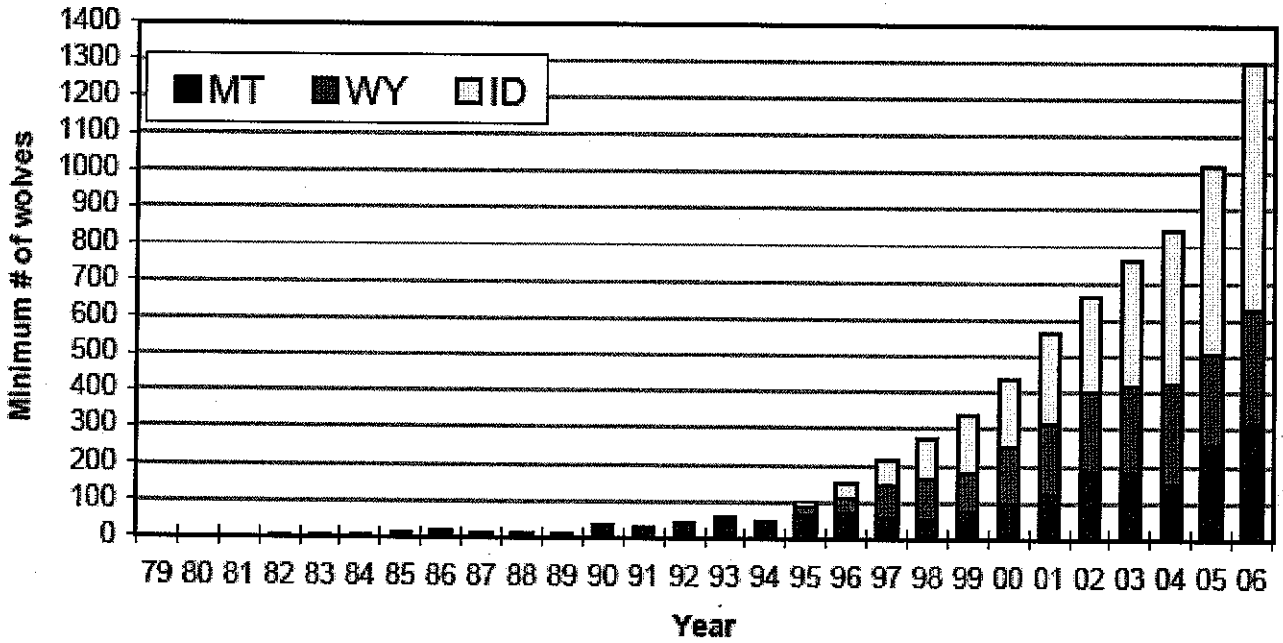
Figure 6. Northern Rocky Mountain Wolf Population Trends by State
1979-2006



Data: USFWS 2006 Annual Report

14.1

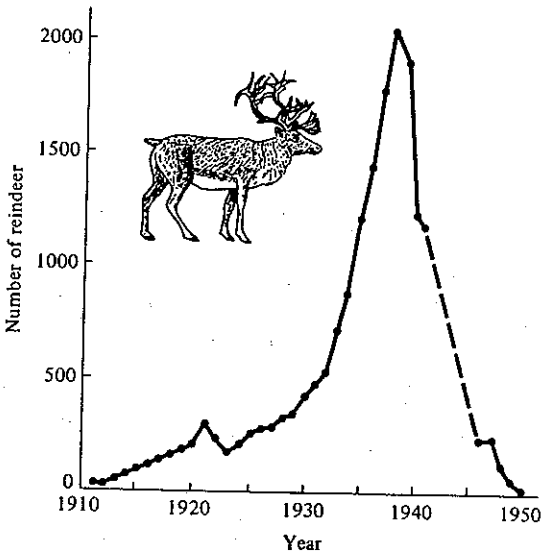


Figure 9.1 In 1911, 25 reindeer were introduced on Saint Paul Island in the Pribolofs off Alaska. The population grew rapidly and nearly exponentially until about 1938, when there were over 2000 animals on the 41-square-mile island. The reindeer badly overgrazed their food supply (primarily lichens) and the population "crashed." Only eight animals could be found in 1950. A similar sequence of events occurred on Saint Matthew Island between 1944 and 1966. [After Krebs (1972) after V. B. Scheffer (1951). The Rise and Fall of a Reindeer Herd. *Science* 73: 356–362.]

