academicJournals

Vol. 5(8), pp. 478-485, August 2013
DOI: 10.5897/IJBC2013.0569
ISSN 2141-243X © 2013 Academic Journals
http://www.academicjournals.org/IJBC

International Journal of Biodiversity and Conservation

Full Length Research Paper

Linking population size to conservation needs of the Grey Parrot in Cameroon

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Accepted 19 June, 2013

Unsustainable exploitation of the wild Grey Parrot is a complex and challenging phenomenon for governments and international organizations to tackle. The need to reverse the negative impacts of exploitation on the Grey Parrot population and to conserve it for future generations formed the basis of this study. Population data on the Grey Parrot in Cameroon were obtained using the point count method with two counting bands (r = 0 - 25 m and r = 25 m - ∞). Parrot densities ranged from 0.50 parrots/km^2 in the Littoral Region to 2.16 parrots/km^2 in the South Region, with a mean for the five regions where nearly all the parrots occur at 1.26 parrots/km^2. By multiplying these regional density estimates of forest cover within each region, a national population size range of 164376 – 251231 parrots was estimated. Regional conservation status of the Grey Parrot was described using the Cameroon classification system of wildlife threats. Emerging conservation challenges and mitigation measures for sustainable management of the bird are proposed.

Key words: Cameroon, conservation status, Grey Parrot, *Psittacus erithacus*, population size.

INTRODUCTION

The African Grey Parrot *Psittacus erithacus* attracts much interest in the international pet market (Mulliken et al., 1992; Juste, 1996; BirdLife International, 2010). Stemming from an assessment that 21% of the global population is harvested yearly, it is currently assessed as vulnerable on the IUCN Red Data list (Birdlife International, 2010; 2011). In addition, there has been a decline in the number of Grey Parrots throughout their range and this is attributed to the parrot trade and habitat loss. (McGowan, 2001; Birdlife International, 2010). The Grey Parrot's longevity, intelligence and ability to mimic human voices and other sounds make it a highly sought-after pet (Pepperberg, 1999) and trade in the birds brings in high returns to those involved (Birdlife International, 2010; Beissinger, 2001; Mulliken et al., 1992).

In the light of DNA studies, the Grey Parrot of Africa is now recognised as comprising two species (Melo and O'Ryan, 2007). The Congo Grey Parrot, *P. erithacus* of the Congo Basin occurs from east of the River Comoé in Côte d'Ivoire to Angola and the western form, the Timneh Parrot *P. timneh* is found from west of the River Comoé in Côte d'Ivoire to Sierra Leone. Although it is an internationally protected bird species, the trade in the Congo Grey Parrot thrives in Cameroon (Tamungang and Cheke, 2009) and in many other African countries, including those where *P. timneh* occurs.

This paper is on the Congo Grey Parrot which occurs in Cameroon as one of its range states. The bird will be

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hence referred to in this paper as the 'Grey Parrot'.

The recognition of the above mentioned debilitating factors on the natural populations of the Grey Parrot became the basis on which the Animal Committee of CITES, in their 22nd meeting in 2006, recommended the categorization of the Grey Parrot's range countries, based on the severity of negative impacts (CITES, 2006). On their list, Cameroon, Côte d'Ivoire, Guinea, Liberia and Sierra Leone were placed under the *Urgent Concern* category; the Republic of Congo, Democratic Republic of Congo and Equatorial Guinea were under the *Possible Concern* category, with most of the rest of the other range countries listed under *Least Concern*.

Furthermore, a two year moratorium, which started on 1st January 2007, was placed on countries in the *Urgent Concern* category, who were asked to carry out measures to forestall the negative situation (CITES 2006, 2007). The need for scientific data on the Grey Parrot for informed management decisions by the Cameroon government and the need to forestall the negative situation in the range states recommended by CITES stimulated this study, which aimed to determine the population size of the Grey Parrot in Cameroon and to propose sustainable ways for its conservation.

MATERIALS AND METHODS

Stratified Random Sampling (Sutherland, 2006) was used for data collection. For the purpose of easy demarcation of each stratum, the administrative regions of Cameroon, except for the three northern regions (Adamaoua, North and Extreme North) which are not part of the endemic range of the Grey Parrot (Figure 1), were chosen as strata, which were further subdivided into sub-strata using 17 protected areas, 8 Important Bird Areas (IBAs) outside protected areas (BirdLife International, 2004) and 7 other sites where the parrots were known to occur. All ecological zones and administrative regions with Grey Parrots within them were represented (Figure 1). Transects of 1 km length were randomly selected in each sample area and 10 paths were covered within them, contributing a total length of 10 km.

