**Bilas Ranking:**	6
Feathers per Outfit:	11 ± 23 (1 – 132)	**PNG Threat Ranking:**	20

At least five species of Lory and Lorikeets were recorded in *bilas*, however due to similarities in the bird's size and colouration and the fact that often only a relatively small number of feathers were used in outfits (mean 11 feathers) identification was not always possible to the species level. As a consequence feathers from these birds were grouped together. Species identified with certainty include the Dusky Lory *Pseudeos fuscata*, Stella's Lorikeeet *Charmosyna stellae* and Rainbow Lorikeet *Trichoglossus haematodus*, and with feathers from the Black-capped Lory *Lorius lory* also likely to be present in *bilas*. These four species and other Lorys and Lorikeets are widely distributed across all regions of the country. The use of these species in *bilas* was best explained by a model with District + Gender (AICcWt = 0.94) as explanatory variables. Women were far more likely to have these species in their *bilas* (53% of outfits) than men (13%), and interviews with performers revealed that the species was often worn by young women to attract a husband. The brightly coloured feathers from Lorys and Lorikeets were most frequently worn in the head dresses of performers, with between 1 and 132 feathers worn in outfits. On occasions whole birds were also seen used in *bilas*. The species were most prevalent from districts in the highlands region and from East New Britain, but was also recorded from districts in Morobe and Milne Bay provinces.

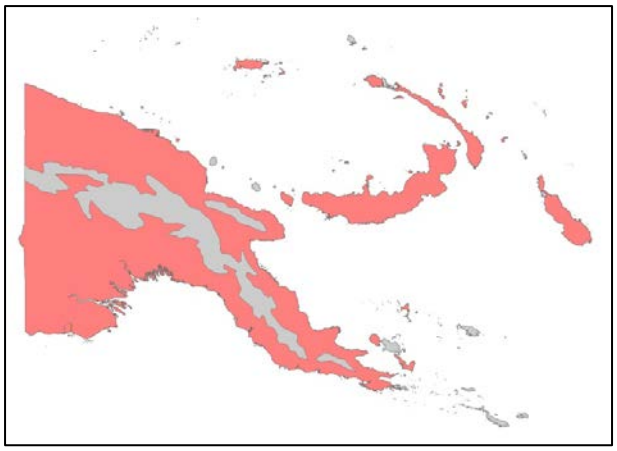


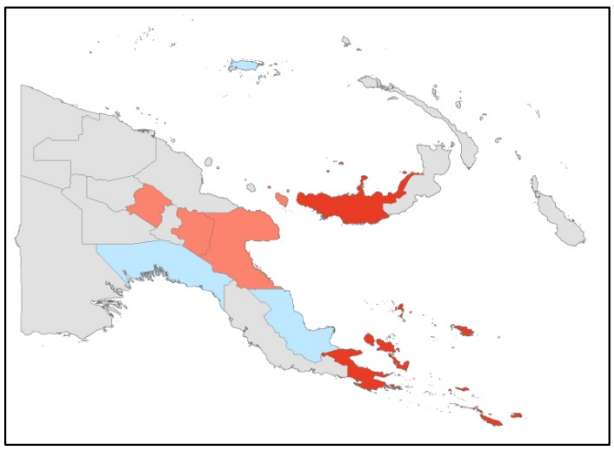




Species: Eclectus Parrot *Eclectus roratus*		**IUCN Threat Status:**	LC
Prevalence of Use:	6%	**Bilas Ranking:**	23
Feathers per Outfit:	24 ± 13 (3 – 49)	**PNG Threat Ranking:**	21

