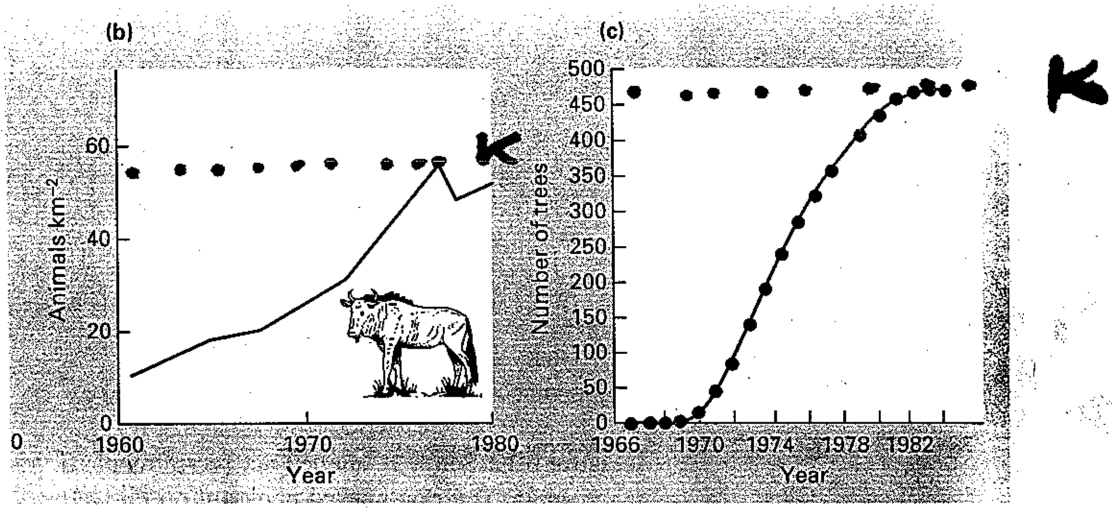
Wildebeest Willows



Intraspecific Competition

≡

Density Dependent Growth

Sigmoid growth curve, levels off at carrying capacity, K.

ran 1967; Draper & Smit

:ESULTS

'oraging Success

ıcks made from 0 to 16 chases ·2 ± 0·2, N=266 days), and ' animals per day (1·8 ± 0·1, uccess (kills/hunt) was 44% n calculated using only data ;, and 45% (range 0–100%) ns. Estimated mass of prey to 208 kg (48·5 ± 2·15 kg, iuration ranged from 1 to ıin, N=357). Chase distances to 4·6 km (0·57 ± 0·03 km, chases also ranged from ɔut were generally longer 304).

± 0·35 kg/dog/day (N=216), 7·5 kg. Clearly, a wild dog a day. Actual food consump- en 2·0 and 2·5 kg/dog/day, tments to the overall mass prey was devalued to reflect usually not eaten (e.g. large nts). Second, observations of known not to have eaten for :hat adult stomach capacity :dible biomass in excess of 1.

ınting Success

which at least one prey , 17 species were hunted: ampus (N=293 hunts), blue warthog (N=88), African (N=32), zebra (N=30), ımia (N=27), Lichtenstein's lichtensteini (N=17), eland, mmon reedbuck, *Redunca ncerus caffer*, greater kudu, ɔs, bushbuck, *Tragelaphus* ᵋ, *Hippotragus niger*, bush- ɔorcus, waterbuck, *Kobus* mongoose, *Mungos mungo*, ıpio cyanocephalus ($N \leq 10$ le of 368 identified kills, 10 ɛd: impala (N=188 kills),

Table I. Profitability of common prey for African wild dogs in Selous

Species	Hunts	Kills	% Success	Mass (kg)	Chase (km)	Profitability kg/hunt	Profitability kg/km chased
Impala	293	188	64	31·9	1·19	20·4	17·1
Wildebeest	266	100	38	92·7	0·69	35·2	51·0
Warthog	88	31	35	33·8	0·31	11·8	38·1
African hare	32	10	31	2·0	0·13	0·6	4·8
Zebra	30	2	7	157·5	1·70	11·0	—
Common duiker	27	16	59	17·6	0·53	10·4	19·6
Total	736	347					
Weighed mean*			47	48·8	0·88	22·9	29·8

*Means were weighted using number of kills or chases (as appropriate) for each species.

blue wildebeest (N=100), warthog (N=31), common duiker (N=16), Lichtenstein's hartebeest (N=15), African hare (N=10), common reedbuck (N=4), zebra (N=2), waterbuck (N=1) and bushbuck (N=1).

