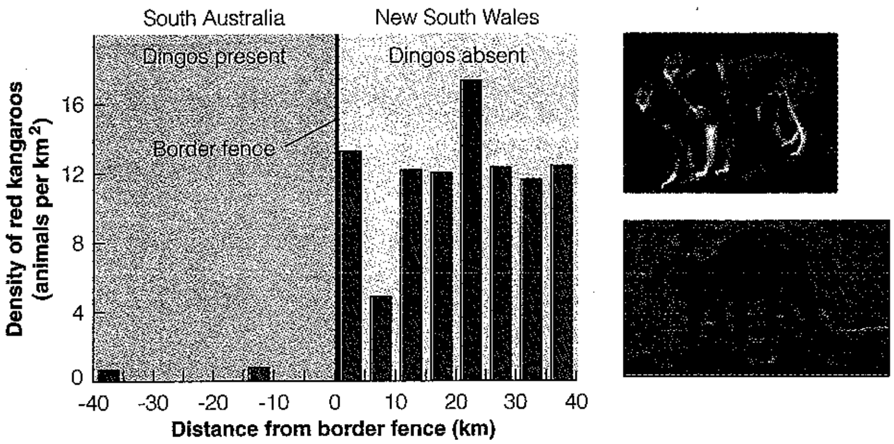


FIGURE 13.12

Density of red kangaroos on a transect across the New South Wales-South Australia border in 1976. The border is coincident with a dingo fence that prevents dingos from moving from South Australia into the sheep country of New South Wales. (After Caughley et al. 1980.)

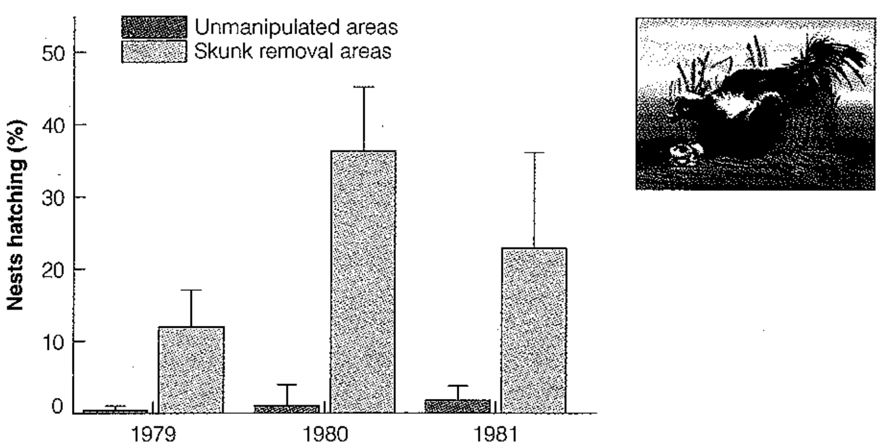
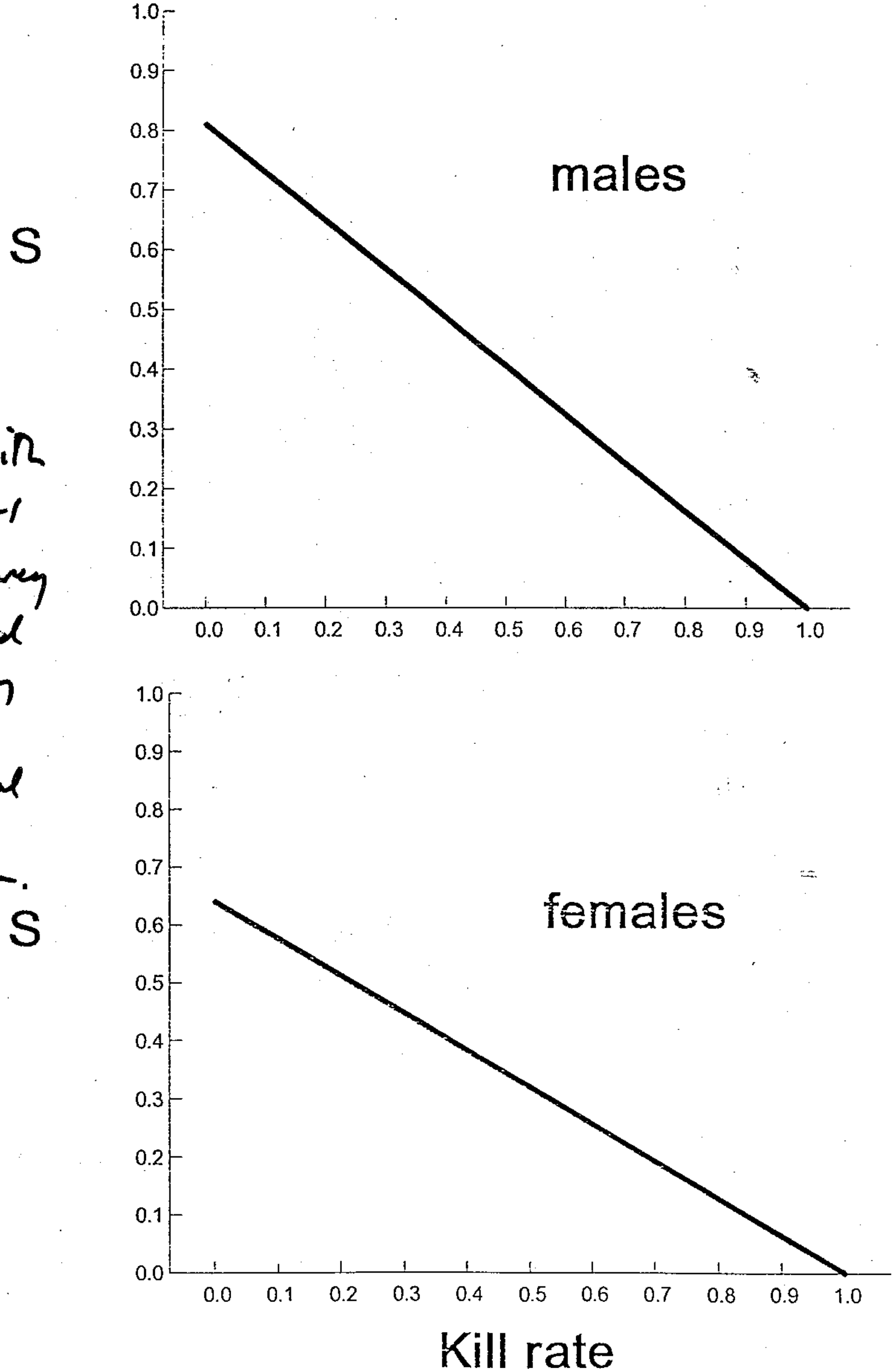


