A. PROPOSAL

Transfer of the Indonesian population of *Cacatua goffini* from Appendix I to Appendix II.

B. PROPONENT

The Republic of Indonesia.

C. SUPPORTING STATEMENT

Preamble (To clarify framework of submission)

It appears that the Berne Criteria (Resolution Conf. 1.1) were not fully complied with in respect to the transfer of *C. goffini* from Appendix II to Appendix I at the eighth meeting of the Parties in Kyoto, 1992.

This proposal for transfer back to Appendix II is in accordance with the Berne Criteria (resolution Conf. 1.2) and special criteria for transfer of taxa in Resolution Conf. 7.14)

In addition, we provide supplementary details of conservation measures which will go in hand with the resumption of strictly controlled trade.

1. Taxonomy:

11. Class: Aves

12. Order: Psittaciformes

13. Family: Psittacdae

14. Species: *Cacatua goffini*

15. Common Names: English: Goffin's cockatoo
Tanimbar corella
French:
Spanish:
Indonesia: Kakatua rawa

16. Code Numbers:

2. Biological data:

21. Distribution: Tanimbar corrella *Cacatua goffini* is endemic to the Tanimbar islands in Maluku Province Indonesia. These islands, with a land area of 5.082 km^2, are located 425 km to the east of Timor, 725 km southwest of Irian Jaya and 350 m north of Australia. *C. goffini* is most closely related to the widespread *C. pasicator* of north Australia and southern New Guinea. Adults, general plumage white; lores and bases to feathers of head salmon-pink.

Furthermore, the 1993 surveys confirmed that *C. goffini* is an agricultural pest in the maize season. When international trade was open, farmers in Yamdena were able to receive some compensation for this damage through the capture and sale of cockatoos.

Farmers in Yamdena are amongst the poorest in Indonesia and live a largely subsistence life. It is not known what effect stopping control of *C. goffini* through capture would have on the population. If the population was to rise substantially this may have a negative impact on local agriculture. Transferring *C. goffini* back to Appendix II and allowing limited harvesting would restore the status quo and this is considered to be in the best interest of the species conservation.

22. Population:

221. Population Size: According to surveys conducted under the PHPA\Birdlife International - Indonesia Programme during April and May 1993, the population on Yamdena island was found to be 347,000 +/- 83,000 (s.e). The population in forest habitats was found to be 297,600 +/- 58,000 (s.e) and in agriculture 49,500 +/- 25,000 (s.e). Yamdena island is the largest of the Tanimbar island and constitutes 61% of the species range.

Data were collected using Variable Circular Plot (Reynolds et al. 1980) and Variable Distance Transect methodologies (Bibby et al.) and analyzed using DISTANCE computer programme (Laake et al. 1993).

The 1993 surveys also investigated the agricultural impact of *C. goffini* on the maize harvest. It concluded that in the region, 0.55% of the crop was lost to *C. goffini* damage.

This is small but significant. Maize fields average 0.7 ha and *C. goffini* travels in flocks of up to 350; the damage to an individual farmers crop can be catastrophic.

Full details of these surveys are present in the draft report (Title) which is attached as an Annex.

222. Population trend This is not possible to quantify because this was the first status assessment of the species. *C. goffini* has been harvested for approximately ten years with annual catch quotas ranging between 8,000 and 14,000; these surveys demonstrate that *C. goffini* is still a common bird on the island.

23. Habitat:

24. Biology:

3. Trade Data

31. Potential for sustainable harvesting: The 1993 surveys collected the following information which is relevant to the potential for sustainable harvest.

- The population is large.
- Yamdena island is still largely covered of forest and catching only occurs in a limited part of the island.

- Cockatoo's are only caught during the maize season when they are raiding crops. Trappers do not enter the forest.

- Local people reported that *C. goffini* breeds before the maize season and it is likely that birds in agriculture and hence those caught include a high proportion of non-breeding and juvenile individuals.

From this evidence it is concluded that a limited off-take from the wild population is sustainable and will not be detrimental to the species survival.

32. Proposal for sustainable utilization of *C. goffini*: If this proposal is approved PHPA proposes to ensure that off-take of *C. goffini* is sustainable through the following actions:

- Establishing an export quota from Yamdena Island of no more than 6,750 birds per year. This is 2,5% of the most conservative population estimate.

- Regulating, through directive of PHPA and Decree of Regent, that *C. goffini* may only be caught on agricultural land during the maize season from March through May.

- Licensing two traders on Yamdena or export from the island and requiring these to submit records of all shipments.

- Repeat survey in 1998. This will be five years after the last survey and three years after the resumption of any trade.

In addition PHPA is pleased to report the following conservation activities which will benefit the conservation of *C. goffini*:

- The gazettal of a protected area is in process. This is planned to cover 882 km^2 of *C. goffini* breeding habitats.

- A poster depicting all parrots in Maluku with notes on relevant legislation and parrot conservation will be distributed to all villages on Yamdena.

4. Protection Status

5. Information on Similar Species

6. Comments from Countries of Origin

7. Additional Remarks

8. References

Bibby, C.J., Burgess, N.D. and Hill, D.A. 1992. Bird Census Techniques. hl Academic Press, London.