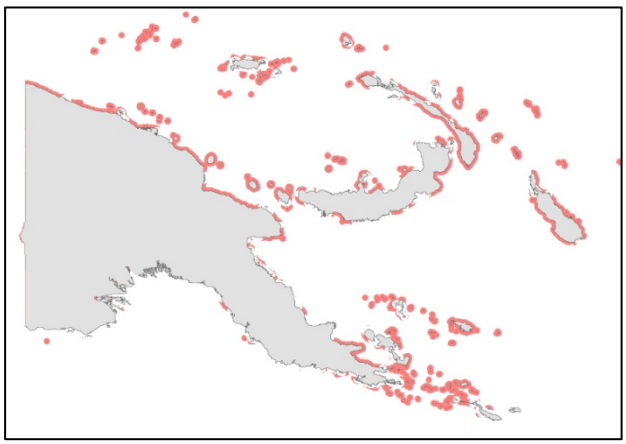
The Eclectus Parrot is widely distributed in PNG and is found in almost all island and coastal regions at altitudes of up to ~1000 m (rarely 1700 m; Beehler et al 1986). Its bright green and red (females) and green and blue (males) wing feathers accounts for its use, and it is either used with whole wings in head-dresses (pictured) or individual feathers are used in a head-dress. The best-fitting models for the species prevalence in *bilas* was with Province (AICcWt = 0.70) or Province + Gender as factors (AICcWt = 0.30). Despite the Eclectus Parrot's large range across most low to mid-altitude regions of PNG the species was recorded from five provinces, occurring most frequently in the coastal provinces of West New Britain (67% of outfits) and Milne Bay (60% of outfits). The species was also found in lower frequencies in Morobe (5%), Western Highlands (6%) and Eastern Highlands (14%). Its presence in *bilas* in two highland provinces suggests it has been traded from coastal regions. Across all provinces there was no difference in the species use by male or female performers (7% versus 6%, respectively), however for the five provinces where the species occurred it was more prevalent in the *bilas* of male performers (14%) in comparison to female performers (10%). Its low prevalence of use and IUCN threat status gives the Eclectus Parrot and overall PNG Threat Ranking of 21. Its high prevalence of use in certain provinces suggests it may be locally threatened from *bilas* use.

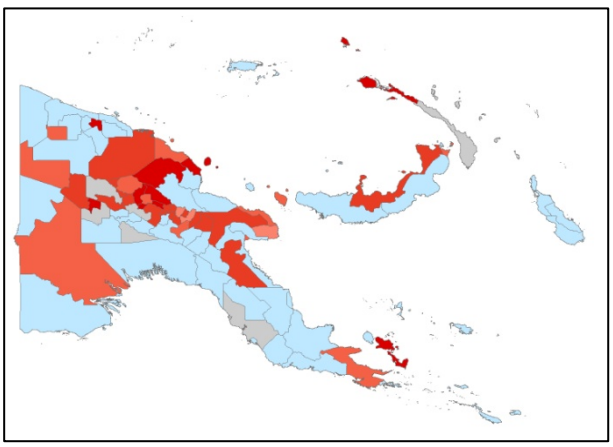




Species: Cowrie and other shells		**IUCN Threat Status:**	LC
Prevalence of Use:	49%	**Bilas Ranking:**	1
Shells per Outfit:	93 ± 145 (2 – 1252)	**PNG Threat Ranking:**	22

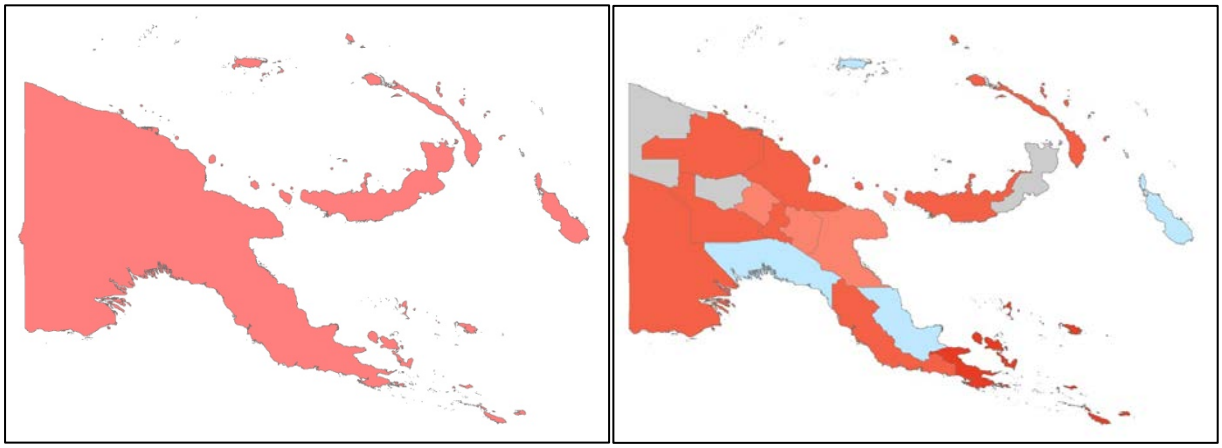
A wide variety of smaller shells of marine molluscs are used in *bilas*, with most shells consisting of species of cowrie within Cypraeidae family. As well as cowries a wide variety of other shells were used, these include species from the Colubrariinae, Conidae, Costellariidae, Nassarlinae, Ovulidae, Strombidae and Volutidae families. Identification to species level was not possible in most instances. Together these shells had the highest prevalence of use in *bilas*, being found in 49% of outfits. An average number of 93 shells were used per outfit and in one instance a performer's had over one thousand shells. These shells are primarily worn as necklaces, but the shells can also be attached to loin cloths, kundu drums and masks. Cowrie and other small shells were widely used as a form of currency in the past in PNG and the shells are widely distributed across the country in the *bilas* decoration. The best-fitting models for the species prevalence in *bilas* were with District + Gender (AICcWt = 0.62) or District as factors (AICcWt = 0.22). Shells were more commonly found in the *bilas* of female performers (70% of outfits) than male performers (40%). The wide geographic use of smaller shells in *bilas* indicates that these species are still traded from coastal regions in to the highlands, although given the evidence for the use of non-native bird feathers in *bilas* outfits in the highlands it is not known if shells are just traded from within PNG (as occurred in the past) or if they are also brought in from overseas.





