PARC NATIONAL DE LA GARAMBA
Et DOMAINES DE CHASSE

GENERAL AERIAL COUNTS 1998, 2000, 2002 & 2003 AND EVALUATION OF THE EFFECTS OF THE CIVIL WARS ON THE ECOSYSTEM

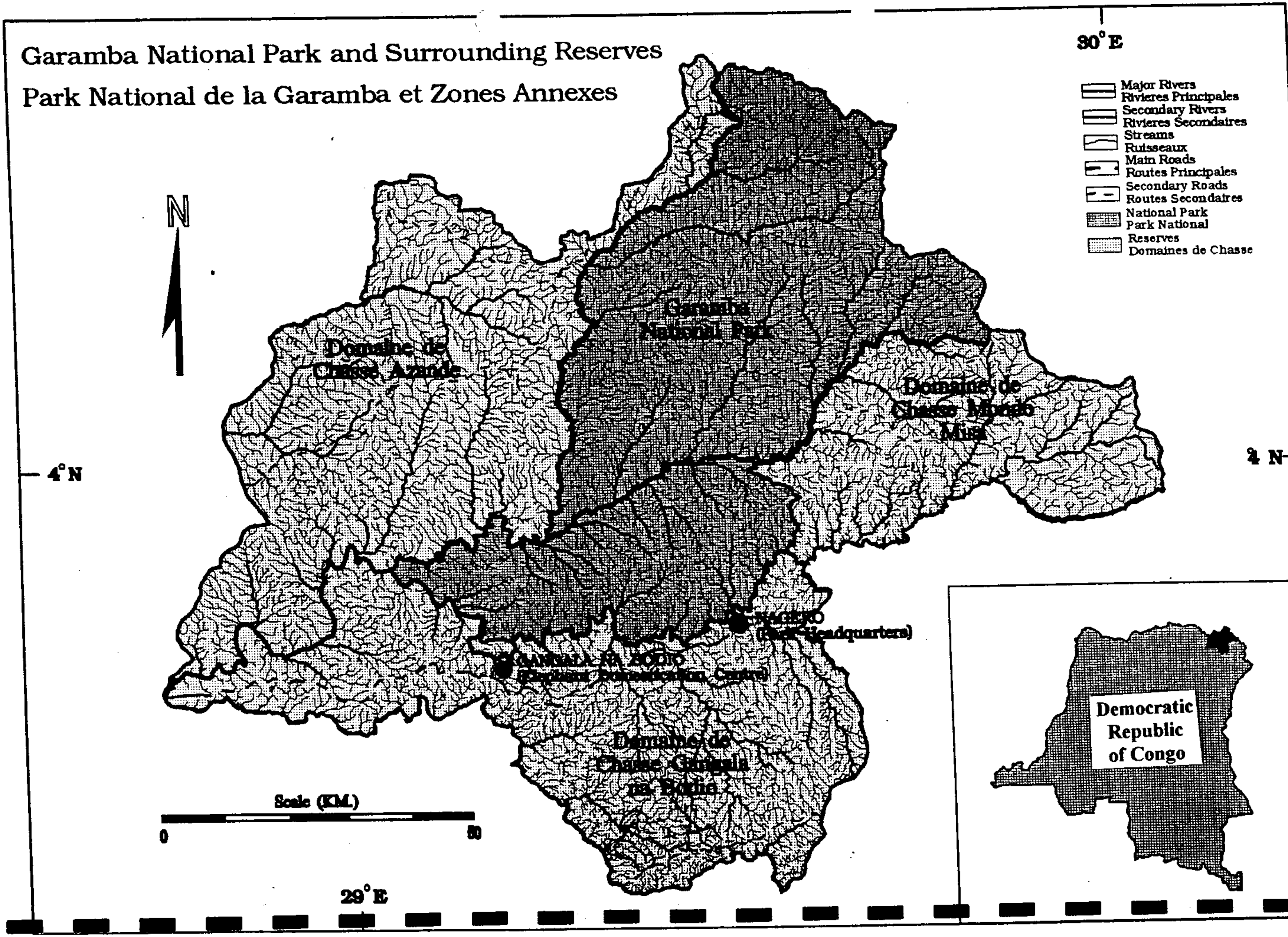
RECENSEMENTS AERIENS GENERAUX DE 1998,2000, 2002 & 2003 ET EVALUATION DES EFFETS DES GUERRES CIVILES SUR L'ECOSYSTEME

Kes Hillman Smith, Fraser Smith, Amube Ndey, Mbayma Atalia
Jean Mafuko, Paulin Tshikaya, Giningayo Panziama & John Watkin

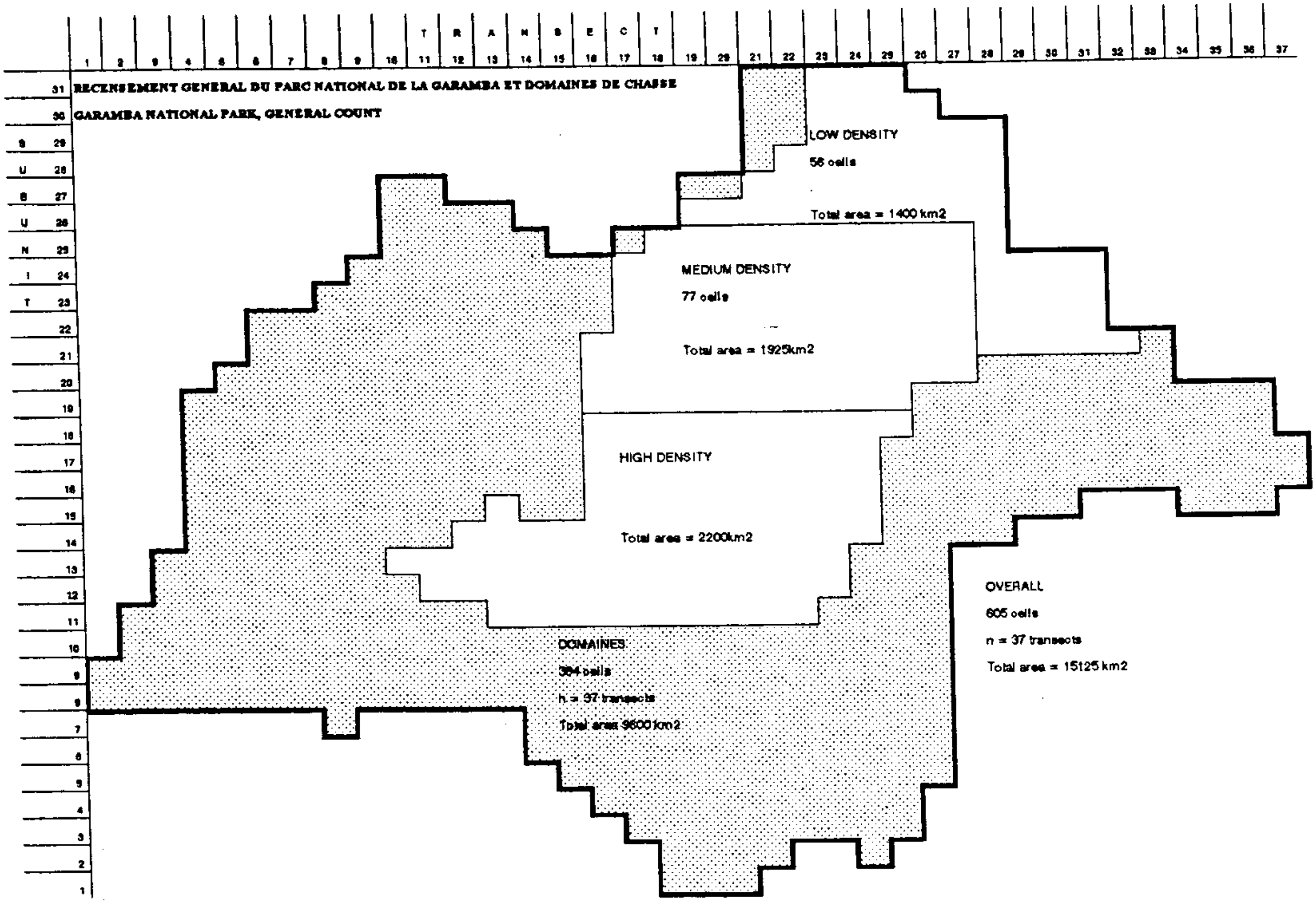
Version Française traduite par Jean Bigirimana Mugabushaka

Garamba National Park and Surrounding Reserves

Park National de la Garamba et Zones Annexes



RECENSEMENT GENERAL DU PARC NATIONAL DE LA GARAMBA ET DOMAINES DE CHASSE
GARAMBA NATIONAL PARK, GENERAL COUNT



GARAMBA NATIONAL PARK
AND RESERVES

GENERAL AERIAL COUNTS 1998, 2000, 2002 & 2003

INTRODUCTION

General all species aerial censuses of the Garamba National Park and surrounding Domaines de Chasse are carried out as part of the ecosystem monitoring programme. This is a report of the counts carried out in May 1998, June 2000, May 2002 and May 2003, with discussion on the status of the ecosystem and the effects of the civil wars during this period.

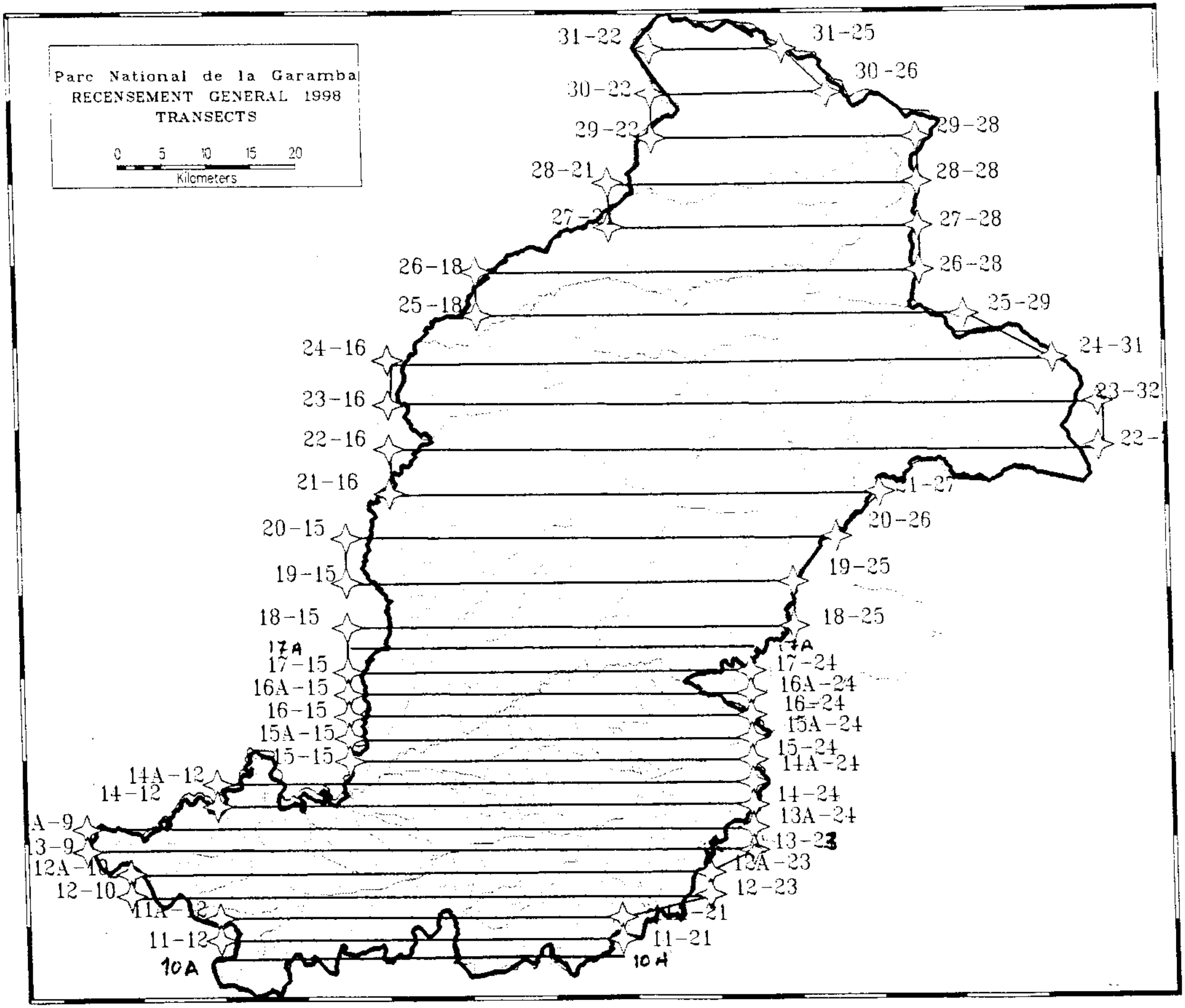
The Garamba National Park (4,900 km^2) is situated between 4° and 3° north and 29° and 30° east in the north east of the Democratic Republic of Congo (DRC). It is surrounded on three sides by reserves, the Domaines de Chasse Azande, 2,892 km^2 to the west, Gangala na bodio, 2,652 km^2 to the south, and Mondo Misa, 1,983 km^2 to the east. All these areas were counted. On the north east, within Sudan, the park is bordered by the Lantoto game reserve. This area was not included, due to the political situation.

The park is situated within the sudano-guinean savanna biome. The southern two thirds of the park comprises long grass savanna dominated by *Loudetia arundinacea* with *Hyparrhenia* species. The reserves are dominated by a complex of deciduous *Combretum* woodland and gallery forest. Within them is limited human settlement and gold mining.

The first aerial census of the area was carried out in 1976 (Savidge et al 1976) by an FAO project. Since then the ecosystem has been censused in 1983 during a survey of northern white rhinos (*Ceratotherium simum cottoni*) (Hillman et al 1983) and since 1984 as part of the Garamba National Park Project. (Hillman Smith 1990, Smith et al 1993).

The counting technique and basic analysis has remained standard throughout, based on the systematic aerial sample count method described by Norton Griffiths (1978) and Jolly Method 2 analysis (In Norton Griffiths 1978), but the process of analysis has varied. Analysis is now carried out with a system developed using the commercial software programme Quattro pro 4 (Borland 1992) for the 1993 count (Watkin et al 1995). The method of counting and analysis as applied at Garamba has been written up as a handbook (Hillman Smith et al 1995) to guide long term standard application of the technique in the monitoring programme at Garamba. We hope it may also contribute a few guidelines for easy analysis of aerial counts elsewhere.

A UTM (universal transverse mercator) compatible system of coordinates, which was based on the transect lines used since the 1983 count has been used to locate all animal and habitat observations since 1983 and all law enforcement monitoring observations since 1992. In conjunction with the establishment of a geographic information system (GIS) at Garamba in 1993, this has now been expanded to cover the surrounding reserves and is maintained as the basis for the positioning of the flown transects. A Garmin global positioning system (GPS) was used to navigate the transects and sub-units. The GIS programme Idrisi has been used in mapping the vegetation cover.


Parc National de la Garamba
RECENSEMENT GENERAL 1998
TRANSECTS
0 5 10 15 20
Kilometers
31-22
31-25
30-22
30-26
29-22
29-28
28-21
28-28
27-21
27-28
26-18
26-28
25-18
25-29
24-16
24-31
23-16
23-32
22-16
22-
21-16
21-27
20-15
20-26
19-15
19-25
18-15
18-25
17A
17A
17-15
17-24
16A-15
16A-24
16-15
16-24
15A-15
15A-24
15-15
15-24
14A-12
14A-24
14-12
14-24
A-9
13A-24
13-9
13-23
12A-10
12A-23
12-10
12-23
11A-12
11A-21
11-12
11-21
10A
10A

Counting method

The counting method is the standard aerial systematic reconnaissance flight (srf) using parallel transect sampling as described by Norton Griffiths (1978) and widely used for aerial counting of wildlife and livestock. Heights, strip widths and general application of the method have been relatively standard throughout the series of counts. Analysis is carried out using jolly's method ii (Norton Griffiths 1978) in the spreadsheet programme quattro pro, and shaded vegetation mapping uses the gis programme idrisi.

Aircraft:	Cessna 206, 9Q-CBR			
Pilot:	Fraser Smith			
Front seat obs.:	Kes Hillman Smith			
	1998	**2000**	**2002**	**2003**
Middle seat obs.:	Mbayma Atalia Mafuko Girineza	Mbayma Atalia Giningayo Panziama	Amube Ndey Giningayo Panziama	Amube Ndey Paulin Tshikaya
Rear seat obs.:	Amube Ndey	Amube Ndey		Serge Iliabo Mambo Marindo
Training & analysis	Giningayo Panziama			

Analysis design: John Watkin & KHS,,
re-design for EW transect re-orientation K H.S & Kerin Adcock

Analysis: Amube Ndey, Kes H. Smith, Mbayma Atalia,
based on Hillman Smith et al (1995) and Watkin et al (1995)

Census zone: Garamba National Park
Total area 4,900 km^2

Timing:

For greatest accuracy in population estimation the period April to mid June, just after the start of the long wet season offers best visibility. The grass is short and the air is cleared by the rain. The preparation, calibrations and counts reported here were carried out in May or in one case June.

Stratification:

The count was stratified in relation to animal distribution. Very few anmials remain in the north and central sectors and these are flown at by transects spaced at 5 km apart. The southern sector is where over 90% of the animals are currently distributed. This was flown at 2.5 km spacing for greater accuracy. Sub-units are spaced at 5 km, as measured by GPS. The stratification that has been adopted since 1993 is based on the elephant distribution observed in 1993, which is known to reflect the elephant distribution over the preceding ten years, is as follows. The count boundaries are based on sub-unit boundaries rather than those of the park and reserves. Hence they are slightly larger than the actual boundaries:

park: 5,500 km^2
  Low density: 1,400 km^2
    14 transects, 55 sub-units
  Medium density: 1,925 km^2
    12 transects, 77 sub-units
  High density: 2,200 km^2
    16 transects, 88 sub-units
domaines de chasse: 9,600 km^2

37 transects, 384 sub-units

The counts reported here since the first war in DRC have included only the park as the objectives have been a rapid assessment of the status of the park, and fuel has always been a limiting factor.
At the start of the project transect used to be flown north south also with 5 km sub-units. In order to mare accurately and correctly analyse a stratified count, since 1998 the transects have been flown east-west with the sub-unit divisions east west. The grid system and method of analysis remain the same and the counts therefore continue to be comparable

Equipment:

King radar altimeter, Garmin global positioning system (gps) , marker rods, tape recorder per observer, tapes and batteries, stopwatch, data sheets, computer for analysis.

Fibreglass fishing rod blanks mounted on a support fitting designed for the wing strut were used as marker rods.

Duties of crew
Pilot:

piloting the aircraft, navigating to the ends of transects and along transects using gps, calling out transects and sub-units at 5km intervals based on the data sheet subunits. The gps was pre-programmed with the beginning and end waypoints of the transects, which are listed in the table gps waypoints.

Front seat observer:

recording the time and speed of each transect and maintaining the transect summary sheet (in annex). Within each sub-unit recording height a.g.l. from the radar altimeter and habitat factors as defined below. (Fso data sheet in hillman smith et al 1995)

Middle seat observers:

counting and recording into the tape-recorders all *animal* species and signs of human occupancy, as listed on the table: **code des especes** , that are seen within the strips. On return from each flight the observations are transcribed onto rso data sheets (example in hillman smith et al 1995). The middle seat observers also noted the habitat in which the animals were seen. Cameras were available, but were only used on two occasions for large groups of buffaloes and of houses.

Rear seat observers:

the rear seat observers made the same observations as the middle seat observers. There were three main values to the second row of animal observers: comparison of the two data sets to verify and improve the data and to enable other methods of analysis to be applied, back-up if a tape-recorder fails and training. To make the first two objectives valid, the strip widths were adjusted to be as near as possible to covering the same strip on the ground as seen by the middle observers. Their strip markers were cords stretched from the wing struts to the tail.

Sample intensity:

sample intensity: 8-10% Low, 15-20% high
transect spacing - low 5km
high 2.5 km
sub-unit spacing: 5 km
target flying height: 350' a.g.l.
Overall mean actual flying height 347' a.g.l.
Target strip width: 400 -500 m total.(200-250 metres each side)

Strip widths are preset according to Norton Griffiths (op.cit.) and calibrated by flying at different heights over markers spaced at 20 metre and 100 metre intervals on the airstrip, simultaneous with radar altimeter readings. Observers count the numbers of spaces between markers included within the strip widths, to calculate the observed widths. These passes were carried out both during training, before counting began and at the beginning and end of each counting flight. The results, analyzed and plotted in quattro pro 4.0 are shown in the graph **calibrations**, and were used combined with measured altitudes per sub-unit to calculate strip widths for each transect and sub-unit. On the basis of this the combined strip widths for middle seat observers are calculated per sub-unit and the sample areas per sub-unit are calculated and used in the calculation of population estimates from animals of each species seen per sub-unit:

Transects:

Transects are spaced at 5 km intervals in the low and medium intensity zones and at 2.5 km in the high intensity southern zone. They are flown east/west as shown on the map **projected transect lines.** The co-ordinates for the start and end points of each transect flown alternately north and south are given on the table **gps waypoints in annex.** Subunit were at 5 km intervals as measured using the gps and is used, sub-unit boundaries are located in multiples of 5 km from the end waypoint, using the tables **of transect and subunits in Annex**.

Species:

Animal species were counted by both middle and rear seat observers, as listed on the table: **codes des espèces**. Signs of human habitation and land use were also counted. Elephant and other species carcases are classified as:

1. Fresh, with flesh present
2. Recent bones, with rot patch present
3. Bones white, no rot patch
4. Bones grey old

(Douglas-hamilton & hillman 1981)
in this high rainfall, high scavenger density environment, fresh recognisable rot patches remain for a considerably shorter time than in east africa. Carcases monitored have usually remained at stage 2. less than two months.

Habitat factors :

Within each sub-unit the front seat observer recorded the height a.g.l. as measured by the radar altimeter and estimates percentages of the following habitat parameters in units of 10% intervals:

tree cover, as percent of sub-unit
tree greenness as percent of trees present

bush cover, as above
bush greenness, as above
grass cover, as above
grass greenness, as above
long old grass, as percent of grass present
burn, as percent in sub-unit
water availability,
  0 = none
  1 = available to humans and livestock
  2 = limited availability
  3 = unlimited availability
  4 = running water
  5 = floods
agriculture, as percent in sub-unit
Vegetation zones are classified within each sub-unit.

Analysis

Analysis was carried out in quattropro according to the method described in detail in Watkin et al (1995) and Hillman smith et al (1995). The method is based on entering the animal and habitat observations and the altitudes per sub-unit onto separate versions of a spreadsheet, which is laid out like a map of the census zone, in which each cell represents a subunit. This was printed directly, to map the distribution of animal observations, and with conversion, to map density distributions. Habitat data was entered in the same way. To produce the shaded mapping it can be transferred to idrisi. The overlay map of the park and reserves was created in arcinfo and they were combined in coreldraw.

A graph of strip width calibrations was created in quattro and the resulting regression applied to the map of altitudes per sub-unit. This enables transect width correction per sub-unit, as opposed to an average applied to whole transects as previously. Superimposition of this on the map of animal observations calculates the densities. Within the map spreadsheet the transect and strata totals are summed and these data were transposed to a second spreadsheet, which was laid out with the formulae from Jolly (1969) and Norton Griffiths (1978) for calculating population estimates and confidence limits. This is printed directly with the details of the observed numbers, stratified population estimates and confidence limits.

Results

Distribution maps in the spreadsheet formats are given for each species for each of the count years. These are followed in each set by the tables calculating population estimates and Standard Errors and 95% Confidence limits for each species. Signs of threat, ie carcasses and poaching camps are mapped for each year.

Vegetation parameters are mapped for one year. Tree cover is dense in the north of the park and relatively dense in the Domaine de Chasse, but very sparse in the south of the park due to the effects of fire and elephants. Bush cover is increasing further and further south each year as the elephants and other large mammals are pushed down or poached out from the north and now even from the centre of the park.

The **summary table** gives population totals and stratified totals, densities and biomasses for the period 1976 until 1995, before the war . The weights used to calculate the biomasses were those used by savidge et al (1976), haltenorth & diller (1977) and d'huart (1978). A second summary table gives the situation since then.

DISCUSSION OF RESULTS WITH EVALUATION OF TRENDS AND THE STATUS OF THE ECOSYSTEM

Methods

The aerial survey manual for Garamba National Park, based on the standard methods developed during the 1993 census was applied throughout as guidance and training manual. However since 1998 the transects have been flown east west instead of north south in order to make more accurate the stratified analysis. The sub-unit cells remain the same.

The front seat observer has been standard since 1983. This therefore minimises errors due to observer bias. However the two middle seat observers have varied over the four year period, and have included Guy Mbayma, the late Jean Mafuko, Jerome Amube, Giningayo Panziama and Paulin Tshikaya. The rear seat positions have been used for training. Practice and training was given by both estimating and counting from digital photos of buffalos, elephants and hippos, but the need to estimate large groups because the observers are not sufficiently practiced with cameras to use them, is a potential source of bias.

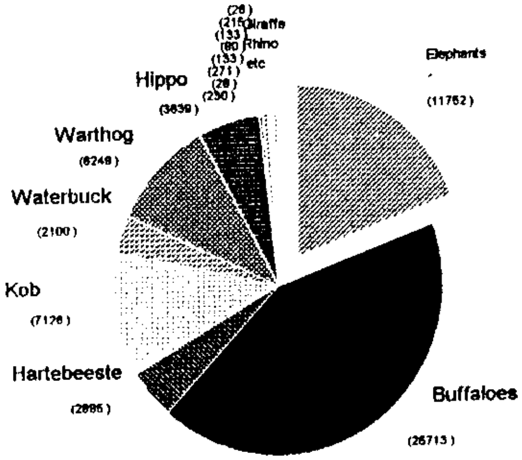
Animal numbers and distribution over time in relation to external events

Historical

Table 1 gives the large mammal numbers from aerial census from 1976, when the FAO project ended through 1983 before the Garamba project started, to 1995, before the civil war. Table 2 gives numbers since the first war, from 1998 to 2003. The graphs Figs.3 and 4 summarise the trends of key species. Pie charts indicate the biomasses and relative species numbers for the two periods.

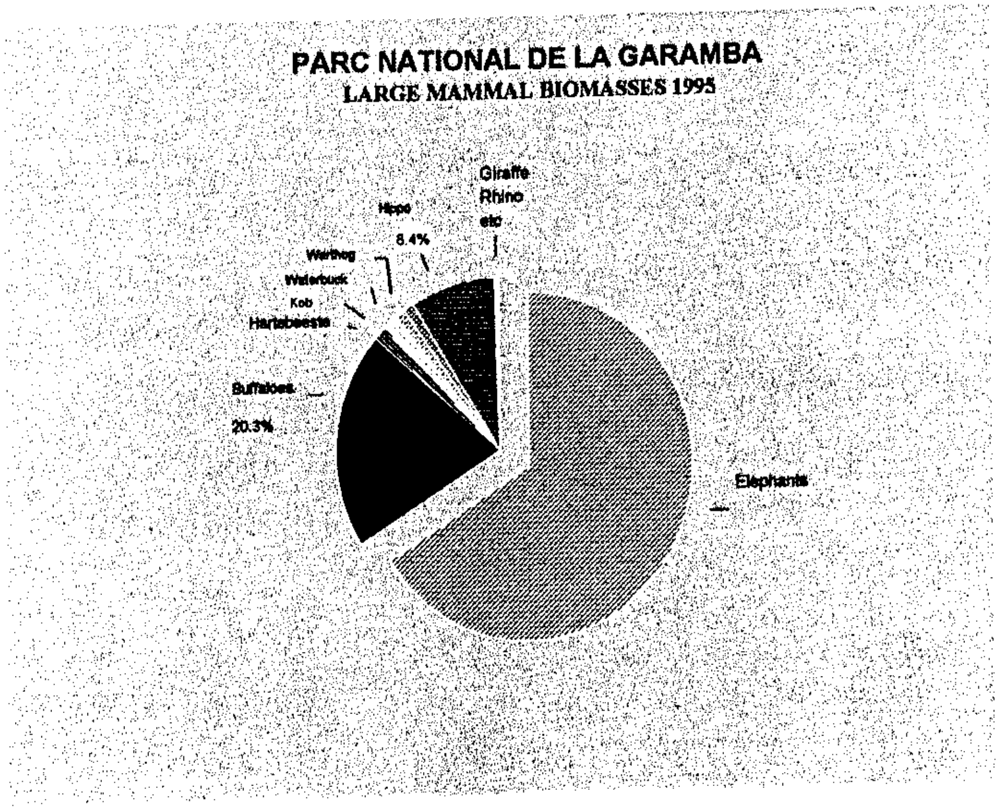
PARC NATIONAL DE LA GARAMBA

LARGE MAMMAL NUMBERS 1995

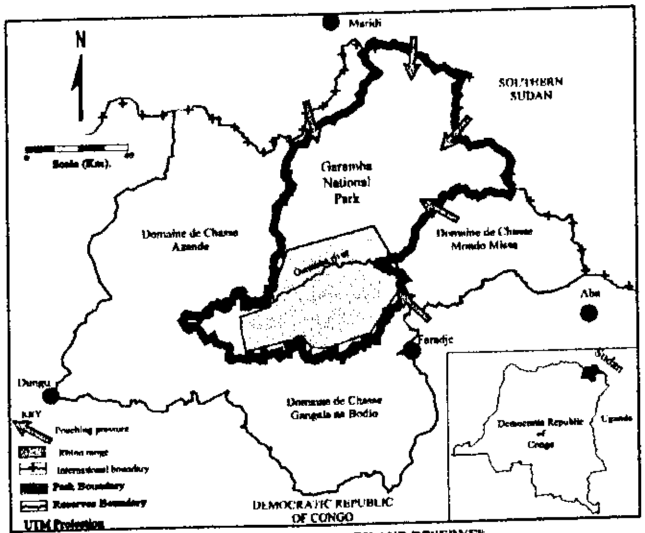


PARC NATIONAL DE LA GARAMBA ET DOMAINES DE CHASSE
WILDLIFE NUMBERS/ NOMBRES DES ANIMAUX 1976 - 1995

YEAR	BUFFALO	GIRAFFE	HIPPO	KOB	HARTEBEESTE	WATERBUCK	REEDBUCK	ROAN	WARTHOG	GR.DUIKER	RF DUIKER	ORIBI	LION	HYENA	BUSHBUC
1976															
PARC	53000	350	1700	7180	7750	3680	640	360	3340	140		380	35	35	4
DC															
95% cl	42390	250		2300	1470	1330	310	530	1440	100		150	40	50	1
1983															
PARC	53312	175	1290	3978	1932	2215	183	91	1117	91		234	15	87	
DC	2864	20		766	146	455	151	0	241	169	36	17			1
95% cl	16960	163	1781	2321	812	1420	107	124	244	72	31	152	15	14	1
1984															
PARC	48284	273	448	3792	1224	568	175	0	404	109		153	33	44	1
DC	76	0	0	0	0	218	0		0	11		0	0	0	
95% cl	5982	144	442	214	442	293	101		182	126		103	69	38	
1986															
PARC	29419	153	2874	7222	1705	1322	328	34	943	12		230	63	157	
DC	341	13	0	490	75	669	93	0	86	23	25	13	0	0	
95% cl	3465	140	1658	2501	589	456	135	25	344	12	26	90	46	121	
1986 1988															
PARC	32163		2851												
1991															
PARC	33910	346	2205	3423	967	718	38	13		13	51	39			
DC															
95% cl	19705	422	2002	2045	675	440	42	25		26	60	56			
1993															
PARC	30555	347	1023	6738	3444	1113	75	150	2692	75	120	90			
DC	549	0	0	564	89	355	0	0	163	15	45	0			
95% cl	15798	419	617	3547	2114	623	91	255	1524	83	57	67			
1995															
PARC	25242	178	3601	6601	2819	1680	271	81	5606	98	107	0	14	14	
DC	472	52	39	524	56	420	0	0	643	39	105		0	0	
95% cl	16920	210	2638	3033	1198	1340	180	159	2646	74	52		27	25	

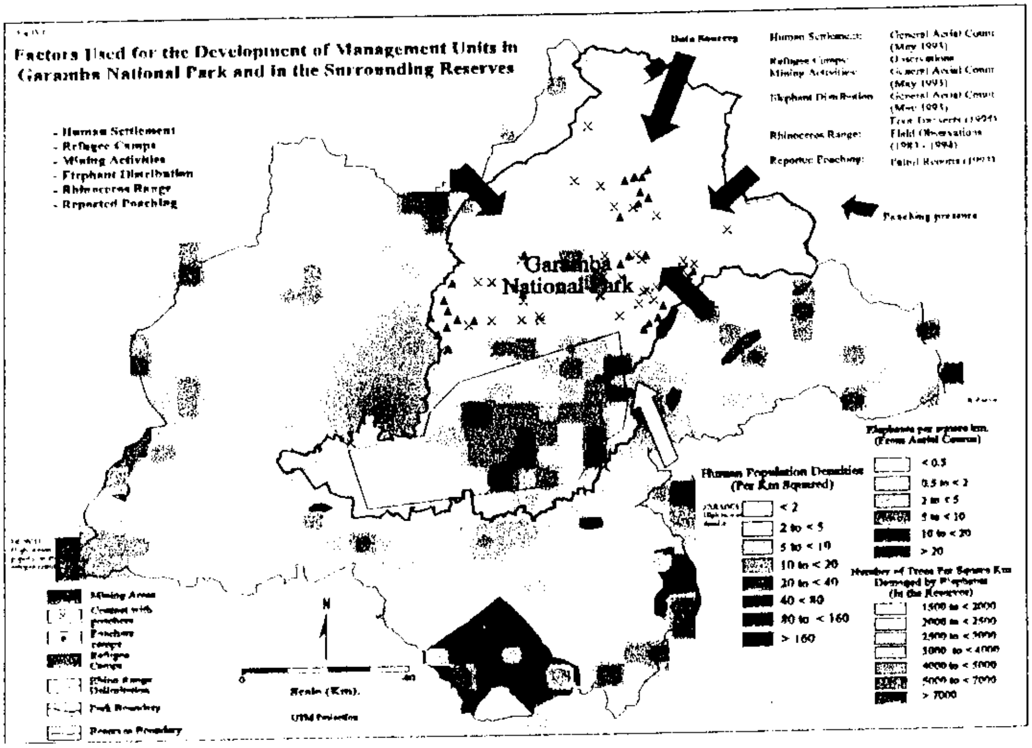


Between the FAO Project and the Garamba project most large mammal numbers dropped dramatically with heavy poaching. This also changed the distribution of the most valuable species, elephants and rhinos, who were eliminated from the north and remained concentrated in the better protected south of the park. The Garamba Project/IZCN partnership was able to eliminate the commercial poaching of elephants and rhinos but a continuation of poaching in the north of the park for meat maintained their unequal distribution and they did not move back to re-populate the centre or north. As the elephants increased they tended to move out more into the wooded Domaine de Chasse at night (Hillman Smith et al)



GARAMBA NATIONAL PARK AND RESERVES

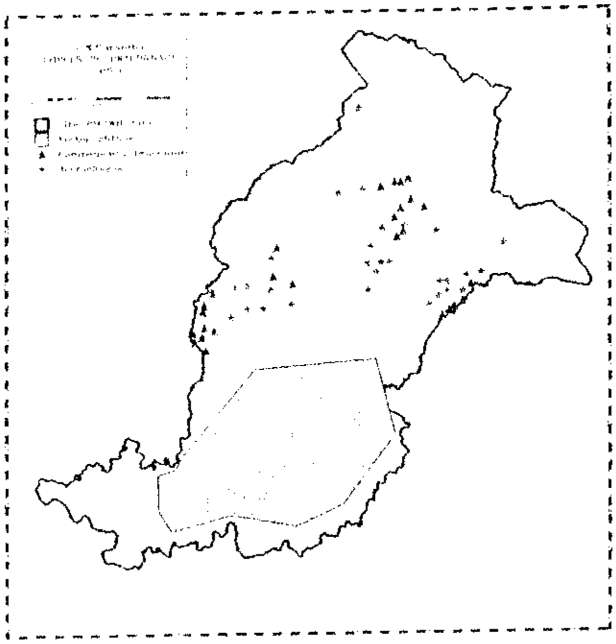
The north of the park is on the Sudan border and it is easy for poachers to cross. Elephant and rhino numbers rose through the first few years of the project, doubling in eight years, (Fig & Table 1), but buffaloes which remained widely distributed throughout the park became the main meat prey species in the north and centre of the park.. Because of this, buffalo numbers have declined steadily throughout the project, but they acted as a buffer to the more valuable species.



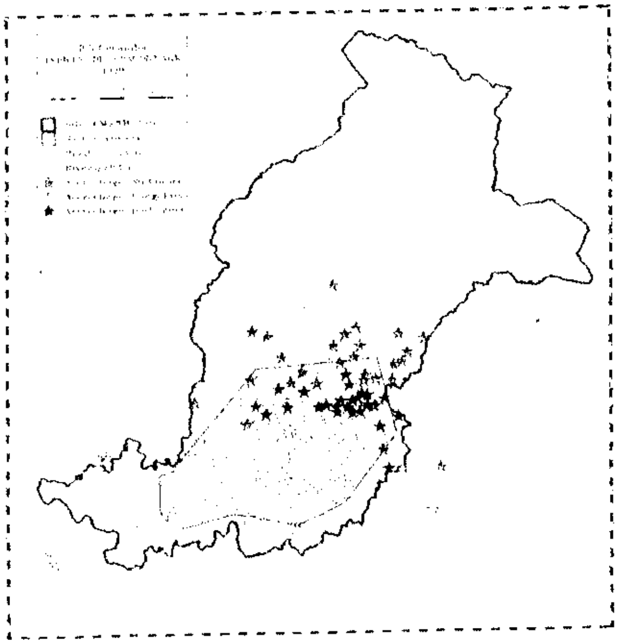
The effects of wars

In 1991 the Sudanese civil war moved south, as the town of Maridi, just across the border from Garamba, was taken by the Sudan Peoples' Liberation army. Arms and ammunition became widely available and about 80,000 refugees were settled east and west of the reserves surrounding the park. SPLA camps were set up adjacent to the border and well armed and trained militia or ex-militia became the main source of poaching pressure, as evidenced by the law enforcement monitoring (LEM) results (Fig.4).

Commercial meat poaching was the main driving force. Most active anti-poaching effort was concentrated in the centre of the park, where the prey species and the poachers were concentrated. In the south, where the elephants and rhinos were concentrated, there was very little poaching before the civil wars. Most patrulling focused on monitoring and on seeking any signs of incursions and on research. However the strength and arms of the SPLA militia, their long periods of inaction away from the Sudanese front line and the market for meat in the area, meant that meat poaching increased in intensity, with poacher groups increasing in size and operating with heavier weapons, including grenades and rocket launchers. Despite extreme efforts, the guards could not completely stop this poaching and the front line of poaching gradually moved south through the park, as the LEM maps show. Major efforts were being made to raise higher levels of funds, ammunition and to bring in training and support, but in 1996 the first two rhinos were lost to poaching. Towards the end of 1996, the civil Liberation war began in the then Zaire.



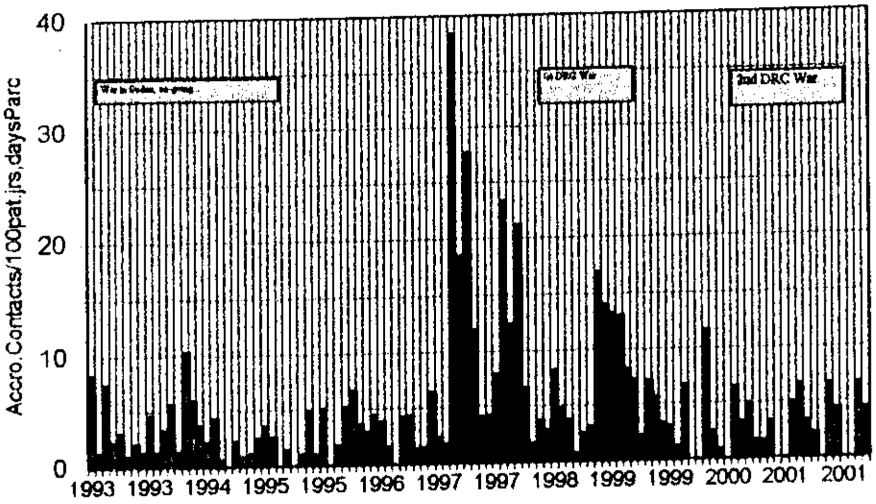
Poaching Camps & armed contacts 1993



Armed contacts 1998

In 1997 the Liberation war forces reached Garamba, the guards were disarmed and anti-poaching was forced to stop for several months. The poachers took advantage of the situation and moved into the high concentration southern sector. The figures of poaching per unit search effort (per 100 patrol days) show how the intensity of poaching increased significantly in the first war (Fig.5).

Parc National de la Garamba
BRACONNAGE/POACHING 1993-2001



As Table 2 shows, over half the elephants, buffaloes and hippos were killed at this time and an aerial survey of the southern sector in 1997 showed fresh carcases and occupied poaching camps widely distributed. Major efforts by the ICCN and project personnel in Garamba, Kinshasa and internationally re-established anti-poaching, evaluated the situation, obtained clearance for training and back-up and began re-equipping and re-activating the conservation operations.

Table 2 Impact of the wars 1996/97 and 1998 to present

Espèces	1995 Population calculation	SE	1998 Pop calc.	SE	2000 Pop. Calc.	SE	2002 Pop. Calc.	SE	2003 Pop. Calc	SE
Elephant	**11,175**	3,670	**5,874**	1,339	**6,022**	1,046	**5,963**	1,184	**6,948**	1995
Buffalo	**25,242**	8,299	**7,772**	2,063	**13,115**	3,066	**13,281**	3,930	**14,480**	4231
Hippopotamus	**3,601**	1,299	**786**	207	**967**	485	**948**	787	**3,036**	1191
Giraffe	**178**	108	**144**	73	**118**	64	**62**	13	**62**	75.4
Waterbuck	**1,680**	669	**1,382**	433	**1,058**	363	**797**	316	**421**	210
Hartebeest	**2,819**	590	**1,685**	398	**1,065**	218	**1,139**	232	**1,224**	260
Kob	**6,601**	1,495	**6,505**	1,558	**3,902**	984	**3,587**	991	**6,235**	2121
Warthog	**5,606**	1,261	**4,765**	668	**1,075**	213	**990**	254	**789**	155
Roan Antelope	**81**	78	**8**	7					**57**	67

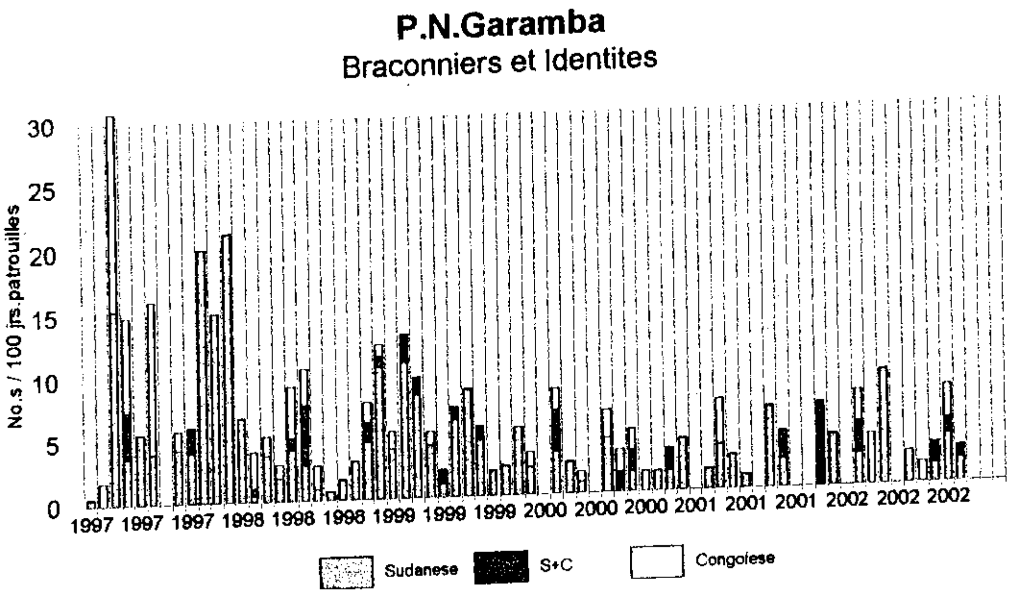
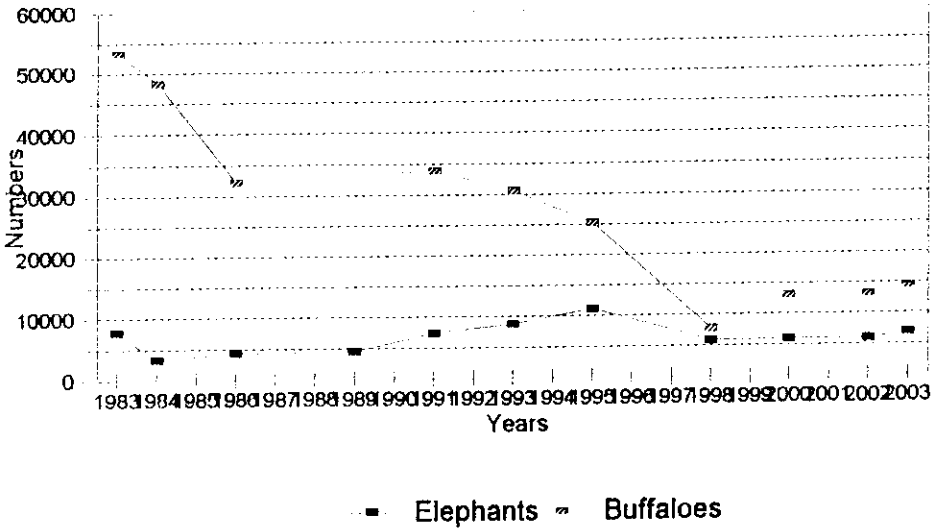


Fig.: Identities of poachers

In August 1998, the second civil war began. This time guards were not disarmed and although the senior staff and project personnel had to leave, the guards themselves continued patrolling and law enforcement monitoring and as soon as possible the project back paid them in relation to this. However, with Uganda being linked to the rebel forces holding the area, and the Ugandan links with the SPLA, it became very much easier for the Sudanese to move across the border semi-officially. The refugee camps were raided. In August 1999 a group of SPLA came across into the Domaine de Chasse Mondo Missa to the east of the park and began recovering weapons and "deserters". At first this had a positive effect on reducing poaching and in December park forces and local authorities joined them for a mixed operation supported by the project to recover more weapons. Agreement was given for a second two month operation in 2000. It delayed for several months and in the meantime, according to patrol reports, the local people were harrassed for food by the SPLA in the area and many moved away from their homes and fields. The official mixed operation involved support from the project in terms of vehicles, fuel and rations and although it was only for an agreed period of two months, at the end of which they were supposed to return to Sudan and continue a more limited trans border collaboration, the park warden at the time built houses for them close to the park border in the Domaine de Chasse in DRC to the east. They therefore did not want to move back to their side of the border even though the project was unable to support this kind of activity in the long term, in one area out of the park, to the detriment of the conservation activities within the park. The SPLA have remained there ever since, demanding support from the park or threatening to wipe out the animals if this is not given. Representation has been made to all the concerned authorities and the park's position has been made officially clear, but the threat remains and has in 2003 become extremely serious.

P.N.Garamba

Large Mammal Populations 1983-2003

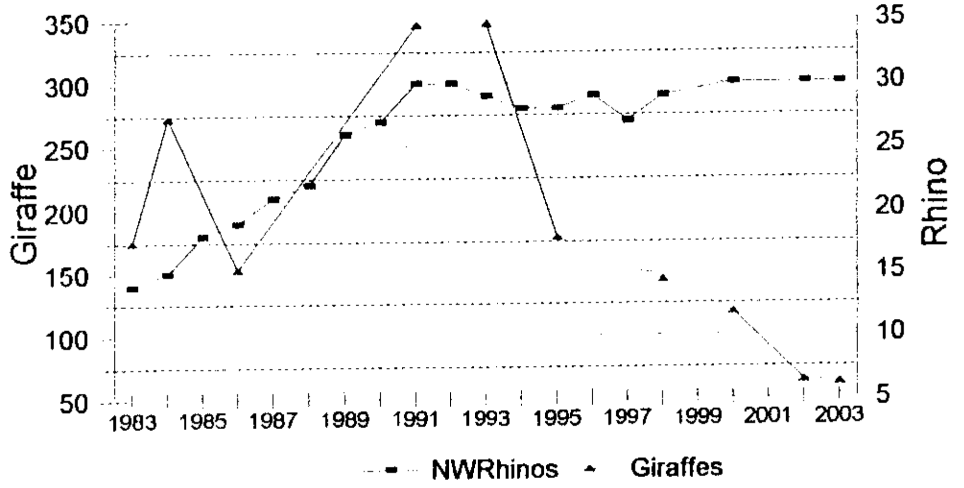


Current trends

As noted above, although the poaching front line had been moving south through the park under pressure from Sudan, while it was still largely for meat and while buffaloes and other species were available in the centre of the park, the rhinos and elephants in the south were relatively secure. During the most active phases of the wars, in early 1997 and late 1998, the poachers were able to penetrate the southern sector, but at times that the guards were able to operate more effectively, they were able to push them back. The most striking result of recent aerial surveys has been the almost complete lack of large mammals in the central and northern sectors of the park . The series of maps of buffalo distribution over time demonstrate this

PARC NATIONAL DE LA GARAMBA

Rhino & Giraffe 1983-2003

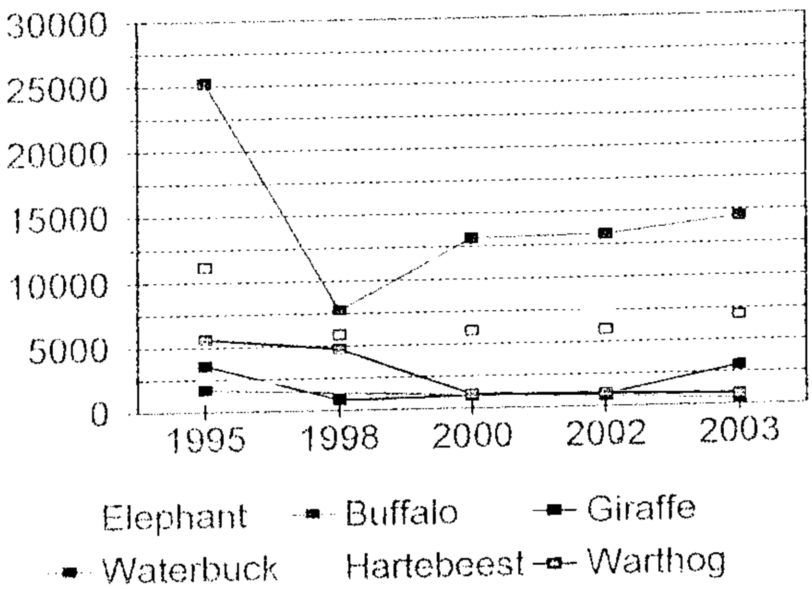


effectively. As these have been the main prey species for meat poaching, all the attraction for poachers for either meat or rhino horn and ivory is focussed in the southern sector. The pressure is serious. In response the guards prefer to go on patrol in very large groups, which halves or quarters the cover of the area and makes them easy to detect. In addition, with the key poachers now established close to the park in the Domaine de Chasse, they no longer have to make camps to smoke meat before travelling 100km back to Sudan, but can move in and out in a day

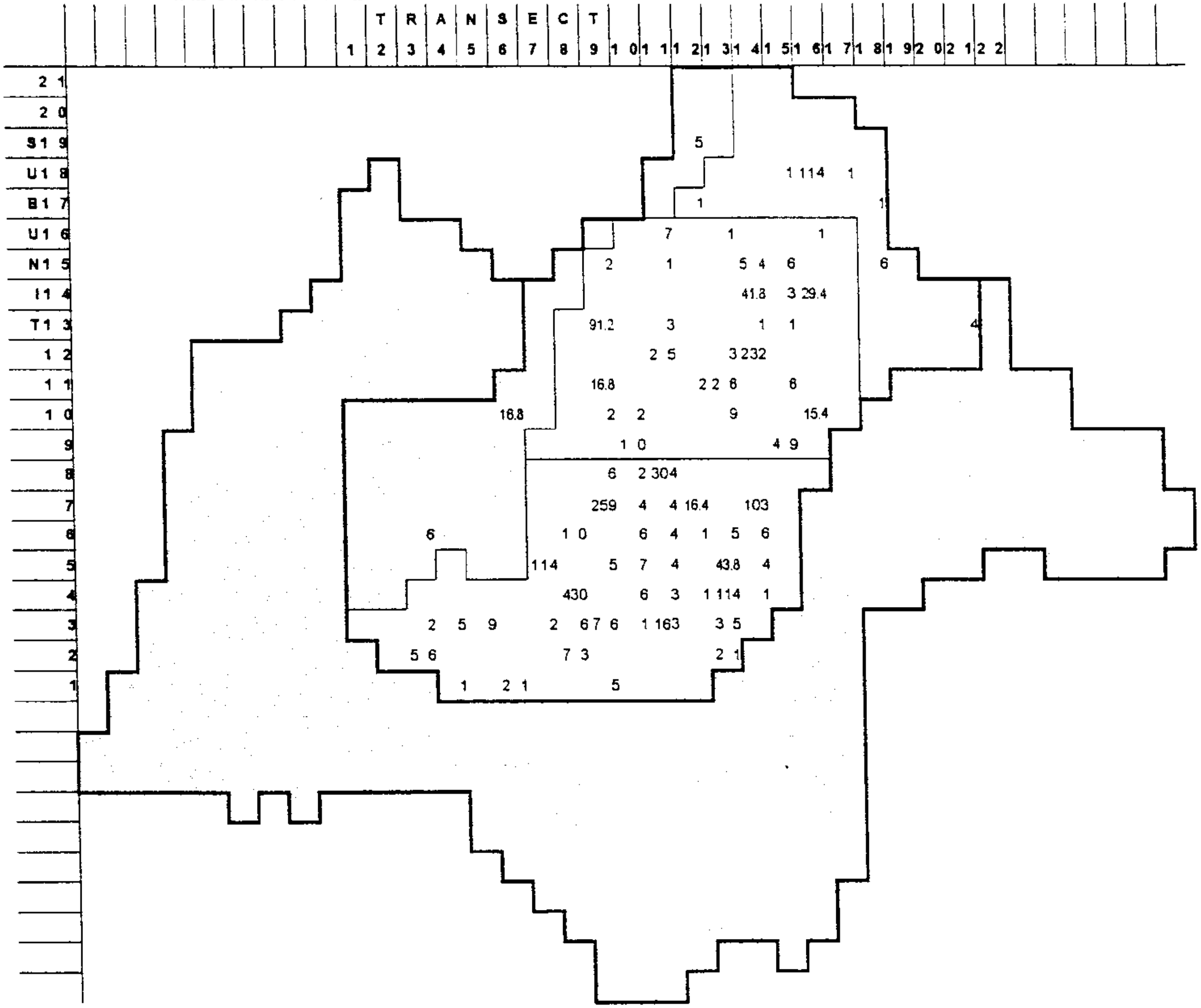
Recent patrol reports indicate that the trend since May has been to kill elephants for ivory and leave the meat, which also means that many more elephants can be killed in a short space of time. In June and July there have been three instances of guards being attacked in their camps, including the new radio relay station which is at Km 15 the very centre of the southern sector and only 15 km from Nagero, the park headquarters. It is urgent that guards receive effective training, back up and leadership. that more young guards are recruited and trained and that an effective strategy is developed and followed. A rhino and poaching recce survey of the southern sector will be carried out in August.

Parc National de la Garamba

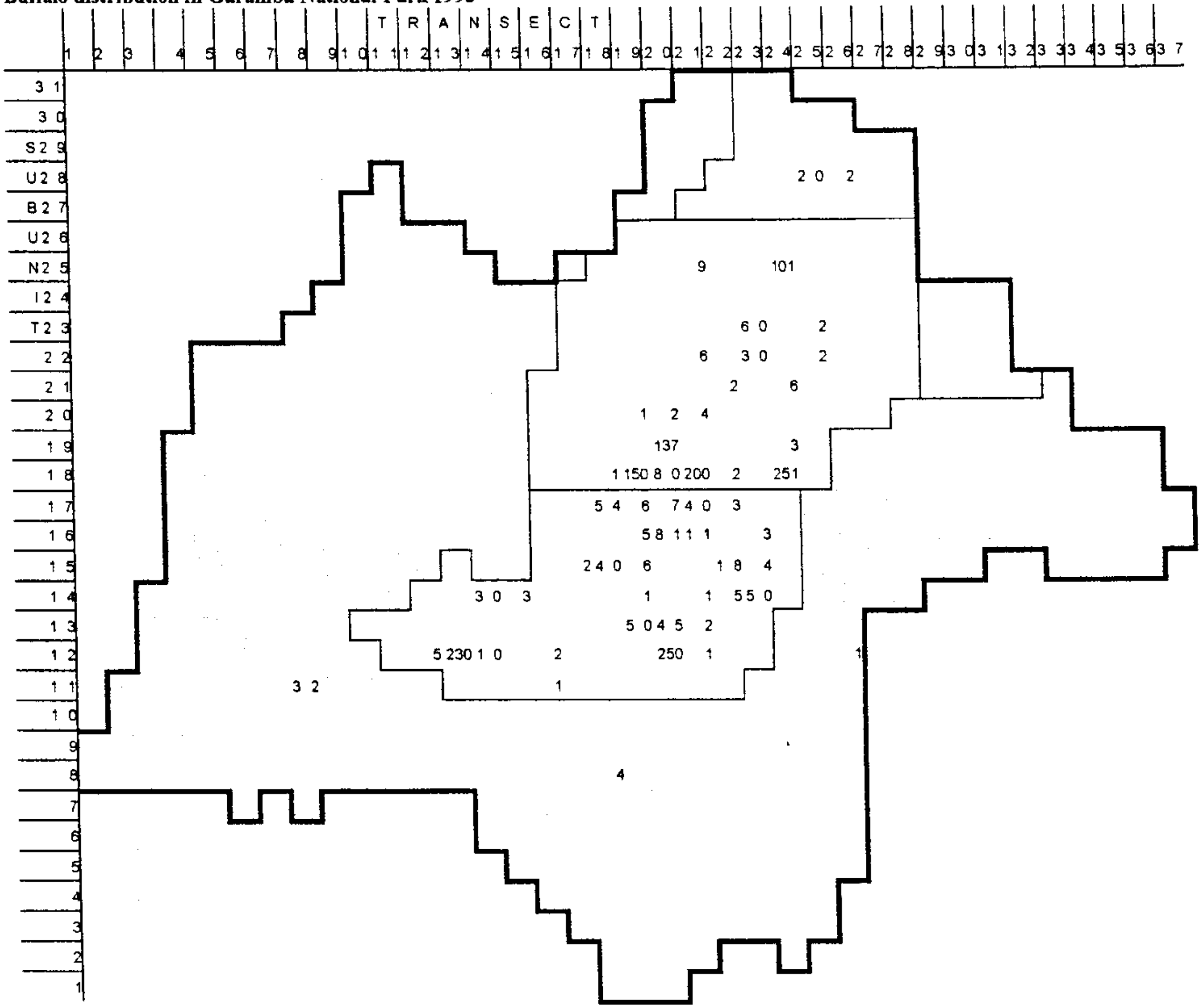
Large Mammal numbers 1995-2003



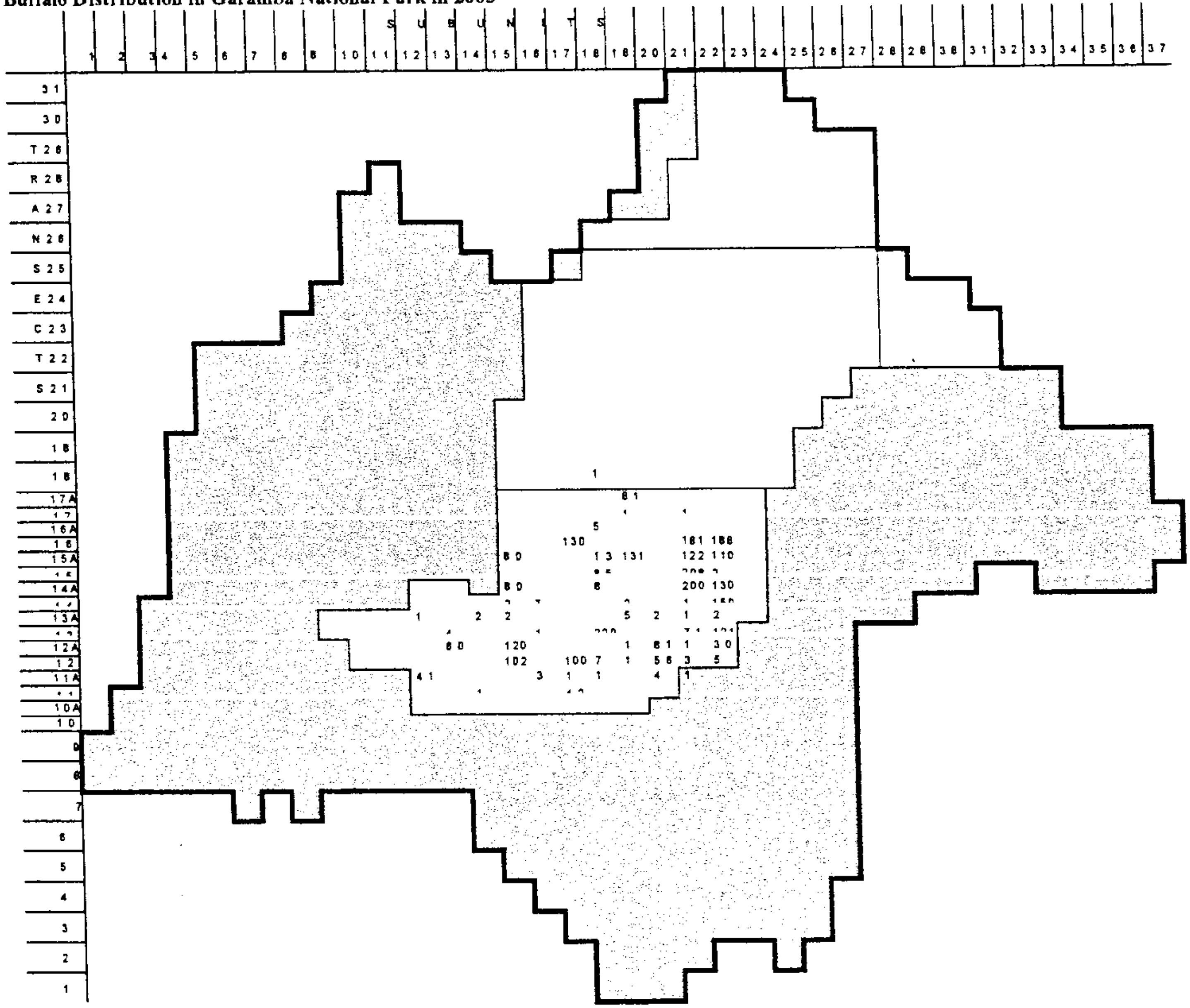
Buffalo Distribution in Garamba National Park in 1986



Buffalo distribution in Garamba National Park 1993



Buffalo Distribution in Garamba National Park in 2003



Elephants

The table and graph of elephant numbers since 1976 show the precipitous decline between 1976 and 1984, with a low of about 4,500 and a time lag in increase as such a slow reproducing species. Numbers then rose exponentially, until they had more than doubled with over 11,000 in 1995. Despite the broad confidence limits inherent in sample counting, the difference was significant at the 5% level (anal. of variance, Cochran in Norton Griffiths 1978). The graph of elephant and buffalo populations, plotted with equally spaced years and lines of best fit calculated from the regression, show that the actual slopes of decline and increase were similar. (r=0.18) both were of the order of 10% per annum. The overall increase in the elephant population since the project started was largely due to the elimination of most of the commercial poaching of internal and external origin. However, the pressure from the war across the border in Sudan, exacerbated by the civil war preventing anti-poaching in early 1997 resulted in a loss of some 5,000 elephants between the counts of 1995 and 1998. Since then elephant numbers have remained relatively stable to slightly increasing, but the recent trends are of considerable concern and the aerial recces and next large mammal survey will be needed to assess the degree of effect.

Although the elephant population remained largely concentrated in the better protected south of the park, as their numbers increased, they increasingly used the woody vegetation in the Domaines de Chasse at night (Hillman Smith et al 1995 and Nicholas & Amube 1995) often forming into large groups near the periphery of the park during the day. In 2003 a large aggregation of some 800 was seen in May, concentrated in long grass patches during the day and moving out into the Domaine in the evening. However no elephants are now found north of the Garamba river in their previous concentration areas. It has been shown, from the results of counts, general observation and from aerial total counts over fire experiment blocks that elephants and rhinos favour long old grass for cover. During the war periods a management effort has been made to maintain mosaics of long old grass with patches of short palatable grass. Their distribution favouring these areas indicates the value of the long grass in helping to protect the more vulnerable species.

Dead to live ratios from carcase counts were relatively low during these surveys compared with the 1 dead to 8 live ratio found in 1983 before the project started. During the recce flight in 1997 carcase numbers had been very high, but by the time of the 1998 sample count reported here, many of those carcases had disappeared and the lack of new ones indicated how the guards were pushing back the poaching. Carcases disappear extremely quickly. Rainfall is over 1300 mm per year, aiding rapid breakdown and hyena and vulture densities are high. Even elephant carcases can sometimes be so scattered as to be unrecognisable from the air a week after death. The 12% cover of termitaria clearings and the tendency of animals to use them and therefore die in them, together with the rapid rate of grass growth also makes it difficult to distinguish all rot patches for as long as in east africa.

Figures for large mammal numbers and biomasses are expressed as pie charts. The biomass contribution of elephants to the ecosystem is very striking. The relative sizes of the populations of elephants and buffaloes in 1995 were the same as those found in 1976 (savidge et al 1976).

An examination of the tree and bush cover from aerial surveys throughout the project reflects both the overall reduction in mature trees within the park compared with the surrounding domaines and the advancing bush regeneration in the north and centre of the park, as the elephant have to a large extent been absent from this area for over twenty years. This is borne out by the 1976 distribution of elephants throughout the park compared with the present and by reports of guards, who say there used to be many elephants in the north of the park, and that much of the poaching between 1978 and 1984 was done by guards themselves. The reduction of woody vegetation is compounded by the effects of fire. The action of the elephants and the hot fires is to damage smaller trees. The elephants further prevent regeneration from old rootstocks by selection for these plants. This leads to dominance by rapidly growing coarse perennial grasses (*loudetia arundinacea and hyparrhennia spp.)* that grow over 2 metres tall. In addition to competing with the woody regrowth amongst them, they provide a huge combustible biomass for the hot fires that sweep through, further destroying that year's regrowth of woody plants that might remain. The management activity of maintaining mosaics of long and old grass is therefore doubly important

Elephant distribution and use of natural woody vegetation in the domaines de chasse was found to be positively correlated with proximity to their daytime core distribution, and negatively with distance from human settlement in the dry season. (Hillman smith et al 1995). This showed that they were not moving out solely to raid crops, though this appeared to be the human perception of the situation. More recent comments by guards are that elephants are escaping from the poaching dangers in the park!

Rhinos

A sample count is not adequate for accurate estimation of so small a rhino population. The difference between seeing 2 or 4 means the difference between population estimates of 27 or 53. We have been monitoring the rhino population through individual recognition over the years, and a rhino total block count using individual recognition was done in April each year, with further observations from recce flights. A minimum of 28 were accounted for in April and on the basis of earlier observations at least 30 were almost certainly present. With the recent poaching pressure in the southern sector, however, several may have been lost.

Rhino numbers increased exponentially before the wars, doubling in eight years. The known population dynamics through the war periods are given in the table. Throughout the wars the population has remained relatively stable and over 12 births were recorded. However according to the rate of reproduction and the previously demonstrated rate of increase, the population should be over 60 individuals now, double current numbers. We cannot be complacent about relative stability and must do all possible to improve protection combined with back up measures to avoid loss of this, the most endangered large mammal sub-species. Under the IUCN red list categories of endangered species (IUCN/SSC,1995), they are classed as **critically endangered** by reason of their low numbers.

The rhinos, like the elephants, are also found only in the south of the park. They are at an over all density of 0.003/km^2, but a local density of 0.03/km^2. Prior to the war, as the population had been expanding and sub-adults in particular had been dispersing, there was more movement north of the Garamba river. Since 1996, however, most rhinos venturing north of the river have been eliminated.
Home ranges for dominant males average 188.6km^2 (124-228). For females the mean is 345km^2 (185-492), and for sub-adults 534 km^2 (up to 786). These ranges are of the order of 100 time larger than those recorded for southern white rhinos. Their size may be related to the very low density of rhinos, which places little restriction on their movement, but may also be related to the dispersal of available food resources at certain times of the year. The extensive movements of the animals, however maximise the chances of encounters between different individuals for breeding. The ecosystem has been shown to be ideal for them as demonstrated by rate of breeding. However adequate protection and monitoring is essential if they are to survive.

Buffalo

Buffalo numbers have fallen steadily throughout and the change in their distribution has been significant. Buffalo are the most numerous large mammals, but contribute less than a third of the biomass of elephants.
However buffalo numbers in 1995 were approximately half what they were in 1976 and are closer to one quarter in 2003. The difference is significant at the 5% level (d=2.07,anal.of variance, Cochran in Norton Griffiths 1978). The graph of buffalo numbers shows no significant change between 1976 and 1983, followed by a gradual decline, which has steepened in recent years. During the period of the project, buffalo have been the species most poached for meat. This meat poaching increased in 1994, with large, well-armed groups of sudanese causing the majority of it. Buffaloes have now been completely eliminated from the north and central sectors of the park. This insidious offtake over the years, while decreasing a once extremely numerous population, had a buffering effect on the protection of the more commercially valuable species, rhinos and elephants. Now, with all species concentrated in the south, all poaching is also concentrated there.

Giraffe

This giraffe population is the only one extant in DRC and probably the only representative of the sub-species (*Giraffa camelopardalis congoensis*). It is classified as **endangered** by the IUCN red list categories

(IUCN/SSC 1995). The northern white rhinos and the giraffes were the main reason for the creation of the park in 1938 and for its world heritage status in 1981.

The population, however is very small and has been decreasing. This estimate in 2003 is only 62 ± 75. The woody habitat needed by the giraffe is only found in the north of the park or around the peripheries of the south or in the Domaines de Chasse, all areas which are very vulnerable now. A preliminary study showed their selection for *acacias* which are very poorly represented in this ecosystem.

Giraffe were not widely poached, because the Azande believe that eating their meat confers leprosy, although their tails are used by local chiefs. However these beliefs are not shared by the Sudanese, who form the majority of the poachers now.

Hippos

Sample counting is not ideal for hippos, whose distribution tends to be in local concentrations, leading to large variations in estimates, and for whom correction factors are needed to allow for those underwater. However the specialised hippo count carried out in 1988 yeilded figures very similar to the preceding sample count. The graph of the results from all the counts shows a gradual trend of increase from 1976 to 1995. This is borne out by personal observation that the hippos appear to have been increasing, and by reports from nagero and faradje of increasing problems of crop-raiding by hippos. If the correction factor calculated in 1988 was applied to the 1995 there would have beeen over 6,000 hippos. However, as figures since the wars show, hippos were hard hit by the poaching during the 1997 war. The aerial survey we carried out in July 1997 of the southern sector confirms the reality of this, since the Garamba river was full of dead hippos floating belly up. Clearly when poachers penetrated as far as the river, they fired fairly indescriminantly at the hippos, but were unable to recover all the bodies.

The 1998 figures are lower than the subsequent figures. There are possibly at least three contributing factors to this: Some hippos may have moved out along the rivers during the major killing of 1997, the other two reasons may be linked to count biases. After training and discussion and practice with photos, I suspect that observers were making some allowances for the up:down ratio in their own counting or estimating of very large dense concentrations. The third factor is the shift in count transects from north south to east west. Transects north south cross the Garamba and Dungu rivers at near right angles. However east west transects, that are only spaced 2.5 km apart fly along relatively parallel to the river and slight drifts in course could easily lead to duplicate counting of some of the large groups. We have tried to check for any obvious duplications here and to control for observer bias in counting, but a spcific hippo count would give more precise figures.

Kob

Apart from an apparent high in 1986, kob appear to have followed a similar pattern to other antelope species, with a decrease between 1976 and 1983, continuation at a similar level, and an increase again in 1993 and 1995 and a decrease then relative stability since the wars. Observer bias may be one factor in their apparent fluctuations, and it will be important to try to standardise on observers for several years. They are distributed mainly in the high density stratum, but with several in the medium density and even the low. They were also seen in parts of the domaines de chasse. Kob tend to show a certain fidelity to areas where the grass is generally shorter all year round, for example on the shallow soils near the nauloloko/eleti confluence and at bac garamba. Their social organisation shows large harem groups, smaller, less coherent female and calf groups, male groups and "leks", with birth peaks in early dry season and breeding peaks in early wet.

Hartebeeste

Hartebeeste were 7750 ± 1470 in 1983, and down to 1932 ± 146 in 1993. They stayed at a similar level until a major increase in 1993 and 1995. The difference between the 1991 and 1995 figures was significant (d=4.9, >5%). They were reduced by about half during the first war of 1997, but since then have remained relatively stable. They tend to be relatively sedentary and their prefered habitat is on ridge tops of the savanna grassland (hp).

Waterbuck

Waterbuck are widely distributed throughout the park and domaines, in association with water courses. They did not show a major drop during the first war, but numbers have shown a steady decline since then.

Reedbuck

Reedbuck are not numerous. Like most of the antelopes they show a decrease from the 1976 figures and an apparent, but insignificant rise in 1995. Numbers are currently low. They are fairly cryptic and not easily seen unless they move. Their distribution was apparentely towards the south and east of the park, but they may have been more difficult to see in the more bushed north and west. Numbers are undoubtedly an undercount.

Roan

Roan antelope are represented by a very small population, which was apparentely larger in 1976 (360± 530). There used to be group south of mt kpaza, near the kasi, but any that remain are now only found south of the Garamba river. A small group usually occupies the region near to source Nauloko each short grass season, and apart from that scattered observations are made from time to time. 57+- 67 were estimated in 2003, but this could be on the high side from chance sightings of several individuals.

Bushbuck

The population estimate for bushbuck is undoubtedly lower than the true population. They are very cryptic, preferring relatively thick bush near to water courses. The apparent reduction or lack of increase in numbers in the last two counts may be associated with lower visibility from a count later in the year than previously. From the ground, however they are fairly frequently seen and Nicholas (1995) found that they were the most numerous small antelope in the Domaines.

Oribi

Oribi are also difficult to see and are in low numbers and only 58 were estimated in 2003, though this was higher than the population estimated of two preceding years. Their population estimate will probably always be lower than the actual, since they are small and not easily seen. Verschuren in 1989 (pers.comm) had a strong impression that oribi had increased since the 1950s, but he conceded that it might have been the effect of more open vegetation.

Duikers

Population estimates for duikers will be minimal, since they are small and not easily seen. Grey duikers are mainly found within the park, but two were seen outside. Their population estimates do not show significant change over time. Red-flanked duikers are found more in the wooded areas to the north of the park and in the domaines. No yellow-backed duikers were seen on this count, but they have previously been seen from the air in wooded areas to the north and in the domaines de chasse. Figures within the park were apparentely higher in the 1993 and 1995 counts despite lower visibility overall. This could be associated with the increasing woody vegetation in the north.

Warthog

The warthog population has shown a rapid decline since 1995. This may be partly due to poaching but is probably largely due to some other factor like disease. Their populations have always fluctuated widely over the years. One suggestion mooted by guards for the previous decline was lion predation, but it was more likely to be an epidemic. Warthog probably go into their burrows to die and carcases would not often be noted.

Lion and hyena

Lion and hyena are both relatively plentiful predators, but are not easily counted by aerial sample counts and their population estimates are definitely lower than true values.

Monkeys, baboons and crocodiles

No reliance is placed on these population estimates that were based on chance sightings. Crocodiles are very plentiful.

Other species

Some species occur only or more commonly in the domaines or the very north of the park, such as the chimpanzee (*pan troglodytes)* , giant forest hog, bushpig, leopard and two of the duiker species. Other valuable species, like bongo (*tragelaphus euryceros)* have been reported only from the domaines de chasse (nicholas 1995) and a derby's eland was once observed walking through the park from the domaines. These differences are largely due to habitat differences as can be seen from the vegetation maps. However, they add weight to the fact that the domaines and park support complementary and different habitats and both need to be considered to maintain maximum biodiversity of the ecosystem as a whole.

Vegetation

The vegetation maps plotted in 1995 (Hillman Smith et al 1995a) and recorded but not necessarily plotted every year on the counts, show the clear differentiation between the wooded reserves and the grassland savanna of the south of the park. The southern half of the park is long grass savanna dominated by *loudetia arundinacea* and *hyparrhenia species*, with scattered *kigelia africana* and *vitex doniana* trees. Relict gallery forest and riverine trees add further to the sparse tree cover in the south. A few areas of sparse tree savanna usually dominated by *crossopteryx febrifuga* exist. They appear to be relicts of a more wooded savanna in the past. They are not favoured by elephants and are usually on patches of shallow soil, where the effect of fire may be less due to reduced grass cover. *Crossopteryx* has also been found in Lope reserve in Gabon to be the relict species remaining in savanna that has in the past been forested (White L. pers.comm). Areas of regenerating bush in the centre of the park are usually dominated by *piliostigma thoningii*, which is relatively fire resistant. The interactions of elephants and fire as controlling factors in the maintenance of the open savannas of the park are dsicussed in the section under elephants. Because the count was done at the early wet season, the greenness factor was high throughout.

Towards the north of the park the ground rises with rocky kopjes and increasing woodland and galerry forest. Monodominant patches of *lophira lanceolata* are noted and other areas domainated by *terminalia mollis, isoberlinia or anogeissus leocarpus* occur. The domaines support a variety of degrees and types of woodland and tree/bush savanna. In some areas particularly towards the west, these are interspersed with dense gallery forest along the water courses. In other areas, particularly to the east and in the north of the park, many of the rivers are bounded by papyrus swamp or grassy plains. Over 104 tree species were recorded by nicholas and ndey (1995) on their ground transects in the domaines.

In the south of the domaines de chasse Gangala na Bodio are limited areas of secondary forest, and in areas. To the east, just outside the domaines, are some conserved forest patches, which indicate the climax type of vegetation of the area when protected. Rainfall averages 1400mm per annum. Most of the region, however shows the effects of human clearing at some stage in the past. In every case where the bush was being cleared for new agriculture it was in areas of secondary forest or dense tree bush savanna, the most species rich stage of this habitat type, or in woodland. There is a positive correlation between tree density and human tree destruction. The people choose these areas because the soil is more fertile in the forest or woodland. The selection for these regions of highest biodiversity and very limited extent is having a destructive effect on the reserves, which would be probably be irrecoverable for several hundred years. Agriculture is not prohibited in the domaines de chasse, but its current method of slash and burn practice is not compatible with sustainable use of natural resources. A proper crop rotation system and the use of fertilizers, with prohibition of tree felling in specified areas is needed if the few remaining forest patches are to be protected to maintain plant and animal biodiversity.

Water availability

Water is not a limiting factor anywhere in the park and reserves, but more surface water appears to be available in the park. In the reserves more of it is tied up in transpiration through trees.

Human influences

Poaching
There was a widespread distribution of poaching camps in 1998, but decreasing numbers since then. A few camps were seen in the north and central sectors on the last count, but as noted previously there is less need for poachers to make meat smoking camps now that they are based so close to the remaining wildlife. On the 2002 count a small group of poachers in military uniform were found close to the eastern border of the park drying manioc on the rocks, and they fired at the aircraft.

Poaching is currently extremely brazen, but far more difficult to detect. The effects of the wars and instability has been most marked where it led to disarming of the guards and reduction of their ability to combat the poaching. As the graphs show, the majority of poaching groups are largely Sudanese and in the current situation in the region weapons and ammunition are readily available. It is urgent that really major effective training and leadership is given to the guards, with development of a new strategy of anti-poaching and recruitment and training of an adequate numbers of guards that can be fully supported and effective in their work. Numbers alone are not the answer.

CONCLUSIONS

There was some loss of most species except buffalo between 1976 and 1983. However the focus of poaching during that time appears to have been for the commercially valuable elephants and rhinos. Both species provided plenty of meat in addition to the trophies, if it was required. Since 1984 most species increased with the better protection, notably the rhinos and elephants, which have shown high rates of increase, and warthog, which showed a recent spectacular rise prior to 1995. The exceptions are buffalo and girafe. Both have declined steadily. The buffalo population has dropped overall since 1983, probably as a result of meat poaching. Although carcase ratios and patrol reports show how poaching was brought down to minimal levels by the combined action of the project and IZCN, prior to 1991, after this time the effect of the war in adjacent Sudan has been the major influence on loss of animals and of the protected area of the park. The main drive for poaching has been for meat, and was hitting the buffalo population.

