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BLACK RHINOCEROSES IN CAPTIVITY - INTERNATIONAL STUDBOOK EVALUATION

by

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Next to the Giant Panda - the emblem of WORLD WILDLIFE FUND FOR NATURE - the 3 remaining rhinoceros species with 2 sub-species symbolize the alarming situation that man has created for the global fauna.

After the catastrophic decline of the rhino population in East Africa through poaching between 1990 and 1993, the remaining population especially in Kenya but also in Zimbabwe has stabilized. This was achieved by an improved anti-poaching policy and foremost by placing a large number of rhinos in so called INTENSIVE PROTECTION ZONES respectively in small private sanctuaries. In June 1994 the AFRICAN RHINO MASTERPLAN reports of a living population of 2 350 Black and 6 770 White rhino world wide.

Berlin Zoo since 1983 publishes the Black and White rhino studbooks combined under the heading INTERNATIONAL STUDBOOK FOR AFRICAN RHINOCEROSES.
Last edition (no. 7) was published in June of 1997 with dead-line 31.12.1996. In this and the previous edition of the studbook we not only list all reported captive births and imports from the wild for respective period but we also have added data of a considerable number of historic individuals. In 1994 we set out to register all such individuals from the data available to us to obtain a general view of all rhinos ever held in captivity, which seems of great interest to many.

In a number of cases we were able to trace the exact geographical origin (PLACE OF BIRTH) of the FOUNDER POPULATION, which may prove important for genetic and demographic research.

Following presentations are for better understanding of the situation of the world captive population.

PRESENTATION 1 gives a general view of the world captive population of *Diceros bicornis* as listed in the international studbook as on 31.12.1996.

GRAPHIC 1: This image depicts WORLD POPULATION GROWTH in *Diceros bicornis* between 01.01.1945 and 31.12.1996. Aside from a stagnation in growths between 1970 to 1983, a continual population increase from 19 individuals in 1945 to 238 (109.129.0) at the end of 1996 is to be noted.

The 3 relevant factors for population growth are rate of BIRTHS, rate of IMPORTS, and rate of DEATHS - see **GRAPHIC 2** which depicts 334 BIRTHS, **GRAPHIC 2A** which depicts 299 IMPORTS, and **GRAPHIC 2B** which depicts 395 DEATHS for period 1945 through 1996.

The line of BIRTHS and DEATHS shows a moderate ascending trend, whereas a continual decline of IMPORTS from the wild in the last 25 years is seen, which since 1991 has reached a rate of close to 0.

For years births and deaths counterbalance with an average birth rate of 4,7% and an average death rate of 5,6%. In the last 10 years, however, rate of births seems to equal that of rate of deaths.

Attempting to predict POPULATION GROWTH in captive Black rhinos it becomes necessary to look at current AGE DISTRIBUTION - see **GRAPHIC 3.** With a large number of young individuals and a decrease in individuals of advanced age, altogether the situation looks rather encouraging not only in Europe but also in the USA. In the next years more and more individuals will become of breeding age and hopefully will produce offspring.

GRAPHIC 4 depicts SEASON OF BIRTH in *Diceros bicornis* for period 1904 through 1996. An increase in the rate of births from July becomes quite obvious. This increase more so applies to Europe than to the USA, as in Europe almost all individuals are kept in the colder northern region - see **GRAPHIC 5** - whereas in the USA on the whole most rhinos live in much warmer climate - see **GRAPHIC 6.**
Mating of Black rhino (gestation length 455 days) in Europe takes place mostly in June through September, which may be explained by the relatively cold climate, which has European zoos bring outdoors their rhinos for mating only in the short summer months.

The image of WORLD SEASON OF DEATH in *Diceros bicornis* looks somewhat alike - see **GRAPHIC 7.**
In Europe most rhino deaths very distinctly occur during the cold season December through April - see **GRAPHIC 8.** The reason for this can only be speculated upon and may have to do with a deficient diet fed during the extended European winter. In the USA this rarely is seen - see **GRAPHIC 9.**

Very important for any zoo veterinarian is to investigate the CAUSE OF DEATH of the species in captivity. This survey can, however, only give a rough view of the world situation, as only those facts are pointed out that by the author are considered important.

Of the cause of deaths listed in the studbook for period 1965 through 1996 only 243 were usable for evaluation. If at all, only primary cause of death is reported to the studbook keeper whereas few autopsy reports are received, which naturally reduces the quality of **PRESENTATION 10:**
Of said number usable for evaluation 102 are ORGANIC DISEASES totalling 42%, 84 are listed under OTHER CLINICAL FINDINGS totalling 34%, and 57 are INFECTIOUS DISEASES totalling 23%.

Proportionately the occurrence of INFECTIOUS DISEASES is rather high considering the fact that only those with specification of the pathogenic agent are included in this evaluation. Looking at **PRESENTATION 11** the high rate of bacterial pneumonia becomes apparent. In many cases of septicaemia also pneumonia is seen. The listed 8 pulmonary mycosis presumably are foremost pulmonary tuberculosis.

Of the ORGANIC DISEASES - see **PRESENTATION 12** - the high rate of HAEMOLYTIC ANAEMIA is rather striking. It comes close to the total rate of deaths through the digestive system. Here enteritis is followed closely by hepatitis. Cardiac disorders and nephritis mainly occurs in older individuals.

The relatively high rate of abortions and stillbirths is rather obvious. Also, death caused by either cage mates or accidents occurs at an extremely high rate in captive Black rhinoceros - **13.**

As in adult Black rhino, death in individuals between 1 day and 1 year of age is largely caused by pneumonia or sepsis. In all, deaths in infant Black rhino is mainly caused by lung affections and haemolytic anaemia. Accidents and death inflicted by cage mates occur at a high rate - see **PRESENTATION 14.**

The original cause of HAEMOLYTIC ANAEMIA, which is seen only in the Black rhinoceros and not in other rhino species, remains a mystery despite the intensive research conducted foremost in the USA. Hypothetically the cause of haemolytic anaemia ranges from leptospirosis, genetic erythrocytic defects, to vitamin E deficiency.

As far as I am concerned, vitamin E deficiency, which is seen mainly in the winter months from December through March, plays a major role in the pathogenesis of haemolytic anaemia. This may explain the increased death rate in Black rhino in Europe during that period. However, in the past years it has been stressed that a virus may possibly be the causative factor of this disease.

In the past 13 years at Berlin Zoo 5 Black rhinos died, in which chronic atrophy of the small intestine with haemosiderosis was found. 2 of the 5 rhinoceroses died of acute haemolytic anaemia.
Such clinical syndrome is seen in many different mammals after endopathogen viral infections.

In the Black rhino that died last in Berlin a herpesvirus was isolated by means of electron microscope. A case of herpesvirus infection in a Black rhinoceros has also become known in the USA.

Consequently, in future necropsies in rhinos should always be performed with regard to possible involvement of viruses in the pathological processes.

Concluding it is to be stressed that in view of the still alarming situation of the wild living African rhino population - especially in East Africa - in the coming years all effort must be made to achieve the set goal of a healthy and self-preserving captive Black rhino population.