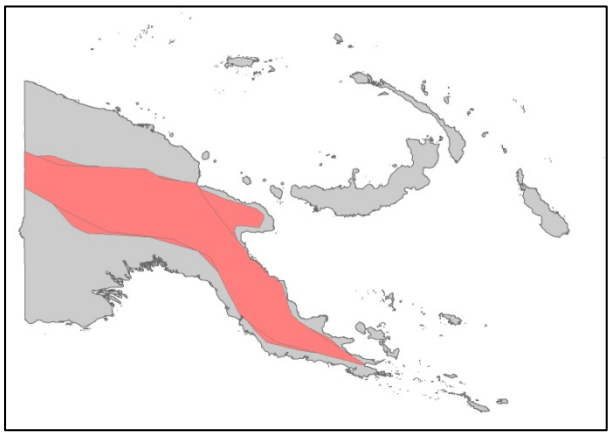
Species: Monitor Lizards		**IUCN Threat Status:**	LC
Prevalence of Use:	18%	**Bilas Ranking:**	13
Feathers per Outfit:	1.1 ± 0.6 (1 – 6)	**PNG Threat Ranking:**	23

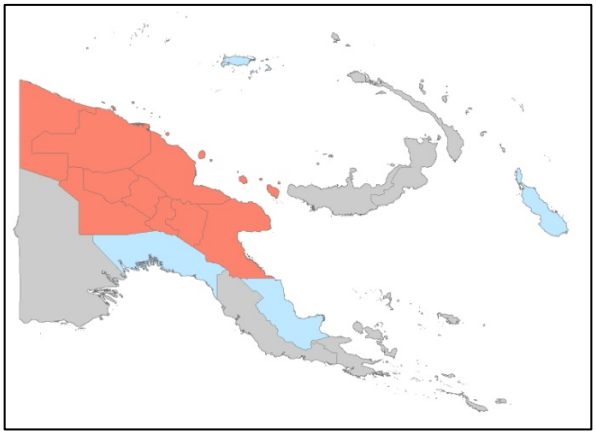
More than five species of Monitor Lizards *Veranus* spp. occur in Papua New Guinea and the species are distributed across all regions. Knowledge of the exact number of species, their distribution and status is generally poor, however currently all known species are classified by the IUNC as Least Concern. Monitor Lizards are consumed for food however a key use of these species is for the covering of *kundu* drums, and their Tok Pisin name of *kundu palai* translates to "drum lizard". Monitor Lizards grow to a large size (0.8 to 1.2 m) and are usually caught by hand (often by the tail) and then clubbed, stoned or speared. The best-fitting model for the presence of the species in *bilas* was with Province + Gender as factors (AICcWt = 0.92), with men more likely to have skins (primarily used on *kundu* drums) which were used by 24% of male performers in comparison to 10% of female performers. Monitor Lizards and *kundu* drums are widely used across the country and were recorded in 12 of the 15 provinces surveyed. Their use was common across the country, but the highest prevalence was seen in Milne Bay Province where 53% of performers had this species in their *bilas*. As well as Monitor Lizards the skins of larger snakes (most likely to be pythons, family Boidae) are also used to cover *kundu* drums. In areas where the species is scarce or absent performers use cloth (often from flour bags), rubber from car-tyre inner tubes and pieces of tarpaulin as a replacement to cover drums.