The four ungulate species that were hunted but not killed were either much larger than the range of normal prey (eland and buffalo), had unusually dangerous horns or were uncommon in Selous (greater kudu and especially sable). Mongooses and yellow baboons were also not killed, but appeared to be hunted in play.

Table I shows hunting success, chase distance and two measures of profitability (mass killed per hunt, and per km chased) for prey species hunted on more than 25 occasions. Impala were hunted most often (40% of the total), killed most often (54% of the total) and yielded the highest hunting success (64%). Zebra provided the most mass per kill, but were rarely killed, with a probability of killing (7%) far lower than other species (minimum of 31%). Excluding zebra, wildebeest were the heaviest prey killed (mean of 93 kg). African hares were killed with the shortest chases (mean of 130 m), but yielded little food (2 kg).

Combining these relationships shows that wildebeest yield the greatest food mass per hunt and the greatest food mass per km chased (Table I). Indeed, wildebeest were hunted three to 10 times more frequently than all prey species except impala (Table I). Impala were hunted most frequently of all, despite ranking second in mass/hunt and fourth in mass per km chased (Table I). The apparently sub-optimal preference for impala is probably the result of different population densities of prey species (impala are common). Also, seasonal patterns of prey species' reproduction create asynchronous peaks in the availability of vulnerable young (which are highly preferred by wild dogs). More detailed analysis of profit, prey availability and prey choice will be presented elsewhere.

Communal Hunting and Group Size

Cooperative hunting behaviour

Coordination between the members of an African wild dog pack is seen throughout a hunt (Fig. 1). At several stages, effectiveness appears to depend on the number of cooperating hunters.

Although its function for hunting is arguable, the members of a pack almost invariably go through an intense greeting ceremony or 'rally' just prior to a period of hunting. The rally appears to ensure that all pack members are awake, alert and ready to hunt simultaneously, prior to trotting in search of prey (Estes & Goddard 1967; Malcolm 1979). Once on the move, pack members trot or canter together at 10 km/h, usually spread over 10–100 m (Fig. 1a).

Upon sighting prey, a pack often does not hunt. If the pack hunts, small prey (e.g. impala or duiker) flee immediately, but large prey (e.g. wildebeest) often stand in a defensive 'pinwheel', facing outward, charging and using their horns to defend themselves (Fig. 1b). Juveniles keep to the centre of the pinwheel. Well-armed prey (e.g. warthog, greater kudu males) may also stand and defend themselves rather than fleeing, even when solitary. When faced with a defensive formation, wild dogs encircle the herd and simultaneously