We used the point count method to census Grey Parrots, a method widely used to sample bird communities in tropical forests and calculate changes in bird abundance over time (Dawson, 1981; Hutto et al., 1986; Hill et al., 2005; Seavy et al., 2005; Volpato et al., 2009). Point counts involve mainly visual and auditory detections of birds with fixed or unlimited radius plots (Blondel et al., 1981; Hutto et al., 1986; Volpato et al., 2009). Their efficiency and accuracy are influenced by observer effort, which may affect the information obtained such as species abundance (Rosenstock et al., 2002; Bart and Earnst 2002; Betts et al., 2005). If well spaced, a sample series of points in an area will provide more representative data than a few transects. The point count therefore has an advantage over transects, being easier to incorporate into a formal study design.

Each point consisted of a circle made up of two counting bands or radii (Bibby et al., 1992). The first band had a radius of 25 m (r = 0 - 25 m). Any parrot that was detected outside the 25 m radius was recorded in the second band with its radius set as infinity (r = 25 m - ∞). It was assumed that as the radius decreased, the probability that Grey Parrots would be detected increased, both in terms of the number of birds detected and the numbers recorded in a series of point counts. The goal was to use a radius as large as possible, but within which detection of all parrots could be reasonably assured, in both open and dense vegetation types. Thus, the 25 m radius was a compromise between the open and closed habitats.

The study area covered the whole of the southern part of Cameroon where rainforest exists (Figure 1). Sample points were selected randomly on each path in a protected or non-protected area, to ensure that a cross-section of the major vegetation types in the geographical range of the Grey Parrot was sampled.

Accurate distance measurements between counting points is very important in this method since bird detection is associated with a certain distance. All walked distances were measured using two pedometers (Scanner Mark II) by two observers. Each pedometer was adjusted to the normal strides of the observer at the beginning of each data collection session. All members of the research team were drilled on distance estimation prior to point data collection to reduce the bias of distance estimates in the field. The distance between two adjacent counting points on the same path was 250 m, which was decided after considering the rate of parrot encounters/km and the associated vegetation types and structures. This distance was chosen to ensure that detection from different points remained statistically independent (Reynolds et al., 1980) and it represented a compromise between sample size and parrot conspicuousness in the dense tropical rainforest. A 1-km path length selected for data collection produced 4 points with 250 m between them and this was considered reasonable to enhance the rate of parrot encounters per counting session. For each study site, a minimum of 10 km was covered, thereby producing a minimum of 40 counting points per site per visit. The 32 sample sites in the whole country produced a minimum of 1280 counting points per sampling round. It is known that activity patterns of Grey Parrots change with seasonality (Tamungang et al., 2003), so we collected data in both the dry and wet seasons. Both dry and rainy season data were collected separately each/per year, with a minimum of 2560 samples of counting points per year [2560 (= 1280x 2 wet/dry season counts/year) and carried out during 4 years (2008-2011) amounts to 2560 x 4 = 10240 counting points]. In this paper, we limited our results to the mean of combined yearly parrot counts.

The duration of data recording at a point was 10 min. A longer duration was considered more likely to record birds making long movements from previously sampled points, which would invalidate the critical assumptions of the method. Shorter durations of 5 min would not have allowed sufficient time to detect parrots that were inconspicuous at counting points, so 10 min was taken as the best compromise between the longer and shorter durations.

Detections between count points were recorded as "present" (+) but these data were not used in the final calculation of population size, being only used to show the presence/absence of birds at the sampling site. Sightings of flying birds and all auditory detections were not included in the dataset, but were simply recorded as present at the site. Two or more observers made individual counts and then compared their results before recording a final total, so as to reduce counting bias. To minimize variations associated with indices of abundance, the counting of parrots was conducted at times when there was little change in conspicuousness of the birds (Dawson, 1981). Generally, Grey Parrots are known to be more active in the morning and evening than around mid-day and in the afternoon (Tamungang and Cheke, 2009; Clemmons, 2003). Data collecting periods were therefore standardized to fit within peak periods of activity of the birds (06:00-10:00 h and 14:00-18:00 h).