Species: Mountain and Silky Cuscus		**IUCN Threat Status:**	LC
Prevalence of Use:	8%	**Bilas Ranking:**	16
Skins per Outfit:	1.4 ± 0.6 (1 – 3)	**PNG Threat Ranking:**	24

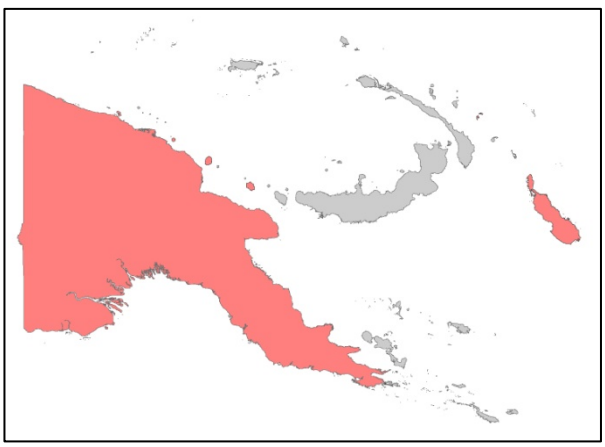
The Mountain Cuscus *Phalanger carmelitae* and Silky Cuscus *Phalanger sericeus* are relatively abundant species that both occur in forested areas in the Central Range of Papua New Guinea, with the Mountain Cuscus having a reported altitudinal range of 1,400 to 3,660 m and Silky Cuscus occurring from 1,500 to 3,900 m. These two cuscus species are widely hunted for food, with most animals being captured from tree hollows, as well as being caught be dogs. Traps and bow and arrows are also reported to kill cuscus. The fur of both species is similar and they could not be separated apart when used in *bilas*. Both the Mountain Cuscus and Silky Cuscus had two main used in *bilas*: as a sown apron/vest used to cover the front of male and female performers and as a covering for kundu drums. Small sections of fur are also cut and sown in to armlets and bracelets, and in the Marawaka culture in the Eastern Highlands the skins are cut and moulded in round ball like shapes and worn on the performer's front. Kundu drums covered with cuscus skins (pictured) are renowned for their clear distinctive sound. The best-fitting models for the presence of the two species in *bilas* were with Region as a factor (AICcWt = 0.68), or with Region + Gender as factors (AICcWt = 0.32). The species use was restricted to the Highlands and Momase regions and women were twice as likely to utilize this species (11% of outfits) than men (5%).

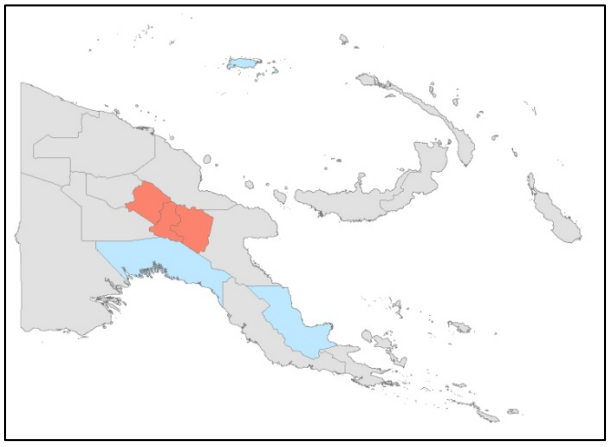




Species: "Barn" Owls *Tyto* spp.		**IUCN Threat Status:**	LC
Prevalence of Use:	6%	**Bilas Ranking:**	24
Wings per Outfit:	2 ± 0.5 (1 – 4)	**PNG Threat Ranking:**	25

Four species of "Barn Owls" (*Tyto* spp.) occur in PNG, consisting of the Australian Barn Owl *Tyto delicatula*, Eastern Grass Owl *Tyto longinenbris*, Australian Masked Owl *Tyto novaehollandiae* and Sooty Owl *Tyto tenebricosa*. These four owls are widely distributed across all the "mainland" of PNG, with the Australian Barn Owl also occurring on Bougainville. The wings of owls are (like eagles) worn at the back of the head and protrude outwards in imitation of a bird in flight. Performers wearing owl wings often imitate the bird in flight during dances. Smaller brown and white owl feathers are also worm in head-dresses, tied in small bundles and tied to small sharpened sticks. *Tyto* owls are recorded as being hunted with a bow and arrow, or with catapults. The best-fitting models for the species prevalence in *bilas* was with Province ((AICcWt = 0.44) or Province + Gender as factors (AICcWt = 0.37). Despite the species wide distribution it was only found in three highland provinces, occurring in Simbu (23% of outfits), the Western Highlands (6%) and Eastern Highlands (5%). Owl wings were more common in female (9% of outfits) versus male performers (3%). The wide range across PNG, international distribution of all four species and their low frequency of use place this group of species with a Bilas Rank of 24 and PNG Threat Rank of 25.