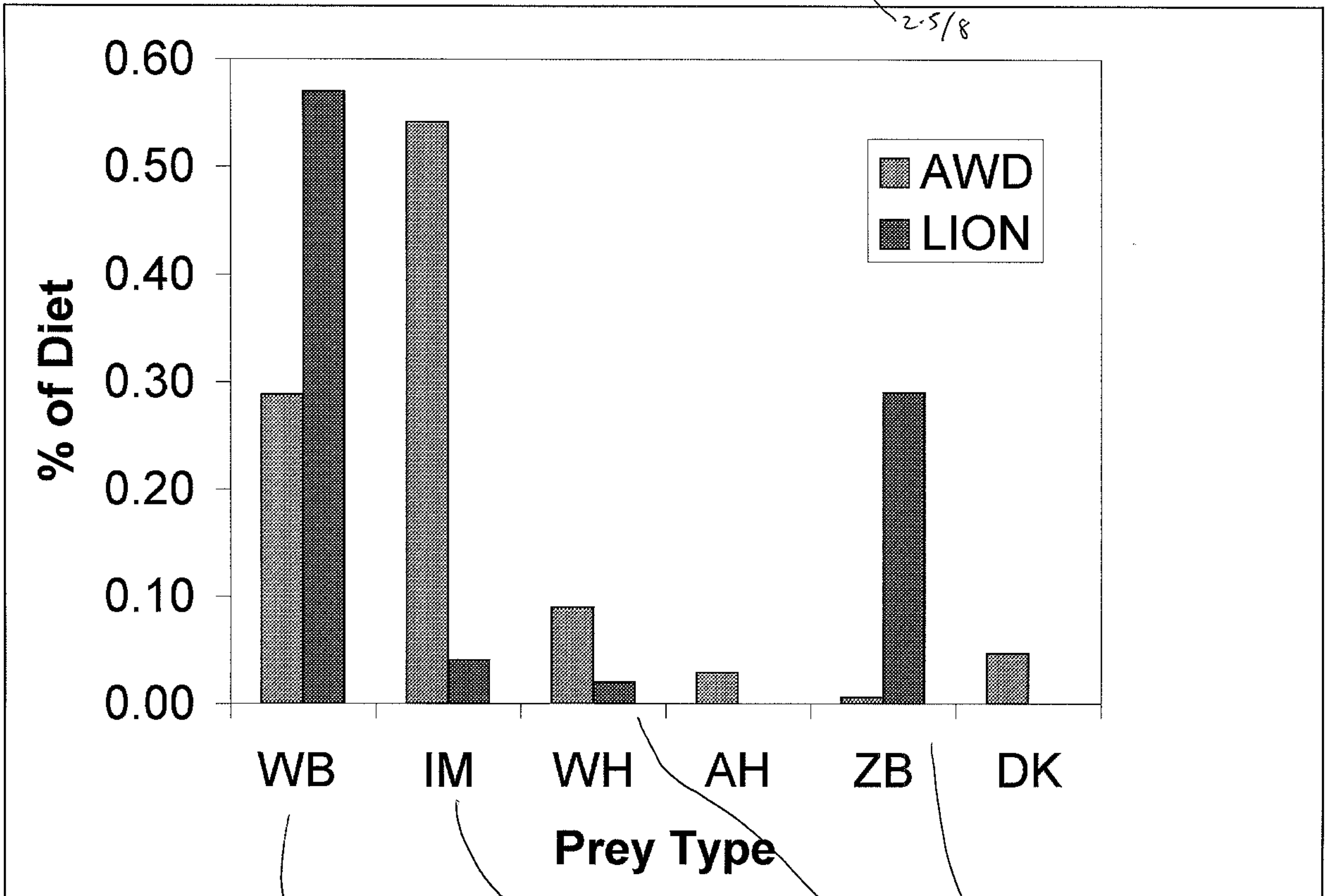
Table 36

Food items (killed and scavenged) eaten by lions in various parts of the Serengeti Park (percentages are in parentheses)

Species	1. Plains	2. Masai and Seronera prides	3. Edge of Woodlands	4. Corridor	5 Northern Extension
Wildebeest	159 (56.7)	121 (22.0)	97 (37.3)	22 (32.8)	10 (47.6)
Zebra	81 (28.9)	87 (15.8)	63 (24.2)	21 (31.3)	3 (14.3)
Thomson's gaz.	21 (7.5)	276 (50.0)	31 (11.9)	3 (4.5)	
Buffalo		13 (2.4)	40 (15.4)	5 (7.5)	7 (33.3)
Topi	4 (1.4)	18 (3.2)	7 (2.7)	4 (6.0)	1 (4.8)
Warthog		12 (2.2)	5 (1.9)	4 (6.0)	
Eland	9 (3.2)		3 (1.2)	1 (1.4)	
Grant's gaz.	3 (1.1)	7 (1.3)	1 (.4)		
Hartebeest	1 (.4)	1 (.2)	4 (1.5)		
Giraffe		3 (.5)	1 (.4)	5 (7.5)	
Impala		1 (.2)	1 (.4)	2 (3.0)	
Reedbuck		6 (1.1)	1 (.4)		
Bushbuck			1 (.4)		
Waterbuck			1 (.4)		
Pangolin			1 (.4)		
Hare		1 (.2)			
Lion	1 (.4)	2 (.3)			
Hyena	1 (.4)	1 (.2)			
Ostrich			3 (1.1)		
Guinea fowl		1 (.2)			
Sand grouse		1 (.2)			
Saddle-bill stork		1 (.2)			
Total	280	552	260	67	21