However the reduction in anti-poaching during the first war led to major wildlife losses in 1997. Since then major efforts by the guards and by the project personnel, principally in developing the UNF/UNESCO project to provide both financial and political support and in keeping up support on the ground, has enabled conservation work to continue as far as possible and has held many of the populations relatively stable. However there have been almost complete losses of wildlife in the northern and central sectors of the park. The combined effects of this is that all poaching focuses on the south, the proximity of well armed poachers to this area and the trands towards ivory and rhino horn poaching put the park in extreme danger, that must be tackled by extreme measures, now that peace is on the horizon in the DRC.

It is important for the sake of the park and its wildlife that sufficient resources and political negotiations are mobilised to stop the trans-border poaching, and that the poaching is tackled on all fronts, including positive integration of local people in resource conservation. For the sake of faunal and floral biodiversity and for long term conservation of the ecosystem and its particularly valuable components, it is important that the park and reserves are considered as a whole in an integrated plan backed with the resources to implement it.

REFERENCES

Burril A., Kaliski K & Douglas- Hamilton I.(1984) Aerocount, aerial survey analysis program manual Typescript

Douglas-Hamilton I. & Hillman A.K.K. (1981) Elephant carcasses and skeletons as indicators of population trends. Low Level Aerial Survey Techniques ILCA Monograph, 113-129

Haltenorth Th. & Diller H (1977) Mammifères d'Afrique et de Madagascar. Delachaux & Niestlé.

Hillman K., Borner M., Mankoto ma Oyisenzou, Rogers P., Smith F.(1983) Aerial census of the Garamba National park, Zaire, March 1983

Hillman Smith K. (1989) Ecosystem Resource Inventory, Garamba National park. Internal document. IUCN/WWF/FZS/IZCN

d'Huart J.P. (1978) Ecologie de l'Hylochère (*Hylochoerus meinertzhageni Thomas)* au Parc National des Virunga. L'Academie Roy.des Sci.d'Outre-mer. FFRSA

IUCN/SSC (1995) IUCN Red List Categories. IUCN Publication.

Nicholas A. (1995) A report on the results of line transect work undertaken during the dry and wet seasons in the Domaines de Chasse of Garamba National Park, north eastern Zaire. 2. Large Mammal abundance and distribution in the Domaines de Chasse.

" **& Amube N.(1995)** A report on the results of line transect work undertaken during the dry and wet seasons

2

in the Domaines de Chasse of Garamba National Park, north eastern Zaire. 1. Elephant distribution, density and feeding preferences in the Domaines de Chasse.

Norton Griffiths M. (1978) Counting animals, AWF handbook 1.

Savidge, J.M. Woodford M.H. and Croze H. (1976) Report on a mission to Zaire, FAO W/K1593 KEN/71/526 - ZAI/70/001

Smith K, Smith F., Mbayma A. Monungu L.,Watkin J. de Merode E., Amube N. Eza K. (1993) Garamba National Park, General Aerial Count 1993 WWF/FZS/IZCN/IUCN/UNESCO Report

Watkin J.,de Merode E. & Hillman Smith K. (1995) A simple method for analysis of aerial sample count data using widely available commercial software. (In press, Pachyderm)

Western D (1976) An aerial method of monitoring large mammals and their environment. FAO KEN/71/526 Project Working Document 9.

ACKNOWLEDGEMENTS

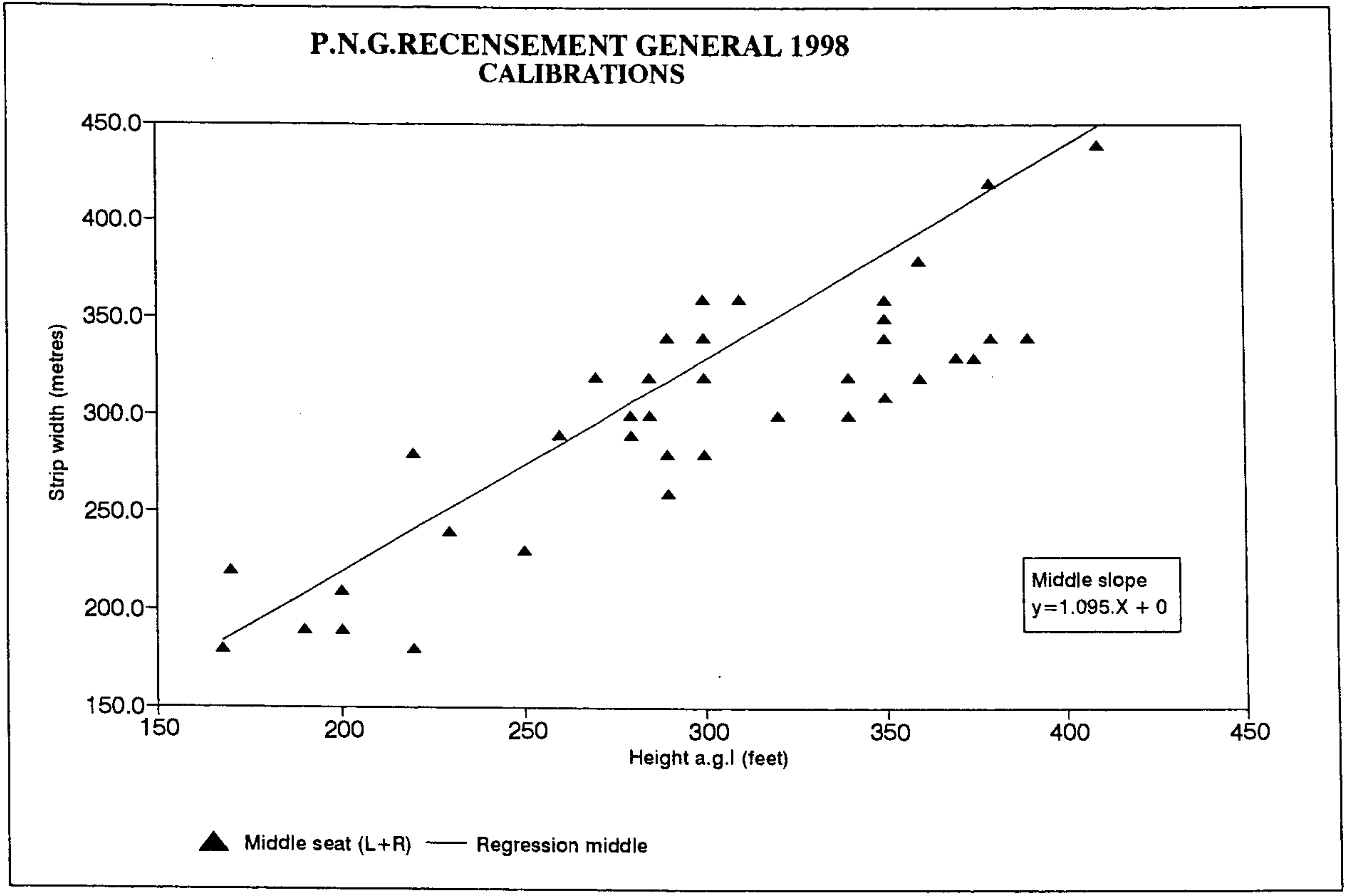
We are extremely grateful to the International Rhino Foundation (IRF) for support to ourselves and the running costs of the project, to Frankfurt Zoological Society (FZS) for the aircraft, to ZSL/Darwin Foundation for support to KHS, to USFWS and the Elephant Foundation ,for equipment to the UN Foundation/UNESCO to for guards' salaries, training funds and political and diplomatic support. and in particular to the Institut Congolese pour la Conservation de la Nature (ICCN) for the the strong partnership to work together to conserve Garamba National Park and its unique species.

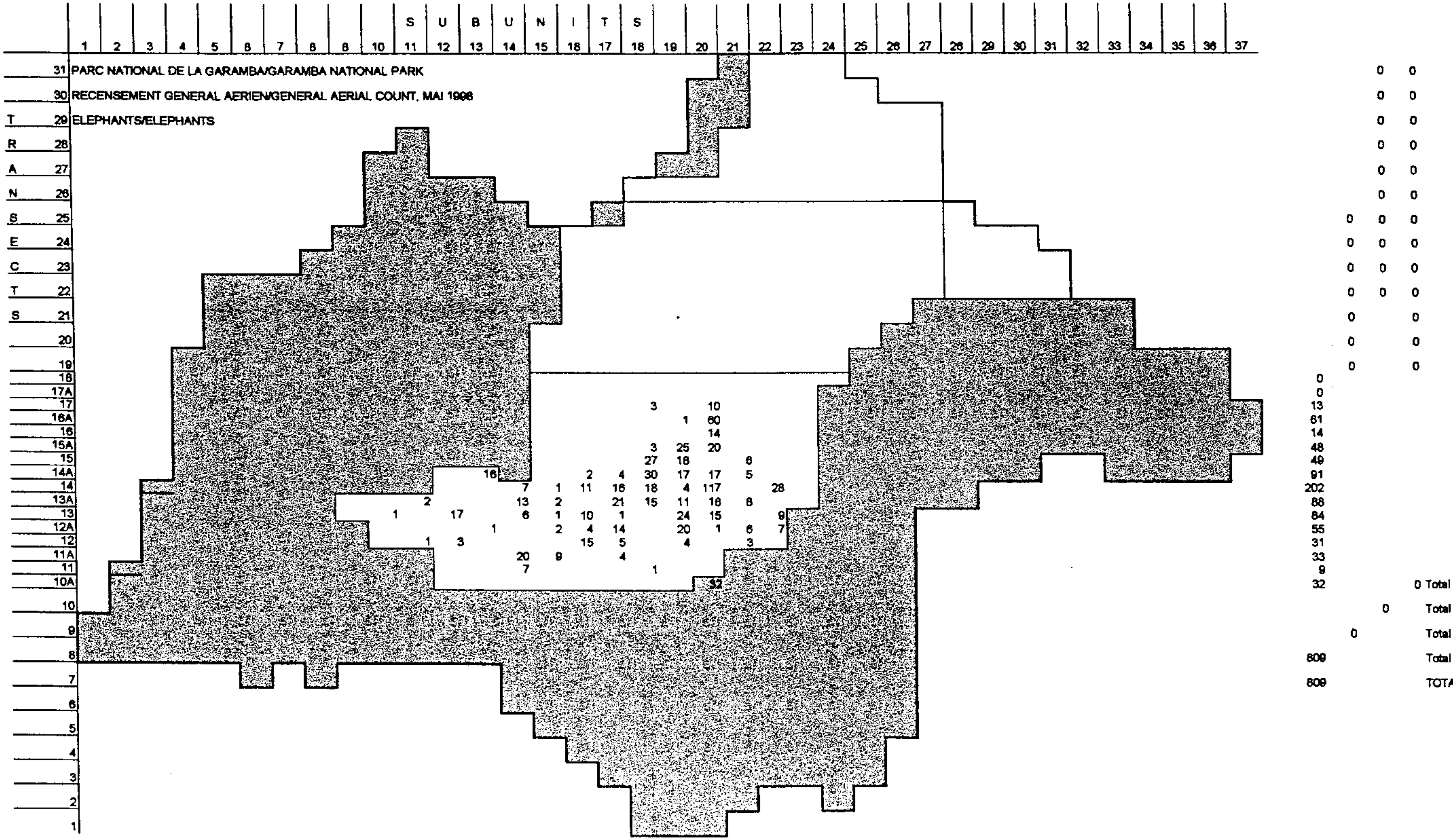
PARC NATIONAL DE LA GARAMBA
GARAMBA NATIONAL PARK

RECENSEMENT GENERAL SYSTEMATIQUE
GENERAL AERIAL SYSTEMATIC SAMPLE COUNT

Calibration Graphs, Distribution Maps and Population Estimate Calculations

May / Mai 1998


P.N.G.RECENSEMENT GENERAL 1998
CALIBRATIONS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
Strip width (metres)
150
200
250
300
350
400
450
Height a.g.l (feet)
Middle slope
y=1.095.X + 0
▲ Middle seat (L+R)
Regression middle



PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 1996

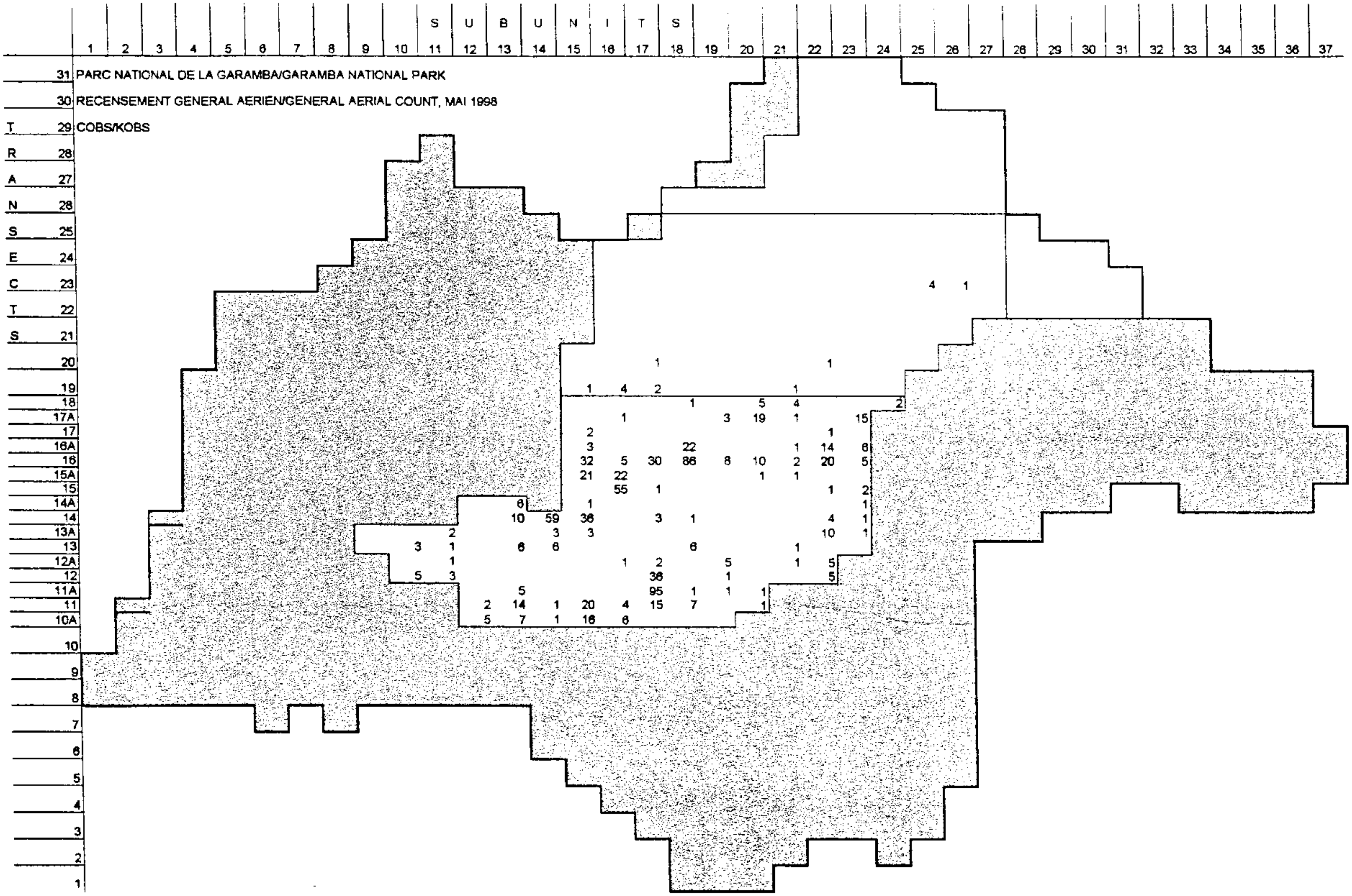
ELEPHANTS/ELEPHANTS

												S	U	B	U	N	I	T	S																							
		1	2	3	4	5	6	7	8	8	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37					
	31	PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK																					350	350	350	300															1350	350	
	30	RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 1998																					300	250	300	350	400														1200	300	
T	29	ALTITUDE DE VOL/FLYING ALTITUDE																					350	350	300	300	350	280													1930	322	
R	28																					300	300	280	310	300	280	300													2070	296	
A	27																					320	300	300	340	300	300	300													2160	309	
N	26																		330	280	300	300	300	280	300	300	300	300													2990	299	
S	25																		320	340	320	350	280	280	300	310	260	250	300											3010	300	301	
E	24																300	300	300	260	350	300	300	280	280	300	300	350	280	310	320									3620	910	302	
C	23																300	300	300	300	300	300	300	280	200	270	300	250	300	280	340	300								3400	2430	289	
T	22																	320	300	300	300	300	280	280	300	300	320	300	300	280	300	330								3300	1210	301	
S	21																360	300	300	300	220	300	320	300	310	320	320													3350		305	
	20															380	350	350	350	350	320	320	300	300	300	320														3640		331	
	19															300	350	350	270	250	200	250	300	320	300															2890		289	
	18															350	350	350	370	320	350	350	300	320	300														3360			336	
	17A															350	320	340	350	300	320	360	360	440															3140			349	
	17															400	350	360	300	450	340	300	400	380															3280			364	
	16A															300	210	280	300	300	300	330	320	310															2650			294	
	16															300	320	340	320	300	300	270	300	300															2750			306	
	15A															250	300	320	300	350	240	300	300	400															2760			307	
	15															350	280	300	300	300	280	300	300	300															2710			301	
	14A												280	300	280	300	280	250	280	300	280	350	320	290															3520			293	
	14												300	350	300	300	300	300	300	280	290	360	320	320															3720			310	
	13A									380	300	300	300	330	320	310	300	320	280	350	300	300	300	320															4710			314	
	13									320	350	300	320	320	360	300	300	330	250	330	320	320	350																4470			319	
	12A										350	330	350	320	340	320	350	300	300	350	300	250	400																4260			328	
	12											350	280	300	270	300	300	350	300	250	300	300	330																3630			303	
	11A												350	300	300	300	330	310	300	290	380																		2860			318	
	11												280	300	320	320	280	280	300	300	320																		2700			300	
	10A												250	270	300	300	280	330	300	300	220																		2330			291	
	10																																						0	0	11700	312	To
	9																																						23210	23210	4850	302	To
	8																																						52850	0	0	315	To
	7																																						52850	23210	16550	311	TC
	6																																										
	5																																										
	4																																										
	3																																										
	2																																										
	1																																										

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

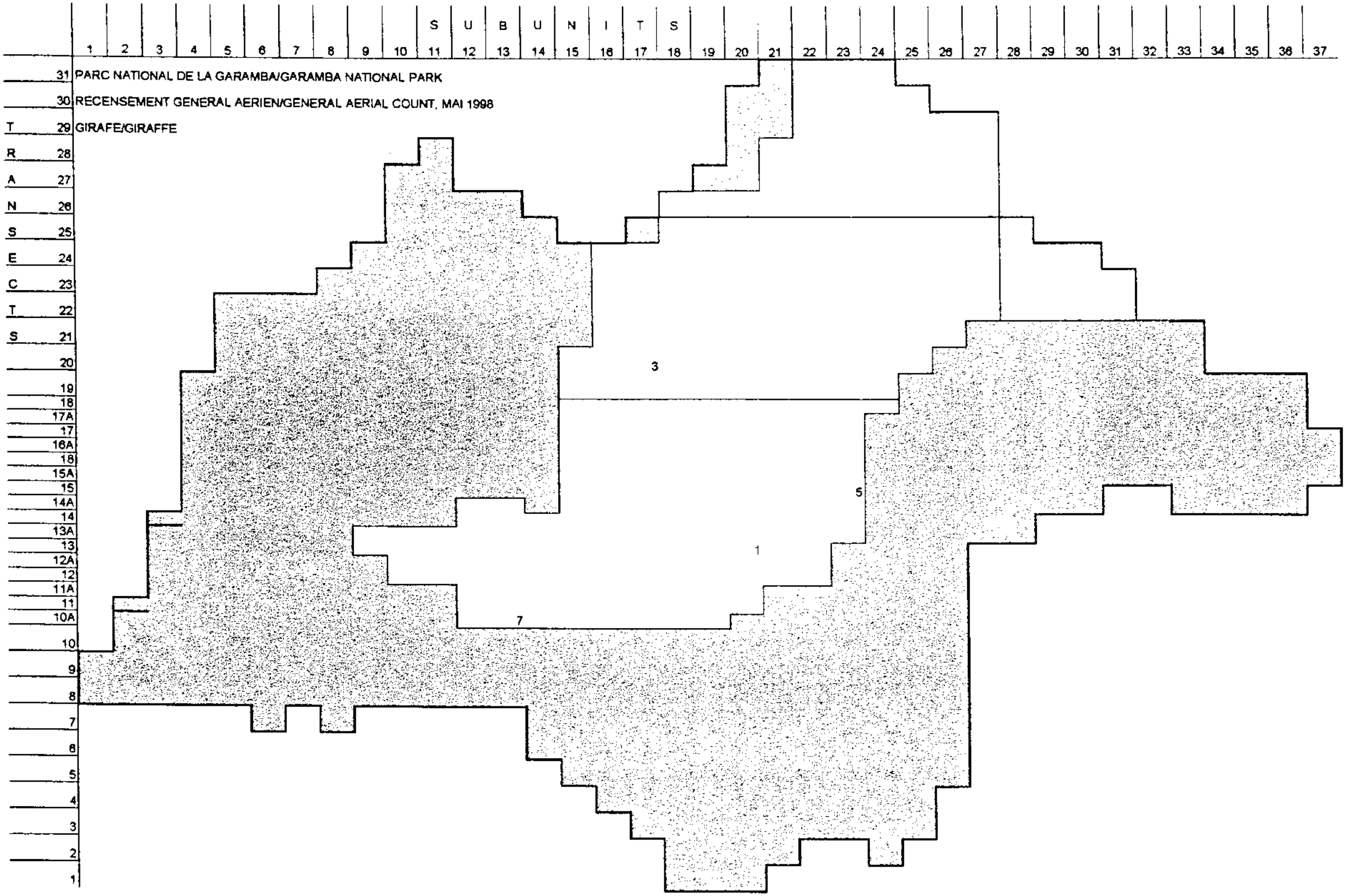
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 1998

COBS/KOBS



31			0
30			0
29			0
28			0
27			0
26			0
25		0	0
24		0	0
23		5	0
22		0	0
21		0	
20		2	
19		6	
18	12		
17A	39		
17	3		
16A	46		
16	196		
15A	45		
15	59		
14A	6		
14	114		
13A	19		
13	23		
12A	15		
12	50		
11A	103		
11	64		
10A	32		

0	0	0	Total Nord
15	15	0	Total Centre
830	0	0	Total Sud
830	15	0	TOTAL



PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 1998

GIRAFE/GIRAFFE

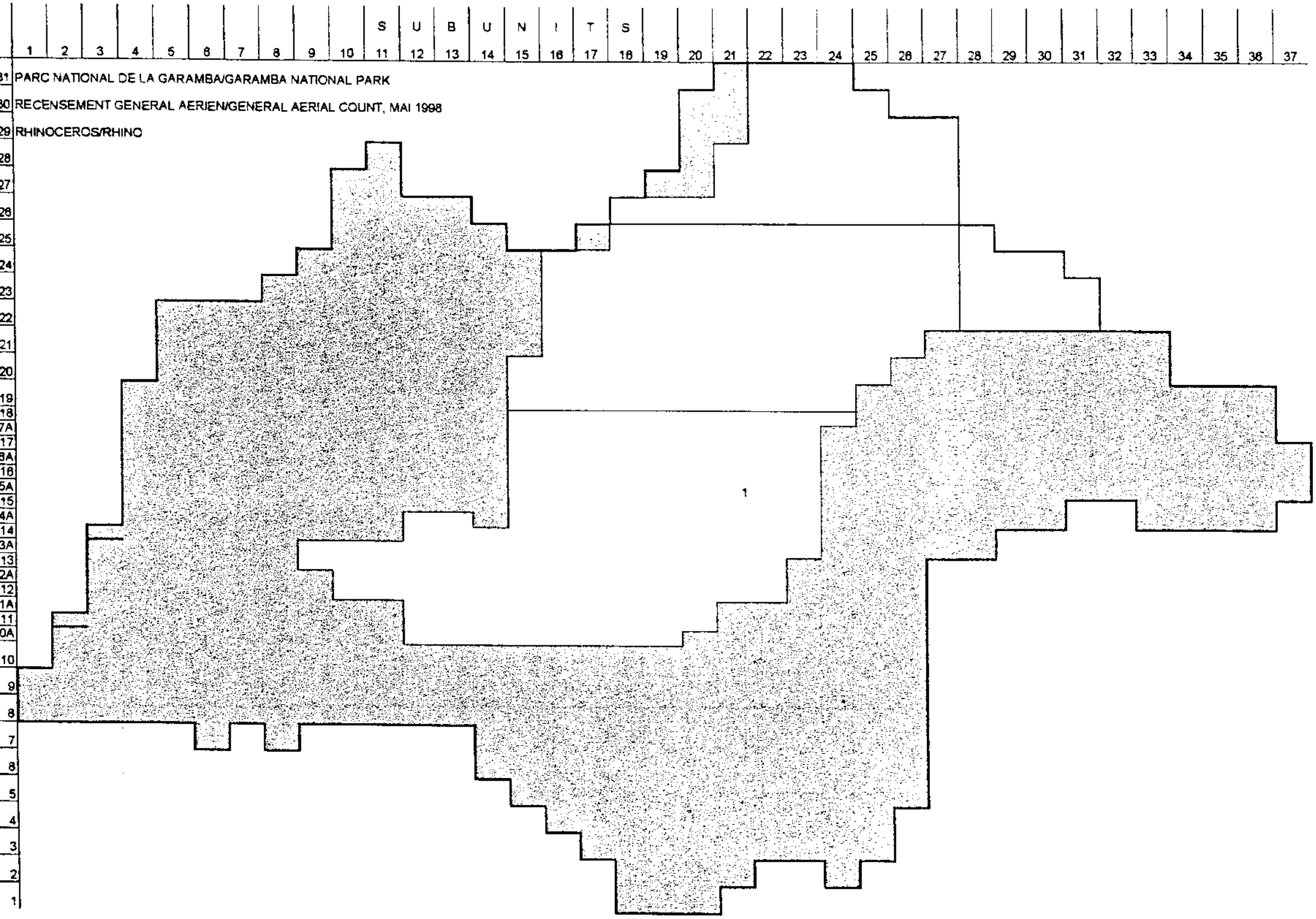
31			0
30			0
29			0
28			0
27			0
26			0
25		0	0
24		0	0
23		0	0
22		0	0
21		0	
20		3	
19		0	
18	0		
17A	0		
17	0		
16A	0		
18	0		
15A	0		
15	5		
14A	0		
14	0		
13A	0		
13	1		
12A	0		
12	0		
11A	0		
11	0		
10A	7		

0	0	0	Total Nord
3	3	0	Total Centr
13	0	0	Total Sud
13	3	0	TOTAL

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 1998

RHINOCEROS/RHINO

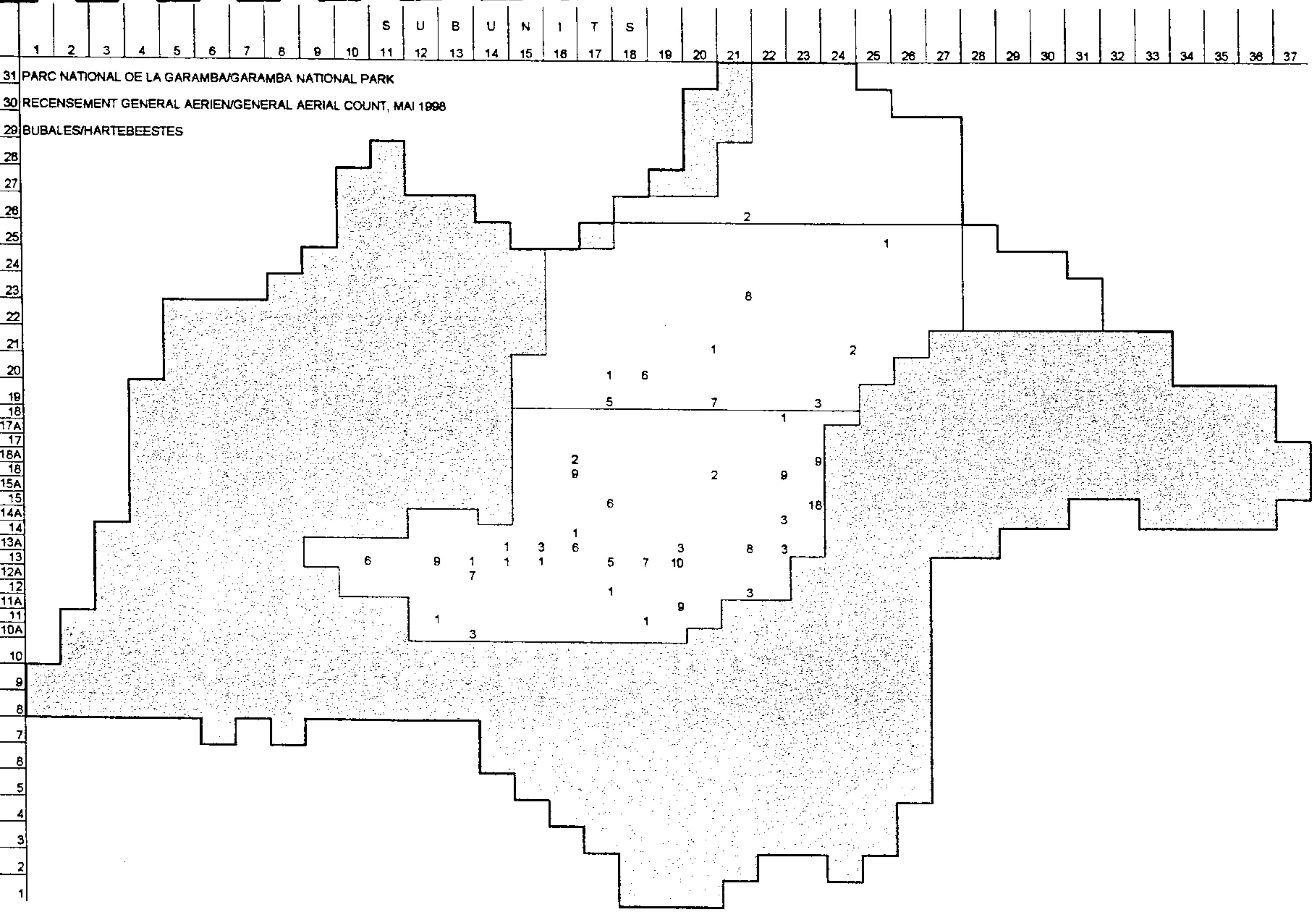


0	0	0	Total Nord
0	0	0	Total Centre
1	0	0	Total Sud
1	0	0	TOTAL

PARC NATIONAL OE LA GARAMBA/GARAMBA NATIONAL PARK

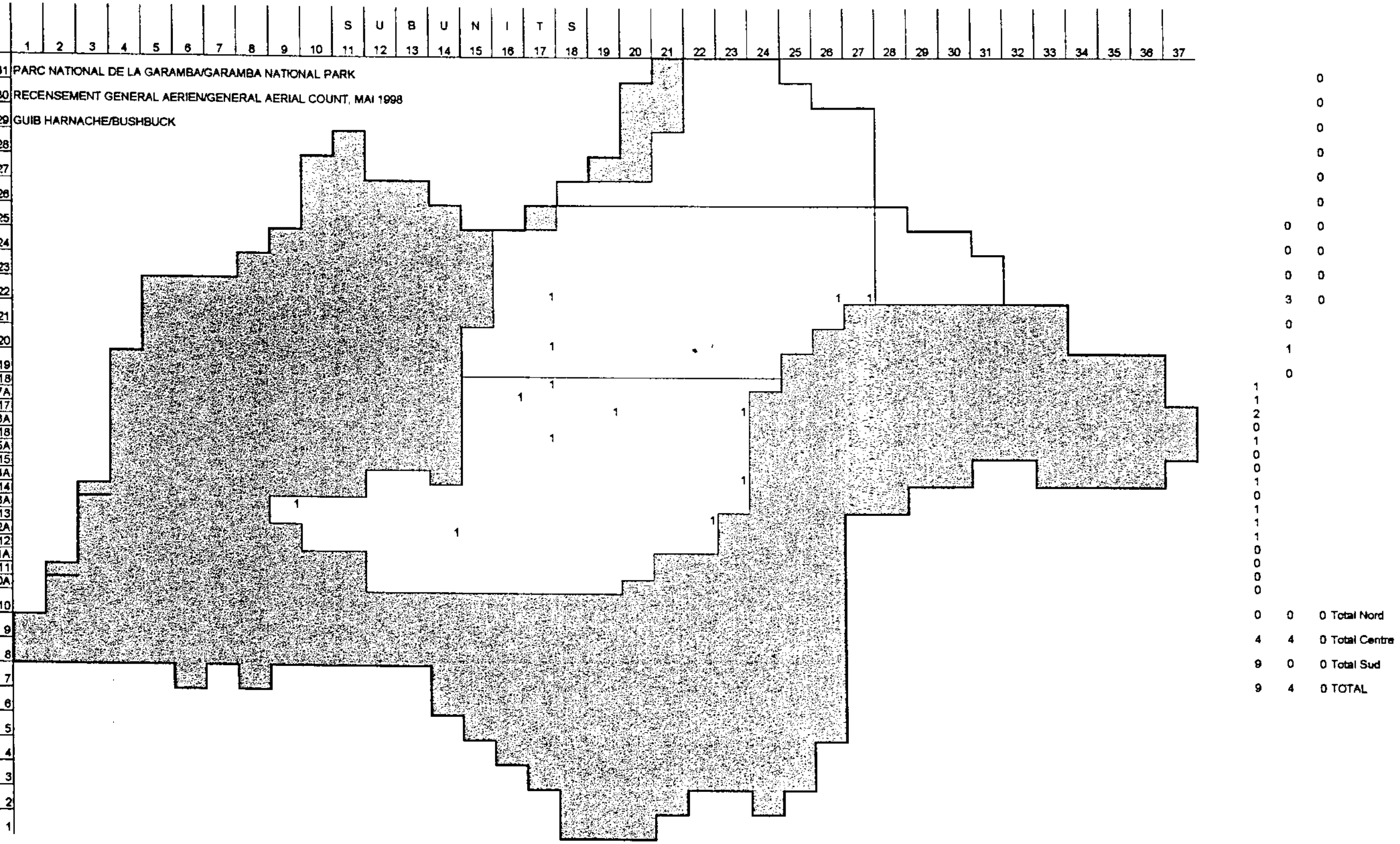
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 1998

BUBALES/HARTEBEESTES



31			0
30			0
29			0
28			0
27			0
26			2
25		1	0
24		0	0
23		6	0
22		0	0
21		3	
20		7	
19		15	
18	1		
17A	0		
17	0		
18A	11		
18	20		
15A	0		
15	24		
14A	3		
14	1		
13A	26		
13	42		
12A	7		
12	4		
11A	9		
11	2		
10A	3		

0	0	2 Total Nord
32	32	0 Total Centre
153	0	0 Total Sud
153	32	2 TOTAL



PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 1998

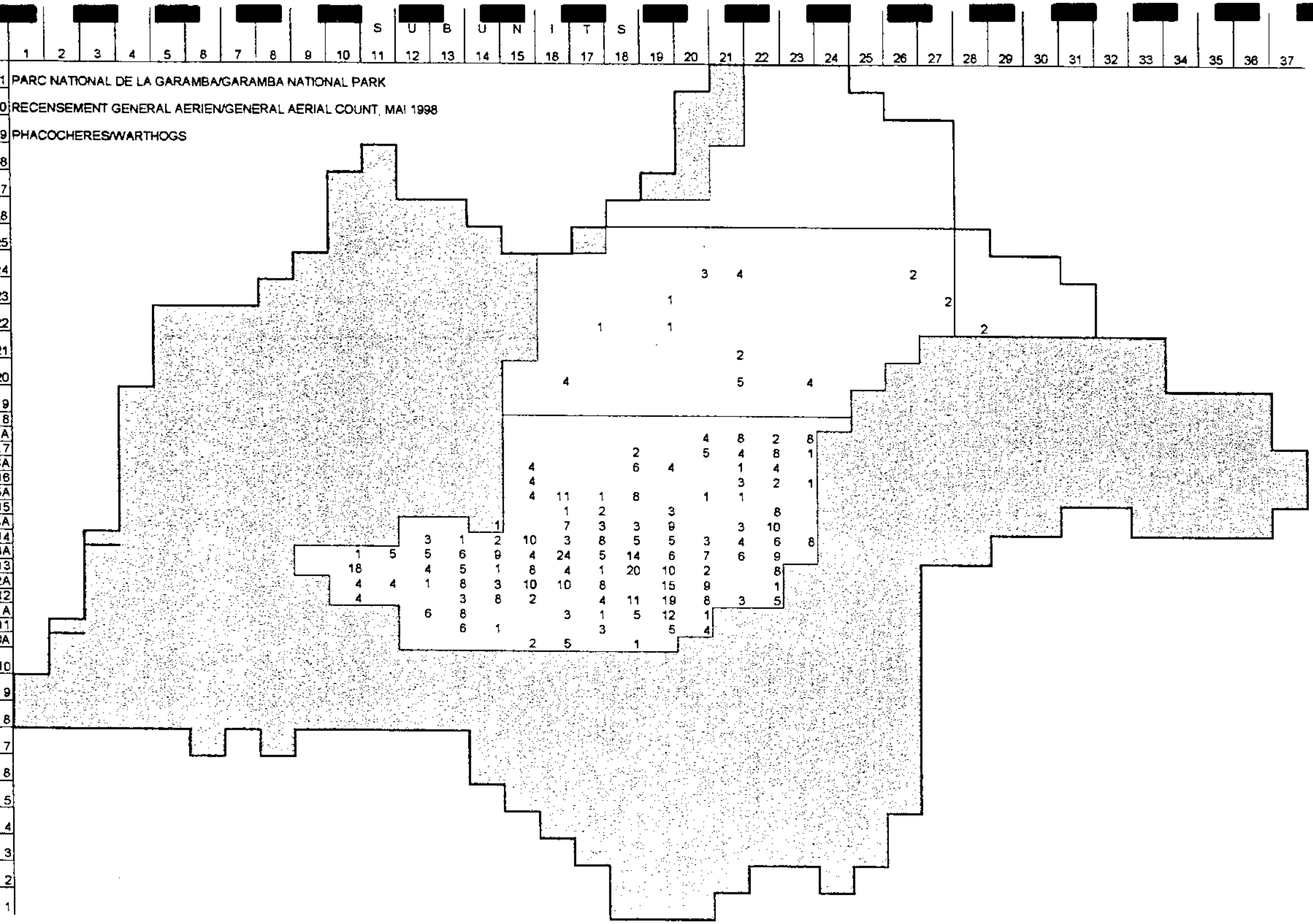
GUIB HARNACHE/BUSHBUCK

0	0	0	Total Nord
4	4	0	Total Centre
9	0	0	Total Sud
9	4	0	TOTAL

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 1998

PHACOCHERES/WARTHOGS



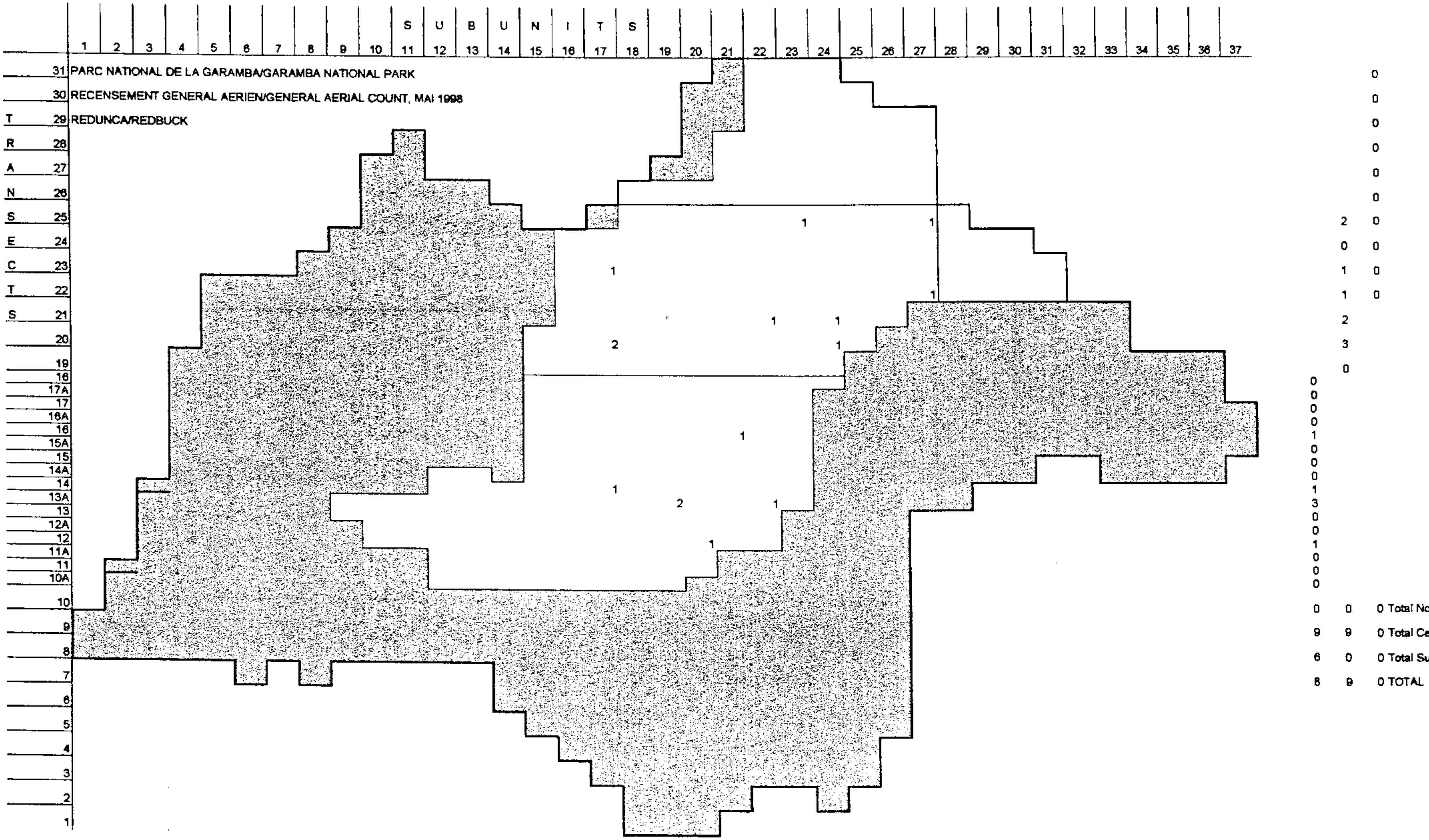
0
0
0
0
0
0
0 0
9 0
3 2
2 2
2
13
0
0
20
20
19
10
24
12
36
58
101
75
69
65
36
19
8

0	0	0	Total Nord
29	29	4	Total Centre
572	0	0	Total Sud
572	29	4	TOTAL

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 1998

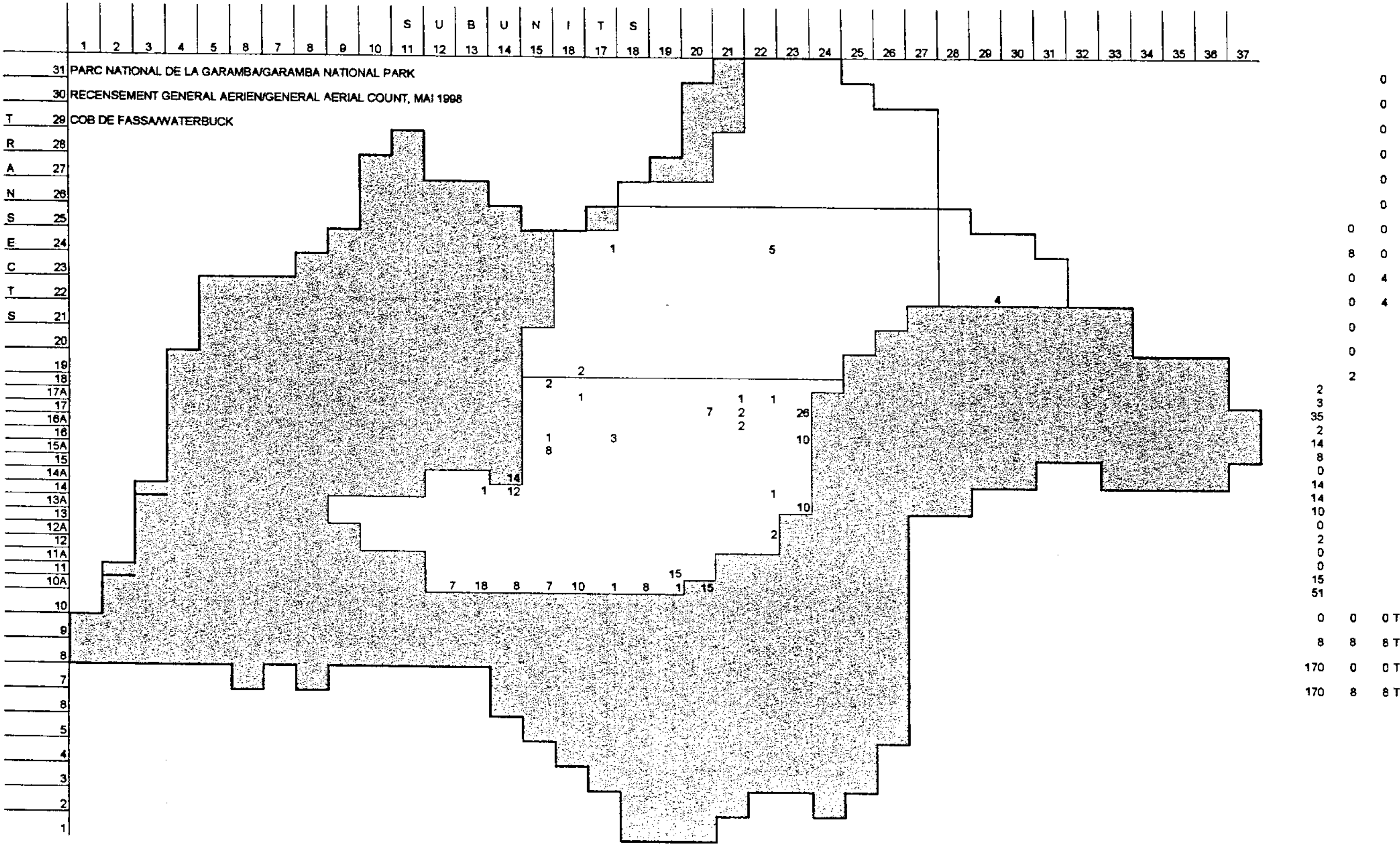
REDUNCA/REDBUCK



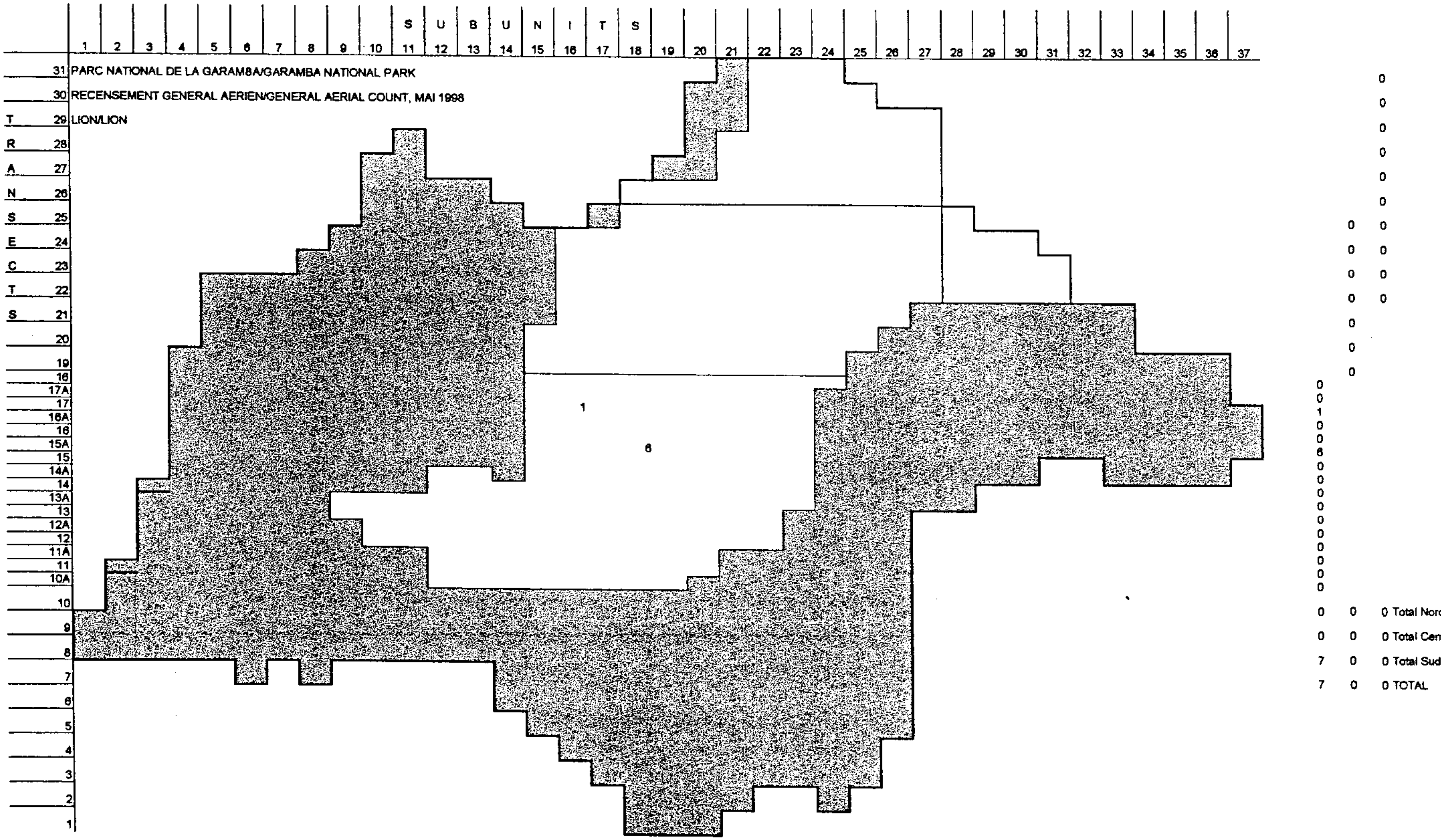
PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

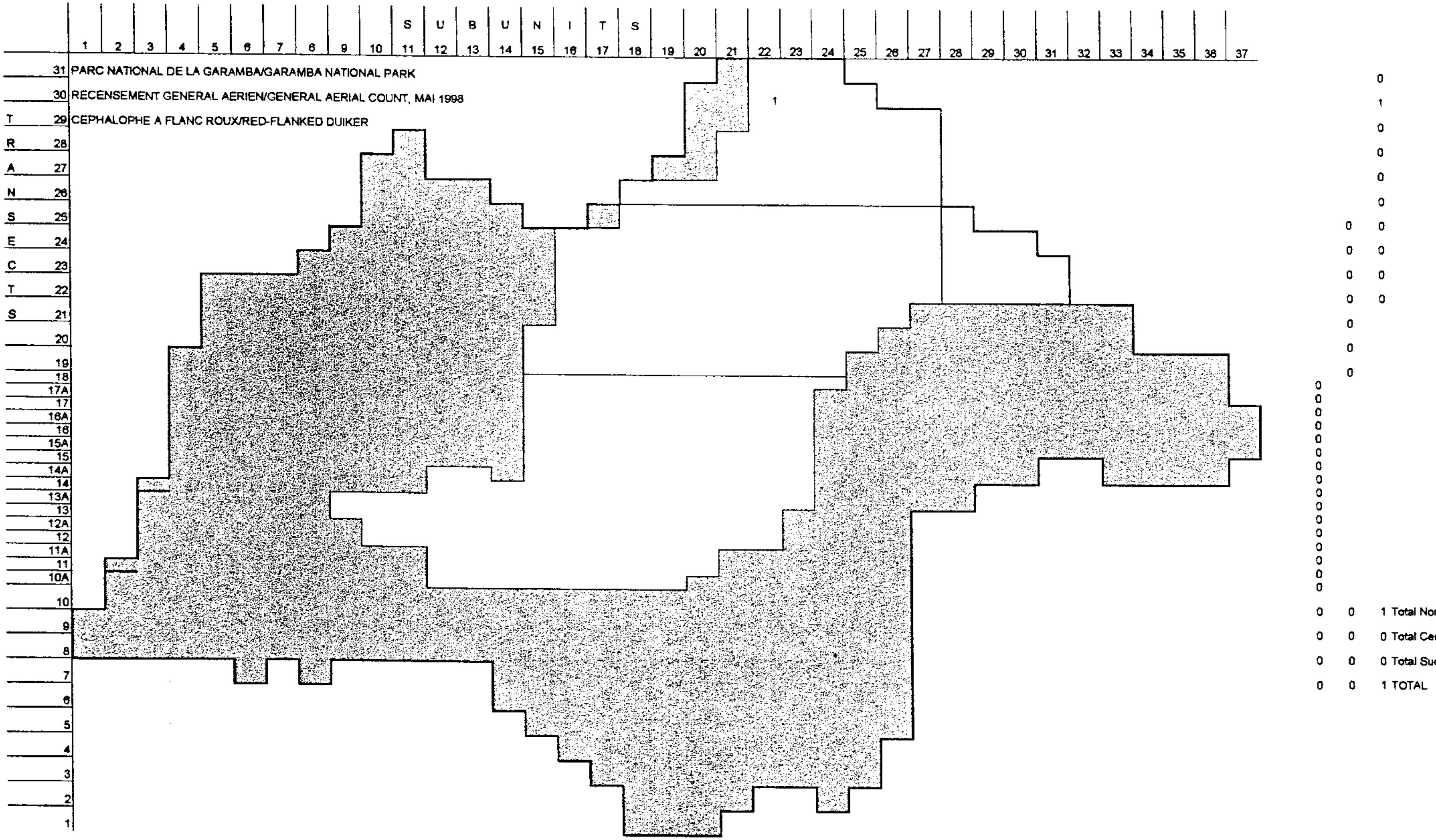
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 1998

COB DE FASSA/WATERBUCK



0	0	0 Total No
8	8	8 Total Ce
170	0	0 Total Su
170	8	8 TOTAL

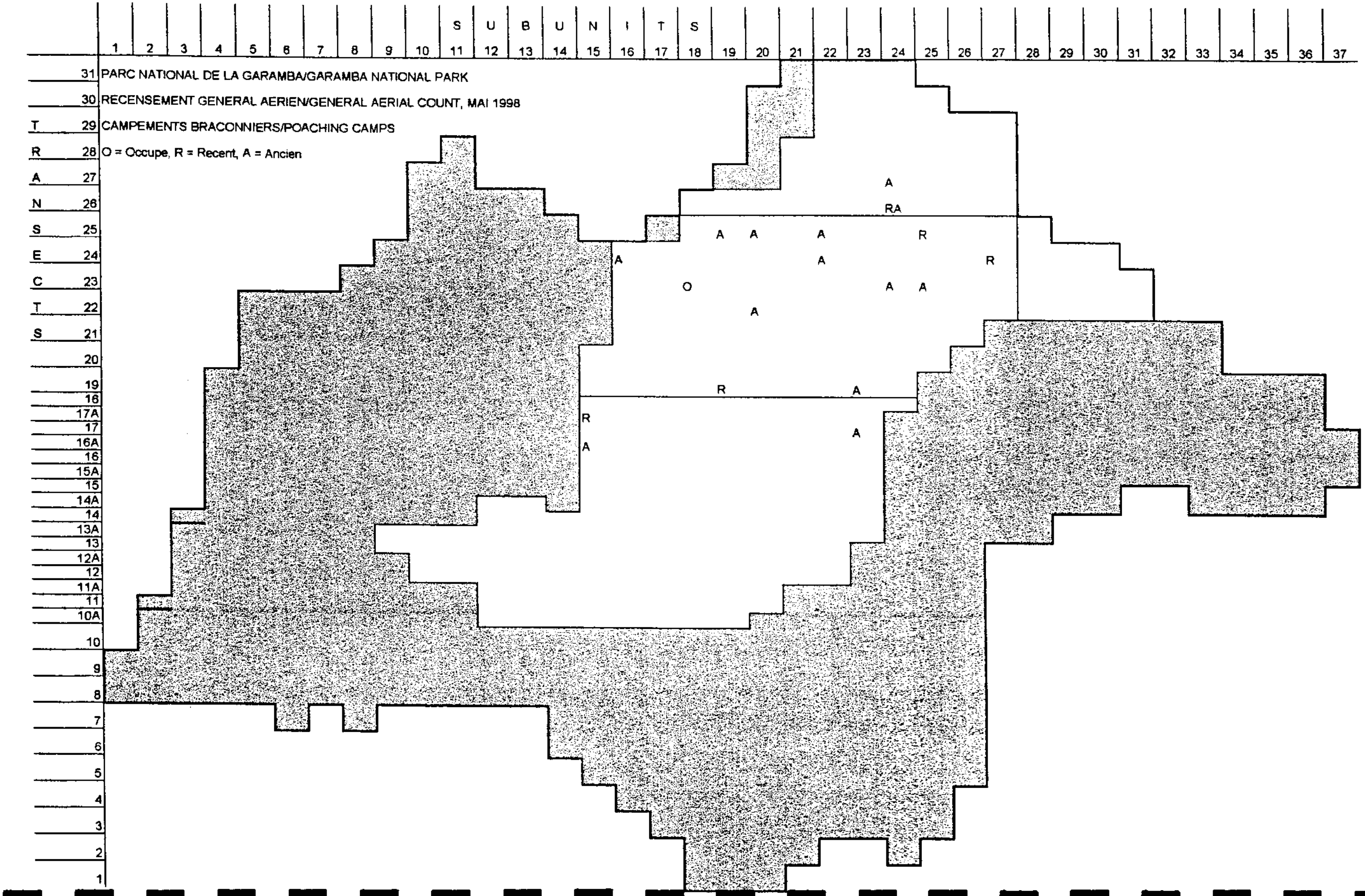

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 1998
LION/LION
SUBUNITS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37
TRANSECTS
31 30 29 28 27 26 25 24 23 22 21 20 19 18 17A 17 16A 16 15A 15 14A 14 13A 13 12A 12 11A 11 10A 10 9 8 7 6 5 4 3 2 1
1
6
0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0
0 0 1 0 0 6 0 0 0 0 0 0 0 0 0 0
0 0 0 Total Nor
0 0 0 Total Cen
7 0 0 Total Sud
7 0 0 TOTAL



PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 1998

CEPHALOPHE A FLANC ROUX/RED-FLANKED DUIKER



PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 1998

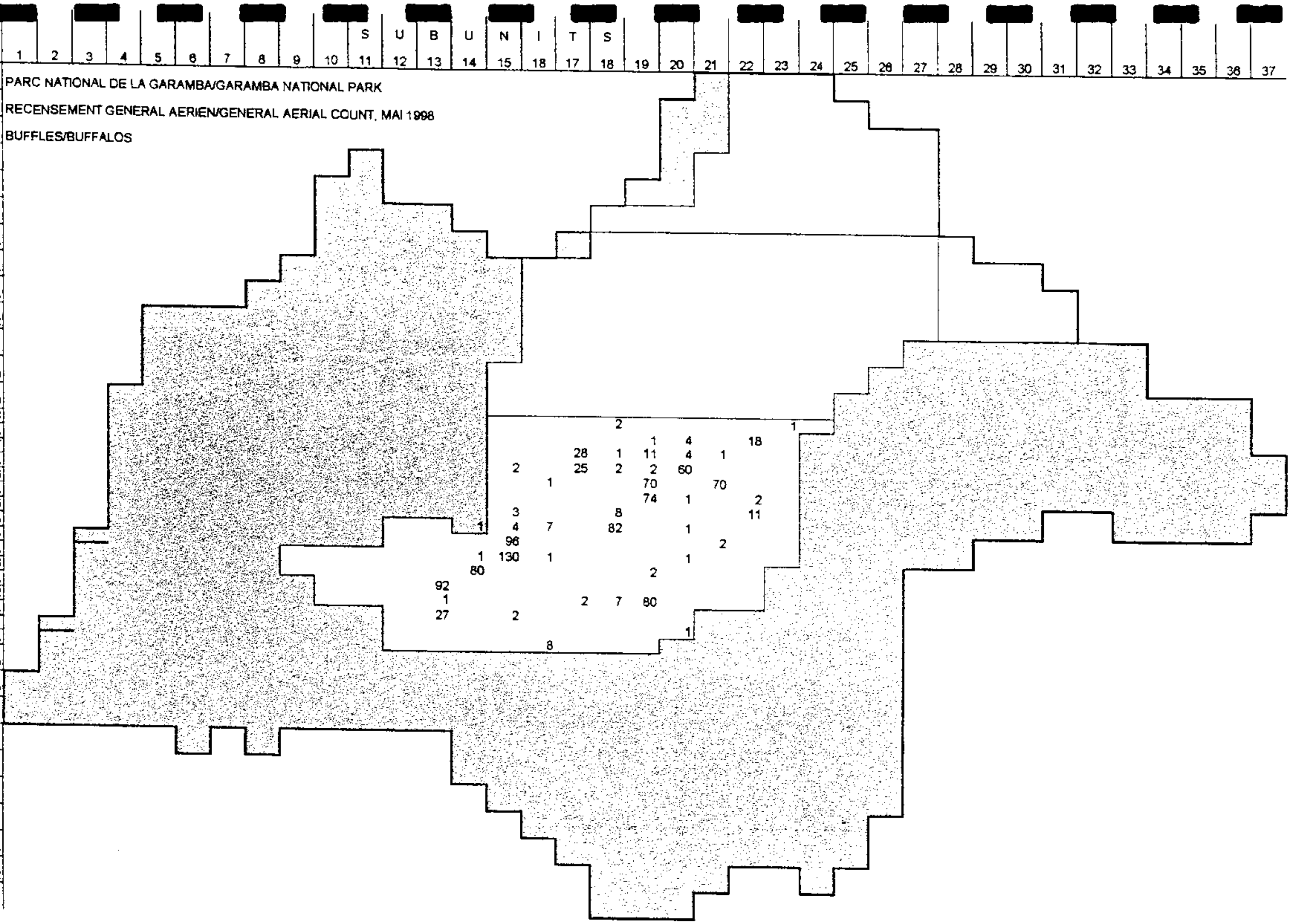
CAMPEMENTS BRACONNIERS/POACHING CAMPS

O = Occupe, R = Recent, A = Ancien

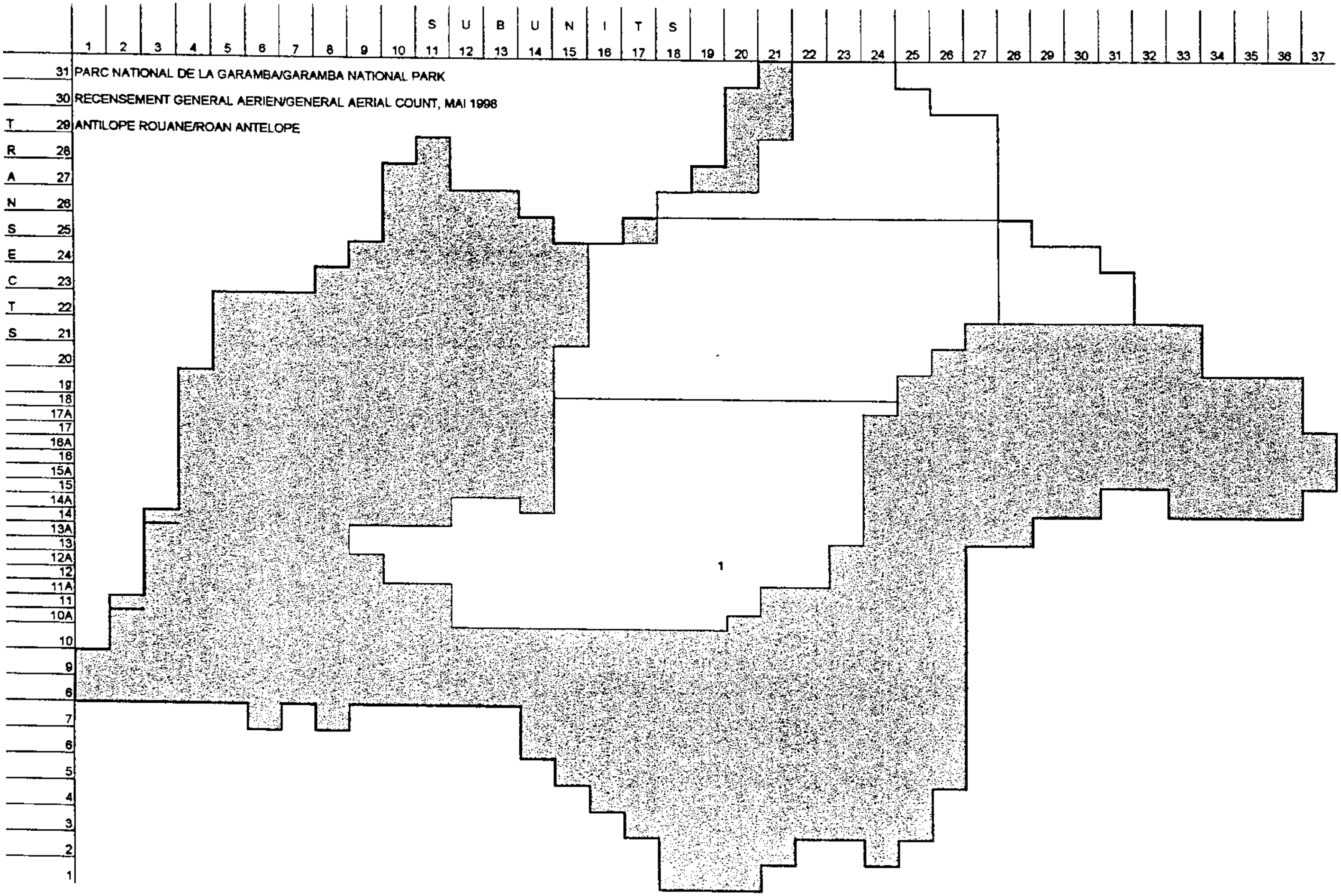
PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 1998

BUFFLES/BUFFALOS



		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0		0	
	0		0	
	0		0	
3				
23				
43				
91				
141				
77				
22				
95				
98				
133				
82				
92				
90				
29				
1				
8				
0		0	0	Total Nord
0	0			Total Centre
1028				Total Sud
1028	0	0	1028	TOTAL



PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 1998

ANTILOPE ROUANE/ROAN ANTELOPE

31			0	0	
30			0	0	
29			0	0	
28			0	0	
27			0	0	
26			0	0	
25		0	0	0	
24		0	0	0	
23		0	0	0	
22		0	0	0	
21		0	0	0	
20		0		0	
19		0		0	
18		0		0	
17A	0				
17	0				
16A	0				
16	0				
15A	0				
15	0				
14A	0				
14	0				
13A	0				
13	0				
12A	0				
12	1				
11A	0				
11	0				
10A	0				
10	0				
	0		0	0	Total
	0	0			Total
	1				Total
	1	0	0	1	TOTA

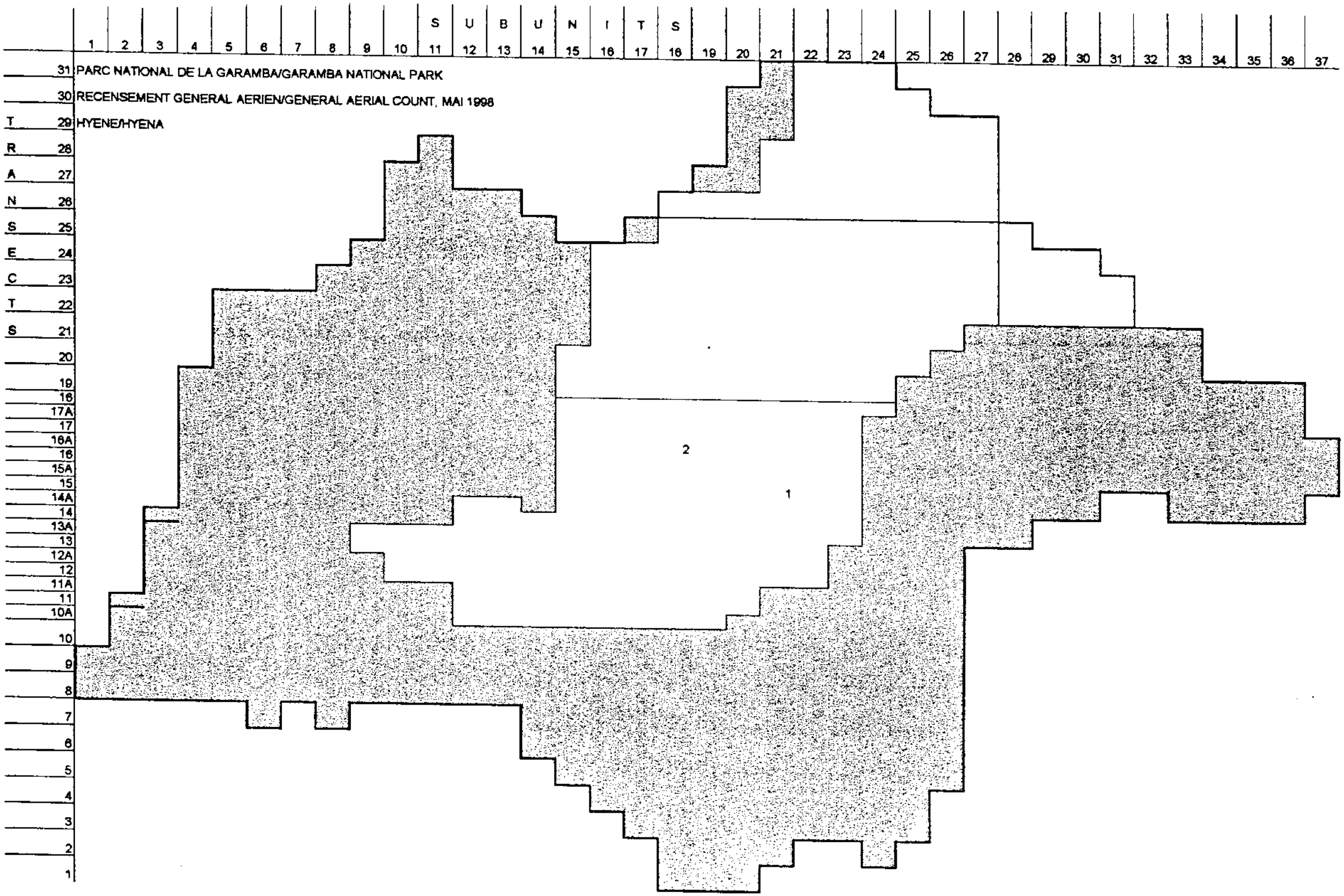
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D										0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	1998	AREA			GIRAFES					HIPPOPOTHAMES				
TRANS	HIGH STI	MID NTH	LOW NTI	TOT.NORTH	HIGH STI	MID NTH	LOW NTI	TOT.NTH	TOTAL	HIGH STI	MID NTH	LOW NTH	TOT.NTH	TOTAL
31			7.39	7.39			0	0				0	0	
30			6.57	6.57			0	0				0	0	
29			10.57	10.57			0	0				0	0	
28			11.33	11.33			0	0				0	0	
27			11.83	11.83			0	0				0	0	
26			16.37	16.37			0	0				0	0	
25		16.48	1.64	18.12		0	0	0			0	0	0	
24		19.82	4.98	24.80		0	0	0			0	0	0	
23		18.62	13.30	31.92		0	0	0			0	0	0	
22		18.07	6.62	24.69		0	0	0			0	0	0	
21		18.34		18.34		0		0			0		0	
20		19.93		19.93		3		3			0		0	
19		15.82		15.82		0		0			0		0	
18	18.40				0					0				
17a	17.19				0					0				
17	17.96				0					4				
16a	14.51				0					1				
16	15.06				0					0				
15a	15.11				0					11				
15	14.84				5					4				
14a	19.27				0					18				
14	20.37				0					10				
13a	25.79				0					1				
13	24.47				1					2				
12a	23.32				0					28				
12	19.87				0					7				
11a	15.66				0					8				
11	14.78				0					7				
10a	12.76				7					3				
Total	289.4	127.1	64.1	217.7	13.0	3.0	0.0	3.0		104.0	0.0	0.0	0.0	
Sum squ	5457.7	2321.3	745.7	4301.7	75.0	9.0	0.0	9.0		1538.0	0.0	0.0	0.0	
				Sum (Z*y)	188.0	59.8	0.0	59.8		1996.4	0.0	0.0	0.0	
				R=õy/õz	0.0	0.0	0.0	0.0		0.4	0.0	0.0	0.0	
				Var y	4.3	1.3	0.0	0.7		57.5	0.0	0.0	0.0	
Var z	15.0	2.4	12.4	54.7					STRAT.					STRAT.
Covar zy					-3.1	-0.8	0.0	0.5	TOTAL	7.7	0.0	0.0	0.0	TOTAL
					GIRAFES					**HIPPOPOTHAMES**				
				Pop.est.(Y)	**98.3**	**46.0**	**0.0**	**43.4**	**144.3**	**786.2**	**0.0**	**0.0**	**0.0**	**786.2**
				SE(Y)	60.5	41.3	0.0	43.5	73.2	206.8	0.0	0.0	0.0	206.8
				95% C.L.	123.4	84.2	0.0	88.8	143.6	421.9	0.0	0.0	0.0	405.3
				95% C.L.as %	125.6	183.0	ERR	204.5	99.5	53.7	ERR	ERR	ERR	51.6

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 1998

HYENE/HYENA



		0
		0
		0
		0
		0
		0
	0	0
	0	0
	0	0
	0	0
	0	
	0	
	0	
0		
0		
0		
2		
0		
0		
1		
0		
0		
0		
0		
0		
0		
0		
0		
0		
0	0	0 Total Nord
0	0	0 Total Cent
3	0	0 Total Sud
3	0	0 TOTAL

	1998	AREA			COBES DE THOMAS					PHACOCHERES				
TRANS	HIGH STI	MID NTH	LOW NTH	TOT.NORTH	HIGH STI	MID NTH	LOW NTH	TOT.NTH	TOTAL	HIGH STI	MID NTH	LOW NTH	TOT.NTH	TOTAL
31			7.39	7.39			0	0				0	0	
30			6.57	6.57			0	0				0	0	
29			10.57	10.57			0	0				0	0	
28			11.33	11.33			0	0				0	0	
27			11.83	11.83			0	0				0	0	
26			16.37	16.37			0	0				0	0	
25		16.48	1.64	18.12		0	0	0			0	0	0	
24		19.82	4.98	24.80		0	0	0			9	0	9	
23		18.62	13.30	31.92		5	0	5			3	2	5	
22		18.07	6.62	24.69		0	0	0			2	2	4	
21		18.34		18.34		0		0			2		2	
20		19.93		19.93		2		2			13		13	
19		15.82		15.82		8		8			0		0	
18	18.40				12					0				
17a	17.19				39					20				
17	17.96				3					20				
16a	14.51				46					19				
16	15.06				198					10				
15a	15.11				45					24				
15	14.84				59					12				
14a	19.27				8					36				
14	20.37				114					58				
13a	25.79				19					101				
13	24.47				23					75				
12a	23.32				15					69				
12	19.87				50					65				
11a	15.66				103					36				
11	14.78				64					19				
10a	12.76				32					8				
Total	289.4	127.1	64.1	217.7	830.0	15.0	0.0	15.0		572.0	29.0	0.0	33.0	
Sum squ	5457.7	2321.3	745.7	4301.7	80904.0	93.0	0.0	93.0		33174.0	267.0	0.0	295.0	
				Sum (Z*y)	13988.6	259.5	0.0	326.0		11832.8	566.1	0.0	777.3	
				R=ðy/õz	2.9	0.1	0.0	0.1		2.0	0.2	0.0	0.2	
				Var y	2523.2	10.1	0.0	6.3		848.3	24.5	0.0	17.6	
Var z	15.0	2.4	12.4	54.7					STRAT.					STRAT.
Covar zy					-68.1	-11.6	0.0	4.9	TOTAL	99.2	-9.6	0.0	16.2	TOTAL
					COBES DE THOMAS					**PHACOCHERES**				
				Pop.est.(Y)	**6275**	**230**	**0**	**217**	**6505**	**4324**	**445**	**0**	**478**	**4769**
				SE(Y)	1553	129	0	125	1558	639	193	0	188	668
				95% C.L.	3168	263	0	256	3054	1304	394	0	384	1309
				95% C.L.as %	50	114	ERR	118	47	30	89	ERR	80	27

	AREA				ELEPHANTS					BUFFLES				
TRANS	HIGH STI	MID NTH	LOW NTH	TOT.NORTH	HIGH STI	MID NTH	LOW NTH	TOT.NTH	TOTAL	HIGH STI	MID NTH	LOW NTH	TOT.NTH	TOTAL
31			7.39	7.39			0	0				0	0	
30			6.57	6.57			0	0				0	0	
29			10.57	10.57			0	0				0	0	
28			11.33	11.33			0	0				0	0	
27			11.83	11.83			0	0				0	0	
26			16.37	16.37			0	0				0	0	
25		16.48	1.64	18.12		0	0	0			0	0	0	
24		19.82	4.98	24.80		0	0	0			0	0	0	
23		18.62	13.30	31.92		0	0	0			0	0	0	
22		18.07	6.62	24.69		0	0	0			0	0	0	
21		18.34		18.34		0		0			0		0	
20		19.93		19.93		0		0			0		0	
19		15.82		15.82		0		0			0		0	
18	18.40				0					3				
17a	17.19				0					23				
17	17.96				13					43				
16a	14.51				61					91				
16	15.06				14					141				
15a	15.11				48					77				
15	14.84				49					22				
14a	19.27				91					95				
14	20.37				202					98				
13a	25.79				88					133				
13	24.47				84					82				
12a	23.32				55					92				
12	19.87				31					90				
11a	15.66				33					29				
11	14.78				8					1				
10a	12.76				0					8				
Total	289.4	127.1	64.1	217.7	777.0	0.0	0.0	0.0		1028.0	0.0	0.0	0.0	
Sum squ	5457.7	2321.3	745.7	4301.7	77815.0	0.0	0.0	0.0		97474.0	0.0	0.0	0.0	
				Sum (Z*y)	15508.4	0.0	0.0	0.0		19924.7	0.0	0.0	0.0	
				R=Sy/Sz	2.7	0.0	0.0	0.0		3.6	0.0	0.0	0.0	
				Var y	2672.1	0.0	0.0	0.0		2095.0	0.0	0.0	0.0	
Var z	15.0	2.4	12.4	54.7										
Covar zy					97.1	0.0	0.0	0.0	STRAT. TOTAL	88.9	0.0	0.0	0.0	STRAT. TOTAL
					ELEPHANTS					BUFFLES				
				Pop.est.(Y)	**5,874**	**0**	**0**	**0**	**5,874**	**7,772**	**0**	**0**	**0**	**7,772**
				SE(Y)	1339.2	0.0	0.0	0.0	1339.2	2062.8	0.0	0.0	0.0	2062.85
				95% C.L.	2732.0	0.0	0.0	0.0	2624.9	4208.2	0.0	0.0	0.0	4043.18
				95% C.L.as %	46.5	0.0	0.0	0.0	44.7	54.1	ERR	ERR	ERR	52.02

	1998		AREA				ANTILOPE ROANNE					GUIB HARNACHE		
TRANS	HIGH ST	MID NTH	LOW NTH	TOT.NORTH	HIGH ST	MID NTH	LOW NTH	TOT.NTH	TOTAL	HIGH ST	MID NTH	LOW NTH	TOT.NTH	TOTAL
31			7.39	7.39			0	0				0	0	
30			6.57	6.57			0	0				0	0	
29			10.57	10.57			0	0				0	0	
28			11.33	11.33			0	0				0	0	
27			11.83	11.83			0	0				0	0	
26			16.37	16.37			0	0				0	0	
25		16.48	1.64	18.12		0	0	0			0	0	0	
24		19.82	4.98	24.80		0	0	0			0	0	0	
23		18.62	13.30	31.92		0	0	0			0	0	0	
22		18.07	6.62	24.69		0	0	0			3	0	3	
21		18.34		18.34		0		0			0		0	
20		19.93		19.93		0		0			1		1	
19		15.82		15.82		0		0			0		0	
18	18.40				0					1				
17a	17.19				0					1				
17	17.96				0					2				
16a	14.51				0					0				
16	15.06				0					1				
15a	15.11				0					0				
15	14.84				0					0				
14a	19.27				0					1				
14	20.37				0					0				
13a	25.79				0					1				
13	24.47				0					1				
12a	23.32				1					1				
12	19.87				0					0				
11a	15.66				0					0				
11	14.78				0					0				
10a	12.76				0					0				
Total	289.4	127.1	64.1	217.7	1.0	0.0	0.0	0.0		9.0	4.0	0.0	4.0	
Sum squ	5457.7	2321.3	745.7	4301.7	1.0	0.0	0.0	0.0		11.0	10.0	0.0	10.0	
				Sum (Z*y)	23.3	0.0	0.0	0.0		179.4	74.1	0.0	94.0	
				R=Sy/Sz	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
				Var y	0.1	0.0	0.0	0.0		0.4	1.3	0.0	0.7	
Var z	15.0	2.4	12.4	54.7										
Covar zy					0.3	0.0	0.0	0.0	STRAT. TOTAL	1.1	-2.1	0.0	1.9	STRAT. TOTAL
					ANTILOPPE ROANNE					**GUIB HARNACHE**				
				Pop.est.(Y)	**8**	**0**	**0**	**0**	**8**	**68**	**61**	**0**	**58**	**187**
				SE(Y)	7	0	0	0	7	16	43	0	43	46
				95% C.L.	14	0	0	0	14	34	87	0	87	90
				95% C.L.as %	187	ERR	ERR	ERR	179	49	142	ERR	151	48