DISCUSSION

This study represents the most detailed and widespread assessment of the modern use of wildlife in traditional outfits, or *bilas*, in Papua New Guinea and has garnered information from 16 provinces, 46 districts, 164 cultural groups and nearly 500 outfits, as well as undertaking detailed interviews with 146 performers. The resulting data provides a comprehensive picture of the current use of wildlife in traditional outfits, enabled key regional patterns to be determined and revealed patterns of change in the use of wildlife that reflect the country's recent and rapid modernization. The study has also revealed which species are being most heavily targeted for *bilas* use and has enabled the WCS PNG programme to prioritize our future conservation work in response. We are not aware of any other such wide-scale assessments of the use of wildlife in *bilas* and its conservation implications for Papua New Guinea, other than references to the use of feathers for individual species such as the Vulturine Parrot (Mack and Wright 1998), or families of birds such as the birds of paradise (Frith and Beehler 1998).

Among the many findings of this study the work confirmed the vital importance of bird feathers, shells and mammal skins in *bilas*, with items from these three major groups being found in 97%, 64% and 51% of outfits, respectively. The use of reptiles (primarily the skins of monitor lizards and also pythons to cover *kundu* drums) and insects was also recorded in *bilas* and occurred in 17% and 2% of outfits. A wide range of other natural plant materials, ranging from grasses, bark and flowers as well as other materials (e.g. mud and soot) were also used in outfits, but their use was not quantitatively recorded in this study. While the widespread use of feathers, shells and mammals was not a surprise, what was revealing from the study was the limited number of species utilized for *bilas* with the majority of use restricted to a few key families of birds, mammals and marine molluscs. These major groups were the Psittacidae (parrots, present in 69% of outfits), Paradisaeidae (birds of paradise, 53% of outfits), Casauridae (cassowaries, 30% of outfits), Phalangeridae (cuscus, 32% of outfits) and Pteriidae (pearl-lipped oysters, 33% of outfits). Within these families the use of items to *bilas* was further restricted to a limited number of species, with for example parrot feathers primarily coming from just two species: the Sulphur-crested Cockatoo (34% of outfits and the second most prevalent item in *bilas* after cowries and other smaller shells) and the Vulturine Parrot (33% of outfits and the third most prevalent item in *bilas*).

These results indicate that the choice of wildlife for *bilas* is highly selective and for birds, where most information is available, the study revealed a total of 37 native species in *bilas*, comprising just 5.3% of the 702 bird species present in Papua New Guinea. If this list of birds used in *bilas* is restricted to just include species whose prevalence of use was ≥5% then the study reveals that 20 species comprised the majority of *bilas* us, representing less than 3% of the country's total avian diversity. Similar results are found for the mammals species found in *bilas*, where despite the diversity of Papua New Guinea's mammal fauna only a handful of species were recorded and the main mammal species used in *bilas* including two species of Tree Kangaroo (Goodfellow's and Central Ranges) and four species of cuscus (Spotted, Ground, Silky and Mountain). Identification to species level was not possible for all of the shells recorded in the survey however it was clear that the majority of use was limited to two species: the Pearl-lipped Oyster and Tiger Cowries *Cypraea tigris*. From a cultural perspective of displaying a *bilas* wearer's wealth

and status the selection for key ornamental species is to be expected, and unsurprisingly the most abundant and commonest species in the country (likely to be rats and other Murid rodents) were not recorded in outfits. Despite the expectation that *bilas* would contain the most colourful and culturally important species (parrots, birds of paradise, cassowaries and Tree Kangaroos) the study was nonetheless revealing in demonstrating just how limited the number of species was in *bilas*. This restricted selection has important implications for the conservation of the most heavily used and rarest species, as is revealed by the PNG threat ranking (Table 7).