(B) lion 8 kg/ind/day
AWD 2.5 kg/ind/day

$\alpha_{DL} = 0.20 \times 3.2 = 0.64$ (3.2 = 8/2.5)
$\alpha_{LD} = 0.20 \times 0.11 = 0.02$ (0.11 = 2.5/8)
} Highly asymmetric

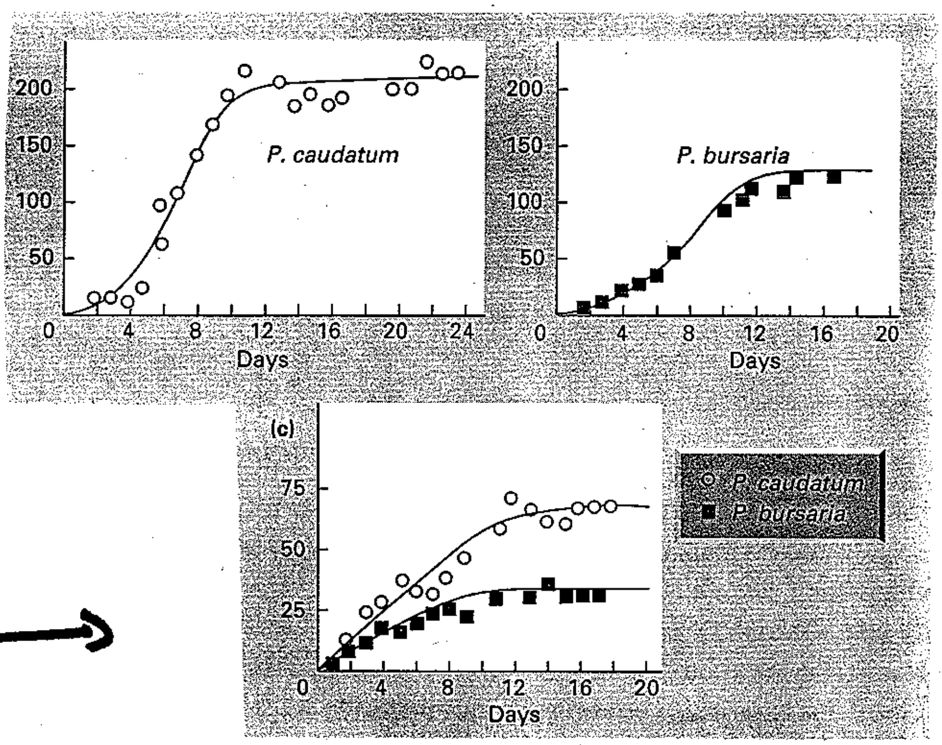


(A) $0.27 * 0.58 = 0.16$
$0.54 * 0.04 = 0.02$
0.01
0.01
} $\Sigma = 0.20$ or 20% overlap.

Competitive Coexistence with Density Compensation

Gause (1934) Paramecium expts.

caudatum without interspp. comp.