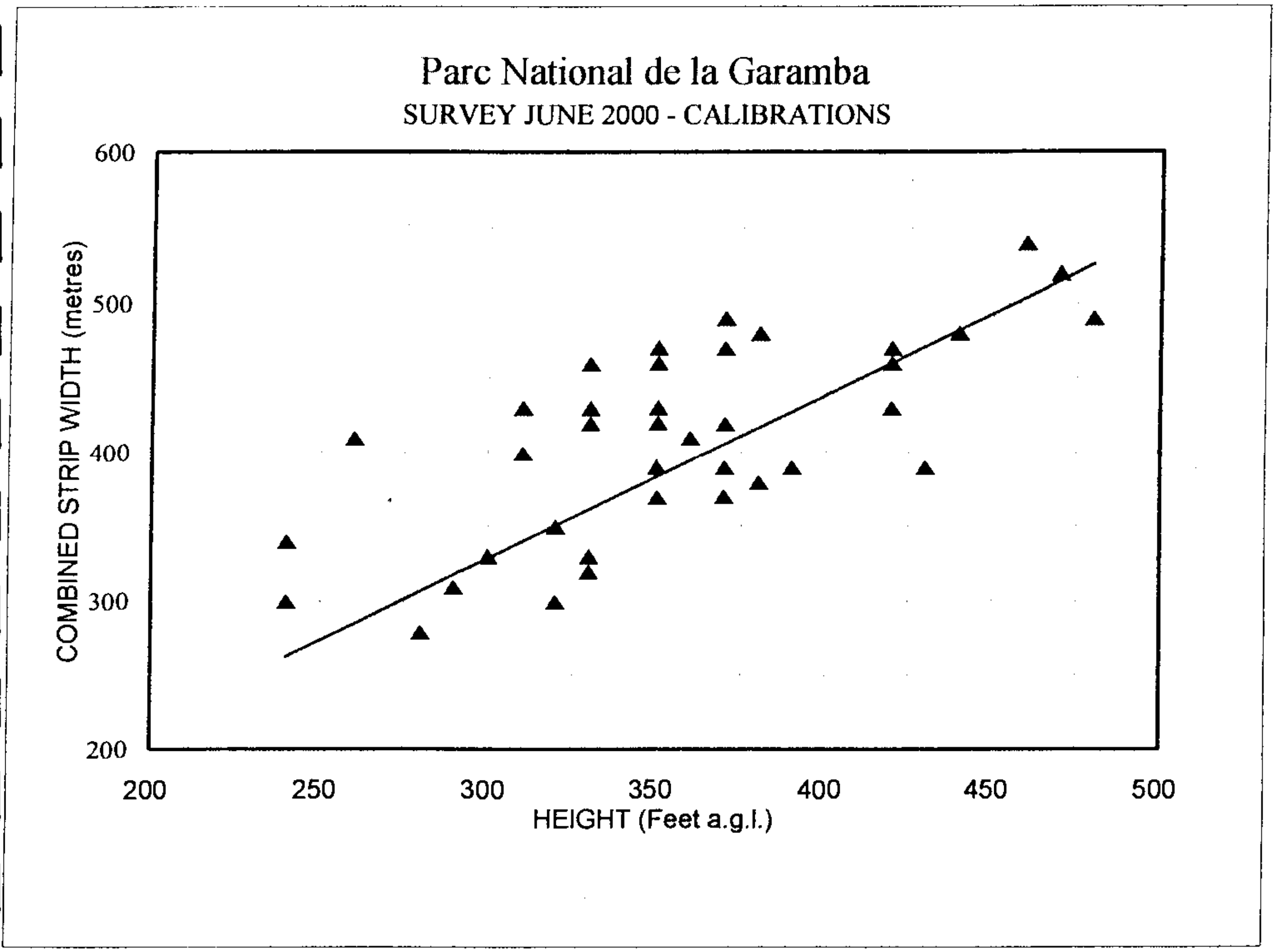
TRANS	AREA				BUBALES					WATERBUCK				
	HIGH STI	MID NTH	LOW NTI	TOT.NORTH	HIGH STI	MID NTH	LOW NTI	TOT.NTH	TOTAL	HIGH STI	MID NTH	LOW NTH	TOT.NTH	TOTAL
31			7.39	7.39			0	0				0	0	
30			6.57	6.57			0	0				0	0	
29			10.57	10.57			0	0				0	0	
28			11.33	11.33			0	0				0	0	
27			11.83	11.83			0	0				0	0	
26			16.37	16.37			2	2				0	0	
25		16.48	1.64	18.12		1	0	1			0	0	0	
24		19.82	4.98	24.80		0	0	0			6	0	6	
23		18.62	13.30	31.92		6	0	6			0	4	4	
22		18.07	6.62	24.69		0	0	0			0	4	4	
21		18.34		18.34		3		3			0		0	
20		19.93		19.93		7		7			0		0	
19		15.82		15.82		15		15			2		2	
18	18.40				1					2				
17a	17.19				0					3				
17	17.96				0					35				
16a	14.51				11					2				
16	15.06				20					14				
15a	15.11				0					8				
15	14.84				24					0				
14a	19.27				3					14				
14	20.37				1					8				
13a	25.79				26					10				
13	24.47				42					0				
12a	23.32				7					2				
12	19.87				4					0				
11a	15.66				9					0				
11	14.78				2					15				
10a	12.76				3					51				
Total	289.4	127.1	64.1	217.7	153.0	32.0	2.0	34.0		164.0	8.0	0.0	16.0	
Sum squ	5457.7	2321.3	745.7	4301.7	3707.0	320.0	4.0	324.0		4692.0	40.0	0.0	72.0	
				Sum (Z*y)	3063.3	560.0	32.7	674.2		2687.2	150.6	0.0	406.9	
				R=ōy/ōz	0.5	0.3	0.0	0.2		0.6	0.1	0.0	0.1	
				Var y	149.6	29.0	0.7	19.6		200.7	5.1	0.0	4.4	
Var z	15.0	2.4	12.4	54.7										
Covar zy					19.8	-23.5	2.2	5.2	STRAT. TOTAL	-18.6	-3.8	0.0	10.6	STRAT. TOTAL
					BUBALES					**WATERBUCK**				
				Pop.est.(Y)	**1,156.7**	**491.0**	**37.5**	**492.0**	**1,685.2**	**1,239.8**	**122.8**	**0.0**	**231.5**	**1,362.6**
				SE(Y)	324.9	229.8	18.0	223.8	398.3	424.2	85.2	0.0	88.4	432.7
				95% C.L.	662.7	468.8	36.7	456.5	780.7	865.4	173.8	0.0	180.3	848.0
				95% C.L.as %	57.3	95.5	98.0	92.8	46.3	69.8	141.5	ERR	77.9	62.2

PARC NATIONAL DE LA GARAMBA
GARAMBA NATIONAL PARK

RECENSEMENT GENERAL SYSTEMATIQUE
GENERAL AERIAL SYSTEMATIC SAMPLE COUNT

Calibration Graphs, Distribution Maps and Population Estimate Calculations

June / Juin 2000



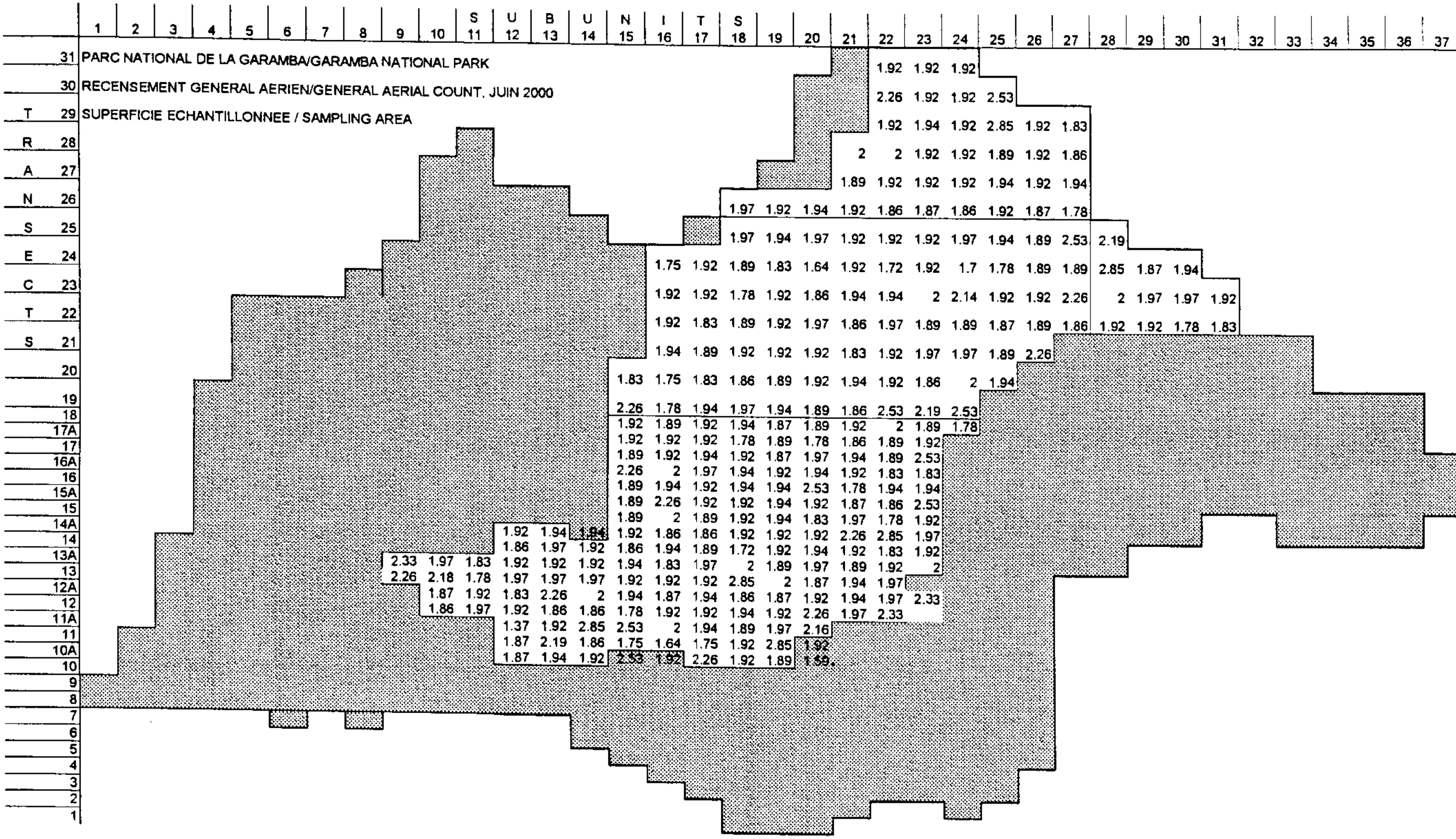
Parc National de la Garamba

SURVEY JUNE 2000 - CALIBRATIONS

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

SUPERFICIE ECHANTILLONNEE / SAMPLING AREA



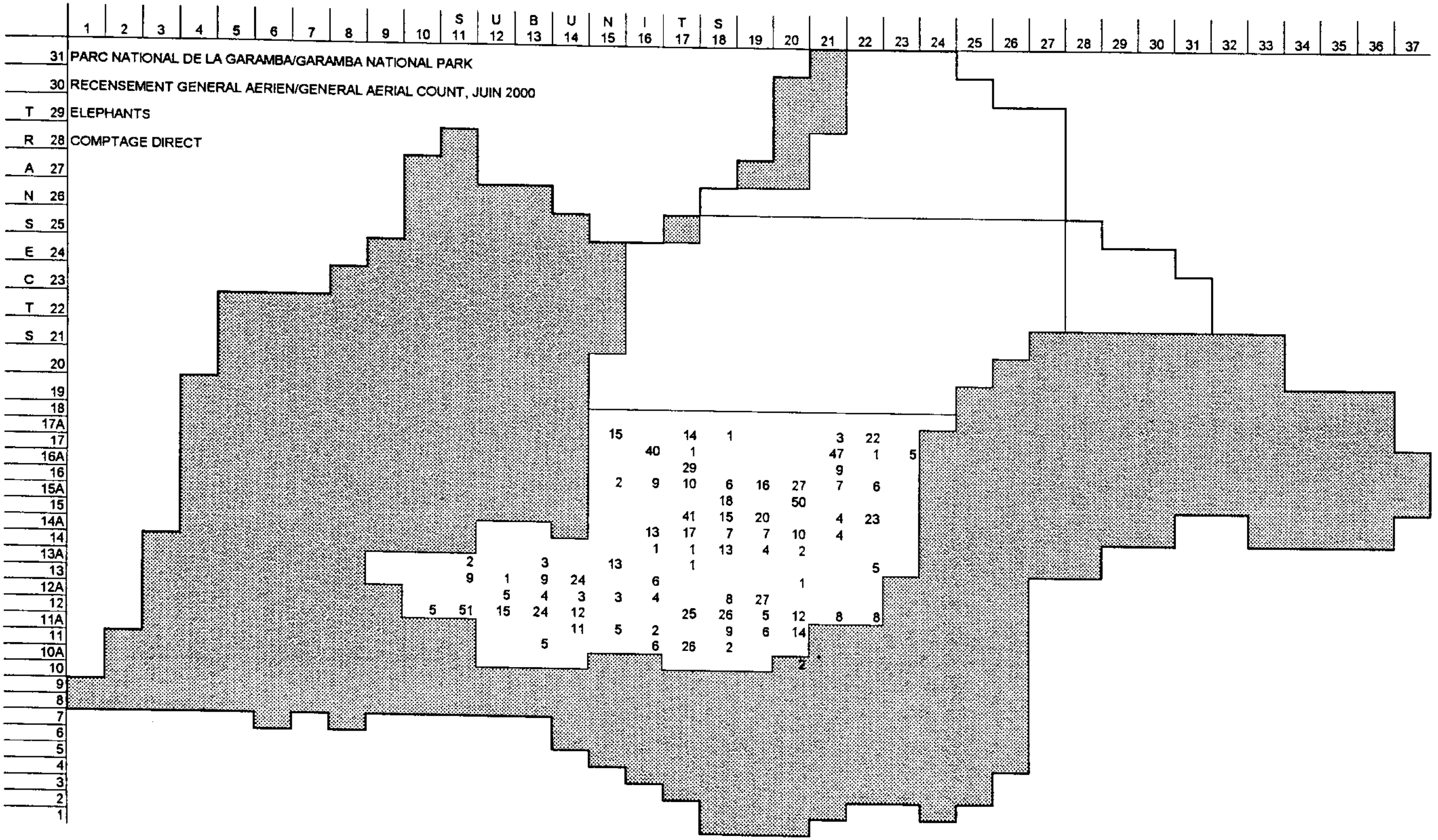
	1	2	3	4	5	6	7	8	9	10	S 11	U 12	B 13	U 14	N 15	I 16	T 17	S 18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
31																						1.92	1.92	1.92													
30																						2.26	1.92	1.92	2.53												
T 29																						1.92	1.94	1.92	2.85	1.92	1.83										
R 28																					2	2	1.92	1.92	1.89	1.92	1.86										
A 27																					1.89	1.92	1.92	1.92	1.94	1.92	1.94										
N 26																		1.97	1.92	1.94	1.92	1.86	1.87	1.86	1.92	1.87	1.78										
S 25																		1.97	1.94	1.97	1.92	1.92	1.92	1.97	1.94	1.89	2.53	2.19									
E 24																1.75	1.92	1.89	1.83	1.64	1.92	1.72	1.92	1.7	1.78	1.89	1.89	2.85	1.87	1.94							
C 23																1.92	1.92	1.78	1.92	1.86	1.94	1.94	2	2.14	1.92	1.92	2.26	2	1.97	1.97	1.92						
T 22																1.92	1.83	1.89	1.92	1.97	1.86	1.97	1.89	1.89	1.87	1.89	1.86	1.92	1.92	1.78	1.83						
S 21																1.94	1.89	1.92	1.92	1.92	1.83	1.92	1.97	1.97	1.89	2.26											
20															1.83	1.75	1.83	1.86	1.89	1.92	1.94	1.92	1.86	2	1.94												
19															2.26	1.78	1.94	1.97	1.94	1.89	1.86	2.53	2.19	2.53													
18															1.92	1.89	1.92	1.94	1.87	1.89	1.92	2	1.89	1.78													
17A															1.92	1.92	1.92	1.78	1.89	1.78	1.86	1.89	1.92														
17															1.89	1.92	1.94	1.92	1.87	1.97	1.94	1.89	2.53														
16A															2.26	2	1.97	1.94	1.92	1.94	1.92	1.83	1.83														
16															1.89	1.94	1.92	1.94	1.94	2.53	1.78	1.94	1.94														
15A															1.89	2.26	1.92	1.92	1.94	1.92	1.87	1.86	2.53														
15															1.89	2	1.89	1.92	1.94	1.83	1.97	1.78	1.92														
14A												1.92	1.94	1.94	1.92	1.86	1.86	1.92	1.92	1.92	2.26	2.85	1.97														
14												1.86	1.97	1.92	1.86	1.94	1.89	1.72	1.92	1.94	1.92	1.83	1.92														
13A									2.33	1.97	1.83	1.92	1.92	1.92	1.94	1.83	1.97	2	1.89	1.97	1.89	1.92	2														
13									2.26	2.18	1.78	1.97	1.97	1.97	1.92	1.92	1.92	2.85	2	1.87	1.94	1.97															
12A										1.87	1.92	1.83	2.26	2	1.94	1.87	1.94	1.86	1.87	1.92	1.94	1.97	2.33														
12										1.86	1.97	1.92	1.86	1.86	1.78	1.92	1.92	1.94	1.92	2.26	1.97	2.33															
11A												1.37	1.92	2.85	2.53	2	1.94	1.89	1.97	2.16																	
11												1.87	2.19	1.86	1.75	1.64	1.75	1.92	2.85	1.92																	
10A												1.87	1.94	1.92	2.53	1.92	2.26	1.92	1.89	1.59																	
10																																					
9																																					
8																																					
7																																					
6																																					
5																																					
4																																					
3																																					
2																																					
1																																					
Low D																		1.97	1.92	1.94	5.8	11.9	11.5	11.4	11.1	7.62	7.42	8.95	5.75	5.69	3.75						
Med D															4.09	11.1	11.3	13.3	13.4	13.2	13.3	13.9	13.7	14.2	11.3	9.84	8.54										
High D									4.58	7.88	7.5	16.5	18	16.3	29.3	28.9	30.9	31.4	31.6	29.8	25.2	26.1	20.4	1.78													
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	1.94	2.53	1.92	0	0	0	1.59	0	0	2.33	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total	0	0	0	0	0	0	0	0	4.58	7.88	7.5	16.5	18	18.2	35.9	41.9	42.3	46.6	46.9	46.5	44.3	51.8	48	27.4	22.5	17.5	16	8.95	5.75	5.69	3.75	0	0	0	0	0	

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

ALTITUDE MOYEN AU DESSUS DU NIVEAU DE LA TERRE/MEAN ALTITUDE ABOVE THE GROUND LEVEL (AGL)

		1	2	3	4	5	6	7	8	9	10	S 11	U 12	B 13	U 14	N 15	I 16	T 17	S 18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
	31																						350	350	350													
	30																						370	350	350	375												
T	29																						350	355	350	380	350	335										
R	28																					365	365	350	350	345	350	340										
A	27																					345	350	350	350	355	350	355										
N	26																		360	350	355	350	340	330	340	350	330	325										
S	25																		360	355	360	350	350	350	360	355	345	375	400									
E	24																320	350	345	335	300	350	315	350	310	325	345	345	380	330	355							
C	23																350	350	325	350	340	355	355	365	390	350	350	370	365	360	360	350						
T	22																350	335	345	350	360	340	360	345	345	330	345	340	350	350	325	335						
S	21																355	345	350	350	350	335	350	360	360	345	370											
	20															335	320	335	340	345	350	355	350	340	365	355												
	19															370	325	355	360	355	345	340	375	400	375													
	18															350	345	350	355	330	345	350	365	345	325													
	17A															350	350	350	325	345	325	340	345	350														
	17															345	350	355	350	330	360	355	345	375														
	16A															370	365	360	355	350	355	350	335	335														
	16															345	355	350	355	355	375	325	355	355														
	15A															345	370	350	350	355	350	330	340	375														
	15															345	365	345	350	355	335	360	325	350														
	14A												350	355	355	350	340	340	350	350	350	370	380	360														
	14												340	360	350	340	355	345	315	350	355	350	335	350														
	13A									425	360	335	350	350	350	355	335	360	365	345	360	345	350	365														
	13									370	385	325	360	360	360	350	350	350	380	365	330	355	360															
	12A										330	350	335	370	365	355	330	355	340	330	350	355	360	425														
	12										340	360	350	340	340	325	350	350	355	350	370	360	425															
	11A												250	350	360	375	365	355	345	360	395																	
	11												330	400	340	320	300	320	350	380	350																	
	10A												330	355	350	375	350	370	350	345	290																	
	10																																					
	9																																					
	8																																					
	7																																					
	6																																					
	5																																					
	4																																					
	3																																					
	2																																					
	1																																					
Low D																			360	350	355	1060	2125	2085	2090	1805	1380	1355	1495	1040	1040	685						
Med D																705	2020	2070	2425	2440	2405	2425	2455	2510	2505	2060	1755	1430										
High D										795	1415	1370	2995	3240	2835	5220	5225	5605	5590	5595	5305	4545	4620	3560	325													
Dom		0	0	0	0	0	0	0	0	0	0	0	0	0	355	375	350	0	0	0	290	0	0	425	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total		0	0	0	0	0	0	0	0	795	1415	1370	2995	3240	3190	6300	7595	7675	8375	8385	8355	8030	9200	8580	4920	3865	3135	2785	1495	1040	1040	685	0	0	0	0	0	0



PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

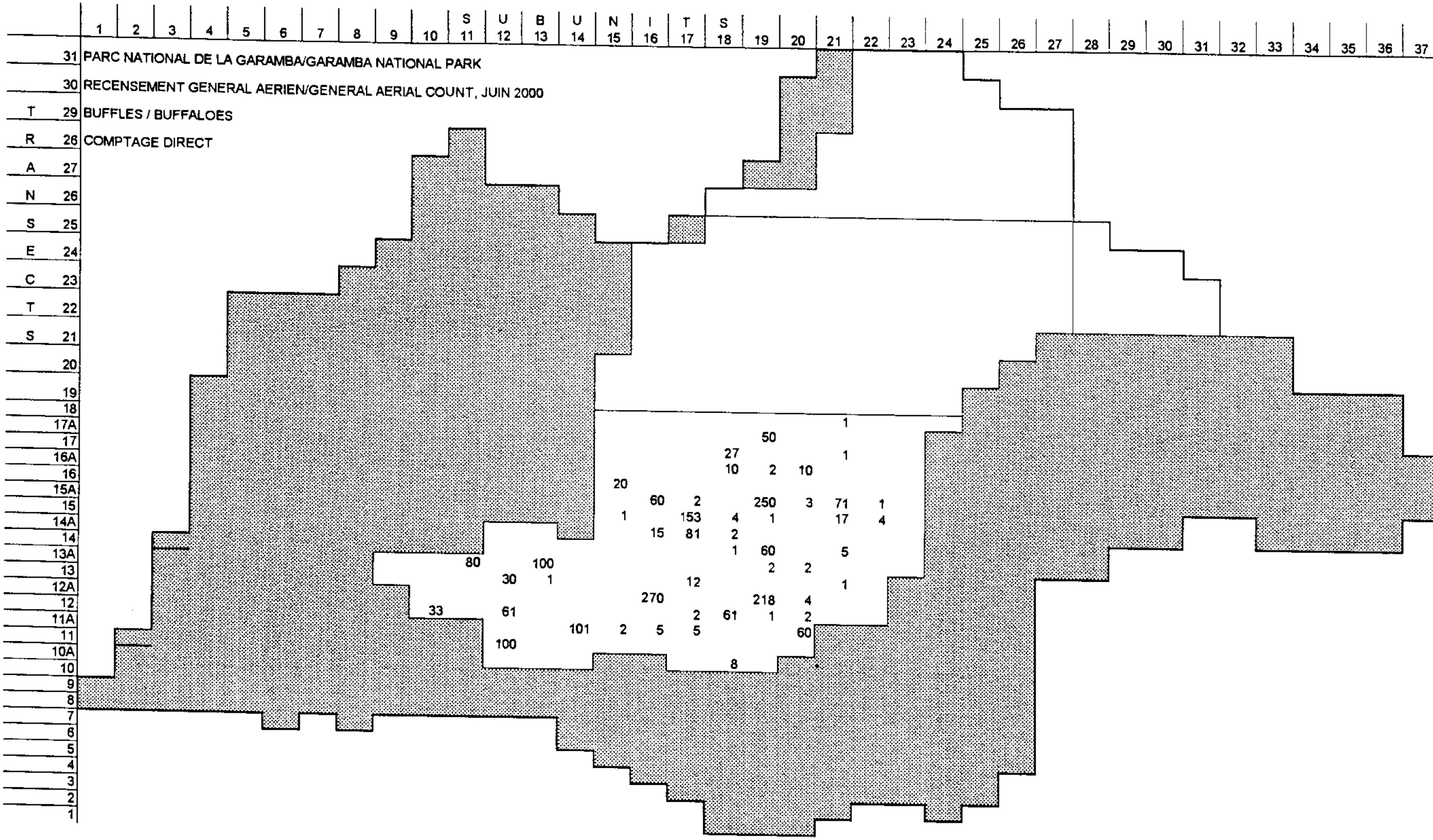
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

ELEPHANTS

COMPTAGE DIRECT

Low D																		0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Med D															0	0	0	0	0	0	0	0	0	0	0	0	0										
High D									0	5	62	21	45	50	38	81	165	105	85	116	82	65	5	0													
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tota	0	0	0	0	0	0	0	0	0	5	62	21	45	50	38	81	165	105	85	118	82	65	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000
BUFFLES / BUFFALOES
COMPTAGE DIRECT

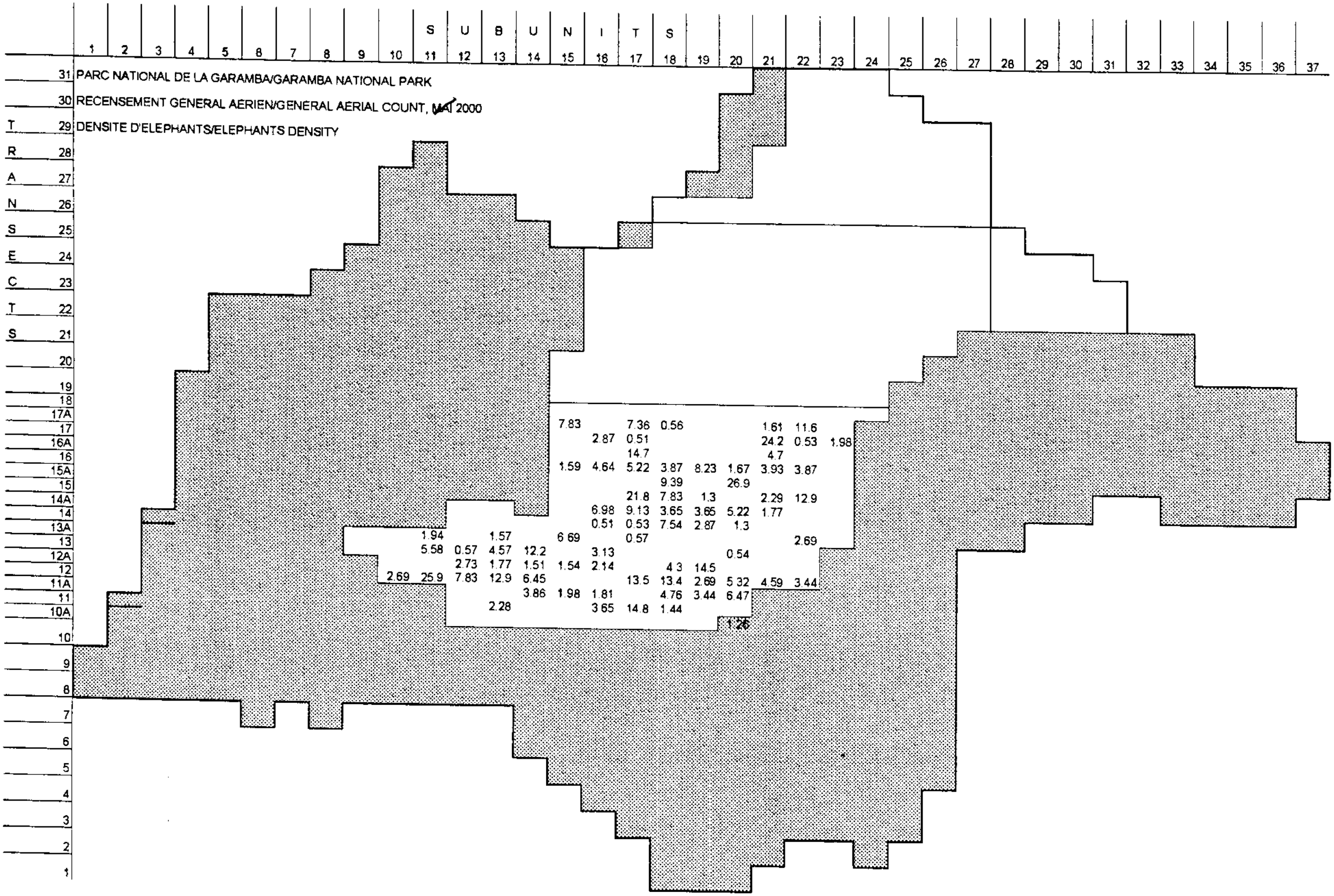


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D										ERR	33	ERR	292	202	103	350	255	105	584	81	96	5	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	ERR	0	ERR	0	0	ERR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	ERR	33	ERR	292	202	ERR	350	255	105	584	81	96	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

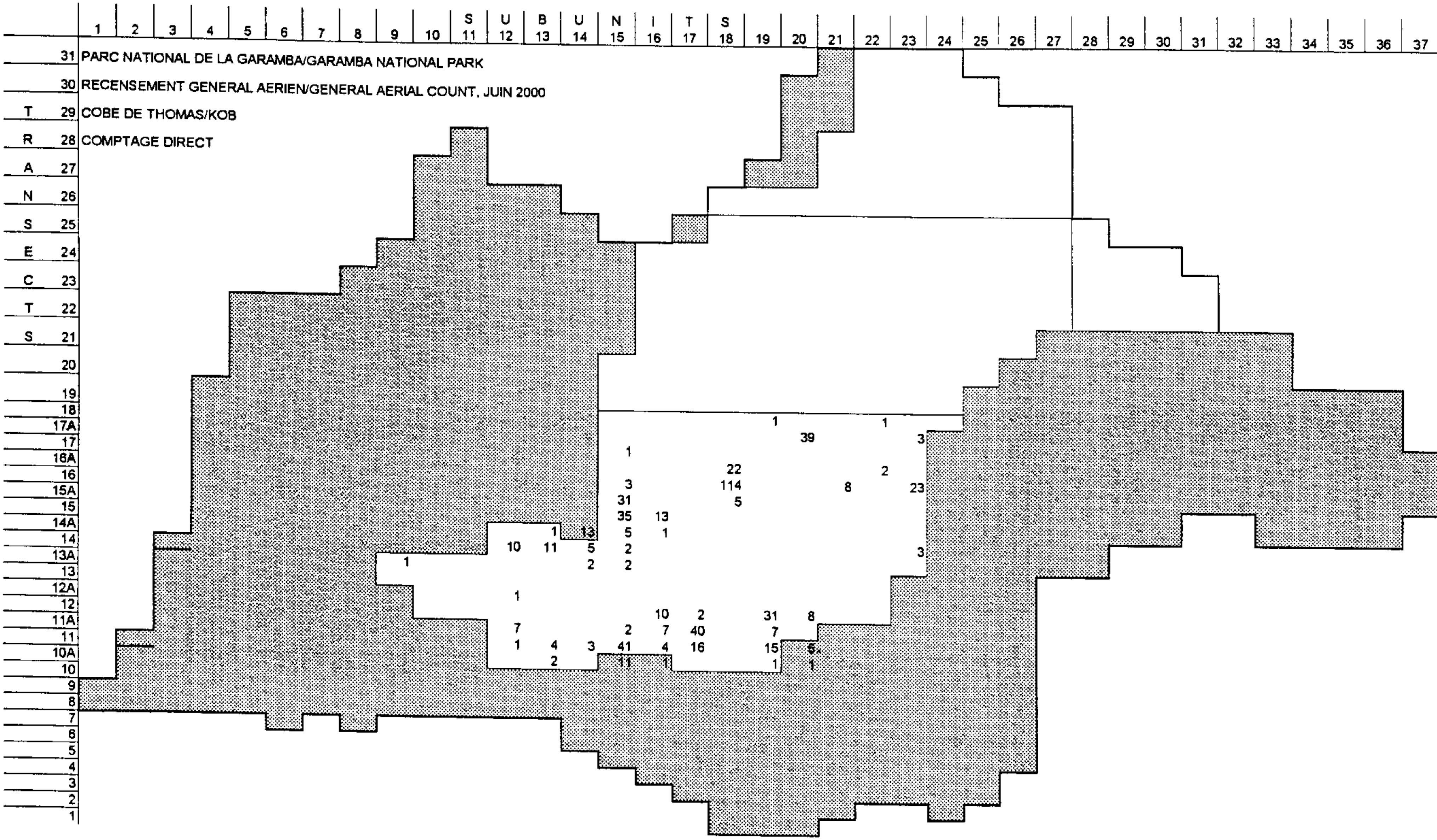
PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, ~~MAI~~ 2000

DENSITE D'ELEPHANTS/ELEPHANTS DENSITY



Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D										0	31.5	11 1	23.1	24	10.2	25.7	88.1	56.7	36.6	47.4	43.1	35.1	1.98	0	0												
Dom	0	0	0	0	0	0	0	0	0	2.69	0	0	0	0	9.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	2.69	31.5	11.1	23 1	24	19.6	25.7	88.1	56.7	36.6	47 4	43.1	35.1	1.98	0	0	0	0	0	0	0	0	0	0	0	0	0	0


PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

COBE DE THOMAS/KOB

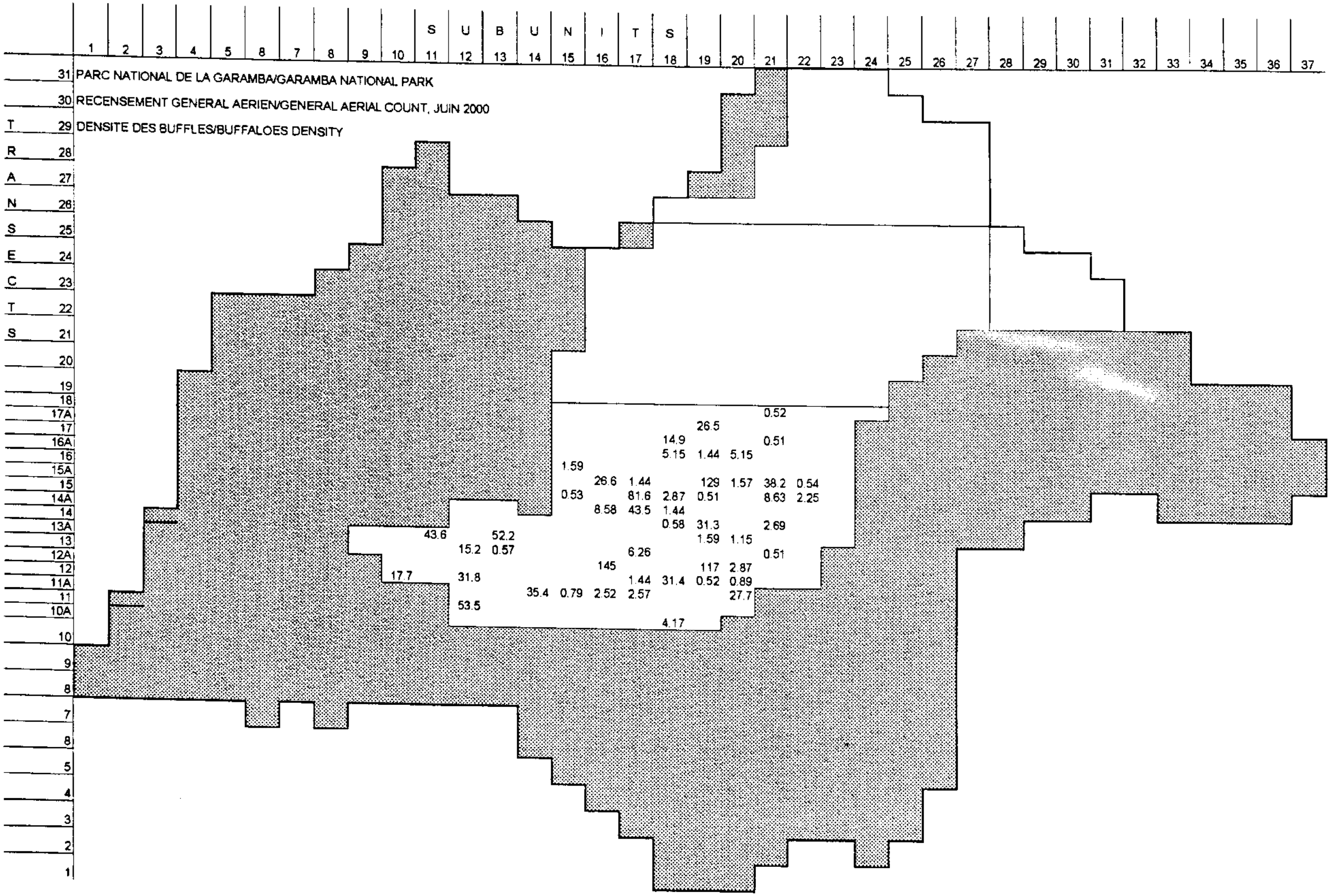
COMPTAGE DIRECT

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D										0	0	ERR	35	15	10	157	93	199	195	106	60	3	32	29	0												
Dom	0	0	0	0	0	0	0	0	1	ERR	0	ERR	0	0	70	0	0	0	0	0	0	0	0	0	0												
Total	0	0	0	0	0	0	0	0	1	ERR	0	ERR	35	15	80	157	93	199	195	106	60	3	32	29	0	0	0	0	0	0	0	0	0	0	0	0	0

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

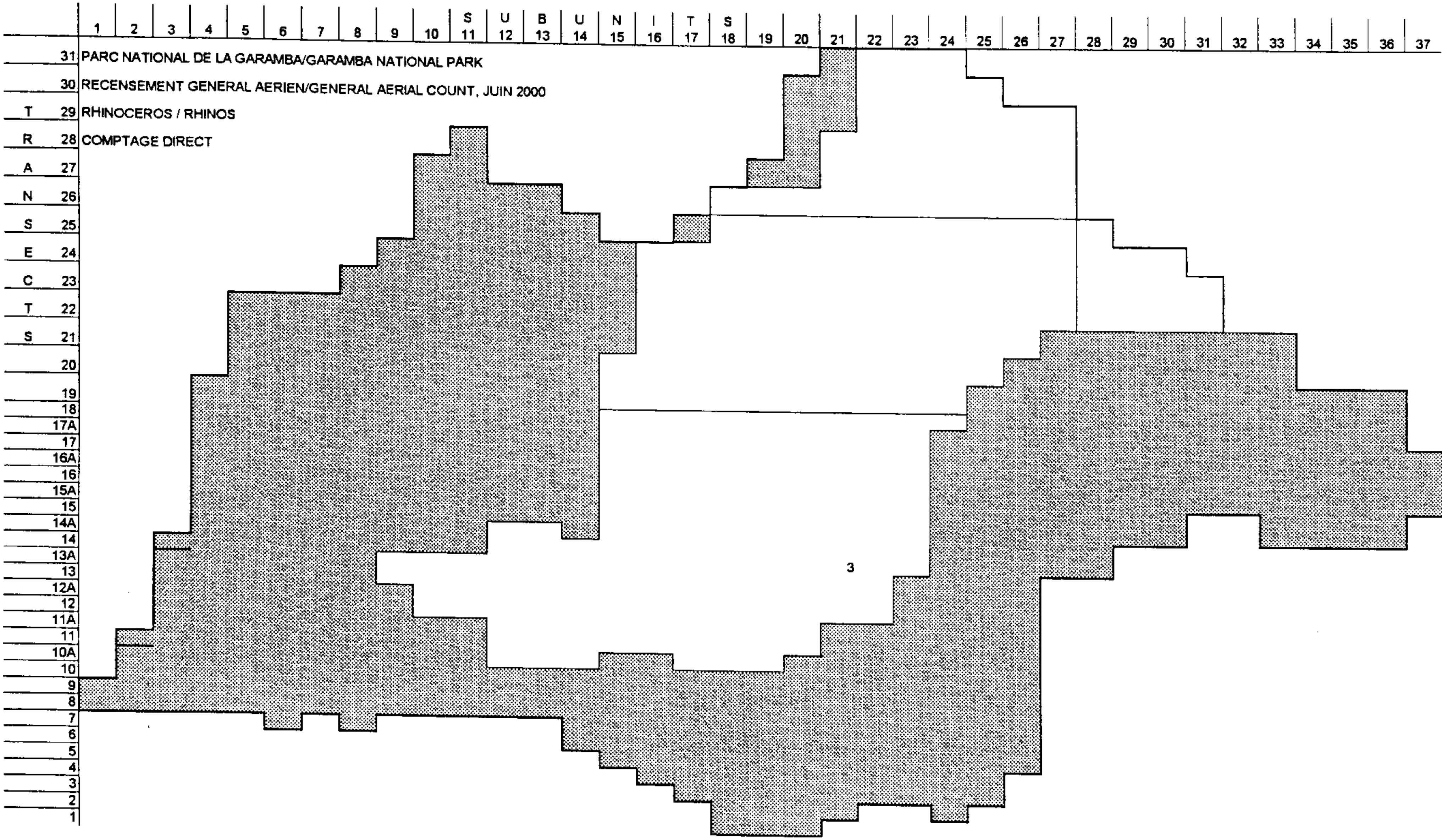
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

DENSITE DES BUFFLES/BUFFALOES DENSITY

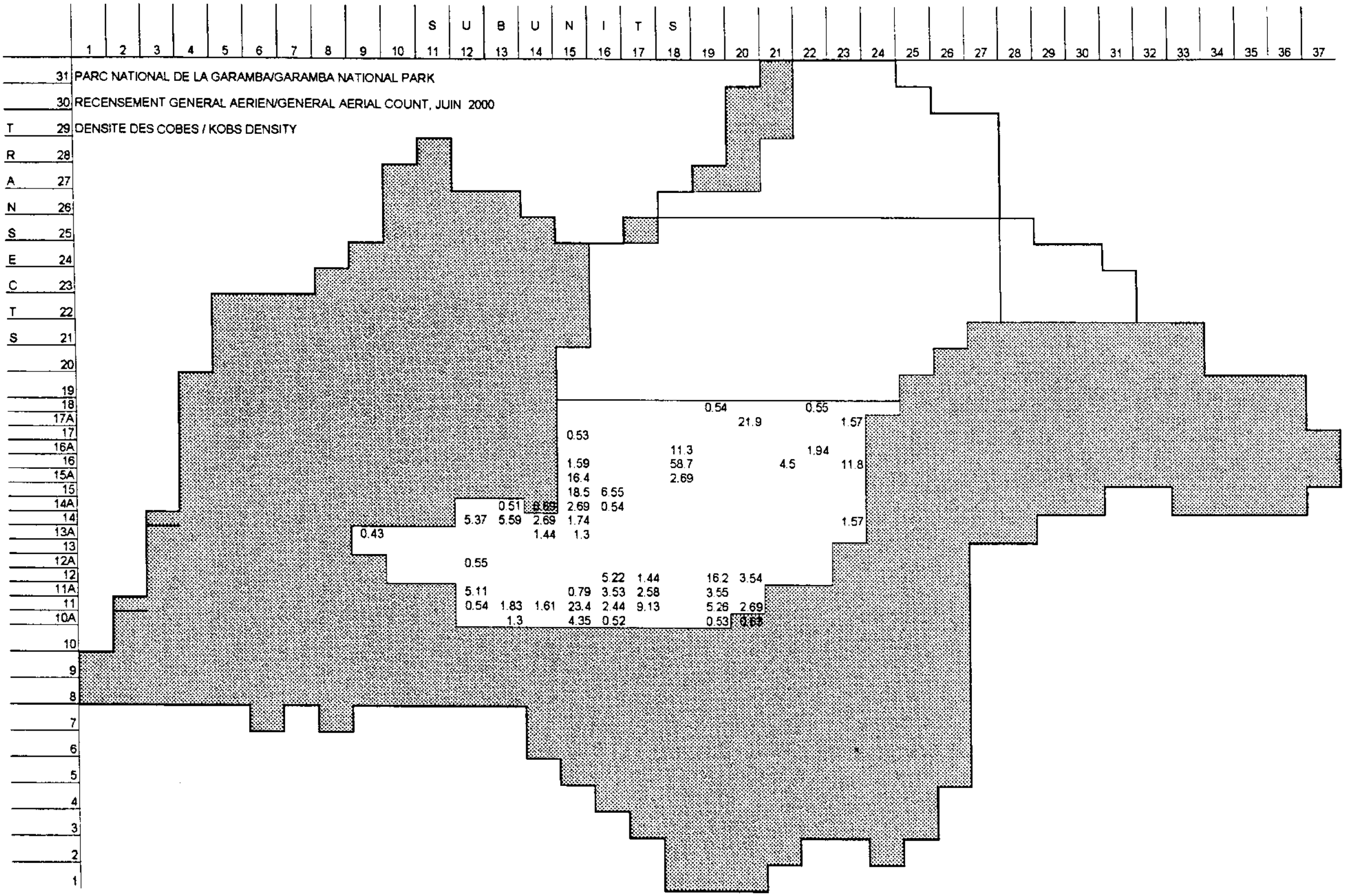


	1	2	3	4	5	8	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D										0	0	47.1	52.8	35.4	0.79	182	137	56.3	307	39.4	51.1	2.79	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	17.7	0	53.5	0	0	2.12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	17.7	0	101	52.8	35.4	2.91	182	137	56.3	307	39.4	51.1	2.79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

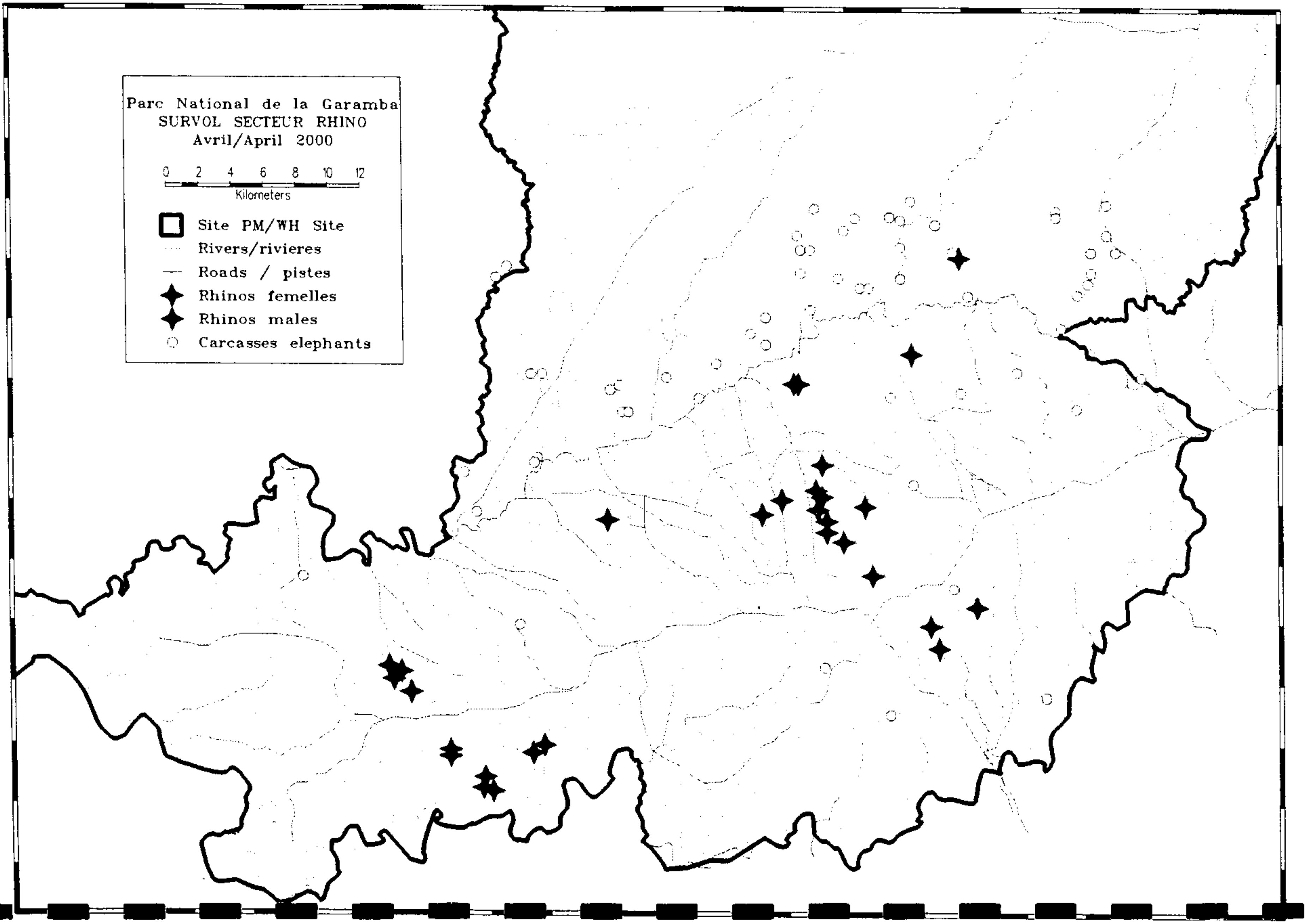
PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000
RHINOCEROS / RHINOS
COMPTAGE DIRECT



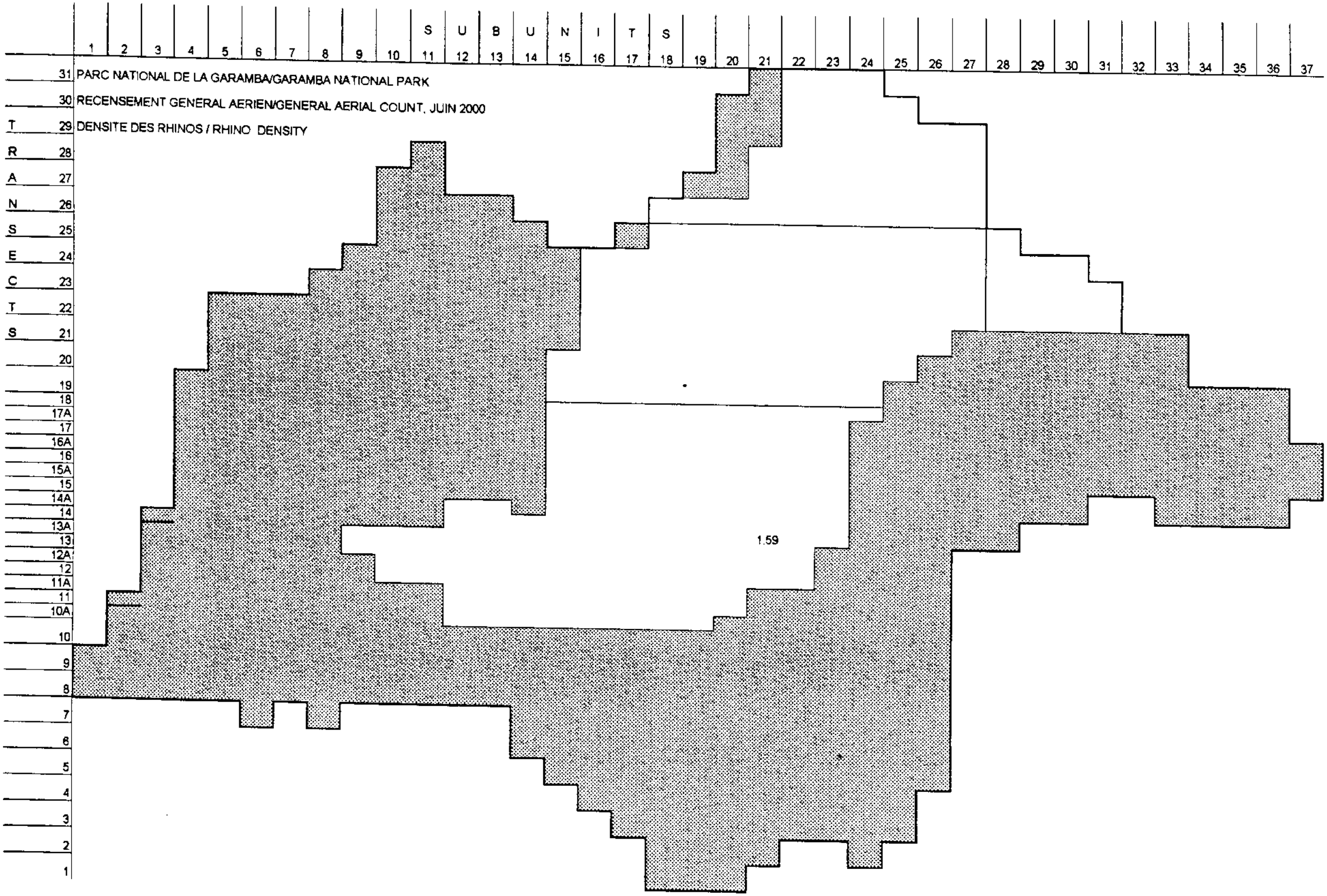
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D										0	ERR	ERR	0	0	ERR	0	0	0	0	0	0	0	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0.	0	0	0	0	0	ERR	ERR	0	0	ERR	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



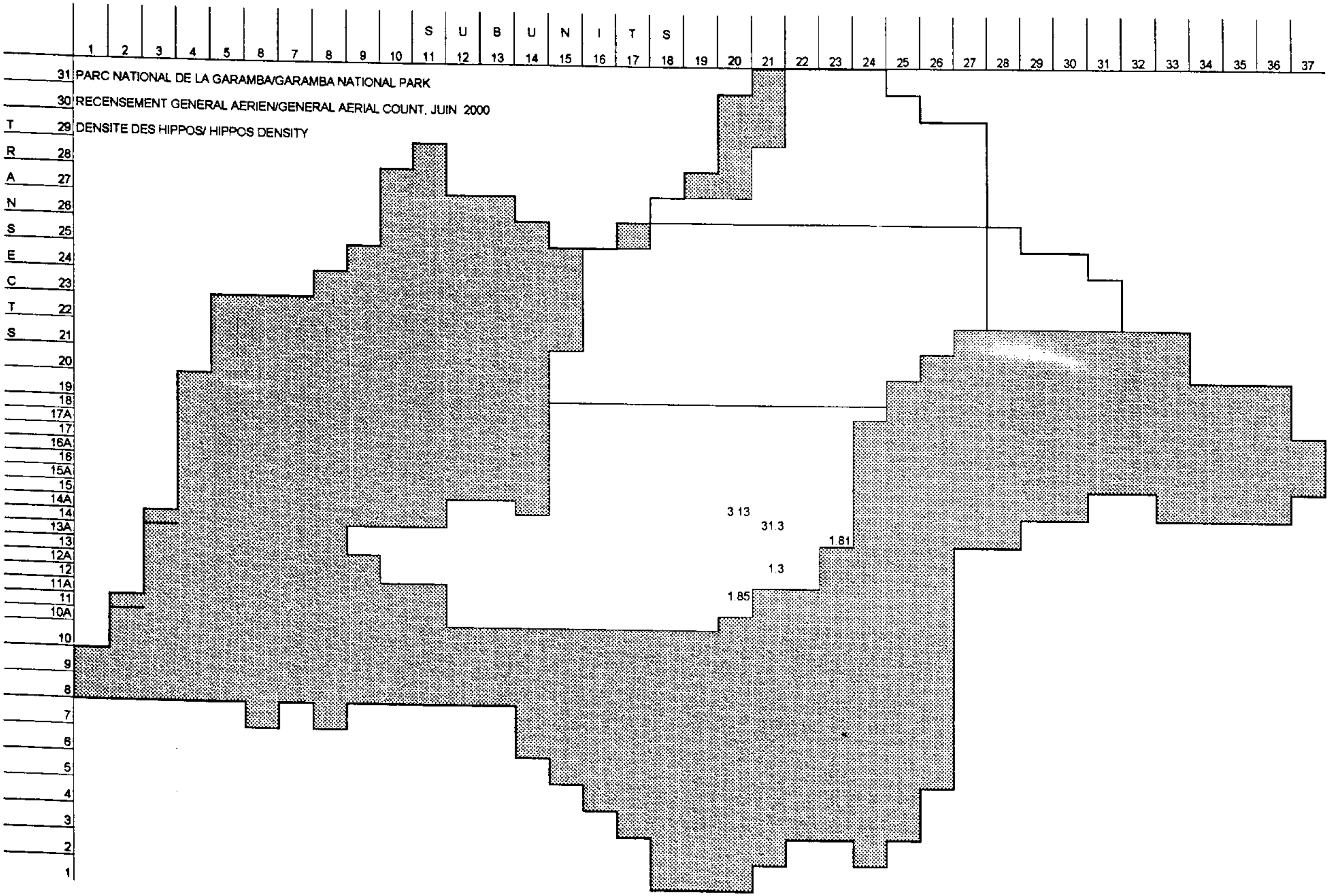
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D										0	0	5.92	7.93	5.74	27.2	18.3	13.2	72.7	25.5	28.2	4.5	2.49	15	0	0												
Dom	0	0	0	0	0	0	0	0	0.43	0	0	0.54	0	0	37 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0.43	0	0	6.45	7.93	5.74	64.3	18.3	13.2	72.7	25.5	28.2	4.5	2.49	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0


Parc National de la Garamba
SURVOL SECTEUR RHINO
Avril/April 2000
0 2 4 6 8 10 12
Kilometers
Site PM/WH Site
Rivers/rivieres
Roads / pistes
Rhinos femelles
Rhinos males
Carcasses elephants

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000
DENSITE DES RHINOS / RHINO DENSITY



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D										0	0	0	0	0	0	0	0	0	0	0	1.59	0	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000
DENSITE DES HIPPOS/ HIPPOS DENSITY

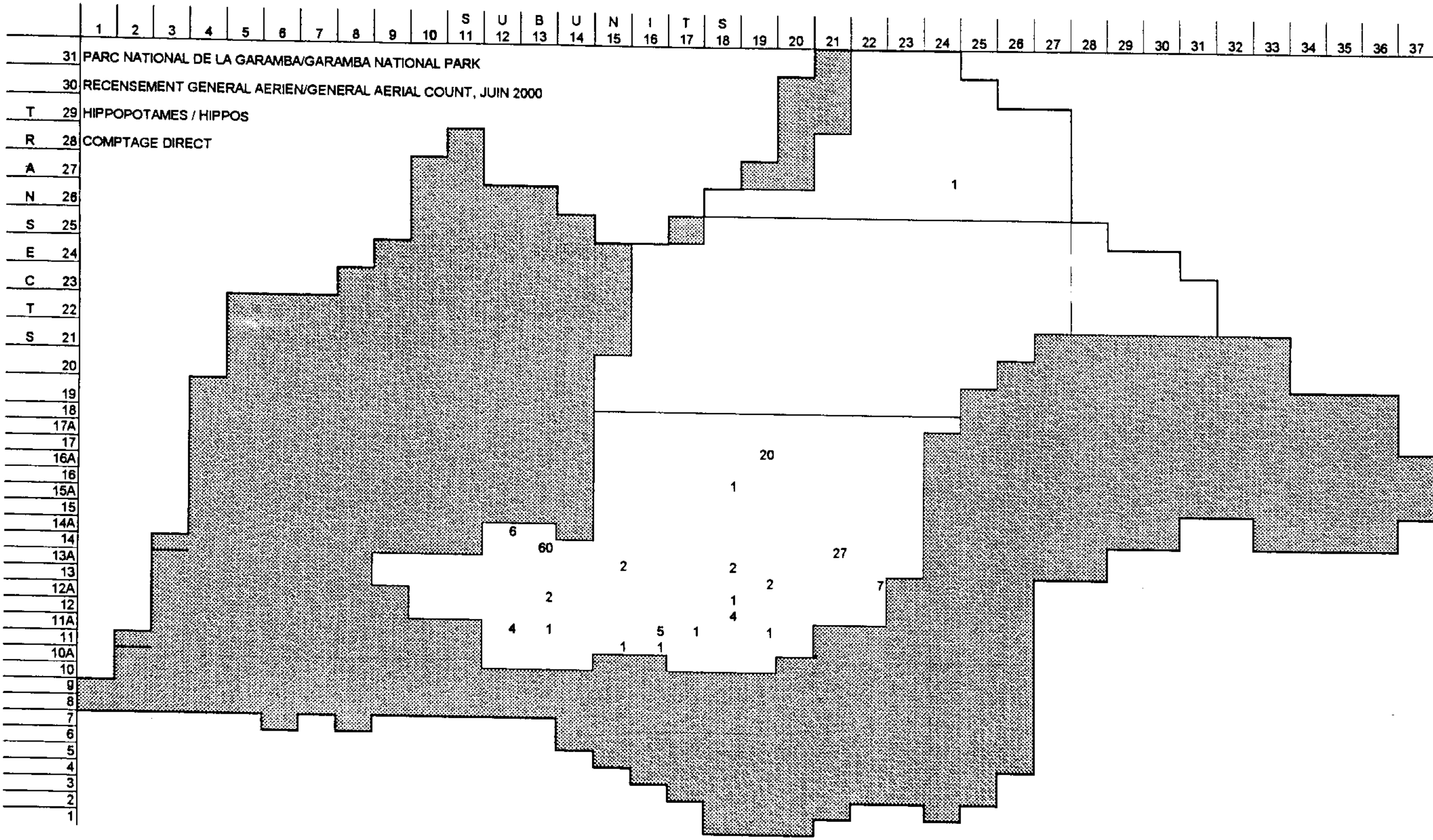
Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D										0	0	0	0	0	0	0	0	0	0	4.98	32.6	0	1.81	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.98	32.6	0	1.81	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

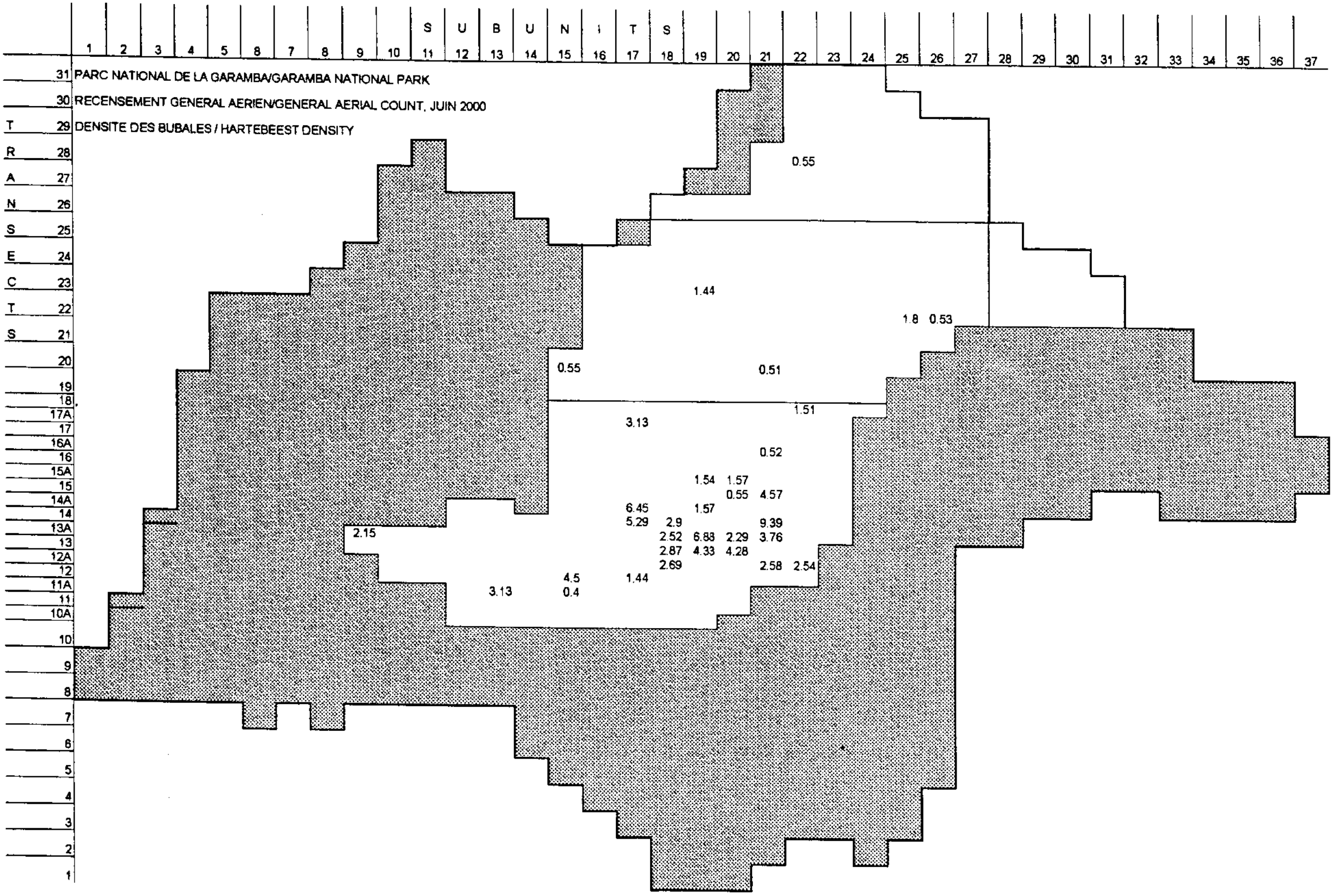
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

HIPPOPOTAMES / HIPPOS

COMPTAGE DIRECT



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			0	0	0	0	0	1	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D										0	ERR	ERR	63	0	ERR	7	8	9	31	23	27	7	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	ERR	ERR	63	0	ERR	7	6	9	31	23	27	7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

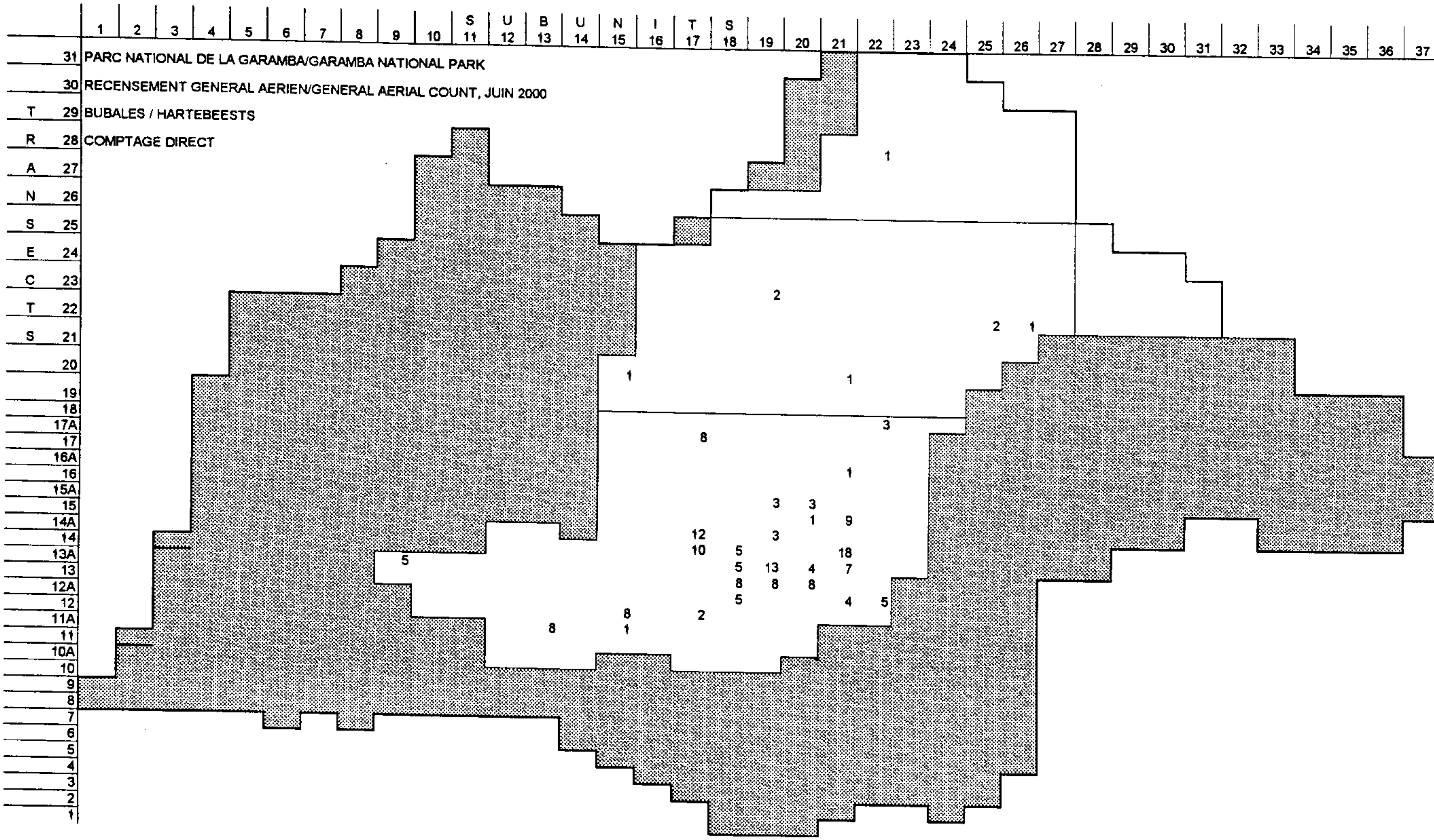


PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

DENSITE DES BUBALES / HARTEBEEST DENSITY

Low D																			0	0	0	0.55	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	1.44	0	0.51	0	0	0	1.8	0.53	0										
High D										0	0	0	3.13	0	4.89	0	16.3	11	14.3	8.69	20.8	4.05	0	0	0												
Dom	0	0	0	0	0	0	0	0	2.15	0	0	0	0	0	0.55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	2.15	0	0	0	3.13	0	5.44	0	16.3	11	15.6	8.69	21.3	4.6	0	0	1.8	0.53	0	0	0	0	0	0	0	0	0	0	0


PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

BUBALES / HARTEBEESTS

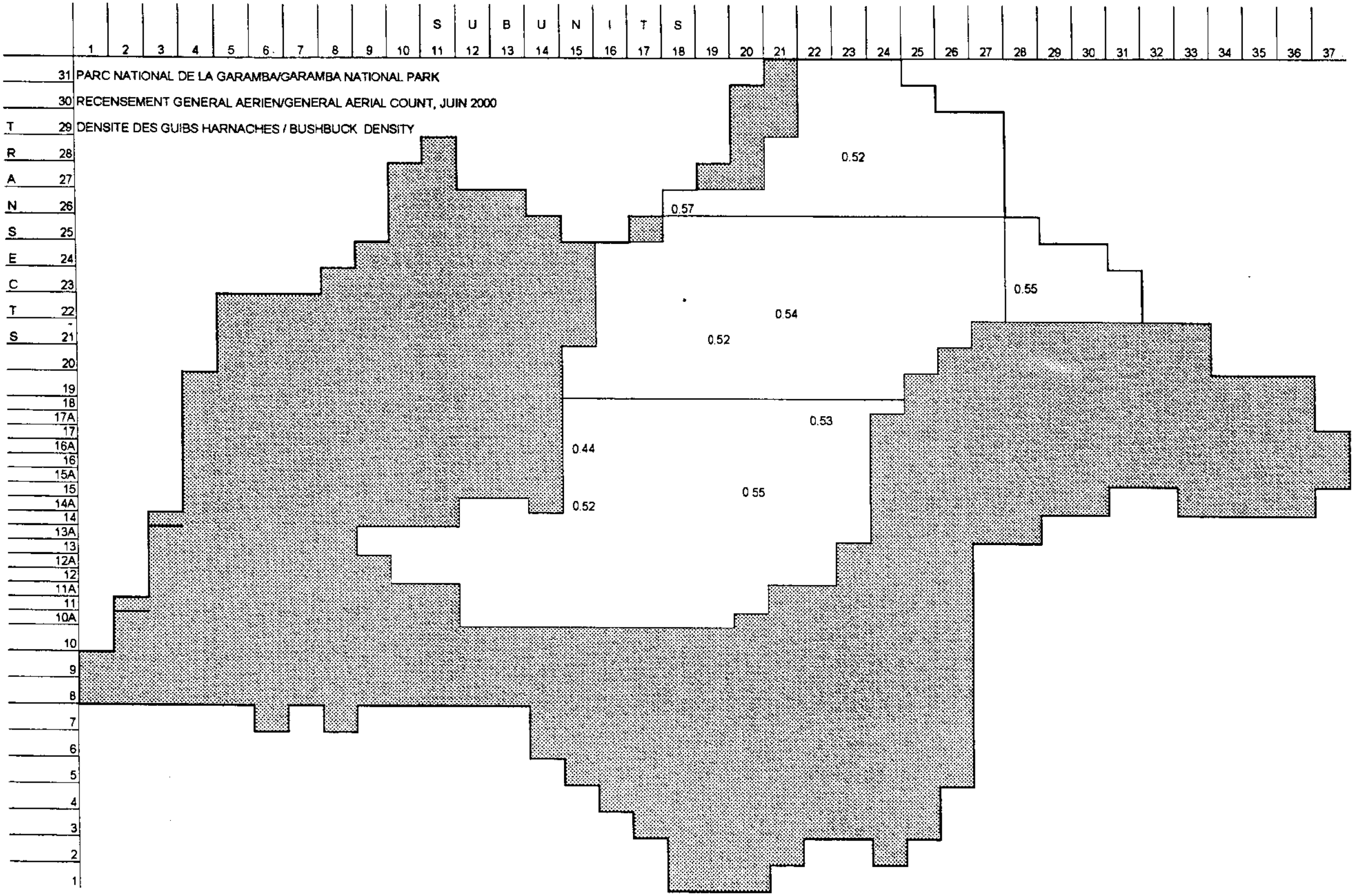
COMPTAGE DIRECT

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			0	0	0	1	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	2	0	1	0	0	0	2	1	0										
High D										0	ERR	ERR	6	0	ERR	9	30	53	50	43	55	8	0	0	0												
Dom	0	0	0	0	0	0	0	0	5	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totai	0	0	0	0	0	0	0	0	5	0	ERR	ERR	6	0	ERR	9	30	53	52	43	56	9	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0

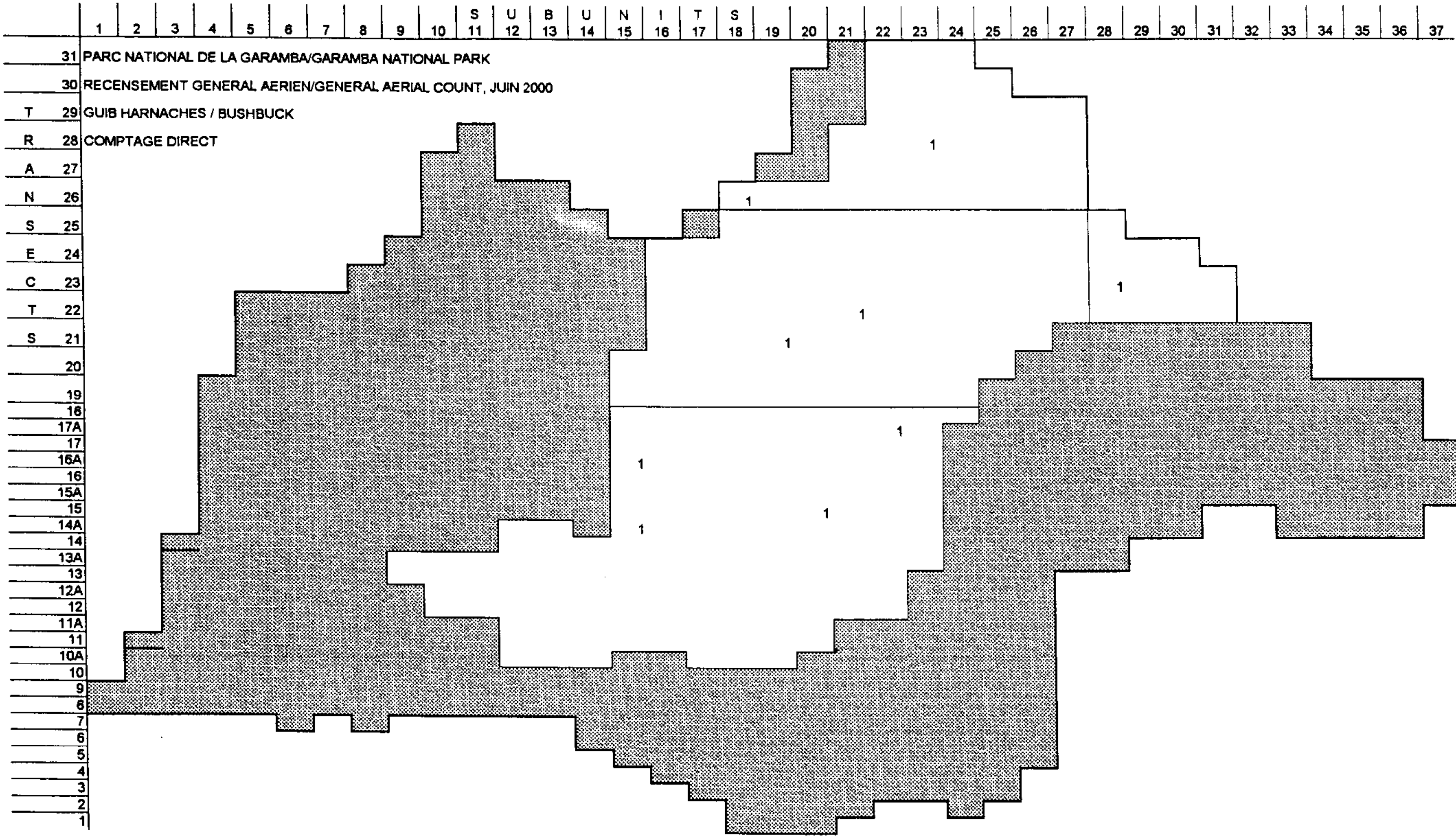
PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

DENSITE DES GUIBS HARNACHES / BUSHBUCK DENSITY



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			0	0	0	0	0.52	0	0	0	0	0.55	0	0	0	0					
Med D																0	0	0	0.52	0	0.54	0	0	0	0	0	0										
High D										0	0	0	0	0	0	0	0	0	0	0.55	0	0.53	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 44	0	0	0	0.52	0.55	0.54	0.53	0.52	0	0	0	0	0.55	0	0	0	0	0	0	0	0	0