Patterns of use of species in *bilas* indicated that geography (at the district, province or regional scale) and gender were the most important factors for understanding variation in the prevalence of species in *bilas*. These factors were important for almost all models, regardless of whether very broad species groups were examined (i.e. "native birds" or "native mammals") or whether the analyses were undertaken at the individual species level. For 21 species variation in the prevalence of use was best explained at the province or district scale (Figure 14) and for the broad patterns of species use the prevalence of use of native birds, native mammals, shells and reptiles was again best explained at the district or province level. A cluster analysis of the *bilas* data based on the species presence or absence and numbers of items in *bilas*, revealed broad geographic groupings at the province level (Figure 11). This analysis grouped all of the highland provinces together in to one major cluster, indicating closer similarities in the number and species used in this region in comparison to the other regions of the country. Cultural group (along with gender) was only the top-selected model for two of the 27 species, suggesting that despite Papua New Guinea's more than 800 languages and cultures that broader geographic groupings were a better explanation for the prevalence of use of most species.

Given the cultural diversity of Papua New Guinea and the wide variation in *bilas* outfits it is at first surprising that variation in the prevalence of use of different species can be explained at the relatively broad scale of districts or even provinces. However, the use of different species in *bilas* is also governed by the ecology and distribution of individual species, and the maps of individual species range and their use in *bilas* indicted that almost all *bilas* was from species that occurred in the same locality as the cultural groups that were utilizing them. These analyses and the close geographic grouping of the cluster analyses indicate that while there is wide variation and diversity in *bilas* outfits they still reflect the underlying distribution of birds and mammals in the country. The exception to this pattern was in the use of shells, which have long been traded from coastal areas in to the highlands for use in *bilas*, bride price ceremonies and as a currency. This was borne out by analyses on the prevalence of use and quantities of shells used in *bilas*, with shells being widely distributed in *bilas* across almost all provinces (Figure 4) and with the highest numbers of shells in *bilas* recorded in the Highlands and Momase regions (Figure 5).

While there are relatively broad geographic groupings that can be made in the species used in *bilas* that reflect the underlying distribution of species, what this study didn't reveal at a quantitative level was the different ways that Papua New Guinea's hundreds of cultures use these species. For example many highland cultures use the long black tail feathers of the Brown Sicklebill and Black Sicklebill in head-dresses, however the exact pattern of use, shape of the head-dress and combination of other feathers in the outfits will vary from culture to culture and be important and distinguishing elements of cultural diversity. While this study did not quantify these fine-scaled differences in outfits one of the important outputs of the study was a

photographic and video archive of performer's *bilas*. This photographic archive will be used in to the future to monitor potential changes in the pattern of use of species in *bilas*.

As well as geographic groupings at the district and province level, the performer's gender was also an important factor in understanding patterns in the prevalence of use of different species and gender was an important factor in 18 of the top-selected models. In many instances women were more likely to be utilizing species than men (see details in the individual species accounts). While this pattern was found a large number of species, there was also evidence that women were also more likely to wear substitutes for real items: both the prevalence of red-dyed chicken feathers (used as a substitute for Vulturine Parrot feathers) and artificial plumes of the King of Saxony Bird of Paradise were six times and sixteen time more likely to be worn by women than men, respectively. These results indicate that men are more likely to utilize real feathers of culturally important and high value species than women, and also suggest that while substitutes are used that they lower value than the real feathers from these culturally important species.

One of the key findings of this study was the high prevalence of use of non-native species and artificial substitutes in performer's outfits. Chicken feathers were the most prevalent single species in *bilas* and were found in the dress of 36% of all performers. Given the widespread abundance of this species, present in almost all villages and towns throughout the country, the species could be considered to be a naturalized species along with pigs and dogs. However, the chicken's cultural importance in Papua New Guinea and introduction in the country is far less and more recent than pigs and dogs (at least several thousand years before present for these two species; Flannery 1995) and in contrast to the use of pig's tusks and dog's teeth that provide status and wealth to the wearer the feathers of chickens are primarily used as a substitute for wild bird species.