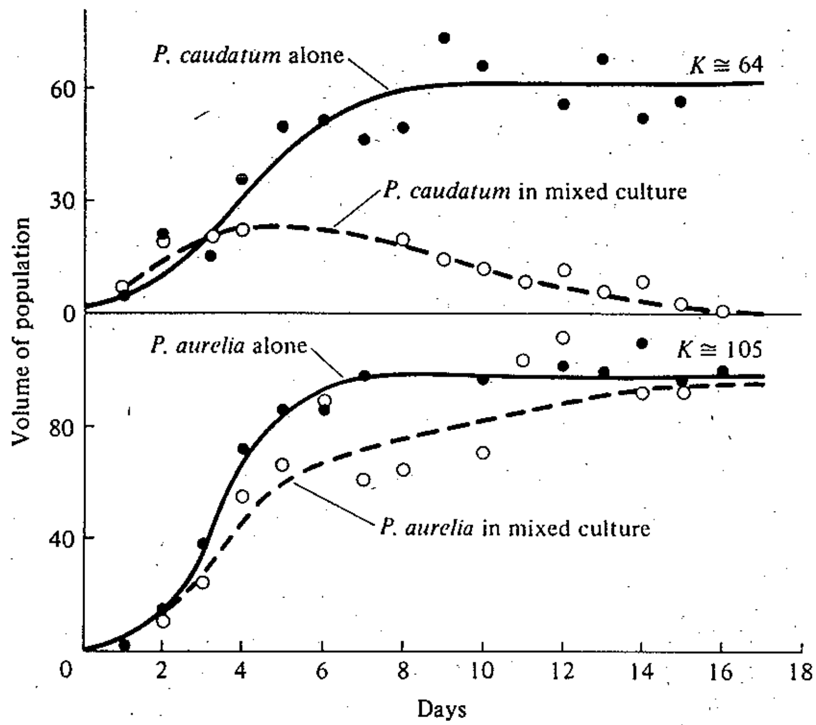


bursaria without interspp. comp.

with interspecific competition, caudatum & bursaria both persist, but each levels out at # less than K.

Competitive Exclusion

Gause (1934) *Paramecium* expts



1. P. aurelia excludes P. caudatum;
2. " below K until " extinct
3. " Then goes to K, levels out.

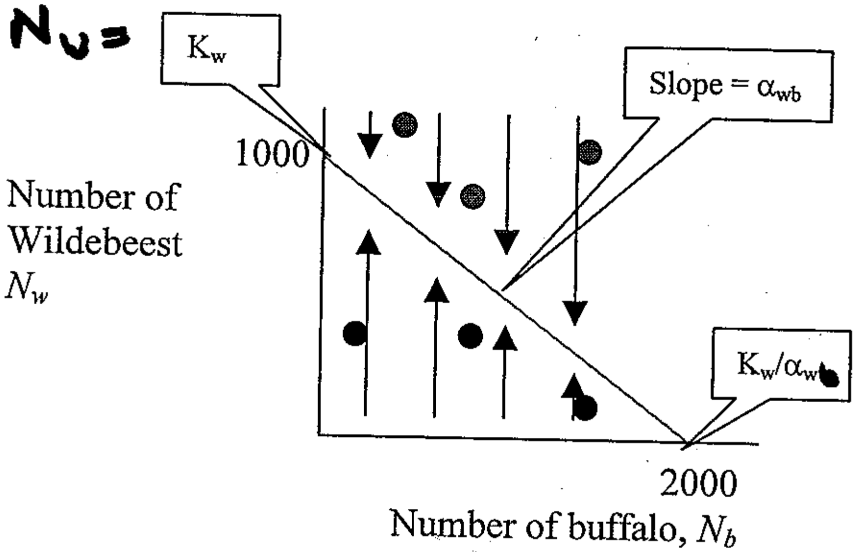
Zero - isocline from Lotka-Volterra eqn.