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PRESENTATION 1

STUDBOOK SIZE of *Diceros bicornis* AS ON 31.12.1996:

T O T A L	NUMBER		666 INDIVIDUALS
	OF WHICH	*Diceros b. michaeli*	575 INDIVIDUALS
	OF WHICH	*Diceros b. minor*	91 INDIVIDUALS

WORLD L I V I N G POPULATION

T O T A L	NUMBER	AT 79 INSTITUTIONS	238 (109. 129. 0)
	OF WHICH	*Diceros b. michaeli*	183 (85. 98. 0)
	OF WHICH	*Diceros b. minor*	55 (24. 31. 0)

C U R R E N T POPULATION IN:

NORTH AMERICA		
	TOTALS	102 (53. 49. 0)
	OF WHICH *minor*	32 (13. 19. 0)
EUROPE		
	TOTALS	65 (25. 40. 0)
	OF WHICH *minor*	1 (1. 1. 0)
ASIA		
	TOTALS	39 (16. 23. 0)
	OF WHICH *minor*	4 (2. 2. 0)
AFRICA		
	TOTALS	16 (8. 8. 0)
	OF WHICH *minor*	7 (4. 3. 0)
AUSTRALIA		
	TOTALS	12 (5. 7. 0)
	OF WHICH *minor*	10 (4. 6. 0)
CENTRAL AMERICA		
	TOTALS *michaeli*	4 (2. 2. 0)

E S S P POPULATION

T O T A L	NUMBER	AT 15 INSTITUTIONS	63 (24. 39. 0)
	OF WHICH	*Diceros b. michaeli*	61 (23. 38. 0)
	OF WHICH	*Diceros b. minor*	2 (1. 1. 0)

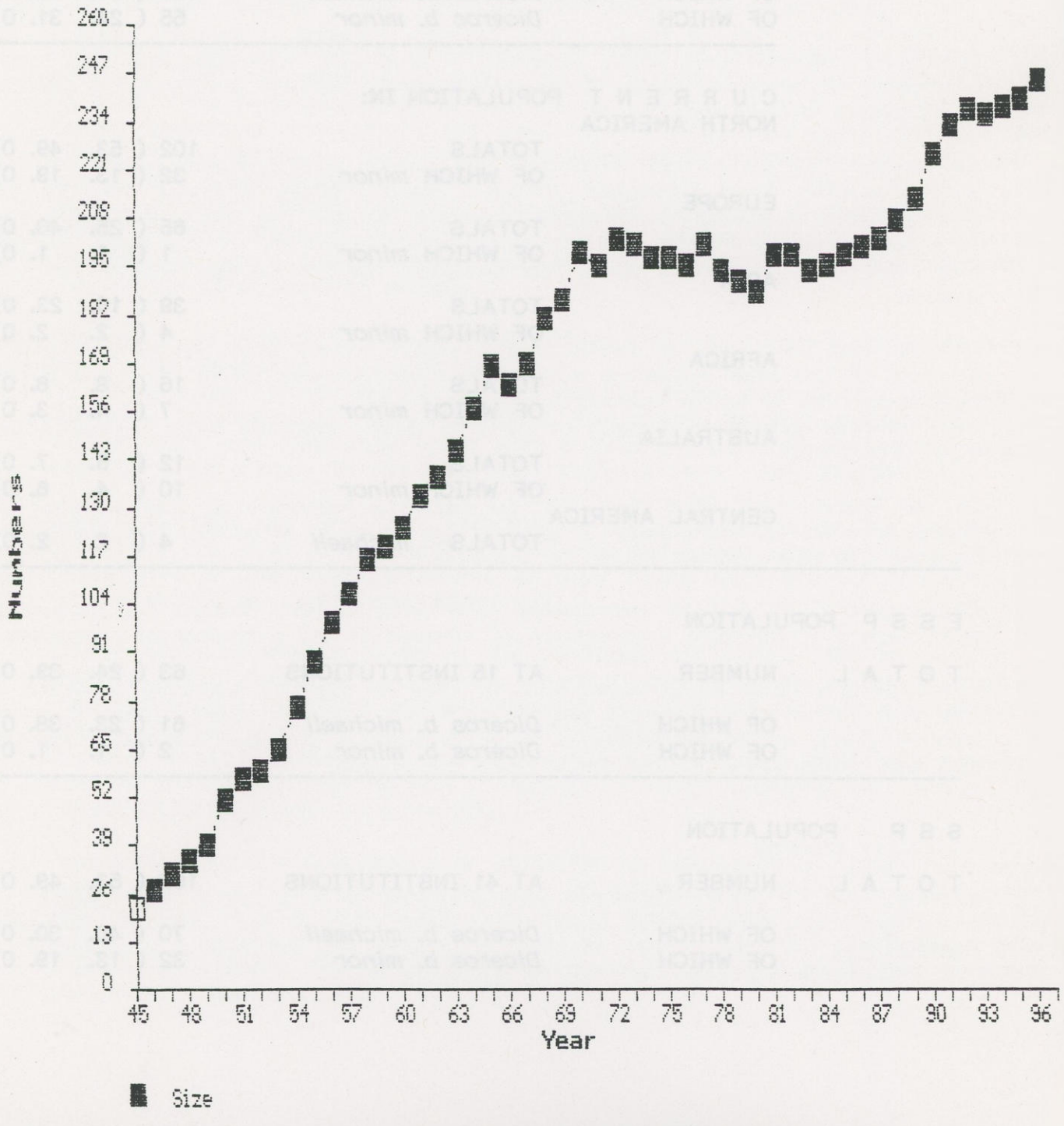
S S P POPULATION

T O T A L	NUMBER	AT 41 INSTITUTIONS	102 (53. 49. 0)
	OF WHICH	*Diceros b. michaeli*	70 (40. 30. 0)
	OF WHICH	*Diceros b. minor*	32 (13. 19. 0)