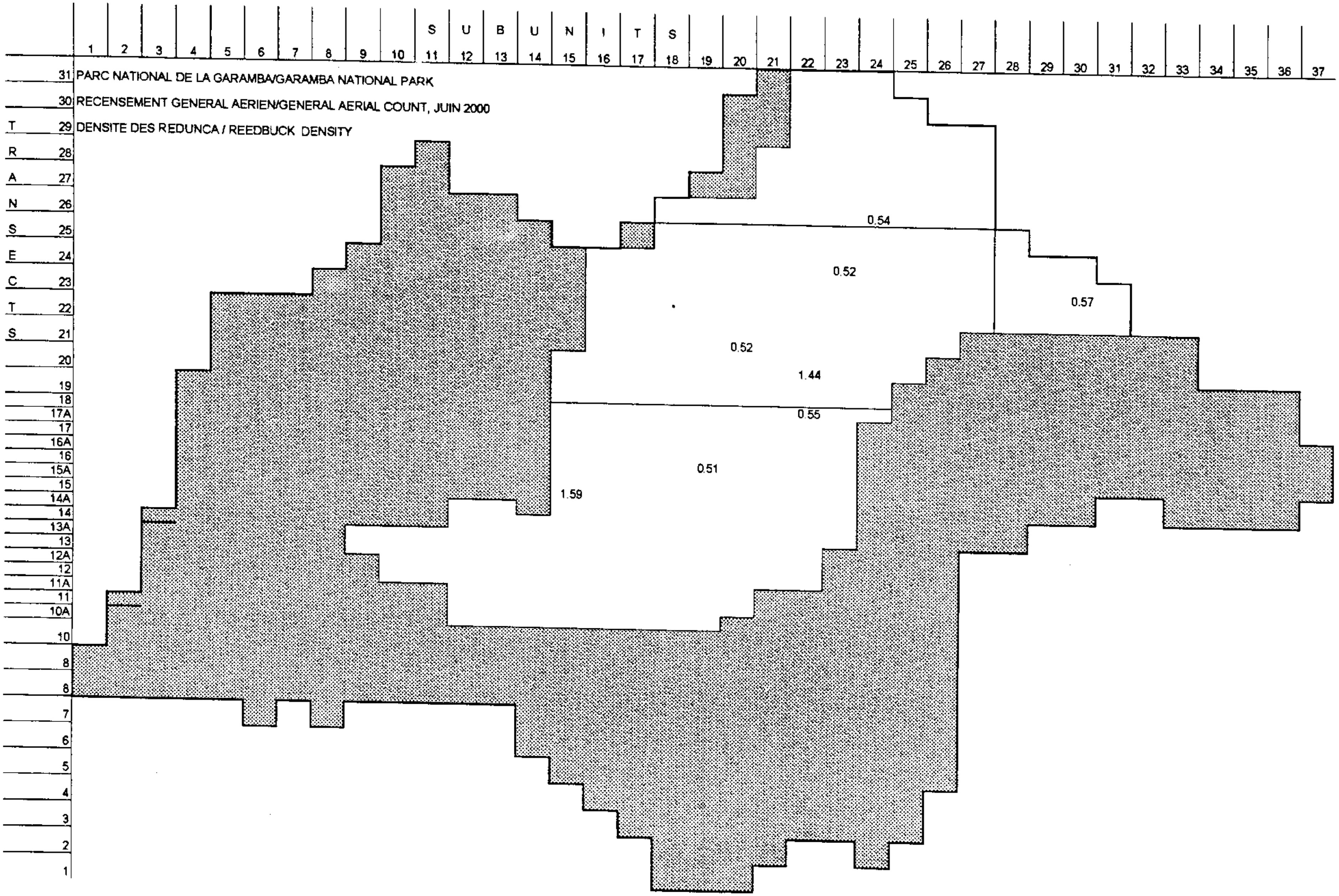
PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

GUIB HARNACHES / BUSHBUCK

COMPTAGE DIRECT

Low D																			0	0	0	0	1	0	0	0	0	1	0	0	0	0					
Med D																0	0	0	1	0	1	0	0	0	0	0	0										
High D										0	ERR	ERR	0	0	ERR	2	0	0	0	1	1	1	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total	0	0	0	0	0	0	0	0	0	0	ERR	ERR	0	0	ERR	2	0	0	1	1	2	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	

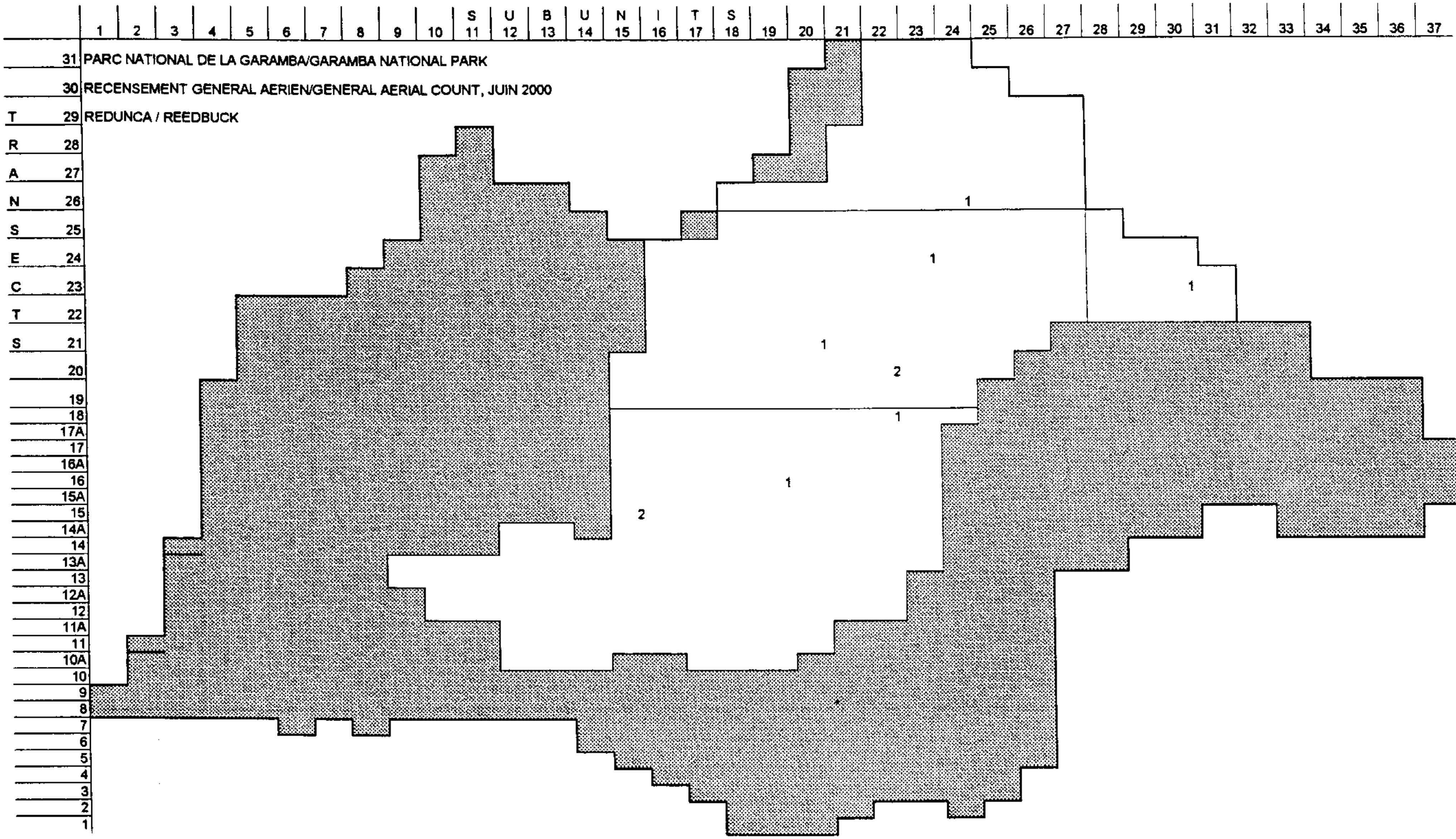


PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

DENSITE DES REDUNCA / REEDBUCK DENSITY

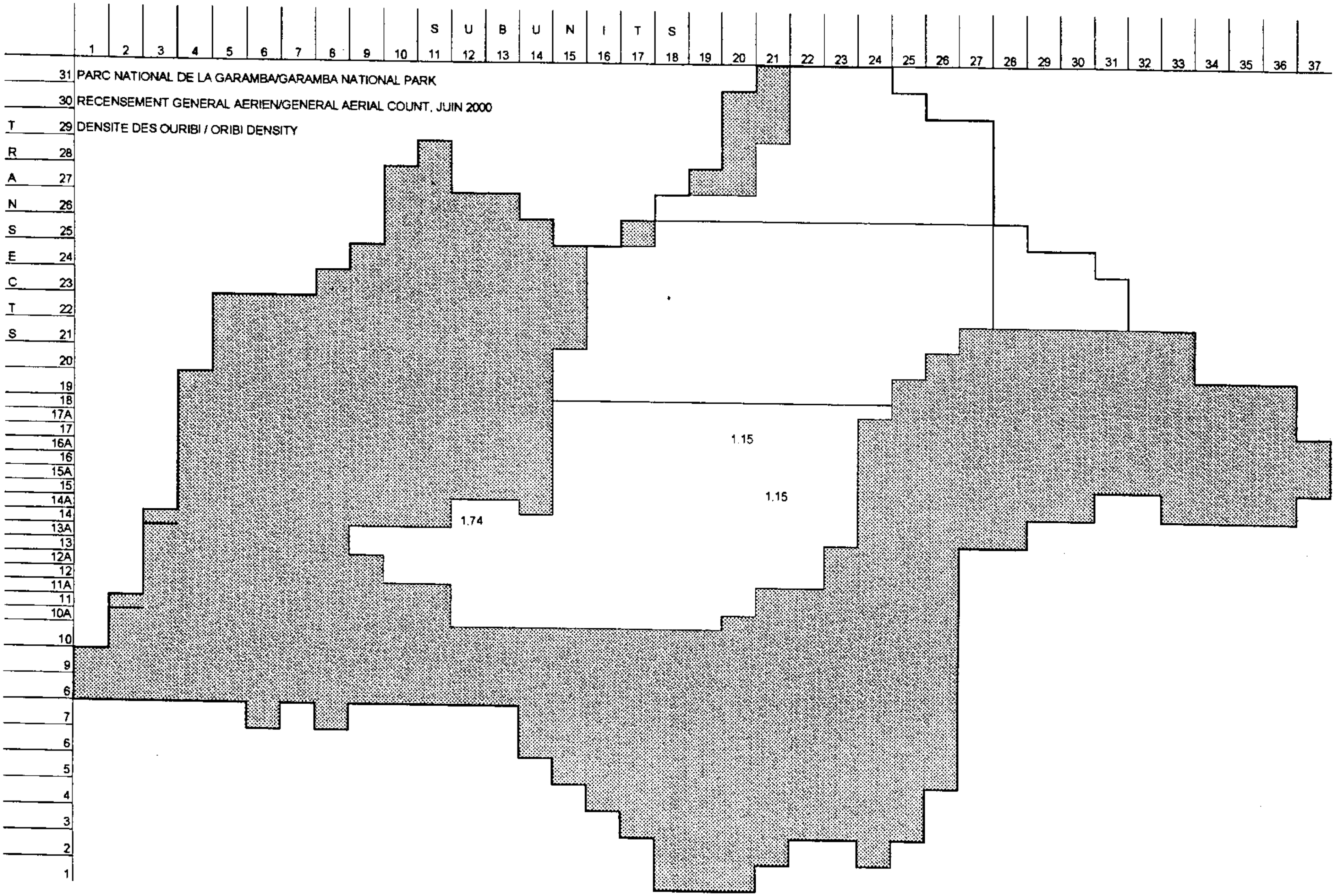
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			0	0	0	0	0	0.54	0	0	0	0	0	0.57	0	0					
Med D																0	0	0	0	0.52	0	1.44	0.52	0	0	0	0										
High D										0	0	0	0	0	0	0	0	0	0.51	0	0	0.55	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.59	0	0	0	0.51	0.52	0	1.98	0.52	0.54	0	0	0	0	0	0.57	0	0	0	0	0	0	0


PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

REDUNCA / REEDBUCK

Low D																		0	0	0	0	0	1	0	0	0	0	0	1	0	0					
Med D															0	0	0	0	1	0	2	1	0	0	0	0										
High D										0	ERR	ERR	0	0	ERR	2	0	0	1	1	0	1	0	0	0											
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	ERR	ERR	0	0	ERR	2	0	0	1	2	0	3	1	1	0	0	0	0	0	1	0	0	0	0	0	0



PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

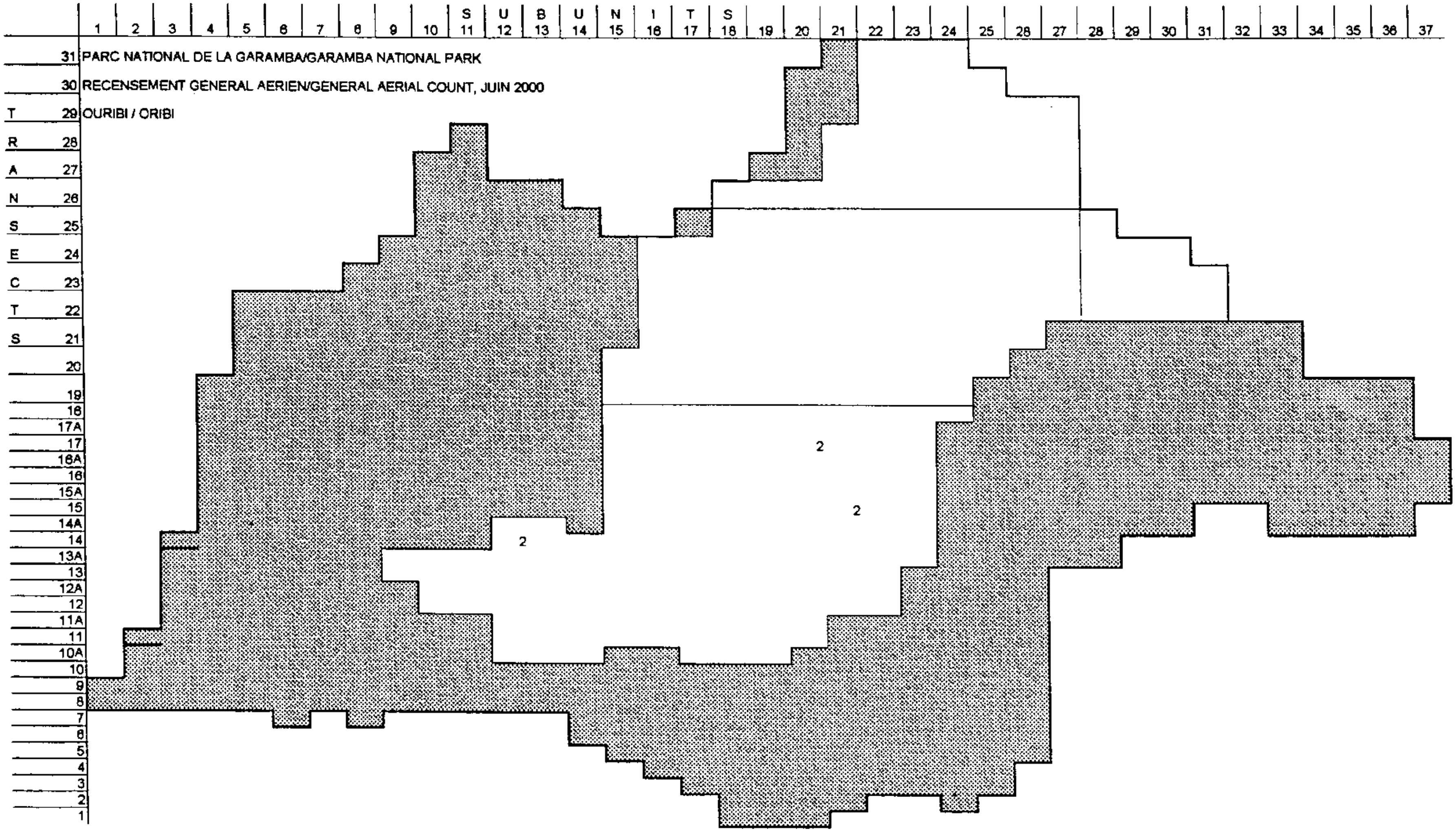
DENSITE DES OURIBI / ORIBI DENSITY

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D										0	0	1.74	0	0	0	0	0	0	0	1.15	1.15	0	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	1.74	0	0	0	0	0	0	0	1.15	1.15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

31 PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

30 RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

29 OURIBI / ORIBI



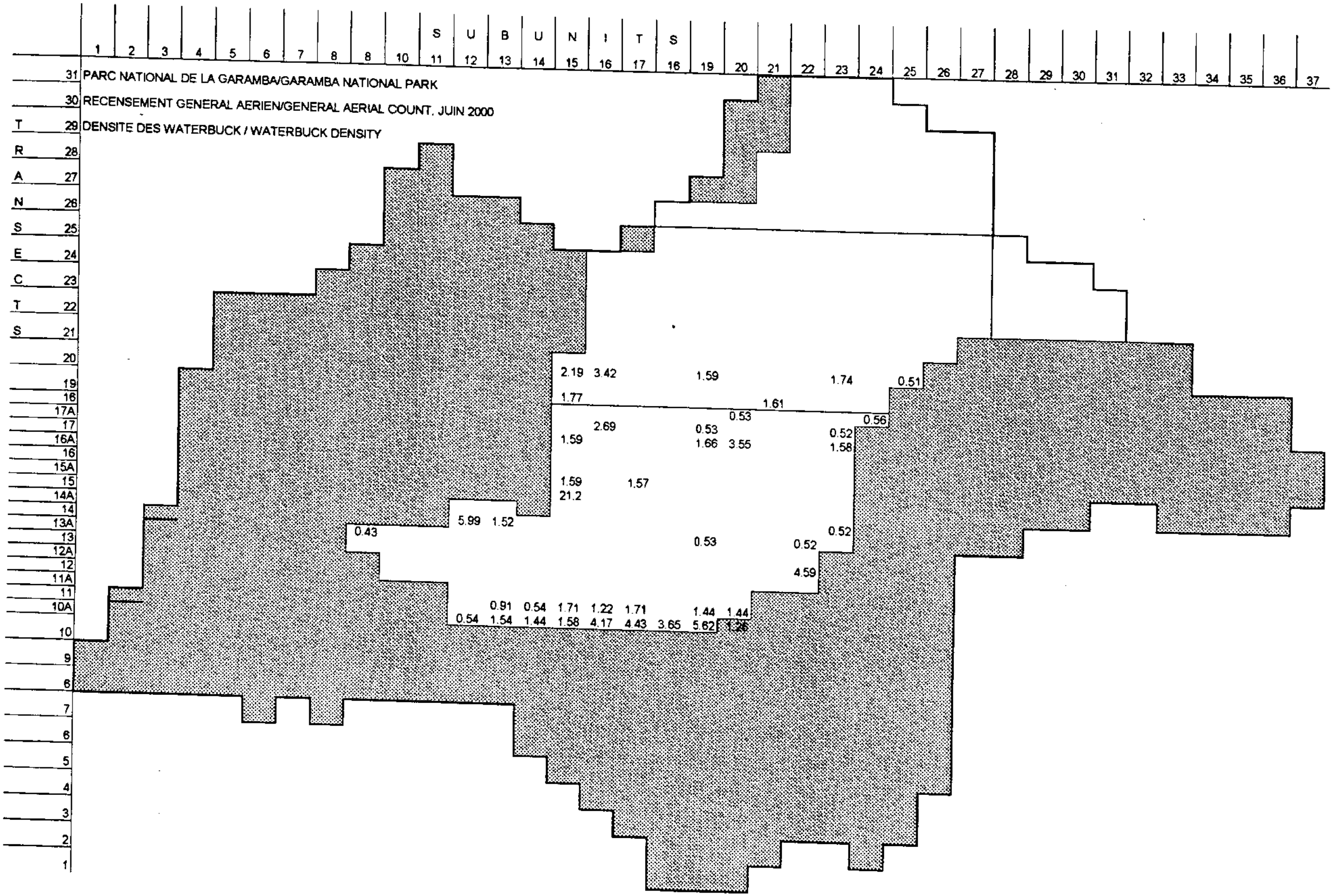
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D										0	ERR	ERR	0	0	ERR	0	0	0	0	2	4	0	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	ERR	ERR	0	0	ERR	0	0	0	0	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0		0	
	0		0	
	0		0	
0				
0				
2				
0				
0				
0				
2				
0				
2				
0				
0				
0				
0				
0				
0				
0				
0		0	0	Tota
0	0			Tota
8				Tota
8	0	0	8	TOT

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

DENSITE DES WATERBUCK / WATERBUCK DENSITY



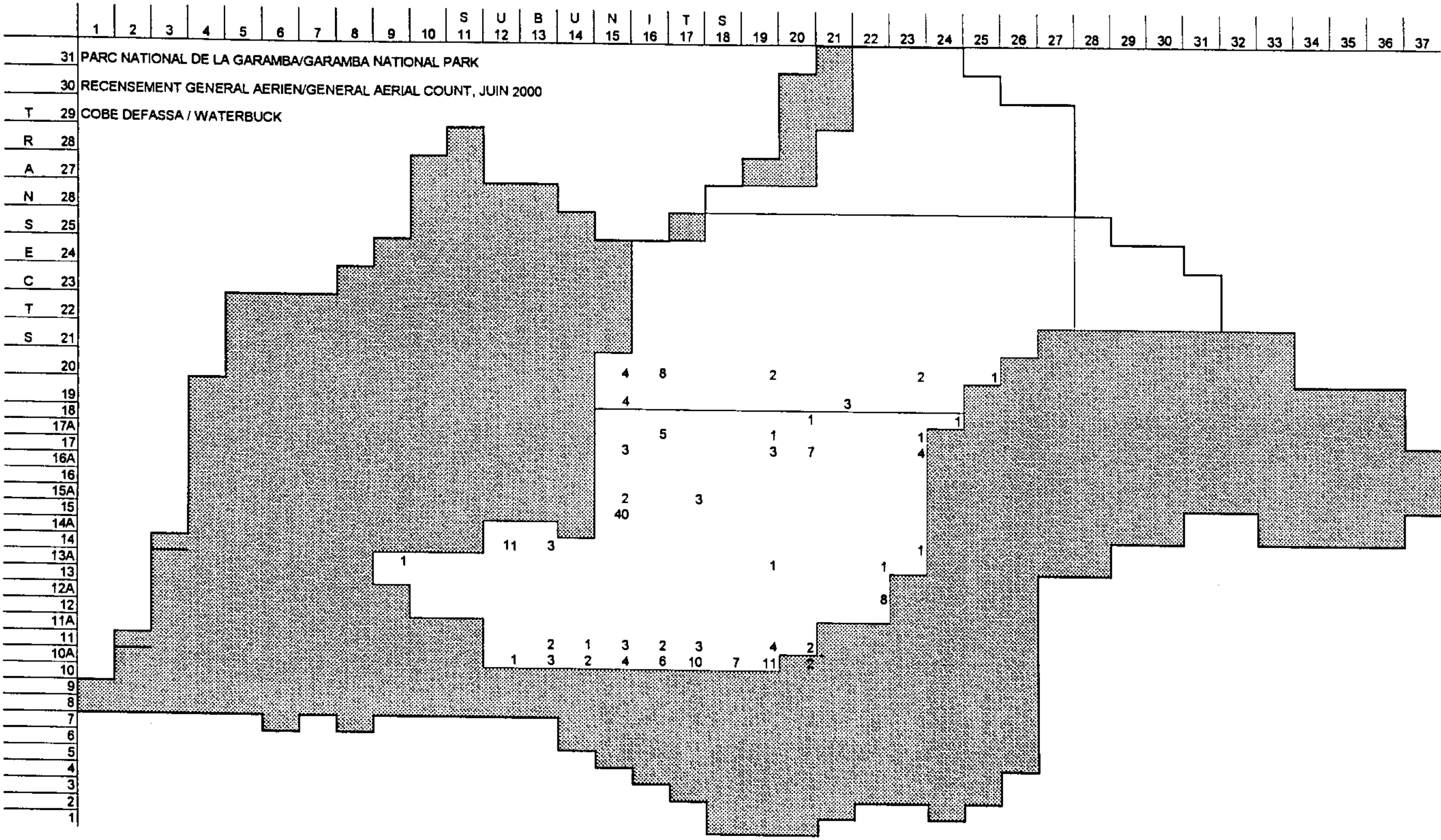
Low D																		0
Med D																3.42	0	0	1.59
High D										0	0	5.99	2.44	0.54	1.71	3.91	3.28	0	4.16
Dom	0	0	0	0	0	0	0	0	0.43	0	0	0.54	0	0	28.3	0	0	0	0
Total	0	0	0	0	0	0	0	0	0.43	0	0	6.53	2.44	0.54	30	7.33	3.28	0	5.75

Low D	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D	0	1.61	0	1.74	0	0.51	0	0										
High D	5.52	0	5.11	2.63	0.56	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	5.52	1.61	5.11	4.37	0.56	0.51	0	0	0	0	0	0	0	0	0	0	0	0

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

COBE DEFASSA / WATERBUCK

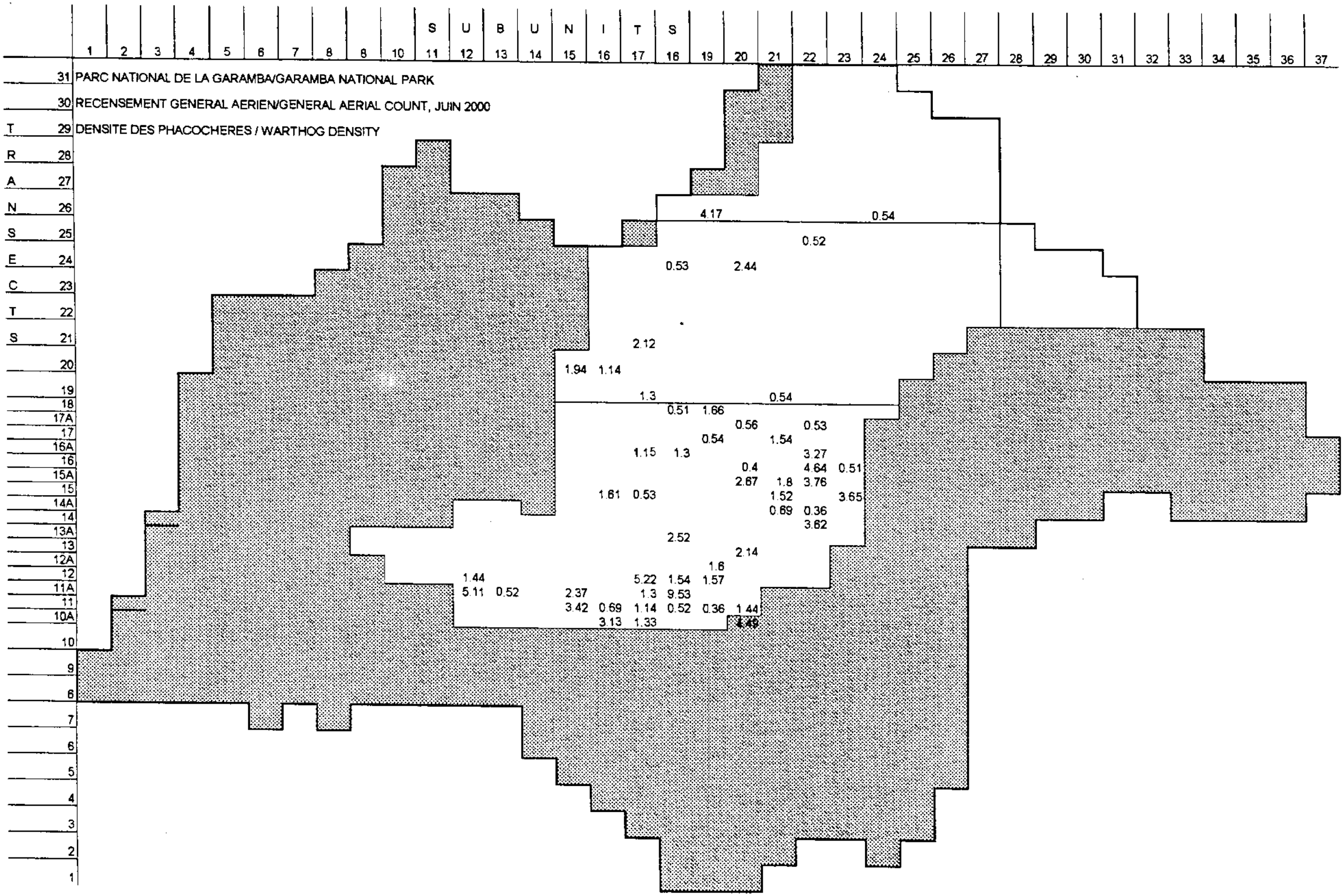


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																6	0	0	2	0	3	0	2	0	1	0	0										
High D										0	ERR	ERR	5	1	ERR	55	13	8	9	19	10	9	6	1	0												
Dom	0	0	0	0	0	0	0	0	1	0	0	1	0	0	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	1	0	ERR	ERR	5	1	ERR	61	13	6	11	19	13	9	8	1	1	0	0	0	0	0	0	0	0	0	0	0	0

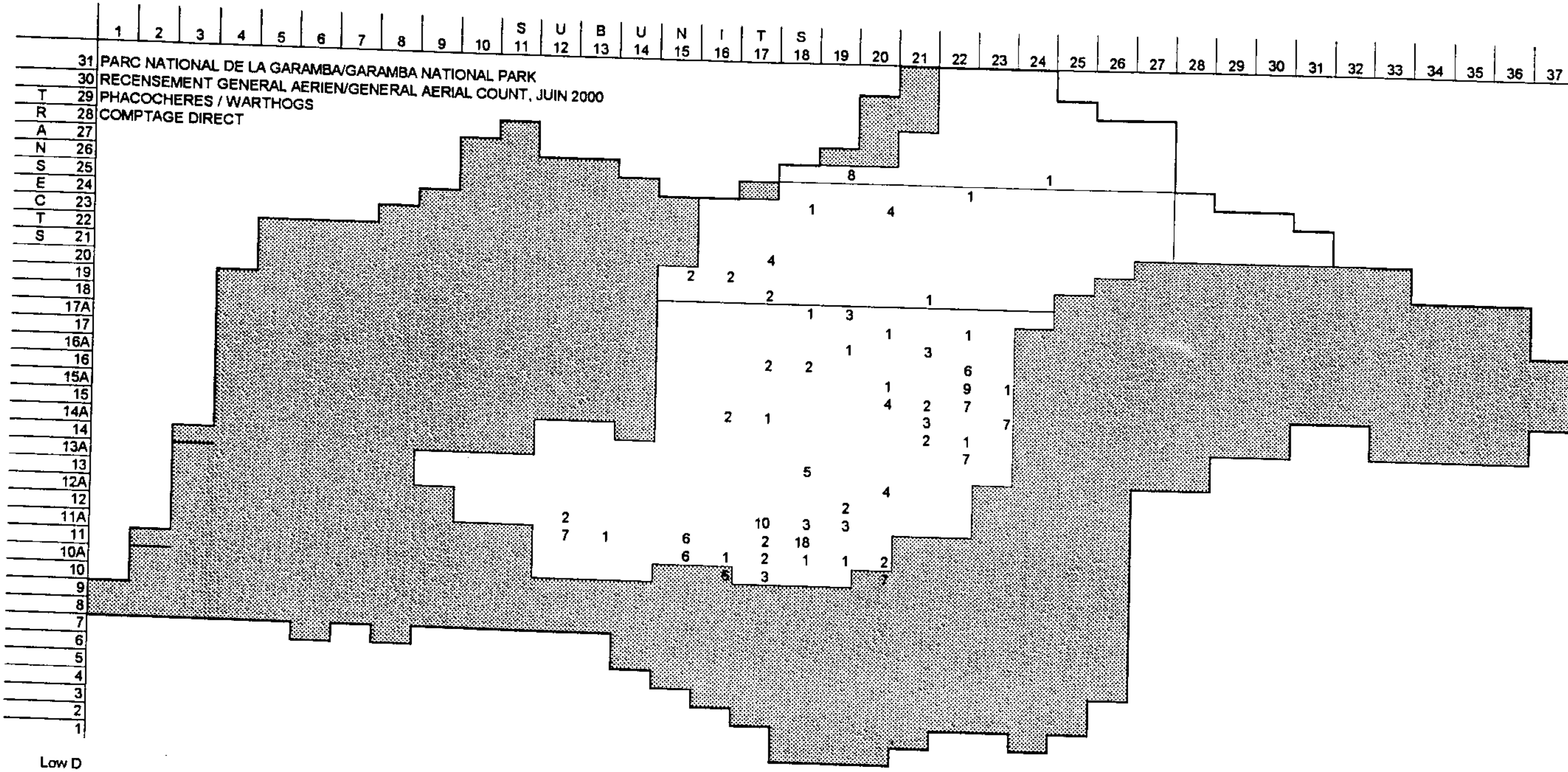
PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

DENSITE DES PHACOCHERES / WARTHOG DENSITY



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			4.17	0	0	0	0	0.54	0	0	0	0	0	0	0	0					
Med D																1.14	3.41	0.53	0	2.44	0.54	0.52	0	0	0	0	0										
High D										0	0	1.44	0.52	0	5.6	2.5	9.33	15.9	5.92	7.41	5.75	16.4	4.17	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	1.44	0.52	0	7.74	3.64	12.7	16.5	10.1	9.85	6.26	16.9	4.17	0.54	0	0	0	0	0	0	0	0	0	0	0	0	0

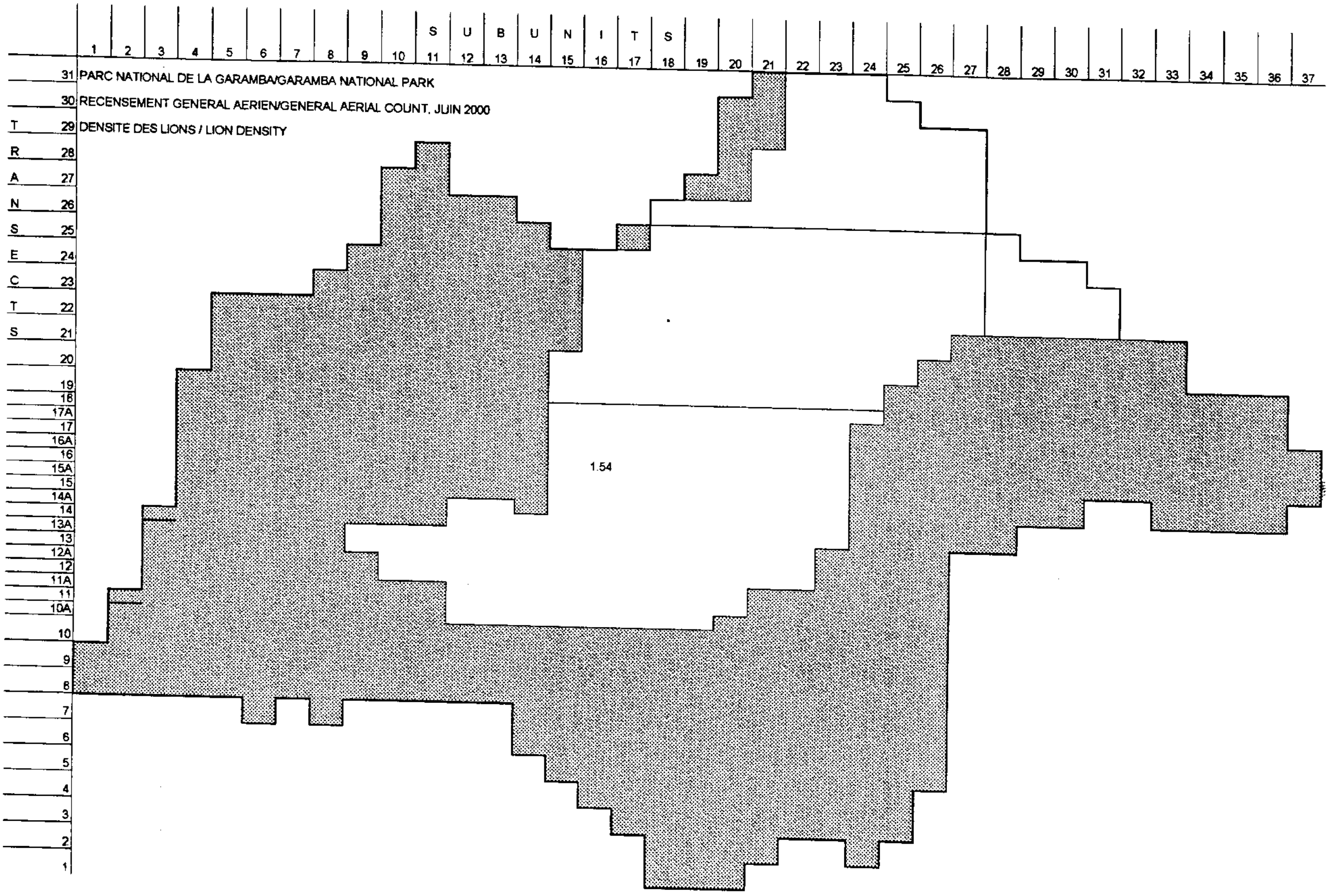


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			6	0	0	0	0	1	0	0	0	0	0	0	0	0					
Med D																2	6	1	0	4	1	1	0	0	0	0	0										
High D										0	ERR	ERR	1	0	ERR	15	20	47	40	22	22	31	8	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	ERR	ERR	1	0	ERR	17	26	48	48	26	23	32	8	1	0	0	0	0	0	0	0	0	0	0	0	0	0

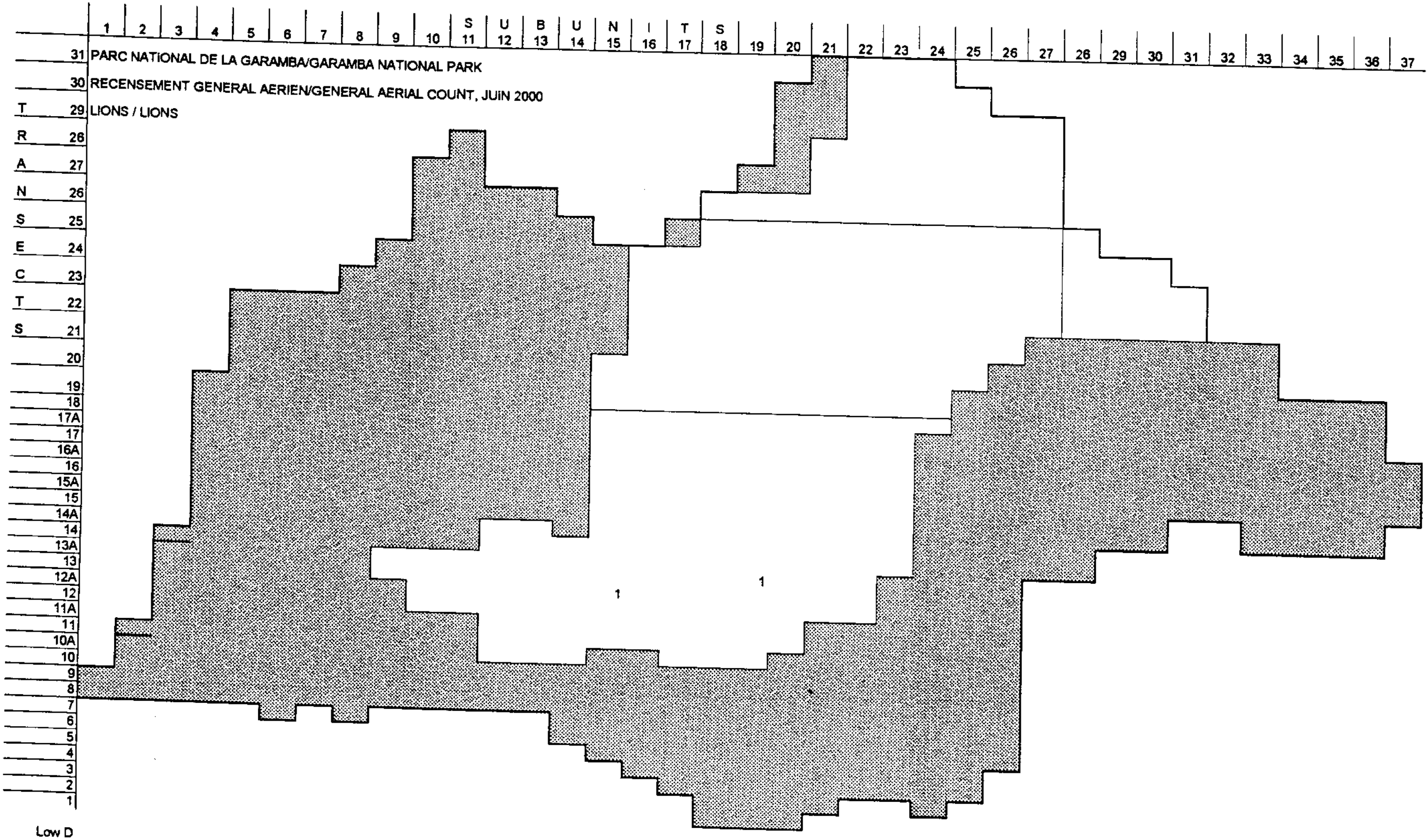
PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

DENSITE DES LIONS / LION DENSITY



Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D										0	0	0	0	0	0	1.54	0	0	0	0	0	0	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

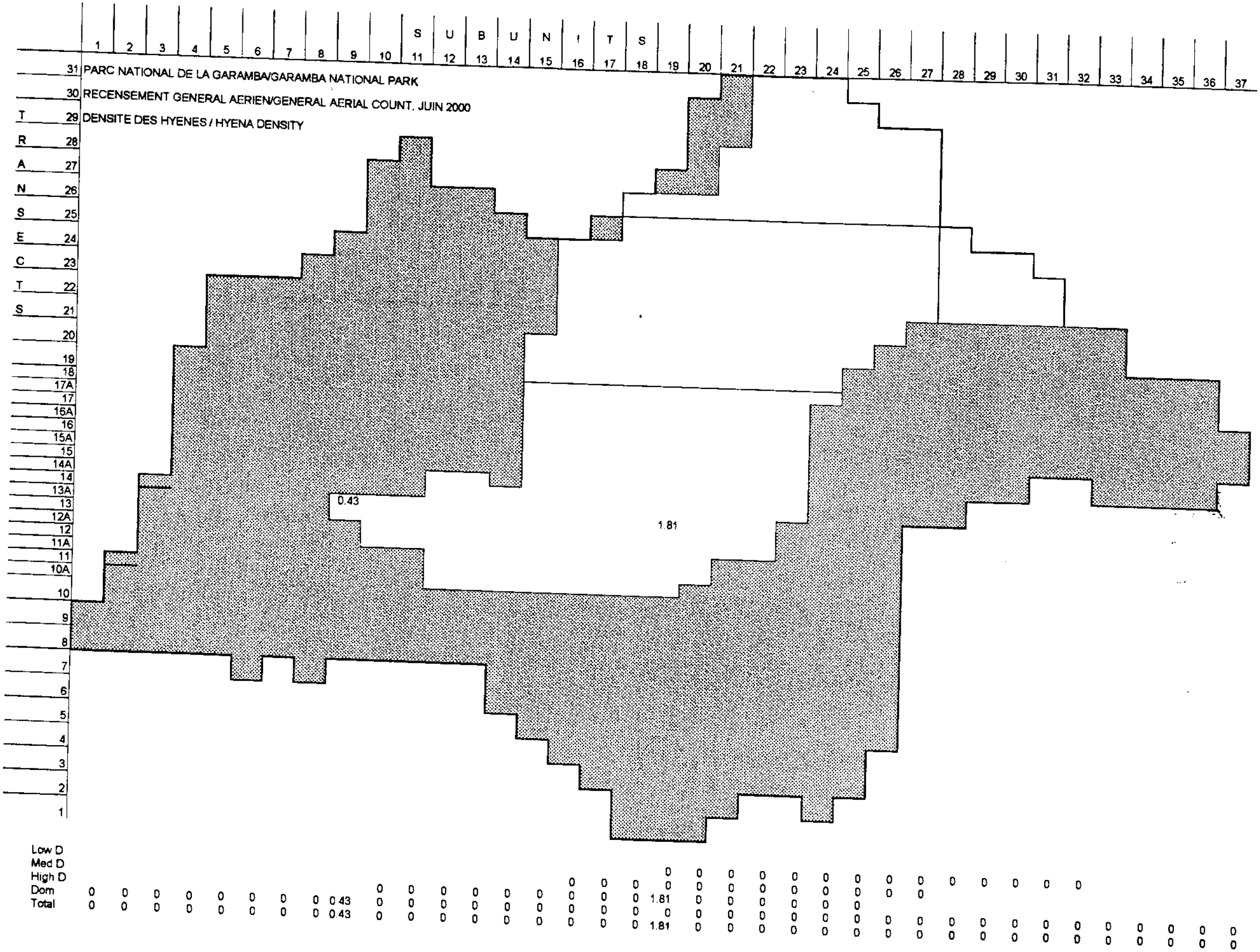


PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

LIONS / LIONS

Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D										0	ERR	ERR	0	0	ERR	1	0	0	1	1	0	0	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	ERR	ERR	0	0	ERR	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

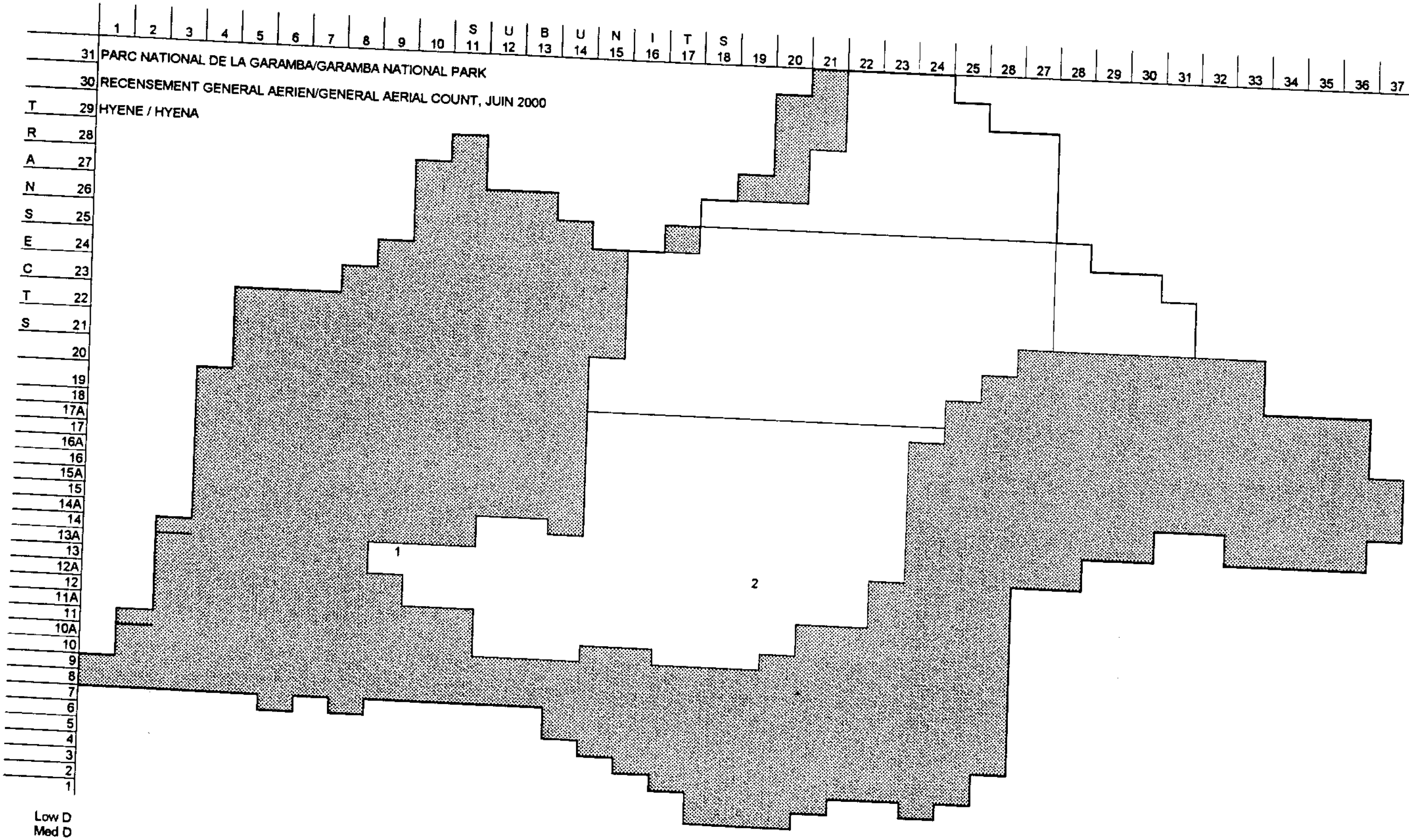


PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

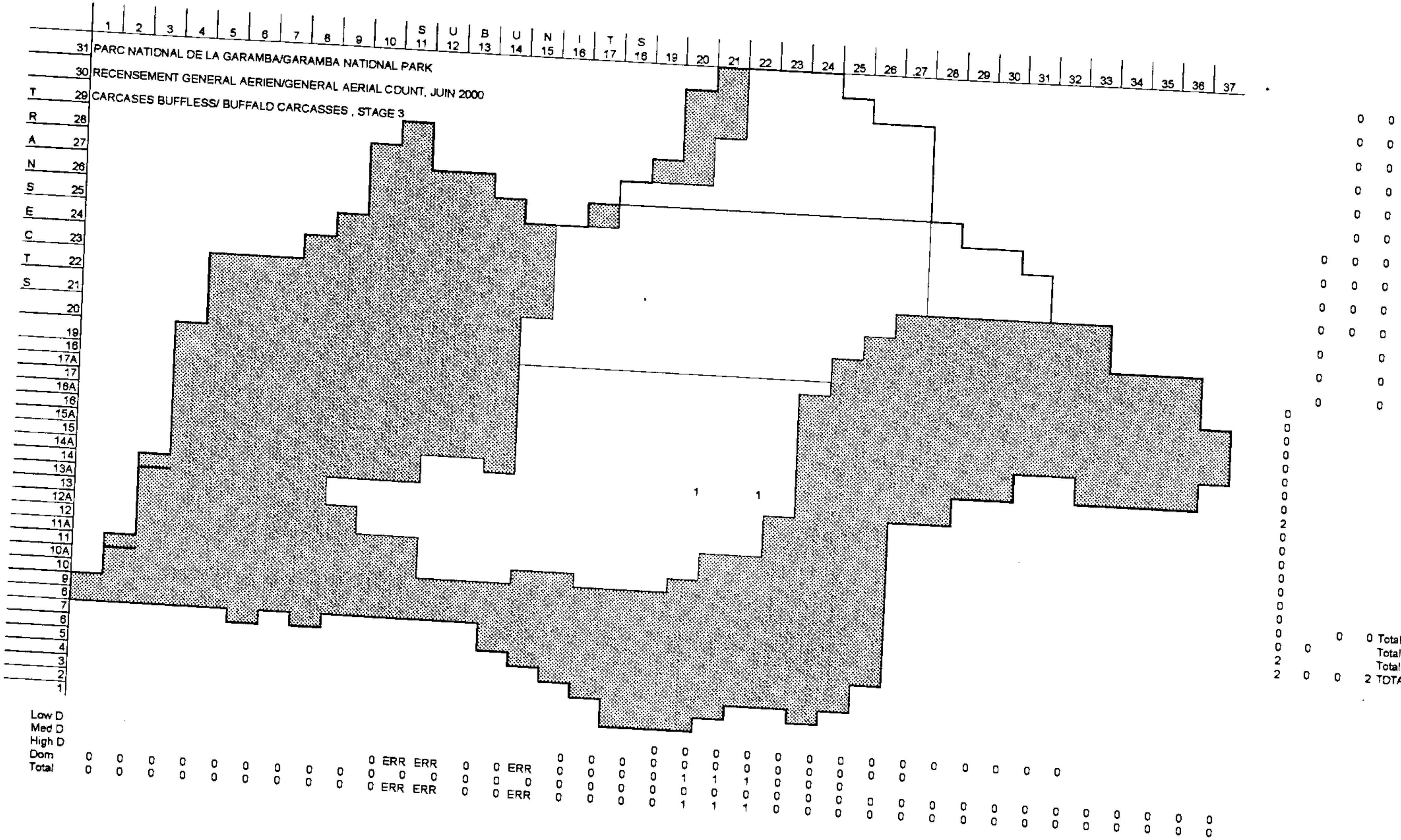
DENSITE DES HYENES / HYENA DENSITY

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000
HYENE / HYENA



Low D
Med D
High D
Dom
Total

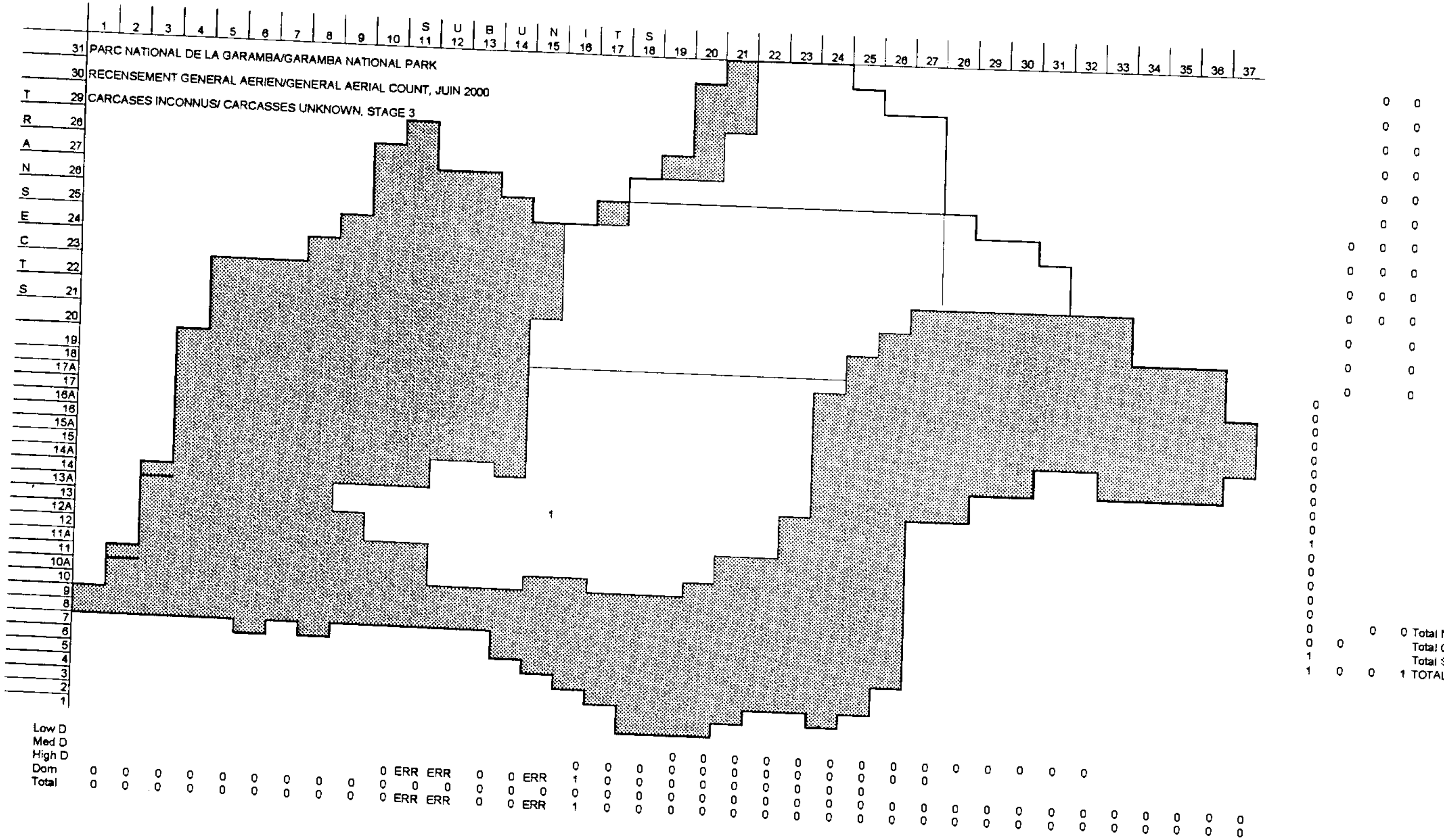
1	0 0
2	0 0
3	0 0
4	0 0
5	0 0
6	0 0
7	0 0
8	0 0
9	1 1
10	0 0 0
11	ERR 0 ERR
12	ERR 0 ERR
13	0 0 0
14	0 0 0
15	ERR 0 ERR
16	0 0 0 0
17	0 0 0 0
18	0 0 0 0
19	0 0 2 0 2
20	0 0 2 0 2
21	0 0 0 0 0
22	0 0 0 0 0
23	0 0 0 0 0
24	0 0 0 0 0
25	0 0 0 0 0
28	0 0 0 0
27	0 0 0 0
28	0 0 0
29	0 0 0
30	0 0 0
31	0 0 0
32	0 0 0
33	0 0
34	0 0
35	0 0
36	0 0
37	0 0



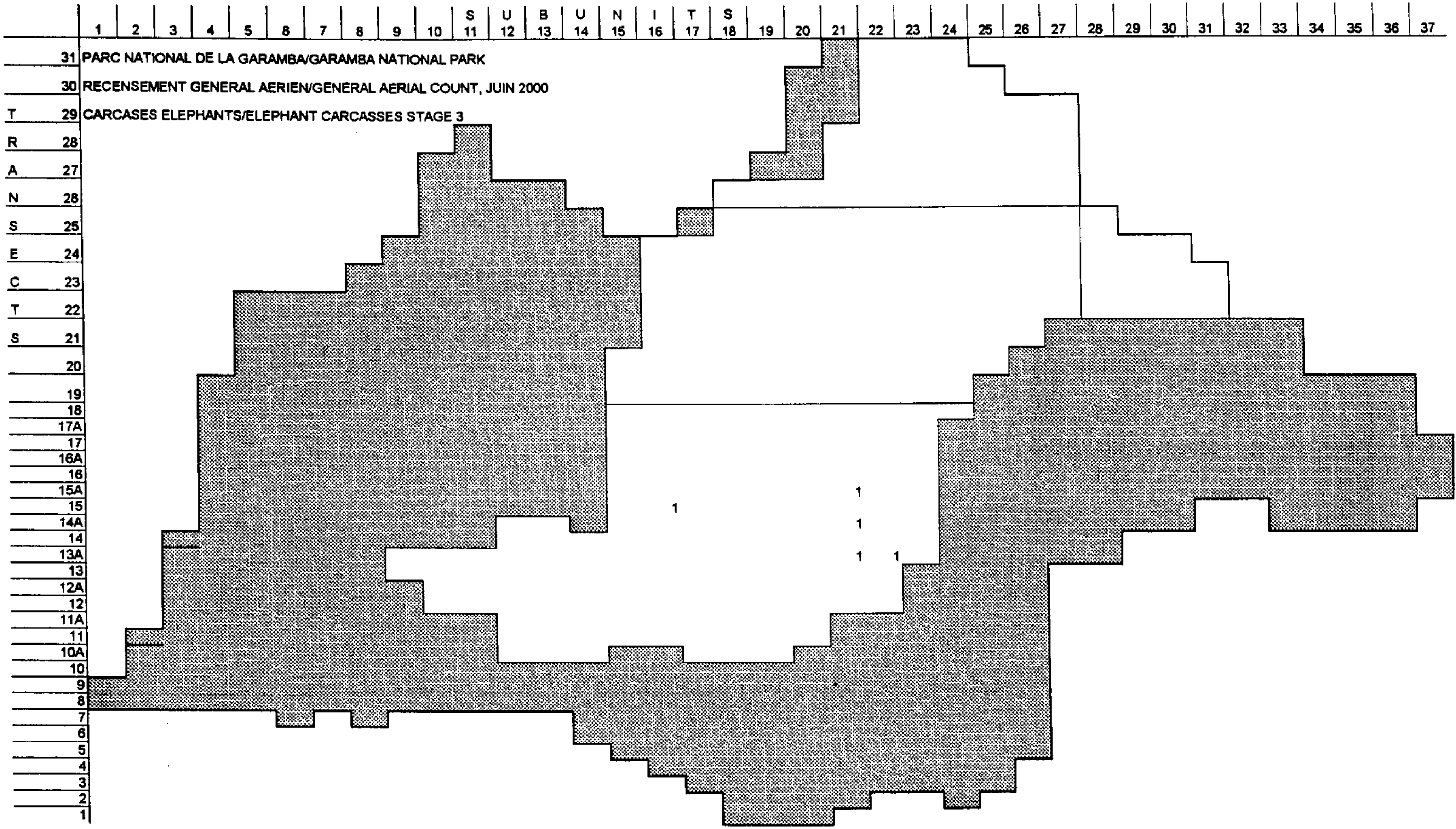
PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

CARCASES BUFFLESS/ BUFFALO CARCASSES , STAGE 3



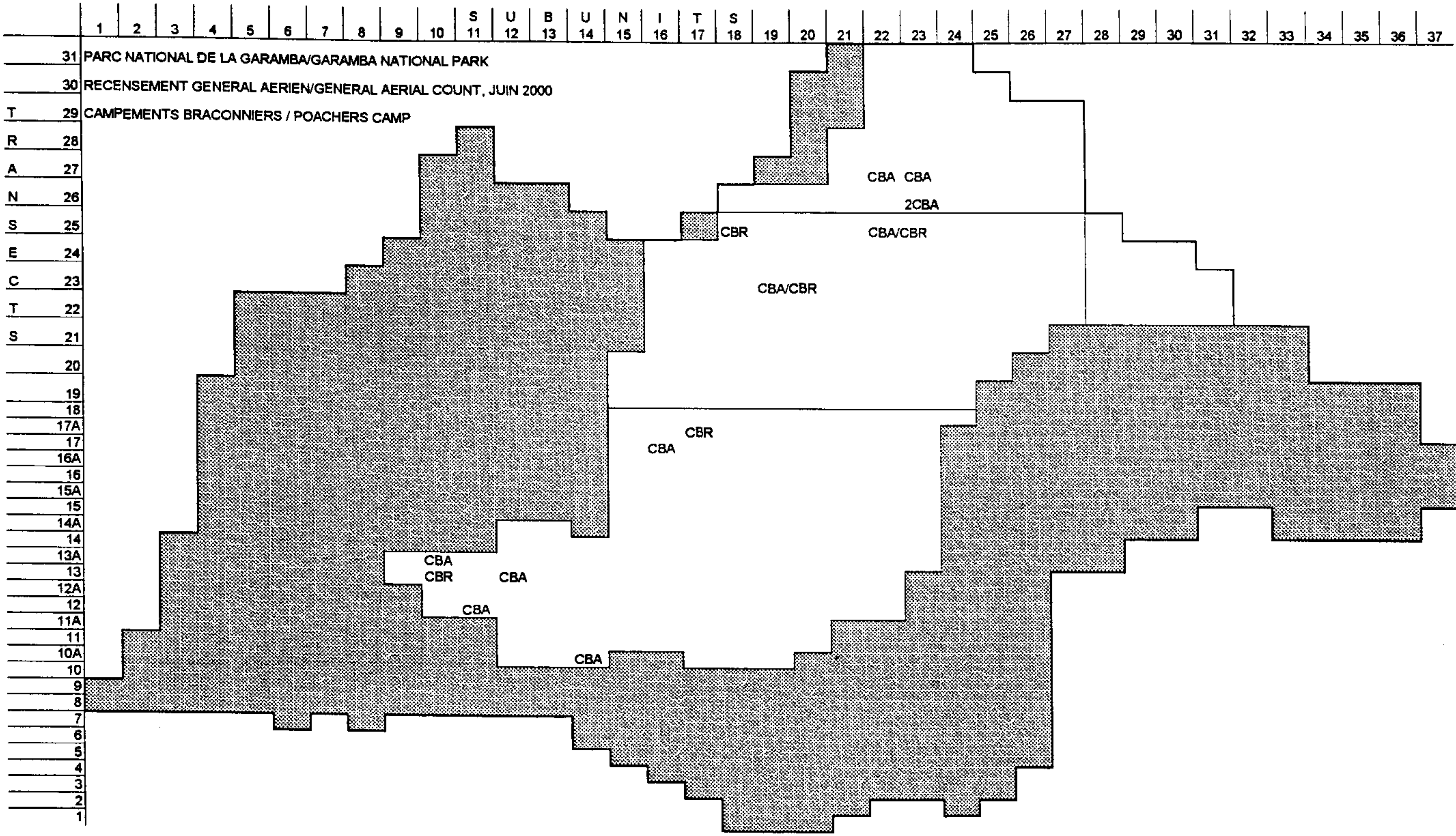
PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000
CARCASES INCONNUS/ CARCASSES UNKNOWN, STAGE 3


PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

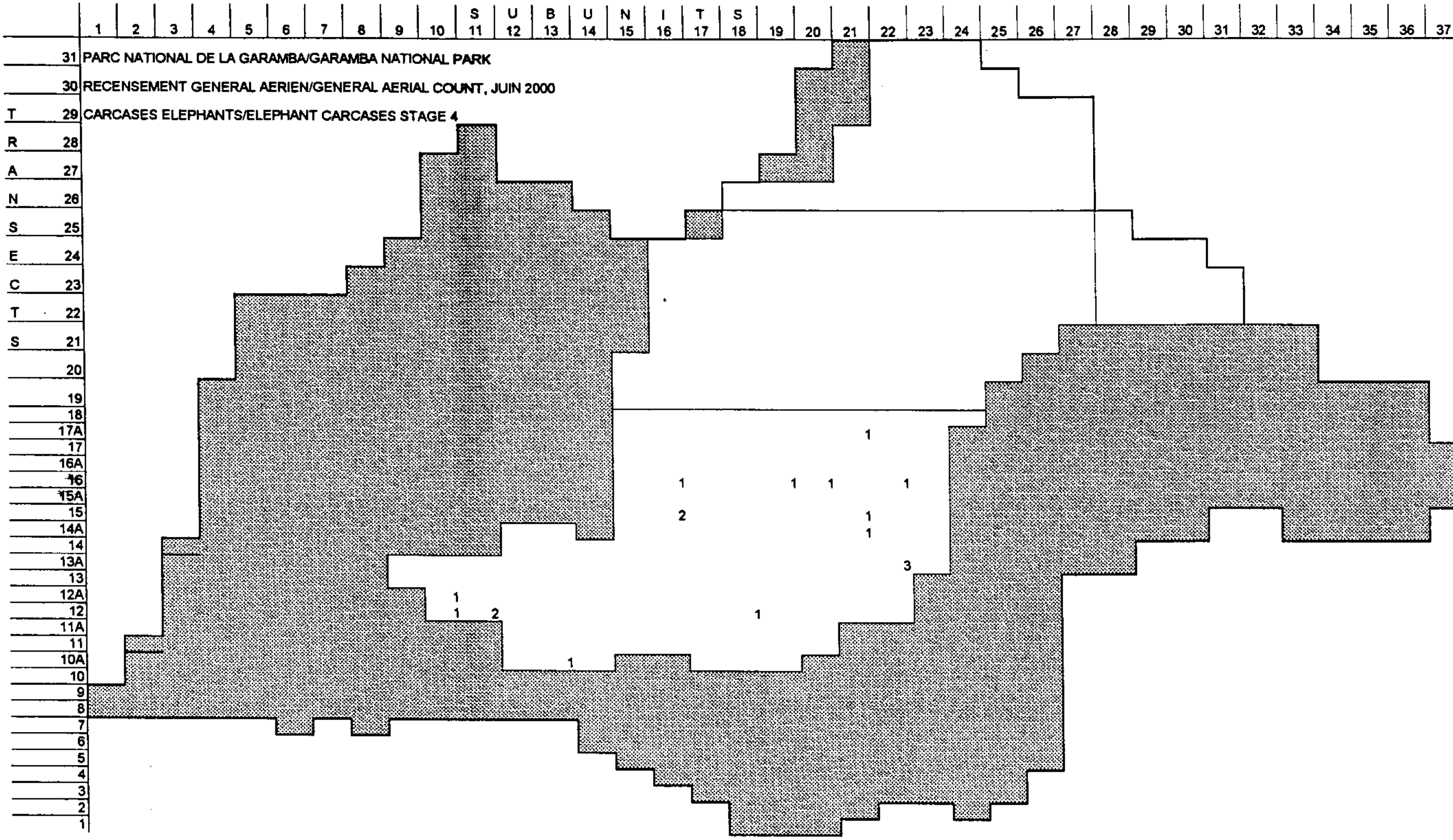
CARCASES ELEPHANTS/ELEPHANT CARCASSES STAGE 3

Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D										0	ERR	ERR	0	0	ERR	1	1	0	0	0	3	1	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	ERR	ERR	0	0	ERR	1	1	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D										0	ERR	ERR	0	0	ERR	0	0	0	0	0	0	0	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	ERR	ERR	0	0	ERR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000
CARCASES ELEPHANTS/ELEPHANT CARCASES STAGE 4



Low D																		
Med D																	0	0	0
High D										0	ERR	ERR	0	0	ERR	3	3	1
Dom	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	1	ERR	ERR	0	0	ERR	3	3	1

Low D	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Med D	0	0	0	0	0	0	0	0	0									
High D	2	2	4	4	0	0	0											
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2	2	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	PNG 2000	AREA			ELEPHANTS					BUFFALOS				
TRANS	HIGH STH	MID NTH	LOW NTH	TOT NORTH	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL
31			5.75	5.75			0	0				0	0	
30			8.62	8.62			0	0				0	0	
29			12.38	12.38			0	0				0	0	
28			13.50	13.50			0	0				0	0	
27			13.44	13.44			0	0				0	0	
26			18.90	18.90			0	0				0	0	
25		19.97	2.19	22.16		0	0	0			0	0	0	
24		21.85	6.66	28.51		0	0	0			0	0	0	
23		23.50	15.30	38.80		0	0	0			0	0	0	
22		22.75	7.45	30.20		0	0	0			0	0	0	
21		21.42		21.42		0		0			0		0	
20		20.75		20.75		0		0			0		0	
19		20.90		20.90		0		0			0		0	
18	19.00				0					1				
17a	16.86				55					50				
17	17.87				94					28				
16a	17.61				38					22				
16	17.83				83					20				
15a	18.10				68					387				
15	17.14				103					180				
14a	22.33				58					98				
14	22.69				21					66				
13a	29.29				24					184				
13	28.51				50					44				
12a	25.19				54					492				
12	25.50				191					160				
11a	18.63				47					173				
11	17.75				39					100				
10a	17.83				2					8				
Total	332.1	151.1	104.2	255.3	927.0	0.0	0.0	0.0		2013.0	0.0	0.0	0.0	
Sum squ	7163.0	3272.1	980.6	6028.1	85439.0	0.0	0.0	0.0		543747.0	0.0	0.0	0.0	
				Sum (Z*y)	19486.2	0.0	0.0	0.0		44138.3	0.0	0.0	0.0	
				R=Sy/Sz	2.8	0.0	0.0	0.0		6.1	0.0	0.0	0.0	
				Var y	2115.4	0.0	0.0	0.0		19365.8	0.0	0.0	0.0	
Var z	17.9	1.5	20.5	84.5					STRAT.					STRAT.
Covar zy					16.2	0.0	0.0	0.0	TOTAL	156.8	0.0	0.0	0.0	TOTAL
					ELEPHANTS					BUFFALOS				
				Pop.est.(Y)	**5,896**	**0**	**0**	**0**	**5,896**	**12,804**	**0**	**0**	**0**	**12,804**
				SE(Y)	1066.0	0.0	0.0	0.0	1066.0	3084.5	0.0	0.0	0.0	3084.54
				95% C.L.	2174.5	0.0	0.0	0.0	2089.3	6292.5	0.0	0.0	0.0	6045.70
				95% C.L.as %	36.9	0.0	0.0	0.0	35.4	49.1	ERR	ERR	ERR	47.22

	PNG 2000	AREA			COBS					HARTBEEST				
TRANS	HIGH ST	MID NTH	LOW NTH	TOT.NORTH	HIGH STH	MID NTH	LOW NTH	TOT.NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT.NTH	TOTAL
31			5.75	5.75			0	0				0	0	
30			8.62	8.62			0	0				0	0	
29			12.38	12.38			0	0				0	0	
28			13.50	13.50			0	0				1	1	
27			13.44	13.44			0	0				0	0	
26			18.90	18.90			0	0				0	0	
25		19.97	2.19	22.16		0	0	0			0	0	0	
24		21.85	6.66	28.51		0	0	0			0	0	0	
23		23.50	15.30	38.80		0	0	0			2	0	2	
22		22.75	7.45	30.20		0	0	0			3	0	3	
21		21.42		21.42		0		0			0		0	
20		20.75		20.75		0		0			2		2	
19		20.90		20.90		0		0			0		0	
18	19.00				2					3				
17a	16.86				42					6				
17	17.87				1					0				
16a	17.61				24					1				
16	17.83				148					0				
15a	18.10				36					6				
15	17.14				48					10				
14a	22.33				7					15				
14	22.69				31					33				
13a	29.29				5					34				
13	28.51				0					24				
12a	25.19				1					14				
12	25.50				51					10				
11a	18.63				63					7				
11	17.75				89					0				
10a	17.83				16					0				
Total	332.1	151.1	104.2	255.3	564.0	0.0	0.0	0.0		163.0	7.0	1.0	8.0	
Sum squ	7163.0	3272.1	980.6	6028.1	43632.0	0.0	0.0	0.0		3573.0	17.0	1.0	18.0	
				Sum (Z*y)	10670.8	0.0	0.0	0.0		3957.7	156.8	13.5	223.2	
				R=Sy/Sz	1.7	0.0	0.0	0.0		0.5	0.0	0.0	0.0	
				Var y	1583.4	0.0	0.0	0.0		127.5	1.7	0.2	1.1	
Var z	17.9	1.5	20.5	84.5					STRAT.					STRAT.
Covar zy					-69.1	0.0	0.0	0.0	TOTAL	38.3	-3.9	0.3	4.8	TOTAL
					COBS					**HARTBEEST**				
				Pop.est.(Y)	**3,587**	**0**	**0**	**0**	**3,587**	**1,037**	**90**	**12**	**99**	**1,139**
				SE(Y)	990.8	0.0	0.0	0.0	990.8	222.4	51.2	9.9	38.4	231.66
				95% C.L.	2021.2	0.0	0.0	0.0	1941.9	453.8	104.4	20.1	78.3	454.05
				95% C.L.as %	56.3	0.0	0.0	0.0	54.1	43.8	115.6	170.9	78.7	39.87

	PNG 2000	AREA			WARTHOGS					WATERBUCK				
TRANS	HIGH STI	MID NTH	LOW NTI	TOT.NORTH	HIGH STI	MID NTH	LOW NTI	TOT NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL
31			5.75	5.75			0	0				0	0	
30			8.62	8.62			0	0				0	0	
29			12.38	12.38			0	0				0	0	
28			13.50	13.50			0	0				0	0	
27			13.44	13.44			0	0				0	0	
26			18.90	18.90			9	9				0	0	
25		19.97	2.19	22.16		1	0	1			0	0	0	
24		21.85	6.66	28.51		5	0	5			0	0	0	
23		23.50	15.30	38.80		0	0	0			0	0	0	
22		22.75	7.45	30.20		0	0	0			0	0	0	
21		21.42		21.42		4		4			0		0	
20		20.75		20.75		4		4			15		15	
19		20.90		20.90		3		3			7		7	
18	19.00				4					2				
17a	16.86				2					7				
17	17.87				4					17				
16a	17.61				10					0				
16	17.83				10					0				
15a	18.10				13					5				
15	17.14				6					40				
14a	22.33				3					0				
14	22.69				7					15				
13a	29.29				5					3				
13	28.51				4					0				
12a	25.19				2					8				
12	25.50				18					0				
11a	18.63				34					0				
11	17.75				11					17				
10a	17.83				9					48				
Total	332.1	151.1	104.2	255.3	142.0	17.0	9.0	26.0		162.0	22.0	0.0	22.0	
Sum squ	7163.0	3272.1	980.6	6028.1	2226.0	67.0	81.0	148.0		4858.0	274.0	0.0	274.0	
				Sum (Z*y)	2858.6	360.6	170.1	566.2		3022.9	457.5	0.0	457.5	
				R=Sy/Sz	0.4	0.1	0.1	0.1		0.5	0.1	0.0	0.1	
				Var y	64.4	4.3	13.5	8.0		214.5	34.1	0.0	19.7	
Var z	17.9	1.5	20.5	84.5					STRAT.					STRAT.
Covar zy					-5.9	-13.5	8.5	1.2	TOTAL	-22.7	-19.3	0.0	-1.0	TOTAL
					WARTHOG					WATERBUCK				
				Pop.est.(Y)	**903**	**219**	**106**	**323**	**1,228**	**1,030**	**284**	**0**	**274**	**1,314**
				SE(Y)	195.4	97.3	85.4	120.4	234.4	355.6	226.5	0.0	192.8	463.63
				95% C.L.	398.6	198.6	174.3	245.7	459.5	725.5	462.1	0.0	393.4	908.72
				95% C.L.as %	44.1	0.0	0.0	0.0	37.4	70.4	162.8	ERR	143.8	69.14

	PNG 2000	AREA			RHINOS					HIPPOS				
TRANS	HIGH STH	MID NTH	LOW NTH	TOT NORTH	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL
31			5.75	5.75			0	0				0	0	
30			8.62	8.62			0	0				0	0	
29			12.38	12.38			0	0				0	0	
28			13.50	13.50			0	0				0	0	
27			13.44	13.44			0	0				1	1	
26			18.90	18.90			0	0				0	0	
25		19.97	2.19	22.16		0	0	0			0	0	0	
24		21.85	6.66	28.51		0	0	0			0	0	0	
23		23.50	15.30	38.80		0	0	0			0	0	0	
22		22.75	7.45	30.20		0	0	0			0	0	0	
21		21.42		21.42		0		0			0		0	
20		20.75		20.75		0		0			0		0	
19		20.90		20.90		0		0			0		0	
18	19.00				0					0				
17a	16.86				0					0				
17	17.87				0					20				
16a	17.61				0					0				
16	17.83				0					1				
15a	18.10				0					0				
15	17.14				0					0				
14a	22.33				0					6				
14	22.69				0					87				
13a	29.29				3					4				
13	28.51				0					9				
12a	25.19				0					3				
12	25.50				0					4				
11a	18.63				0					12				
11	17.75				0					2				
10a	17.83				0					0				
Total	332.1	151.1	104.2	255.3	3.0	0.0	0.0	0.0		148.0	0.0	1.0	1.0	
Sum squ	7163.0	3272.1	980.6	6028.1	9.0	0.0	0.0	0.0		8276.0	0.0	1.0	1.0	
				Sum (Z*y)	87.9	0.0	0.0	0.0		3293.9	0.0	13.4	13.4	
				R=Sy/Sz	0.0	0.0	0.0	0.0		0.4	0.0	0.0	0.0	
				Var y	0.6	0.0	0.0	0.0		460.5	0.0	0.2	0.1	
Var z	17.9	1.5	20.5	84.5					STRAT.					STRAT.
Covar zy					1.7	0.0	0.0	0.0	TOTAL	14.8	0.0	0.3	-0.7	TOTAL
					RHINOS					HIPPOS				
				Pop.est.(Y)	**19**	**0**	**0**	**0**	**19**	**941**	**0**	**12**	**12**	**953**
				SE(Y)	16.7	0.0	0.0	0.0	16.7	486.5	0.0	9.9	12.4	486.77
				95% C.L.	34.1	0.0	0.0	0.0	32.8	992.5	0.0	20.1	25.3	954.08
				95% C.L.as %	178.9	0.0	0.0	0.0	171.8	105.4	ERR	171.0	203.7	100.10

	PNG 2000	AREA			BUSHBUCK					REEDBUCK				
TRANS	HIGH STH	MID NTH	LOW NTH	TOT NORTH	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL
31			5.75	5.75			0	0				0	0	
30			8.62	8.62			0	0				0	0	
29			12.38	12.38			0	0				0	0	
28			13.50	13.50			1	1				0	0	
27			13.44	13.44			0	0				0	0	
26			18.90	18.90			1	1				1	1	
25		19.97	2.19	22.16		0	0	0			0	0	0	
24		21.85	6.66	28.51		0	0	0			1	0	1	
23		23.50	15.30	38.80		0	1	1			0	1	1	
22		22.75	7.45	30.20		1	0	1			0	0	0	
21		21.42		21.42		1		1			1		1	
20		20.75		20.75		0		0			2		2	
19		20.90		20.90		0		0			0		0	
18	19.00				0					1				
17a	16.86				1					0				
17	17.87				0					0				
16a	17.61				1					0				
16	17.83				0					1				
15a	18.10				0					0				
15	17.14				1					2				
14a	22.33				1					0				
14	22.69				0					0				
13a	29.29				0					0				
13	28.51				0					0				
12a	25.19				0					0				
12	25.50				0					0				
11a	18.63				0					0				
11	17.75				0					0				
10a	17.83				0					0				
Total	332.1	151.1	104.2	255.3	4.0	2.0	3.0	5.0		4.0	4.0	2.0	6.0	
Sum squ	7163.0	3272.1	980.6	6028.1	4.0	2.0	2.0	5.0		6.0	6.0	1.0	8.0	
				Sum (Z*y)	73.9	44.2	32.4	122.8		71.1	84.8	18.9	149.1	
				R=Sy/Sz	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
				Var y	0.2	0.2	0.3	0.3		0.3	0.6	0.2	0.4	
Var z	17.9	1.5	20.5	84.5					STRAT.					STRAT.
Covar zy					-0.6	-1.2	0.1	1.5	TOTAL	-0.8	-3.2	-0.2	2.0	TOTAL
					BUSHBUCK					**REEDBUCK**				
				Pop.est.(Y)	**25**	**26**	**35**	**62**	**87**	**25**	**52**	**24**	**75**	**101**
				SE(Y)	10.7	18.7	12.9	19.2	25.1	13.7	31.9	10.5	25.4	44.23
				95% C.L.	21.8	38.1	26.2	39.2	49.2	27.9	65.1	21.3	51.7	86.70
				95% C.L.as %	85.6	0.0	0.0	0.0	56.8	109.5	126.1	90.7	69.3	86.21