FIGURE 13.11

*Mean hatching rates of upland duck nests in waterfowl areas of North Dakota from which striped skunks (*Mephitis mephitis*) were removed during the nesting season, April–July 1979–1981. Skunk removal dramatically improved duck nesting success. (Data from Greenwood 1986, Table 3.)*

Fig. 3. USFWS - Mallard models 21.1

SURVIVAL (additive hunting)

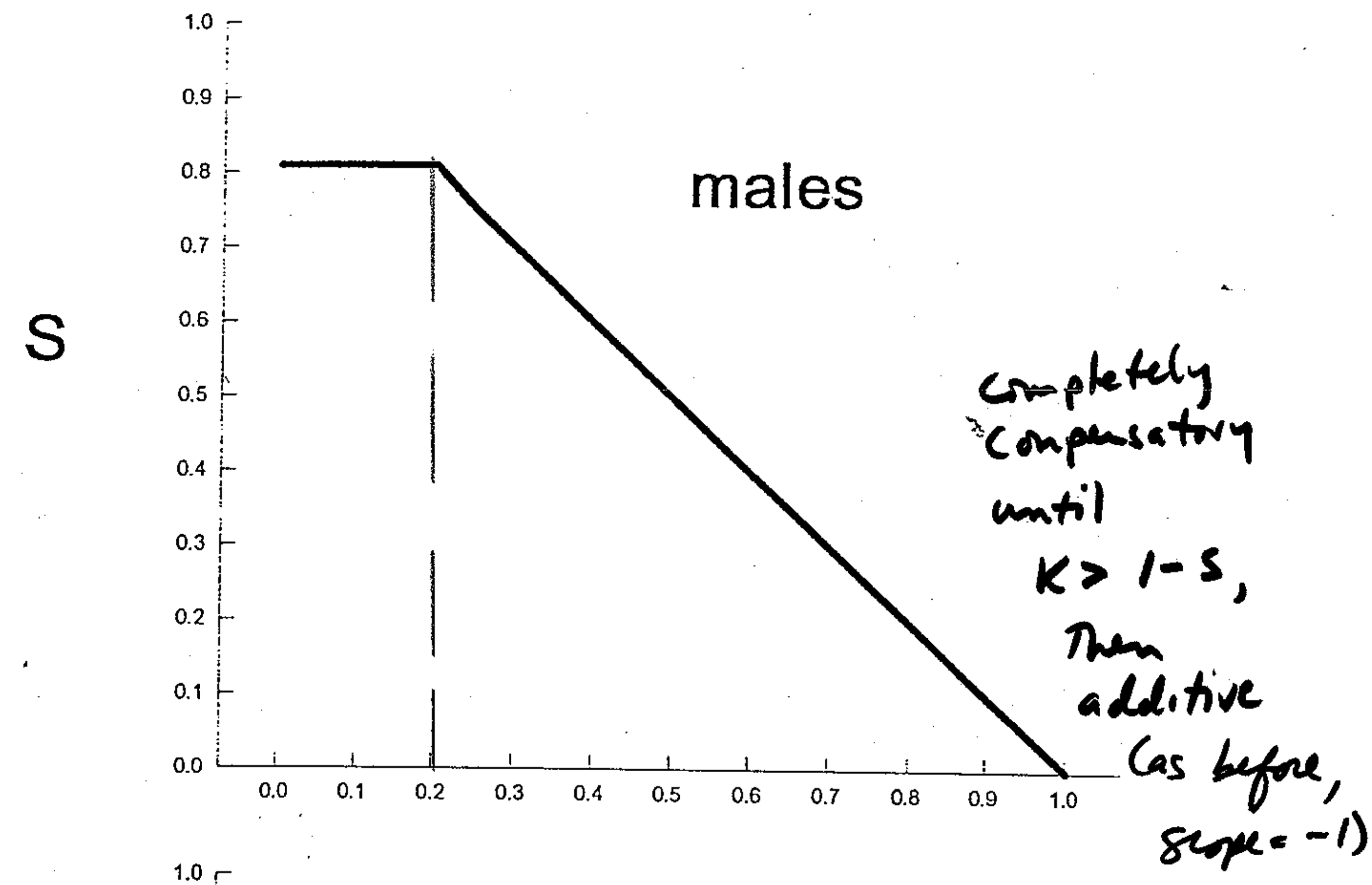


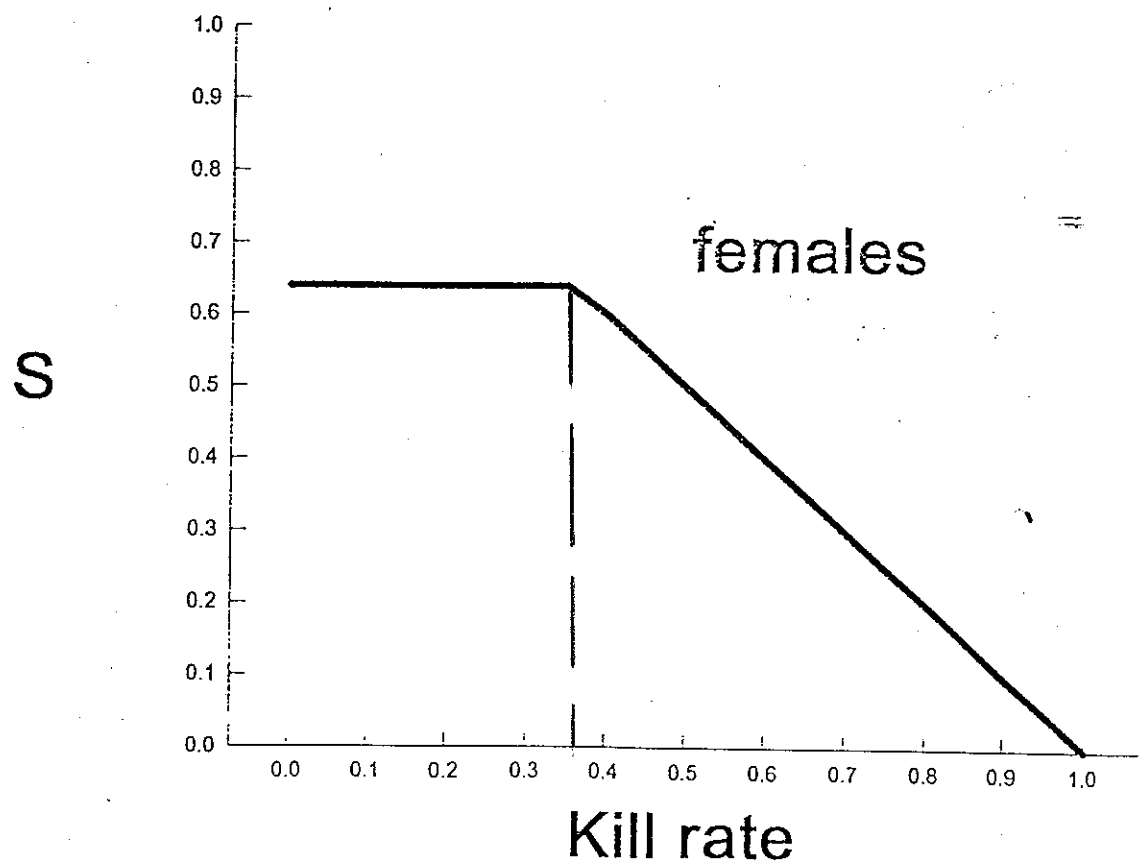
linear, with slope = -1

- every prey individual taken by hunters ↓ survival rate for population.