GRAPHIC 1

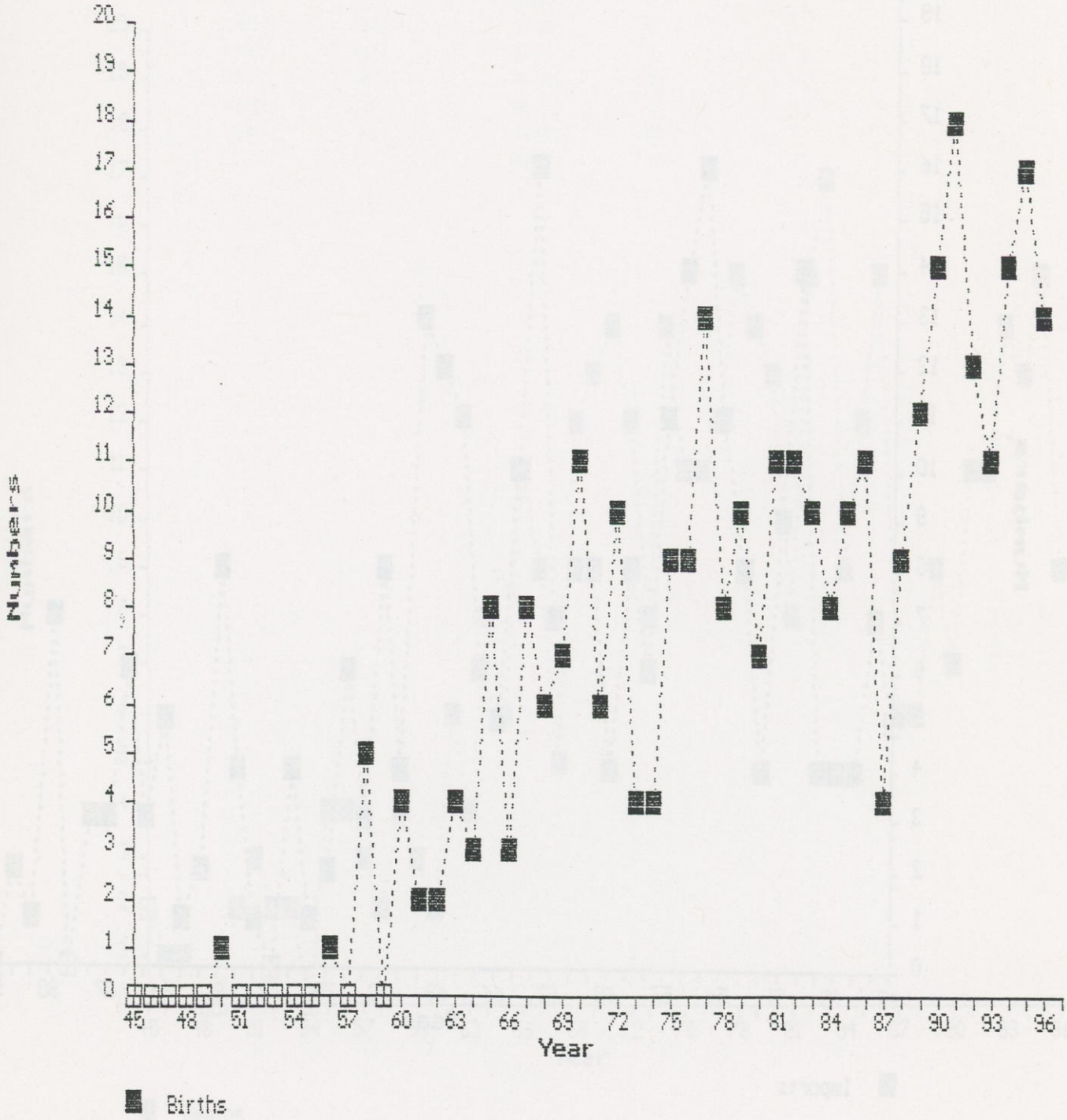
POPULATION G R O W T H IN *Diceros bicornis*