As well as using the feathers of domestic chickens the study also revealed that feathers of exotic species were also being used, with Blue Peacock and Ring-necked Pheasant feathers being found in 14% and 5% of outfits, respectively, and with these two species only recorded from the Highland region in Simbu and Western Highlands Province. Feathers from Guinea Fowl (Numididae family) which naturally occur in Africa (but are also domesticated in many countries) were also seen in photographs of *bilas*; however detailed information on their use was not recorded as they were not identified by local observers at the shows. The source of the feathers from these exotic species is unknown, but they must have been purchased from outside of the country and brought in to Papua New Guinea. Australia and New Zealand place very strong restrictions on the importation of bird and mammals and other biological materials due to the potential bio-security risk of zoonotic diseases coming in to these countries and potential major impacts on wildlife and agriculture sectors. Such risks will also be present in Papua New Guinea and tightening the customs regulations to limit the importation of feathers and other biological materials is recommended to limit the potential risk of diseases in the country. Tightening of customs and border bio-security measures should also be considered for the export of *bilas* materials by nationals or tourists purchasing souvenirs, and many species will already have export restrictions places on them under the Convention for International Trade in Endangered Species (CITES) to which Papua New Guinea is a signatory.

As well as the use of non-native species in *bilas* the study revealed the widespread use of other artificial substitutes in *bilas*. This was unexpected and the true extent of the use of substitutes was not fully quantified in this study, with the exception of artificial plumes of the King of Saxony Bird of Paradise where data was recorded on the use of substitutes in all outfits where this occurred and revealed that substitutes were in 8% of outfits. Other substitutes recorded in use in outfits included the use of domestic cat skins and rabbit skins in place of Spotted Cuscus or other cuscus species, the use cushion covers and artificial "fur" car seat covers as replacements for native mammal skins, and the use of rubber car inner tubes, flour bags and pieces of tarpaulin to cover *kundu* drums in place of monitor lizards or python skins.

The use of non-native species and artificial substitutes in *bilas* suggest that *bilas* wearers are finding it increasingly hard to find real examples of these species from their surrounding land, and/or that that *bilas* wearers are losing the cultural connection with the real species that are important in their dress and artificial substitutes are as good a substitute as the genuine article. If the higher prevalence of red chicken feathers and artificial King of Saxony Bird of Paradise plumes in the dress of women in comparison to men reflects the differential value of artificial versus real items (assuming that male performers are choosing the higher value real items) then this suggests that the use of artificial substitutes may be being driven by the scarcity and/or high costs of real items. Further research is required to tease these factors apart, but it seems likely that the high prevalence of use of artificial items and non-native species in *bilas* will reflect the real scarcity of wild species and be an indicator of conservation threat.

The threat ranking calculations within Table 7 quantifies the threat that *bilas* is likely to be imposing on Papua New Guinea's native species, and indicates that targeted research and conservation actions may be required for tree kangaroos, cassowaries, Vulturine Parrots, Harpy Eagles and a number of species of birds of paradise. WCS PNG has already working produced species prescriptions for the top two ranked species (Vulturine Parrot and Goodfellow's Tree Kangaroo) and is undertaking research and beginning to implement conservation actions for these species. Initiatives for these and other species will also be developed at WCS program sites and in collaboration with local communities.

For conservation actions for these species to be successful it is vital that local communities and cultural groups that utilize them for *bilas* are involved and support these initiatives. Interviews with performers indicate that many *bilas* users already recognize that a wide range of species are becoming scarce. Almost half of performers indicated that birds of paradise are now hard to find and more than a third of performers indicated that cassowaries, parrots, cuscus and tree kangaroos were scarce (Table 4). When performer's perceptions of scarcity are analysed at the species level particular concerns were raised for Stephanie's and Huon Astrapia (73% reporting these two species as hard to find), Eclectus parrot (69%) and with four other birds of paradise all being reported as hard to find by 50% or more performers (Table 5). Due to the survey's design these listed species are likely to be the more widespread species that are identified by *bilas* wearers and reliable information is lacking for other rarer and more restricted range species. For example, interviews conducted by WCS with communities that utilize Goodfellow's Tree Kangaroo in their *bilas* in the Eastern Highlands revealed widespread concern for the scarcity of this species and the fact that it was much harder to capture than previously. Further work to

investigate finer-scale patterns of scarcity is recommended, particularly for the rarer species with restricted ranges in the country.

While *bilas* user's perception of scarcity is a broad-brush classification it is also supported by the reported average cost of *bilas*, with the scarcest species (birds of paradise and cassowaries) having the highest value in comparison to easily found species. This relationship (between scarcity and cost) was found when the data were examined at the family level and at the species level, and the same trends for increasing price with increasing scarcity were found among birds and mammals. The reported scarcity of many native birds and mammals in Papua New Guinea along with the relationship to their monetary value supports the concept that there are real threats to the species that are used for *bilas* in the country, although it is unknown at this stage if the reported value and scarcity relate to ecological factors (e.g. birds of paradise and tree kangaroos may always have been hard to find and consequently have a higher value) or instead relate to more recent scarcity in these species. Continued data collection and further assessments on price and scarcity will be required to monitor present day changes in scarcity and cost.