Population growth in reindeer introduced to Pribilof Islands.

14·2

Table 17–2
Reproductive parameters of white-tailed deer (*Odocoileus virginianus*) in five regions of New York State, 1939–1949

Region*	Per cent of females pregnant	Embryos per female	*Corpora lutea* per ovary
Western (best range)	94	1.71	1.97
Catskill periphery	92	1.48	1.72
Catskill central	87	1.37	1.72
Adirondack periphery	86	1.29	1.71
Adirondack center (worst range)	79	1.06	1.11

* Arranged by decreasing suitability of range.
Source: Chaetum and Severinghaus 1950.

density-dependent decline in my is due to over-eating food supply

Table 17–3
Reproductive parameters of white-tailed deer (*Odocoileus virginianus*) in the Adirondack Mountains of New York State prior to and after hunting

Region	Per cent of females pregnant	Embryos per female	*Corpora lutea* per ovary
DeBar Mountain			
1939–1943 (prehunting)	57	0.71	0.60
1947 (after heavy hunting)	100	1.78	1.86
Moose River			
1939–1943 (prehunting)	91	1.00	0.98
1947 (after light hunting)	69	1.00	1.13

Source: Cheatum and Severinghaus 1950.

Density dependent reproduction in deer

Density-dependent survival and reproduction in Song Sparrows

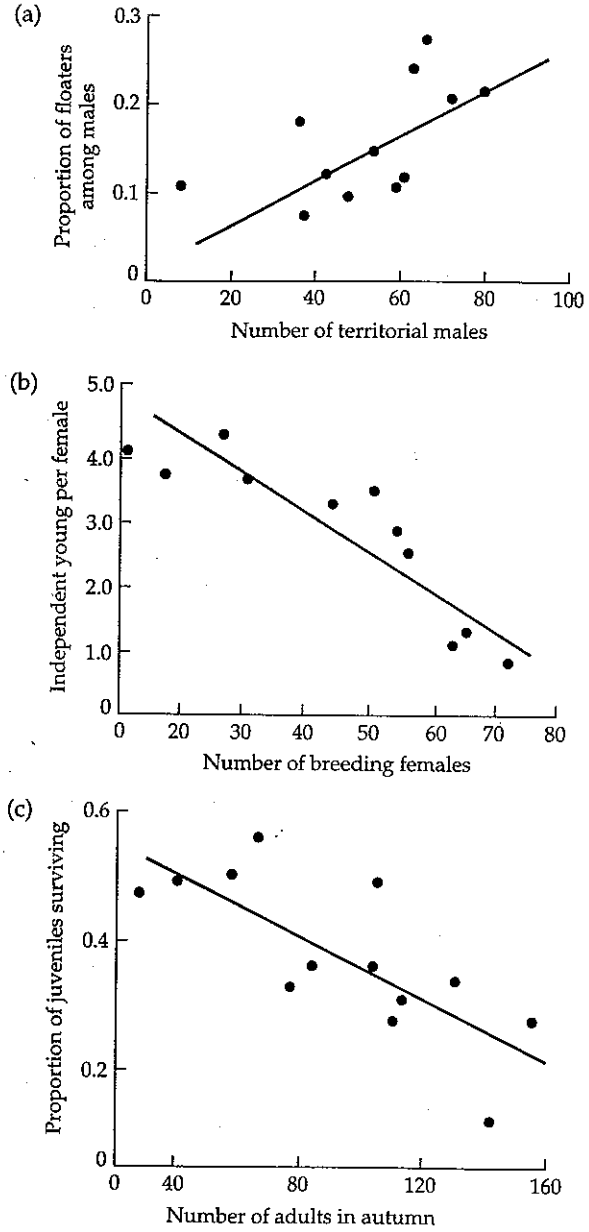


Figure 2.11 Density dependence in the Mandarte Island song sparrow (*Melospiza melodia*) population. As the population becomes more crowded (a) the proportion of nonterritorial "floater" males increases; (b) the number of surviving young produced per female decreases; (c) juvenile survival decreases. (After Arcese and Smith 1988 and Smith et al. 1991.)