BETWEEN 1945 and 1996



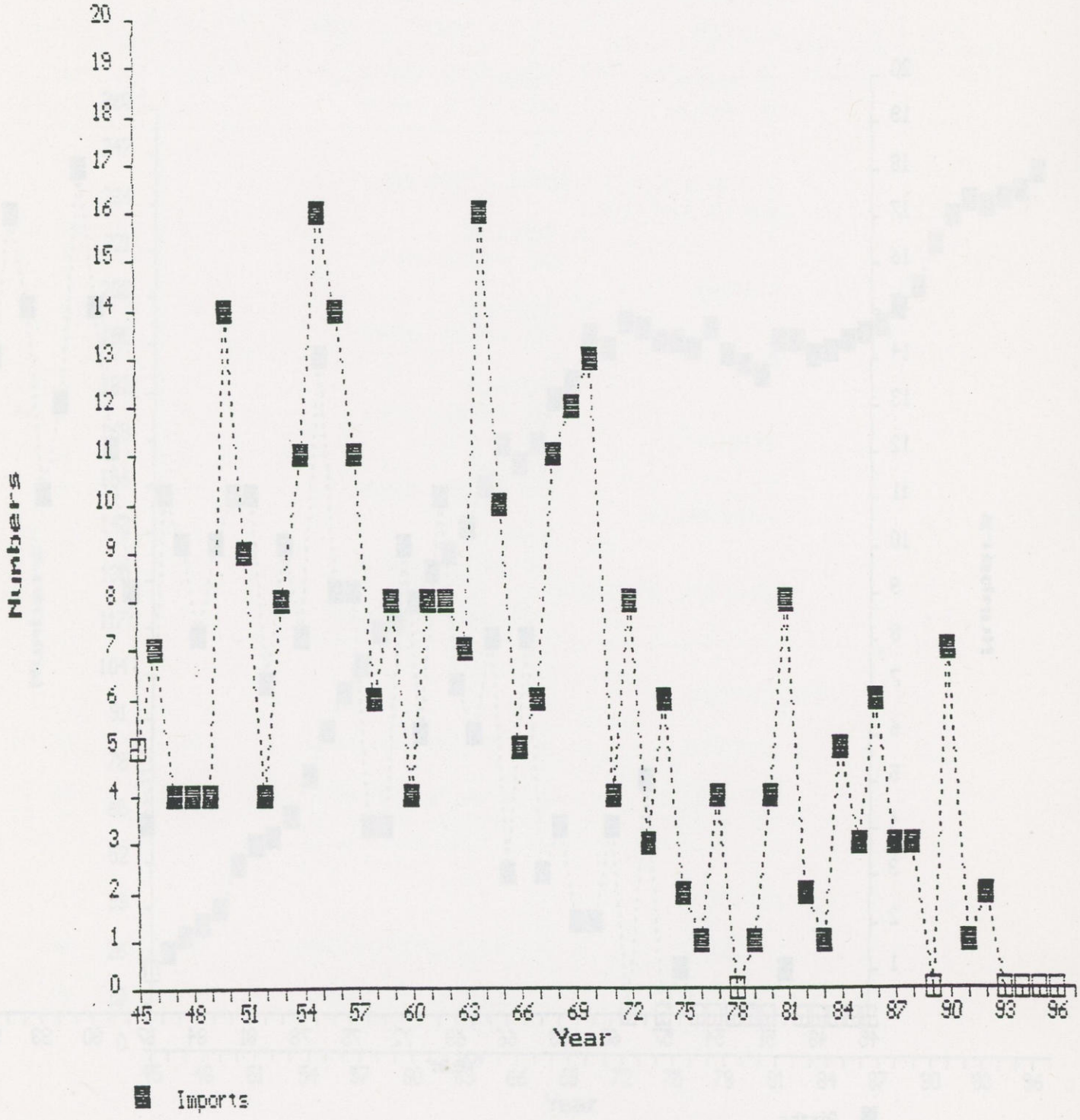
GRAPHIC 2

B I R T H S IN *Diceros bicornis* (No=334)
BETWEEN 1945 and 1996



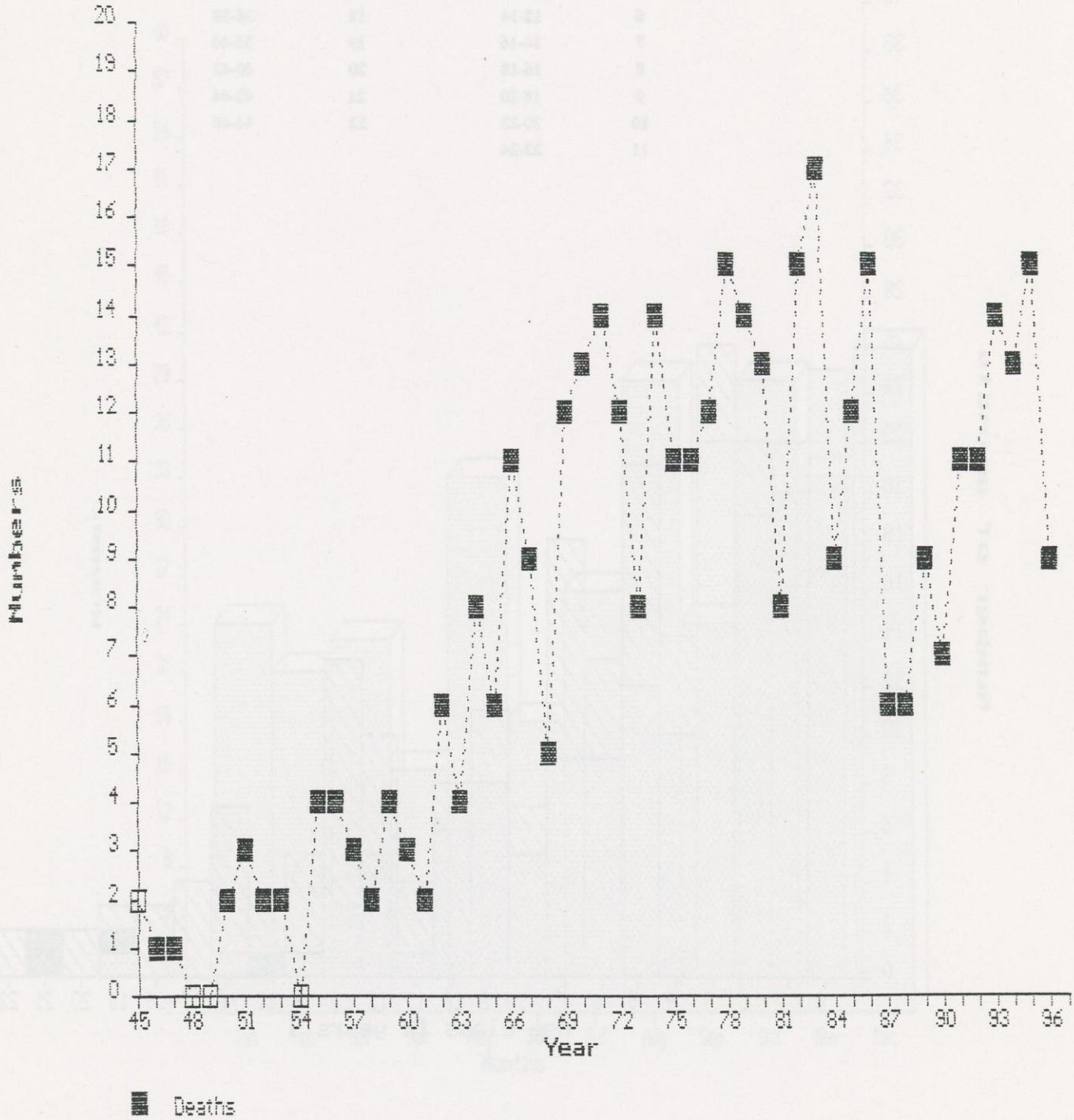
GRAPHIC 2A

I M P O R T S IN *Diceros bicornis* (No=299)
(OF WHICH 22 OF UNKNOWN ORIGIN)
BETWEEN 1945 and 1996



GRAPHIC 2B

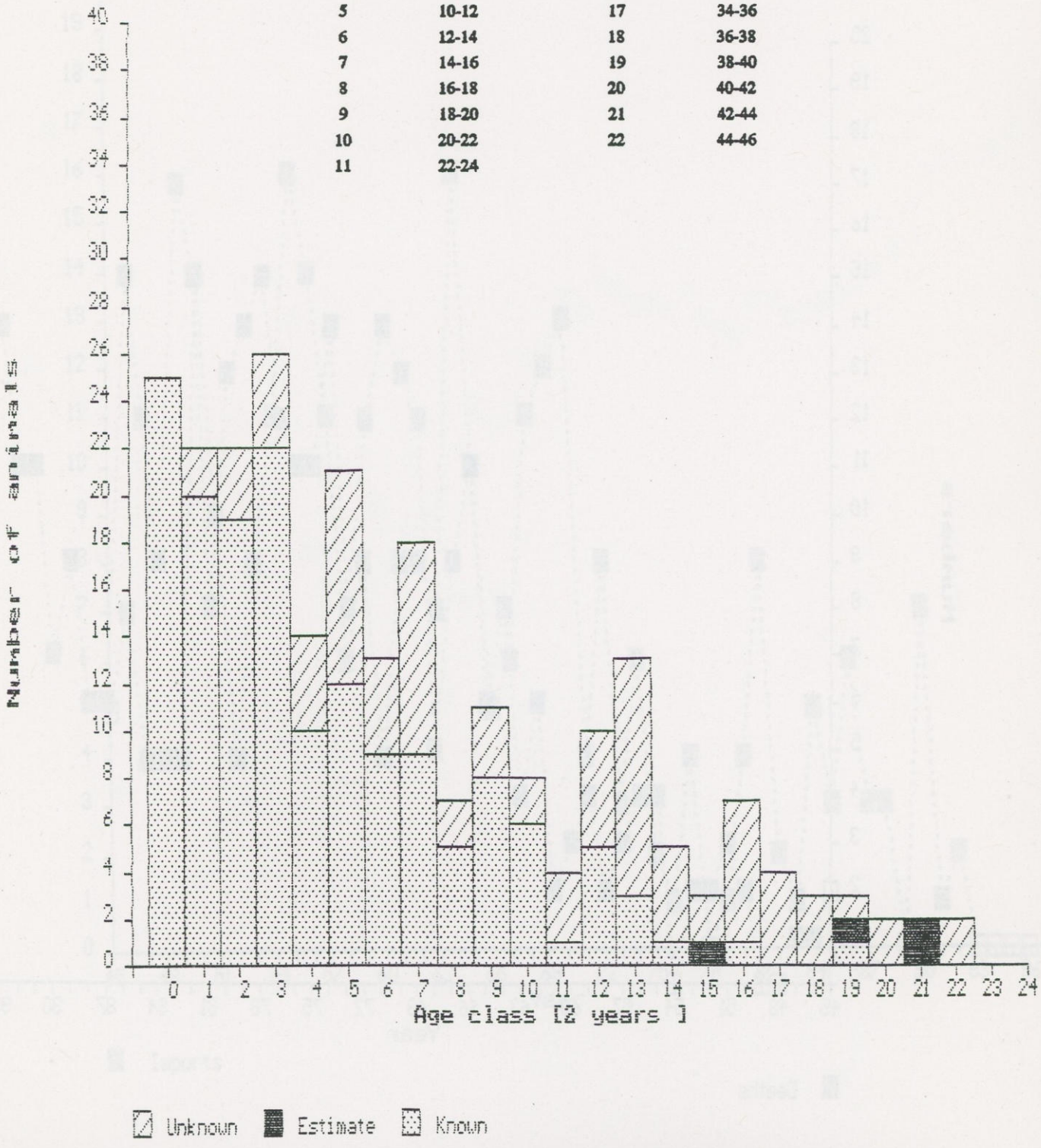
D E A T H S IN *Diceros bicornis* (No=395)
BETWEEN 1945 and 1996