Fig. 4. US FWS - Mallard models 21:2

SURVIVAL (compensatory hunting)





Mallard Hunting Data Compared to models

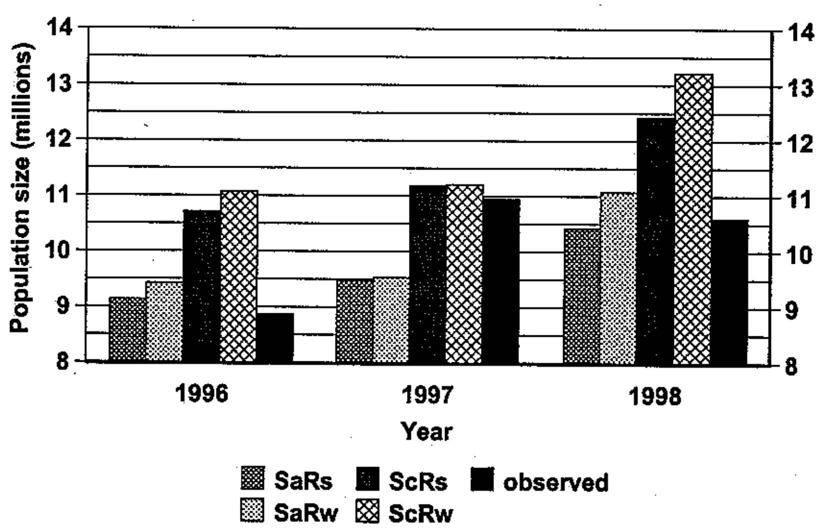


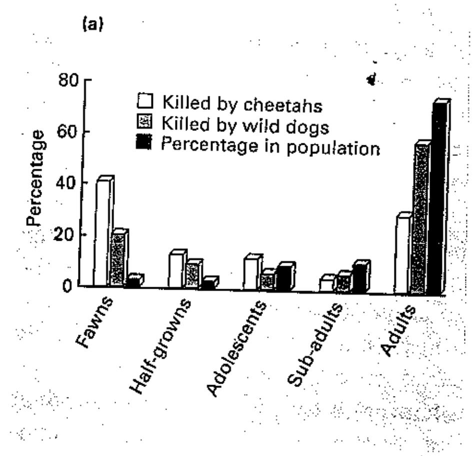
Fig. 2. Estimates of observed mallard population size (solid bar) compared with predictions from four alternative models of population dynamics (SaRs = additive mortality and strongly density-dependent reproduction; SaRw = additive mortality and weakly density-dependent reproduction; ScRs = compensatory mortality and strongly density-dependent reproduction; ScRw = compensatory mortality and weakly density-dependent reproduction).

1) HUNTING MORT < ADDITIVE / COMPENSATORY

2) REPRODUCTION < STRONG DENS. DEP. / WEAK DENS. DEP.

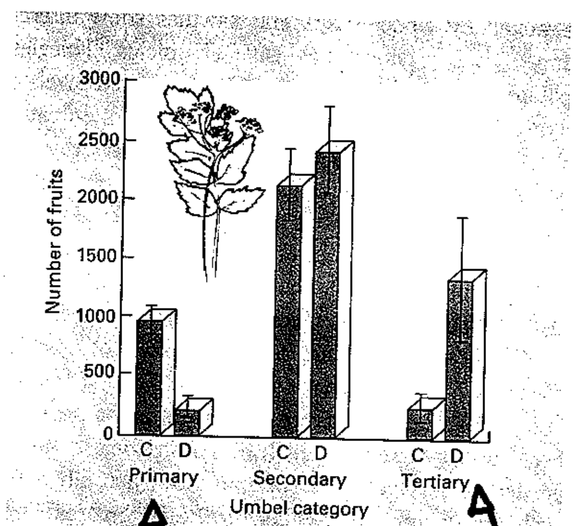
1 ⇒ COMPETING RISKS 2 ⇒ DEMOGRAPHIC COMPENSATION

Compensation



"COMPETING RISKS"

- Cheetahs kill Thomson's Gazelle fawns more heavily than wild dogs do.
- Fawns have low R.V.
- So each cheetah kill has less impact on TG pop than each wild dog kill.



LIFE-HISTORY COMPENSATION

Figure 8.3 Compensation via reduced death rate of flowers. Although most of the flowers and fruits of primary umbels of *Pastinaca sativa* are destroyed by parsnip webworm, damaged plants (D) produce similar numbers of fruits from their secondary umbels and many more fruits from their tertiary umbels than do control plants (C) (means plus the standard error). (After Hendrix, 1979; from Crawley, 1983.)

Loss of 1° flowers — compensated by ↑ in 3° flowers

C = control
D = damaged by predation.