Laake, J.l., Buckland, S.T. Anderson, D.R. and Burnham, K.P. ll1993. DISTANCE User's Guide, Version 2.0. Colorado State University, Fort Collins, CO. 72 pp.

Reynolds, R.T. Scott, J.M. and Nussbaum, R.A. 1980. A variable circular plot method for estimating bird numbers. Condor ll82: 309-313.

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THE STATUS OF *CACATUA GOFFINI* AND *EOS RETICULATA* ON THE TANIMBAR ISLANDS AND EVALUATION OF THE IMPACT ON *C.GOFFINI* ON AGRICULTURE

1. Key point summary

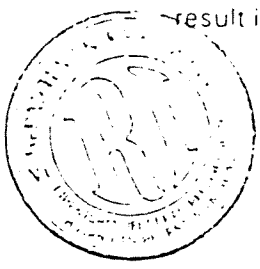
1.1. Two parrot species, the Tanimbar Corrella *Cacatua goffini* and Blue-streaked Lory *Eos reticulata* are unique endemic to the Tanimbar Island in South East, Maluku, Indonesia.

1.2. According to official figures of the Indonesian Directorate General of Forest Protection and Nature Conservation and Forest Protection (PHPA), capture quotas for these two species in the ten years up to 1992 were between 8,000 and 14,000 for *G. goffini* and between 1,500 and 2,000 for *Eos reticulata*.

1.3 *C. goffini* was placed on appendix 1 of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) at the 8th meeting of the parties in Tokyo, March 1992. In the face of serve pressure to also inlcude *Eos reticulata* on Appendix I Indonesia proposed that a zero catch quota be placed on *Eos reticulata* pending the results of fields surveys.

1.4 This docment reports on the findings of PHPA\BirdLife International surveys on Yamdena, the largest of the Tanimbar islands, which were conducted between March and May 1993. The surveys aimed to assess the status of these two species and to evaluate the damage caused to the local maize harvest by *Catatua goffini*.

1.5 Population estimates were calculated from data collected using Variable Circular Plot and Varibale Distance Transect methodologies. At every analytical step decisions were in favour of analytical methods which would result in a lower population estimate. The population estimates given in this



report are therefore biased towards the conservative side. Agricultural impact was assessed through direct observation measurements.

1.5 The population of *Cacatua goffini* on Yamdena islands was found to be between 240,681 - 425,772 (Mean 333,227). Yamdena island consitutes 61 % of the species terrestrial range.

1.6 The population of *Eos reticulata* on Yamdena islands was found to be between 114,895 - 191,920 (mean 153,408). Yamdena island consitutes 61 % of the species terrestrial range.

1.7 Past catch levels of c. 4.2 % of the total *goffini* population and c. 1.3% of the total *reticulata* were clearly within sustainable limits.

1.7 This study further concludes that *C. goffini* damages in the region of 1.6% of the islands maize harvest. Overal this is small but significant. Maize fileds averge 0.7 Ha and as *C. goffini* travels in flocks of up to 350 the damage to an individual farmer can be catastrophic.

1.8 On Yamdena *C. goffini* is only caught when it raids the crop. This provided villages with a source of compensation for crop damage of apporximately $65,000 per anum when the international export trade was open. This has fallen to $17,500 since the species was placed on Appendix 1 in 1992. It is widely acknowledged that political rather than scientific reasons resulted in *C.goffini* being proposed for on Appendix 1. It appears to be the poor villagers of Yamdena who are paying the price of this decision.

2. Introduction

Tanimbar Corella *Cacatua goffini* and Blue-streaked Lory *Eos reticulata* are endemic to the Tanimbar islands in Maluku province Indonesia. These islands, with a land area of 5.082 Km^2, are located 425 km to the east of Timor, 725 km southwest of Irian Jaya and 350 km north of Australia. *C. goffini* is most closely

related to the widespread *C. pasicator* of north Australia and southern New Guinea. *Eos* lorys are endemic to the Sub-region of Wallacea and *E. reticulata* is the most southerly representative of the five species in the genera. The Tanimbar islands have received little recent attention from ornithologists, indeed since 1924 only one study has been made of the avifauna (Rozendal in 1986).

Tanimbar Corrella and Blue-streaked Lory were rare in captivity before the 1970's and local exploitation is thought to have been small. During the last ten years a significant trade has emerged in both species. According to figures of the Indonesian Forestry department covering the period 1983 - 1992 catch quotas for *G. goffini* ranged from 8,000 - 14,000 per year and for *Eos reticulata* from 1,500 and 2,000 per year.

Following concerns that this level of capture might be unsustainable for species with such restricted-ranges, *C. goffini* and *E. reticulata* were proposed for inclusion on Appendix I of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) at the 8th meeting of the parties in Tokyo, March 1992. At this meeting the Indonesian delegation reported that both species were still plentiful and that flocks of *C. goffini* were to be found in agricultural areas during the maize season. The meeting of the Parties resolved to put *C. goffini* on Appendix 1 and accepted a proposal from Indonesia that a zero catch quota be placed on *Eos reticulata* pending the results of fields surveys.

This report presents the results of a survey of *C. goffini* and *E. reticulata* on Yamdena (the largest of the Tanimbar islands) which was conducted by a joint BirdLife\PHPA team during April and May 1993.