$$N_w = K_w - \alpha_{wb} N_b$$

$$(y = a - bx)$$

$$= \text{y-int.} + \text{slope } X$$

$N_b = 0$, $N_w =$



$N_w = 0$, $N_b = \dfrac{K_w}{\alpha_{wb}}$

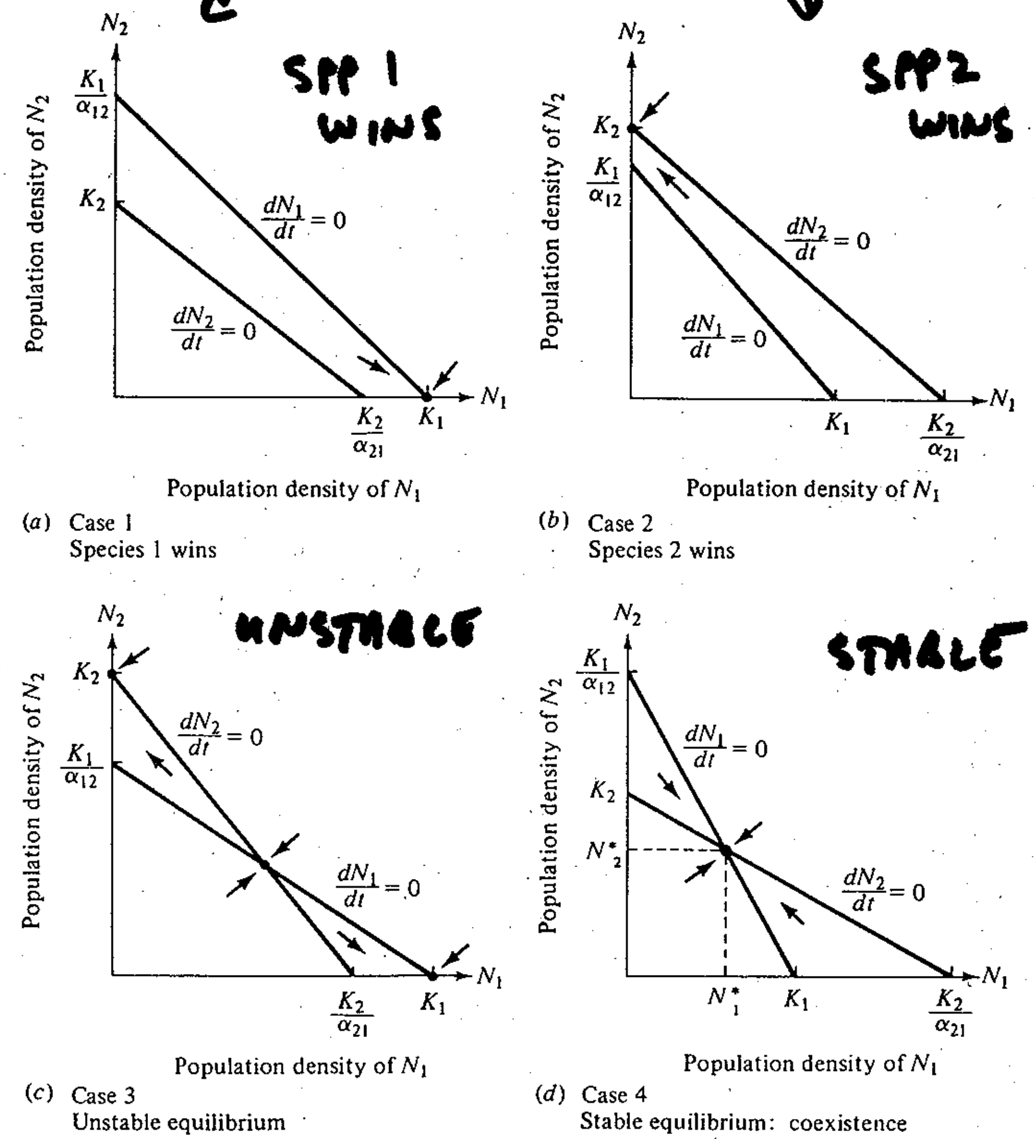
On the isocline, wildebeest numbers stay constant

Above the isocline, wildebeest decline. If the numbers of wildebeest and buffalo were a any of the red points, then wildebeest numbers would drop to the isocline.

Below the isocline, wildebeest increase. If the numbers of wildebeest and buffalo were a any of the blue points, then wildebeest would rise to the isocline.

Outcome of interspp. comp. from L-V isoclines.

EXCLUSION



(*a*) Case 1
Species 1 wins

(*b*) Case 2
Species 2 wins

(*c*) Case 3
Unstable equilibrium

(*d*) Case 4
Stable equilibrium: coexistence

COEXISTENCE

N_1 reaches K_1 before reaching limit due to spp 2.

N_2 reaches K_2 before reaching limit due to spp 1