GRAPHIC 3

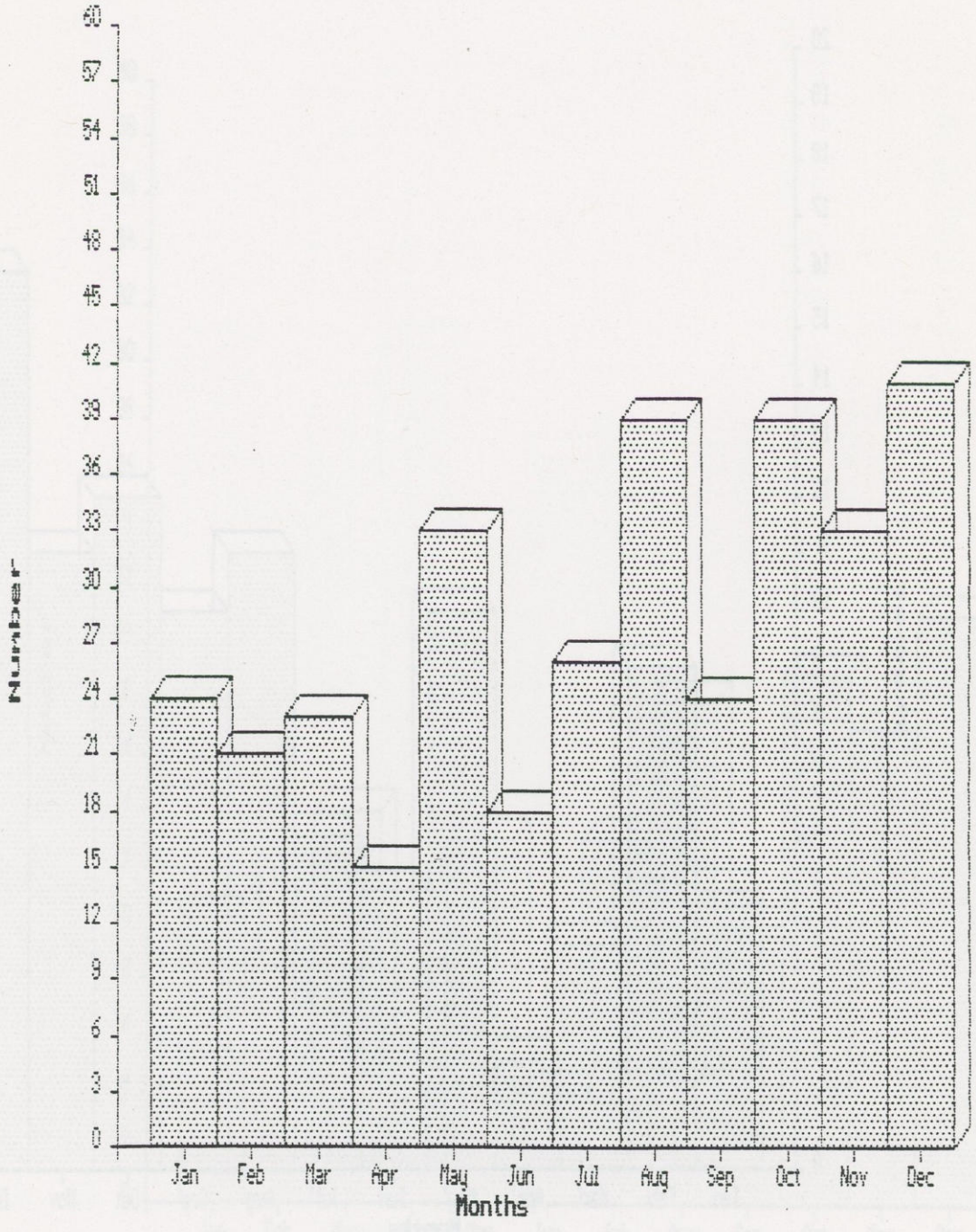
A G E DISTRIBUTION OF *Diceros bicornis*
IN WORLD AS ON 31. 12. 1996

CLASS ##	AGE GROUP 2 years	CLASS ##	AGE GROUP 2 years
0	0- 2	12	24-26
1	2- 4	13	26-28
2	4- 6	14	28-30
3	6- 8	15	30-32
4	8-10	16	32-34
5	10-12	17	34-36
6	12-14	18	36-38
7	14-16	19	38-40
8	16-18	20	40-42
9	18-20	21	42-44
10	20-22	22	44-46
11	22-24		