3 Objectives

The objectives of this survey were:

1. to assess the population size of *Cacatua goffini* and *Eos reticulata*
2. to establish long-term monitoring transects for *Cacatua goffini and Eos reticulata* and to train the local PHPA office in an appropriate monitoring

methodology

3. to evaluate the damage caused by *Cacatua goffini* to the maize harvest

4. Methodology

4.1 Survey Design

The field survey plan was prepared following a visit to Yamdena by P. Jepson of BirdLife International in November 1992. In preparing a survey plan four factors were considered, namely;

- current interpreation of the CITES convention in respect to non-detrimental findings
- the data requirements of each objective
- the skill levels of available human resources
- the physical and infra-structural characteristics of the survey area

The survey period was timed to coincide with the end of the wet season when the maize is ripening and when streams are running in the dry limestone interior of Yamdena island. The survey team had insufficient personnel to conduct concurrent counts in agriculutral and forest habitats (the ideal) and surveys in forest were made immeadiatly after completion of the agricultural surveys.

Under the CITES convention a range state is required to determine that trade is "non-detrimental to a species survival". Current thinking on how non-detrimental finding should be made favours a modelling approach, whereby a total population estimate is entered into a simple equation with data on export quota levels and (if available) life history data and mortality rates between point of capture and export (see Lambert 1992). The total population figure is calculated by multiplying density data from each major habitat division by the area of that habitat. Obtaining densities per unit area requires the use of quantitative methodologies.

As the CITES management authority, the PHPA is responsible for monitoring. PHPA field staff lack a university education and sophisticated quantitative

methodologies and therefore inappropriate as a regular monitoring tool. A second school of thought on non-detrimental findings, proposes that these be made by comparing catch quotas with an annual index of relative abundance and adjusting the former until the graph levels out and sustainability has presumably been reached. Relative abundance methodologies are suitiable for people with a high school education and without access to computing facilities.

This survey was designed to get the best of both worlds. Mindful of the desire of the international conservation community for a definitive population statement standardised methodologies were used, but a simple relative abundance methodology was employed concurrently to establish a base line against which relative fluctuations can be measured on an annual or biannual basis and absolute changes monitored over longer time intervals.

Both objectives require that the principle habitat types be sampled. Reliable topographic and vegetation maps are lacking for Yamdena, but reference to a LANDSET TN satellite image showed distinct differences in vegetation reflectance between the west and the unexplored east side of Yamdena island. Various logistical constraints meant the only practical way to sample the east coast was to transect across the island and back. The presence of just two settlements on the east coast effectively pre-defined the end and start points of the two transects.

The route of the two transects and broad habitat types is shown on map 1. The first crossed the north-central section of Yamdena close to the northern boundary of a proposed protected area. The second transect crossed the southern section of the island through forest which is being selectively logged.

Trekking for several days across unmapped tropical forest terrain can be an exhausting experience. Constant effort transects where considered inappropriate for such conditions and a point count methodology, which allows data to be collected when the observer is stationary and at rest, was selected.

Establishing the level of crop damage by *C. goffini* required the collection of data on population density, feeding rates and the area under maize cultivation. All villages are located on the coast. Coconut plantations immeadiatly behind the beach are replaced inland by dry-land shifting agriculture was extends to the forest boundary. To collect these data in the most efficient way a system was devised whereby the observer left a village in the mid afternoon and made a transect (following a trail) to the forest edge where camp was made. Along this transect data on cockatoo numbers and crops was collected. The following morning the transect was repeated in the following direction, but suspended when flocks suitable for observation on feeding rates were encountered.

Agricultural land forms a band up the east coast of Yamdena, which is topographically, climatically and culturally homogeneous. It was therefore assumed that any area of reasonable size would be representative of the whole. Yamdena has only one surfaced road extending 60km along the coast from Saumlaki. A group of villages between 30 and 55 Km along this road was selected so that it would be possible to travel from one village to another within a day. To avoid the temptation of responding to reports of large cockatoo flocks study villages were selected before arrival on Yamdena.

4.2 Methods used on cross-island (forest) transects

Parrot and habitat records were made at 250 m intervals ("station") along the length of both transects. For the target parrot species, point counts in Variable Circular Plots was used (Bibby et al 1992; Buckland 1987). All parrot records were collected by a single observer (N. Brickle). Ten minutes was spent at each station and the species, group size and distance to any bird heard or seen was recorded. To establish satisfactory accuracy in distance estimation, ten three hour "training" periods were spent beforehand in the Bogor Botanical Gardens and four one hour periods on Tanimbar. Distance estimates were checked at intervals throughout the census. Three minutes was allowed after the arrival at each station to allow the birds to settle after disturbance. Observations were limited to times

of high bird activity and when light was sufficient to identify birds: i.e. 06.00 - 10.00 and 15.30 - 17.30 hr. No records were taken during rainstorms. Distance estimates for flying birds were made to the point of departure or landing, if observed, or to the nearest point to which they approached the station.

Between stations encountered rate for the two parrot species were recorded by two observers (Y. Cahyadin and C. Bulurdity). The number of contacts and groups size of each was recorded. Distance between stations and overall transect length was measured using a pedometer.