Datasets were analysed using relevant statistical packages (SPSS, Map Info, and Microsoft EXCEL). To calculate Grey Parrot densities and numbers for each region of the country, the following formula for point counts within and beyond a fixed radius (Bibby et al., 1992) was used:

$$\text{Density} = (\text{Log}_e\,(n/n_2) \times n/m(\pi r^2)$$

Where, n is the total number of birds counted; n_2 is the number beyond the fixed radius; n_1 is the number counted within the radius (r) so that $n = n_1 + n_2$; m is the total number of counts; r is the fixed

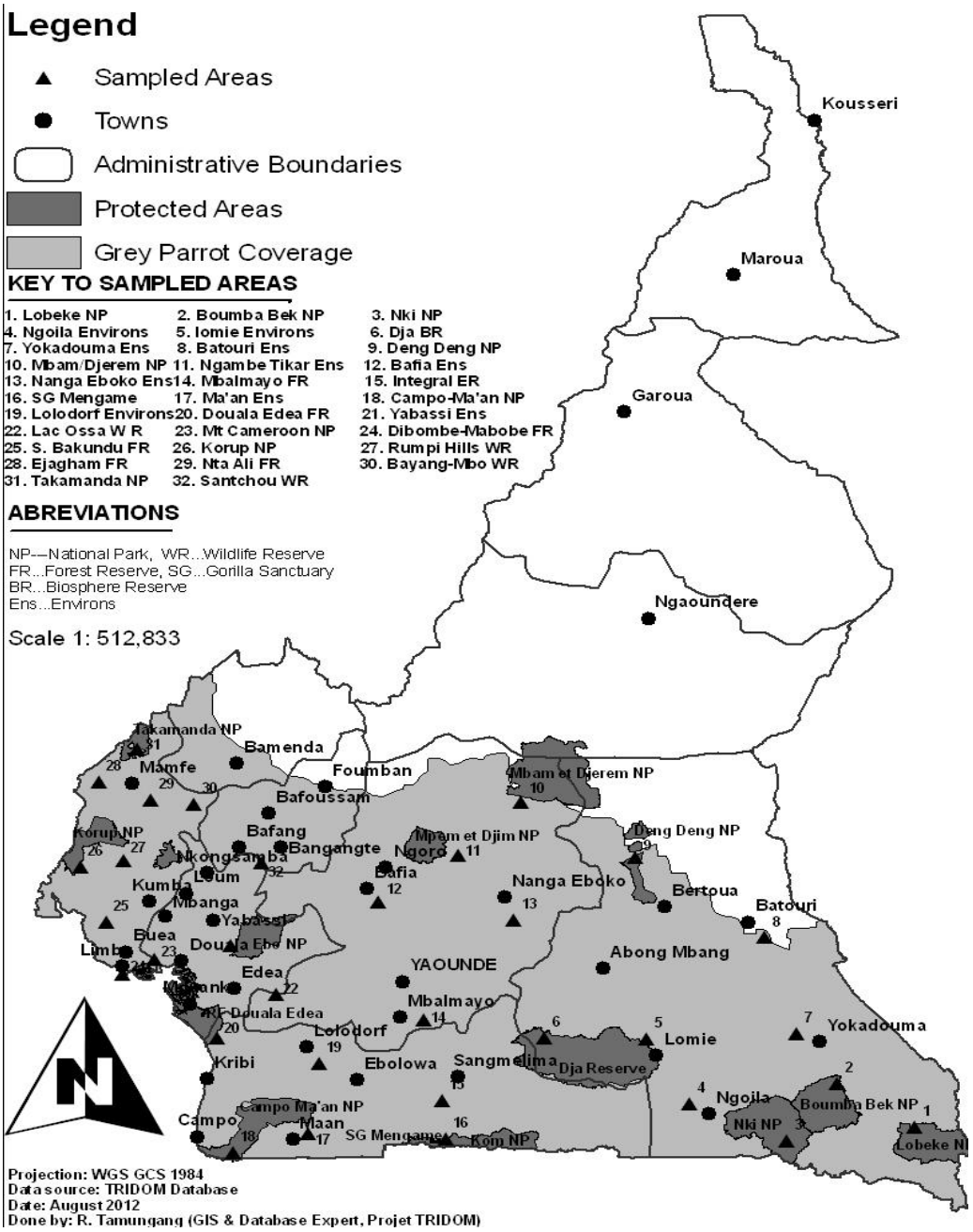

Figure 1. Original Grey Parrot coverage (range) in relation to sampled areas covered in four seasons in Cameroon during 2008-2011.

radius.

