

Trophy hunting quotas

The population model described in the subsection on **Reproduction and Population Dynamics** in the main body of the report has been used to test the effects of different levels of trophy male hunting quotas on the age structure of a hippo population.

Tests were carried out on a population set initially at 1,000 animals with a growth rate of 7.13% (see page 11). The population was allowed to increase to 10,000 animals (taking about 34 years) with the hunting regime in place and, when the population reached 10,000 animals, the age structure was recorded. It was assumed that the age of maximum longevity was 50 years and no animals younger than 20 years of age would be taken as trophies. A hunting selectivity of 10% for larger animals was used in the model. The selectivity was applied as follows –

- (1) The proportion which each age class forms of the total number of huntable age classes is calculated:

$$P_a = 100 / (\text{No. of age classes}) = 100/31 = 3.23 \%$$

For zero selectivity, each age class would contribute this proportion of whatever quota was set.

- (2) The actual proportion expected to be contributed by the oldest age class (50 years) is then calculated as –

$$P_{50} = P_a + S \cdot (100 - P_a) = 3.23 + 0.1 (100 - 3.23) = 12.91 \%$$

– where S is the selectivity expressed as a fraction.

- (3) The next age class (49 years) contributes –

$$P_{49} = (100 - P_{50}) \cdot (1 + S \cdot N_R) / (N_R + 1) = (100 - 12.91) \cdot (1 + 0.1 \times 29) / 30 = 11.32 \%$$

– where N_R is the number of age classes remaining

- (4) The next age class (48 years) contributes –

$$P_{48} = (100 - P_{50} - P_{49}) \cdot (1 + S \cdot N_R) / (N_R + 1) = (100 - 24.23) \cdot (1 + 0.1 \times 28) / 29 = 9.93 \%$$

- (5) This process is continued until an expected proportion has been calculated for each of 31 age classes (the values are shown in the table on the next page). As hunting pressure is increased, it is not possible for the upper age classes to supply the number of animals demanded and so the required quota is progressively transferred to lower age classes until it has been satisfied.

Hunting quotas from zero to 0.9% of the total population were tested: a quota of 0.9% of the population results in the removal of all males older than 20 years. The detailed results are shown in **Table 10** on the next page and in **Fig.18** (page 40) in the main report. The ‘optimum’ quota is about 0.5% which allows some males in the population to reach an age of 30 years.

Table 11. Response of the adult male age structure of a hippo population to various levels of hunting quotas

Q – Quota (% of total population)	Total population 10,000																														Selectivity 10%										N – Number actually hunted	
	AGE CLASSES (years)																																									
Q	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	Males	N									
0.0	70	63	59	53	46	39	36	34	32	28	27	20	18	15	13	10	9	7	6	5	3	2	2	1	1	1	1	1	0	0	0	4,959	0									
0.1	71	63	59	52	44	38	37	35	32	30	26	22	21	14	13	8	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	4,941	10									
0.2	69	62	57	49	46	37	35	34	30	21	19	16	13	10	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	4,901	19										
0.3	69	63	59	52	43	35	31	25	21	19	14	10	10	7	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4,868	29										
0.4	73	64	55	45	38	30	21	16	13	10	6	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,824	39										
0.5	72	59	46	37	28	18	13	8	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,778	49										
0.6	66	48	35	22	12	7	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,729	59										
0.7	54	31	13	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,680	69										
0.8	21	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	4,637	79										
0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,623	78										
	0.14	0.17	0.20	0.24	0.29	0.35	0.41	0.49	0.57	0.67	0.78	0.92	1.07	1.24	1.43	1.66	1.92	2.21	2.55	2.94	3.37	3.87	4.44	5.09	5.83	6.67	7.62	8.70	9.93	11.32	12.91	Selectivity %										