Each station was attributed to a broad vegetation class. The vegetation classes and their distribution on Yamdena was predicted from existing vegetation maps and a LANDSET TM false colour satellite image. The vegetation classes were: dry-land agriculture (A); evergreen lowland forest (EF); monsoon forest (MF); mangrove (M); coastal vegetation associations; coconut plantation; and riparian forest.

To test whether observed differences between evergreen and monsoon forest were true, the following vegetation measures were made within a circular area of 100 m radius around each station in the forest transects but not in the additional transects (see below) due to time limitations:-

- girth and height of the ten trees nearest to the station point which were over 39 cm in girth;
- height of first branch on the same trees;
- distance from the station point to the same trees;
- relative cover of upper-, mid- and low- tree canopy strata (low = 0.5m - 4.9m; mid = 5m - 15m; upper = >15m)
- estimate of percentage ground cover (below 0.5 m) and note of the dominant plant life-form e.g. grass, phanerophyte.
- presence of surface water.

The density of the trees measured as above was analyzed using the DISTANCE software program (Laake et al 1993).

The length of the forest transects was 40 and 45 km for transects one and two respectively. The planned transects routes did not adequately sample monsoon and mangrove forest and two additional transects where conducted in these habitats. For logistic reasons the maximum time that could be spent on transect censusing was eight days on transect one and six days on transect two. A minimum length of travel was set each day and this resulted in gaps of random length in the transects which went uncensused. Of the 85 km of transect a total of 34 km was censused (136 stations at 250 m intervals).

The number of VCP stations in different vegetation classes is tabulated below

Table 1. **Number of forest transect stations in different vegetation classes by transect.**

Transect	Agriculture	Monsoon Forest	Evergreen forest	Mangrove
1	9	9	58	-
2	5	5	42	-
3	-	-	-	8
4	-	7	-	-
TOTAL	14	21	100	8

Monsoon forest stations in transects 1 and 2 occurred in the Monsoon/evergreen forest mosaic area; MF stations in transect 4 occurred in the Monsoon forest block adjacent to the west coast (Fig. 2).

The bird census data was analyzed using the software package DISTANCE (Laake et al 1993). This program uses distance sampling data to estimate the density and abundance of a population. It compensates for differences in detectability between habitats; it makes due adjustment for clustered observations and calculates an inflection point from the recorded distances, to discount records of unusually long distance. The data was analysed twice, with aerial birds included and excluded.

4.1.2. Methods used to Census *Cacatua goffini* and *Eos reticulata* in

Agricultural areas.

Transects were established at every second village (seven in all) on the east coast of the Island. It was found that target bird species were rare in coconut plantations so this habitat was ignored in this census. The observer walked as many transects as could be accommodated in the single morning and evening observation period allocated to each village (between the hours of 05.30-10.00 and 16.00-18.30). This resulted in variable transect length dependent upon the terrain, size of the cropped area and demands of other data collection (see below). The transects were each walked at a steady pace and the target bird species were recorded for group number, distance along the transect and perpendicular distance from the transect. Data was also collected from Selaru Island (Name Village Namtabung). The census data was analyzed using the software package DISTANCE (Laake et al 1993).

4.3 Evaluation of Impact of *C. goffini* on Agriculture

When large flocks of *C. goffini* were encountered feeding on maize during early morning transects, the transect was suspended in favour of studying feeding rates. Such observations were generally made between the hours of 05.30 and 09.00, before the owner arrived at his field. Feeding *goffini* were observed with a x20 magnification telescope at a distance of 50-75 m. The proportion of the flock actively feeding and at rest was recorded on first contact 7 times in the morning (0630 - 0830). An actively feeding bird was observed until it flew off of was displaced by another flock member. The duration of each observation, the number and part of corn kernels eaten, and method of feeding was recorded.

The density of maize plants was calculated by measurments from 21 (1 x 1 m) random plotes in 7 fields. The number average number of kernels per cobs was calculted from counts of 15 cobs.

At 250 m intervals an estimate of the cover by four classes of vegetation was

made over a circular area of approximately 100 m radius. These were: maize, other crops, uncropped fields with herbaceous and woody weeds and forest (in various stages of disturbance). The total area of agriculture (including coconut plantations) on Yamdena was calculated from the LANDSET TM false colour satellite image. The ratio of dry-land agriculture to coconut planation on the seven village transects was averaged and used as coefficient to calculate the area under dry-land agriculture on Yamdena.

Supplementary information on crop damage levels and on cockatoo catching was collected through semi-structured interviews with farmers and community leaders of the study villages.

5. RESULTS

5.1 Description of vegetation

5.1.1 Forest classes

Monsoon forest was characterised by a discontinuous canopy of tall trees >30m tall with a continuous canopy of shorter trees ca. 5-10m tall. The light penetration through the canopy was relatively high and the vegetation below 0.5m was composed of discontinuous grass tussocks (Table 4).

Evergreen forest exhibited a continuous, multi-storey canopy with low light penetration to the ground. The ground layer (< 0.5m) consisted of young trees but was often absent.