	PNG 2000		AREA		LION					HYENA				
TRANS	HIGH STH	MID NTH	LOW NTH	TOT NORTH	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL
31			5.75	5.75			0	0				0	0	
30			8.62	8.62			0	0				0	0	
29			12.38	12.38			0	0				0	0	
28			13.50	13.50			0	0				0	0	
27			13.44	13.44			0	0				0	0	
26			18.90	18.90			0	0				0	0	
25		19.97	2.19	22.16		0	0	0			0	0	0	
24		21.85	6.66	28.51		0	0	0			0	0	0	
23		23.50	15.30	38.80		0	0	0			0	0	0	
22		22.75	7.45	30.20		0	0	0			0	0	0	
21		21.42		21.42		0		0			0		0	
20		20.75		20.75		0		0			0		0	
19		20.90		20.90		0		0			0		0	
18	19.00				0					0				
17a	16.86				0					0				
17	17.87				0					0				
16a	17.61				0					0				
16	17.83				3					0				
15a	18.10				0					0				
15	17.14				0					0				
14a	22.33				0					0				
14	22.69				0					0				
13a	29.29				0					1				
13	28.51				0					2				
12a	25.19				0					0				
12	25.50				0					0				
11a	18.63				0					0				
11	17.75				0					0				
10a	17.83				0					0				
Total	332.1	151.1	104.2	255.3	3.0	0.0	0.0	0.0		3.0	0.0	0.0	0.0	
Sum squ	7163.0	3272.1	980.6	6028.1	9.0	0.0	0.0	0.0		5.0	0.0	0.0	0.0	
				Sum (Z*y)	53.5	0.0	0.0	0.0		86.3	0.0	0.0	0.0	
				R=Sy/Sz	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
				Var y	0.6	0.0	0.0	0.0		0.3	0.0	0.0	0.0	
Var z	17.9	1.5	20.5	84.5					STRAT.					STRAT.
Covar zy					-0.6	0.0	0.0	0.0	TOTAL	1.6	0.0	0.0	0.0	TOTAL
					LION					HYENA				
				Pop.est.(Y)	**19**	**0**	**0**	**0**	**19**	**19**	**0**	**0**	**0**	**19**
				SE(Y)	17.4	0.0	0.0	0.0	17.4	11.9	0.0	0.0	0.0	11.87
				95% C.L.	35.4	0.0	0.0	0.0	34.0	24.2	0.0	0.0	0.0	23.26
				95% C.L.as %	185.7	0.0	0.0	0.0	178.4	126.9	ERR	ERR	ERR	121.92

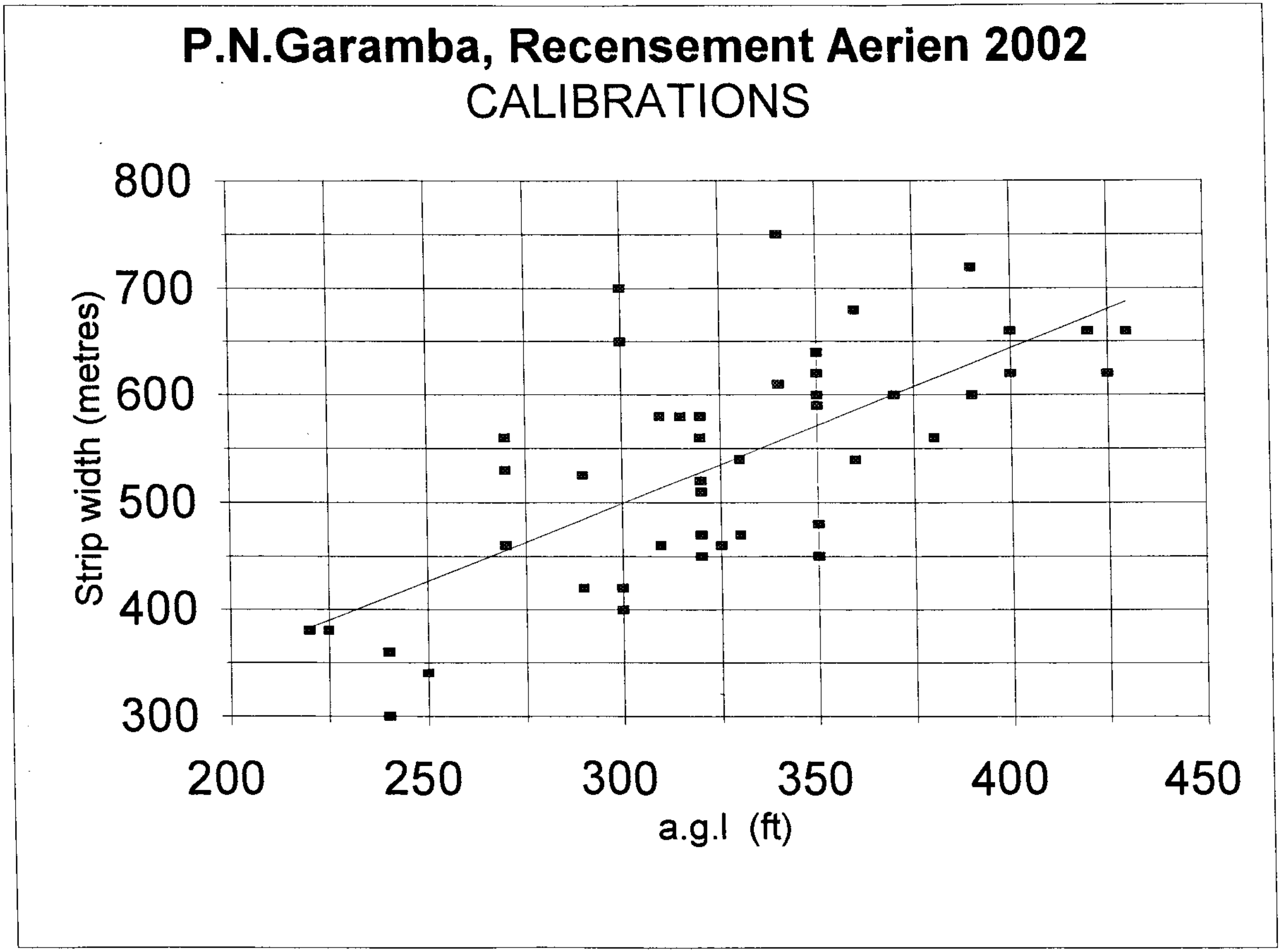
	PNG 2000	AREA			ORIBI					ELEPHANTS CARCASES, STAGE 3					ELEPHANTS CARCASES, STAGE 4				
TRANS	HIGH STH	MID NTH	LOW NTH	TOT NORTH	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL
31			5.75	5.75			0	0				0	0				0	0	
30			8.62	6.62			0	0				0	0				0	0	
29			12.38	12.38			0	0				0	0				0	0	
28			13.50	13.50			0	0				0	0				0	0	
27			13.44	13.44			0	0				0	0				0	0	
26			18.90	18.90			0	0				0	0				0	0	
25		19.97	2.19	22.16		0	0	0			0	0	0			0	0	0	
24		21.85	6.66	28.51		0	0	0			0	0	0			0	0	0	
23		23.50	15.30	38.80		0	0	0			0	0	0			0	0	0	
22		22.75	7.45	30.20		0	0	0			0	0	0			0	0	0	
21		21.42		21.42		0		0			0		0			0		0	
20		20.75		20.75		0		0			0		0			0		0	
19		20.90		20.90		0		0			0		0			0		0	
18	19.00				0					0					0				
17a	16.86				0					0					1				
17	17.87				2					0					0				
16a	17.61				0					0					0				
16	17.83				0					0					4				
15a	18.10				0					1					0				
15	17.14				2					1					3				
14a	22.33				0					1					1				
14	22.69				2					0					0				
13a	29.29				0					2					3				
13	28.51				0					0					0				
12a	25.19				0					0					1				
12	25.50				0					0					4				
11a	18.63				0					0					0				
11	17.75				0					0					0				
10a	17.83				0					0					1				
Total	332.1	151.1	104.2	255.3	6.0	0.0	0.0	0.0		5.0	0.0	0.0	0.0		18.0	0.0	0.0	0.0	
Sum squ	7163.0	3272.1	980.6	6028.1	12.0	0.0	0.0	0.0		7.0	0.0	0.0	0.0		54.0	0.0	0.0	0.0	
				Sum (Z*y)	115.4	0.0	0.0	0.0		116.1	0.0	0.0	0.0		394.8	0.0	0.0	0.0	
				R=Sy/Sz	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.1	0.0	0.0	0.0	
				Var y	0.7	0.0	0.0	0.0		0.4	0.0	0.0	0.0		2.3	0.0	0.0	0.0	
Var z	17.9	1.5	20.5	84.5					STRAT.					STRAT.					STRAT.
Covar zy					-0.6	0.0	0.0	0.0	TOTAL	0.8	0.0	0.0	0.0	TOTAL	1.4	0.0	0.0	0.0	TOTAL
					ORIBI					ELEPHANTS CARCASES, STAGE 3					ELEPHANTS CARCASES, STAGE 4				
				Pop.est.(Y)	38	0	0	0	38	32	0	0	0	32	114	0	0	0	114
				SE(Y)	18.9	0.0	0.0	0.0	18.9	13.4	0.0	0.0	0.0	13.39	33.6	0.0	0.0	0.0	33.59
				95% C.L.	38.5	0.0	0.0	0.0	37.0	27.3	0.0	0.0	0.0	26.25	68.5	0.0	0.0	0.0	65.84
				95% C.L.as %	100.8	0.0	0.0	0.0	96.9	85.9	ERR	ERR	ERR	82.55	59.9	ERR	ERR	ERR	57.51

PARC NATIONAL DE LA GARAMBA
GARAMBA NATIONAL PARK

RECENSEMENT GENERAL SYSTEMATIQUE
GENERAL AERIAL SYSTEMATIC SAMPLE COUNT

Calibration Graphs, Distribution Maps and Population Estimate Calculations

May / Mai 2002


P.N.Garamba, Recensement Aerien 2002
CALIBRATIONS
Strip width (metres)
800
700
600
500
400
300
200
250
300
350
400
450
a.g.l (ft)

CALIBRATION , May 2002

No	Alt agl	Strip Width
1	330	470
2	315	580
3	370	600
4	290	525
5	270	460
6	270	530
7	320	560
8	350	450
9	350	590
10	320	450
11	270	560
12	350	480
13	320	470
14	390	720
15	310	460
16	300	400
17	300	420
18	380	560
19	425	620
20	390	600
21	300	700
22	300	650
23	330	540
24	360	680
25	420	660
26	320	520
27	400	660
28	400	620
29	340	750
30	220	380
31	320	510
32	360	540
33	340	610
34	350	640
35	430	660
36	350	600
37	360	540
38	225	380
39	250	340
40	240	300
41	240	360
42	290	420
43	310	580
44	325	460
45	320	580
46	350	620

Regression Output:

Constant	**131.8018**
Std Err of Y Est	**80.24209**
R Squared	**0.436305**
No. of Observations	**47**
Degrees of Freedom	**45**

X Coefficient(s)	**1.23E+00**
Std Err of Coef.	**0.2090577828**

Y = M.X + C

Y = 1.23380318303919 X + 131.801796597442
not used - eliminated 500/600 anomolous reading

Regression Output:

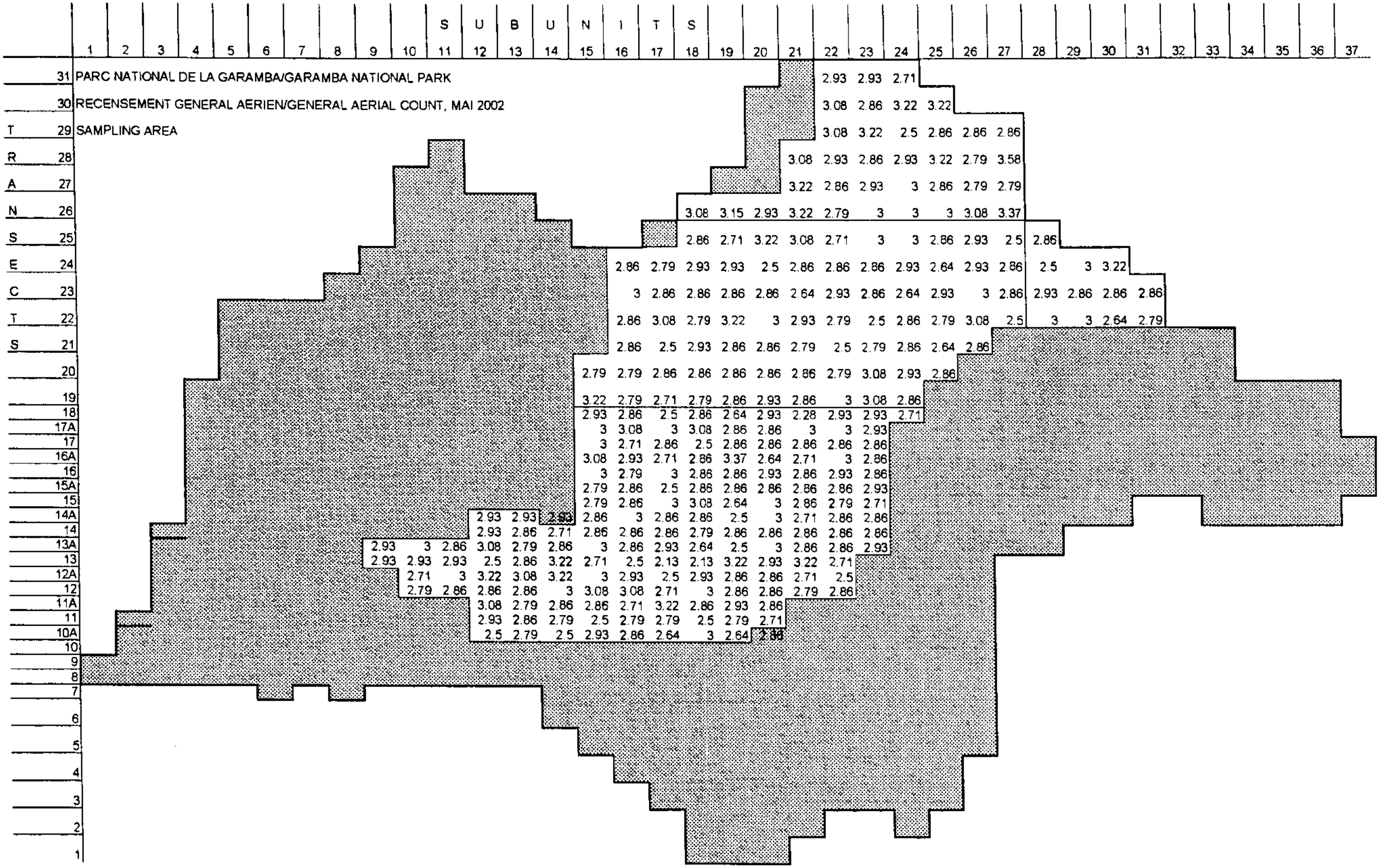
Constant	64.00504
Std Err of Y Est	77.10593
R Squared	0.48747
No. of Observations	46
Degrees of Freedom	44

X Coefficient(s)	1.4506150141
Std Err of Coef.	0.2242389917

Y= 1.4506 . X + 64.005

220	380	383.137
225	380	390.39
240	360	412.149
240	300	412.149
250	340	426.655
270	560	455.667
270	460	455.667
270	530	455.667
290	525	484.679
290	420	484.679
300	400	499.185
300	420	499.185
300	700	499.185
300	650	499.185
310	580	513.691
310	460	513.691
315	580	520.944
320	580	528.197
320	510	528.197
320	450	528.197
320	560	528.197
320	520	528.197
320	470	528.197
325	460	535.45
330	540	542.703
330	470	542.703
340	750	557.209
340	610	557.209
350	640	571.715
350	590	571.715
350	450	571.715
350	600	571.715
350	480	571.715
350	620	571.715
360	540	586.221
360	540	586.221
360	680	586.221
370	600	600.727
380	560	615.233
390	600	629.739
390	720	629.739
400	620	644.245
400	660	644.245
420	660	673.257
425	620	680.51
430	660	687.763

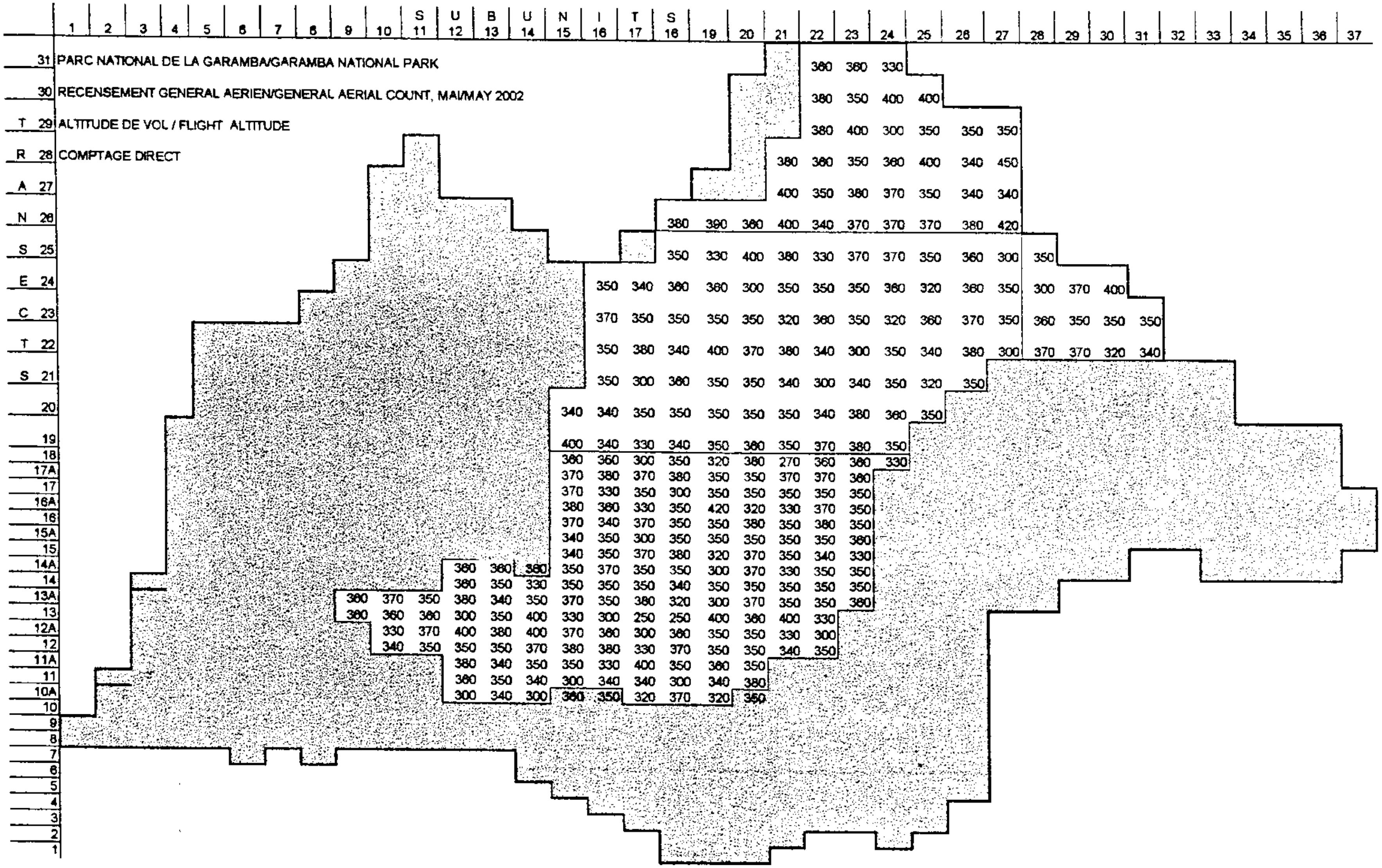
PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2002
SAMPLING AREA



SUBUNITS

TRANSECTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
31																						2.93	2.93	2.71													
30																						3.08	2.86	3.22	3.22												
29																						3.08	3.22	2.5	2.86	2.86	2.86										
28																					3.08	2.93	2.86	2.93	3.22	2.79	3.58										
27																					3.22	2.86	2.93	3	2.86	2.79	2.79										
26																		3.08	3.15	2.93	3.22	2.79	3	3	3	3.08	3.37										
25																		2.86	2.71	3.22	3.08	2.71	3	3	2.86	2.93	2.5	2.86									
24																2.86	2.79	2.93	2.93	2.5	2.86	2.86	2.86	2.93	2.64	2.93	2.86	2.5	3	3.22							
23																3	2.86	2.86	2.86	2.86	2.64	2.93	2.86	2.64	2.93	3	2.86	2.93	2.86	2.86	2.86						
22																2.86	3.08	2.79	3.22	3	2.93	2.79	2.5	2.86	2.79	3.08	2.5	3	3	2.64	2.79						
21																2.86	2.5	2.93	2.86	2.86	2.79	2.5	2.79	2.86	2.64	2.86											
20															2.79	2.79	2.86	2.86	2.86	2.86	2.86	2.79	3.08	2.93	2.86												
19															3.22	2.79	2.71	2.79	2.86	2.93	2.86	3	3.08	2.86													
18															2.93	2.86	2.5	2.86	2.64	2.93	2.28	2.93	2.93	2.71													
17A															3	3.08	3	3.08	2.86	2.86	3	3	2.93														
17															3	2.71	2.86	2.5	2.86	2.86	2.86	2.86	2.86														
16A															3.08	2.93	2.71	2.86	3.37	2.64	2.71	3	2.86														
16															3	2.79	3	2.86	2.86	2.93	2.86	2.93	2.86														
15A															2.79	2.86	2.5	2.86	2.86	2.86	2.86	2.86	2.93														
15															2.79	2.86	3	3.08	2.64	3	2.86	2.79	2.71														
14A												2.93	2.93	2.93	2.86	3	2.86	2.86	2.5	3	2.71	2.86	2.86														
14												2.93	2.86	2.71	2.86	2.86	2.86	2.79	2.86	2.86	2.86	2.86	2.86														
13A									2.93	3	2.86	3.08	2.79	2.86	3	2.86	2.93	2.64	2.5	3	2.86	2.86	2.93														
13									2.93	2.93	2.93	2.5	2.86	3.22	2.71	2.5	2.13	2.13	3.22	2.93	3.22	2.71															
12A										2.71	3	3.22	3.08	3.22	3	2.93	2.5	2.93	2.86	2.86	2.71	2.5															
12										2.79	2.86	2.86	2.86	3	3.08	3.08	2.71	3	2.86	2.86	2.79	2.86															
11A												3.08	2.79	2.86	2.86	2.71	3.22	2.86	2.93	2.86																	
11												2.93	2.86	2.79	2.5	2.79	2.79	2.5	2.79	2.71																	
10A												2.5	2.79	2.5	2.93	2.86	2.64	3	2.64	2.86																	
10																																					
9																																					
8																																					
7																																					
6																																					
5																																					
4																																					
3																																					
2																																					
1																																					
Low D																			3.15	2.93	6.44	8.58	17.8	17.4	15.2	11.5	12.6	11.3	8.87	8.72	5.64	0					
Med D																8.43	16.8	20	20.3	20.2	20	19.6	20.2	20.1	16.7	14.8	10.7										
High D										2.93	8.79	14.6	23	20.7	20	42.8	41.6	41.8	42.6	43.2	36.6	37	28.7	2.71	0												
Dom	0	0	0	0	0	0	0	0	5.86	2.79	0	5.43	0	0	26.6	8.72	0	0	0	0	3.08	9.08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	5.86	5.72	8.79	20	23	20.7	46.6	60	58.4	61.8	66	66.3	66.1	74.3	66.7	40.2	31.9	26.3	23.3	11.3	8.87	8.72	5.64	0	0	0	0	0	0



PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002

ALTITUDE DE VOL / FLIGHT ALTITUDE

COMPTAGE DIRECT

	9	10	S 11	U 12	B 13	U 14	N 15	I 16	T 17	S 18	19	20	21	22	23	24	25	26	27	28	29	30	31					
31														380	380	330										350	350	
30														380	350	400	400									383	382.5	
T 29														380	400	300	350	350	350							355	355	
R 28													380	380	350	360	400	340	450							377	377 1	
A 27													400	350	380	370	350	340	340							359	358 8	
N 26										380	390	380	400	340	370	370	370	380	420							376	376	
S 25										350	330	400	380	330	370	370	350	360	300	350					354	350	352	
E 24								350	340	380	380	300	350	350	350	360	320	380	350	300	370	400			346	357	351.3	
C 23								370	350	350	350	350	320	380	350	320	360	370	350	360	350	350	350		350	351	350.6	
T 22								350	380	340	400	370	380	340	300	350	340	380	300	370	370	320	340		351	350	350.4	
S 21								350	300	380	350	350	340	300	340	350	320	350							337		337.3	
20							340	340	350	350	350	350	350	340	380	360	350								351		350.9	
19							400	340	330	340	350	380	350	370	380	350									357		357	
18							380	360	300	350	320	380	270	360	380	330								336				
17A							370	380	370	380	350	350	370	370	380									366.7				
17							370	330	350	300	350	350	350	350	350									344.4				
16A							380	380	330	350	420	320	330	370	350									356.7				
16							370	340	370	350	350	380	350	380	350									355.6				
15A							340	350	300	350	350	350	350	350	380									344.4				
15							340	350	370	380	320	370	350	340	330									350				
14A				380	360	360	350	370	350	350	300	370	330	350	350									349.1				
14				380	350	330	350	350	350	340	350	350	350	350	350									348.3				
13A	360	370	350	380	340	350	370	350	380	320	300	370	350	350	380									352				
13	380	360	360	300	350	400	330	300	250	250	400	380	400	330										339.3				
12A		330	370	400	380	400	370	360	300	360	350	350	330	300										353.8				
12		340	350	350	350	370	380	380	330	370	350	350	340	350										354.6				
11A				380	340	350	350	330	400	350	360	350												356.7				
11				360	350	340	300	340	340	300	340	380												333.3				
10A				300	340	300	380	350	320	370	320	350												334.4				
10																										367		Total
9																									349			Total
8																								348.5				Total
7																								348.5	349	381	352.9	TOTA

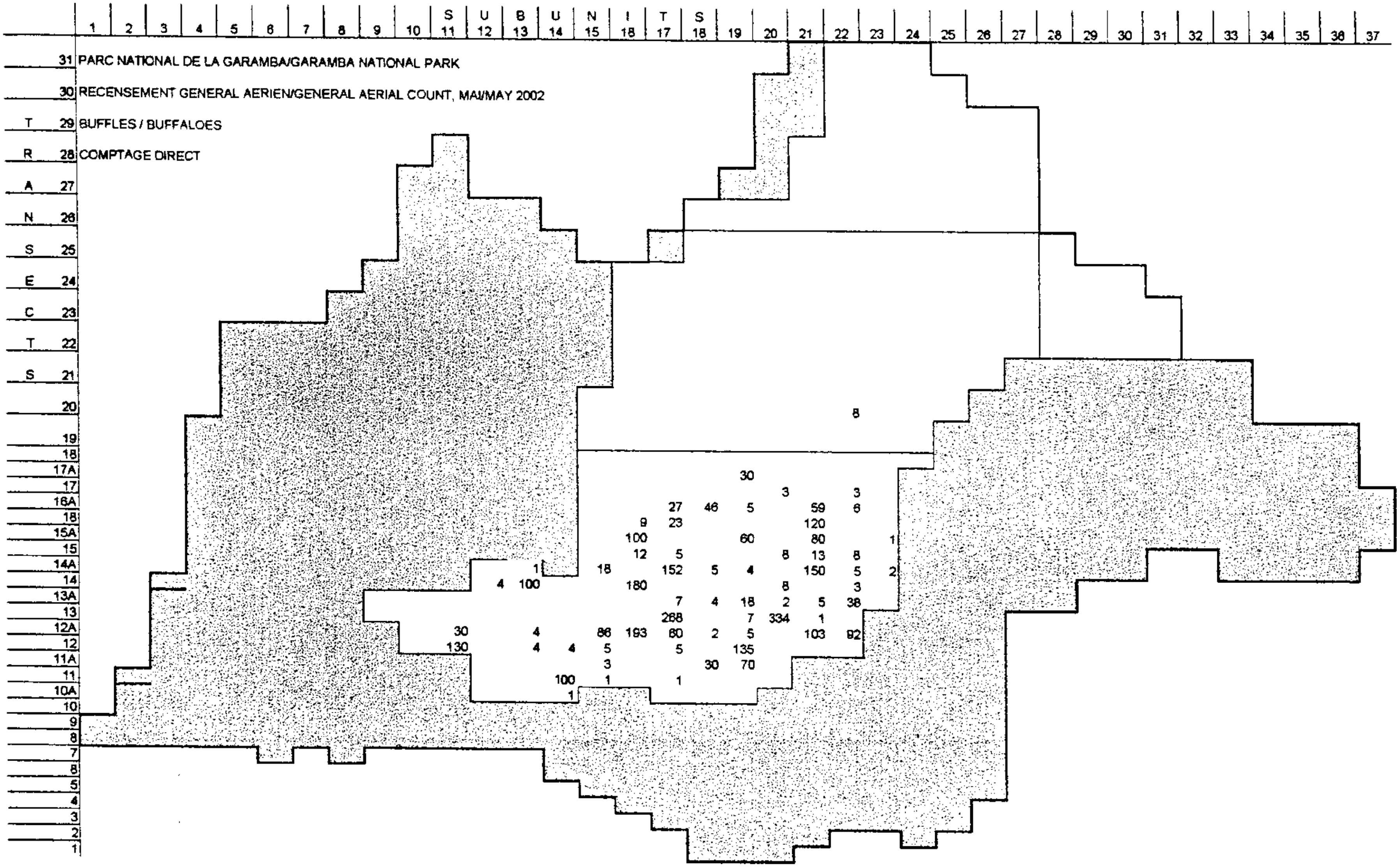
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			390	360	400	350	365	355	374	352.5	390	345	363	357	345	0					
Med D																343	342	350	355.7	354	350	341	353	351	340	364	325										
High D									ERR	350	350	341	353	353	356	349	338	340	347.3	353	344	348	352	330	0												
Dorr	ERR	ERR	ERR	****	ERR	ERR	ERR	ERR	360	ERR	ERR	ERR	ERR	ERR	360	357	0	ERR	0	ERR	360	373	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR
Tota	ERR	ERR	ERR	****	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	358	350	227	ERR	273.3	ERR	368	353	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR	ERR

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002

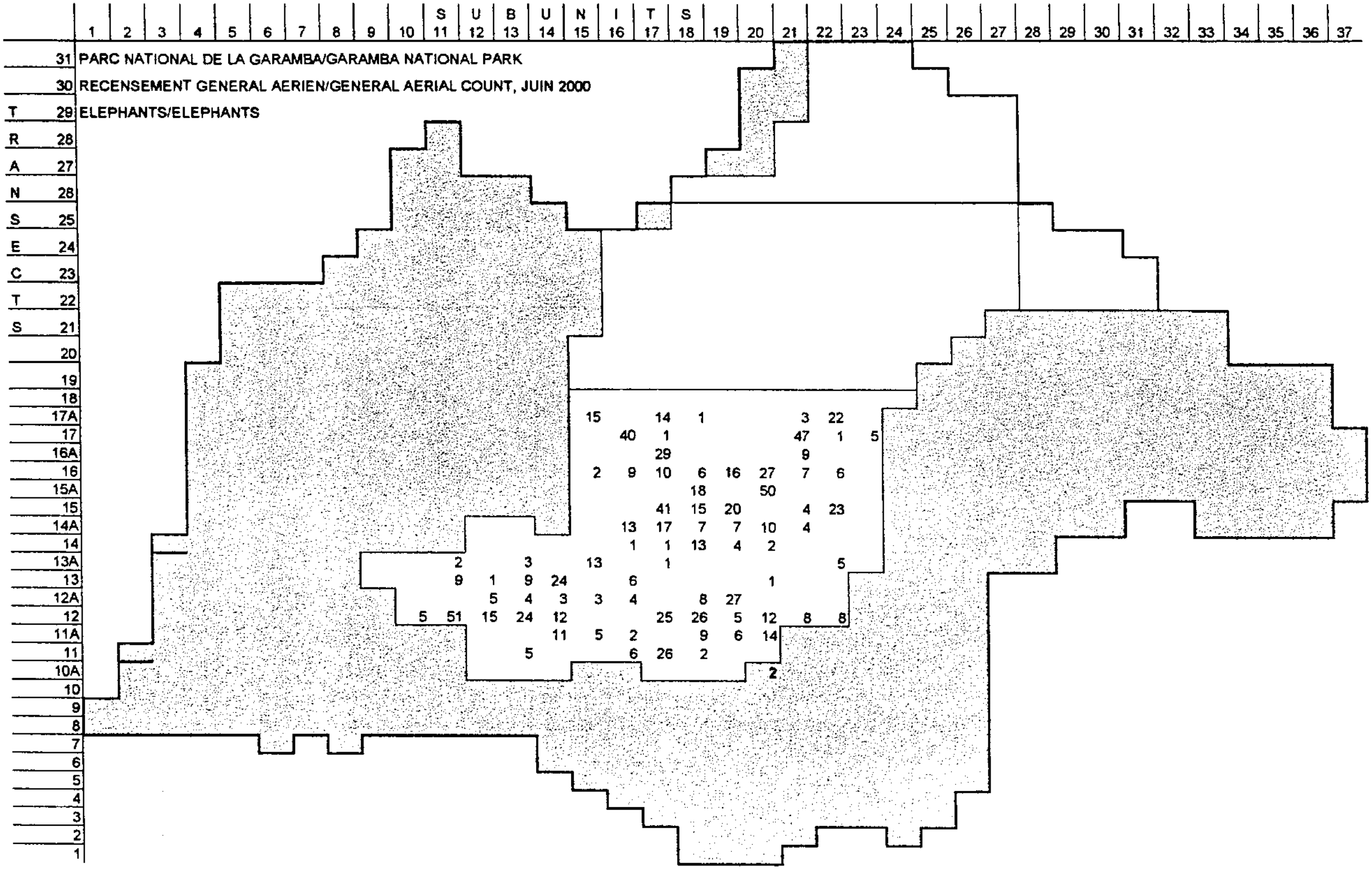
BUFFLES / BUFFALOES

COMPTAGE DIRECT



Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	8	0	0	0	0	0										
High D									0	0	0	239	342	214	199	494	548	87	334	351	531	153	3	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	239	342	214	199	494	548	87	334	351	531	181	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0		0	
	8		8	
	0		0	
0				
30				
8				
143				
152				
241				
42				
337				
293				
74				
610				
575				
283				
103				
102				
1				
0		0		To
	8			To
2992				To
2992	8	0	3000	TO



PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, JUIN 2000

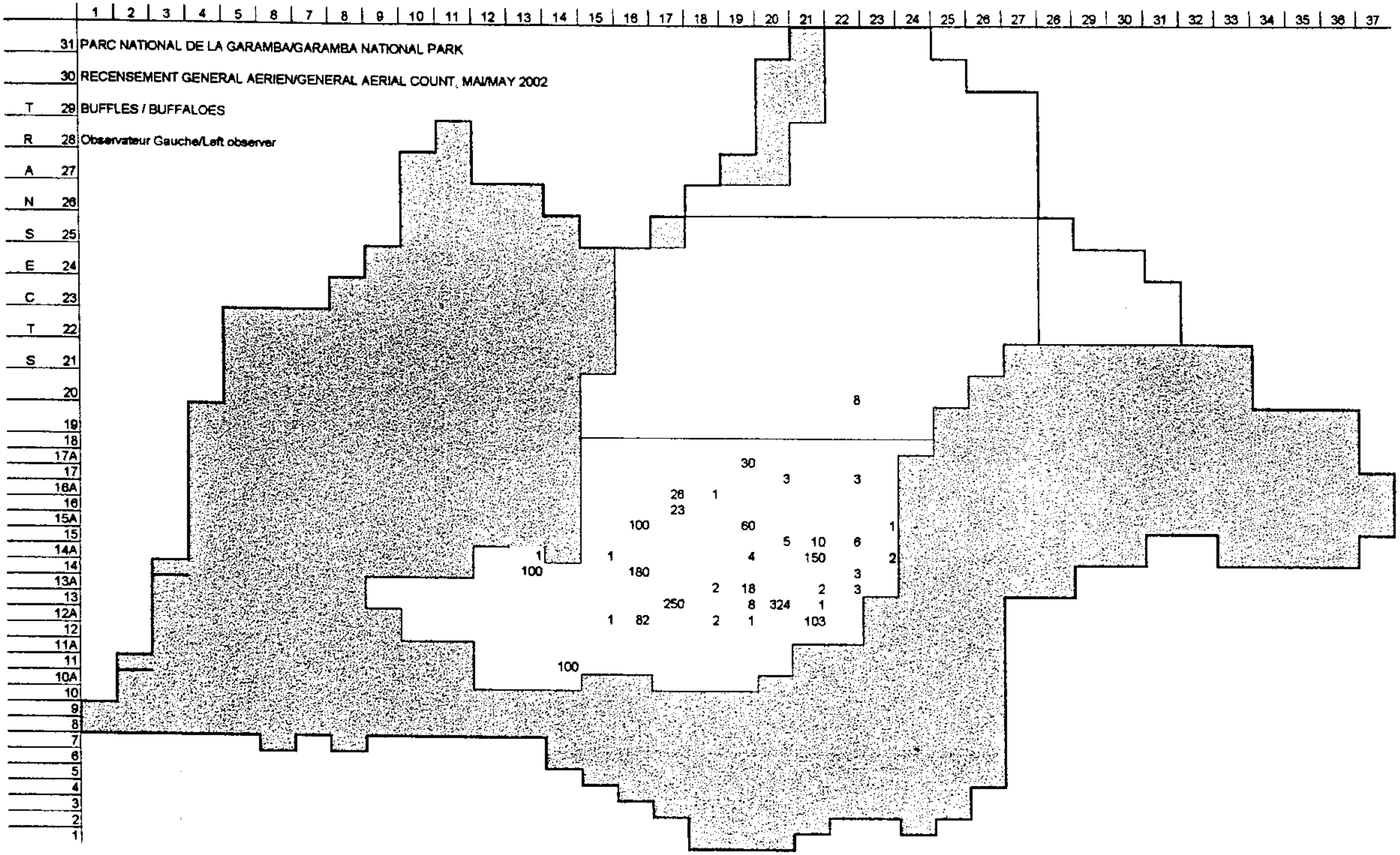
ELEPHANTS/ELEPHANTS

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002

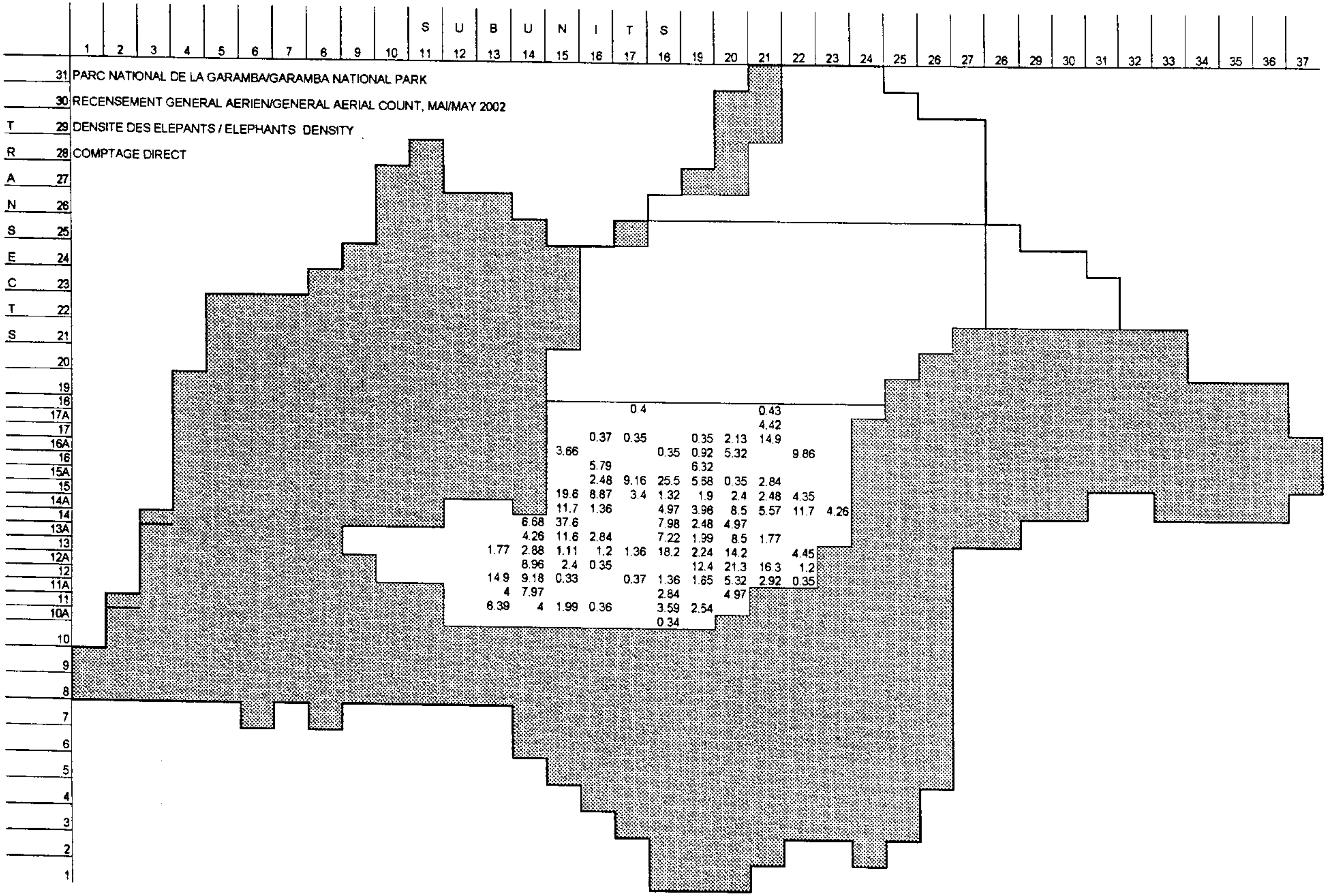
BUFFLES / BUFFALOES

Observateur Gauche/Left observer



Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	6	0	0	0	0	0										
High D									0	0	0	29	324	201	101	362	299	5	119	332	266	15	3	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	29	324	201	101	362	299	5	119	332	266	23	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0		0	
	8		6	
	0		0	
0				
30				
6				
27				
23				
161				
21				
158				
283				
25				
581				
189				
0				
0				
100				
0				
0		0		Tot
	6			Tot
1604				Tot
1604	6	0	1612	TO



PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002

DENSITE DES ELEPANTS / ELEPHANTS DENSITY

COMPTAGE DIRECT

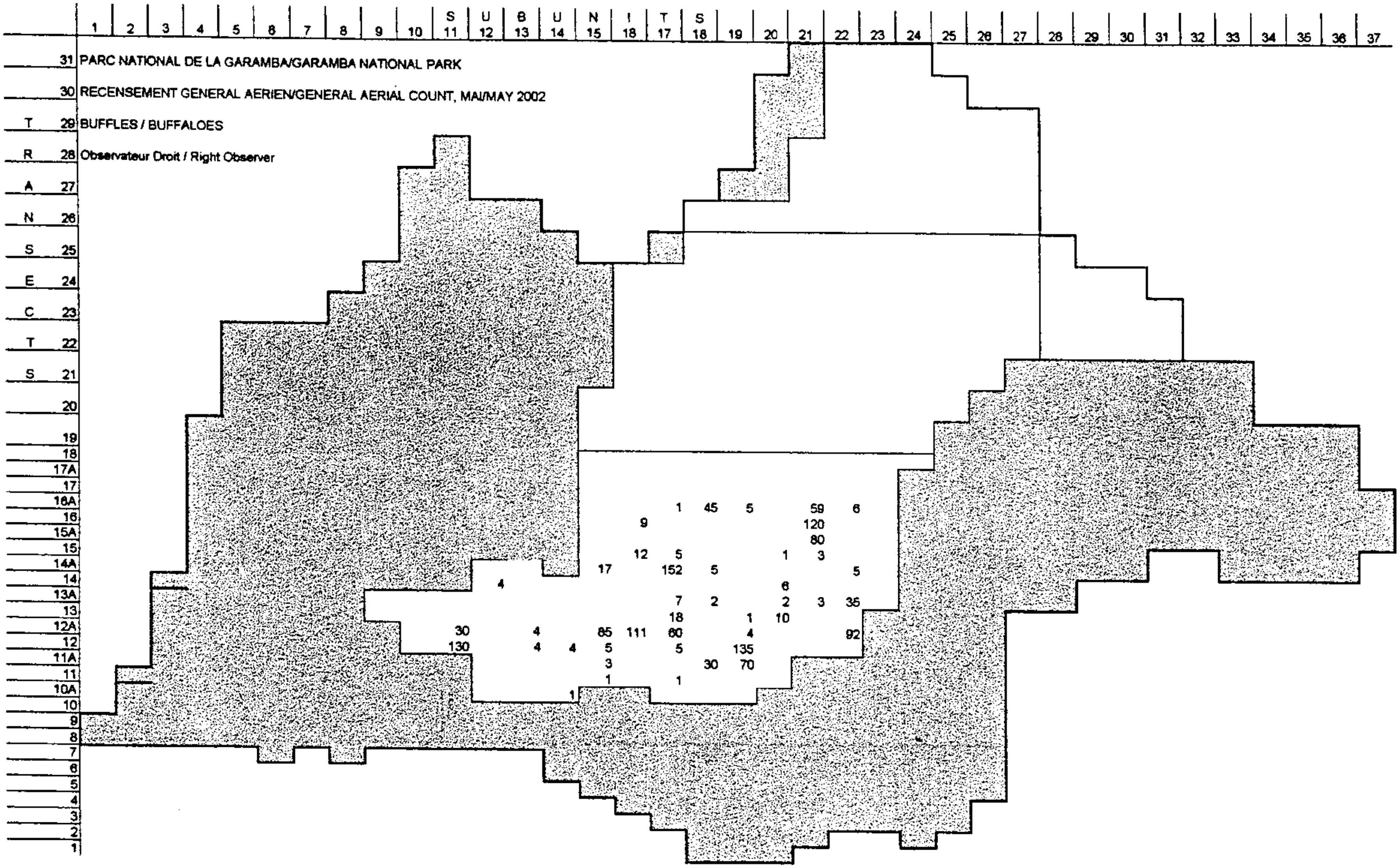
Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D										0	0	0	27.1	43.9	55	23.6	15.1	73.3	42.5	78	51.7	31.9	4.26	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	27.1	43.9	78.3	23.6	15.1	73.3	42.5	76	51.7	31.9	4.26	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002

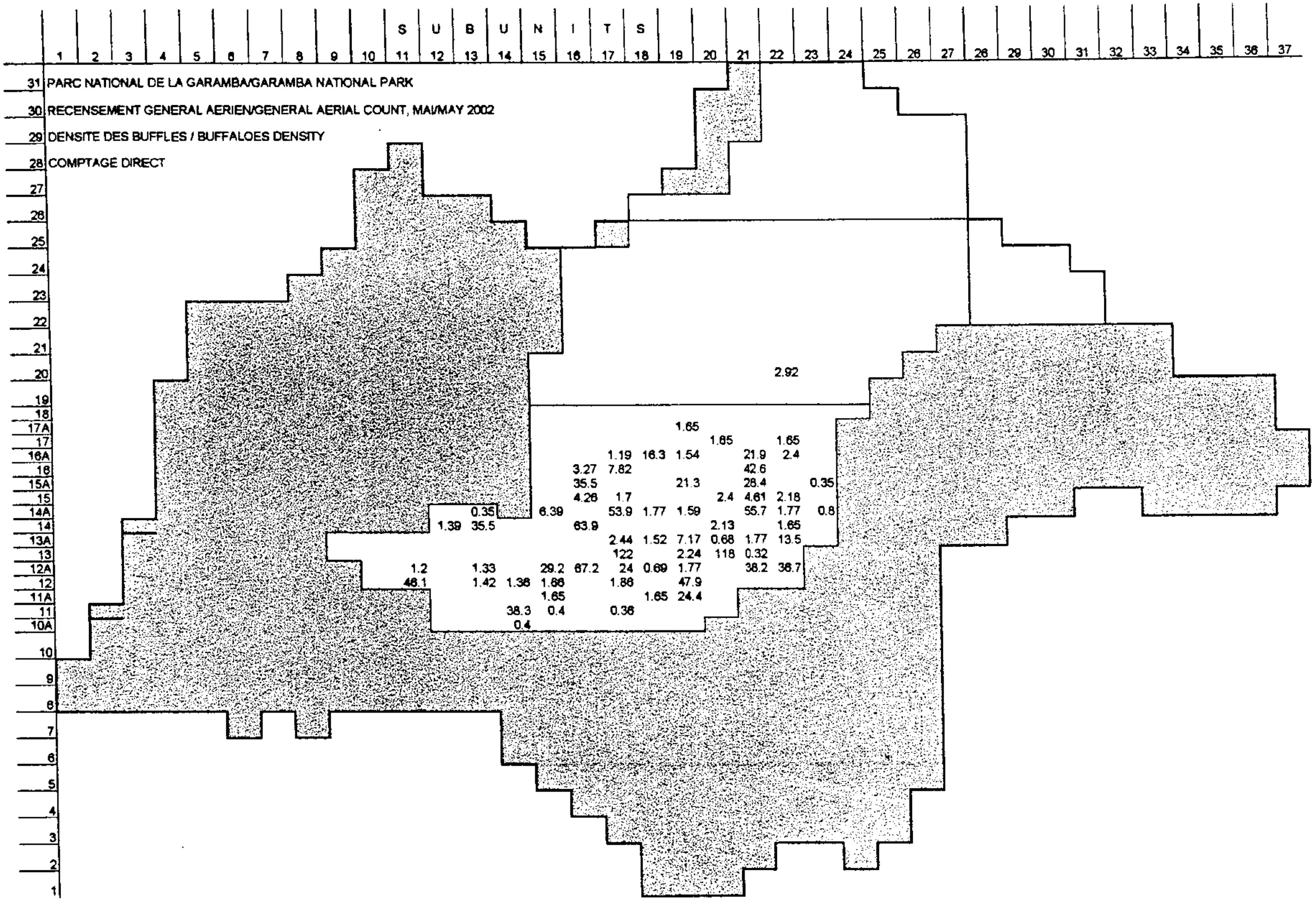
BUFFLES / BUFFALOES

Observateur Droit / Right Observer



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D									0	0	0	210	18	13	98	132	249	82	215	19	265	138	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	210	18	13	98	132	249	82	215	19	265	138	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0		0	
	0		0	
	0		0	
0				
0				
0				
116				
129				
80				
21				
179				
10				
49				
29				
386				
283				
103				
2				
1				
0		0		Tot
	0			Tot
1388				Tot
1388	0	0	1388	TO


PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002

DENSITE DES BUFFLES / BUFFALOES DENSITY

COMPTAGE DIRECT

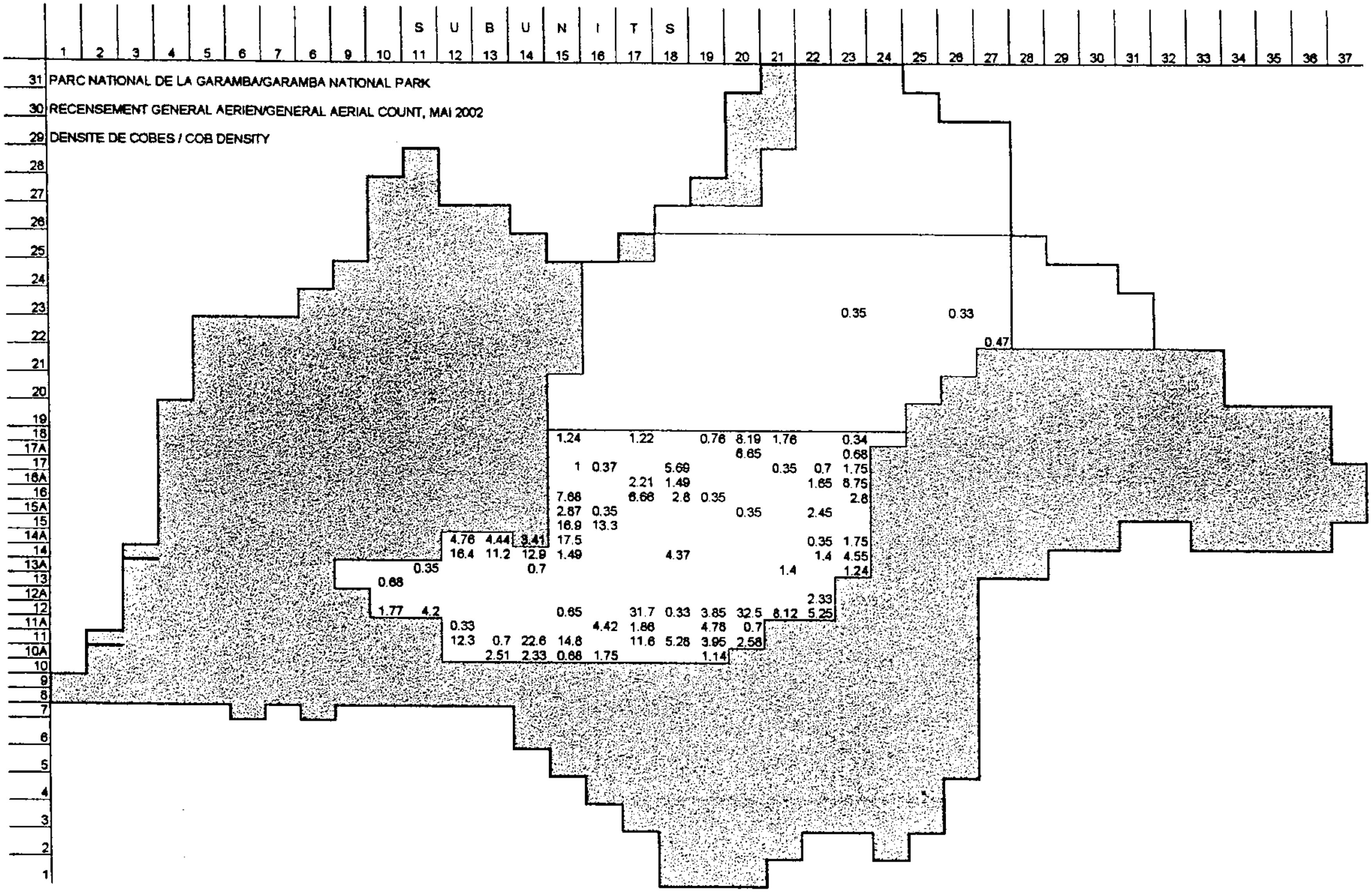
		0	ERR	
		0	ERR	
		0	ERR	
		0	ERR	
		0	ERR	
		0	ERR	
	0	0	ERR	
	0	0	ERR	
	0	0	ERR	
	0	0	ERR	
	0		ERR	
	2.92		2.92	
	0		ERR	
0			ERR	
1.65			1.65	
3.29			1.65	
43.3			8.87	
53.7			17.9	
65.5			21.4	
15.1			3.03	
122			15.3	
105			20.9	
27.1			4.51	
240			60.1	
200			22.3	
100			18.7	
27.7			9.22	
37			12.3	
0.4			0.4	
0	0	0	ERR	Total Nord
2.92	2.92	0	ERR	Total Centr
1062	0	0	ERR	Total Sud
1062	2.92	0	ERR	TOTAL

Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	2.92	0	0	0	0	0										
High D										0	47.3	1.39	38.6	37.6	32.9	174	215	22	110	123	193	59.8	1.14	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	47.3	1.39	38.6	37.6	32.9	174	215	22	110	123	193	62.7	1.14	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2002

DENSITE DE COBES / COB DENSITY



		0	0
		0	0
		0	0
		0	0
		0	0
		0	0
	0	0	0
	0	0	0
	0.68	0	0.68
	0.47	0	0.47
	0		0
	0		0
	0		0
13.5			13.5
7.33			7.33
9.86			8.86
14.1			14.1
20.3			20.3
6.02			6.02
30.2			30.2
32.2			32.2
54.3			54.3
3.68			3.68
0.68			0.68
2.33			2.33
86.4			86.4
12.1			12.1
74.1			74.1
8.41			6.41

0	0	0	0	Total Nord
1.15	1.15	0	1.15	Total Cent
375	0	0	375	Total Sud
375	1.15	0	377	TOTAL

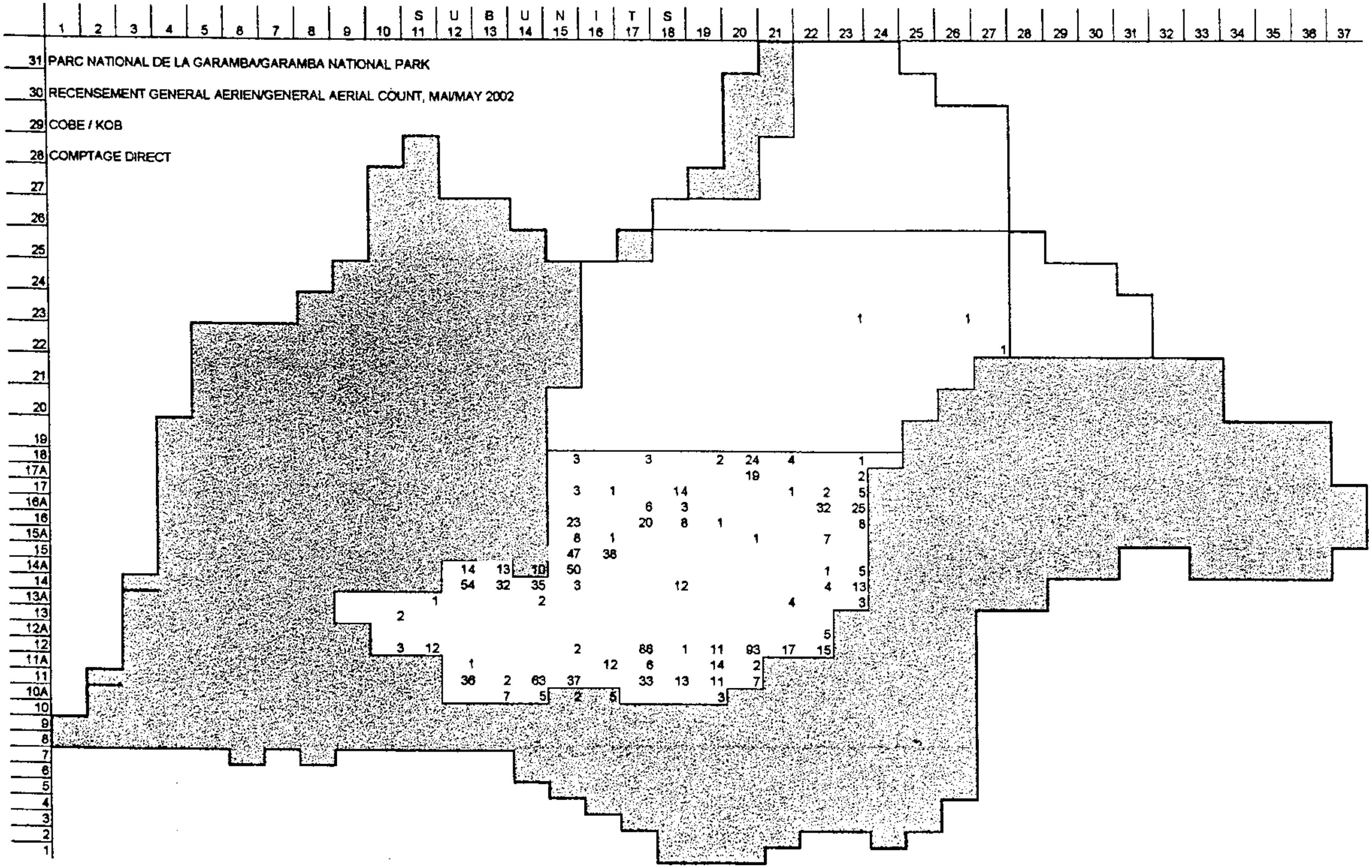
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0.35	0	0	0.33	0.47										
High D										0.68	4.2	18.4	16.3	36.2	17	18.4	55.5	20	13.7	51	9.62	14.1	21.6	0	0												
Dom	0	0	0	0	0	0	0	0	0	1.77	0	12.3	0	0	29.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	2.45	4.2	30.7	16.3	36.2	46.6	18.4	55.5	20	13.7	51	9.62	14.1	22.2	0	0	0.33	0.47	0	0	0	0	0	0	0	0	0	0

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002

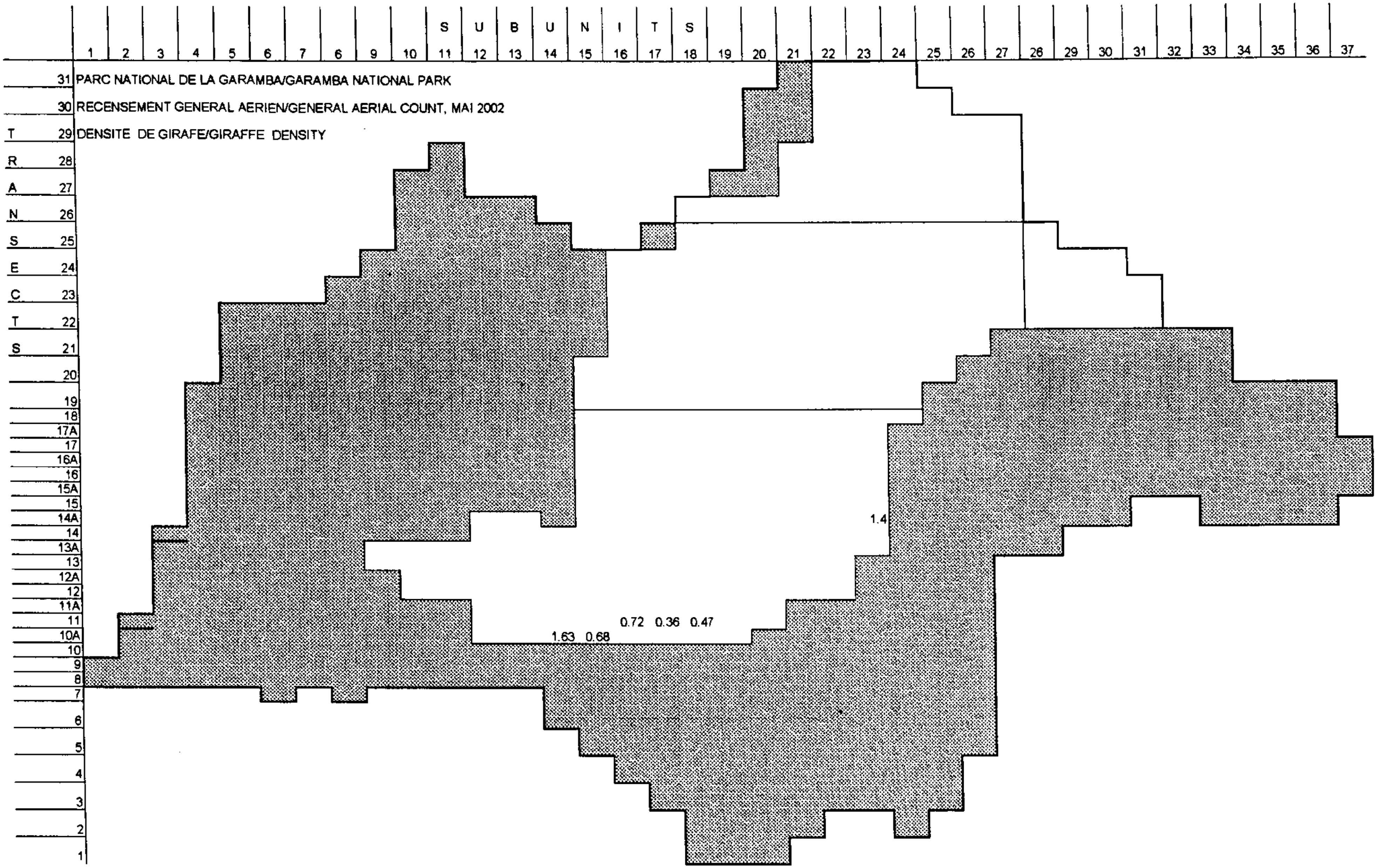
COBE / KOB

COMPTAGE DIRECT



Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	1	0	0	1	1										
High D									0	5	5	39	102	169	142	52	154	51	39	146	26	66	62	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	5	5	39	102	169	144	52	154	51	39	146	26	66	63	0	0	1	1	0	0	0	0	0	0	0	0	0	0

		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	2	0	2	
	1	0	1	
	0		0	
	0		0	
	0		0	
37				
21				
26				
66				
60				
17				
85				
83				
153				
10				
2				
5				
240				
35				
202				
22				
0		0		Total N
	3			Total C
1064				Total S
1064	3	0	1067	TOTAL



PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2002

DENSITE DE GIRAFE/GIRAFFE DENSITY

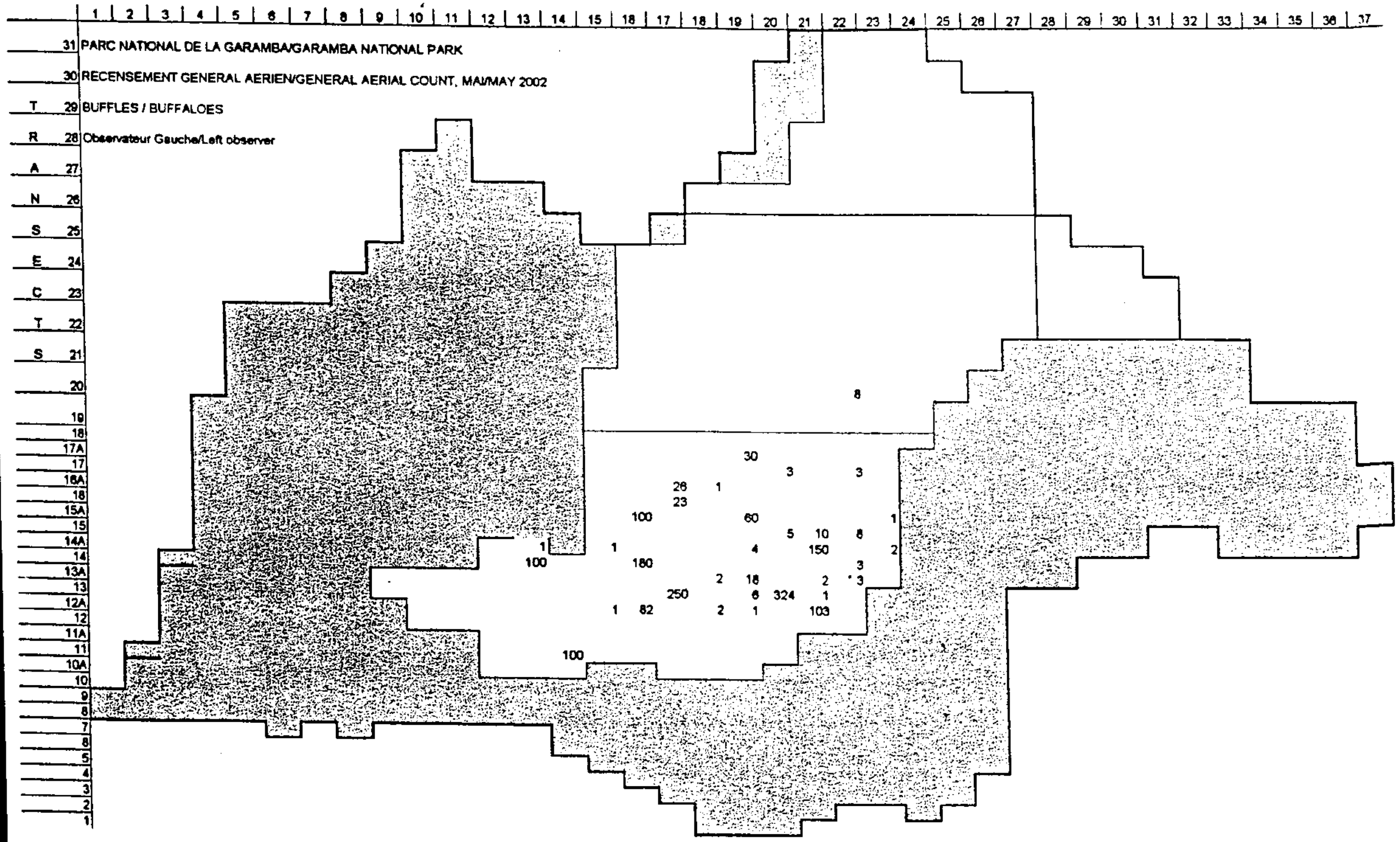
Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D										0	0	0	0	0	0	0.72	0.36	0.47	0	0	0	0	1.4	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.72	0.36	0.47	0	0	0	0	1.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002

BUFFLES / BUFFALOES

Observateur Gauche/Left observer



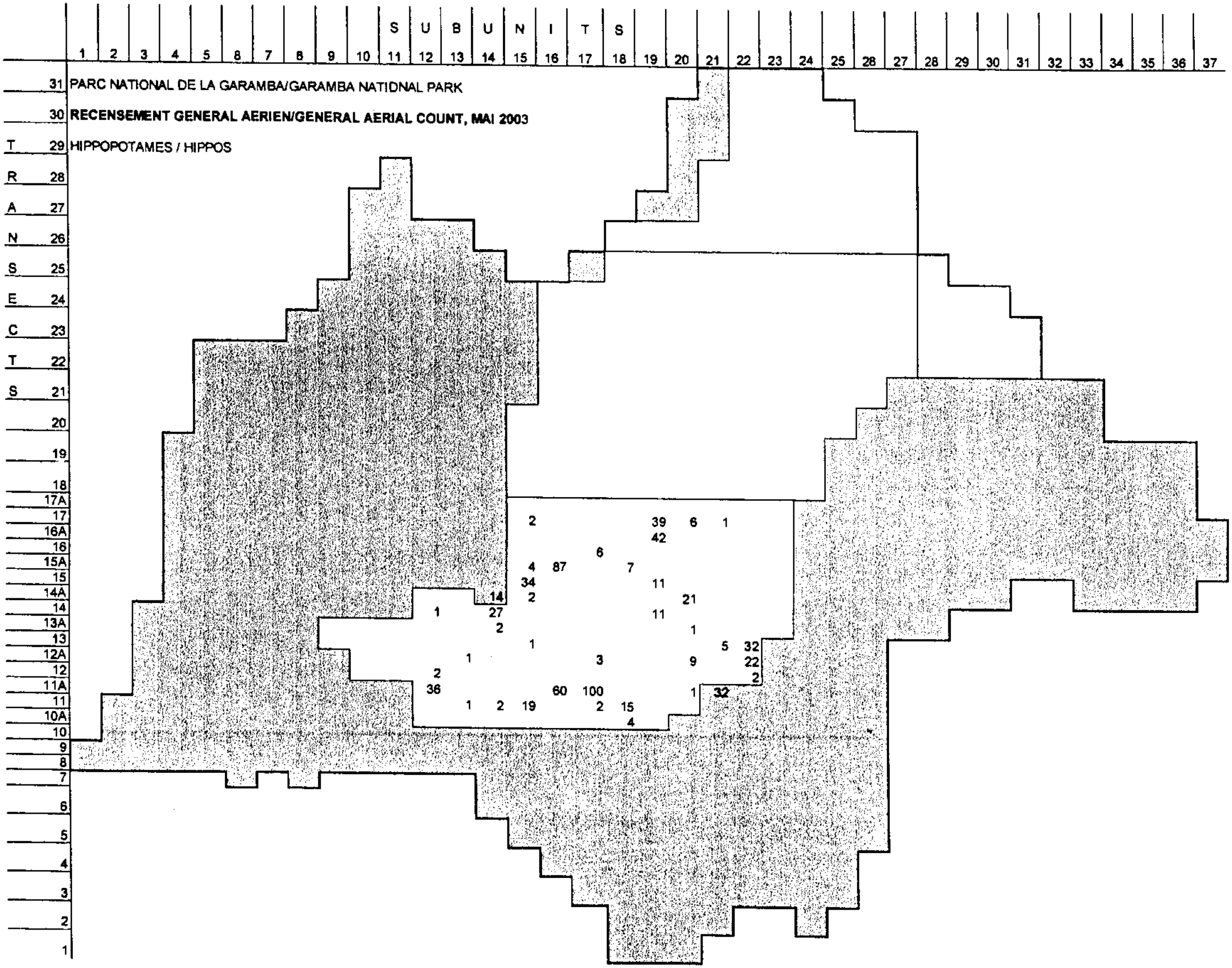
	0		0	
	0		0	
	0		0	
	0		0	
	0		0	
	0		0	
0	0	0		
0	0	0		
0	0	0		
0	0	0		
0		0		
6		8		
0		0		
0				
30				
6				
27				
23				
161				
21				
158				
283				
25				
581				
189				
0				
0				
100				
0				
0		0		Tota
	8			Tota
1604				Tota
1604	6	0	1812	TOT

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Med D																0	0	0	0	0	0	8	0	0	0	0	0										
High D									0	0	0	29	324	201	101	362	299	5	119	332	266	15	3	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	29	324	201	101	362	299	5	119	332	266	23	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0

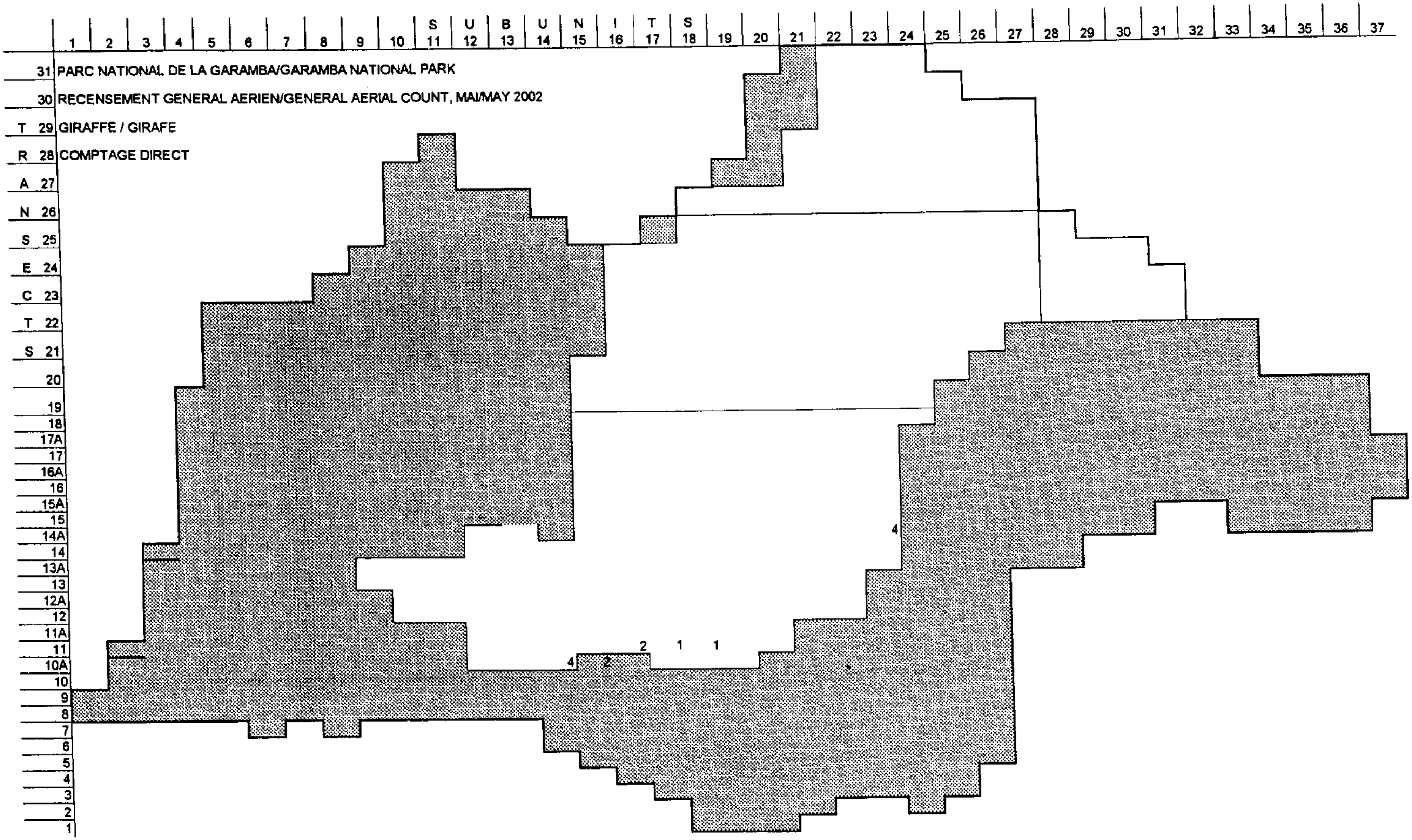
PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

HIPPOPOTAMES / HIPPOS



		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0		0	
	0		0	
	0		0	
0			0	
0			0	
48			48	
42			42	
6			8	
98			98	
45			45	
37			37	
39			39	
3			3	
38			38	
35			35	
4			4	
197			197	
39			39	
4			4	
0	0	0	0	Total Nord
0	0	0	0	Total Centre
635	0	0	635	Total Sud
635	0	0	635	TDTAL



PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002

GIRAFFE / GIRAFE

COMPTAGE DIRECT

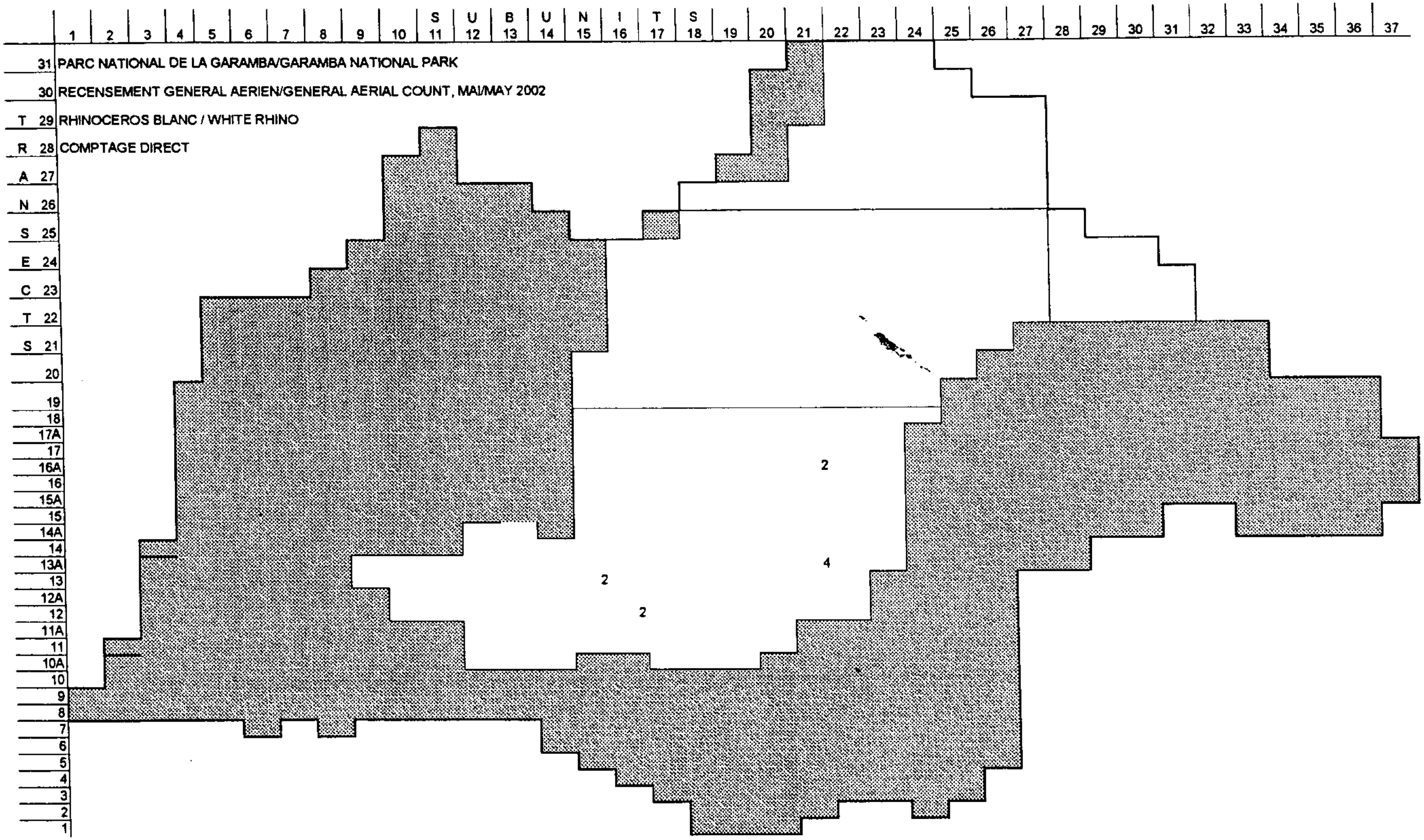
Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D									0	0	0	0	0	4	0	2	1	1	0	0	0	0	4	0	0												
Don	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tots	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	2	1	1	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