RESULTS

Grey parrot abundance

The natural range of the Grey Parrot in Cameroon falls in major parts of the South West, Littoral, South, Centre and East Regions and small parts of the North West and West Regions. This range of the parrot is relatively large as compared to the size of the country (about 25.4%). Within this range, but omitting data for the North West and West Regions, yearly densities of Grey Parrots were obtained from the mean of the estimated annual dry and rainy season densities for the study period (2008-2011) (Table 1).

The regional mean parrot densities in Cameroon ranged from 0.50 to 2.16 parrots/km^2/ (Table 1), and the mean of these means was 1.26 parrots/km^2 for the study period.

Table 1. Mean Grey Parrot (GP) annual densities (parrots/km^2), with standard deviations (Stdev) and upper and lower 95% confidence levels (CL), in five regions of Cameroon during 2008-2011.

Region	GP density distribution				Mean	Stdev	Lower CL (95%)	Upper CL (95%)
	2008	2009	2010	2011				
Centre	0.71	0.70	0.82	0.71	0.74	0.05	0.69	0.79
East	1.99	1.66	2.87	2.11	2.16	0.44	1.73	2.59
Littoral	0.50	0.40	0.50	0.68	0.50	0.11	0.39	0.61
South	1.33	1.56	1.98	2.00	1.72	0.28	1.44	2.00
South West	0.47	0.40	1.98	1.95	1.20	0.77	0.45	1.95

Table 2. Regional estimated Grey Parrot population sizes in Cameroon during 2008-2011.

Region	Forest area/km^2	Parrot density/km^2	Parrot population size	Lower CL (95%)	Upper CL (95%)
Centre	14058.47	0.74	10403	9700	11106
East	62559.15	2.16	135128	108227	162028
Littoral	6973.58	0.50	3487	2720	4254
South	27275.43	1.72	46914	39277	54551
South West	9893.17	1.20	11872	4452	19292

Translating densities into populations

The surface areas occupied by rainforest within the endemic range of the parrots in each of the 5 sampled regions were obtained from the Ministry of Forestry and Wildlife (MINFOF) in Cameroon (MINFOF, 2007). The rainforest habitat in Cameroon is incidentally the area covered by the Grey Parrot range. These rainforest areas were mapped relative to the survey points and protected areas already shown in Figure 1 (see Grey Parrot coverage). Similar information was also obtained on the total surface area of each region of the country. Parrot densities were obtained from the formula:

Density = Number of individual animals/surface area occupied

From this equation, we obtained the number of parrots from the densities as presented in Table 2, with the CLs calculated in relation to the amount of forest that are still surviving in each region.

The national parrot population size obtained from the sum of the regional population sizes was 207804, with a range based on the CLs of 164376–251231 parrots.

Regional population status

We adopted the Cameroonian classification system of wildlife threats (found in the 1994 Forestry and Wildlife Law) to describe the regional conservation status of the Grey Parrot (Table 3). Thus, out of the seven regions that harbour Grey Parrots in Cameroon, three regions (North West, West and Littoral) were listed as Class A, where the birds are seriously threatened, while two regions (South West and Centre) were listed as Class B, where the populations are vulnerable to threat and thus are of concern and need sustainable management activities. Two regions (East and South) were listed as Class C (Table 3).

Parrots were abundant and could be sustainably harvested. Sustainable limits of the populations need to be determined before harvesting could be done, and then only above such limits.

DISCUSSION

Threat to population size

From a national perspective, a previous estimate of the Grey Parrot population in 1998 for the country was 300,000 - 500,000 (Fotso, 1998). The current study suggests that there has been a drop to about 50% of the 1998 population in 14 years, but it is important to note that census methods used in the two studies were not the same. Generally, the high variability in regional population sizes of the parrots is indicative of the variety of factors that influence wildlife at different levels in the regions (Tamungang and Cheke, 2012; Chardonnet et al., 2002). Such factors include past history of harvesting for the pet trade, distribution and abundance of habitat resources (in quality, quantity and diversity), and human influences (demographic pressure and forest disturbance, as well as community awareness of parrot conservation (Collar and Juniper, 1992). These threat factors could be summarised into two major categories: parrot trade and habitat destruction.

Table 3. Regional conservation status of the Grey Parrot in Cameroon during 2008-2011.

Region	GP population size	Conservation status	Explanation
North West	Very low (inadequate data)	Class A	-Birds are threatened with extinction. -It is strictly forbidden to carry out any harvesting activity. -Urgent restoration programmes are needed to bring the population up to abundance level.
West	Very low (inadequate data)	Class A	
Littoral	2720-4254	Class A	
South West	4452-19292	Class B	-Birds are vulnerable to threat. - A few birds can be harvested under administratively supervised conditions, along with population development programmes.
Centre	9700-11106	Class B	
South	39277-54551	Class C	-Birds are abundant. -Legal harvesting can be sustainably carried out above the carrying capacity of the population.
East	108227-162028	Class C	

Conservation status is adapted from the Cameroonian classification system of Wildlife threats (MINFOF, 1994).