The central area of Yamdena was found to be a mosaic of these two forest types which remained distinct with little transitional vegetation. The pattern of patches was visible on the satellite imagery in two distinct colours.

Mangroves were not subject to any formal vegetation measurements. Those censused for birds were 5-8m tall. This and Swamp Forest may not be reliably distinguished or mapped in Fig. 1. Some maps show considerably more Swamp

Forest along the east coast than we were able to distinguish e.g. RePPProT 1990 Map 10.

This survey observed treeless areas, of a few hectares or less each, which occur along rivers and scattered through the forest. These areas are heavily disturbed by water buffalo and it is not known whether these areas are naturally treeless. A summary of the results of vegetation measurements in monsoon and evergreen forest is provided in Appendix 1.

All stations were correctly attributed to these forest classes.
Monsoon forest reflected shades of pink, evergreen forest shades of green and agriculture green-white on LANDEST TM false-colour satellite image exposed band 2 (), 4() and 7(). Map one was created from this image and areas of each forest class are shown below.

Table 2. Areas of habitat class represented on Yamdena island

Habitat Type	Area (Km^2)	Percentage
Agriculture	682.1	20.9
Monsoon Forest	312.3	9.6
Evergreen Forest	881.9	27.0
Monsoon\Evergreen Forest Mosaic	803.7	24.6
Logged Forest (evergreen)	364.1	11.2
Mangrove & Swamp Forest	192.4	5.9
GrassLand	27.5	0.8
Total	3.264.0	100.0 %

Use map RePPProT (1988) No. 2808 & 2809 Maluku Provincie

5.1.2 Description of agricultural land

The agricultural system on Yamdena is one of shifting agriculture whereby forest is cleared and cultivated for (3-6) years until the sol is exhausted. Farmers are two poor to purchase fertilisers and pesticides. The agricultural areas could be divided into mixed gardens of nuts, papaya, banana and cassava, small maize fields and abandoned areas of alang-alang grass and shrub regrowth. The proportion of each is illustrated in Table 3.

Table 3. The Proportional Agricultural Land

Agriculture Type	Percentage
Mixed Gardens	37
Small Maize	17
Alang-alangs	28
Shrub Regrowth	18
Total	100

The total area of dry-land agriculture on Yamdena is 682.2 km² and assuming the 17% proporation as consitant the area under maize is estimated to be 116 km² (11.600 Ha). Maize is planted at an average density of 6 plants/m2 and each has three cobs. By simple multiplication this provides a figure for maize productivty on Yamdena of 2,088,000,000 cobs a year.

5.2 Parrot density estimates from cross-island (forest) transects

A total of 120 *C. goffini* contacts were made totalling 180 individuals in groups of between 1 and 6 birds (mean group size 1,5). For *Eos* these figures were 51 contacts of 96 individuals in flocks ranging in size between 1 and 6 (mean goup size 1,9). The proportions of these attributed to each forest class is tabulated below.

Table 4. Observations of *C. goffini* and *Eos reticulata* on Yamdena according to broad habitat classes.

Species	M	Agriculture			Monsoon forest			Evergreen forest			mangrove		
		NC	NI	MGS (SD)	NC	NI	MGS (SD)	NC	NI	MGS (SD)	NC	NI	MGS (SD)
Eos reticulata	E	3	6	2.0 (1.0)	6	13	2.2 (1.0)	36	77	2.2 (0.7)	11	37	3.4 (2.7)
	V	0	0	0	9	20	2.2 (1.7)	37	69	1.9 (0.7)	3	6	2.0 (0.0)
Cacatua goffini	E	9	63	7.0 (11.2)	24	34	1.5 (0.7)	188	292	1.6 (0.9)	3	5	1.7 (1.2)
	V	14	24	1.7 (1.3)	19	23	1.4 (0.8)	83	130	1.6 (1.1)	5	6	1.2 (0.5)

M = Method. V = Variable Circuler Plot. E = Encounter Rate NC = No of Contacts. NI = No of Individuals. MGS = Mean Groups Size (SD) = Standar deviation.

Standardised encounter rates by distance and time are presented below.

Table 5. Standardised encounter rates for *Cacatua goffini* and *Eos reticulata* on two cross island transects.

Species	Agriculture	Monsoon forest	Evergreen forest	Mangrove
Eos reticulata	2.4/Km & 5.8/Hr	3.6/Km & 9.7/Hr	1.3/km & 33/Hr	7.9/km & 12.5/hr
Cacatua goffini	24.6/km & 48.9/Hr	3.6/km & 10.3/hr	4.8/km & 18.9/hr	0.5/km & 1.1/hr

Sufficient contacts were made for density estimates in the above three vegetation classes and results are given below.

Table 6. Densities of C. goffini and E. reticulata calculated from VCP data

Species		Monsoon forest			Evergreen forest			Terrestrial forest			Mangrove		
		D.	SE	n	D.	SE	n	D.	SE	n	D.	SE	n
Eos reticulata	inc aerial bird	598	313	9	123	30	37	171	38	46	0	0	0
	ex aerial bird	(70	74	2)	77	26	21	68	22	23	0	0	0
Cacatua goffini	inc aerial bird	142	50	19	124	23	84	145	24	103	56	36	5
	ex aerial bird	105	37	17	118	22	72	113	18	89	56	36	5

D. = Density. SE. = Standar Error. N = Sample size.

Non Density estimates and Standard Error (S.E.) are in birds per Km^2.