21·4

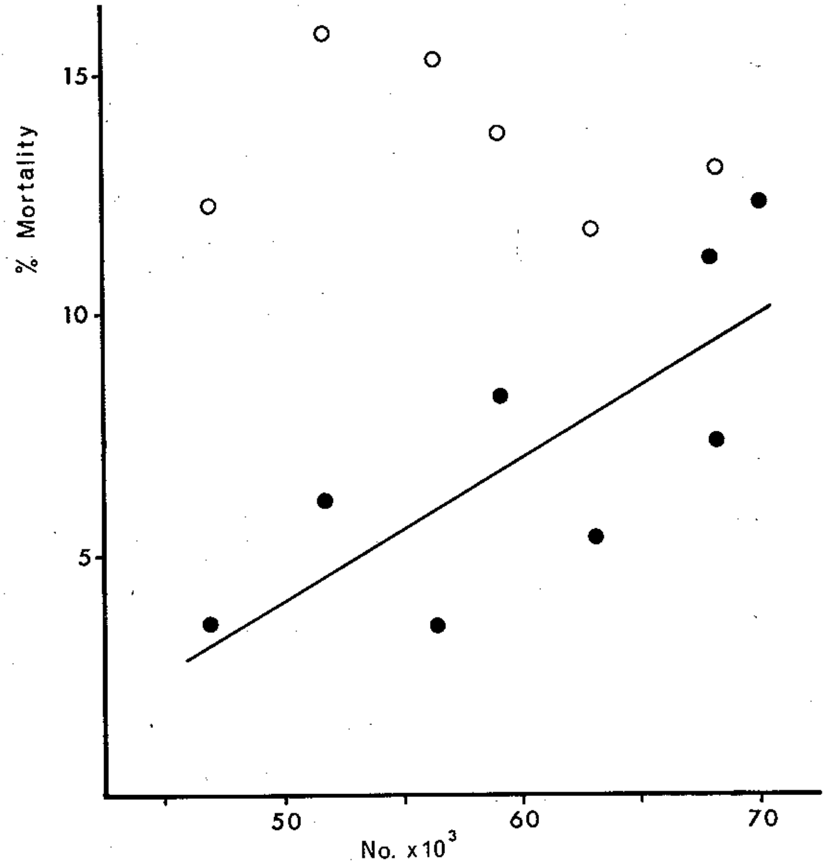


Fig. 71. Mortality as a percentage of the population size immediately preceding it in June. The regression line is for mortality of adults (*solid circles*). Open circles illustrate juvenile mortality.

Serengeti Buffalo ⇒ linear density dependence

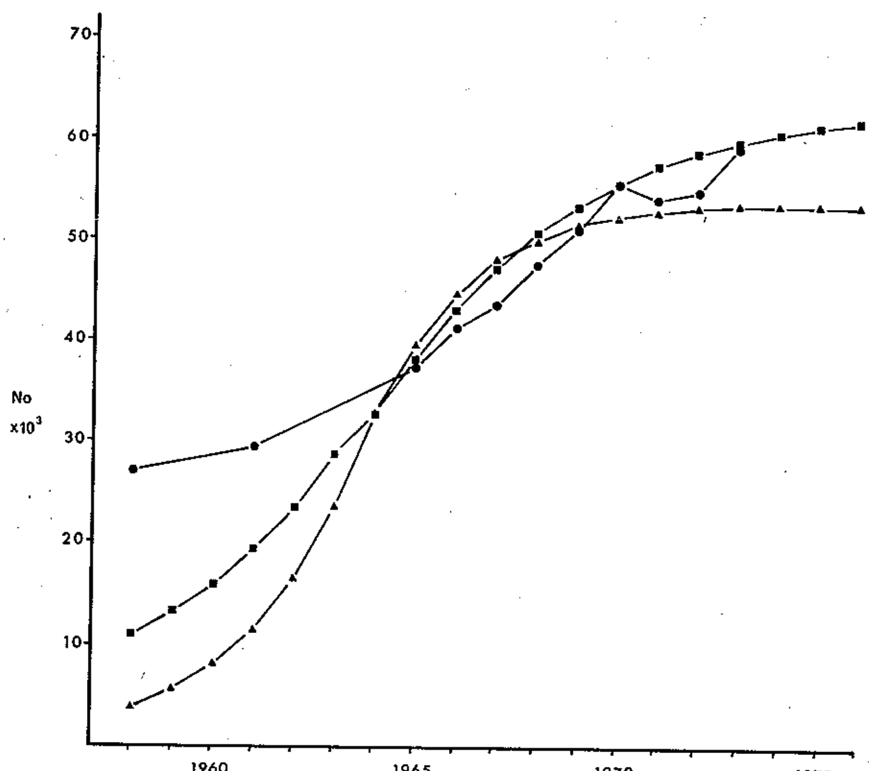


Fig. 73. Population models, starting with the observed number of adults and yearlings in May 1965 and extrapolating forward and backward. Model with *ka* alone regulating (*squares*), that with the sum of *ka* and *kj* regulating (*triangles*), compared with the observed data (*circles*).