Parrot trade threat

The parrot trade is a big business in Cameroonian society involving the public and private sectors (Chupezi et al., 2006; Ngenyi, 2003). It begins with the trappers and villagers in the rural communities and extends to the middlemen who dwell in the towns and cities. The driving force behind the trade is poverty alleviation and unemployment. Major suppliers of Grey Parrots are those in the rainforest areas of Cameroon where, at the regional level, three regions (with the estimated quota in 2006: South 31%; Centre and East, 23% each) were the major sources of Grey Parrots in the country. The international trade from Cameroon is financially motivated as exporters get much higher prices per bird abroad than their local counterparts. In recent years, the Grey Parrot has been the most exploited and exported wild bird species in Cameroon. From 1981-2005, Cameroon exported 367,166 birds with a yearly average of 15,299 (Tamungang and Cheke, 2006).

From 1990 - 1996, Cameroon exported 48% of the Grey Parrots from the 25 exporting countries in Africa, thereby positioning itself as the leading exporter of the wild Grey Parrots in the world (Tamungang and Cheke, 2006). Official figures do not account for parrots that are smuggled across borders into neighbouring countries, consumed locally or that die in the process of trapping and transportation. Effectively dismantling the illegal parrot trade remains a big challenge to the Cameroon Government.

Habitat destruction threat

Another major threat to Grey Parrot population growth in Cameroon is habitat degradation and its complete loss in some places. Threats are felt by the parrot at various essential habitat-based sites used by the bird. The following major threatened sites are discussed:

Roosting sites: All the roosts identified by this study were threatened by anthropogenic pressure. These threats were predominantly through human predation on the roosting birds and /or habitat (roost) destruction, e.g. felling of roosting trees for socioeconomic reasons Similar observations were made by Dändliker (1992) in Ghana. Loss of roosting sites has many negative consequences on parrot population growth including reduction of population size.

Foraging sites: Farmers attributed the birds' habit of feeding heavily on the fruits of economic tree species, such as plum *Dacryodes edulis* and oil palm nut *Elaeis guineensis,* to reductions in their yields. Various methods were adopted for chasing them away, trapping or killing the birds including shooting with guns and catapults. This is a type of parrot-human conflict that tends to reduce bird population growth (CITES, 2011).

Nesting sites: The felling of nest trees for timber exploitation, farming and infrastructure development brought about the destruction of nests, some of which might have contained eggs or fledglings. The scarcity of nesting sites could be due to forest exploitation activities (Madindou and Mulwa, 2008). Scarcity of nest sites can lead to prevention of reproductive activities by mature females, or mature birds may migrate to neighbouring countries in search of suitable nesting sites.

Some explanation could be advanced for the seemingly high densities in the Centre and South Regions in spite of the many towns, cities and agro-industrial plantations within them. We observed relatively high levels of public sensitization to parrot conservation in Campo (in the

South) and at Ndikinimeki (in the Centre), where the bulk of the parrots roost in villages close to human houses and gain protection from the villagers. Although the parrot habitats were located around human settlements, there seemed to be a good level of sustainable co-existence between parrots and the inhabitants. The conditions of the forest habitats in and around these villages were seriously fragmented. The further away from the village, the less the fragmentation and degradation process of the forest. It was observed that the parrots travelled far from the roosts to forage and breed. Some forms of community participation in parrot conservation and human protection of parrots from poachers were well developed in Campo. The creation there of a tourism management committee and construction of camps for tourists to use while watching parrots, especially at roosts, was illustrative of this approach.

Grey Parrots frequently nest in natural cavities in *Terminalia superba* trees, popularly called *fraquet* in French, whose wood is also in high demand for house construction. Many low-income earners use '*fraquet*' in constructing houses, market centres and cheap furniture. There is intensive exploitation of this resource to meet the needs of the increasing local population or by timber exploiting firms to establish low-cost houses (locally called "*Kara-boat"*) for workers. By indiscriminate felling of the trees, potential nesting sites are destroyed. Destruction of nesting sites constrains natural increases in parrot numbers because trees that produce these nesting sites occur at low densities.