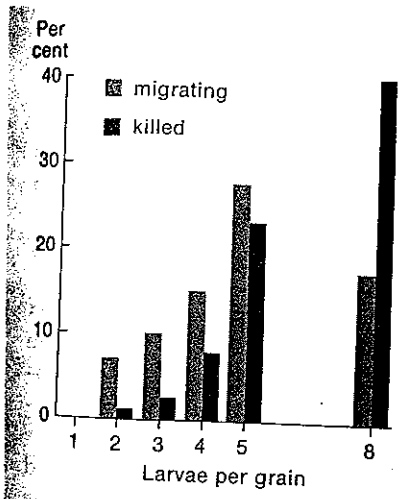
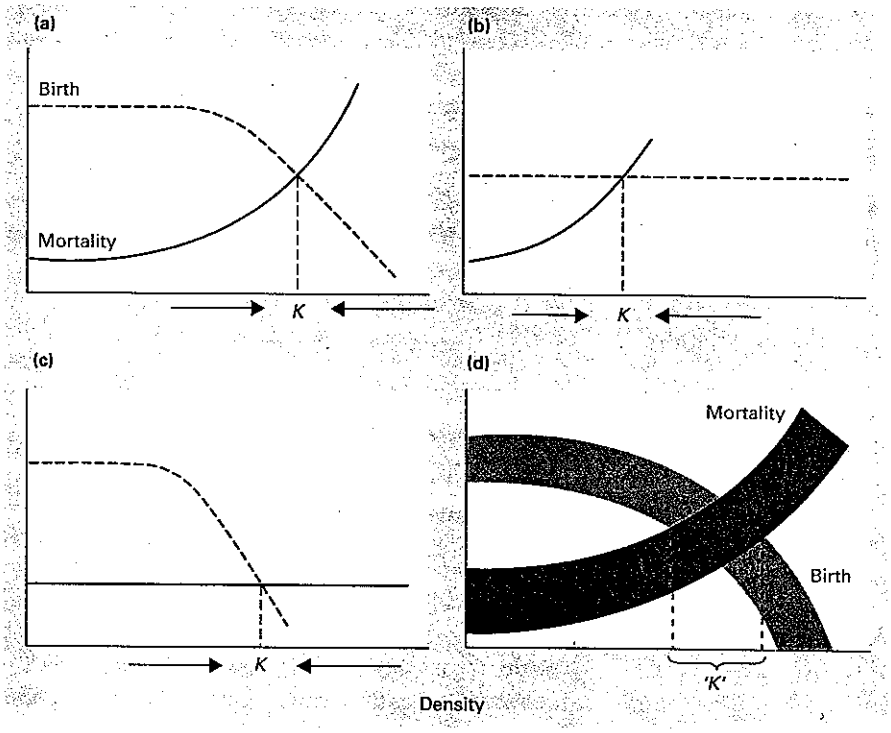


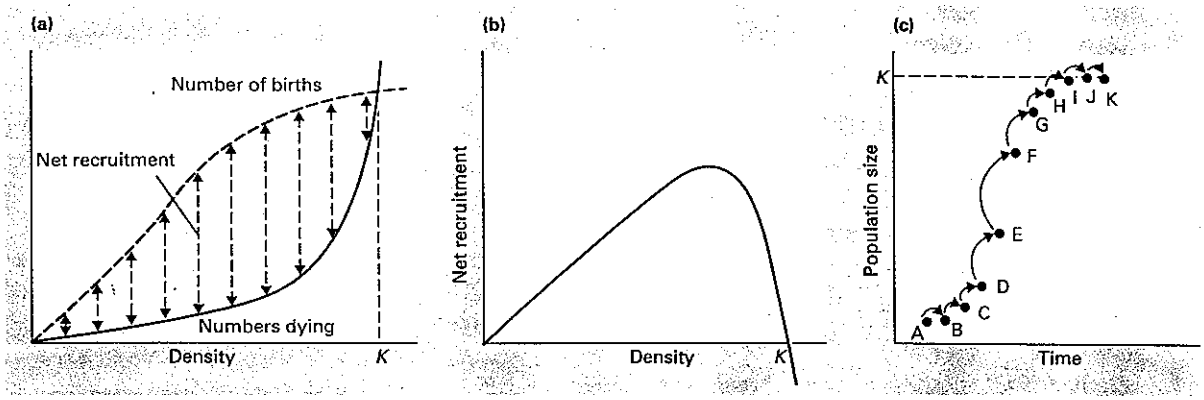
Figure 17–7
Effects of density (number of larvae per grain) on migration and mortality in the grain beetle *Rhizopertha*. (From data in Crombie 1944.)