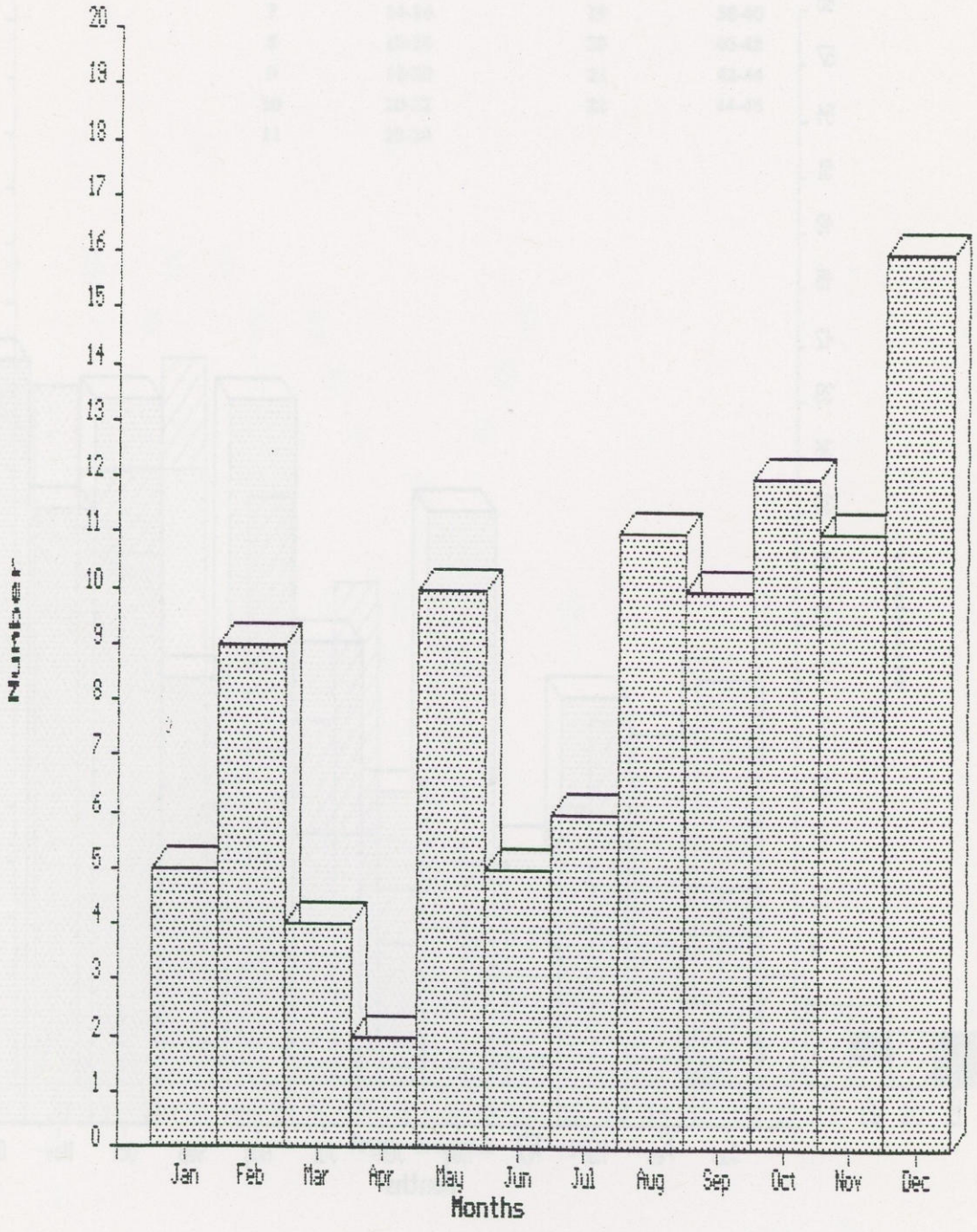
GRAPHIC 4

SEASON OF B I R T H IN *Diceros bicornis*
IN WOLRD BETWEEN 1904-1996 (N=335)



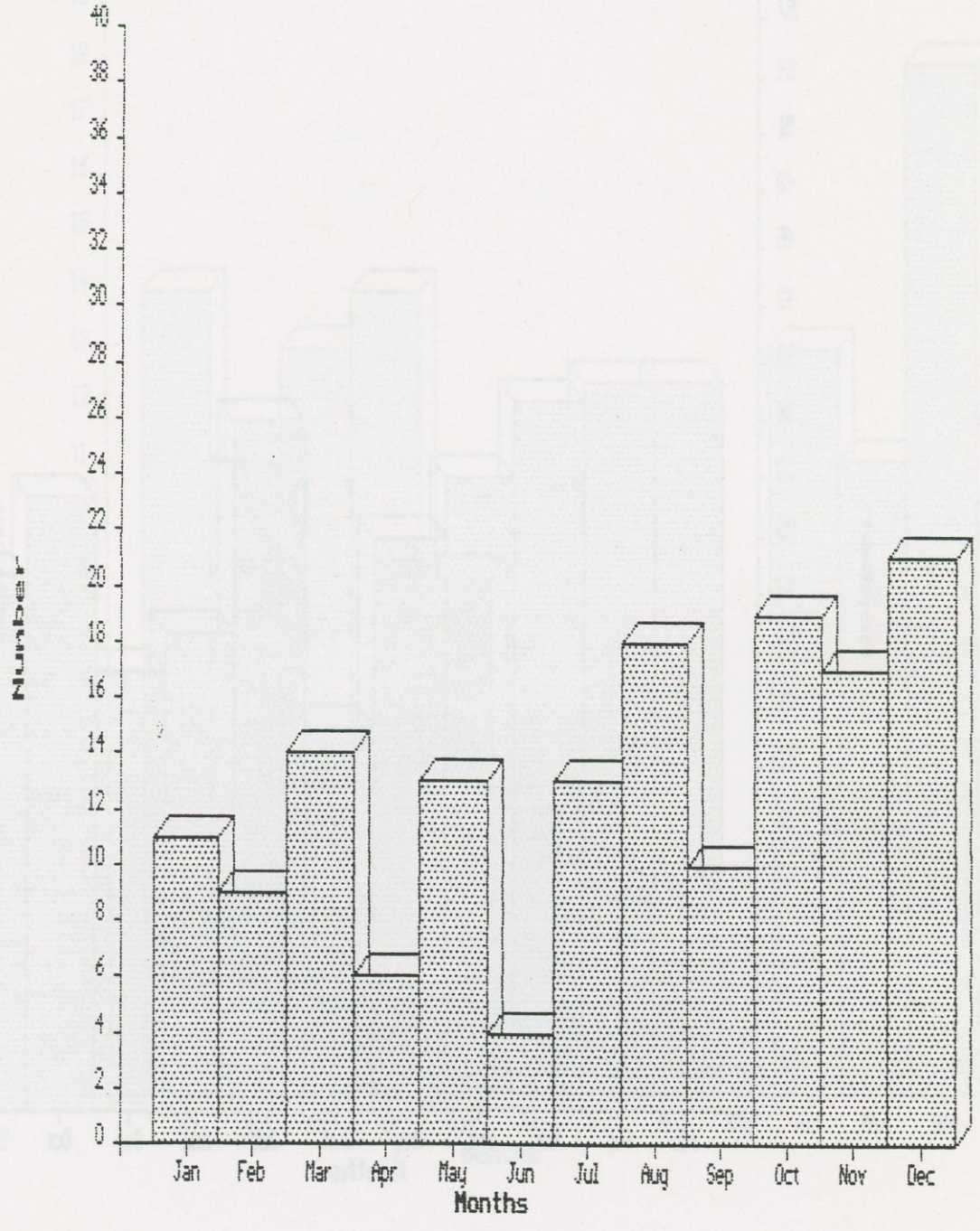
GRAPHIC 5

SEASON OF B I R T H IN *Diceros bicornis*
IN E U R O P E BETWEEN 1904-1996 (N=101)