5.3 Density estimates of *C.goffini* from agricultural transects

A total of 115 *C. goffini* contacts were made totalling 2,488 individuals in groups of between 2 and 305. For *Eos* these figures were 35 contacts of 170 individuals in flocks ranging in size between 2 and 60. Perpendicular distances were obtained for 86 contacts comprising 1.526 individuals. The DISTANCE analysis gave a result of 121 birds/sq.km., with standard error (SE) of 61 birds/sq.km.

5.4 *C. goffini* feeding rates on maize.

Farmers reported that goffini feeds predominently on maize and rice crop, spending approximately 80% of the time in maize and 20% in rice, and to a much lesser extent attack nuts (beans) and cassava. During this study observation of eights activity feeding flocks showed 88 % of birds feeding on maize and 12 % in mixed gardens (beans & cassava); cocokatoos were not observed feeding on the rice.

Table 7. Feeding and Resting on Agriculture Land

Activity	N.O.	N.I.	H A B Y T A T							
			Maize		Mixed Gardens		Alang-alangs		Shrub Regrowth	
			N I	%	N I	%	N I	%	N I	%
Feeding	8	1.160	1.019	88	141	12	0	0	0	0
Resting	20	290	50	17	25	9	84	29	131	45
Total	28	1.450								

N.O. = Number of Observation. N.I. = Number of Individu.

The peak feeding period on maize was between 06.30 and 08.30 hrs and the 7 flocks observed were present on a maize crop for between 17 and 45 minutes (average = 31 min.). The leaves encapsulating the cob were pealed back useing the Bill. Once opened the average feeding rate (72 birds observ) was ll maize kernels per minute. Only they base of the kernel was eaten, the yellow part being discarded.

Tabel 8. *Cacatua goffini* Destroy the maize field

Village	Feeding activity					Maize Broken (Plant)	(%) of Crop
	Date	Flock Size	Time Observ	No Of Sample	Average (feed kernels)		
Tunibur	22/3	216	35	10	9	405	39
	23/3	217	45	20	8	246	19
Lerolon	24/3	10	17	4	10	80	9
	25/3	16	21	0	0	.	.
Atauul Dol	26/3	291	28	10	10	800	50
	27/3	201	37	12	8	400	30
Namtabung	2/4	93	0	0	0	.	.

From a sample of 725 cobs, cockatoo damage covered an average of 50% of the

cob. Villagers reported that if cockatoo damage accounts for more than 50% of the crop then it will not be a harvested.

Of the 7 flocks the ratio resting to feeding was 164 (1) : 1.151 (9) during the peak feeding period. Birds rested in near by bushes or trees. In late morning flocks were seen to fly to tall trees on the edge of the forest to rest during the hot mid-day period.

5.5 Parrot catching

Villagers reported that parrot catching started approximately ten years ago following request from traders in Ambon. The price fluctuates. In 1992 when the export market was open villages were selling *goffini* for Rp13,500 (US$6.50) and *Eos reticulata* for Rp 7,500 (US$3.75). In 1993, after the closer of export markets these prices were respectively Rp 5,000 (US$2,50) and Rp 2,500 (US$ 1.25).

Cockatoo's on Yamdena are only caught during the period of maize harvest, *Eos reticulata* is caught (during when sago fruiting). A village usually has a team of two cockatoo catchers. They sell to two dealers in Saumlaki.) Normally cockatoo's are caught with the boundaries of villages agricultural land but, depending on demand and the location of large flocks, they will sometimes catch the birds from land of other villages. A team can catch 30 - 50 birds/day during the corn season.

Cockatoo's are snared with loops made from nylon fishing line. Two snaring techniques are used. In the first strings of snares are wound around the maize plant and in the second circles of snares are placed around a decoy bird placed on a bare piece of ground. Eos reticulata is snared by wrapping strings of snares around fruiting sago or the branches of a tall exposed tree.

6 Discusion and Conclusions

6.1 Calculating a total population estimate for C. goffini and E. reticulata.

6.1.1 *C.goffini*

C. goffini is a ubiqitous species; at the end of the rainy season it occurs in dry-land agriculture, disturbed or undistured monsoon and evergreen forest but not in coconut plantions or grassland.

Densities from VCP stations were calculated for monsoon, evergreen and mangrove forest, and from Varibale distance transects for shifting agriculture. The area of mangrove forest on Yamdena can not be determined with any accuracy and as the number of contacts (n = 5) is small this data set is ignored. Quantatative data was not collected from the area of activdogging but forestry workers reported *C. goffini* to be quite common. As we can not attribute a density to the logging concesion this area has also been ignored in the analaysis. Lambert (1992) showed that in the case of *C. alba* on Bacan, population densities were higher in logged forest than primary forest. The area ignored of forest under logging concesions and ignored in this calculation is 30% of the total forets on Yamdena and the population figure peresented below may be an under-estimate by this factor.