Density-dependent mortality in grain beetles

Density dependent + independent birth (b) and death (d) rates determine K



Density dependent graph is sigmoid?



14.6

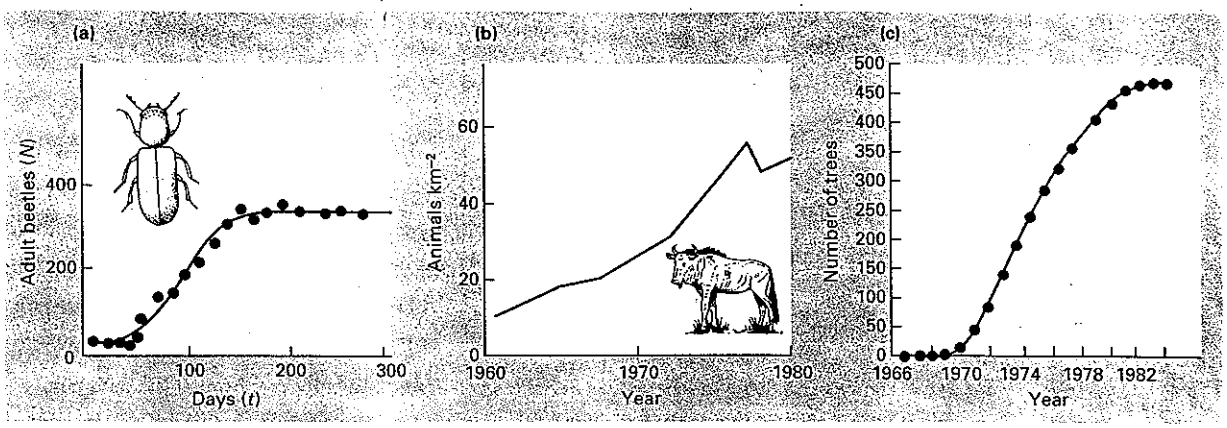


Figure 6.13 Real examples of S-shaped population increase. (a) The beetle (*Rhizopertha dominica*) in 10 g of wheat grains replenished each week. (After Crombie, 1945.) (b) The population of wildebeest (*Connochaetes taurinus*), of the Serengeti region of Tanzania and Kenya seems to be levelling off after rising from a low density caused by the disease rinderpest. (After Sinclair & Norton-Griffiths, 1982; Deshmukh, 1986.) (c) The population of the willow tree (*Salix cinerea*) in an area of land after myxomatosis had effectively prevented rabbit grazing. (After Alliende & Harper, 1989.)

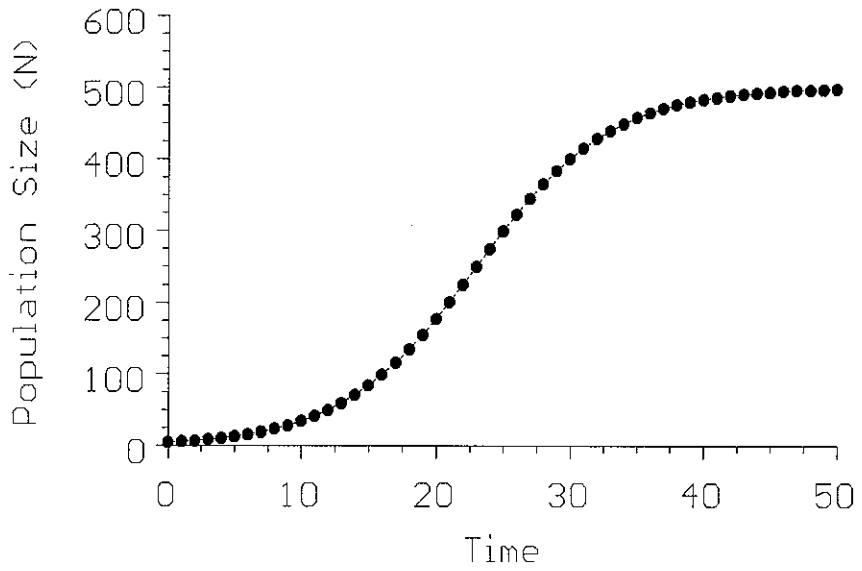
Sigmoid growth curves in nature.