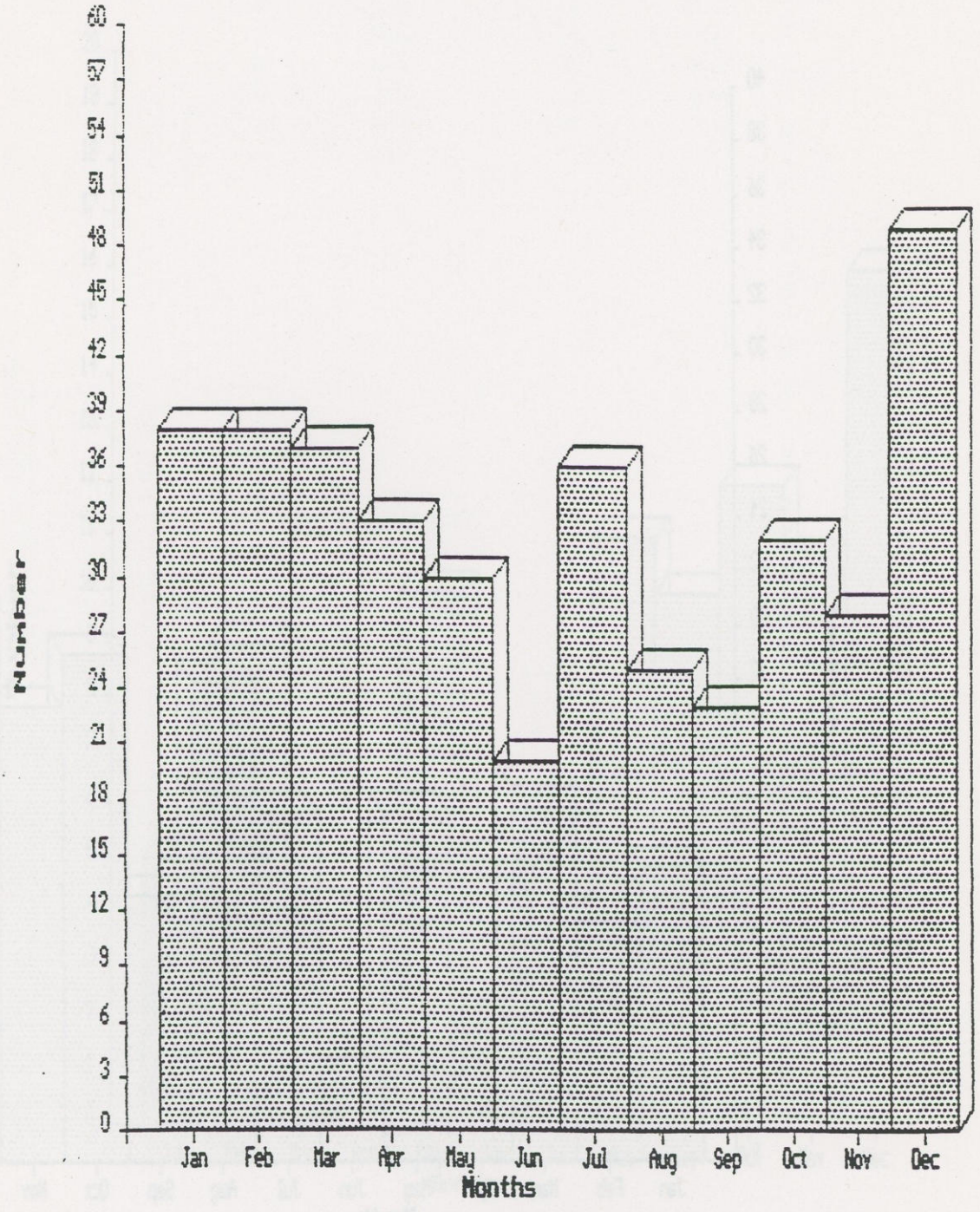
GRAPHIC 6

SEASON OF B I R T H IN *Diceros bicornis*
IN N O R T H AMERICA BETWEEN 1904-1996 (N=155)



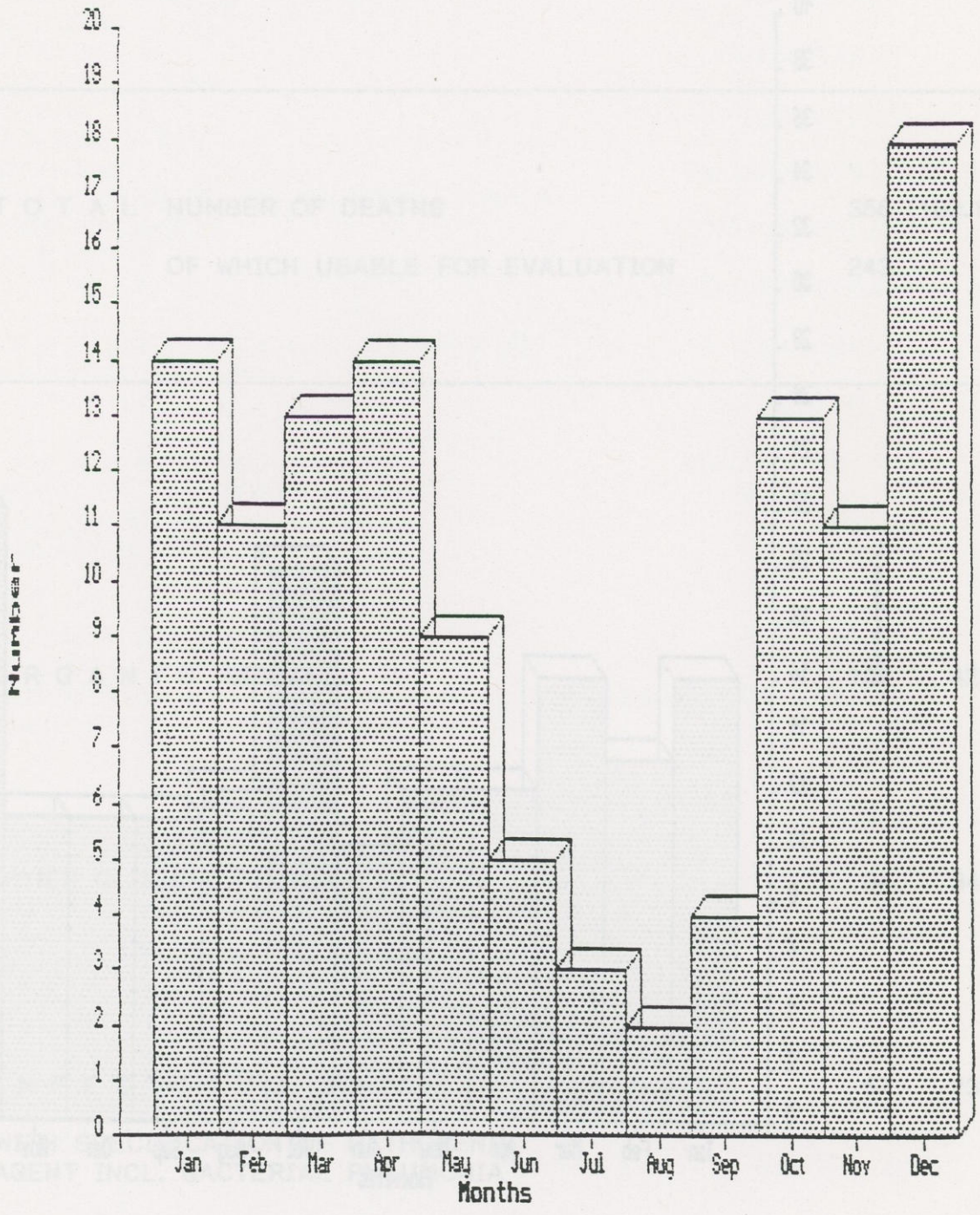
GRAPHIC 7

SEASON OF D E A T H IN *Diceros bicornis*
IN W O L R D BETWEEN 1904-1996 (N=389)