Densities in monsoon and evergreen forest were not significanlty different (142km^2 SE = 50 vs 124km^2 SE = 23). Higher standard errors in monsoon forest are as a result of a smaller sample size (n = 19) and greater variation in group size. In evergreen forest average group size was 1.6. *C. goffini* was encountered in evenly spaced pairs (probably breeding) and this resulted in a highly accurate density estimate with a SE of only 18.6% of the mean. By comparision densities estimates of *C. alba* on Bacan produced desity estimates of 61% of the mean. The inclusion of aireal birds in the data set result in higher density estimates (Lambert 1992, Jones et al see below), in this data set they accounted for only (3%) of

contacts and as such there influence will be insignificant.

There are two ways of arriving at a total forest population estimate: a) to multiply the densities by the area of monsoon and evergreen forest and attribute 50% of the area of the monsonn\evergreen mosaic to each; b) to combine and reanalyse the data from both forest types on the basis that there is not a significant difference between the two. The results of these two approaches are:

a. (Density MF x (area MF + 50% area MF/EF)) + (Density EF x (area EF + 50% area MF/EF))

inc Arieal (142 SE 50 x (312.18 + 401.87) + (124 SE 23 x (881,87 + 401,87))
= 195,658 - 325,808 (Mean 260,733).

ex Arieal (105 SE 37 x (312,18 + 401,87) + (118 SE 22 x (881,87 + 401,87) = 171,800.0 - 281,130.0 (mean 226,425.0)

b) Density MF¦EF x (area MF + area EF + area MF/EF) =

Inc Aerial 145 SE 23 x (312.3 + 881.9 +803.7) = 241,745.9 - 337,800.0 (mean 289,772.9)

Ex Aerial 113 SE 18 x (312.3 + 881.9 + 803.7) = 189,800.5 - 261,724.9 (mean 225,762.7)

The true figure lies between these four different results. By averaging the four a population of *C. goffini* in forest on Yamdena of 199,751 - 301,616 (mean 250,683) is arrived at.

To this should be added the total in agriculture, which is calculated as 121 (SE = 61) x 682.18 Km2 = 40,930 - 124,156 (Mean 82,543).

This gives a conservative total population estimate of between 240,681 and

425,772 (Mean 333.226) for Yamdena island. Yamdena island constitutes 61% of the species range. *Cacatua goffini* is clearly common and ubiquitous bird within this restricted-range.

6.1.2 *E. reticulata*

At the end of the rainy season *Eos reticulata* occurs in disturbed and undisturbed monsoon and evergreen forest and occasionally in dry-land agriculture. It does not occur in mangrove forest, coconut plantations or grassland.

Densities from VCP stations were calculated for monsoon, evergreen and forest. There were insufficient contacts to calculate densities for other vegetation types. Quantitative data was not collected from the area of active logging but the species was commonly in this habitat by the survey team. As we can not attribute a density the logging concession area has also been ignored in the analysis. Lambert (1992) showed that *E. squamata* on Bacan occurred at higher densties in logged forest. The area ignored of forest under logging concesions and ignored in this calculation is 18.2% of the total forests on Yamdena and 28.36% of evergreen forest (See below). The population figure peresented below may be an under-estimate by this factors.

Eos reticulata is a flocking species which frequently moves between forest trees. A significant proportion (47%) of our contacts were of aerial birds. VCP (Reynolds) *et al* does not describe what to do with aerial contacts. The problem lies with the methodologie's assumption that the point count period (10 minutes in this study) represents a "snap shot" in time and that the distance from observer to birds is constant ie. the birds are stationary. This assumption is reasonable for most forest species, but is violated by aireal birds.

When areal birds are included in the analysis there is a significnat deiffence

in densities betwen monsoon and forest, however SE is 58% of the emgn in moonsoon forest reflecting a small number of contacts (N=9). If aireal bird are excluded (n=2) and a reliable population density can not be calculated. However all contacts with E. reticulata attributed to monsoon forest were from stations in the monsoon forest mosaic. Considering the larger proprotion of arieal birds and the absence of contacts in pure stands of monsoon forest it seems reasonable to conlude that *E. reticulata* is an evergreen forest species and our contacts at monsoon forest stations were of birds flying between evergreen forest stations. In calculating a population estimate we have therefore lumped all contacts to give a new denity for EF and multipied this by the area of evergreen forest, ie.

Density EF x (Area EF + 50% AreaMF/EF)

Inc Aerial : (171 SE 38) x (881.9 + 803.7/2) = 170,738 - 268,303 (mean 219,521)

Ex Aerial : (68 SE 22) x (881.9 + 803.7/2) = 59,052 - 115,537 (mean 87,295)

The real population figure lies some where between these two figures. taking the mean we arrive at a population estimate for Eos reticulata and Yamdena of between 114,895 - 191,920 (mean 153,408)

The two approaches described above give population estimates of respectively 294,307 and 632,236 (Mean 463,272) for Yamdena island which is 61% of the species range. *Eos reticulata* is a common bird of forested land within in it's restricted-range.

6.2 Estimating the impact of *C. goffini* on the maize harvest

Our data on is not of sufficient accuracy to make a definitive statement on the impact of *C. goffini*, but is possible to estimate in the order of magnitude.

The means of estimating the area of maize cultivation assumed that the

study area was representative of all agriculture. There is no reason why this should not be the case but the resulting figure of 116 km^2 should be treated with some caution.