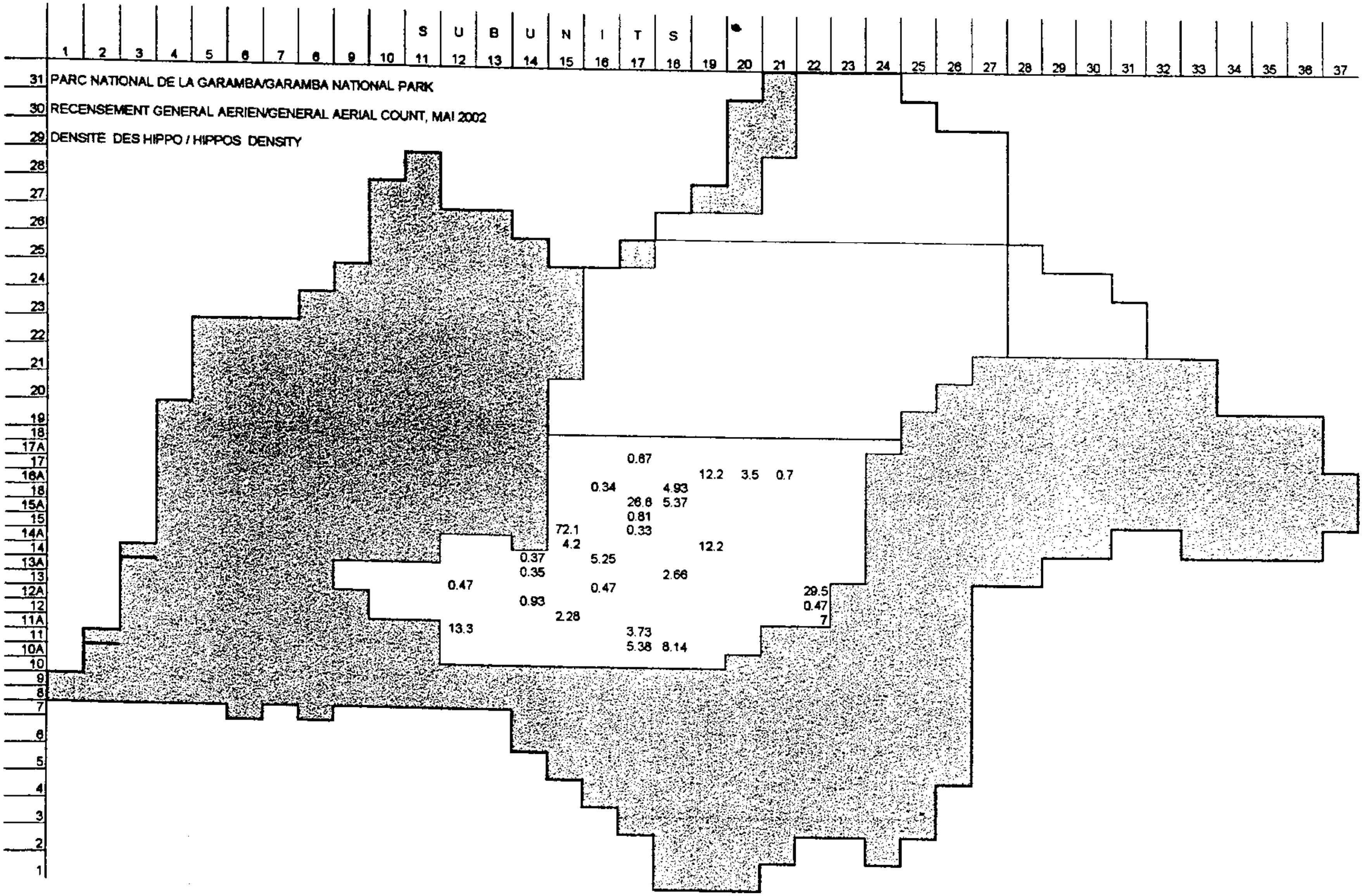
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002

RHINOCEROS BLANC / WHITE RHINO

COMPTAGE DIRECT



Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D									0	0	0	0	0	0	2	2	0	0	0	0	6	0	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tots	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

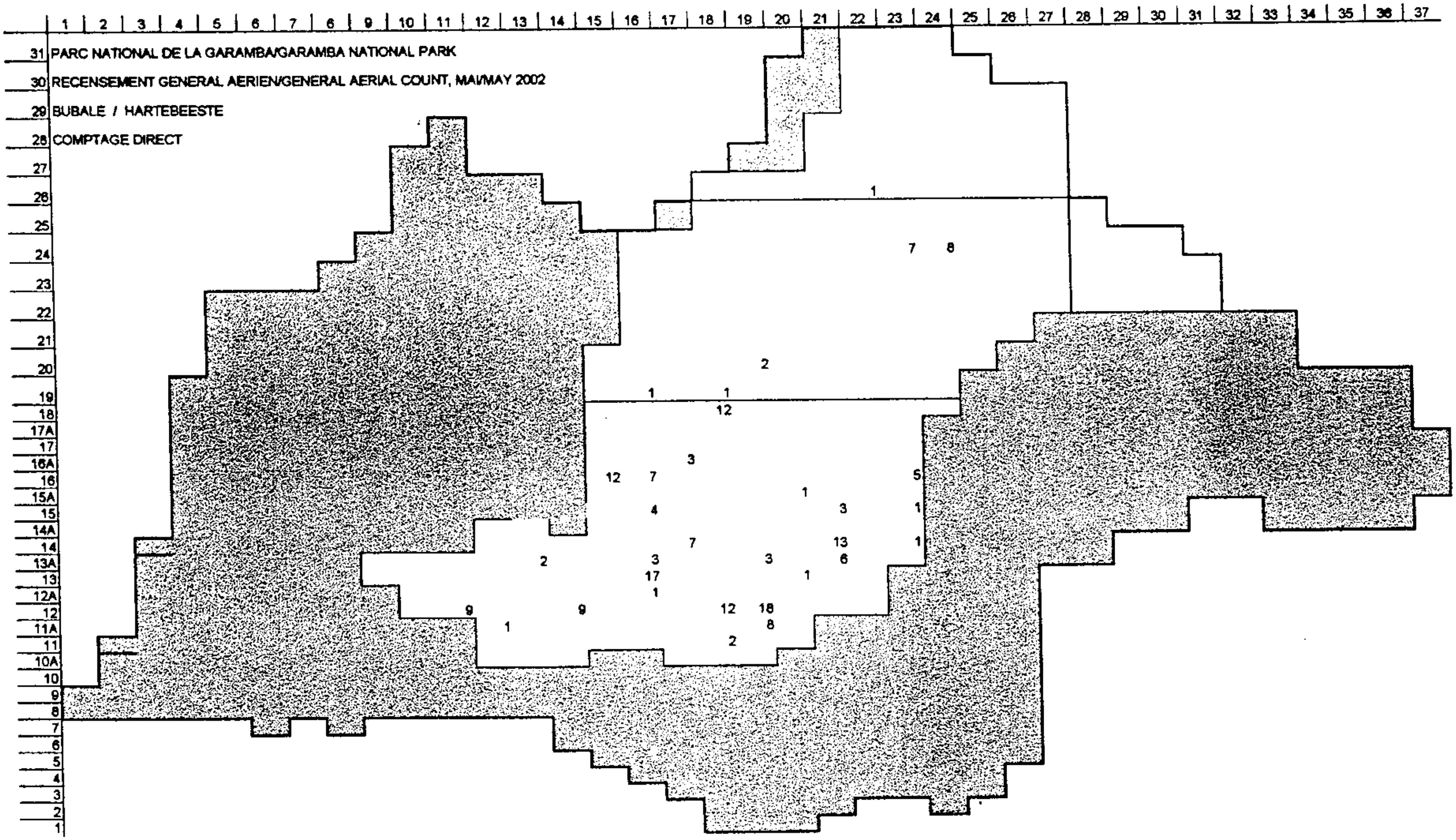
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2002

DENSITE DES HIPPO / HIPPOS DENSITY

		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0		0	
	0		0	
	0		0	
0			0	
0.67			0.67	
16.4			16.4	
5.27			5.27	
32			32	
0.61			0.61	
72.5			72.5	
16.4			16.4	
5.62			5.62	
3.01			3.01	
30.4			30.4	
1.4			1.4	
9.27			9.27	
17.1			17.1	
13.5			13.5	
0			0	
0	0	0	0	Total Nord
0	0	0	0	Total Centr
224	0	0	224	Total Sud
224	0	0	224	TOTAL

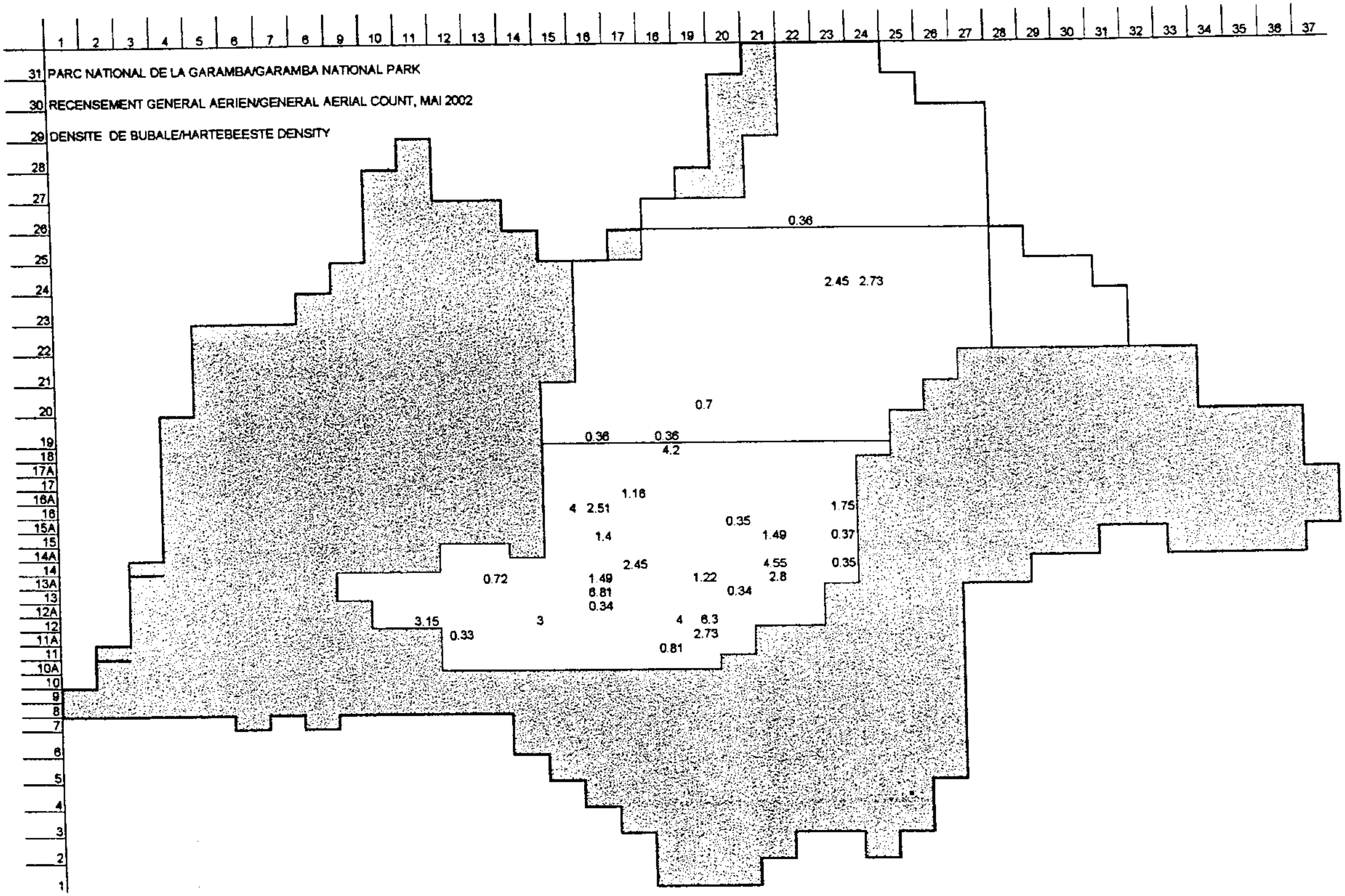
Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D										0	0	0.47	0	1.65	2.28	6.05	37.6	21.1	24.4	3.5	0.7	38.9	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	72.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0.47	0	1.65	74.4	8.05	37.6	21.1	24.4	3.5	0.7	38.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002
BUBALE / HARTEBEESTE
COMPTAGE DIRECT



Low D																			0	0	0	1	0	0	0	0	0	0	0	0	0	0					
Med D																1	0	1	2	0	0	0	7	6	0	0	0										
High D									0	0	0	29	1	11	9	32	10	26	29	2	24	0	7	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	29	1	11	9	33	10	27	31	2	24	1	14	8	0	0	0	0	0	0	0	0	0	0	0	0	0

		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		1	1	
	0	0	0	
	15	0	15	
	0	0	0	
	0	0	0	
	0		0	
	2		2	
	2		2	
12				
0				
0				
3				
24				
1				
8				
0				
21				
16				
16				
1				
46				
9				
2				
0				
0		1		Total N
	19			Total C
163				Total S
163	19	1	183	TOTAL


PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2002

DENSITE DE BUBALE/HARTEBEESTE DENSITY

Low D																			0	0	0	0.36	0	0	0	0	0	0	0	0	0	0					
Med D																0.36	0	0.38	0.7	0	0	0	2.45	2.73	0	0	0										
High D										0	3.15	0	0.72	3	0	12.6	3.6	9.01	10.2	0.69	8.84	0	2.47	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	3.15	0	0.72	3	4	12.9	3.6	9.37	10.9	0.69	8.84	0.36	4.92	2.73	0	0	0	0	0	0	0	0	0	0	0	0	0

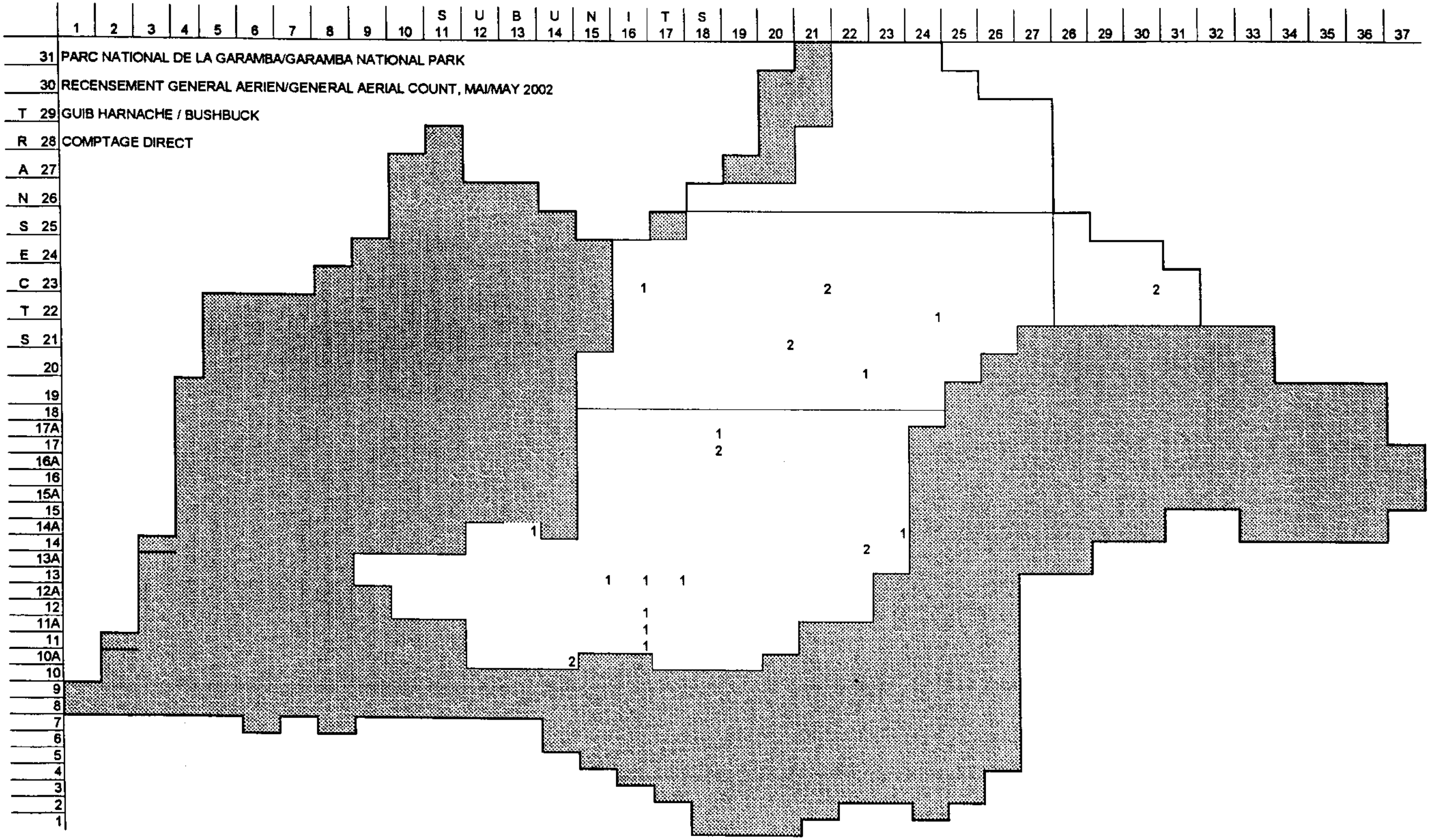
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0.36	0.36	
	0	0	0	
	5.18	0	5.18	
	0	0	0	
	0	0	0	
	0		0	
	0.7		0.7	
	0.72		0.72	
4.2			4.2	
0			0	
0			0	
1.16			1.16	
6.26			8.26	
0.35			0.35	
3.26			3.26	
0			0	
7.35			7.35	
6.23			6.23	
7.15			7.15	
0.34			0.34	
16.4			16.4	
3.06			3.06	
0.61			0.61	
0			0	
0	0	0.36	0.36	Total Nor
6.6	6.6	0	6.6	Total Cen
58.6	0	0	58.6	Total Sud
58.6	6.6	0.36	65.6	TOTAL

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

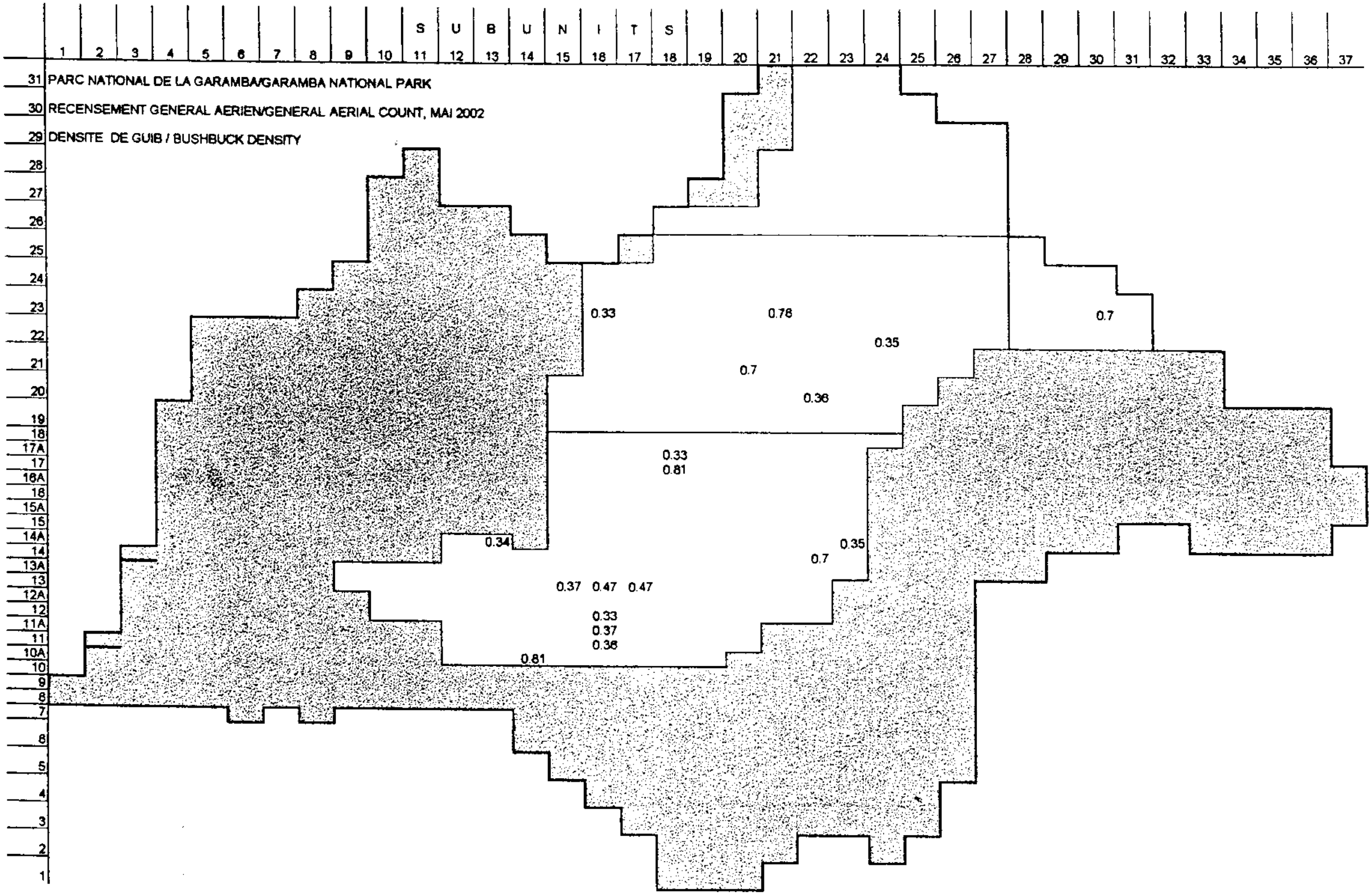
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002

GUIB HARNACHE / BUSHBUCK

COMPTAGE DIRECT



Low D																			0	0	0	0	0	0	0	0	0	0	0	2	0	0					
Med D																0	0	0	0	2	2	1	0	1	0	0	0										
High D									0	0	0	0	0	3	1	4	1	3	0	0	0	2	1	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tots	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	5	1	3	0	2	2	3	1	1	0	0	0	0	0	2	0	0	0	0	0	0	0



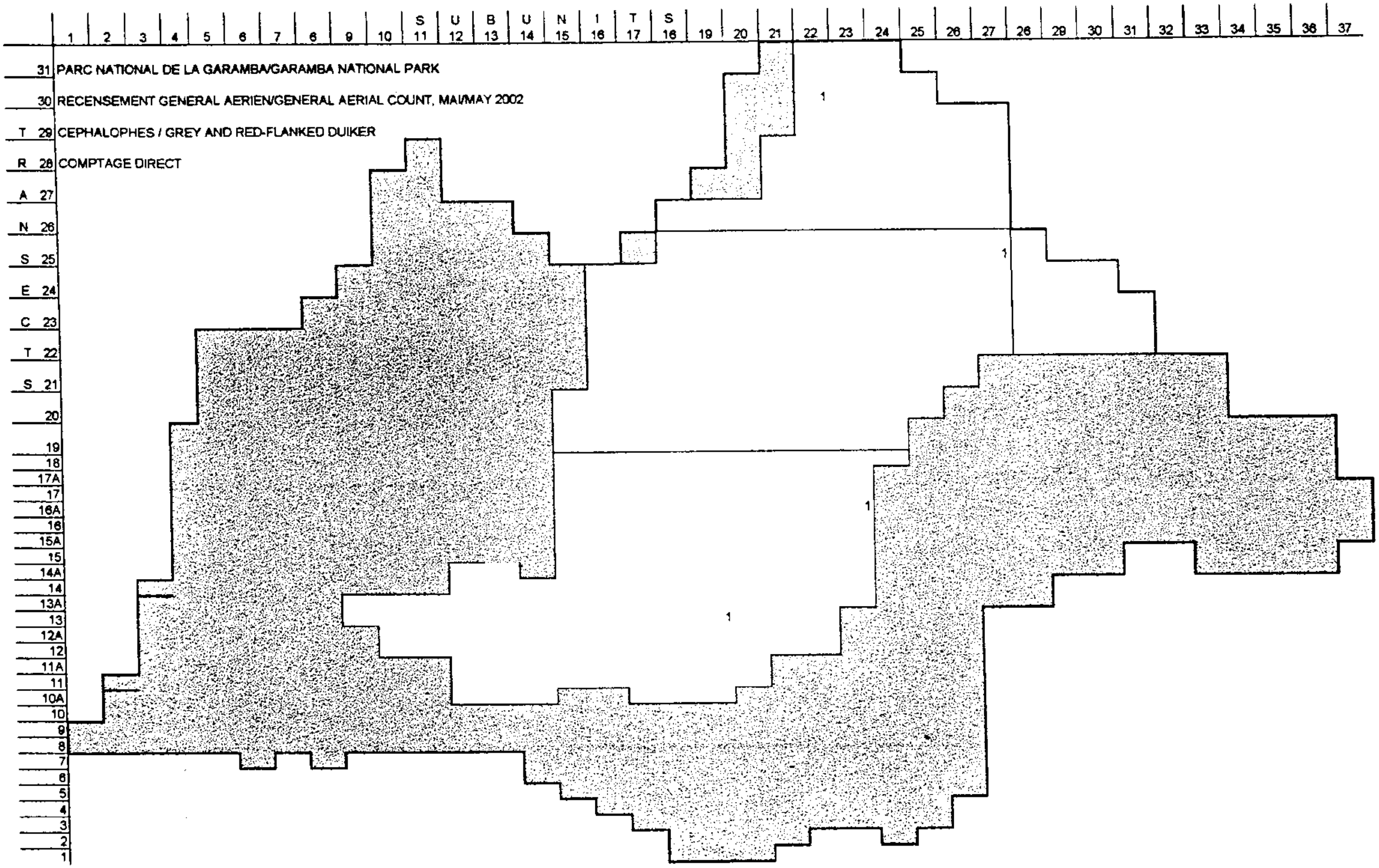
PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2002

DENSITE DE GUIB / BUSHBUCK DENSITY

		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	1.09	0.7	1.79	
	0.35	0	0.35	
	0.7		0.7	
	0.36		0.36	
	0		0	
0			0	
0.33			0.33	
0.61			0.61	
0			0	
0			0	
0			0	
0			0	
0.69			0.69	
0.7			0.7	
0			0	
1.3			1.3	
0			0	
0.33			0.33	
0.37			0.37	
0.36			0.36	
0.81			0.61	
0	0	0	0	Total Nord
2.5	2.5	0.7	3.2	Total Cent
5.7	0	0	5.7	Total Sud
5.7	2.5	0.7	8.9	TOTAL

Low D																			0	0	0	0	0	0	0	0	0	0	0	0.7	0	0					
Med D																0	0	0	0	0.7	0.78	0.36	0	0.35	0	0	0										
High D										0	0	0	0.34	0	0.37	1.52	0.47	1.14	0	0	0	0.7	0.35	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0.34	0	0.37	1.85	0.47	1.14	0	0.7	0.78	1.06	0.35	0.35	0	0	0	0	0	0.7	0	0	0	0	0	0	0


PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002

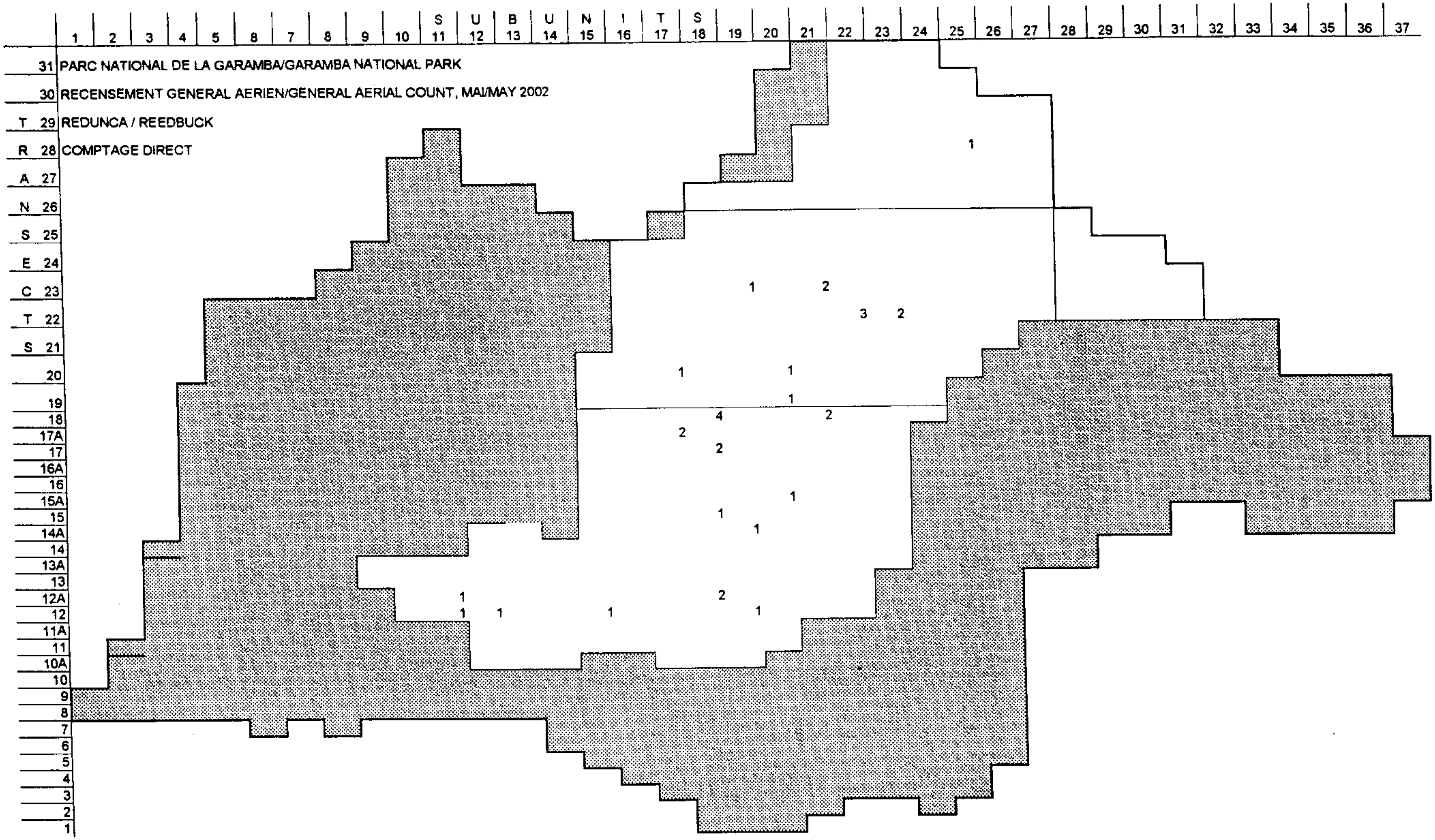
CEPHALOPHES / GREY AND RED-FLANKED DUIKER

COMPTAGE DIRECT

Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	1										
High D									0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tota	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0

		0	0	
		1	1	
		0	0	
		0	0	
		0	0	
		0	0	
	1	0	1	
	0	0	0	
	0	0	0	
	0	0	0	
	0		0	
	0		0	
	0		0	
0				
0				
0				
1				
0				
0				
0				
0				
0				
0				
1				
0				
0				
0				
0				
0				
0		1		Total
	1			Total
2				Total
2	1	1	4	TOTA

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002
REDUNCA / REEDBUCK
COMPTAGE DIRECT

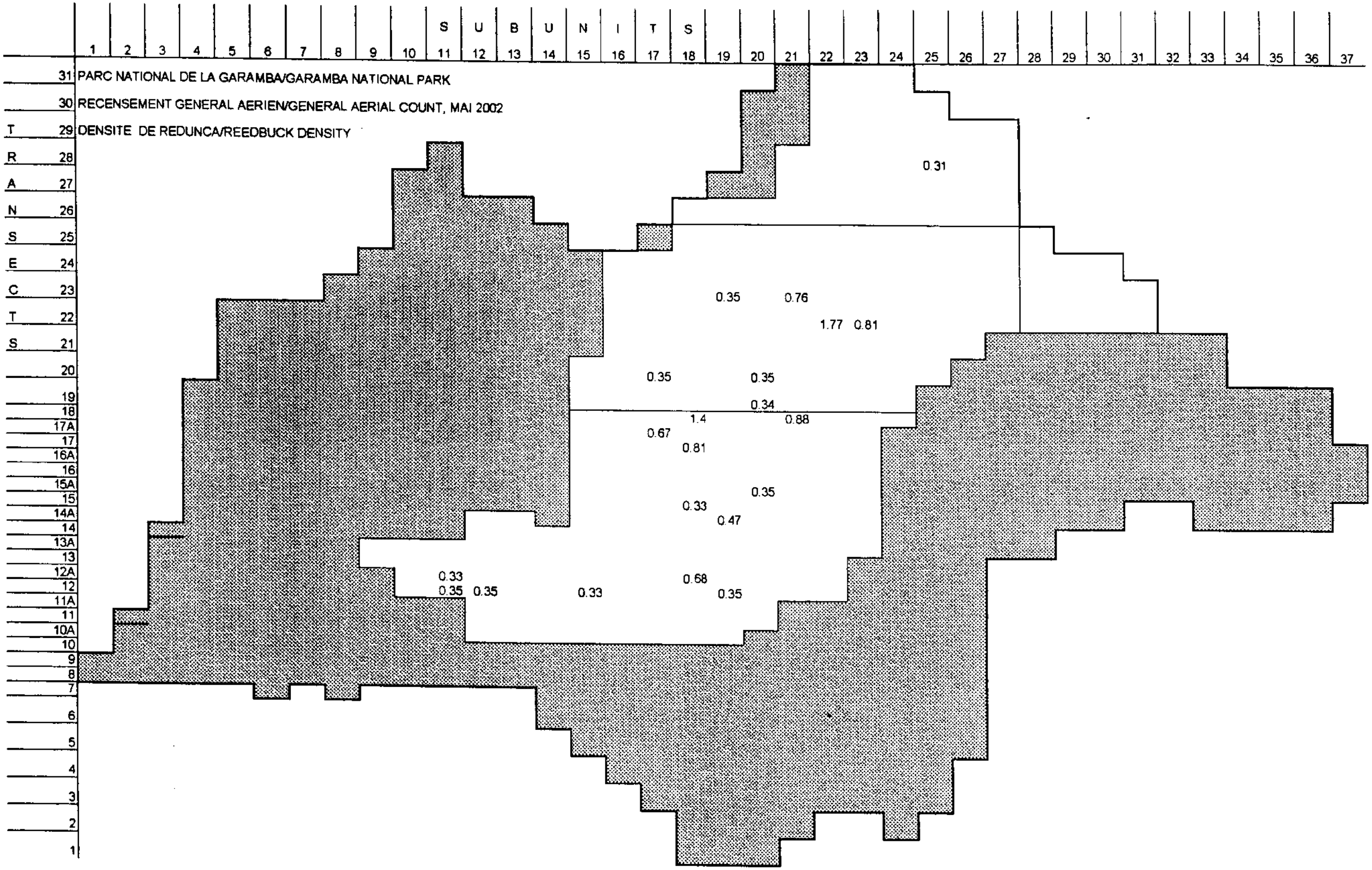


Low D																			0	0	0	0	0	0	1	0	0	0	0	0	0	0					
Med D																0	1	0	1	2	2	3	2	0	0	0	0										
High D									0	0	0	2	0	0	1	0	2	9	2	1	2	0	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tots	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	3	9	3	3	4	3	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

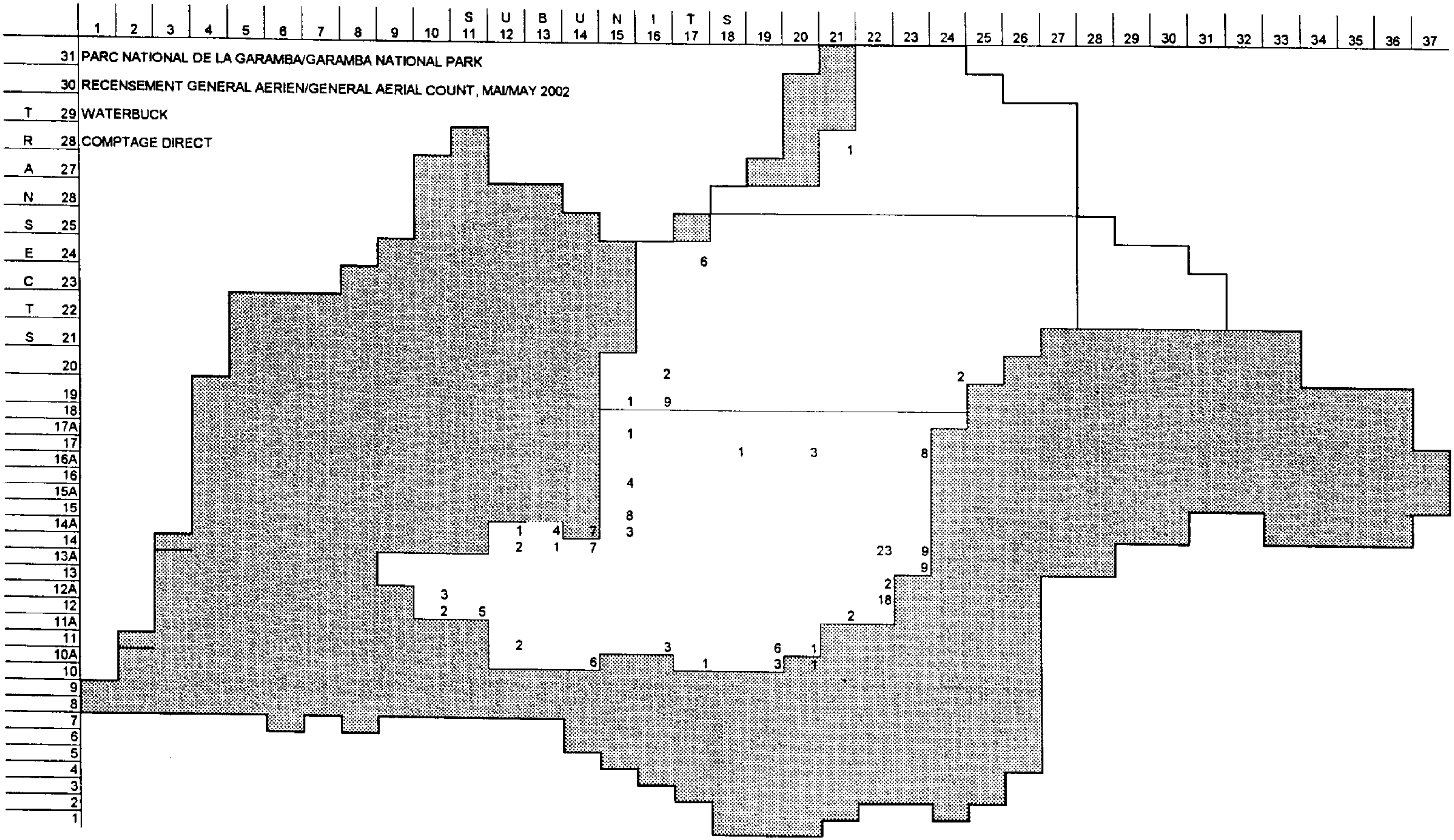
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2002

DENSITE DE REDUNCA/REEDBUCK DENSITY

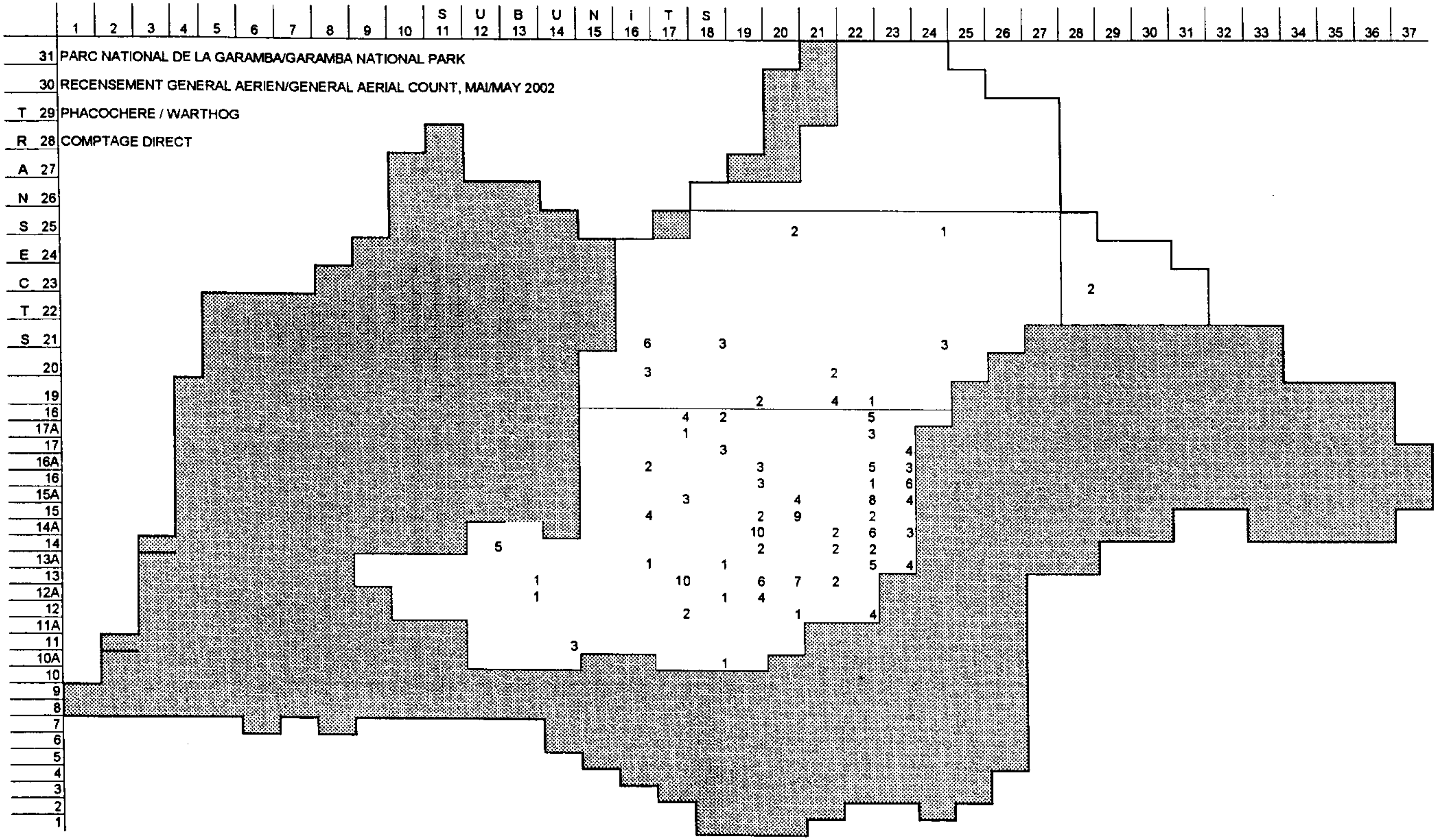


Low D																			0	0	0	0	0	0	0.31	0	0	0	0	0	0	0					
Med D																0	0.35	0	0.35	0.69	0.76	1.77	0.81	0	0	0	0										
High D										0	0.68	0.35	0	0	0.33	0	0.67	3.22	0.82	0.35	0.88	0	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0.68	0.35	0	0	0.33	0	1.02	3.22	1.17	1.04	1.64	1.77	0.81	0	0.31	0	0	0	0	0	0	0	0	0	0	0	0

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002
WATERBUCK
COMPTAGE DIRECT



Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																11	6	0	0	0	0	0	0	2	0	0	0										
High D									0	5	5	9	2	25	7	3	0	1	6	4	2	43	26	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	5	5	9	2	25	7	14	6	1	6	4	3	43	26	2	0	0	0	0	0	0	0	0	0	0	0	0	0



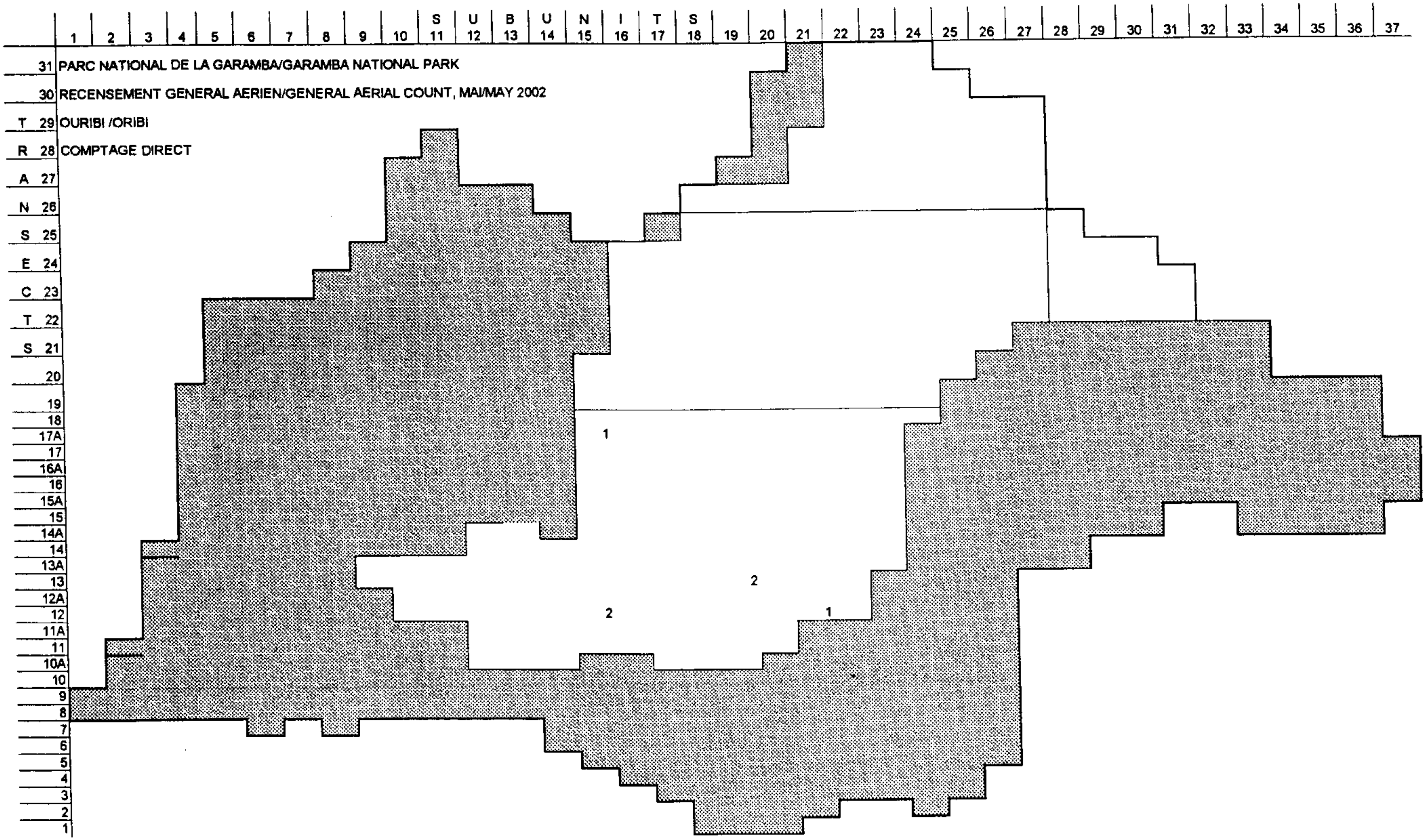
31 PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

30 RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002

29 PHACOCHERE / WARTHOG

28 COMPTAGE DIRECT

Low D																			0	0	0	0	0	0	0	0	0	2	0	0	0	0					
Med D																9	0	3	2	2	6	1	0	4	0	0	0										
High D									0	0	0	22	8	5	3	7	20	7	30	21	6	41	24	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tota	0	0	0	0	0	0	0	0	0	0	0	22	8	5	3	16	20	10	32	23	12	42	24	4	0	0	0	2	0	0	0	0	0	0	0	0	0



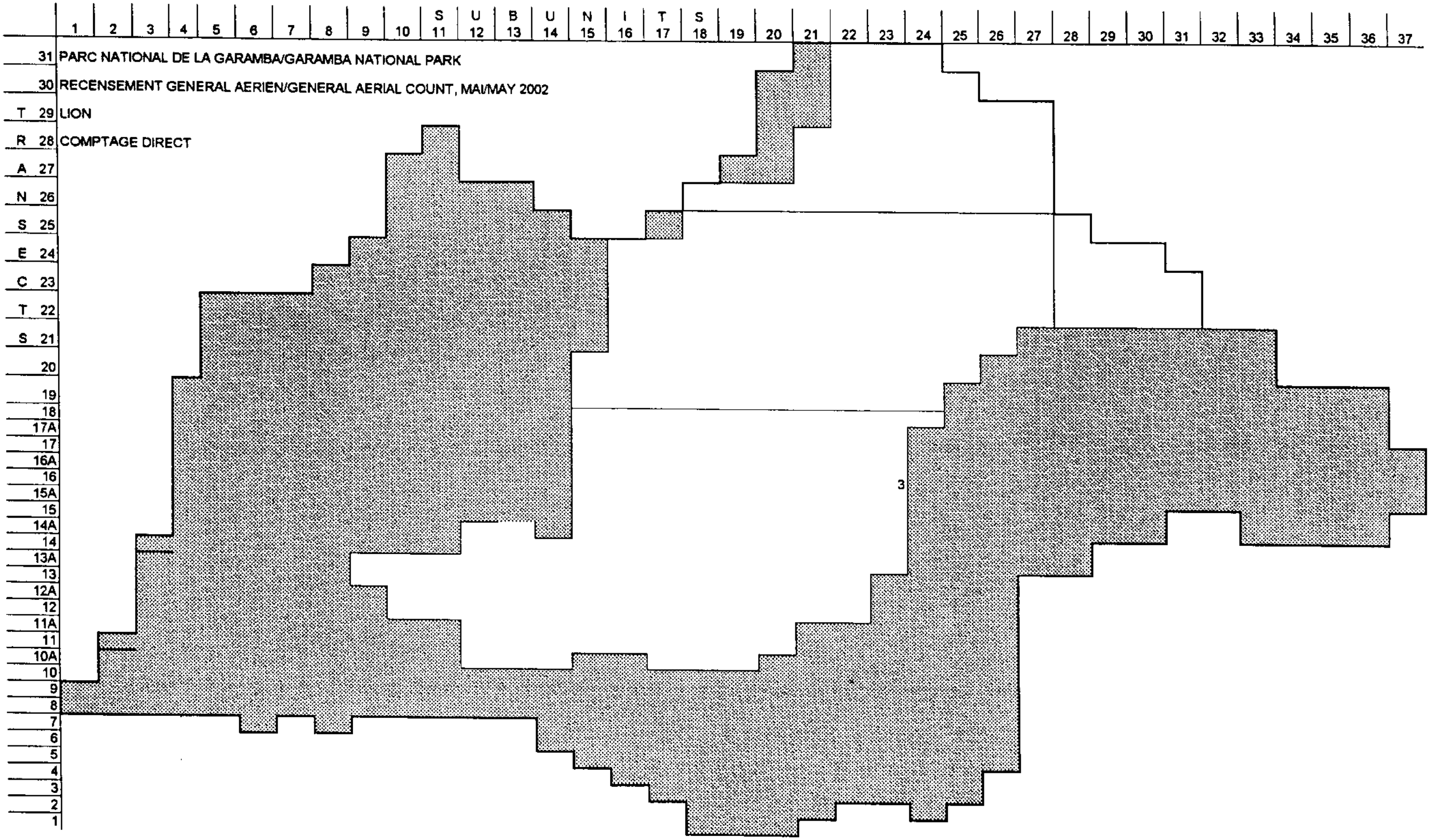
31 PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

30 RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002

29 OURIBI /ORIBI

28 COMPTAGE DIRECT

Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D									0	0	0	2	0	0	2	0	0	0	2	0	1	0	0	0	0												
Dorr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tots	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



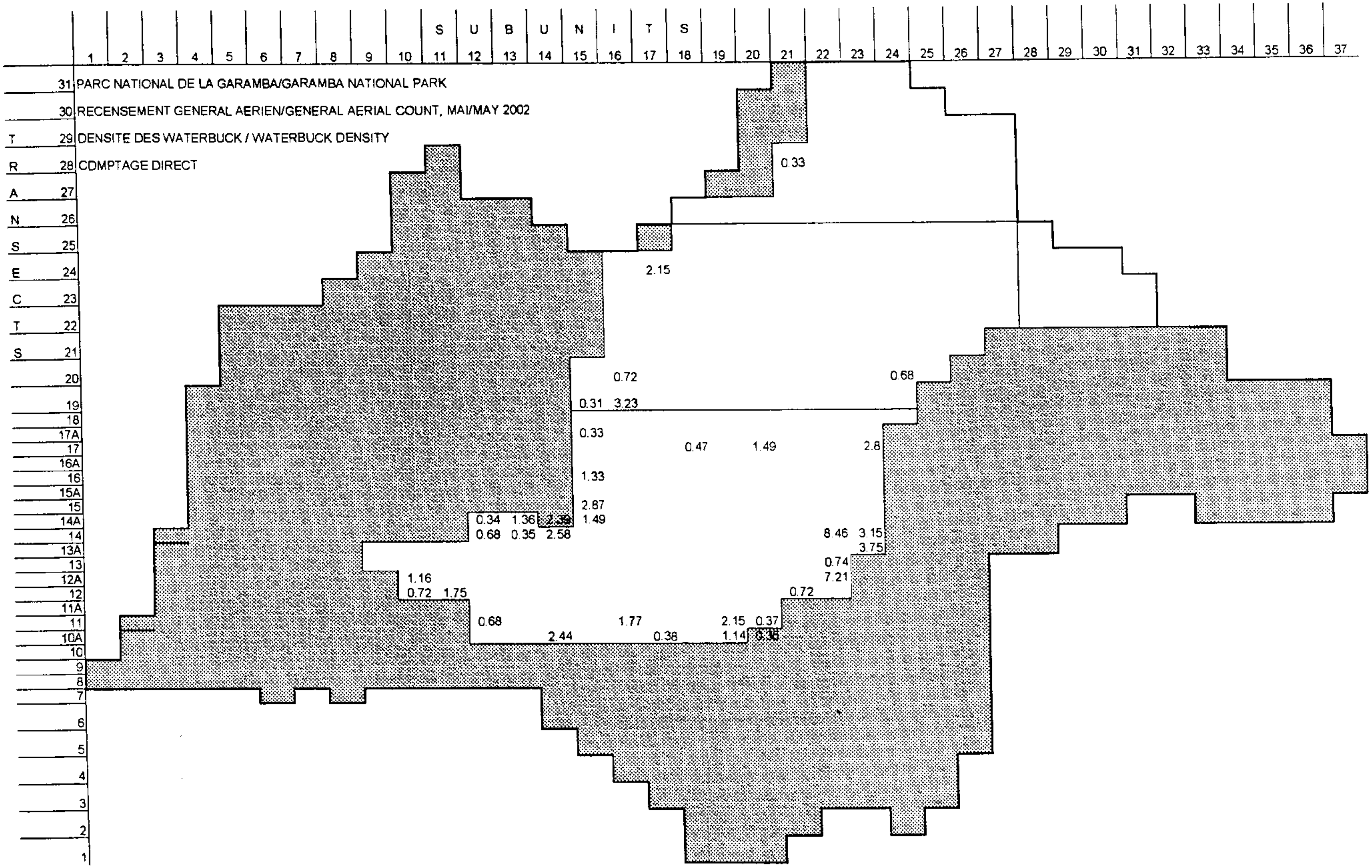
PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002

LION

COMPTAGE DIRECT

Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D									0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0												
Tots	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0



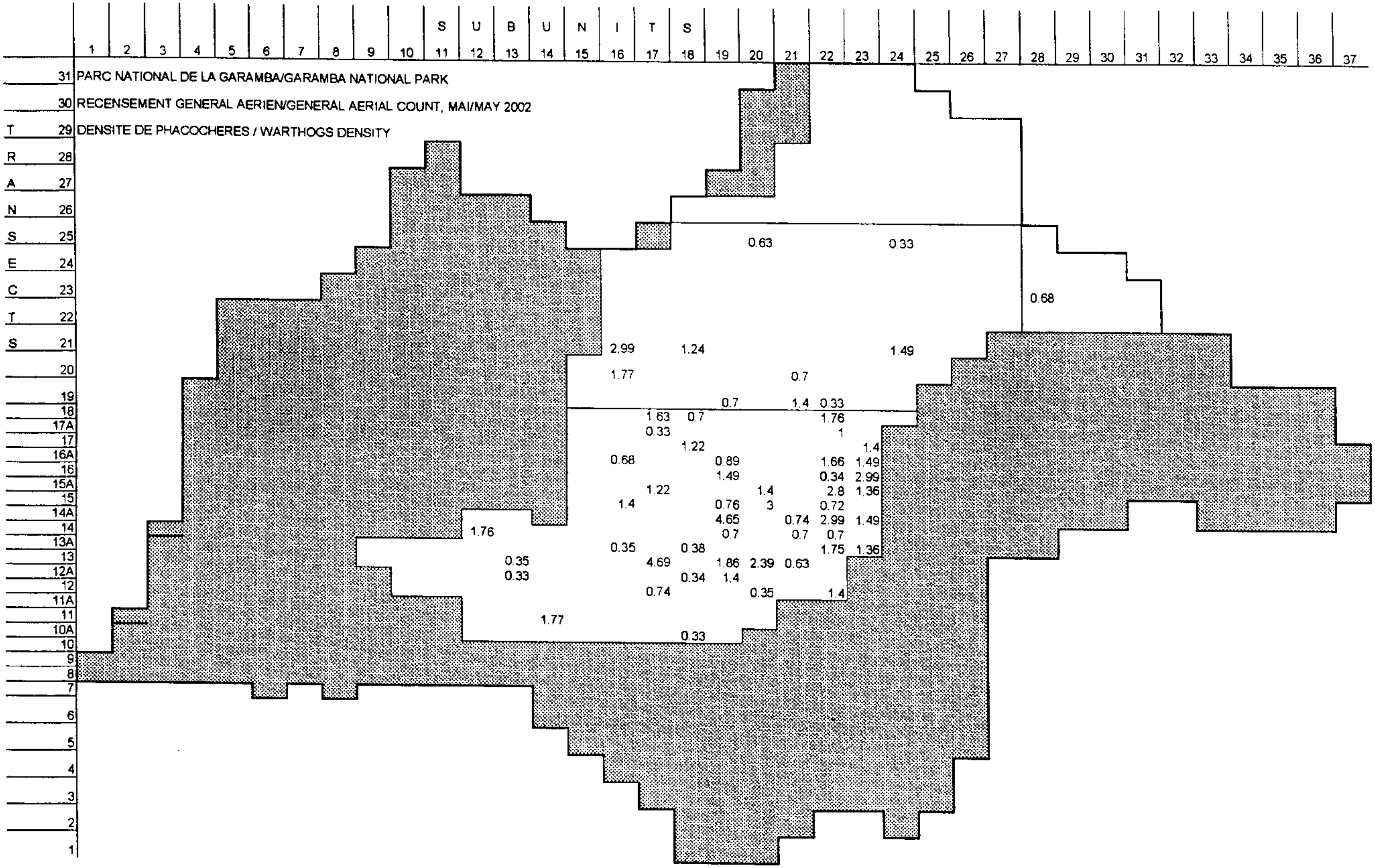
Low D																			0
Med D																3.95	2.15	0	0
High D										0	1.75	0.68	1.71	2.58	0	1.77	0	0.47	2.15
Dom	0	0	0	0	0	0	0	0	0	0.72	0	0.68	0	0	4.85	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0.72	1.75	1.36	1.71	2.58	4.85	5.72	2.15	0.47	2.15

Low D	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D	0	0	0	0	0.68	0	0	0										
High D	1.86	0.72	16.4	9.7	0	0												
Dom	0	0.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1.86	1.04	18.4	9.7	0.68	0	0	0	0	0	0	0	0	0	0	0	0	0

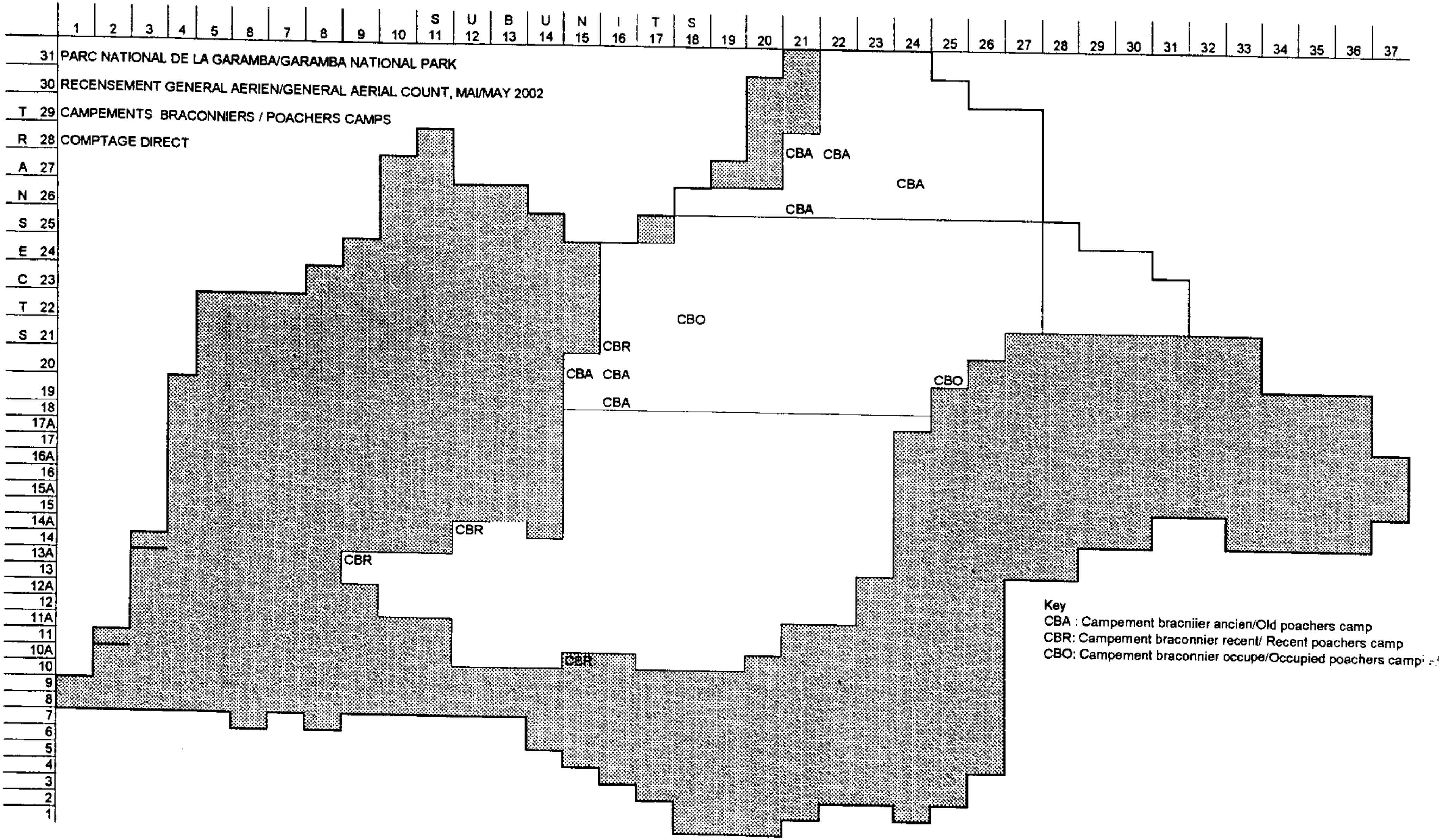
PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002

DENSITE DE PHACOCHERES / WARTHOGS DENSITY



Low D																			0	0	0	0	0	0	0	0	0	0.68	0	0	0	0					
Med D																4.76	0	1.24	0.7	0.63	2.1	0.33	0	1.83	0	0	0										
High D										0	0	1.76	0.68	1.77	0	2.43	8.6	2.64	11.8	7.13	2.07	15.1	10.1	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	1.76	0.68	1.77	0	7.19	8.6	3.87	12.5	7.76	4.16	15.4	10.1	1.83	0	0	0	0.68	0	0	0	0	0	0	0	0	0



PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002

CAMPEMENTS BRACONNIERS / POACHERS CAMPS

COMPTAGE DIRECT

Key

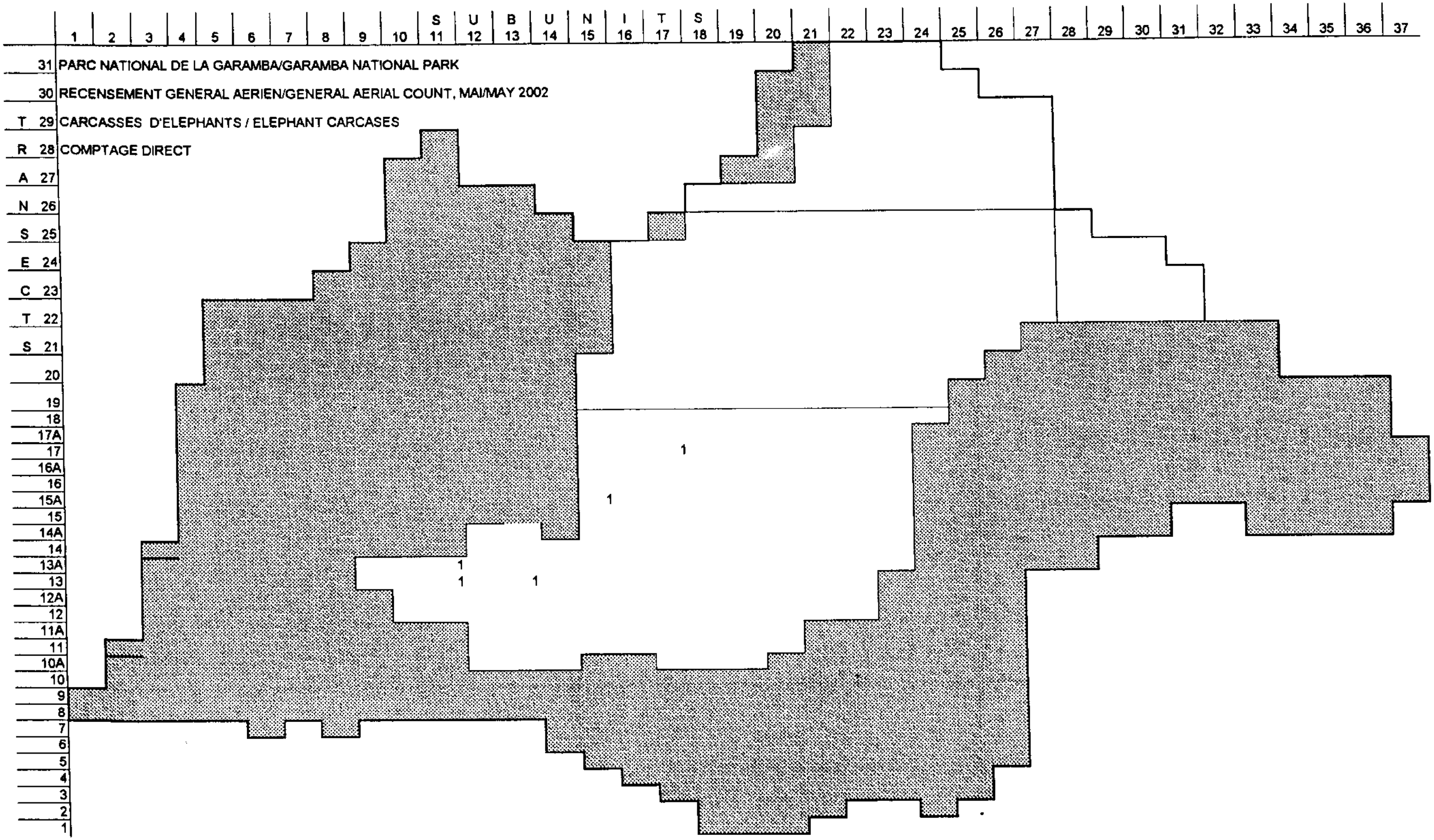
CBA : Campement bracniier ancien/Old poachers camp

CBR: Campement braconnier recent/ Recent poachers camp

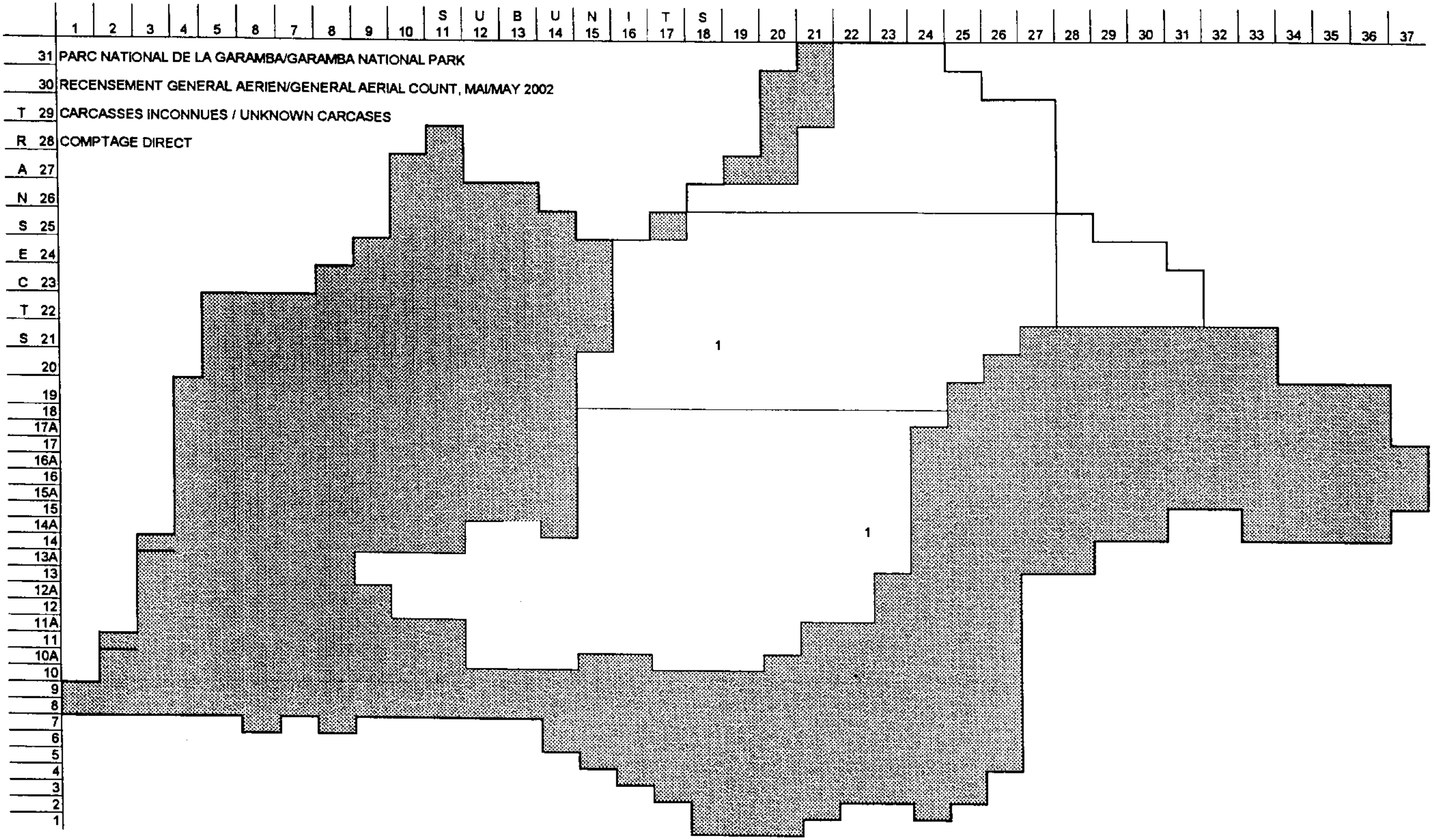
CBO: Campement braconnier occupe/Occupied poachers camp

	1	2	3	4	5	8	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D									0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0												
Tots	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002
CARCASSES D'ELEPHANTS / ELEPHANT CARCASES
COMPTAGE DIRECT



Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D									0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0												
Don	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tota	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



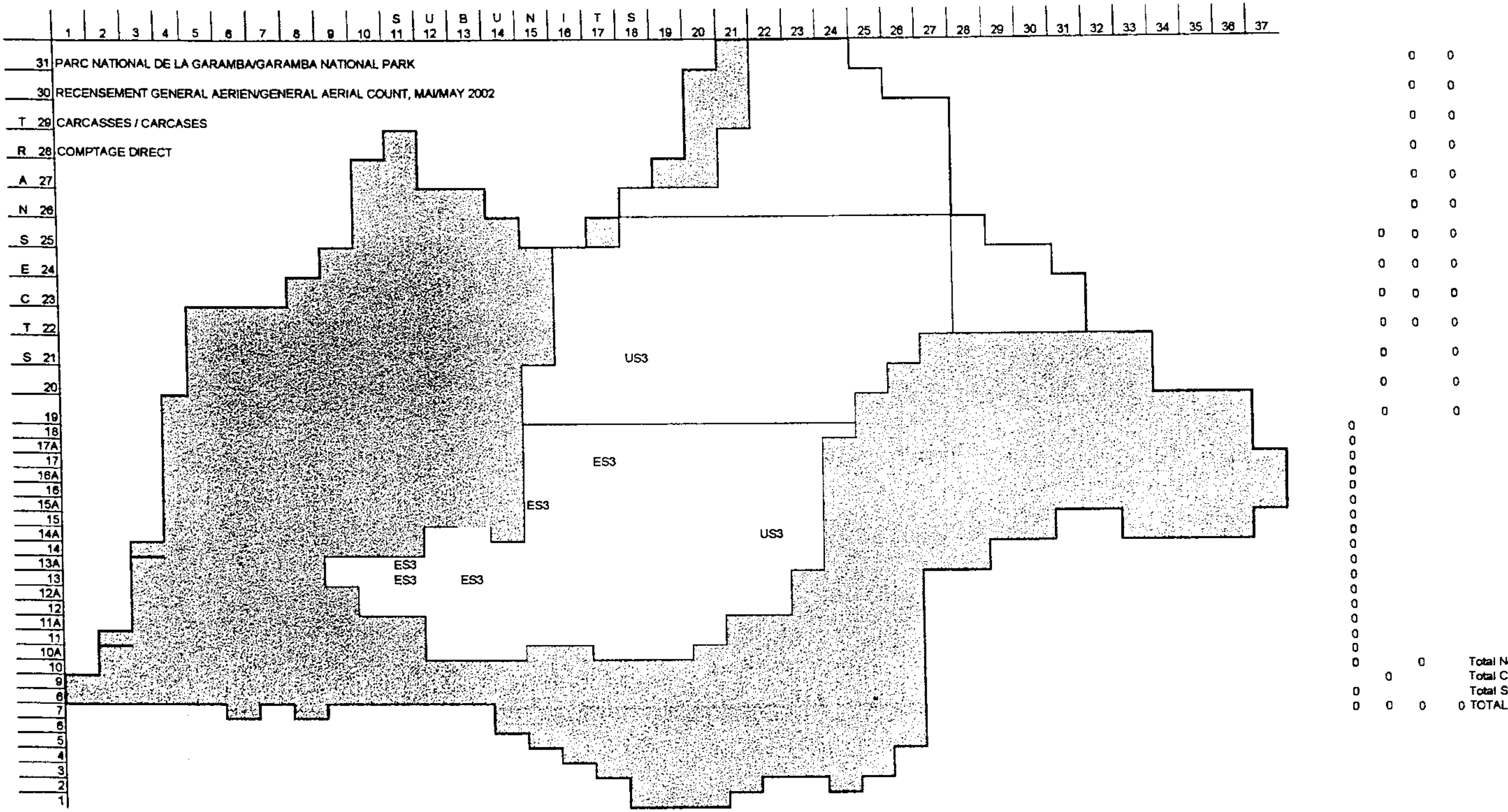
PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI/MAY 2002

CARCASSES INCONNUES / UNKNOWN CARCASES

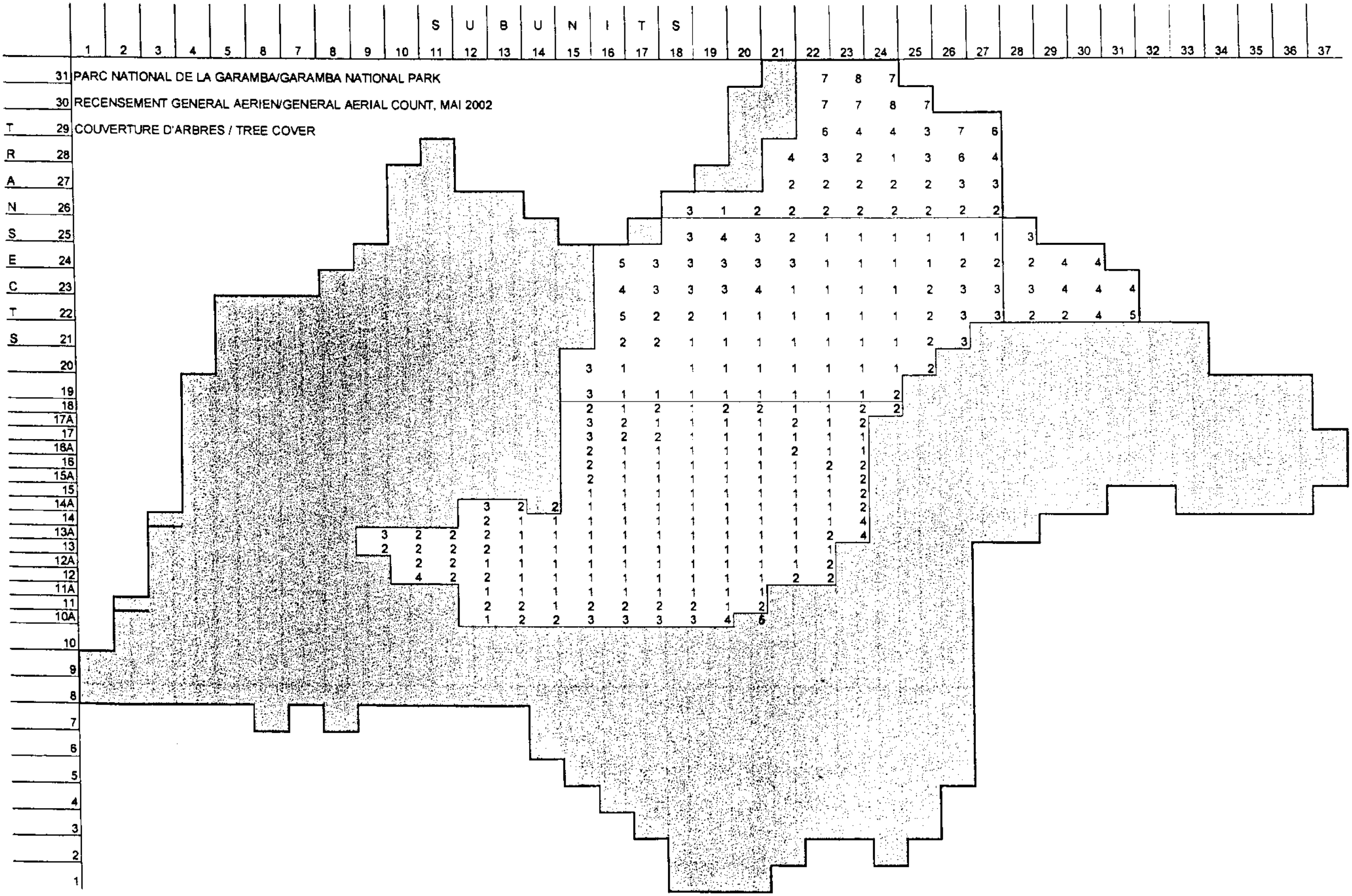
COMPTAGE DIRECT

Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	1	0	0	0	0	0	0	0	0	0										
High D									0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tots	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Low D																			0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Med D																0	0	0	0	0	0	0	0	0	0	0	0										
High D									0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0												
Dom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tota	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2002
COUVERTURE D'ARBRES / TREE COVER