∴ logistic population growth.

Fixed Quota Harvesting + Collapse of Fisheries 21.5

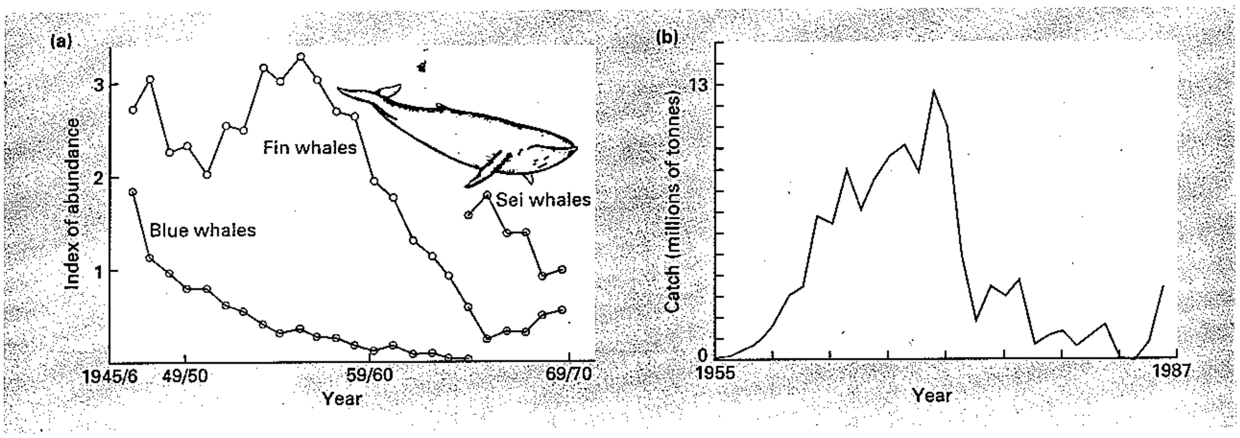


Figure 16.13 (a) The declines in the abundance of Antarctic baleen whales under the influence of human harvesting. (After Gulland, 1971.) (b) Catch history of the Peruvian anchoveta fishery. (After Hilborn & Walters, 1992.)

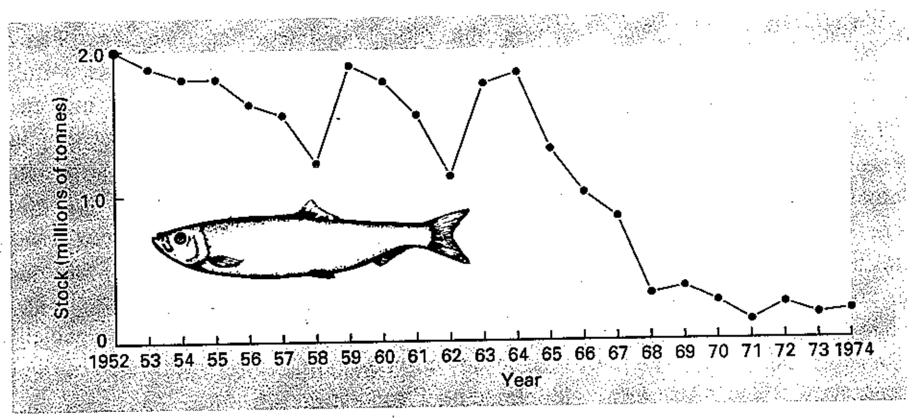


Figure 16.16 The decline in the stock of North Sea herring, *Clupea harengus*. (After Iles, 1981.)

21·6

Fixed Effort Harvest - less likely to cause collapse of prey population.