RESEARCH AND CONSERVATION ACTIONS

The key recommended actions that arise from this study include the following:

1. To continue to promote the link between cultural conservation and wildlife conservation at cultural shows and at regional and national forums, to ensure that the connection between Papua New Guinea's species and their traditional use is not lost and that long-standing prohibitions for managing and protecting wild species are maintained and enhanced.
2. To increase knowledge and awareness of the simple and cost-effective methods required for *bilas* preservation and supply this information to local communities, cultural groups and individuals who use and hire *bilas* outfits, as a means of reducing the harvest pressure on wild populations of birds, mammals and reptiles.
3. To investigate the feasibility of local airlines imposing a moratorium on carrying live animals to reduce the modern trade in wildlife for *bilas* from areas where key populations remain.
4. To better understand the occurrence and distribution of key *bilas* species so that WCS can map the species distributions and prioritize key areas for conservation intervention and community action.
5. To undertake targeted research and conservation actions on the species that are most threatened by their use in *bilas*, including developing research programs for tree kangaroos, the Vulturine Parrot, cassowaries, Harpy Eagle and birds of paradise.
6. To work with communities whose land contains key populations of priority species and who are still utilizing and value these species for *bilas*, in order to produce community based conservation initiatives to safeguard these species.
7. To utilize the results of this study as a baseline on *bilas* use in Papua New Guinea and to undertake monitoring at cultural shows at a 4-5 year interval to determine patterns of change in the cultural use of wildlife in the country.

CONCLUSIONS

The information collected by this study suggests that the use of wildlife in *bilas* is at a cultural crossroads, with the majority of outfits still reflecting the culturally important species whose hunting and use has been handed down for generations and whose traditional use is often specific to a cultural group. At the same time the surveys revealed increasing evidence of cultural change; with performers no longer just using species that were traditionally important and from their locality, but instead relying on both natural and artificial substitutes to provide further ornamentation to outfits or to replace the use of native species altogether. Such a change in the use of wildlife in *bilas* parallels many of the changes that Papua New Guinea as a nation is facing, as the country grapples with modernization, urbanization, a growing middle class and a growing disparity in earnings across the country but particularly between remote areas without infrastructure in comparison to the nation's town and cities. As Papua New Guinea modernizes and increasingly exploits its rich natural resources, often through destructive resource extraction from mining and large scale forest clearance for logging and agricultural commodities, it also increasingly celebrates its natural and cultural heritage. Images of wildlife and traditional outfits are ever present in Papua New Guinea and are used to sell everything from mobile phone networks to tourist destinations. Pictures of Papua New Guineans in cultural dress are found almost daily in the nation's newspapers as people greet ministers and overseas company managers, and school graduation ceremonies in the country's town and cities are frequently comprised of children complete in full *bilas* that have been hired for the occasion.

This modern use and commoditisation of *bilas* is a cause for hope in so far that the cultural identity and interest in wildlife used in traditional outfits is not altogether lost, but also a cause for concern as urban users of *bilas* may no longer know or understand the cultural value of the species used in outfits and will as happily wear a red-dyed chicken feather or exotic Blue Peacock feather instead of feathers of native species of Vulturine Parrot or Ribbon-tailed Astrapia. Such a commoditisation of *bilas* may also be imposing contrasting pressures on wildlife in Papua New Guinea: on the one hand the use of red-dyed chicken feathers or peacock tail feathers may be relieving the pressure to harvest Vulturine Parrots or Birds of Paradise, alternatively the hiring of outfits and increased need to own or wear *bilas* may be imposing increased threats and an increased trade in wildlife for *bilas* with animals being hunted from the remotest (and poorest) parts of the country with no regard to the species natural scarcity or traditional cultural prohibitions. It is too early to know how these changes will play out, however one important outcome of this project is that the surveys undertaken in 2012 and 2013 represent a "snap shot" in the use of wildlife in Papua New Guinea and will serve as a baseline for monitoring further cultural changes in the use of wildlife and the threat and opportunities this present for wildlife conservation.

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