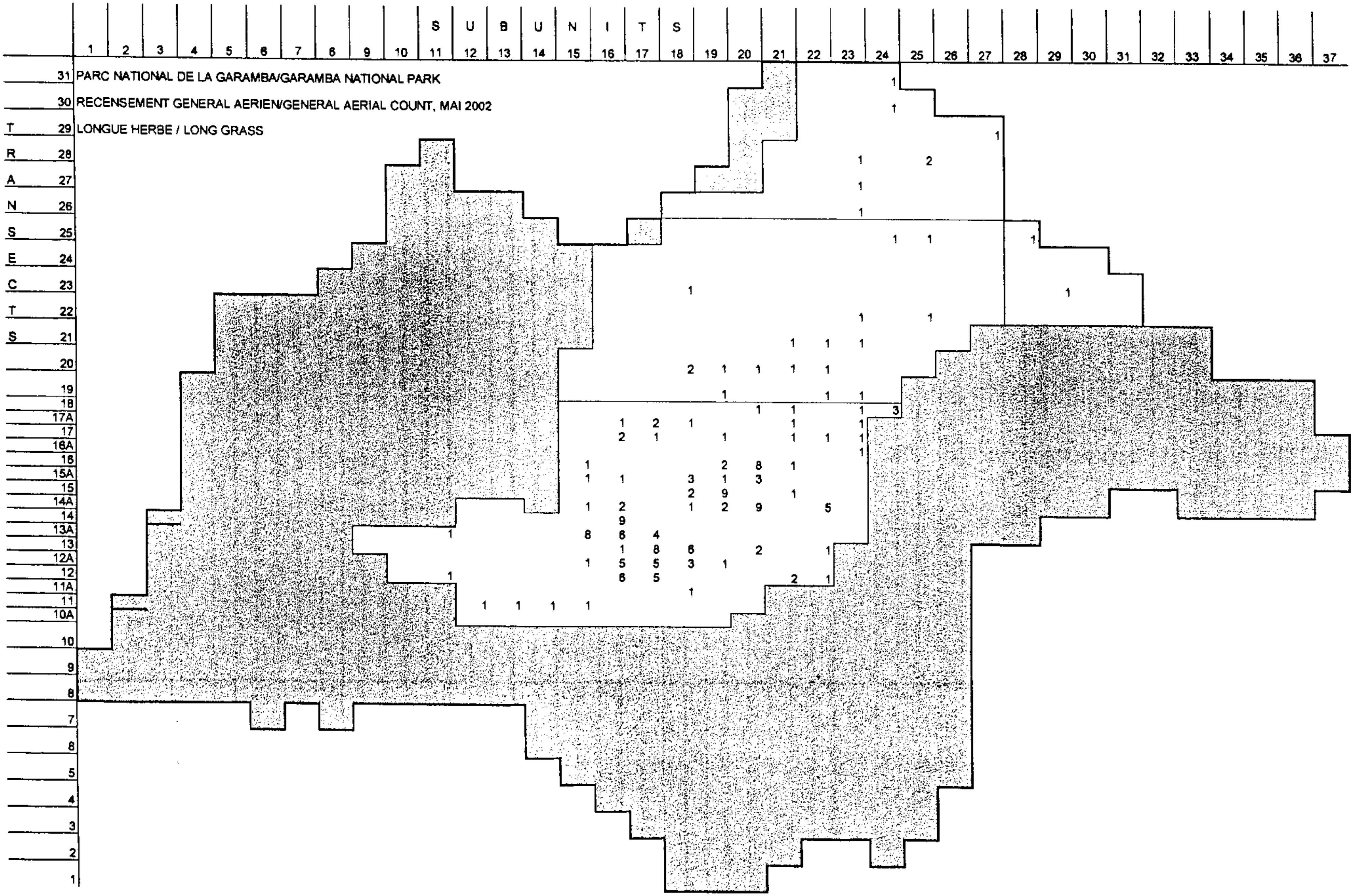


	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
31														7	8	7							
30														7	7	8	7						
29														6	4	4	3	7	6				
28													4	3	2	1	3	6	4				
27													2	2	2	2	2	3	3				
26										3	1	2	2	2	2	2	2	2	2				
25										3	4	3	2	1	1	1	1	1	1	3			
24								5	3	3	3	3	3	1	1	1	1	2	2	2	4	4	
23								4	3	3	3	4	1	1	1	1	2	3	3	3	4	4	4
22								5	2	2	1	1	1	1	1	1	2	3	3	2	2	4	5
21								2	2	1	1	1	1	1	1	1	2	3					
20							3	1		1	1	1	1	1	1	1	2						
19							3	1	1	1	1	1	1	1	1	2							
18							2	1	2	1	2	2	1	1	2	2							
17A							3	2	1	1	1	1	2	1	2								
17							3	2	2	1	1	1	1	1	1								
16A							2	1	1	1	1	1	2	1	1								
16							2	1	1	1	1	1	1	2	2								
15A							2	1	1	1	1	1	1	1	2								
15							1	1	1	1	1	1	1	1	2								
14A				3	2	2	1	1	1	1	1	1	1	1	2								
14				2	1	1	1	1	1	1	1	1	1	1	4								
13A	3	2	2	2	1	1	1	1	1	1	1	1	1	2	4								
13	2	2	2	2	1	1	1	1	1	1	1	1	1	1									
12A		2	2	1	1	1	1	1	1	1	1	1	1	2									
12		4	2	2	1	1	1	1	1	1	1	1	2	2									
11A				1	1	1	1	1	1	1	1	1											
11				2	2	1	2	2	2	2	1	2											
10A				1	2	2	3	3	3	3	4	6											

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2002

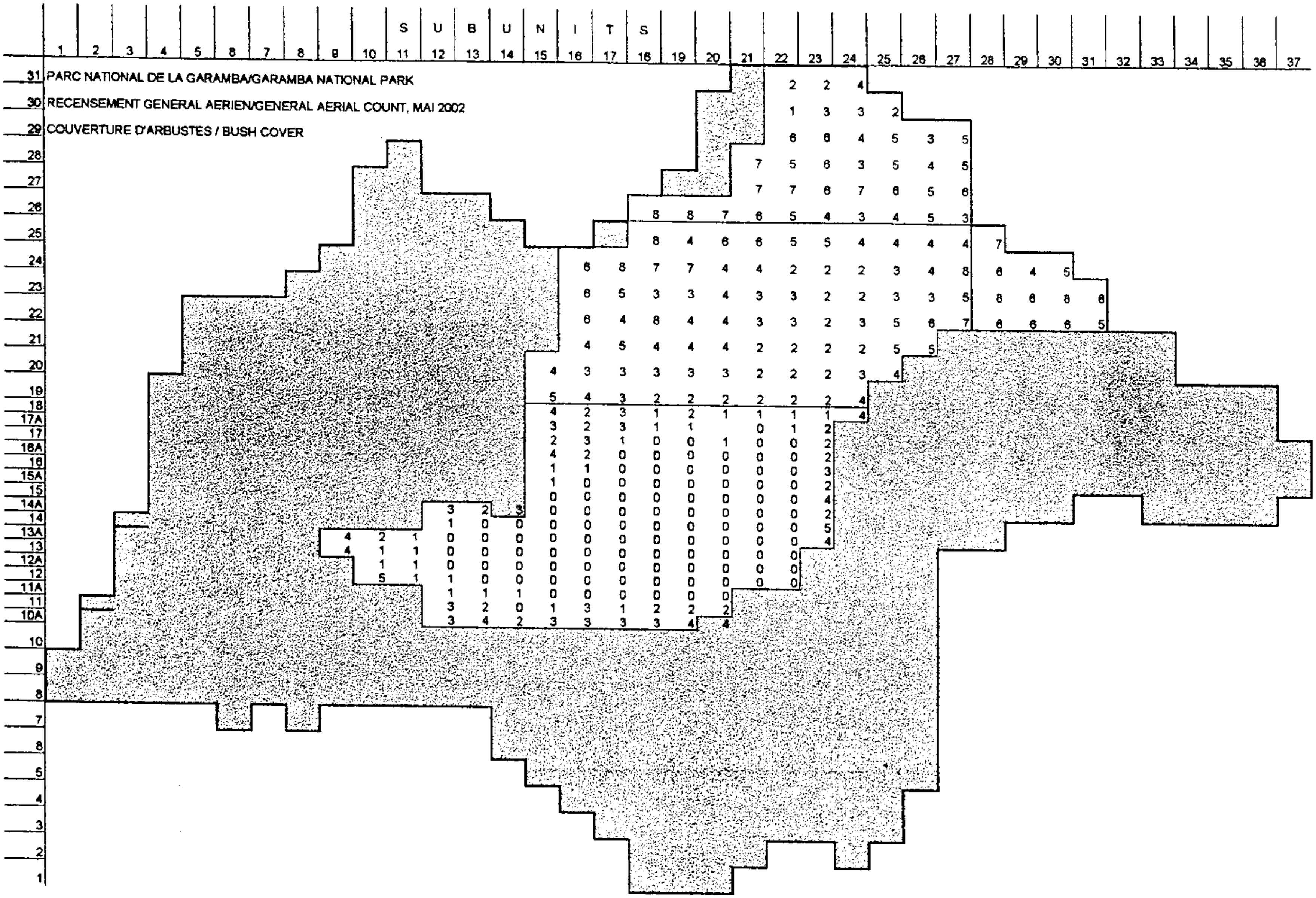
LONGUE HERBE / LONG GRASS



PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2002

COUVERTURE D'ARBUSTES / BUSH COVER



		6	2.67	
		9	2.25	
		29	4.83	
		35	5	
		44	8.29	
		53	5.3	
	50	7	5.18	
	55	15	4.67	
	42	47	4.13	
	55	23	4.86	
	39		3.55	
	32		2.91	
	26		2.8	
20			2	
13			1.63	
9			1	
6			0.89	
5			0.56	
3			0.33	
4			0.44	
10			0.83	
6			0.5	
11			0.73	
6			0.43	
2			0.15	
7			0.54	
3			0.33	
16			1.78	
25			3.13	
0	0	178	4.39	Total Nor
301	301	92	4.01	Total Cen
148	0	0	0.95	Total Sud
148	301	270	2.4	TOTAL

Low D																			8	7	13	17	27	24	22	17	19	25	16	17	11	0					
Med D																11	28	35	27	27	22	19	17	20	24	22	22										
High D										1	3	2	5	1	1	13	8	4	5	4	1	2	27	4	0												
Dom	0	0	0	0	0	0	0	0	8	5	0	8	0	0	24	18	0	0	0	0	7	9	0	0	0												
Total	0	0	0	0	0	0	0	0	6	8	3	8	5	1	25	42	36	39	40	38	43	47	71	48	46	39	41	25	16	17	11	0	0	0	0	0	0

TRANS	PNG 2002 AREA HIGH STH	MID NTH	LOW NTH	TOT NOR	WARTHOG HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL	WATERBUCK HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL
31			8.58	8.58			0	0				0	0	
30			12.38	12.38			0	0				0	0	
29			17.37	17.37			0	0				0	0	
28			21.39	21.39			0	0				1	1	
27			20.45	20.45			0	0				0	0	
26			30.62	30.62			0	0				0	0	
25		28.88	2.86	31.73		3	0	3			0	0	0	
24		33.94	8.72	42.66		0	0	0			6	0	6	
23		34.30	22.94	57.24		0	2	2			0	0	0	
22		34.38	11.43	45.81		0	0	0			0	0	0	
21		30.43		30.43		12		12			0		0	
20		31.52		31.52		5		5			4		4	
19		29.09		29.09		7		7			10		10	
18	27.57				11					0				
17a	26.82				4					1				
17	25.36				7					12				
16a	26.16				13					0				
16	26.09				10					4				
15a	25.36				19					0				
15	25.73				17					8				
14a	31.37				21					8				
14	34.16				11					42				
13a	43.10				11					9				
13	38.93				26					2				
12a	37.52				6					21				
12	37.60				7					9				
11a	26.16				0					0				
11	24.64				3					12				
10a	24.71				1					11				
Total	481.3	222.5	156.7	379.3	167.0	27.0	2.0	29.0		139.0	20.0	1.0	21.0	
Sum squ	15040.7	7109.8	2341.3	13309.4	2559.0	227.0	0.0	231.0		2925.0	152.0	1.0	153.0	
				Sum (Z*y	5216.2	813.0	0.0	936.1		4486.6	620.6	21.4	694.4	
				R=Sy/Sz	0.3	0.1	0.0	0.1		0.3	0.1	0.0	0.1	
				Var y	54.4	20.5	0.0	13.9		114.5	15.8	0.2	9.9	
Var z	37.6	5.9	59.2	187.1										
Covar zy					12.8	-37.7	-3.5	1.8	STRAT. TOTAL	20.4	-24.2	0.6	2.8	STRAT. TOTAL
					WARTHOG					**WATERBUCK**				
			Pop.est.(Y)		**737**	**237**	**16**	**243**	**990**	**614**	**175**	**8**	**176**	**797**
				SE(Y)	162.0	195.7	7.7	159.3	254.2	235.8	161.4	9.8	134.0	315.75
				95% C.L.	330.5	399.2	15.7	325.1	498.2	480.9	329.3	20.0	273.4	618.88
				95% C.L.	44.8	0.0	0.0	0.0	50.3	78.4	187.9	256.3	155.5	77.67

	PNG 2002	AREA			ELEPHANTS					BUFFALOS				
TRANS	HIGH STI	MID NTH	LOW NTH	TOT NOR	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL
31			8.58	8.58			0	0				0	0	
30			12.38	12.38			0	0				0	0	
29			17.37	17.37			0	0				0	0	
28			21.39	21.39			0	0				0	0	
27			20.45	20.45			0	0				0	0	
26			30.62	30.62			0	0				0	0	
25		28.88	2.86	31.73		0	0	0			0	0	0	
24		33.94	8.72	42.66		0	0	0			0	0	0	
23		34.30	22.94	57.24		0	0	0			0	0	0	
22		34.38	11.43	45.81		0	0	0			0	0	0	
21		30.43		30.43		0		0			0		0	
20		31.52		31.52		0		0			0		0	
19		29.09		29.09		0		0			8		8	
18	27.57				2	0		0		0	0		0	
17a	26.82				13					30				
17	25.36				50					6				
16a	26.16				58					143				
16	26.09				31					152				
15a	25.36				127					241				
15	25.73				150					42				
14a	31.37				142					337				
14	34.16				167					293				
13a	43.10				108					74				
13	38.93				123					610				
12a	37.52				177					575				
12	37.60				102					283				
11a	26.16				53					103				
11	24.64				51					102				
10a	24.71				1					1				
Total	481.3	222.5	156.7	379.3	1355.0	0.0	0.0	0.0		2992.0	8.0	0.0	8.0	
Sum squ	15040.7	7109.8	2341.3	13309.4	167617.0	0.0	0.0	0.0		1113056.0	64.0	0.0	64.0	
				Sum (Z*y)	43825.3	0.0	0.0	0.0		100824.0	252.1	0.0	252.1	
				R=Sy/Sz	2.8	0.0	0.0	0.0		6.2	0.0	0.0	0.0	
				Var y	3524.4	0.0	0.0	0.0		36903.5	9.1	0.0	4.9	
Var z	37.6	5.9	59.2	187.1										
Covar zy					204.4	0.0	0.0	0.0	STRAT. TOTAL	721.6	-8.9	0.0	-0.1	STRAT. TOTAL
			Pop.est.(Y)		ELEPHANTS 5,983	0	0	0	5,983	BUFFALOS 13,210	70	0	67	13,281
				SE(Y)	1184.2	0.0	0.0	0.0	1184.2	3927.6	112.4	0.0	95.9	3930.42
				95% C.L.	2415.7	0.0	0.0	0.0	2321.0	8012.4	229.2	0.0	195.7	7703.62
				95% C.L.	40.4	0.0	0.0	0.0	38.8	60.7	326.9	ERR	292.2	58.01

TRANS	PNG 2002		AREA		GIRAFFE					LION				
	HIGH ST	MID NTH	LOW NT	TOT.NOR	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL
31			8.58	8.58			0	0				0	0	
30			12.38	12.38			0	0				0	0	
29			17.37	17.37			0	0				0	0	
28			21.39	21.39			0	0				0	0	
27			20.45	20.45			0	0				0	0	
26			30.62	30.62			0	0				0	0	
25		28.88	2.86	31.73		0	0	0			0	0	0	
24		33.94	8.72	42.66		0	0	0			0	0	0	
23		34.30	22.94	57.24		0	0	0			0	0	0	
22		34.38	11.43	45.81		0	0	0			0	0	0	
21		30.43		30.43		0		0			0		0	
20		31.52		31.52		0		0			0		0	
19		29.09		29.09		0		0			0		0	
18	27.57				0					0				
17a	26.82				0					0				
17	25.36				0					0				
16a	26.16				0					0				
16	26.09				0					3				
15a	25.36				0					0				
15	25.73				0					0				
14a	31.37				4					0				
14	34.16				0					0				
13a	43.10				0					0				
13	38.93				0					0				
12a	37.52				0					0				
12	37.60				0					0				
11a	26.16				0					0				
11	24.64				4					0				
10a	24.71				6					0				
Total	481.3	222.5	156.7	379.3	14.0	0.0	0.0	0.0		3.0	0.0	0.0	0.0	
Sum squ	15040.7	7109.8	2341.3	13309.4	68.0	0.0	0.0	0.0		9.0	0.0	0.0	0.0	
				Sum (Z*y	372.3	0.0	0.0	0.0		78.3	0.0	0.0	0.0	
				R=Sy/Sz	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
				Var y	3.7	0.0	0.0	0.0		0.6	0.0	0.0	0.0	
Var z	37.6	5.9	59.2	187.1					STRAT.					STRAT.
Covar zy					-3.3	0.0	0.0	0.0	TOTAL	-0.8	0.0	0.0	0.0	TOTAL
					GIRAFFE					**LION**				
			Pop.est.(Y)		**62**	**0**	**0**	**0**	**62**	**13**	**0**	**0**	**0**	**13**
				SE(Y)	45.5	0.0	0.0	0.0	45.5	17.4	0.0	0.0	0.0	17.36
				95% C.L.	92.8	0.0	0.0	0.0	89.1	35.4	0.0	0.0	0.0	34.02
				95% C.L.	150.1	0.0	0.0	0.0	144.2	267.3	ERR	ERR	ERR	256.85

PNG 200	AREA				COB					HARTBEEST				
TRANS	HIGH STH	MID NTH	LOW NTH	TOT NOR	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL
31			8.58	8.58			0	0				0	0	
30			12.38	12.38			0	0				0	0	
29			17.37	17.37			0	0				0	0	
28			21.39	21.39			0	0				0	0	
27			20.45	20.45			0	0				0	0	
26			30.62	30.62			0	0				1	1	
25		28.88	2.86	31.73		0	0	0			0	0	0	
24		33.94	8.72	42.66		0	0	0			15	0	15	
23		34.30	22.94	57.24		2	0	2			0	0	0	
22		34.38	11.43	45.81		1	0	1			0	0	0	
21		30.43		30.43		0		0			0		0	
20		31.52		31.52		0		0			2		2	
19		29.09		29.09		0		0			2		2	
18	27.57				37					12				
17a	26.82				21					0				
17	25.36				26					0				
16a	26.16				66					3				
16	26.09				60					24				
15a	25.36				17					1				
15	25.73				85					8				
14a	31.37				83					0				
14	34.16				153					21				
13a	43.10				10					16				
13	38.93				2					18				
12a	37.52				5					1				
12	37.60				240					48				
11a	26.16				35					9				
11	24.64				202					2				
10a	24.71				22					0				
Total	481.3	222.5	156.7	379.3	1064.0	3.0	0.0	3.0		163.0	19.0	1.0	20.0	
Sum squ	15040.7	7109.8	2341.3	13309.4	148496.0	5.0	0.0	5.0		4205.0	233.0	1.0	234.0	
				Sum (Z*y)	32138.9	103.0	0.0	160.3		5501.2	630.3	30.6	791.8	
				R=Sy/Sz	2.2	0.0	0.0	0.0		0.3	0.1	0.0	0.1	
				Var y	5182.7	0.6	0.0	0.4		169.6	30.2	0.2	16.9	
Var z	37.6	5.9	59.2	187.1										
Covar zy					8.9	-1.7	0.0	6.0	STRAT. TOTAL	39.9	-14.9	1.7	14.5	STRAT. TOTAL
					COB					**HARTBEEST**				
			Pop.est.(Y)		**4,698**	**26**	**0**	**25**	**4,724**	**720**	**166**	**8**	**167**	**894**
				SE(Y)	1672.3	29.3	0.0	22.2	1672.6	277.7	205.7	9.4	169.7	385.13
				95% C.L.	3411.5	59.7	0.0	45.4	3278.2	566.6	419.6	19.2	346.1	754.86
				95% C.L.a	72.6	0.0	0.0	0.0	69.4	78.7	252.0	245.7	206.7	84.44

	PNG 2002	AREA			BUSHBUCK					REEDBUCK				
TRANS	HIGH STH	MID NTH	LOW NTH	TOT NOR	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL
31			8.58	8.58			0	0				0	0	
30			12.38	12.38			0	0				0	0	
29			17.37	17.37			0	0				0	0	
28			21.39	21.39			0	0				1	1	
27			20.45	20.45			0	0				0	0	
26			30.62	30.62			0	0				0	0	
25		28.88	2.86	31.73		0	0	0			0	0	0	
24		33.94	8.72	42.66		0	0	0			0	0	0	
23		34.30	22.94	57.24		3	2	5			3	0	3	
22		34.38	11.43	45.81		1	0	1			5	0	5	
21		30.43		30.43		2		2			0		0	
20		31.52		31.52		1		1			2		2	
19		29.09		29.09		0		0			1		1	
18	27.57				0					6				
17a	26.82				1					2				
17	25.36				2					2				
16a	26.16				0					0				
16	26.09				0					0				
15a	25.36				0					1				
15	25.73				0					1				
14a	31.37				2					1				
14	34.16				2					0				
13a	43.10				0					0				
13	38.93				3					0				
12a	37.52				0					3				
12	37.60				1					4				
11a	26.16				1					0				
11	24.64				1					0				
10a	24.71				2					0				
Total	481.3	222.5	156.7	379.3	15.0	7.0	2.0	9.0		20.0	11.0	1.0	12.0	
Sum squ	15040.7	7109.8	2341.3	'13309.4	29.0	15.0	0.0	31.0		72.0	39.0	1.0	40.0	
				Sum (Z*y	463.2	229.7	0.0	424.4		615.2	366.9	21.4	514.3	
				R=Sy/Sz	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
				Var y	1.0	1.3	0.0	2.1		3.1	3.6	0.2	2.4	
Var z	37.6	5.9	59.2	187.1										
Covar zy					0.8	-6.0	-3.5	12.7	STRAT. TOTAL	0.9	-8.2	0.6	12.3	STRAT. TOTAL
					BUSHBUCK					**REEDBUCK**				
				Pop.est.(Y)	**66**	**61**	**16**	**75**	**143**	**88**	**96**	**8**	**100**	**193**
				SE(Y)	22.7	47.0	7.7	52.2	52.8	40.5	75.7	9.8	55.2	102.56
				95% C.L.	46.3	96.0	15.7	106.6	103.5	82.6	154.4	20.0	112.7	201.02
				95% C.L.	70.0	0.0	0.0	0.0	72.3	93.5	160.2	256.3	112.2	104.42

	PNG 2002	AREA			RHINOS					HIPPOS				
TRANS	HIGH ST	MID NTH	LOW NTH	TOT NOR	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL
31			8.58	8.58			0	0				0	0	
30			12.38	12.38			0	0				0	0	
29			17.37	17.37			0	0				0	0	
28			21.39	21.39			0	0				0	0	
27			20.45	20.45			0	0				0	0	
26			30.62	30.62			0	0				0	0	
25		28.88	2.86	31.73		0	0	0			0	0	0	
24		33.94	8.72	42.66		0	0	0			0	0	0	
23		34.30	22.94	57.24		0	0	0			0	0	0	
22		34.38	11.43	45.81		0	0	0			0	0	0	
21		30.43		30.43		0		0			0		0	
20		31.52		31.52		0		0			0		0	
19		29.09		29.09		0		0			0		0	
18	27.57				0					0				
17a	26.82				0					2				
17	25.36				0					47				
16a	26.16				2					118				
16	26.09				0					224				
15a	25.36				0					2				
15	25.73				0					202				
14a	31.37				0					42				
14	34.16				0					16				
13a	43.10				4					8				
13	38.93				2					82				
12a	37.52				0					4				
12	37.60				2					27				
11a	26.16				0					139				
11	24.64				0					35				
10a	24.71				0					0				
Total	481.3	222.5	156.7	379.3	10.0	0.0	0.0	0.0		948.0	0.0	0.0	0.0	
Sum squ	15040.7	7109.8	2341.3	13309.4	28.0	0.0	0.0	0.0		137220.0	0.0	0.0	0.0	
				Sum (Z*y	377.8	0.0	0.0	0.0		26490.1	0.0	0.0	0.0	
				R=Sy/Sz	0.0	0.0	0.0	0.0		2.0	0.0	0.0	0.0	
				Var y	1.5	0.0	0.0	0.0		5403.4	0.0	0.0	0.0	
Var z	37.6	5.9	59.2	187.1										
Covar zy					5.1	0.0	0.0	0.0	STRAT. TOTAL	-135.1	0.0	0.0	0.0	STRAT. TOTAL
					RHINO					**HIPPOS**				
			Pop.est.(Y)		**44**	**0**	**0**	**0**	**44**	**4,186**	**0**	**0**	**0**	**4,186**
				SE(Y)	25.6	0.0	0.0	0.0	25.6	1786.8	0.0	0.0	0.0	1786.80
				95% C.L.	52.3	0.0	0.0	0.0	50.3	3645.1	0.0	0.0	0.0	3502.12
				95% C.L.	118.5	0.0	0.0	0.0	113.9	87.1	ERR	ERR	ERR	83.67

	PNG 2002	AREA			GREY AND RED-FLANKED DUIKER					ORIBI				
TRANS	HIGH STH	MID NTH	LOW NTH	TOT NOR	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT NTH	TOTAL
31			8.58	8.58			0	0				0	0	
30			12.38	12.38			1	1				0	0	
29			17.37	17.37			0	0				0	0	
28			21.39	21.39			1	1				1	1	
27			20.45	20.45			0	0				0	0	
26			30.62	30.62			0	0				0	0	
25		28.88	2.86	31.73		1	0	1			1	0	1	
24		33.94	8.72	42.66		0	0	0			0	0	0	
23		34.30	22.94	57.24		0	0	0			0	0	0	
22		34.38	11.43	45.81		0	0	0			0	0	0	
21		30.43		30.43		0		0			0		0	
20		31.52		31.52		0		0			0		0	
19		29.09		29.09		0		0			0		0	
18	27.57				0					0				
17a	26.82				0					0				
17	25.36				0					0				
16a	26.16				1					0				
16	26.09				0					0				
15a	25.36				0					0				
15	25.73				0					0				
14a	31.37				0					0				
14	34.16				0					0				
13a	43.10				0					0				
13	38.93				1					2				
12a	37.52				0					0				
12	37.60				0					3				
11a	26.16				0					0				
11	24.64				0					0				
10a	24.71				0					0				
Total	481.3	222.5	156.7	379.3	2.0	1.0	2.0	3.0		5.0	1.0	1.0	2.0	
Sum squ	15040.7	7109.8	2341.3	13309.4	2.0	1.0	2.0	3.0		13.0	1.0	1.0	2.0	
				Sum (Z*y	65.1	28.9	33.8	65.5		190.7	28.9	21.4	53.1	
				R=Sy/Sz	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
				Var y	0.1	0.1	0.3	0.2		0.8	0.1	0.2	0.1	
Var z	37.6	5.9	59.2	187.1					STRAT.					STRAT.
Covar zy					0.3	-1.6	0.3	-2.7	TOTAL	2.7	-1.6	0.6	-0.9	TOTAL
					GREY AND RED-FLANKED DUIKER					ORIBI				
				Pop.est.(Y)	**9**	**9**	**16**	**25**	**33**	**22**	**9**	**8**	**17**	**39**
				SE(Y)	7.8	14.3	12.7	20.9	20.6	19.3	14.3	9.8	16.8	30.90
				95% C.L.	15.8	29.1	25.9	42.7	40.4	39.4	29.1	20.0	34.2	60.56
				95% C.L.	179.2	0.0	0.0	0.0	121.6	178.5	332.0	256.3	204.5	156.66

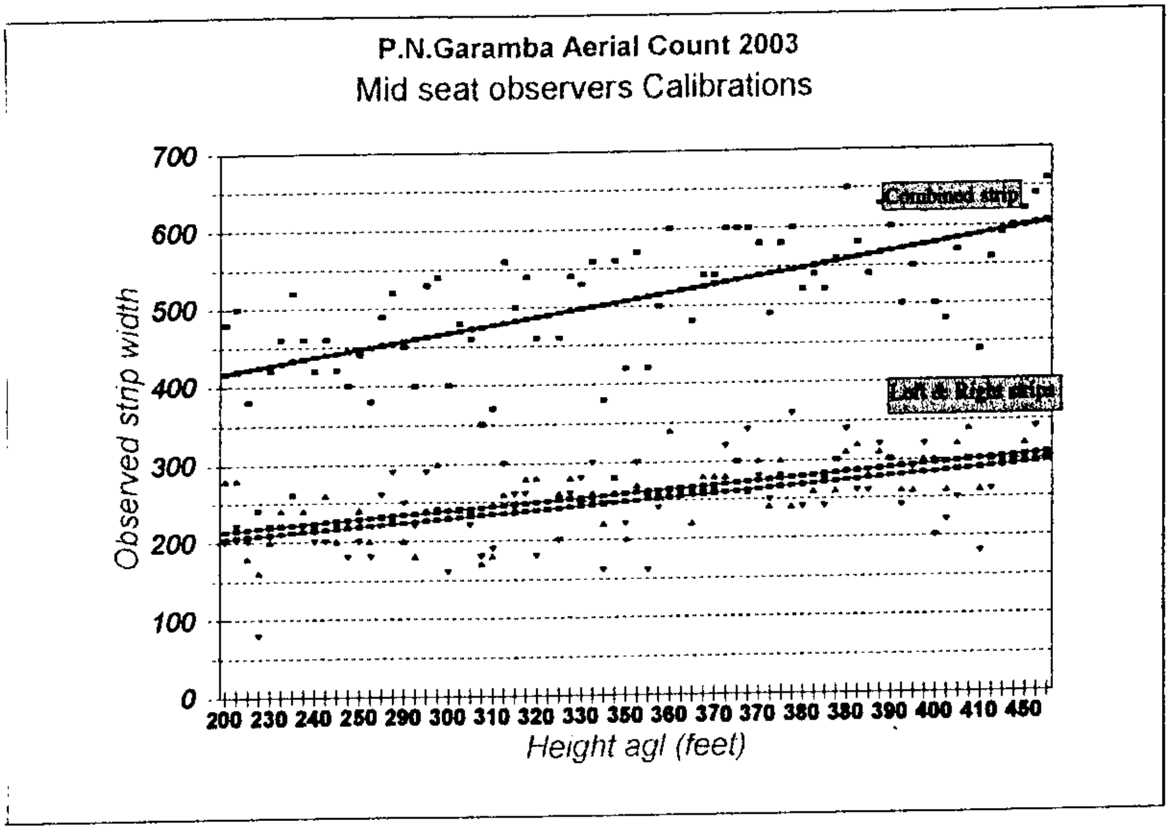
	AREA				ELE CARCASES					UNKNOWN CARCASES				
TRANS	HIGH STI	MID NTH	LOW NTI	TOT.NOR	HIGH STH	MID NTH	LOW NTI	TOT.NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT.NTH	TOTAL
31			8.58	8.58			0	0				0	0	
30			12.38	12.38			0	0				0	0	
29			17.37	17.37			0	0				0	0	
28			21.39	21.39			0	0				0	0	
27			20.45	20.45			0	0				0	0	
26			30.62	30.62			0	0				0	0	
25		28.88	2.86	31.73		0	0	0			0	0	0	
24		33.94	8.72	42.66		0	0	0			0	0	0	
23		34.30	22.94	57.24		0	0	0			0	0	0	
22		34.38	11.43	45.81		0	0	0			0	0	0	
21		30.43		30.43		0		0			1		1	
20		31.52		31.52		0		0			0		0	
19		29.09		29.09		0		0			0		0	
18	27.57				0					0				
17a	26.82				0					0				
17	25.36				1					0				
16a	26.16				0					0				
16	26.09				0					0				
15a	25.36				1					0				
15	25.73				0					0				
14a	31.37				0					1				
14	34.16				0					0				
13a	43.10				1					0				
13	38.93				2					0				
12a	37.52				0					0				
12	37.60				0					0				
11a	26.16				0					0				
11	24.64				0					0				
10a	24.71				0					0				
Total	481.3	222.5	156.7	379.3	5.0	0.0	0.0	0.0		1.0	1.0	0.0	1.0	
Sum squ	15040.7	7109.8	2341.3	13309.4	7.0	0.0	0.0	0.0		1.0	1.0	0.0	1.0	
				Sum (Z*y	171.7	0.0	0.0	0.0		31.4	30.4	0.0	30.4	
				R=Sy/Sz	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
				Var y	0.4	0.0	0.0	0.0		0.1	0.1	0.0	0.1	
Var z	37.6	5.9	59.2	187.1					STRAT.					STRAT.
Covar zy					1.4	0.0	0.0	0.0	TOTAL	0.1	-1.3	0.0	-0.1	TOTAL
					ELE CARCASES					UNKNOWN CARCASES				
			Pop.est.(Y)		22	0	0	0	22	4	9	0	8	13
				SE(Y)	13.3	0.0	0.0	0.0	13.3	5.7	14.1	0.0	12.0	19.42
				95% C.L.	27.1	0.0	0.0	0.0	26.1	11.7	28.8	0.0	24.5	38.07
				95% C.L.	122.9	0.0	0.0	0.0	118.1	264.2	329.0	ERR	293.2	288.89

PARC NATIONAL DE LA GARAMBA
GARAMBA NATIONAL PARK

RECENSEMENT GENERAL SYSTEMATIQUE
GENERAL AERIAL SYSTEMATIC SAMPLE COUNT

Calibration Graphs, Distribution Maps and Population Estimate Calculations

May / Mai 2003



Regression Output:

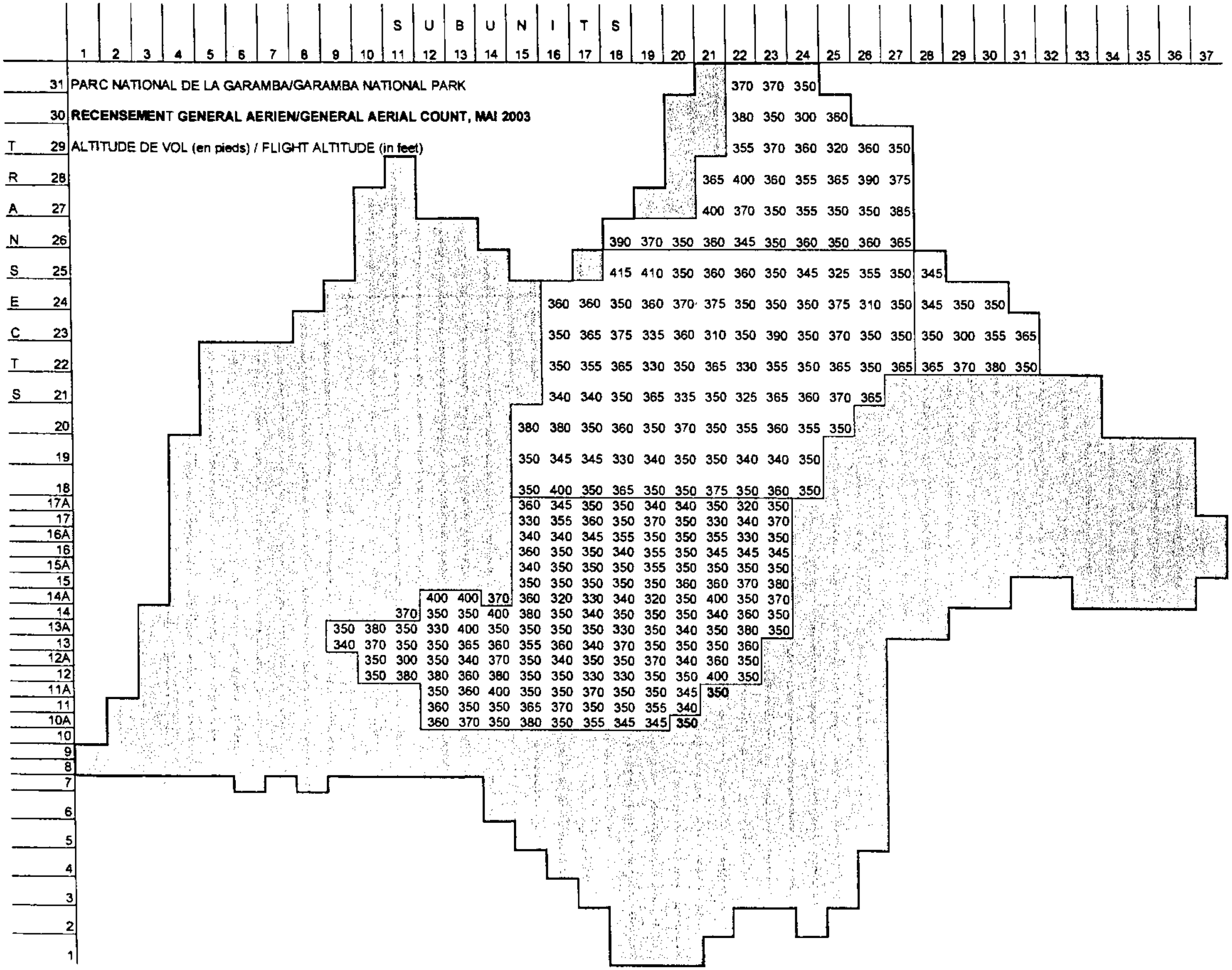
Constant		218.1045
Std Err of Y Est		59.65976
R Squared		0.480829
No. of Observations		75
Degrees of Freedom		73
X Coefficient(s)	0.87003	
Std Err of Coef.	0.105812	

y=mx+c
y= 0.87003 *alt + 218.1045

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

ALTITUDE DE VOL (en pieds) / FLIGHT ALTITUDE (in feet)



SUBUNITS

TRANSECTS

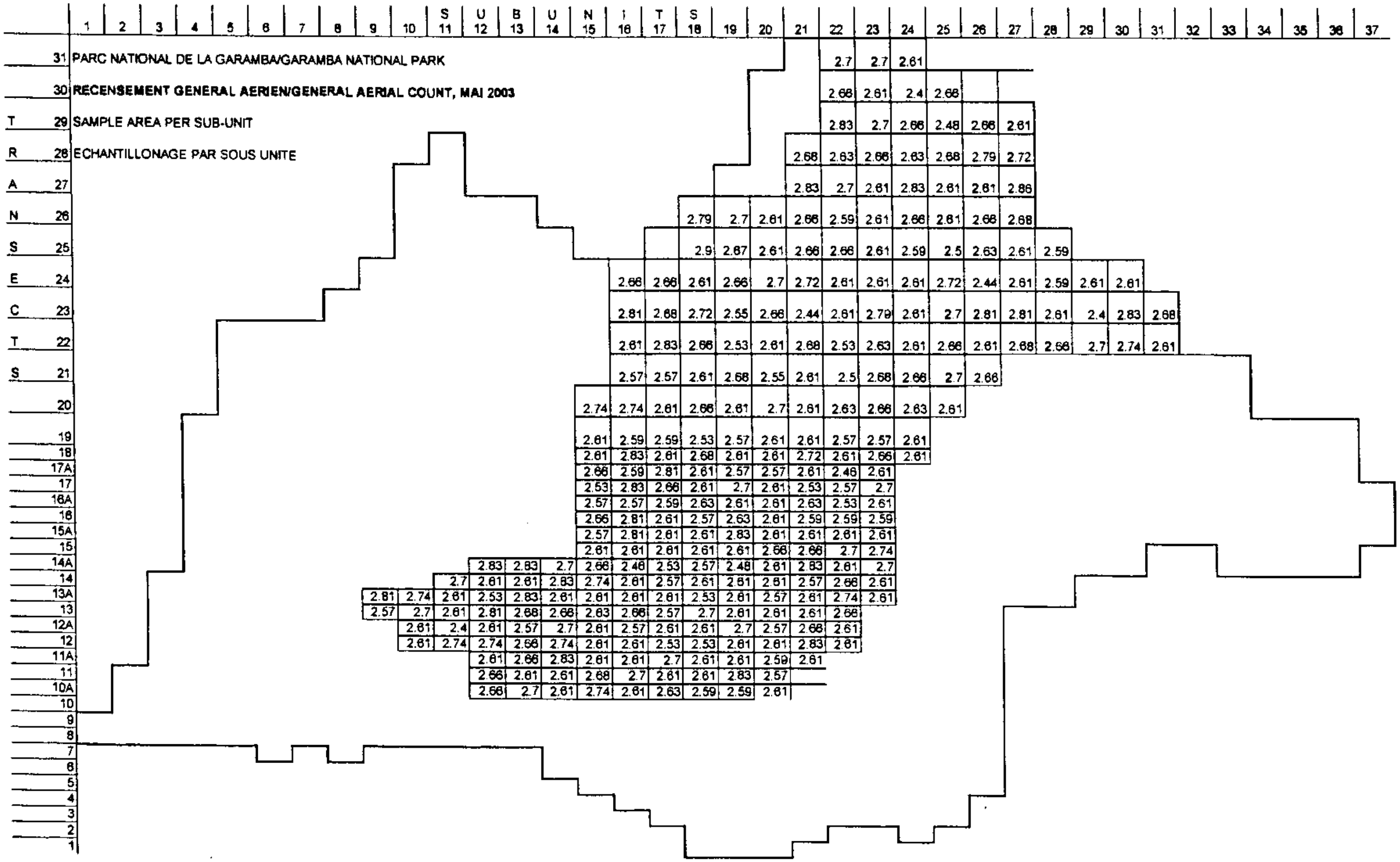
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37					
31																						370	370	350																363	363	
30																						380	350	300	360															343	343	
29																						355	370	360	320	360	350													353	353	
28																					365	400	360	355	365	390	375													373	373	
27																					400	370	350	355	350	350	385													363	363	
26																		390	370	350	360	345	350	360	350	360	365													360	360	
25																		415	410	350	360	360	350	345	325	355	350	345											362	345	360	
24																360	360	350	360	370	375	350	350	350	375	310	350	345	350	350									355	348	354	
23																350	365	375	335	360	310	350	390	350	370	350	350	350	300	355	365								355	354	352	
22																350	355	365	330	350	365	330	355	350	365	350	365	365	370	380	350								353	366	356	
21																340	340	350	365	335	350	325	365	360	370	365													351		351	
20															380	380	350	360	350	370	350	355	360	355	350														360		360	
19															350	345	345	330	340	350	350	340	340	350															344		344	
18															350	400	350	365	350	350	375	350	360	350														360			360	
17A															360	345	350	350	340	340	350	320	350															345			345	
17															330	355	360	350	370	350	330	340	370															351			351	
16A															340	340	345	355	350	350	355	330	350															346			346	
16															360	350	350	340	355	350	345	345	345															349			349	
15A															340	350	350	350	355	350	350	350	350															349			349	
15															350	350	350	350	350	360	360	370	380															358			358	
14A												400	400	370	360	320	330	340	320	350	400	350	370															359			359	
14											370	350	350	400	380	350	340	350	350	350	340	360	350															356			356	
13A									350	380	350	330	400	350	350	350	350	330	350	340	350	380	350															354			354	
13									340	370	350	350	365	360	355	360	340	370	350	350	350	360																355			355	
12A										350	300	350	340	370	350	340	350	350	370	340	360	350																348			348	
12										350	380	380	360	380	350	350	330	330	350	350	400	350																358			358	
11A												350	360	400	350	350	370	350	350	345	350																	358			358	
11												360	350	350	365	370	350	350	355	340																		354			354	
10A												360	370	350	380	350	355	345	345	350																		357			357	
10																																								359	359	Total Nord
9																																						354	354	353	354	Total Centre
8																																						354			354	Total Sud
7																																						354	354	357	355	TOTAL
6																																										
5																																										
4																																										
3																																										
2																																										
1																																										

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

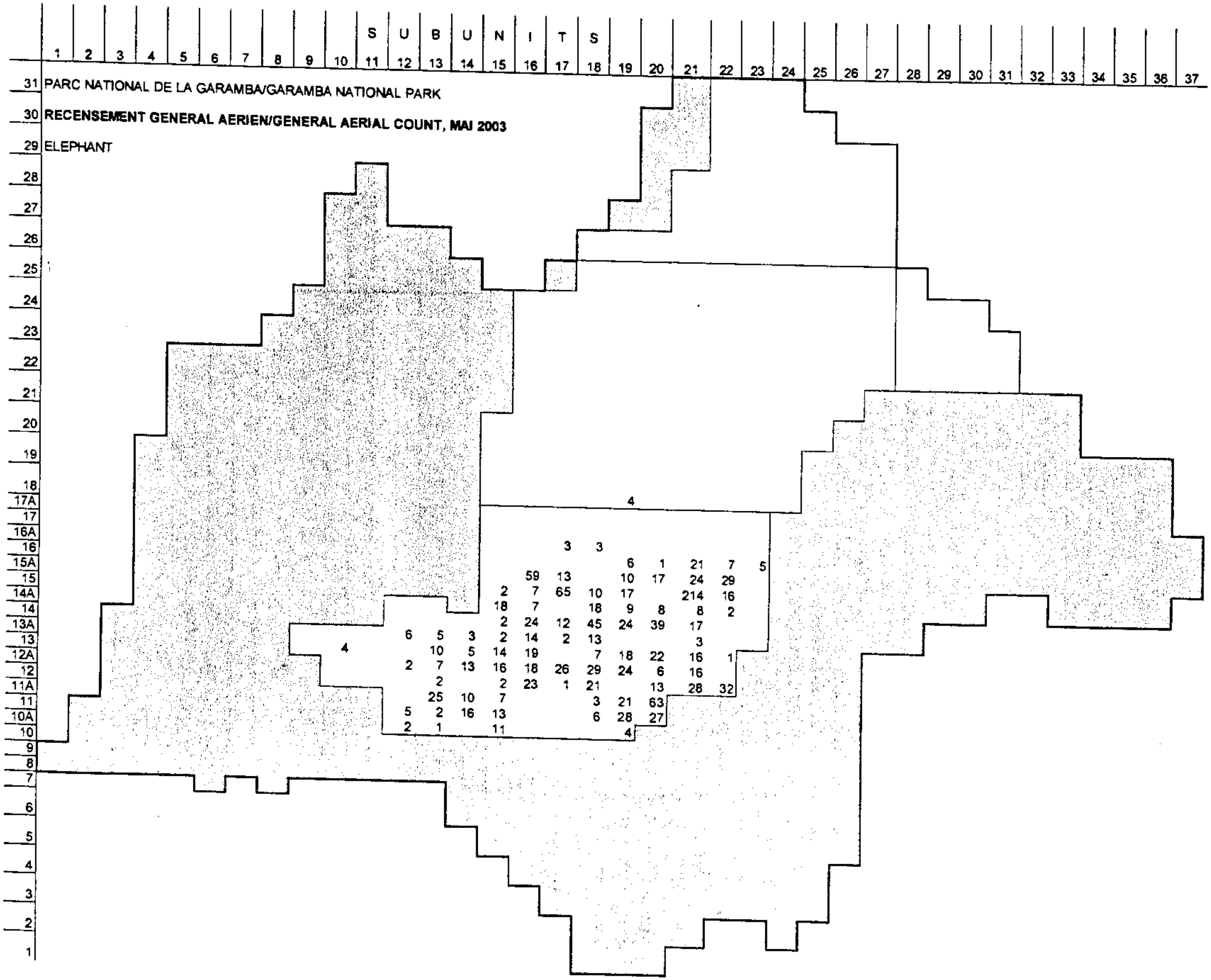
SAMPLE AREA PER SUB-UNIT

ECHANTILLONAGE PAR SOUS UNITE



	1	2	3	4	5	6	7	8	9	10	S 11	U 12	B 13	U 14	N 15	I 16	T 17	S 18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37				
31																						2.7	2.7	2.61																8.01	8.01
30																						2.68	2.61	2.4	2.68															10.32	10.32
T 29																						2.83	2.7	2.66	2.48	2.66	2.61													15.74	15.74
R 28																					2.68	2.63	2.66	2.63	2.68	2.79	2.72													18.99	18.99
A 27																					2.83	2.7	2.61	2.83	2.61	2.61	2.86													16.68	18.68
N 26																			2.79	2.7	2.61	2.66	2.59	2.61	2.66	2.61	2.68	2.68												26.57	26.57
S 25																			2.9	2.67	2.61	2.66	2.66	2.61	2.59	2.5	2.63	2.61	2.59										26.65	2.59	29.24
E 24																	2.66	2.66	2.61	2.66	2.7	2.72	2.61	2.61	2.61	2.72	2.44	2.61	2.59	2.61	2.61									31.62	7.82	39.44
C 23																	2.81	2.68	2.72	2.55	2.66	2.44	2.61	2.79	2.61	2.7	2.81	2.81	2.61	2.4	2.83	2.68								31.60	21.06	41.92
T 22																	2.61	2.83	2.66	2.53	2.61	2.68	2.53	2.63	2.61	2.66	2.61	2.68	2.66	2.7	2.74	2.61								31.49	10.74	42.22
S 21																	2.57	2.57	2.61	2.68	2.55	2.61	2.5	2.68	2.66	2.7	2.66													28.61		26.81
20																2.74	2.74	2.61	2.66	2.61	2.7	2.61	2.63	2.66	2.63	2.61														29.22		29.22
19																2.61	2.59	2.59	2.53	2.57	2.61	2.61	2.57	2.57	2.61															25.87		25.87
18																2.61	2.83	2.61	2.68	2.61	2.61	2.72	2.61	2.66	2.61														26.57			26.57
17A																2.66	2.59	2.81	2.61	2.57	2.57	2.61	2.46	2.61															23.32			23.32
17																2.53	2.83	2.66	2.61	2.7	2.61	2.53	2.57	2.7															23.54			23.54
16A																2.57	2.57	2.59	2.63	2.61	2.61	2.63	2.53	2.61															23.37			23.37
16																2.66	2.81	2.61	2.57	2.63	2.61	2.59	2.59	2.59															23.47			23.47
15A																2.57	2.81	2.61	2.61	2.83	2.61	2.61	2.61	2.61															23.50			23.50
15																2.61	2.61	2.61	2.61	2.61	2.66	2.66	2.7	2.74															23.82			23.82
14A												2.83	2.83	2.7	2.66	2.46	2.53	2.57	2.48	2.61	2.83	2.61	2.7															31.84			31.84
14											2.7	2.61	2.61	2.83	2.74	2.61	2.57	2.61	2.61	2.61	2.57	2.66	2.61															31.66			31.66
13A									2.61	2.74	2.61	2.53	2.83	2.61	2.61	2.61	2.61	2.53	2.61	2.57	2.61	2.74	2.61															39.46			39.46
13									2.57	2.7	2.61	2.81	2.68	2.66	2.63	2.66	2.57	2.7	2.61	2.61	2.61	2.66																36.89			36.89
12A										2.61	2.4	2.61	2.57	2.7	2.61	2.57	2.61	2.61	2.7	2.57	2.66	2.61																33.84			33.84
12										2.61	2.74	2.74	2.66	2.74	2.61	2.61	2.53	2.53	2.61	2.61	2.83	2.61																34.45			34.45
11A												2.61	2.66	2.83	2.61	2.61	2.7	2.61	2.61	2.59	2.61																	23.84			23.84
11												2.66	2.61	2.61	2.68	2.7	2.61	2.61	2.83	2.57																		23.69			23.69
10A												2.66	2.7	2.61	2.74	2.61	2.63	2.59	2.59	2.61																		21.14			21.14
10																																									
9																																									
8																																									
7																																									
6																																									
5																																									
4																																									
3																																									
2																																									
1																																									

0.00	0.00	98.32	98.32	Total Nord
0.00	205.26	42.20	236.72	Total Centre
444.39	0.00	0.00	444.39	Total Sud
444.39	205.26	140.52	779.43	TOTAL



PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

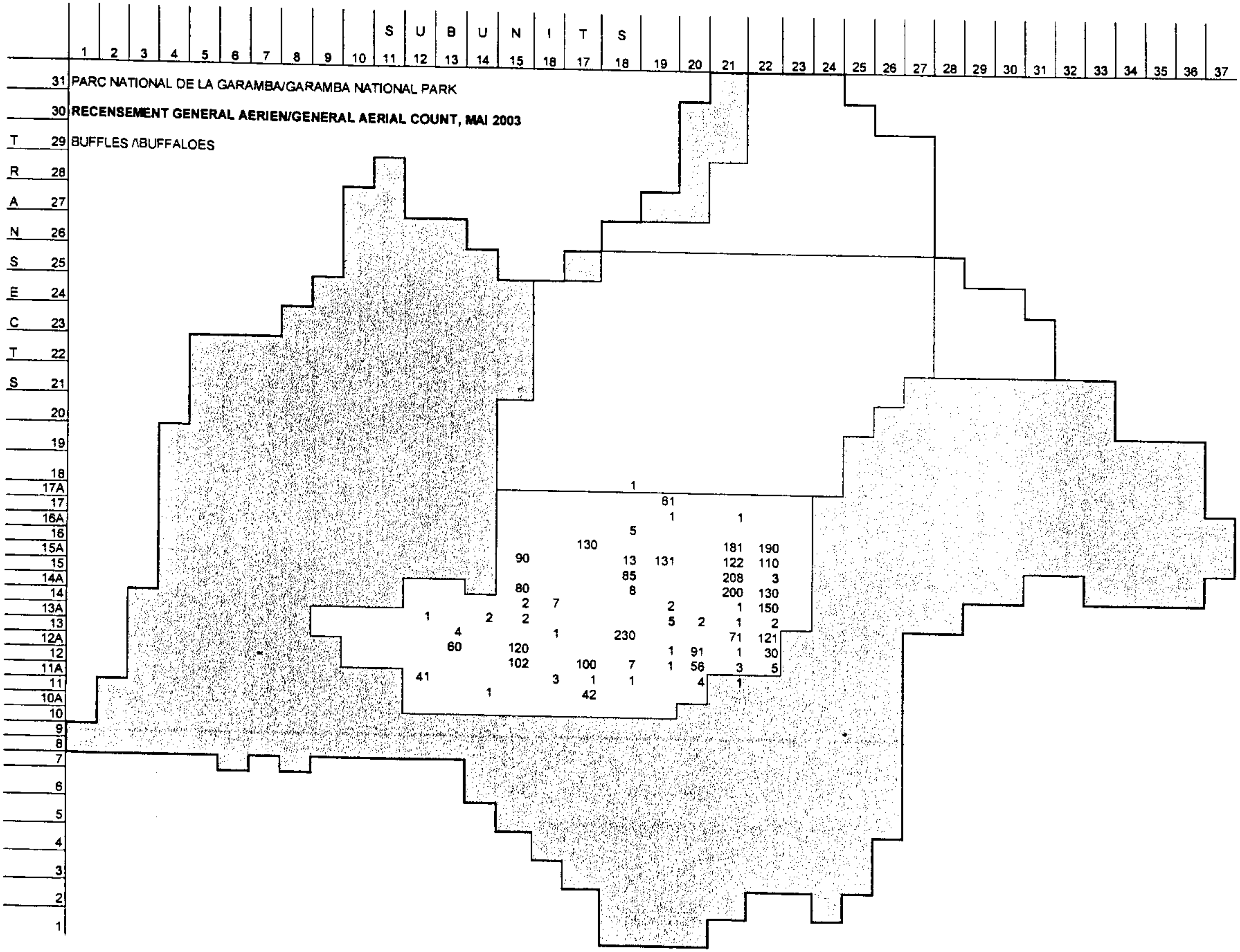
ELEPHANT

		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0		0	
	0		0	
	0		0	
4			4	
0			0	
0			0	
6			6	
40			40	
152			152	
331			331	
70			70	
163			163	
48			48	
116			116	
157			157	
122			122	
129			129	
97			97	
18			18	
	0	0	0	Total Nord
	0	0	0	Total Centre
1453	0	0	1453	Total Sud
1453	0	0	1453	TOTAL

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

BUFFLES /BUFFALOES

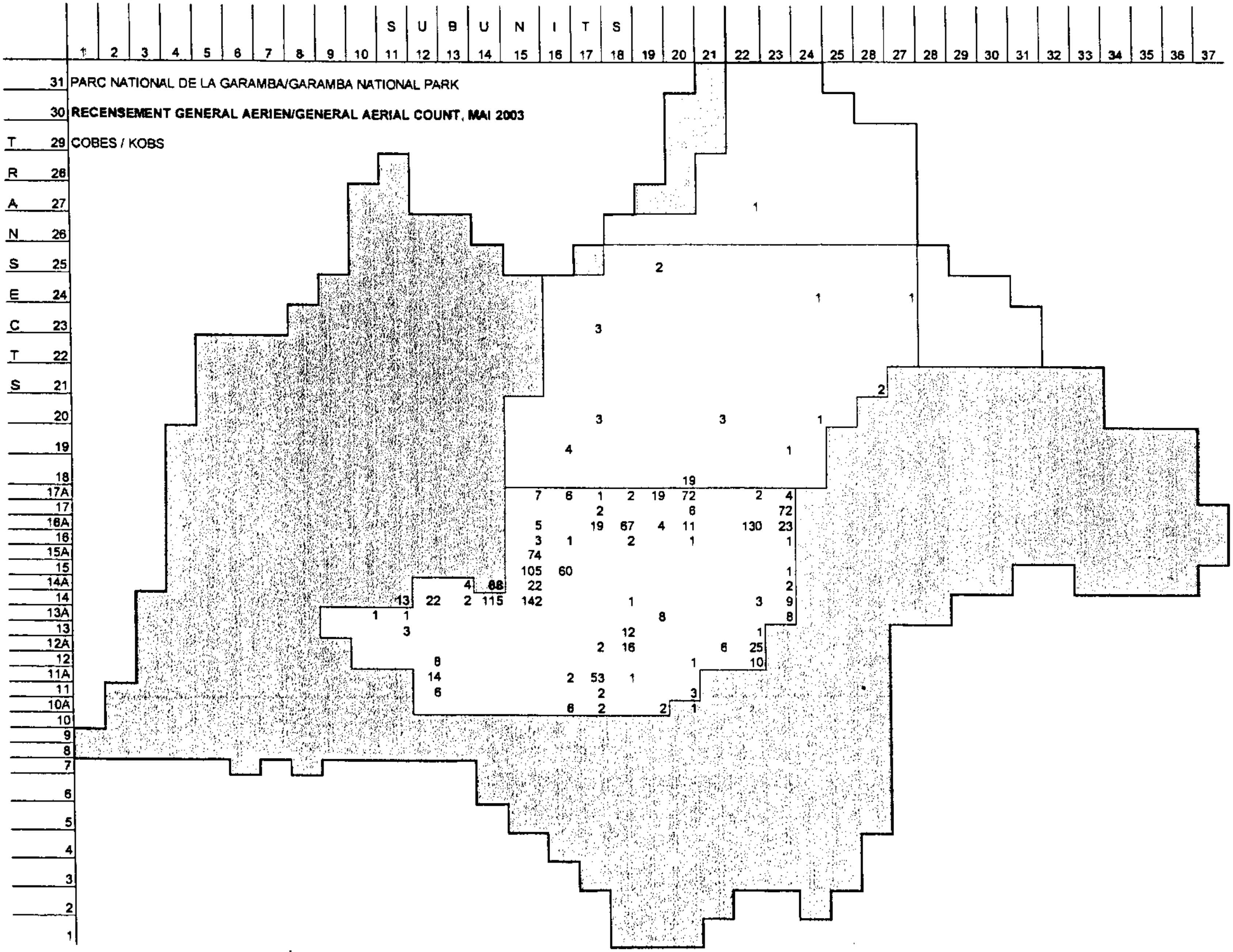


		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0		0	
	0		0	
	0		0	
1			1	
81			61	
2			2	
5			5	
501			501	
466			466	
296			296	
418			418	
162			162	
15			15	
427			427	
303			303	
274			274	
50			50	
43			43	
0			0	
0	0	0	0	Total Nor
0	0	0	0	Total Cer
3024	0	0	3024	Total Suc
3024	0	0	3024	TOTAL

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

COBES / KOBS

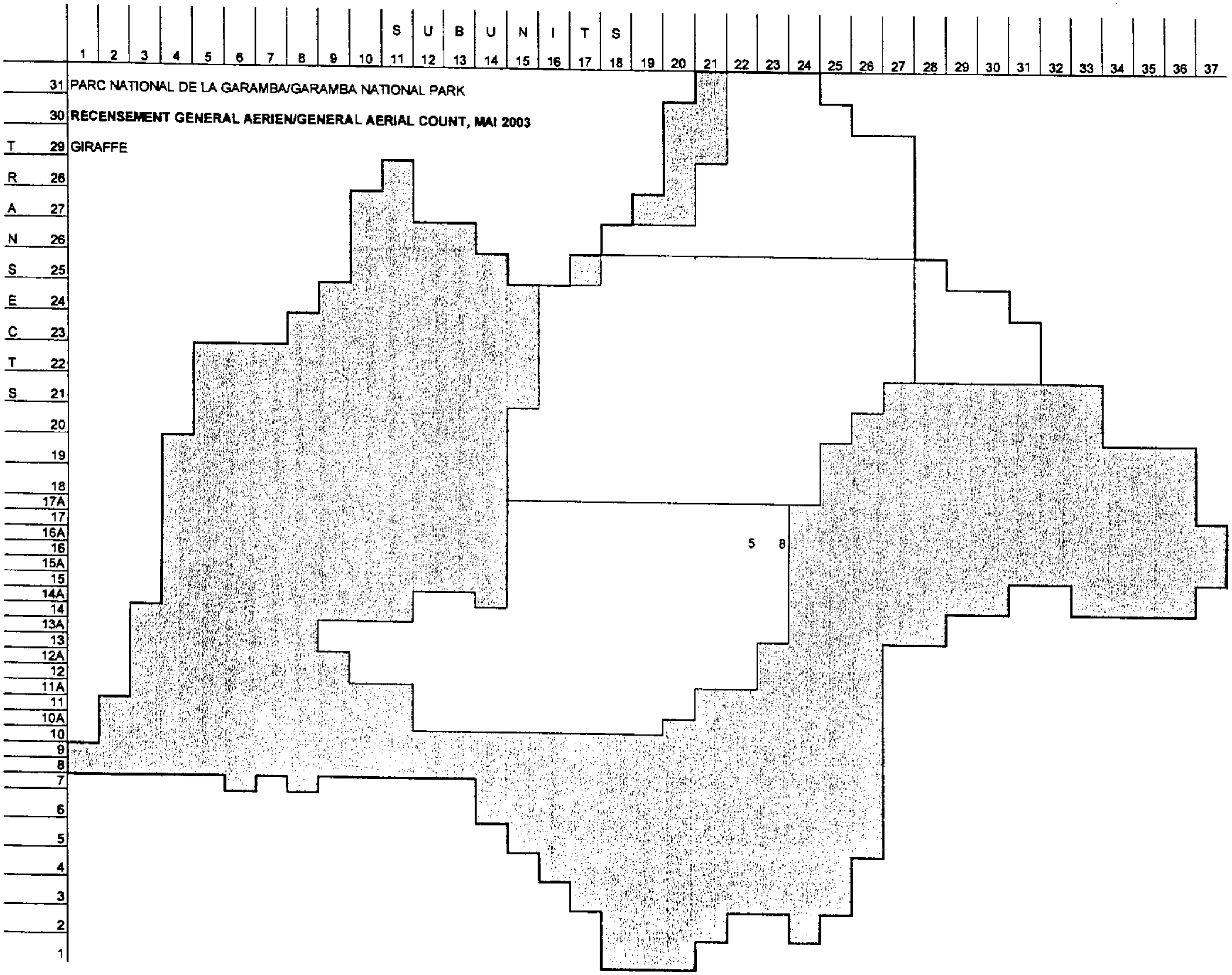


		0	0	
		0	0	
		0	0	
		0	0	
		1	1	
		0	0	
	2	0	2	
	2	0	2	
	3	0	3	
	0	0	0	
	2		2	
	7		7	
	5		5	
19			19	
113			113	
80			80	
259			259	
6			6	
74			74	
166			166	
96			96	
294			294	
18			16	
16			16	
49			49	
19			19	
70			70	
11			11	
12			12	
0	0	1	1	Total Nord
21	21	0	21	Total Centre
1304	0	0	1304	Total Sud
1304	21	1	1326	TOTAL

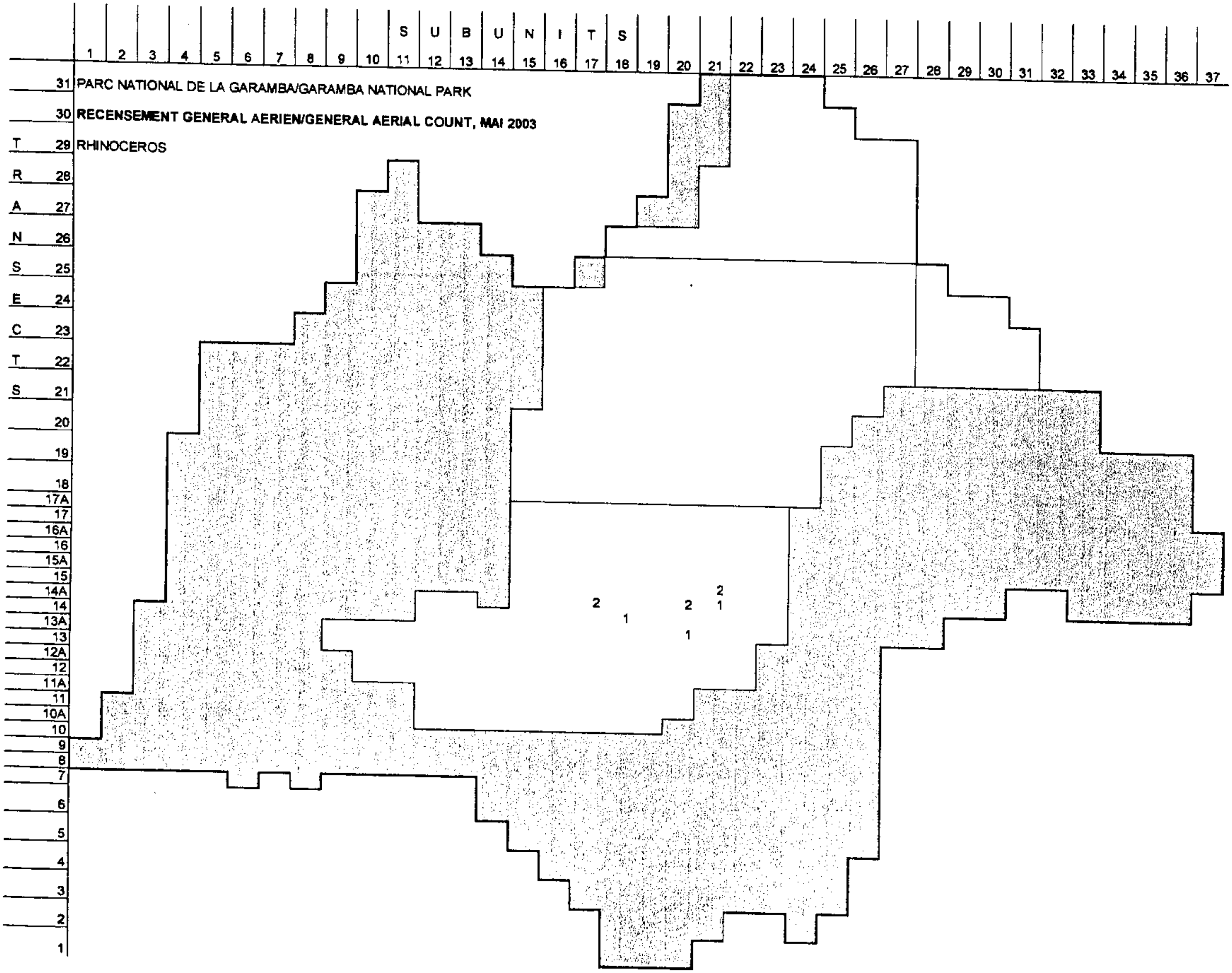
PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

GIRAFFE



		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0		0	
	0		0	
	0		0	
0			0	
0			0	
0			0	
13			13	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0	0	0	0	Total Nord
0	0	0	0	Total Centre
13	0	0	13	Total Sud
13	0	0	13	TOTAL

 PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

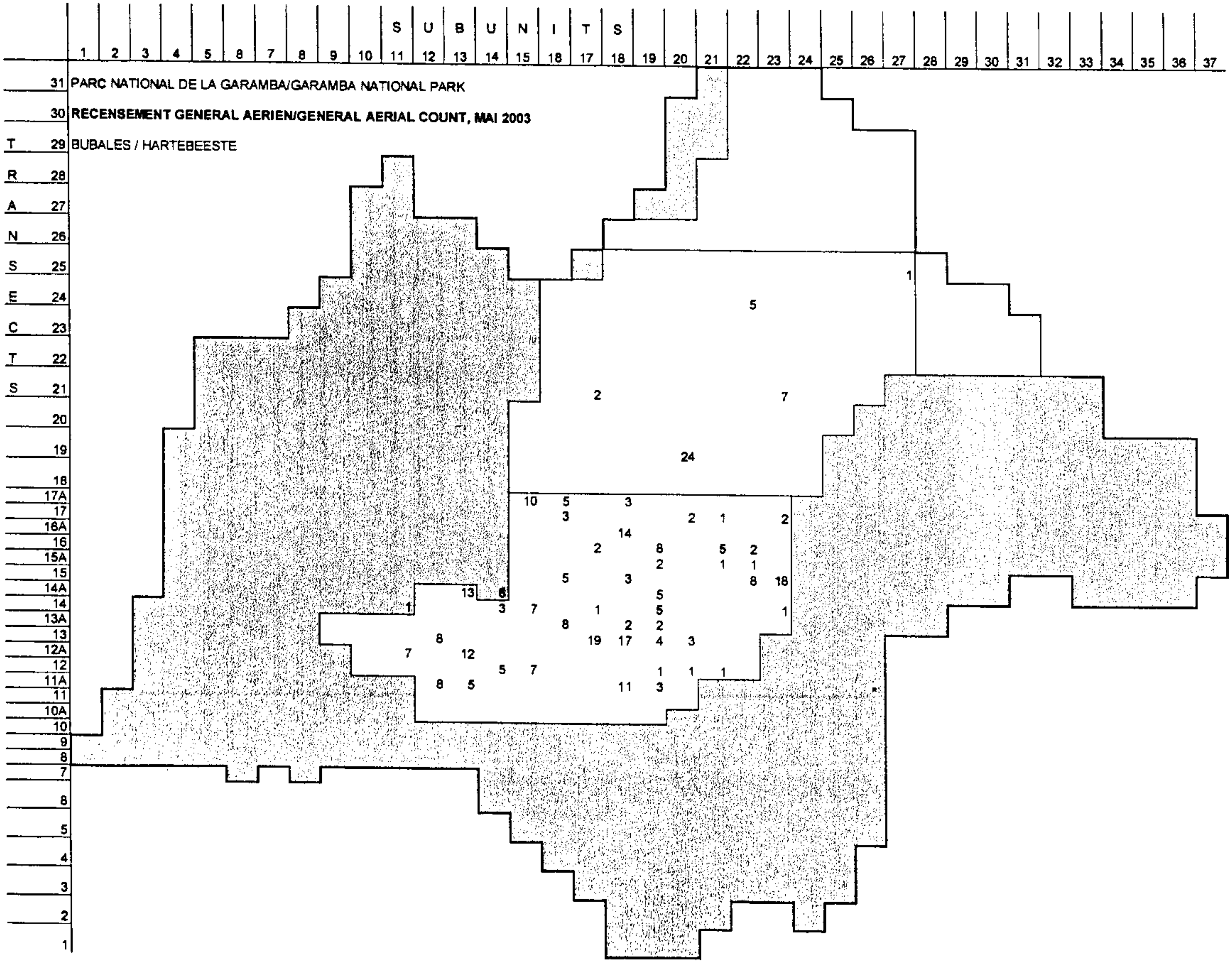
RHINOCEROS

		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0		0	
	0		0	
	0		0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
2			2	
5			5	
1			1	
1			1	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0	0	0	0	Total Nord
0	0	0	0	Total Centre
9	0	0	9	Total Sud
9	0	0	9	TOTAL

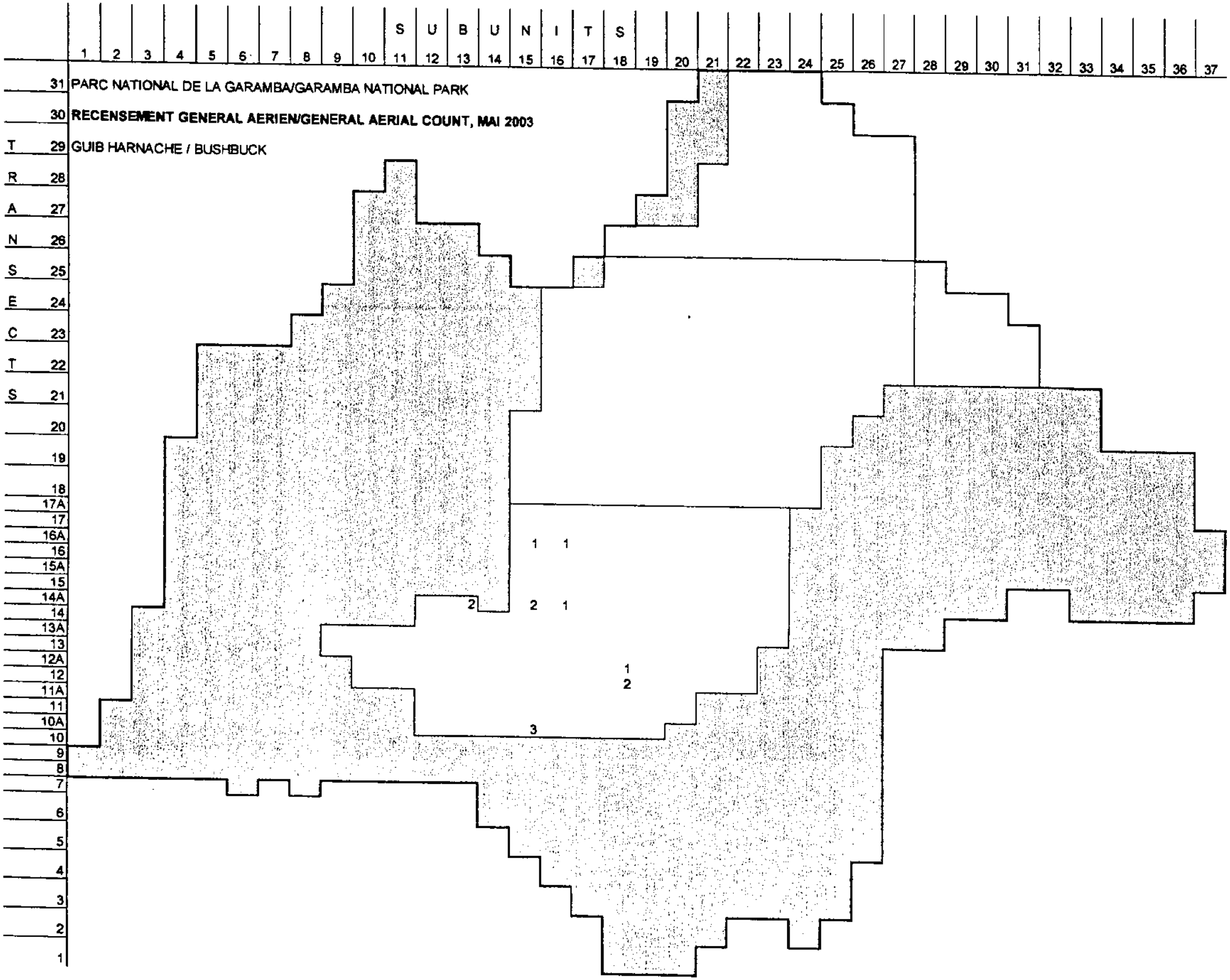
PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

BUBALES / HARTEBEESTE



		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	1	0	1	
	5	0	5	
	0	0	0	
	0	0	0	
	9		9	
	0		0	
	24		24	
0			0	
18			18	
8			8	
14			14	
17			17	
4			4	
32			32	
24			24	
17			17	
12			12	
51			51	
19			19	
15			15	
25			25	
0			0	
0			0	
0	0	0	0	Total Nord
39	39	0	39	Total Centre
256	0	0	256	Total Sud
256	39	0	295	TOTAL


PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

GUIB HARNACHE / BUSHBUCK

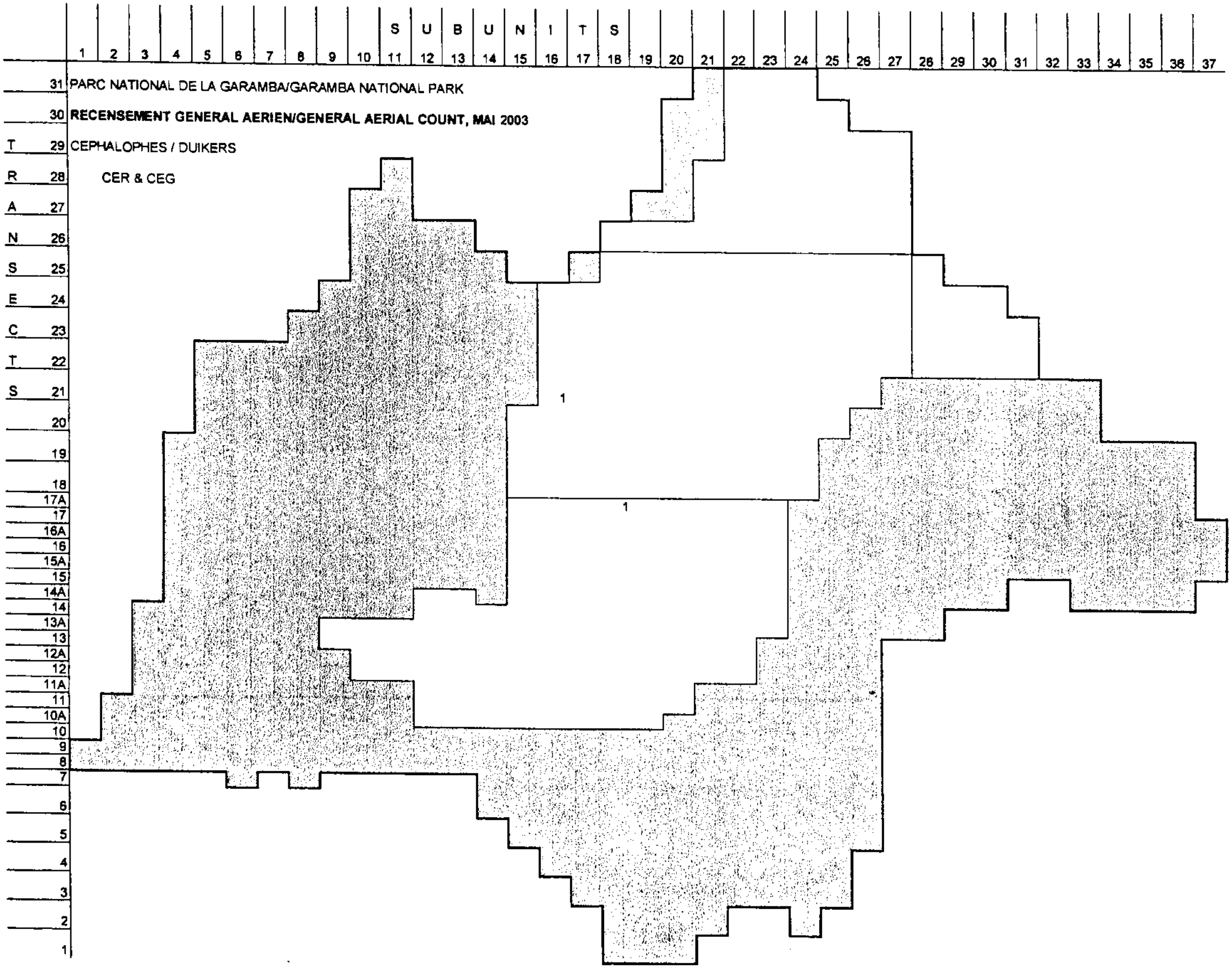
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0		0	
	0		0	
	0		0	
0			0	
0			0	
0			0	
2			2	
0			0	
0			0	
0			0	
5			5	
0			0	
0			0	
0			0	
1			1	
2			2	
0			0	
0			0	
3			3	
0	0	0	0	Total Nord
0	0	0	0	Total Centre
13	0	0	13	Total Sud
13	0	0	13	TOTAL