Recommendations for grey parrot population development

Restructure the parrot trade to boost wild population growth

The sustainability of the parrot trade in Cameroon depends on its structure and function. A well structured and managed trade is likely to be profitable for the benefit of both the people and wild parrot populations. The current structure has many short-comings including lack of understanding of procedures to be followed by both traders and administrators, problems of information flow and lack of coordination of stakeholders to achieve common goals of the trade. It is recommended that a guideline-document should be produced identifying the challenges in the sector and outlining possible solutions. For the trade to be more functional, integrative and profitable, the following points should be considered in the guideline document:

1. Trapping season: Parrots should not be trapped during their breeding seasons. These seasons vary slightly from the South West to the East Region but the peak period is from June to October in most parts of the country. Trapping should therefore be carried out from November to April each year and trapping should be limited to fledglings.

2. Identification of trappers and traders: All legal parrot traders should identify their trappers with names, photographs and copies of identity cards. They should be issued with permits to show that they are working for the designated traders. These permits should be carried and if necessary displayed at any time the trappers or traders are in the field.

3. Verification and control of trappers: Effective means of verification and management of parrot trappers before, during and after trapping should be established. This action will go a long way to ensure that trapping rules are obeyed for the benefit of all the stakeholders in the sector.

4. Period for issue of parrot trapping permits: All permits for commercial purposes should be issued from October to December but should be valid only in January to December of the next year. This means that parrots that have not been trapped or exported within the above period cannot be carried over to the following year. This measure will ensure that yearly export quotas are not exceeded.

5. Parrot trapping in protected areas: Parrots should never be trapped in protected areas, even by valid permit holders for the trade, except for research purposes and then only under officially supervised conditions.

Encourage rural community participation in parrot conservation

Rural communities are the backbone for any meaningful wildlife conservation practice, as they are the resident custodians of the parrots that thrive in their forests. The integrated approach to parrot conservation in Cameroon cannot be successfully implemented without regarding the rural communities as major stakeholders.

1. Provide incentives to local communities: The government should provide incentives to galvanise these communities towards sustainable parrot conservation through community development projects. Assistance of rural communities in creating income-generating activities for sustenance during their annual programmes is very important. In this way they will have a sense of recognition and responsibility to be vanguards of parrot management programmes and can become strong government collaborators. Enhancing community level participation in

sustainable parrot management will be a major breakthrough for wildlife management in Cameroon, since the level of grass-root wildlife conservation awareness is currently very low.

2. Communities should work with parrot trappers: The community should work with parrot trappers/traders in their region to ensure that the laws and regulations in this sector are fully implemented.

Improve policy and law enforcement measures

Wildlife law enforcement at all levels of society has remained a major challenge in Cameroon. The 1994 Forestry and Wildlife law should be revised and effectively implemented in the field. There is an urgent need for more infrastructure, equipment and personnel to deter and combat wildlife crimes in general.

Scientific and research requirements

Field research on parrots is generally a difficult and specialised domain, especially on the Grey Parrot that thrives in the humid and dense tropical forest. Scientific research in this domain will offer capacity building services, sustainable protection of wild parrots, and informed management and policy decisions.

1. A parrot GIS database be created and regularly updated in Cameroon. Uses of such a functional database are many, including population monitoring and regulation, informed management and policy decisions and trade regulation.

2. More emphasis should be placed on studies of demographic trends of parrots for long- and short-term analysis, reproduction, ecology and behaviour, radio-tracking studies to determine home range and seasonal movements, and their effects on the birds and changes over time in habitat use.

3. Habitats with substantial parrot populations should be identified and protected from socio-economic activities. Such targeted habitats include those used for nesting, roosting and feeding. An inventory of these sites should be carried out at regional levels and the village communities around them should be organised to safeguard their protection.

Encourage captive breeding of Grey Parrots in the country. Parrots from captive-bred programmes can be used as pets locally or exported, thereby reducing harvesting pressures on the population in the wild. Captive-bred parrots can be released in the wild after long periods of acclimatization to boost wild population growth rates.

ACKNOWLEDGEMENTS

Immense thanks is due to all who assisted in the project, they are too numerous to mention here. Fritz Oben analysed the data. Gilbert Mofor, Edwin Penn and Ernest Achu, all of PARROTPRO Research Group, collected field data. Estella Tamungang processed the manuscript and Rowan Martin reviewed it. This study was carried out with financial support from the Ministry of Forestry and Wildlife, Cameroon; the Loro Parque Fundación, Spain, and the British Ecological Society, UK.

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