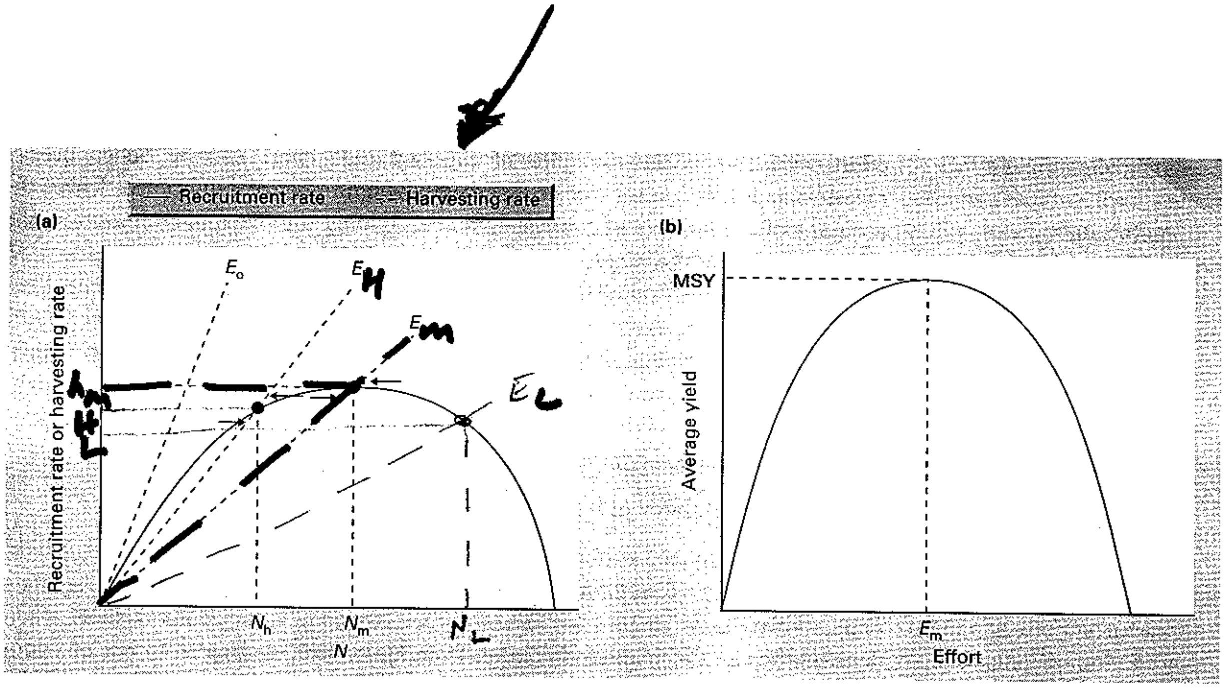


Figure 16.14 Fixed-effort harvesting. (a) Curves, arrows and dots as in Figure 16.11. The maximum sustainable yield (MSY) is obtained with an effort of E_m, leading to a stable equilibrium at a density of N_m with a yield of h_m. At a somewhat higher effort (E_h), the equilibrium density and the yield are both lower than with E_m but the equilibrium is still stable. Only at a much higher effort (E_0) is the population driven to extinction. (b) The overall relationship between the level of the fixed effort and average yield.