From the results presented in Table 3 the averge number of maize plants was calculated. All observations were started when a flock landed and commenced feeding. An average period of 30.5 minutes was derived for the time cocktoo's feed a maize each morning (=day). From data on two flocks which were watched on consecutive days and one flock which attacked a virgin field an average damage of 0.04 miaze plants per minute was calculated which equates to 1.22 plants per feeding day.

The population of *C. goffini* in agriculutre is between 240.681 and ~~4~~425,772 (Mean 326.454) and therefore between 293,630 and 519,441 (mean 406,536) maize plants are damaged each day. The islands maize crop ripens over a period of approximatley one month. Multiplying the mean figure by 28 days gives an annual damage of 11,383,000 maize plants ~~which~~ which represents 1.64% of the total maize harvest.

This study shows that cockatoo damage to the overall maize crop is small but significant. It is not possible to quantify this in monetary terms because maize on Yamdena is a substance crop. The impact of cockatoo damage to an individual farmer, who grows maize in small fields, may be severe.

6.3 People and the parrots trade from Yamdena

The population estimates presented above show that past catch quotas for both *C. goffini* and *Eos reticulata* were at a level which could not be considered detrimental to either species survial.

Villagers reported their belief that *C. goffini* timed its breeding so that fledgling of young birds coincided with the maize ripening. We have no dat

to confirm this but the high density of pairs of birds in the evergreen forest is consistent with agricultural flocks being made up of predominetly non-breeding birds. This and the practice of only catching cockatoo during a short season outside their breeding habitat are factors which would reduce the impact of capture on the overall population. A similar situation is the case for Eos reticulata which is caught when birds leave the forest to feed on sago palms in agricultural areas.

In 1992 when an export market was still open villagers recieved an income of in the region of $65,000 per anum if 10,000 birds were exported. There are 8 villages which might catch cockatoo's on Yamdena and (other islands). Following the closure of the international trade this figure had fallen to $17.500 in 1993. Outside income to the Tanimbar islands comes from government offices and projects (eg road building), logging the sale of copra and the sale of cockatoo's. The latter is likely to be significant in village economies.

Before the suspension of the international trade it seems that a balance existed. While some farmers from a village might suffer loss from cockatoo damage, the village cockatoo catchers would profit. Although we have no information on wealth sharing in Yamdena villages it would be very surprising if the catcher did not share some of his profits with the farmer in whose maize field he had caught the birds. For a farmer with few means of raising hard cash (to buy basics such as tools and medicines) income from cockatoo's might have been preferred to a maize harvest.

The CITES ruling has upset this balance. As mentioned in the introduction, goffini was placed on appendix 1 for political reasons and this study has confirmed PHPA's representation that there is no conservation justification relating to the species cited for this decision. A discussion of the wisdom of CITES politics is outside the scope of this report. However it should be noted that it is the desperately poor villagers of Yamdena who are paying

the costs of this decision.

6.4 Future monitoring

As *C. goffini* is still being exported from Tanimbar for the domestic market it is recommended that the levels of capture levels continue to be monitored. The most effective way to do this would be to permit export from Tanimbar only by licensed traders and for them to be required to submit records of the number of birds bought and exported from Yamdena.

The wild population should also be monitored, especially if an export trade is re-opened. It is recommended that the local PHPA officer repeat the two transects at the same time each year and collect encounter rate data, and that in the fifth year the transects be repeated using VCP and a total population density calculated.

The encounter rate data will alert wildlife mangers to any serious declines. The plotting of this, in combination with catch levels and two population estimates will enable the catch quotas to be set with a very high degree of confidence concerning their sustainability.

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Appendix 1.

Table 4. Density of large trees (per ha) in Open and Closed Forest (n = no. of trees censused).

Tree Girth	Forest Type	Density perha	SE	Coefficient of Variation	n
> 119cm	Open	111	16	14	71
	Closed	230	38	17	496
> 239cm	Open	49	13	27	29
	Closed	30	4	12	131

Girth of 120 and 240cm equals trunk diameter at breast height (dbh) of 38 and 76cm respectively. Trees of the larger size were more frequent in monsoon forest than evergreen forest but were not sufficiently dense to form a closed (continuous) canopy (Table 4). Trees above 119cm girth were twice as common in evergreen forest as monsoon forest (Table 4), which reflects the closed canopy and greater canopy depth of the evergreen forest.

Table 5. Relative contribution of three canopy layers (0.5 - 4.9m; 5.0 - 14.9m; > 15m) to the interception of light in monsoon and evergreen forest.

Canopy layer	Low (%)	Mid (%)	Upper (%)
Monsoon forest	18	49	33
Evergreen forest	19	41	40

Mid-canopy estimates were higher for monsoon than evergreen forest (Table 5), which reflects the incidence of a virtually closed canopy by trees with a girth less than 40cm and a height less than 15m. Such trees were not sampled in the ten nearest trees to each bird census station point (Table 4). Because the estimates in Table 5 deal in relative measures (canopy cover equals 100% for both forest types) the monsoon forest has a lower percentage contribution to overall canopy cover from the Upper layer than does evergreen forest.