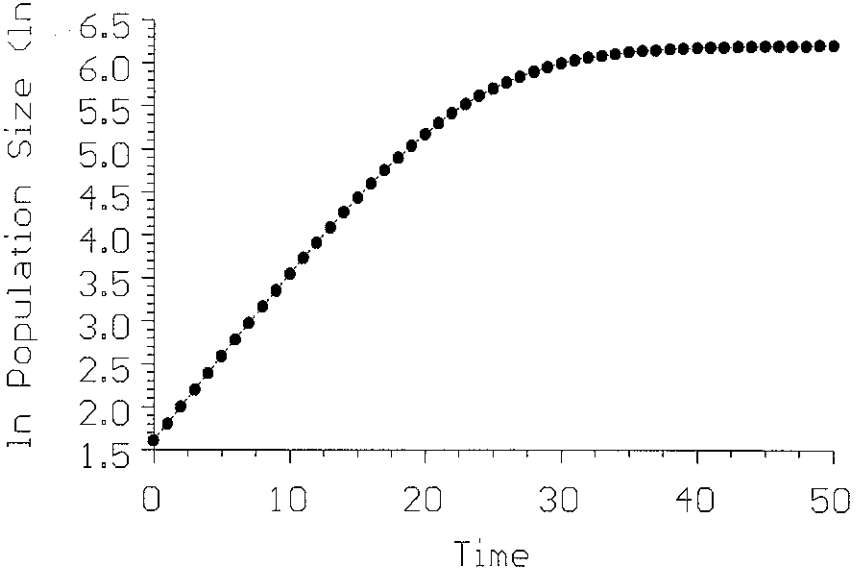
Grain beetles

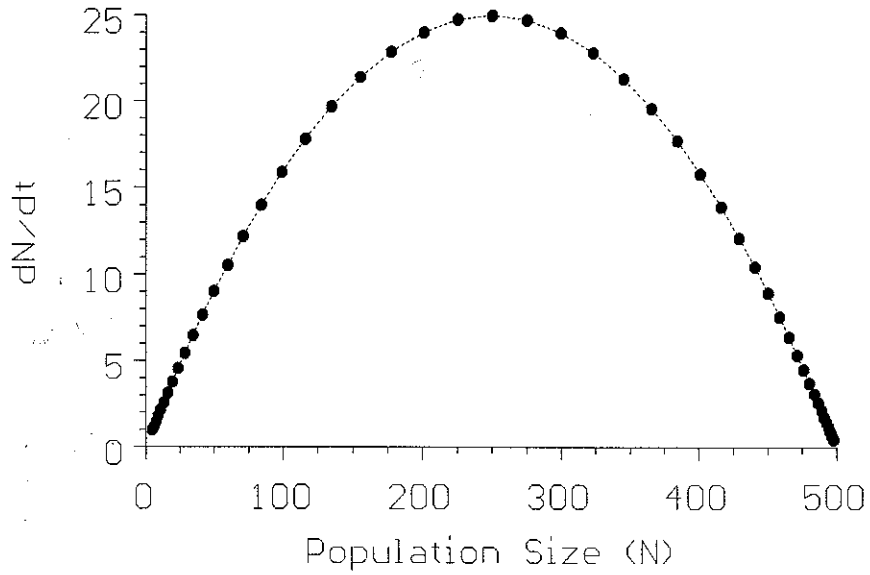
Wildebeest

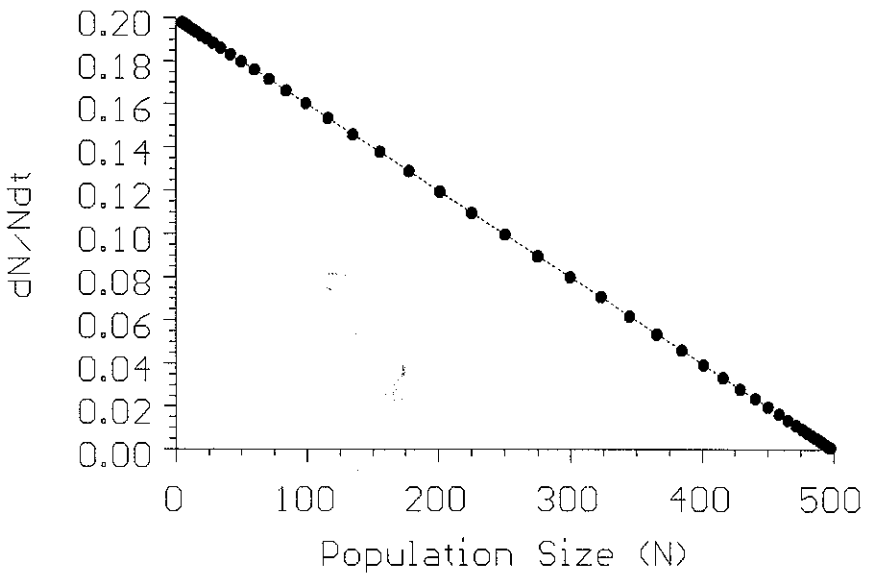
Willows

$N_0 = 5, \quad K = 500, \quad r = 0.2$



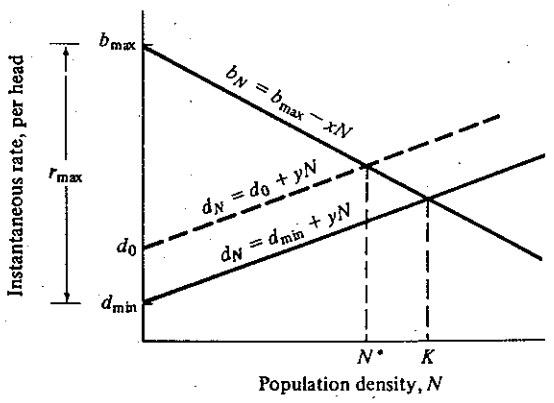






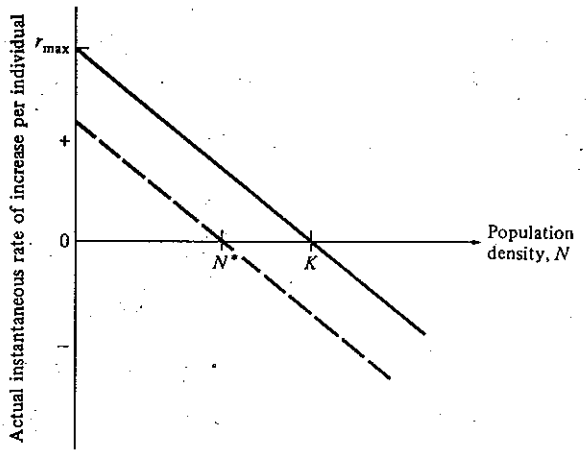
Linear density dependence

14.7



b & d vs. N

Figure 9.5 The instantaneous birth rate per individual decreases linearly with population density under the logistic equation, whereas the instantaneous death rate per head rises linearly as population density increases. Two death rate lines are plotted, one with a high death rate (dashed line) and one with a lower death rate (solid line). Equilibrium population density, N^*, is lowered by either an increased death rate or by a reduced birth rate.



$\frac{dN/dt}{N} = r_a$ vs. N

Figure 9.2 The actual instantaneous rate of increase per individual, r_a, decreases linearly with increasing population density under the assumptions of the Pearl-Verhulst logistic equation. The solid line depicts conditions in an optimal environment in which the difference between b and d is maximal. The dashed line shows how the actual rate of increase decreases with N when the death rate per head, d, is higher; equilibrium population size, N^*, is then less than carrying capacity, K. (Compare with Figure 9.5.)