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

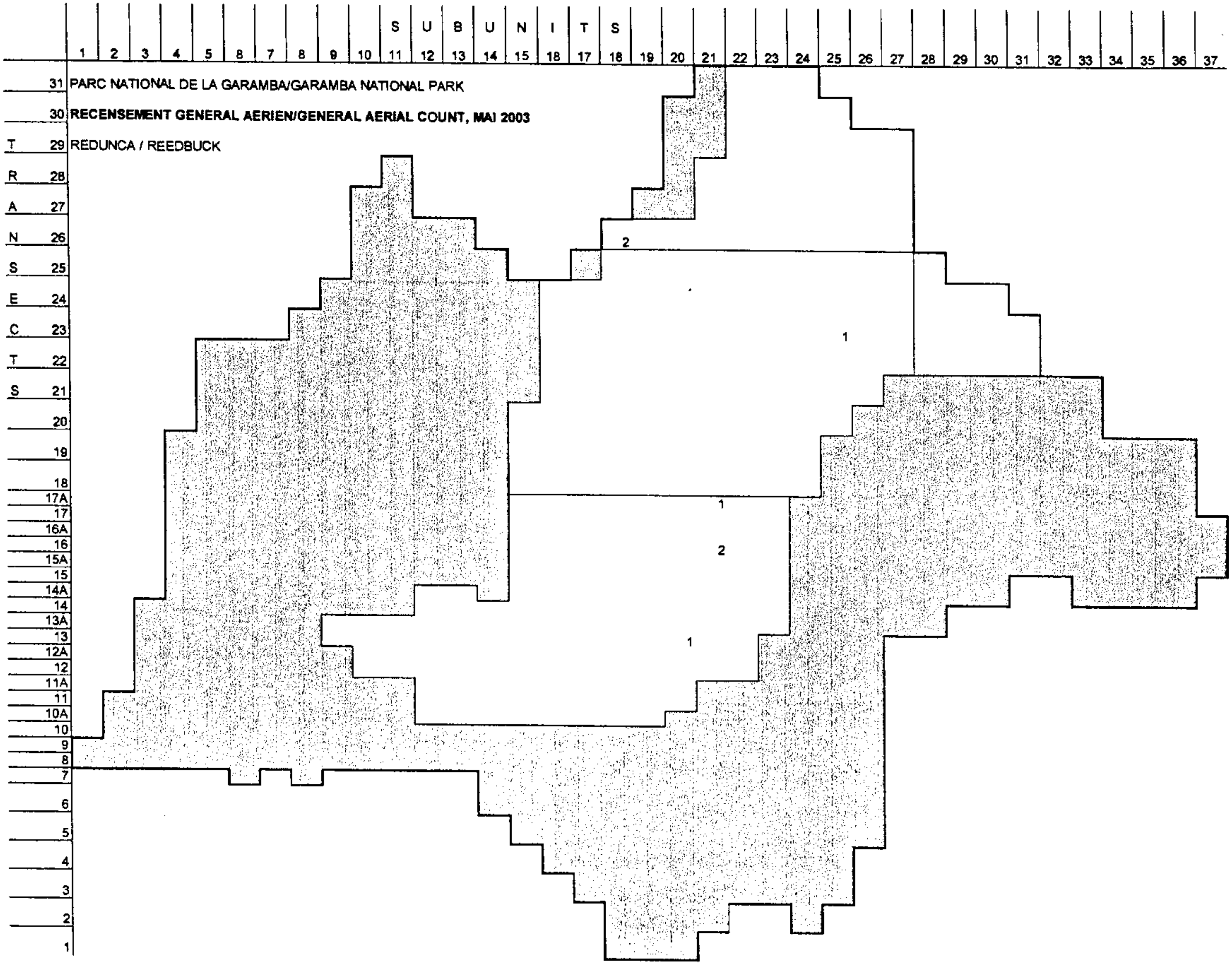
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

CEPHALOPHES / DUIKERS

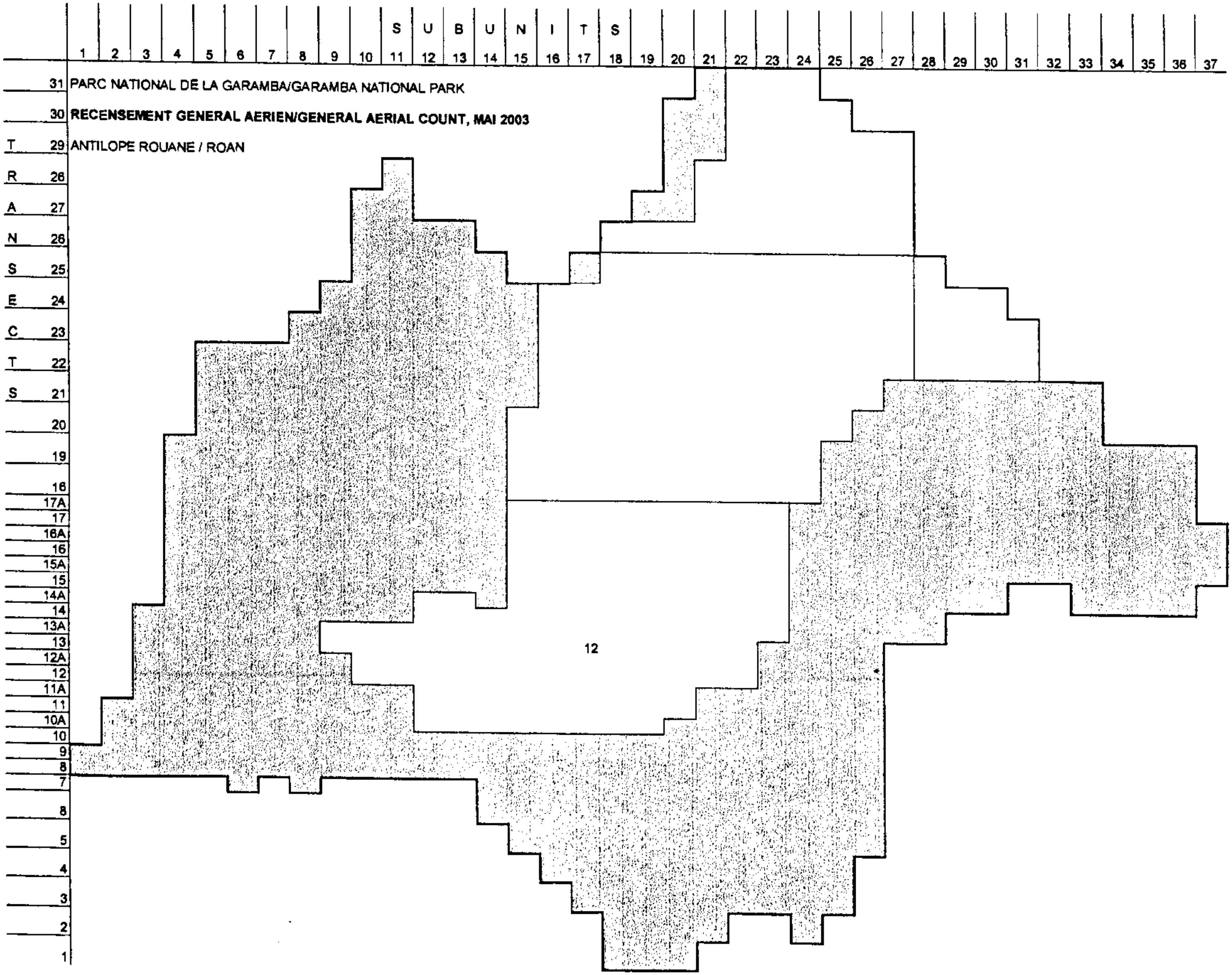
CER & CEG



		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	1		1	
	0		0	
	0		0	
0			0	
1			1	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0	0	0	0	Total Nord
1	1	0	1	Total Centre
1	0	0	1	Total Sud
1	1	0	2	TOTAL



		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		2	2	
	0	0	0	
	0	0	0	
	1	0	1	
	0	0	0	
	0		0	
	0		0	
	0		0	
0			0	
1			1	
0			0	
0			0	
2			2	
0			0	
0			0	
0			0	
0			0	
0			0	
1			1	
0			0	
0			0	
0			0	
0			0	
0			0	
0	0	2	2	Total Nord
1	1	0	1	Total Centre
4	0	0	4	Total Sud
4	1	2	7	TOTAL

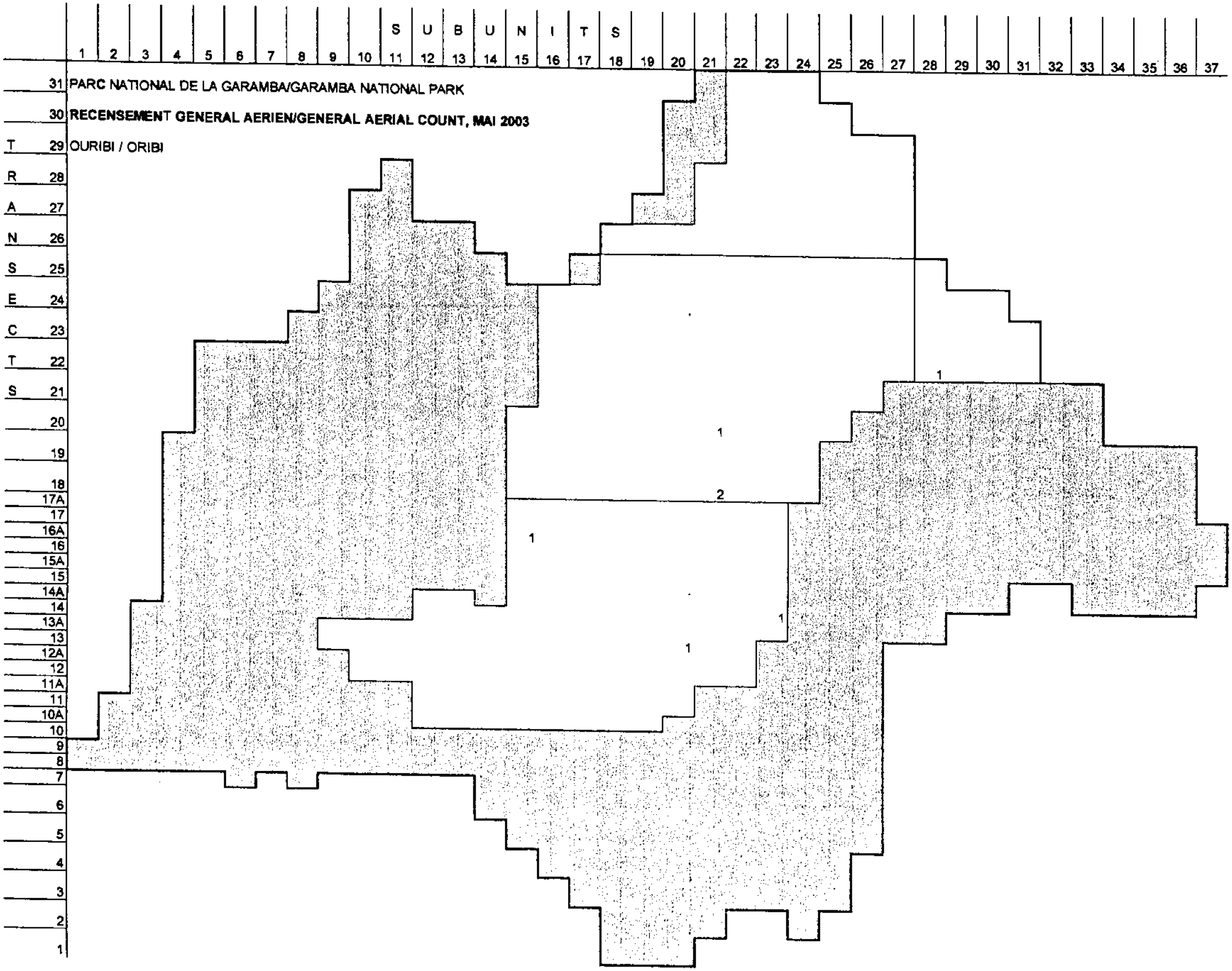


PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

ANTILOPE ROUANE / ROAN

		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0		0	
	0		0	
	0		0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
12			12	
0			0	
0			0	
0			0	
0			0	
0			0	
0	0	0	0	Total Nord
0	0	0	0	Total Centre
12	0	0	12	Total Sud
12	0	0	12	TOTAL



PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

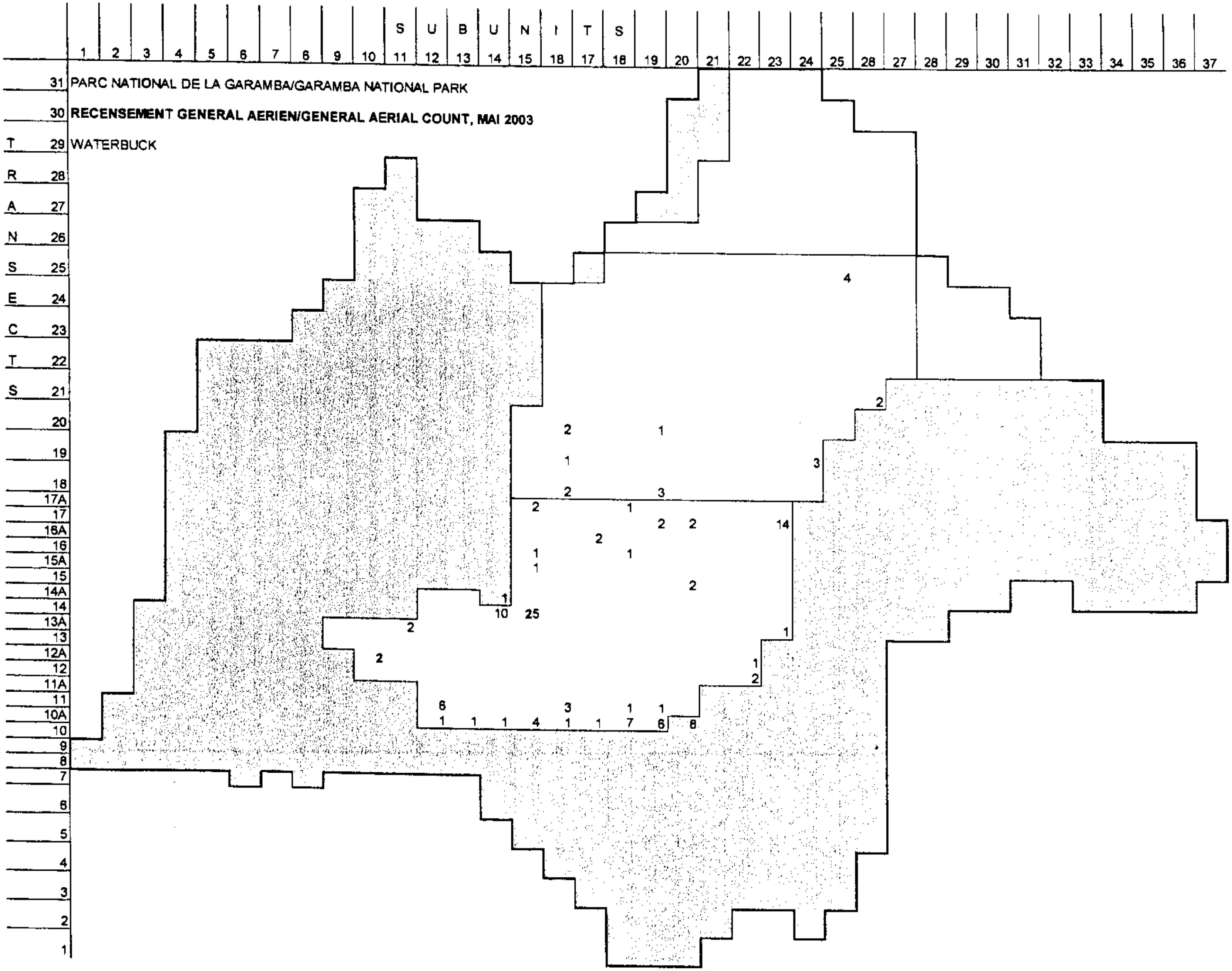
OURIBI / ORIBI

		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	0	1	0	
	0	1	1	
	0		0	
	1		1	
	0		0	
2			2	
0			0	
0			0	
1			1	
0			0	
0			0	
0			0	
0			0	
1			1	
0			0	
1			1	
0			0	
0			0	
0			0	
0			0	
0			0	
0	0	0	0	Total Nord
1	1	2	2	Total Centre
5	0	0	5	Total Sud
5	1	2	7	TOTAL

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

WATERBUCK

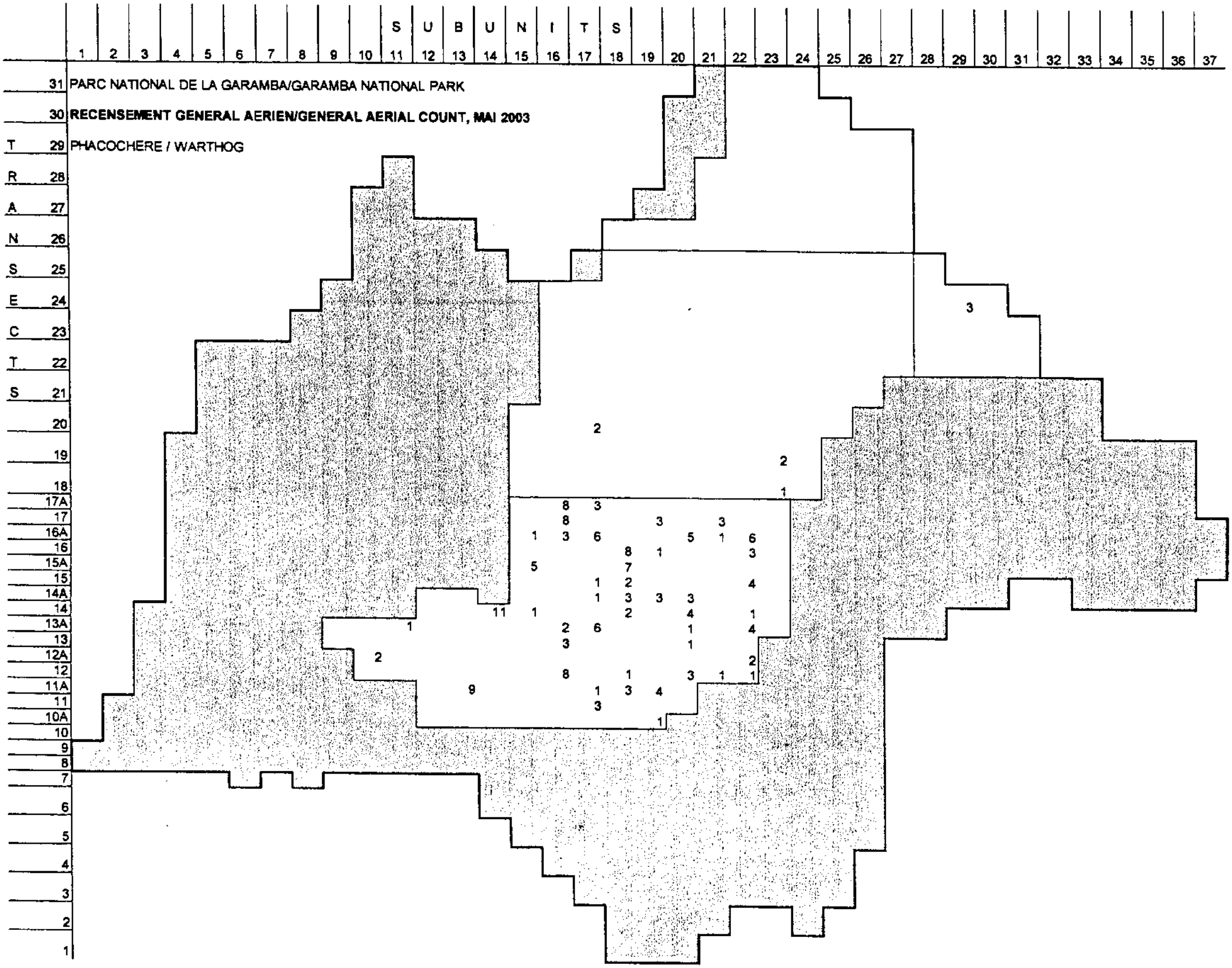


		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	4	0	4	
	0	0	0	
	0	0	0	
	0	0	0	
	2		2	
	3		3	
	4		4	
5			5	
3			3	
16			18	
2			2	
2			2	
1			1	
2			2	
1			1	
35			35	
3			3	
0			0	
3			3	
2			2	
0			0	
11			11	
22			22	
0	0	0	0	Total Nord
13	13	0	13	Total Centre
110	0	0	110	Total Sud
110	13	0	123	TOTAL

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

PHACOCHERE / WARTHOG

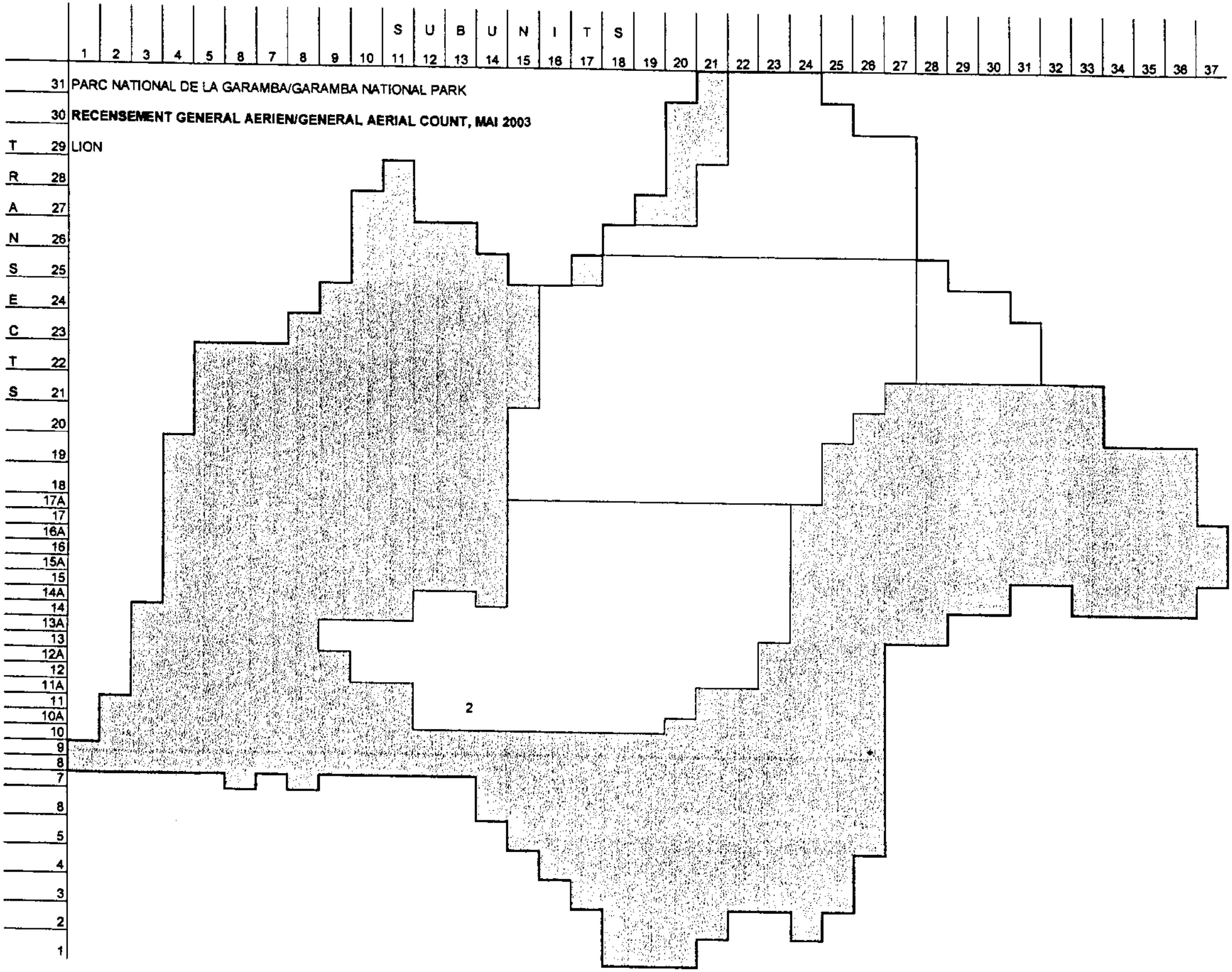


		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	3	3	
	0	0	0	
	0	0	0	
	0		0	
	2		2	
	2		2	
1			1	
11			11	
14			14	
22			22	
12			12	
12			12	
7			7	
10			10	
19			19	
14			14	
4			4	
4			4	
14			14	
17			17	
3			3	
1			1	
0	0	0	0	Total Nord
4	4	3	7	Total Centre
165	0	0	165	Total Sud
165	4	3	172	TOTAL

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

LION

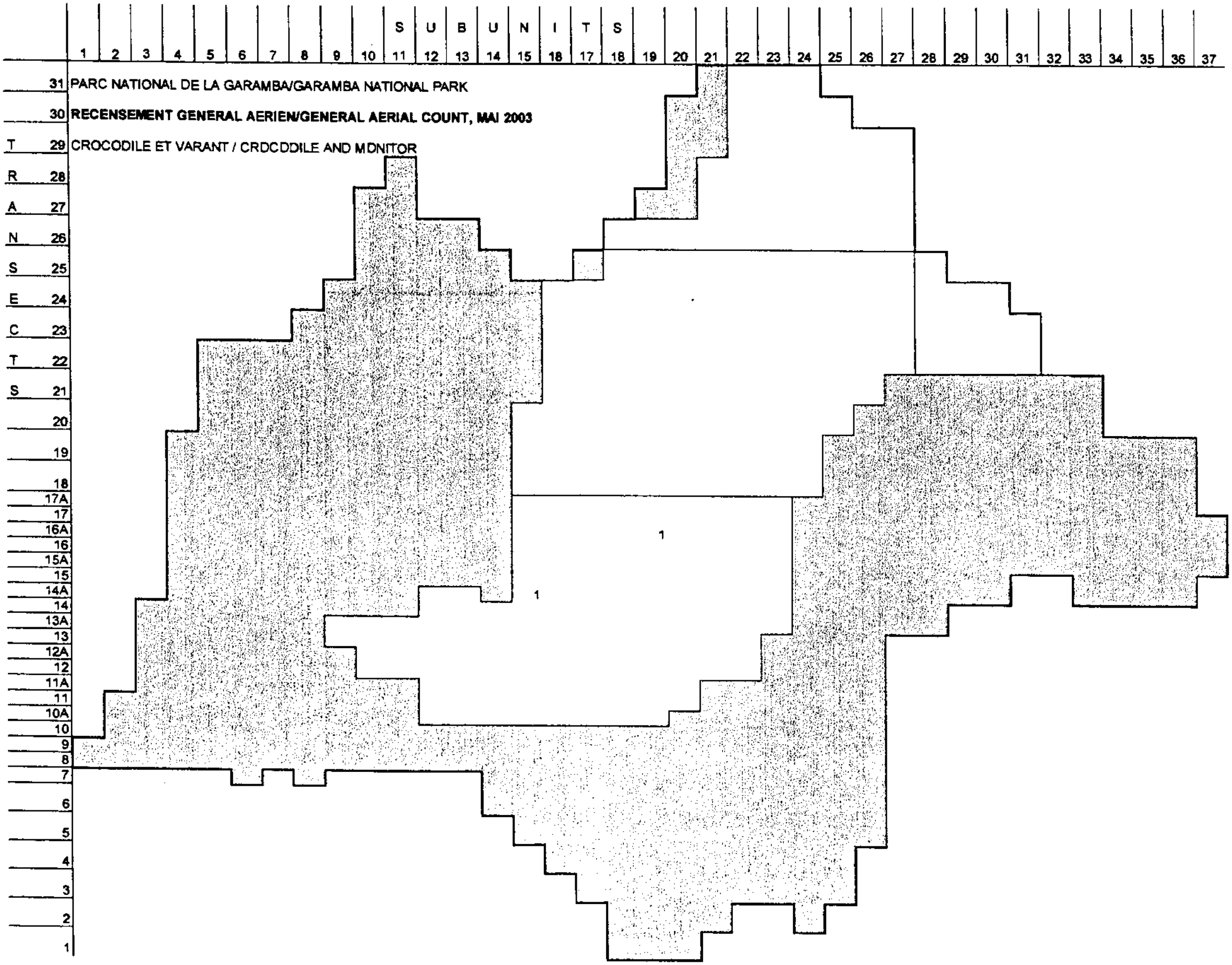


		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0		0	
	0		0	
	0		0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
2			2	
0			0	
0	0	0	0	Total Nord
0	0	0	0	Total Centre
2	0	0	2	Total Sud
2	0	0	2	TOTAL

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

CROCODILE ET VARANT / CROCODILE AND MONITOR

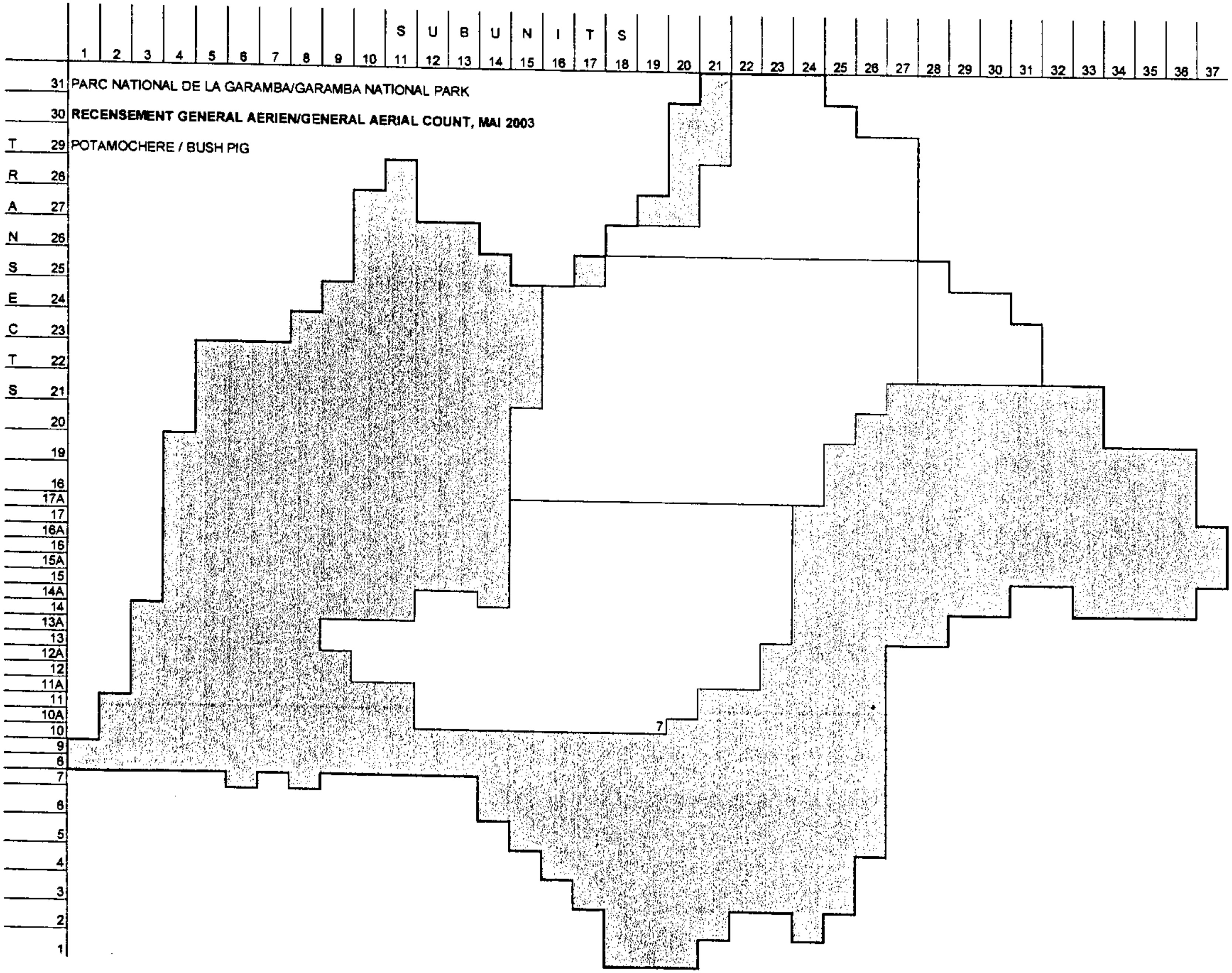


		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0		0	
	0		0	
	0		0	
0			0	
0			0	
0			0	
1			1	
0			0	
0			0	
0			0	
1			1	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0	0	0	0	Total Nord
0	0	0	0	Total Centre
2	0	0	2	Total Sud
2	0	0	2	TOTAL

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

POTAMOCHERE / BUSH PIG



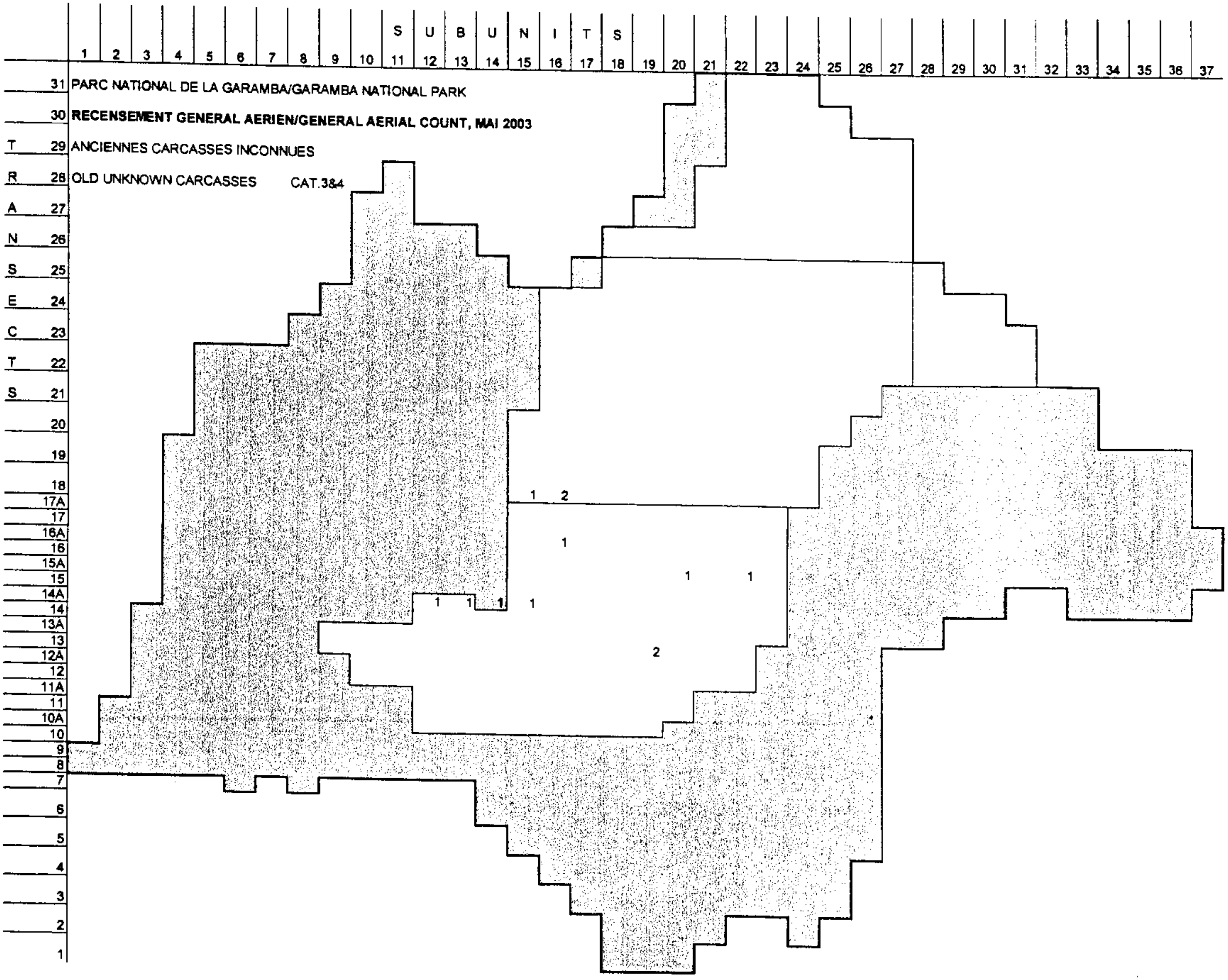
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0		0	
	0		0	
	0		0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
0			0	
7			7	
0	0	0	0	Total Nord
0	0	0	0	Total Centre
7	0	0	7	Total Sud
7	0	0	7	TOTAL

PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

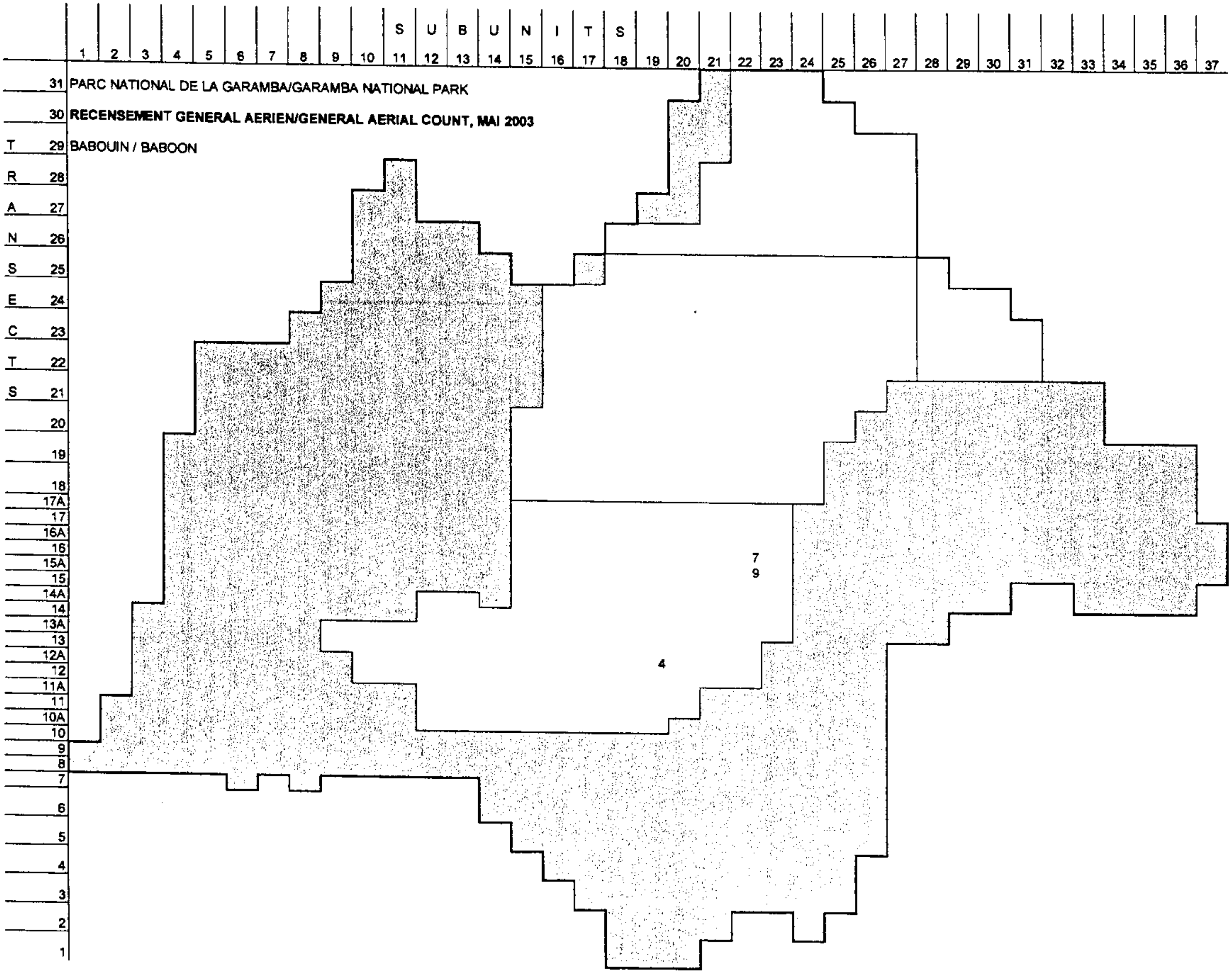
RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

ANCIENNES CARCASSES INCONNUES

OLD UNKNOWN CARCASSES CAT.3&4



		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0		0	
	0		0	
	0		0	
3			3	
0			0	
0			0	
1			1	
0			0	
2			2	
0			0	
4			4	
0			0	
0			0	
2			2	
0			0	
0			0	
0			0	
0			0	
0			0	
0	0	0	0	Total Nord
0	0	0	0	Total Centre
12	0	0	12	Total Sud
12	0	0	12	TOTAL



PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

BABOUIN / BABOON

		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
		0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0	0	0	
	0		0	
	0		0	
	0		0	
0			0	
0			0	
0			0	
0			0	
7			7	
9			9	
0			0	
0			0	
0			0	
0			0	
0			0	
4			4	
0			0	
0			0	
0			0	
0			0	
0	0	0	0	Total Nord
0	0	0	0	Total Centre
20	0	0	20	Total Sud
20	0	0	20	TOTAL

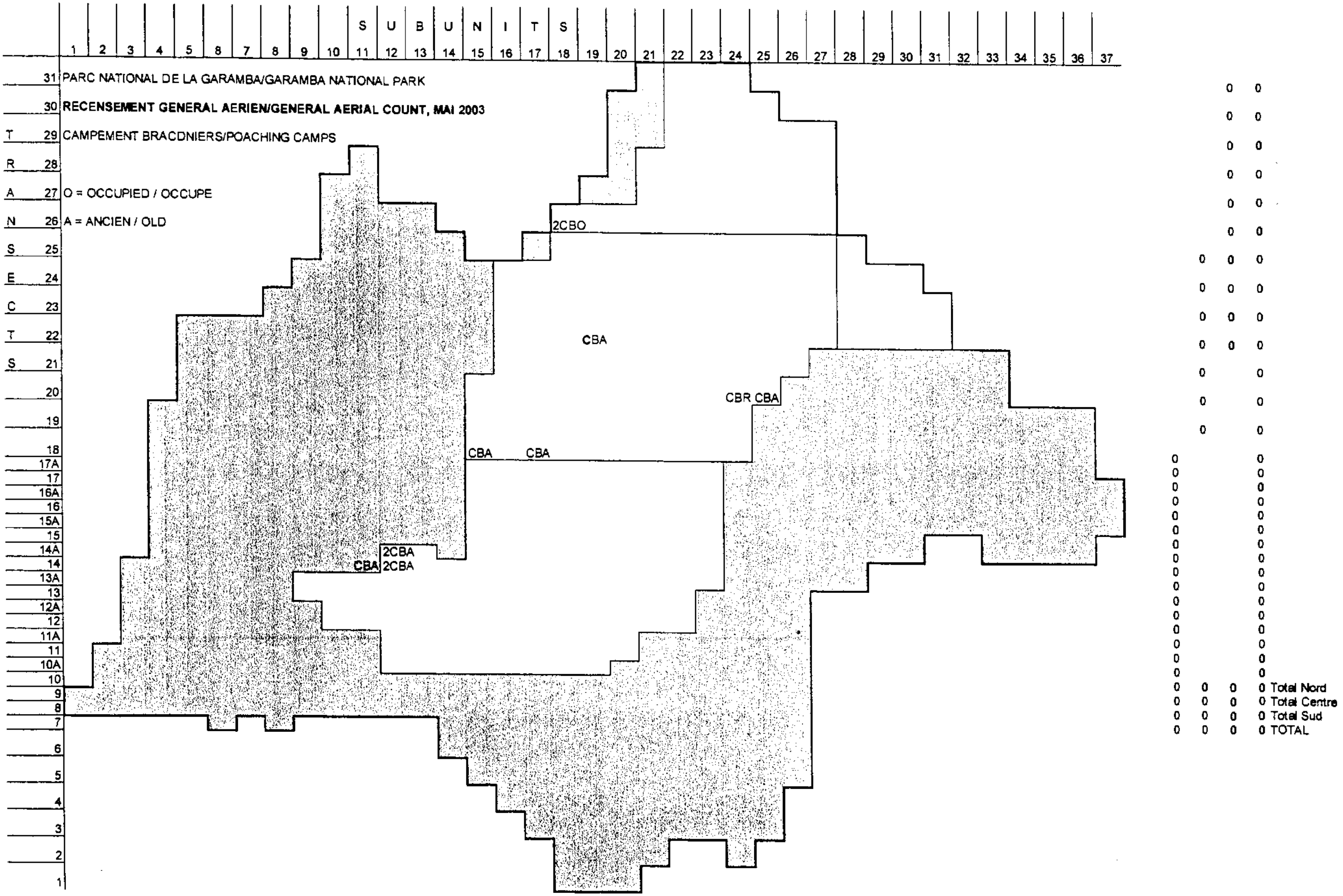
PARC NATIONAL DE LA GARAMBA/GARAMBA NATIONAL PARK

RECENSEMENT GENERAL AERIEN/GENERAL AERIAL COUNT, MAI 2003

CAMPEMENT BRACONNIERS/POACHING CAMPS

O = OCCUPIED / OCCUPE

A = ANCIEN / OLD



	AREA				ELEPHANTS					BUFFALOES/BUFFLES					COBS				
TRANS	HIGH STH	MID NTH	LOW NTH	TOT.NOR	HIGH STH	MID NTH	LOW NTH	TOT.NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT.NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT.NTH	TOTAL
31			8.01	8.01			0	0				0	0				0	0	
30			10.32	10.32			0	0				0	0				0	0	
29			15.74	15.74			0	0				0	0				0	0	
28			18.99	18.99			0	0				0	0				0	0	
27			18.66	18.68			0	0				0	0				1	0	
26			26.57	26.57			0	0				0	0				0	0	
25		26.65	2.59	29.24		0	0	0			0	0	0			2	0	0	
24		31.62	7.82	39.44		0	0	0			0	0	0			2	0	0	
23		31.60	21.06	41.92		0	0	0			0	0	0			3	0	0	
22		31.49	10.74	42.22		0	0	0			0	0	0			0	0	0	
21		28.81		28.81		0		0			0		0			2		0	
20		29.22		29.22		0		0			0		0			7		0	
19		25.87		25.87		0		0			0		0			5		0	
18	26.57				4					1					19				
17a	23.32				0					81					113				
17	23.54				0					2					80				
16a	23.37				8					5					259				
16	23.47				40					501					8				
15a	23.50				152					466					74				
15	23.82				331					296					166				
14a	31.84				70					418					96				
14	31.66				163					162					294				
13a	39.46				48					15					18				
13	36.89				116					427					16				
12a	33.84				157					303					49				
12	34.45				122					274					19				
11a	23.84				129					50					70				
11	23.69				97					43					11				
10a	21.14				18					0					12				
Total	444.39	205.26	98.32	98.32	1453.0	0.0	0.0	0.0		3024.0	0.0	0.0	0.0		1304.0	21.0	1.0	0.0	
Sum squ	12862.49	205.26	42.20	236.72	247453.0	0.0	0.0	0.0		1114280.0	0.0	0.0	0.0		223866.0	95.0	1.0	0.0	
		0.00	0.00	444.39	41474.2	0.0	0.0	0.0		88056.5	0.0	0.0	0.0		35117.0	602.9	18.7	0.0	
		205.26	140.52	779.43															
				R=Sy/Sz	3.3	0.0	0.0	0.0		6.8	0.0	0.0	0.0		2.9	0.1	0.0	0.0	
				Var y	7700.2	0.0	0.0	0.0		36182.9	0.0	0.0	0.0		7839.3	5.3	0.2	0.0	
Var z	34.6	5.7	44.6	125.2															
Covar zy					74.5	0.0	0.0	0.0	STRAT. TOTAL	271.1	0.0	0.0	0.0	STRAT. TOTAL	-73.4	-23.1	1.0	0.0	STRAT. TOTAL
					ELEPHANTS					BUFFALOES/BUFFLES					COBS				
			Pop.est.(Y)		**6,948**	**0**	**0**	**0**	**6,948**	**14,460**	**0**	**0**	**0**	**14,480**	**6,235**	**200**	**12**	**0**	**6,447**
				SE(Y)	1995.3	0.0	0.0	0.0	1995.3	4231.0	0.0	0.0	0.0	4231.00	2120.9	114.2	9.5	0.0	2124.0
				95% C.L.	4070.4	0.0	0.0	0.0	3910.8	8631.2	0.0	0.0	0.0	8292.76	4326.7	233.0	19.4	0.0	4163.1
				95% C.L.	58.6	0.0	0.0	0.0	56.3	59.7	0.0	0.0	0.0	57.35	69.4	0.0	0.0	0.0	64.6

TRANS	AREA HIGH STH	 MID NTH	 LOW NTH	 TOT.NOR
31			8.01	8.01
30			10.32	10.32
29			15.74	15.74
28			18.99	18.99
27			18.68	18.68
26			26.57	26.57
25		26.65	2.59	29.24
24		31.62	7.82	39.44
23		31.60	21.06	41.92
22		31.49	10.74	42.22
21		28.81		28.81
20		29.22		29.22
19		25.87		25.87
18	26.57			
17a	23.32			
17	23.54			
16a	23.37			
16	23.47			
15a	23.50			
15	23.82			
14a	31.84			
14	31.66			
13a	39.46			
13	36.89			
12a	33.84			
12	34.45			
11a	23.84			
11	23.69			
10a	21.14			
Total	444.39	205.26	98.32	98.32
Sum squ	12862.49	205.26	42.20	236.72
		0.00	0.00	444.39
		205.26	140.52	779.43
				R=Sy/Sz
				Var y
Var z	34.6	5.7	44.6	125.2
Covar zy				
		Pop.est.(Y)		
				SE(Y)
				95% C.L.
				95% C.L.

TRANS	GIRAFFES HIGH STH	 MID NTH	 LOW NTH	 TOT NTH	 TOTAL
31			0	0	
30			0	0	
29			0	0	
28			0	0	
27			0	0	
26			0	0	
25		0	0	0	
24		0	0	0	
23		0	0	0	
22		0	0	0	
21		0		0	
20		0		0	
19		0		0	
18	0				
17a	0				
17	0				
16a	13				
16	0				
15a	0				
15	0				
14a	0				
14	0				
13a	0				
13	0				
12a	0				
12	0				
11a	0				
11	0				
10a	0				
Total	13.0	0.0	0.0	0.0	
Sum squ	169.0	0.0	0.0	0.0	
	303.8	0.0	0.0	0.0	
R=Sy/Sz	0.0	0.0	0.0	0.0	
Var y	10.6	0.0	0.0	0.0	
Var z					
Covar zy	-3.8	0.0	0.0	0.0	STRAT. TOTAL
Pop.est.(Y)	GIRAFFES 62	0	0	0	62
SE(Y)	75.4	0.0	0.0	0.0	75.4
95% C.L.	153.7	0.0	0.0	0.0	147.7
95% C.L.	247.3	0.0	0.0	0.0	237.6

TRANS	RHINOS HIGH STH	 MID NTH	 LOW NTH	 TOT.NTH	 TOTAL
31			0	0	
30			0	0	
29			0	0	
28			0	0	
27			0	0	
26			0	0	
25		0	0	0	
24		0	0	0	
23		0	0	0	
22		0	0	0	
21		0		0	
20		0		0	
19		0		0	
18	0				
17a	0				
17	0				
16a	0				
16	0				
15a	0				
15	2				
14a	5				
14	1				
13a	1				
13	0				
12a	0				
12	0				
11a	0				
11	0				
10a	0				
Total	9.0	0.0	0.0	0.0	
Sum squ	31.0	0.0	0.0	0.0	
	277.9	0.0	0.0	0.0	
R=Sy/Sz	0.0	0.0	0.0	0.0	
Var y	1.7	0.0	0.0	0.0	
Var z					
Covar zy	1.9	0.0	0.0	0.0	STRAT. TOTAL
Pop.est.(Y)	RHINOCEROS 43	0	0	0	43
SE(Y)	29.6	0.0	0.0	0.0	29.59
95% C.L.	60.4	0.0	0.0	0.0	58.00
95% C.L.	140.3	0.0	0.0	0.0	134.77

TRANS	HIPPOPOTAMES/HIPPOS HIGH STH	 MID NTH	 LOW NTH	 TOT.NTH	 TOTAL
31			0	0	
30			0	0	
29			0	0	
28			0	0	
27			0	0	
26			0	0	
25		0	0	0	
24		0	0	0	
23		0	0	0	
22		0	0	0	
21		0		0	
20		0		0	
19		0		0	
18	0				
17a	0				
17	48				
16a	42				
16	6				
15a	98				
15	45				
14a	37				
14	39				
13a	3				
13	38				
12a	35				
12	4				
11a	197				
11	39				
10a	4				
Total	635.0	0.0	0.0	0.0	
Sum squ	61663.0	0.0	0.0	0.0	
	16587.5	0.0	0.0	0.0	
R=Sy/Sz	1.4	0.0	0.0	0.0	
Var y	2430.8	0.0	0.0	0.0	
Var z					
Covar zy	-70.0	0.0	0.0	0.0	STRAT. TOTAL
Pop.est.(Y)	HIPPOS 3,036	0	0	0	3,036
SE(Y)	1190.9	0.0	0.0	0.0	1190.9
95% C.L.	2429.4	0.0	0.0	0.0	2334.2
95% C.L.	80.0	0.0	0.0	0.0	76.9

	AREA				WATERBUCK					PHACOCHERE					LION				
TRANS	HIGH STH	MID NTH	LOW NTI	TOT.NOR	HIGH STH	MID NTH	LOW NTI	TOT.NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT.NTH	TOTAL	HIGH STH	MID NTH	LOW NTI	TOT.NTH	TOTAL
31			8.01	8.01			0	0				0	0				0	0	
30			10.32	10.32			0	0				0	0				0	0	
29			15.74	15.74			0	0				0	0				0	0	
28			18.99	18.99			0	0				0	0				0	0	
27			18.68	18.68			0	0				0	0				0	0	
26			26.57	26.57			0	0				0	0				0	0	
25		26.65	2.59	29.24		4	0	0			0	0	0			0	0	0	
24		31.62	7.82	39.44		0	0	0			0	3	0			0	0	0	
23		31.60	21.06	41.92		0	0	0			0	0	0			0	0	0	
22		31.49	10.74	42.22		0	0	0			0	0	0			0	0	0	
21		28.81		28.81		2		0			0		0			0		0	
20		29.22		29.22		3		0			2		0			0		0	
19		25.87		25.87		4		0			2		0			0		0	
18	26.57				5					1					0				
17a	23.32				3					11					0				
17	23.54				18					14					0				
16a	23.37				2					22					0				
16	23.47				2					12					0				
15a	23.50				1					12					0				
15	23.82				2					7					0				
14a	31.84				1					10					0				
14	31.66				35					19					0				
13a	39.46				3					14					0				
13	36.89				0					4					0				
12a	33.84				3					4					0				
12	34.45				2					14					0				
11a	23.84				0					17					0				
11	23.69				11					3					2				
10a	21.14				0					1					0				
Total	444.39	205.26	98.32	98.32	68.0	13.0	0.0	0.0		165.0	4.0	3.0	0.0		2.0	0.0	0.0	0.0	
Sum squ	12862.49	205.26	42.20	236.72	1740.0	45.0	0.0	0.0		2323.0	8.0	0.0	0.0		4.0	0.0	0.0	0.0	
		0.00	0.00	444.39	2480.7	355.4	0.0	0.0		4592.2	110.2	0.0	0.0		47.4	0.0	0.0	0.0	
		205.26	140.52	779.43															
				R=5y/Sz	0.2	0.1	0.0	0.0		0.4	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
				Var y	83.7	3.5	0.0	0.0		41.4	1.0	0.0	0.0		0.3	0.0	0.0	0.0	
Var z	34.6	5.7	44.6	125.2					5TRAT.					5TRAT.					5TRAT.
Covar zy					2.4	-17.9	0.0	0.0	TOTAL	0.6	-5.3	-3.3	0.0	TOTAL	-0.5	0.0	0.0	0.0	TOTAL
					WATERBUCK					PHACOCHERE					LION				
			Pop.est.(Y)		**421**	**124**	**0**	**0**	**544**	**788**	**38**	**37**	**0**	**864**	**18**	**0**	**0**	**0**	**10**
				SE(Y)	210.2	86.2	0.0	0.0	227.1	155.0	38.7	12.0	0.0	160.18	11.6	0.0	0.0	0.0	11.6
				95% C.L.	428.7	175.8	0.0	0.0	445.2	316.1	79.0	24.5	0.0	313.95	23.8	0.0	0.0	0.0	22.7
				95% C.L.	101.9	0.0	0.0	0.0	81.8	40.1	0.0	0.0	0.0	36.32	247.1	0.0	0.0	0.0	237.4

	AREA				BUBALES / HARTEBEEST					GUIB HARNACHE /BUSHBUCK					CEPHALOPHES /DUIKERS				
TRANS	HIGH STH	MID NTH	LOW NTH	TOT.NOR	HIGH STH	MID NTH	LOW NTH	TOT.NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT.NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT.NTH	TOTAL
31			8.01	8.01			0	0				0	0				0	0	
30			10.32	10.32			0	0				0	0				0	0	
29			15.74	15.74			0	0				0	0				0	0	
28			18.99	16.99			0	0				0	0				0	0	
27			18.66	18.68			0	0				0	0				0	0	
26			26.57	26.57			0	0				0	0				0	0	
25		28.65	2.59	29.24		1	0	0			0	0	0			0	0	0	
24		31.62	7.82	39.44		5	0	0			0	0	0			0	0	0	
23		31.60	21.06	41.92		0	0	0			0	0	0			0	0	0	
22		31.49	10.74	42.22		0	0	0			0	0	0			0	0	0	
21		28.81		28.81		9		0			0		0			1		0	
20		29.22		29.22		0		0			0		0			0		0	
19		25.87		25.87		24		0			0		0			0		0	
18	26.57				0					0					0				
17a	23.32				16					0					1				
17	23.54				8					0					0				
16a	23.37				14					2					0				
16	23.47				17					0					0				
15a	23.50				4					0					0				
15	23.82				32					0					0				
14a	31.84				24					5					0				
14	31.66				17					0					0				
13a	39.46				12					0					0				
13	36.89				51					0					0				
12a	33.84				19					1					0				
12	34.45				15					2					0				
11a	23.84				25					0					0				
11	23.69				0					0					0				
10a	21.14				0					3					0				
Total	444.39	205.26	98.32	98.32	256.0	39.0	0.0	0.0		13.0	0.0	0.0	0.0		1.0	1.0	0.0	0.0	
Sum squ	12862.49	205.26	42.20	236.72	6734.0	683.0	0.0	0.0		43.0	0.0	0.0	0.0		1.0	1.0	0.0	0.0	
		0.00	0.00	444.39	7603.4	1064.9	0.0	0.0		372.1	0.0	0.0	0.0		23.3	28.6	0.0	0.0	
		205.26	140.52	779.43															
				R=Sy/Sz	0.8	0.2	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
				Var y	175.9	77.6	0.0	0.0		2.2	0.0	0.0	0.0		0.1	0.1	0.0	0.0	
Var z	34.6	5.7	44.6	125.2															
Covar zy					32.9	-53.9	0.0	0.0	STRAT. TOTAL	0.7	0.0	0.0	0.0	STRAT. TOTAL	-0.3	-1.1	0.0	0.0	STRAT. TOTAL
					BUBALES /HARTEBEEST					GUIB HARNACHE/BUSHBUCK					CEPHALOPHES / DUIKERS				
				Pop.est.(Y)	**1,224**	**371**	**0**	**0**	**1,595**	**62**	**0**	**0**	**0**	**62**	**5**	**10**	**0**	**0**	**14**
				SE(Y)	280.1	356.0	0.0	0.0	453.0	33.6	0.0	0.0	0.0	33.59	5.8	14.1	0.0	0.0	15.2
				95% C.L.	571.5	726.2	0.0	0.0	867.8	68.5	0.0	0.0	0.0	65.84	11.8	28.7	0.0	0.0	29.6
				95% C.L.	46.7	0.0	0.0	0.0	55.7	110.2	0.0	0.0	0.0	105.91	247.3	0.0	0.0	0.0	208.8

	AREA				CARCASSES CAT 3&4					CROCODILES					POTAMOCHERES				
TRANS	HIGH STH	MID NTH	LOW NTH	TOT.NOR	HIGH STH	MID NTH	LOW NTH	TOT.NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT.NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT.NTH	TOTAL
31			8.01	8.01			0	0				0	0				0	0	
30			10.32	10.32			0	0				0	0				0	0	
29			15.74	15.74			0	0				0	0				0	0	
28			18.99	18.99			0	0				0	0				0	0	
27			18.68	18.68			0	0				0	0				0	0	
26			26.57	26.57			0	0				0	0				0	0	
25		26.65	2.59	29.24		0	0	0			0	0	0			0	0	0	
24		31.62	7.82	39.44		0	0	0			0	0	0			0	0	0	
23		31.60	21.06	41.92		0	0	0			0	0	0			0	0	0	
22		31.49	10.74	42.22		0	0	0			0	0	0			0	0	0	
21		26.81		26.61		0		0			0		0			0		0	
20		29.22		29.22		0		0			0		0			0		0	
19		25.67		25.67		0		0			0		0			0		0	
18	26.57				3					0					0				
17a	23.32				0					0					0				
17	23.54				0					0					0				
16a	23.37				1					1					0				
16	23.47				0					0					0				
15a	23.50				2					0					0				
15	23.82				0					0					0				
14a	31.84				4					1					0				
14	31.66				0					0					0				
13a	39.46				0					0					0				
13	36.89				2					0					0				
12a	33.84				0					0					0				
12	34.45				0					0					0				
11a	23.84				0					0					0				
11	23.69				0					0					0				
10a	21.14				0					0					7				
Total	444.39	205.26	98.32	98.32	12.0	0.0	0.0	0.0		2.0	0.0	0.0	0.0		7.0	0.0	0.0	0.0	
Sum squ	12862.49	205.26	42.20	236.72	34.0	0.0	0.0	0.0		2.0	0.0	0.0	0.0		49.0	0.0	0.0	0.0	
		0.00	0.00	444.39	351.2	0.0	0.0	0.0		55.2	0.0	0.0	0.0		148.0	0.0	0.0	0.0	
		205.26	140.52	779.43															
				R=Sy/Sz	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
				Var y	1.7	0.0	0.0	0.0		0.1	0.0	0.0	0.0		3.1	0.0	0.0	0.0	
Var z	34.6	5.7	44.6	125.2					STRAT.					STRAT.					STRAT.
Cover zy					1.2	0.0	0.0	0.0	TOTAL	-0.0	0.0	0.0	0.0	TOTAL	-3.1	0.0	0.0	0.0	TOTAL
					CARCASSES CAT 3&4					CROCODILES					POTAMOCHERES				
			Pop.est.(Y)		**57**	**0**	**0**	**0**	**57**	**10**	**0**	**0**	**0**	**10**	**33**	**0**	**0**	**0**	**33**
				SE(Y)	29.2	0.0	0.0	0.0	29.2	7.9	0.0	0.0	0.0	7.86	40.8	0.0	0.0	0.0	40.8
				95% C.L.	59.6	0.0	0.0	0.0	57.3	16.0	0.0	0.0	0.0	15.40	83.2	0.0	0.0	0.0	79.9
				95% C.L.	103.9	0.0	0.0	0.0	99.8	167.6	0.0	0.0	0.0	181.02	248.6	0.0	0.0	0.0	238.8

	AREA				REDUNCA / REEDBUCK					ANTELOPE ROUANE /ROAN					OURIBI / ORIBI				
TRANS	HIGH STH	MID NTH	LOW NTH	TOT.NOR	HIGH STH	MID NTH	LOW NTH	TOT.NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT.NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT.NTH	TOTAL
31			8.01	8.01			0	0				0	0				0	0	
30			10.32	10.32			0	0				0	0				0	0	
29			15.74	15.74			0	0				0	0				0	0	
28			18.99	18.99			0	0				0	0				0	0	
27			18.68	18.68			0	0				0	0				0	0	
26			26.57	26.57			2	0				0	0				0	0	
25		26.65	2.59	29.24		0	0	0			0	0	0			0	0	0	
24		31.62	7.82	39.44		0	0	0			0	0	0			0	0	0	
23		31.60	21.06	41.92		1	0	0			0	0	0			0	1	0	
22		31.49	10.74	42.22		0	0	0			0	0	0			0	1	0	
21		28.81		28.81		0		0			0		0			0		0	
20		29.22		29.22		0		0			0		0			1		0	
19		25.87		25.87		0		0			0		0			0		0	
18	26.57				0					0					2				
17a	23.32				1					0					0				
17	23.54				0					0					0				
16a	23.37				0					0					1				
16	23.47				2					0					0				
15a	23.50				0					0					0				
15	23.82				0					0					0				
14a	31.84				0					0					0				
14	31.66				0					0					1				
13a	39.46				0					0					0				
13	36.89				1					12					1				
12a	33.84				0					0					0				
12	34.45				0					0					0				
11a	23.84				0					0					0				
11	23.69				0					0					0				
10a	21.14				0					0					0				
Total	444.39	205.26	98.32	98.32	4.0	1.0	2.0	0.0		12.0	0.0	0.0	0.0		5.0	1.0	2.0	0.0	
Sum squ	12862.49	205.26	42.20	236.72	6.0	1.0	4.0	0.0		144.0	0.0	0.0	0.0		7.0	1.0	0.0	0.0	
		0.00	0.00	444.39	107.2	31.6	53.1	0.0		442.7	0.0	0.0	0.0		145.0	29.2	0.0	0.0	
		205.26	140.52	779.43															
				R=Sy/Sz	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
				Var y	0.3	0.1	0.7	0.0		9.0	0.0	0.0	0.0		0.4	0.1	0.0	0.0	
Var z	34.6	5.7	44.6	125.2															
Covar zy					-0.3	-0.5	3.7	0.0	STRAT. TOTAL	7.3	0.0	0.0	0.0	STRAT. TOTAL	0.4	-1.0	-2.2	0.0	STRAT. TOTAL
					REDUNCA /REEDBUCK					ANTELOPE ROUANE /ROAN					OURIBI / ORIBI				
			Pop.est.(Y)		**19**	**10**	**25**	**0**	**54**	**57**	**0**	**0**	**0**	**57**	**24**	**10**	**25**	**0**	**58**
				SE(Y)	13.4	13.8	17.9	0.0	25.3	67.3	0.0	0.0	0.0	67.32	13.7	14.0	8.0	0.0	21.2
				95% C.L.	27.3	28.2	36.5	0.0	51.5	137.3	0.0	0.0	0.0	131.94	28.0	28.6	16.4	0.0	41.5
				95% C.L.	142.7	0.0	0.0	0.0	96.1	239.3	0.0	0.0	0.0	229.94	116.9	0.0	0.0	0.0	71.2

	AREA				BABOUINS / BABOONS					CROCODILES					POTAMOCHERES				
TRANS	HIGH STH	MID NTH	LOW NTH	TOT.NOR	HIGH STH	MID NTH	LOW NTH	TOT.NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT.NTH	TOTAL	HIGH STH	MID NTH	LOW NTH	TOT.NTH	TOTAL
31			8.01	8.01			0	0				0	0				0	0	
30			10.32	10.32			0	0				0	0				0	0	
29			15.74	15.74			0	0				0	0				0	0	
28			18.99	18.99			0	0				0	0				0	0	
27			18.68	18.68			0	0				0	0				0	0	
26			26.57	26.57			0	0				0	0				0	0	
25		26.65	2.59	29.24		0	0	0			0	0	0			0	0	0	
24		31.62	7.82	39.44		0	0	0			0	0	0			0	0	0	
23		31.60	21.06	41.92		0	0	0			0	0	0			0	0	0	
22		31.49	10.74	42.22		0	0	0			0	0	0			0	0	0	
21		28.81		28.81		0		0			0		0			0		0	
20		29.22		29.22		0		0			0		0			0		0	
19		25.87		25.87		0		0			0		0			0		0	
18	26.57				0					0					0				
17a	23.32				0					0					0				
17	23.54				0					0					0				
16a	23.37				0					1					0				
18	23.47				7					0					0				
15a	23.50				9					0					0				
16	23.82				0					0					0				
14a	31.84				0					1					0				
14	31.66				0					0					0				
13a	39.46				0					0					0				
13	36.89				0					0					0				
12a	33.84				4					0					0				
12	34.45				0					0					0				
11a	23.84				0					0					0				
11	23.69				0					0					0				
10a	21.14				0					0					7				
Total	444.39	205.26	98 32	98.32	20.0	0.0	0.0	0.0		2.0	0.0	0.0	0.0		7.0	0.0	0.0	0.0	
Sum squ	12862.49	205.26	42.20	236.72	146.0	0.0	0.0	0.0		2.0	0.0	0.0	0.0		49.0	0.0	0.0	0.0	
		0.00	0.00	444.39	511.1	0.0	0.0	0.0		55.2	0.0	0.0	0.0		146.0	0.0	0.0	0.0	
		205.26	140.52	779.43															
				R=Sy/Sz	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
				Var y	8.1	0.0	0.0	0.0		0.1	0.0	0.0	0.0		3.1	0.0	0.0	0.0	
Var z	34.6	5.7	44.6	125.2															
Covar zy					-3.0	0.0	0.0	0.0	STRAT. TOTAL	-0.0	0.0	0.0	0.0	STRAT. TOTAL	-3.1	0.0	0.0	0.0	STRAT. TOTAL
					BABBOUINS / BABOONS					CROCODILES					POTAMOCHERES				
		Pop.est.(Y)			98	0	0	0	96	10	0	0	0	10	33	9	0	0	33
				SE(Y)	66.4	0.0	0.0	0.0	66.4	7.9	0.0	0.0	0.0	7.86	40.6	0.0	0.0	0.0	40.8
				95% C.L.	135.5	0.0	0.0	0.0	130.2	16.0	0.0	0.0	0.0	15.40	83.2	0.0	0.0	0.0	79.9
				95% C.L.	141.7	0.0	0.0	0.0	136.'	167.8	0.0	0.0	0.0	161.02	248.6	0.0	0.0	0.0	238.8

PARC NATIONAL DE LA GARAMBA, RECENSEMENT GENERAL
PILOT SUMMARY SHEET

Survey...........Garamba N.P. General large mammal systematic sample survey

Dates: From.. 14 May 2003 To: 18th May 2003

Pilot.....Fraser Smith.......................... Aircraft....9Q-CBR C 206................

DATE	TAKE OFF	LAND	HOURS	PURPOSE	FUEL
14.5.2003	15:40	16:05	0.4	Calibrations	
15.5.2003	08:25	10:50	2.4	Transect 31-26	
15.5.2003	16:08	17:38	1.5	Transects 25-24	
16.5.2003	08:22	11:20	2.8	Transects 23-18	
16.5.2003	16:02	17:52	1.8	Transects 17A-16	
17.5.2003	08:10	10:37	2.5	Transects 15A-13A	
17.5.2003	16:29	17:25	0.9	Transects 11-10A	
18.5.2003	08:20	10:45	2.4	Transects 13A-11A	
4 days			14.7	Hrs@55Lit/hr =	808.5lit

PARC NATIONAL DE LA GARAMBA, RECENSEMENT GENERAL

TRANSECT SUMMARY

SURVEY. General systematic large mammal survey

DATES: From.14 May 2003....... To.18 May 2003......................... Aircraft..C206 9Q-CBR.....................

AREAS....Garamba National Park (5,000 km2)

Nominal flying height.......350.........feet Target strip width (L+R)......500...............metres

Pilot...........Fraser Smith.......... FSO.............Kes Hillman Smith

RSO L.M. Amube Ndey RSO R.M..... Paulin Tshikaya

RSO L.R. Serge Iliabo RSO R.R......Mambo Marindo

Z..................................N..........................n...............

TRANS	DIR	ORDER FLOWN	DATE	SUBUNITS	FROM-TO	DISTANCE (km)	TIME (mins)	SPEED (kph)
31	W-E	1	15.5.03	3	22-24	15	4.5	200
30	E-W	2	15.5.03	4	25-22	20	6.38	188
29	W-E	3	15.5.03	6	22-27	30	9.42	191
28	E-W	4	15.5.03	7	27-21	35	11.18	188
27	W-E	5	15.5.03	7	21-27	35	11.08	190
26	E-W	6	15.5.03	10	27-18	50	16.25	185
25	W-E	7	15.5.03	11	18-28	55	17	194
24	E-W	8	15.5.03	15	30-16	75	25	180
23	W-E	9	16.5.03	16	16-31	80	27.2	176
22	E-W	10	16.5.03	16	31-16	80	24.38	197
21	W-E	11	16.5.03	11	16-26	55	17.6	187
20	E-W	12	16.5.03	11	15-25	55	16.12	205
19	W-E	13	16.5.03	10	15-24	50	15.25	197
18	E-W	14	16.5.03	10	24-15	50	14.1	213
17A	W-E	15	16.5.03	9	15-23	45	15.1	179
17	E-W	16	16.5.03	9	23-15	45	11.57	233
16A	W-E	17	16.5.03	9	15-23	45	15.25	177
16	E-W	18	16.5.03	9	23-15	45	13.18	205
15A	W-E	19	17.5.03	9	15-23	45	14.58	185
15	E-W	20	17.5.03	9	23-15	45	13.26	204
14A	W-E	21	17.5.03	12	12-23	60	19.04	189
14	E-W	22	17.5.03	13	23-11	65	19.4	201
13A	W-E	23	17.5.03	15	9-23	75	23.29	193
13	E-W	26	18.5.03	15	23-9	75	24	188
12A	W-E	27	18.5.03	13	10-22	65	20	195
12	E-W	28	18.5.03	13	23-11	65	19	205
11A	W-E	29	18.5.03	11	12-22	55	17.4	190
11	E-W	24	17.5.03	9	20-12	45	14.45	187
10A	W-E	25	17.5.03	9	12-20	45	14.22	190
					Trans.tot.km	**1505**	**Avg kph**	**193**

COUNT EAST-WEST WAYPOINTS

EAST		NORTH		
-29	31.84957	4	37.94531	31-22
-29	39.96121	4	37.94466	31-25
-29	42.66391	4	35.24904	30-26
-29	31.84957	4	35.25033	30-22
-29	31.84989	4	32.55535	29-22
-29	48.06996	4	32.55246	29-28
-29	48.06449	4	29.85877	28-28
-29	29.14204	4	29.86263	28-21
-29	29.14204	4	27.16797	27-21
-29	48.06352	4	27.16379	27-28
-29	48.05902	4	24.47010	26-28
-29	21.03007	4	24.47815	26-18
-29	21.03007	4	21.78317	25-18
-29	50.76011	4	21.77352	25-29
-29	56.15972	4	19.07307	24-31
-29	15.62145	4	19.09109	24-16
-29	15.62145	4	16.39612	23-16
-29	58.85984	4	16.37584	23-32
-29	58.85727	4	13.68118	22-32
-29	15.62113	4	13.70114	22-16
-29	15.62017	4	11.00616	21-16
-29	45.34312	4	10.99683	21-27
-29	42.63849	4	8.30314	20-26
-29	12.91714	4	8.31248	20-15
-29	12.91231	4	5.61750	19-15
-29	39.93031	4	5.61010	19-25
-29	39.92903	4	2.91512	18-25
-29	12.91264	4	2.92252	18-15
-29	12.93291	4	1.57487	17A-15
-29	37.24789	4	1.56876	17A-24
-29	12.91264	4	0.22754	17-15
-29	37.22600	4	0.22175	17-24
ROUTE SOUTH 4				
-29	37.22472	3	58.87443	16A-24
-29	12.91264	3	58.88022	16A-15
-29	12.91264	3	57.53289	16-15
-29	37.22472	3	57.52678	16-24
-29	37.22343	3	56.17945	15A-24
-29	12.91264	3	56.18524	15A-15
-29	12.91264	3	54.83792	15-15
-29	37.22343	3	54.83180	15-24
-29	37.22182	3	53.48190	14A-24
-29	4.80904	3	53.49220	14A-12
-29	4.80871	3	52.14487	14-12
-29	37.22150	3	52.13457	14-24
-29	37.21957	3	50.78209	13A-24
-28	56.70544	3	50.79787	13A-9
-28	56.70576	3	49.45054	13-9
-29	37.21924	3	49.43477	13-24
-29	34.51654	3	48.09130	12A-23
-28	59.40621	3	48.10289	12A-10
-28	59.40621	3	46.75556	12-10
-29	34.51654	3	46.74365	12-23
-29	29.11339	3	45.40180	11A-21
-29	4.80743	3	45.40759	11A-12
-29	4.80743	3	44.05994	11-12
-29	29.11339	3	44.05447	11-21
-29	29.09151	3	42.70553	10A-21
-29	4.78908	3	42.71133	10A-12

P.N.Garamba RECENSEMENT GENERAL 2003 Centre 1998,2000,2002,2003

24	E-W	23	W-E	22	E-W	21	W-E	20	E-W	19	W-E	18	E-W
Dist(km)	Subunit	*Dist(km)*	Subunit	*Dist(km)*	Subunit	*Dist(km)*	Subunit	*Dist(km)*	Subunit	*Dist(km)*	Subunit	*Dist(km)*	Subunit
	goto 24-31E	*80*	start 23-16		goto 22-32	*55*	start 21-16		goto20-26	*50*	start 19-15		goto18-25
75	start 24-30	*75*	**17**	*80*	start 22-31	*50*	**17**	*55*	start su 25	*45*	**16**	*45*	start 18-24
70	**29**	*70*	**18**	*75*	**30**	*45*	**18**	*50*	**24**	*40*	**17**	*40*	**23**
65	**28**	*65*	**19**	*70*	**29**	*40*	**19**	*45*	**23**	*35*	**18**	*35*	**22**
60	**27**	*60*	**20**	*65*	**28**	*35*	**20**	*40*	**22**	*30*	**19**	*30*	**21**
55	**26**	*55*	**21**	*60*	**27**	*30*	**21**	*35*	**21**	*25*	**20**	*25*	**20**
50	**25**	*50*	**22**	*55*	**26**	*25*	**22**	*30*	**20**	*20*	**21**	*20*	**19**
45	**24**	*45*	**23**	*50*	**25**	*20*	**23**	*25*	**19**	*15*	**22**	*15*	**18**
40	**23**	*40*	**24**	*45*	**24**	*15*	**24**	*20*	**18**	*10*	**23**	*10*	**17**
35	**22**	*35*	**25**	*40*	**23**	*10*	**25**	*15*	**17**	*5*	**24**	*5*	**16**
30	**21**	*30*	**26**	*35*	**22**	*5*	**26**	*10*	**16**	*0*	**end 19-25**	*0*	end 18-15
25	**20**	*25*	**27**	*30*	**21**	*0*	end 21-27	*5*	15				
20	**19**	*20*	**28**	*25*	**20**			*0*	end 20-15				
15	**18**	*15*	**29**	*20*	**19**								
10	**17**	*10*	**30**	*15*	**18**								
5	**16**	*5*	**31**	*10*	**17**								
0	end 24-16	*0*	**end 26-32**	*5*	**16**								
				0	end 22-16								

P.N.Garamba RECENSEMENT GENERAL 2003 Sud 1998,2000,2002,2003

17A	W-E	17	E-W	16A	W-E	16	E-W	15A	W-E	15	E-W	14A	W-E
Dist(km)	Subunit	*Dist(km)*	Subunit	*Dist(km)*	Subunit	*Dist(km)*	Subunit	*Dist(km)*	Subunit	*Dist(km)*	Subunit	*Dist(km)*	Subunit
45	**start17A-15**		**goto 17-24**	*45*	**start16A-15**		**goto 16-24**	*45*	**start15A-15**		**goto 15-24**	*60*	**start 14A-12**
40	**16**	45	**start 23**	*40*	**16**	*45*	**start 23**	*40*	**16**	45	**start 23**	55	**13**
35	**17**	*40*	**22**	*35*	**17**	*40*	**22**	*35*	**17**	*40*	**22**	50	**14**
30	**18**	*35*	**21**	*30*	**18**	*35*	**21**	*30*	**18**	*35*	**21**	*45*	**15**
25	**19**	*30*	**20**	*25*	**19**	*30*	**20**	*25*	**19**	*30*	**20**	*40*	**16**
20	**20**	*25*	**19**	*20*	**20**	*25*	**19**	*20*	**20**	*25*	**19**	*35*	**17**
15	**21**	*20*	**18**	*15*	**21**	*20*	**18**	*15*	**21**	*20*	**18**	*30*	**18**
10	**22**	*15*	**17**	*10*	**22**	*15*	**17**	*10*	**22**	*15*	**17**	*25*	**19**
5	**23**	*10*	**16**	*5*	**23**	*10*	**16**	*5*	**23**	*10*	**16**	*20*	**20**
0	**end17A-24**	*5*	**15**	*0*	**end16A-24**	*5*	**15**	*0*	**end15A-24**	*5*	**15**	*15*	**21**
		0	**end 17-15**			*0*	**end 16-15**			*0*	**end 15-15**	*10*	**22**
												5	**23**
												0	**end14A-24**

P.N.Garamba RECENSEMENT GENERAL 2003 Sud 1998,2000,2002,2003

14A	W-E	14	E-W	13A	W-E	13	E-W	12A	W-E	12	E-W	11A	W-E
Dist(km)	Subunit	*Dist(km)*	Subunit	*Dist(km)*	Subunit	*Dist(km)*	Subunit	*Dist(km)*	Subunit	*Dist(km)*	Subunit	*Dist(km)*	Subunit
60	start 14A-12		goto 14-24	75	start 13A-9		goto 13-24	65	start 12A-10		goto 15-23	45	start 11A-12
55	13	60	start 23	70	10	70	start 23	60	11	65	start 22	40	13
50	14	55	22	65	11	65	22	55	12	60	21	35	14
45	15	50	21	60	12	60	21	50	13	55	20	30	15
40	16	45	20	55	13	55	20	45	14	50	19	25	16
35	17	40	19	50	14	50	19	40	15	45	18	20	17
30	18	35	18	45	15	45	18	35	16	40	17	15	18
25	19	30	17	40	16	40	17	30	17	35	16	10	19
20	20	25	16	35	17	35	16	25	18	30	15	5	20
15	21	20	15	30	18	30	15	20	19	25	14	0	end 11A-21
10	22	15	14	25	19	25	14	15	20	20	13		cont 5km 21
5	23	10	13	20	20	20	13	10	21	15	12		
0	end14A-24	5	12	15	21	15	12	5	22	10	11		
		0	wpt 14-12	10	22	10	10	0	end 12A-23	5	10		
			cont.5km	5	23	5	9			0	end 12-10		
				0	end13A-24	0	end 13-9						

11	E-W	10A	W-E
Dist(km)	Subunit	*Dist(km)*	Subunit
	goto 11-21	45	start 10A-12
45	start 20	40	13
40	19	35	14
35	18	30	15
30	17	25	16
25	16	20	17
20	15	15	18
15	14	10	19
10	13	5	20
5	12	0	end 10A-21
0	end 11-12		