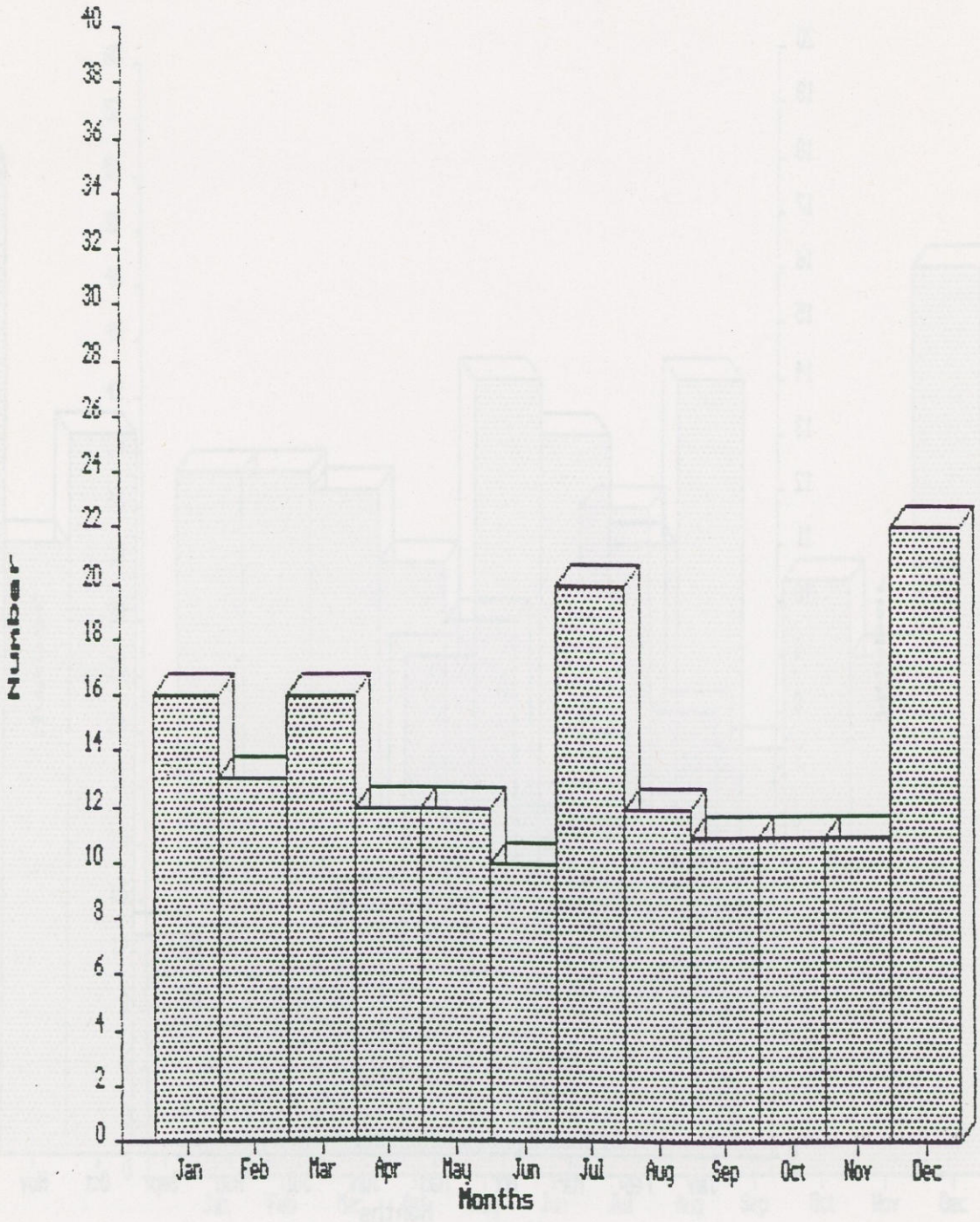
GRAPHIC 8

SEASON OF D E A T H IN *Diceros bicornis*
IN E U R O P E BETWEEN 1904-1996 (N=117)



GRAPHIC 9

SEASON OF D E A T H IN *Diceros bicornis*
IN N O R T H AMERICA BETWEEN 1904-1996 (N=166)



PRESENTATION 10

Black rhinoceroses *(Diceros bicornis)*

CAUSES OF DEATH BETWEEN 1965 and 1996 - STUDBOOK EVALUATION

T O T A L NUMBER OF DEATHS	356	(180.170.6)
OF WHICH USABLE FOR EVALUATION	243	
O R G A N I C DISEASES	102	42%
OTHER CLINICAL FINDINGS	84	34%
I N F E C T I O U S DISEASES	57	23%
WITH SPECIFICATION OF PATHOGENIC AGENT INCL. BACTERIAL PNEUMONIA		

PRESENTATION 11

INFECTIOUS DISEASES

- B A C T E R I A L		
PNEUMONIA	17	
SEPTICAEMIA	11	
TUBERCULOSIS	9	
LEPTOSPIROSIS	3	
SALMONELLOSIS	2	
PASTEURELLOSIS	1	
YERSINOSIS	1	
CLOSTRIDIUM	1	
ACTINOMYCOSIS	1	
		46
- V I R A L		
SMALL POX	1	
SUSPECTED HERPES VIRUS INFECTION	1	
		2
- F U N G A L		
PULMONARY MYCOSIS	8	
		8
- P A R A S I T I C		
GASTROINTESTINAL	1	
		1
T O T A L S		**57**

PRESENTATION 12

ORGANIC DISEASES

- E R Y T H R O P O E T I C SYSTEM		
HAEMOLYTIC ANAEMIA	25	
ANAEMIA	2	
		27
- D I G E S T I V E SYSTEM		
ENTERITIS	8	
HEPATITIS	6	
GASTRIC ULCERS	3	
COLICS	3	
PROLAPSUS RECTI	3	
VOLVULUS	3	
OVERLOADING OF THE STOMACH, TYMPANY	2	
LIVER CIRRHOSIS	1	
PERITONITIS	1	
		30
- C A R D I O V A S C U L A R SYSTEM		
CARDIAC DISORDERS	15	
		15
- U R I N A R Y SYSTEM		
NEPHRITIS, NEPHROSIS	14	
BLADDER STONE	1	
PROLAPSUS UTERI	1	
		16
- R E S P I R A T O R Y SYSTEM		
GANGRENE OF THE LUNGS	2	
EMPHYSEMA	1	
SINUSITIS	1	
		4
- S K I N DISEASES		
DERMATOSES (ULCERS)	4	
		4
- N E R V O U S SYSTEM		
ENCEPHALOMALACIA	2	
BLINDNESS	1	
		3
- M U S C U L A R, SKELETAL SYSTEM		
POLYARTHRITIS	2	
MUSCULAR DYSTROPHY	1	
		3
T O T A L S		**102**

PRESENTATION 13

OTHER CLINICAL FINDINGS

A B O R T U S	16	
S T I L L BORN	9	
DID NOT SURVIVE	11	
		36 (20.11.5)
ACCIDENTAL DEATH	12	
DEATH INFLICTED BY CAGE MATE	9	
CACHEXIA OF OLD AGE	12	
TUMOURS	6	
INTOXICATION	5	
DURING IMMOBILIZATION	3	
HYPOTHERMIA	1	
		48
T O T A L S		**84**

PRESENTATION 14

Black rhinoceroses *(Diceros bicornis)*

CAUSE OF DEATH IN INDIVIDUALS OF 1 DAY TO 1 YEAR of age

BETWEEN 1965 and 1996

PNEUMONIA & SEPSIS	8
KILLED BY DAM	3
UNSUCCESSFUL HAND REARING	1
CUTANEOUS-MUCOSAL ULCER	1
CARDIO FASCULAR FAILURE	1
PROLAPSUS RECTI	1
ACCIDENTAL DEATH	1
VITAMIN DEFICIENCY	1
UNKNOWN CAUSE	15
T O T A L S	**32** (14.16.2) = 13,2%