21.7

LOTKA VOLTERRA MODEL OF PREDATION

Isoclines

neutrally stable cycles →

Effect of disturbance →

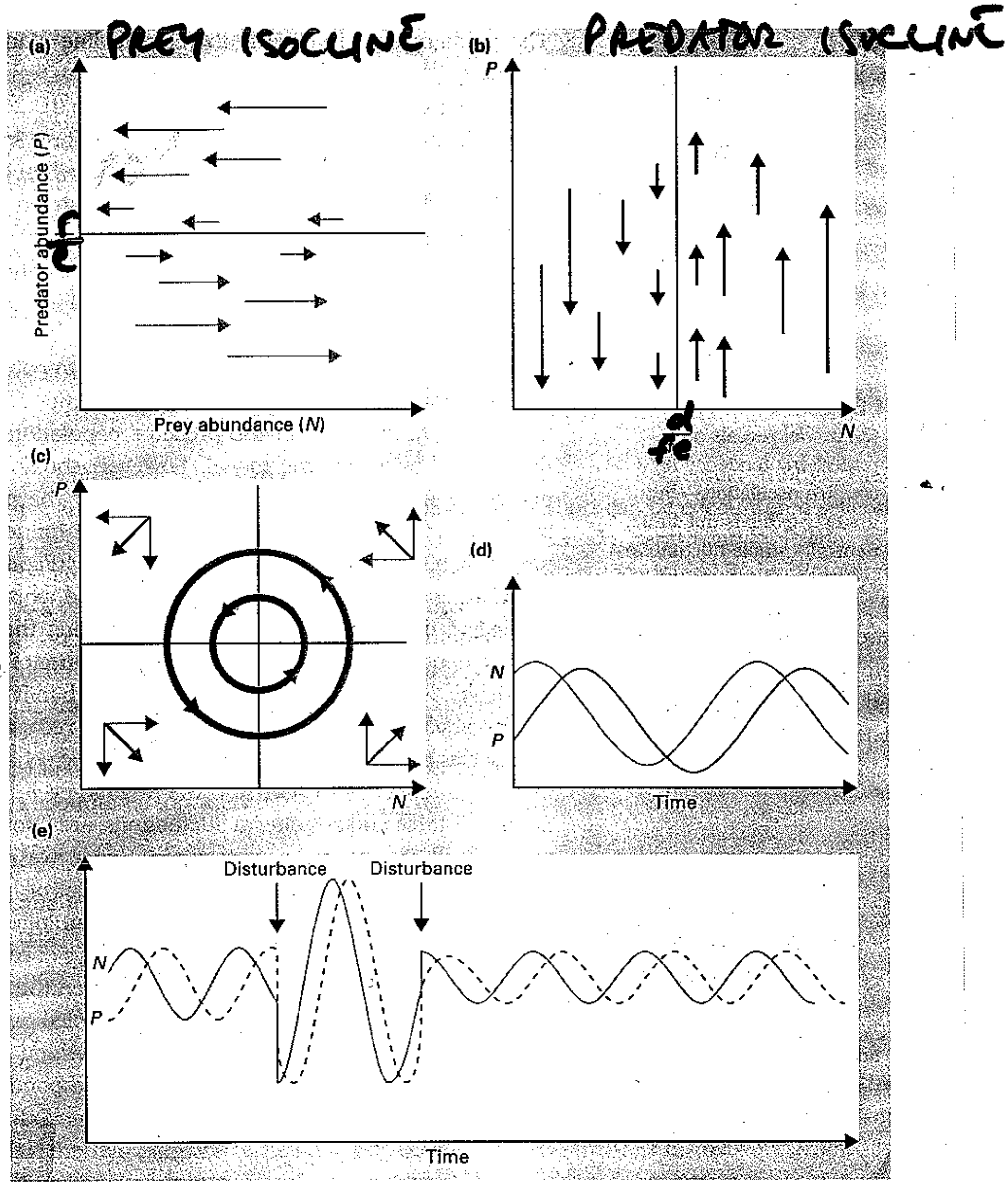


Figure 10.2 The Lotka–Volterra predator–prey model. (a) The prey zero isocline, with prey

Modifications to L-V predation model 21·8

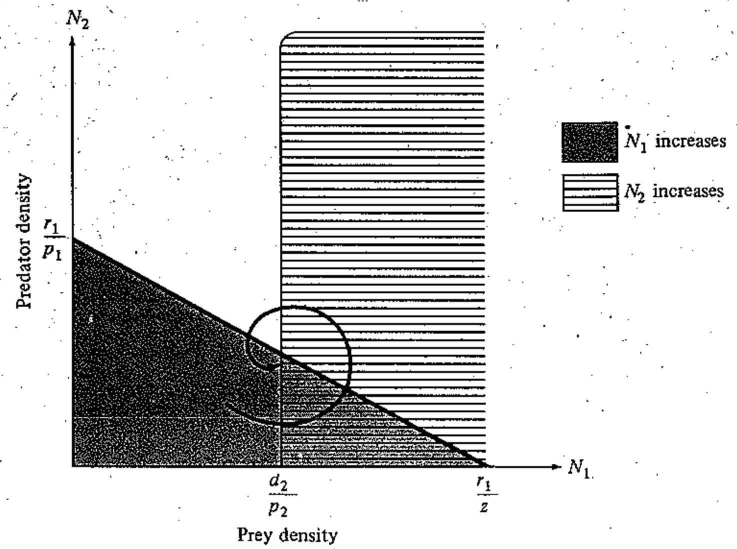


Figure 15.3 Prey and predator isoclines with self-damping in the prey population. Population densities converge on the stable joint equilibrium.

add density dependent prey pop. growth.

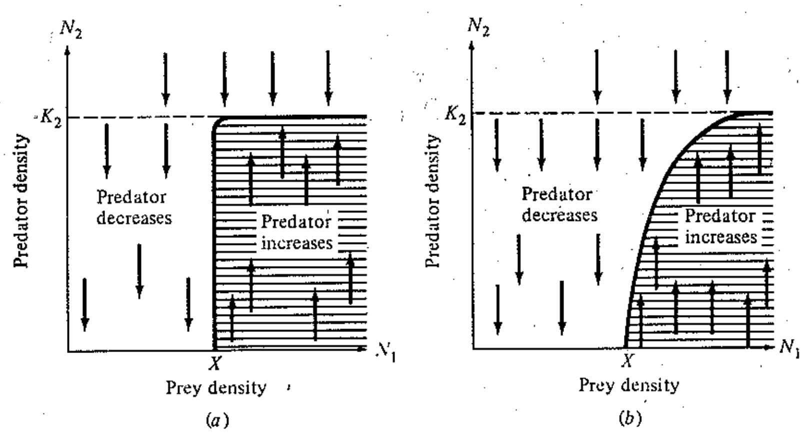


Figure 15.7 Two hypothetical predator isoclines. (*a*) Below some threshold-prey density, *X*, individual predators cannot capture enough prey per unit time to replace themselves. To the left of this threshold-prey density, predator populations decrease; to the right of it, they increase provided that the predators are below their own carrying capacity, K_2 (i.e., within the cross hatched area). So long as predators do not interfere with one another's efficiency of prey capture, the predator isocline rises vertically to the predator's carrying capacity, as shown in (*a*). (*b*) Should competition between predators reduce their foraging efficiency at higher predator densities, the predator isocline might slope somewhat like the curve shown. More rapid learning of predator escape tactics by prey through increased numbers of encounters with predators would have a similar effect.

Add intraspecific competition among predators for prey, at high predator density

Outcomes of Rosenzweig-MacArthur predation model.