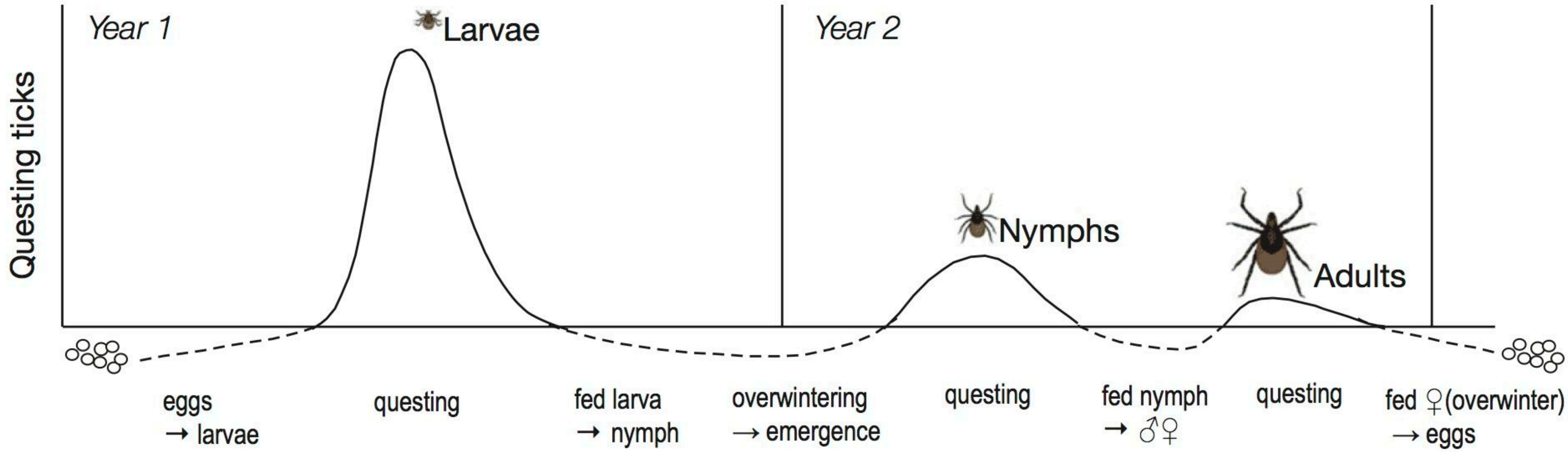
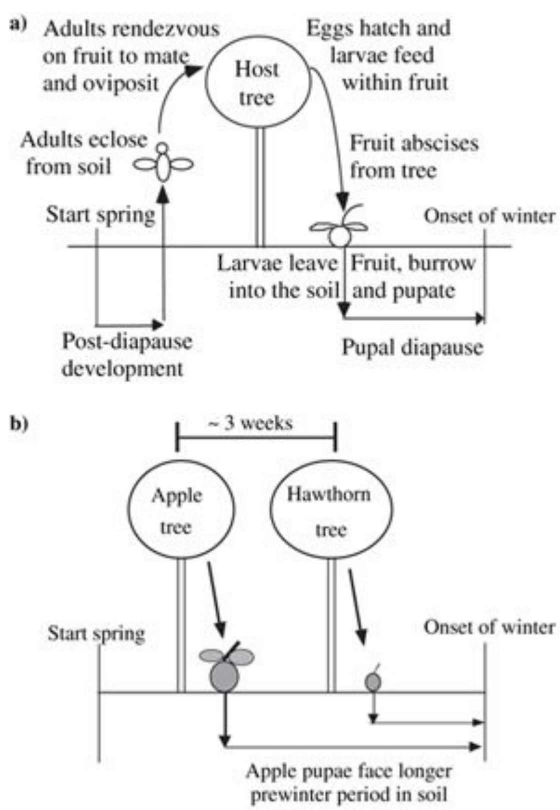
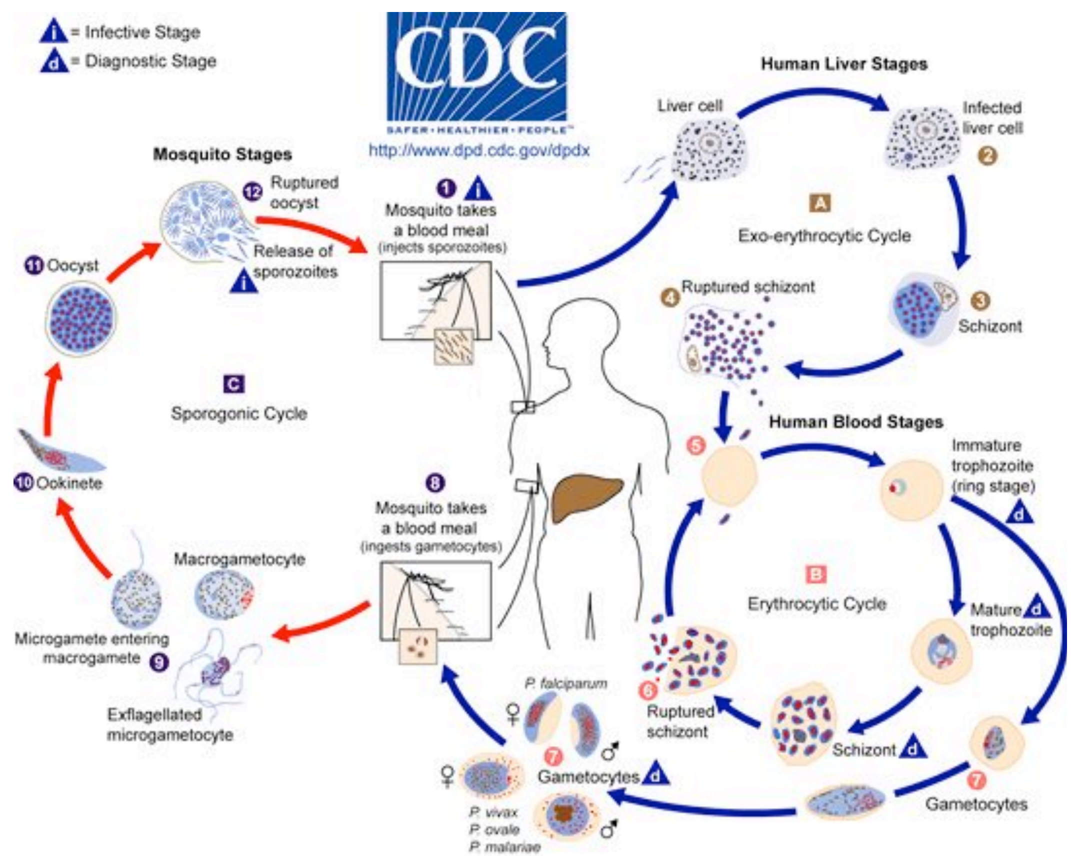


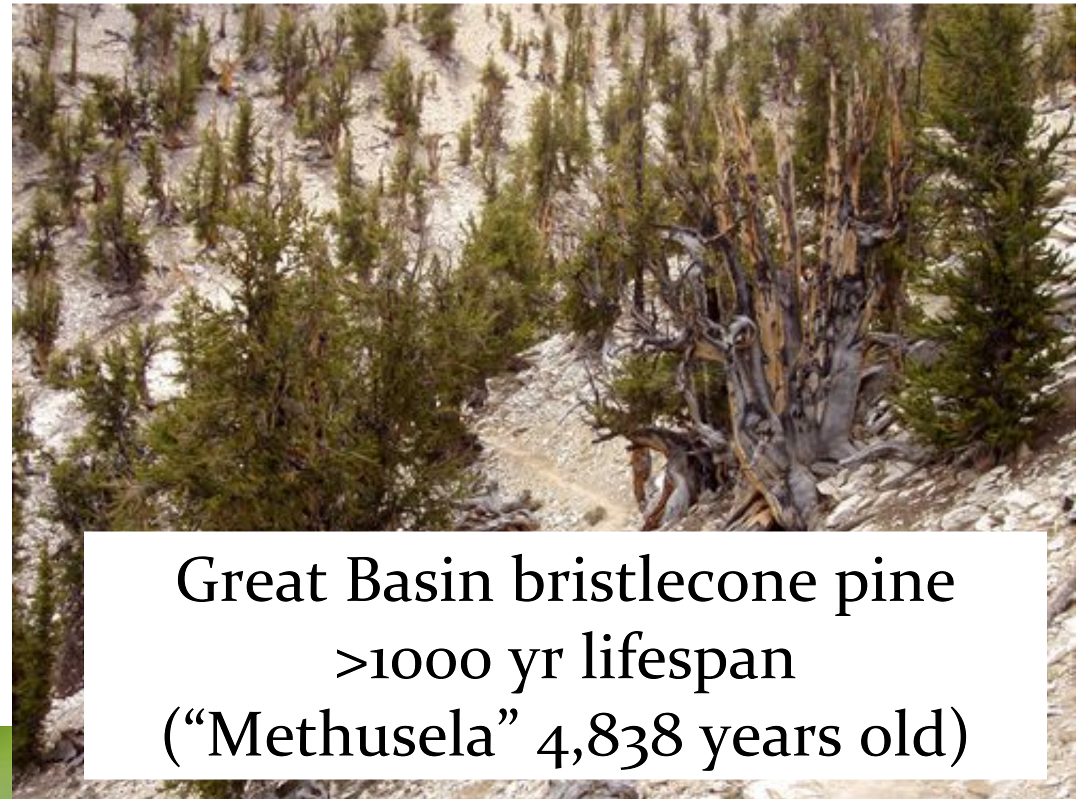
Year 1
Larvae
Year 2
Nymphs
Adults
Questing ticks
eggs
→ larvae
questing
fed larva
→ nymph
overwintering
→ emergence
questing
fed nymph
→ ♂♀
questing
fed ♀(overwinter)
→ eggs



a)
Adults rendezvous on fruit to mate and oviposit
Host tree
Eggs hatch and larvae feed within fruit
Adults eclose from soil
Fruit abscises from tree
Start spring
Onset of winter
Larvae leave into the soil
Fruit, burrow and pupate
Post-diapause development
Pupal diapause
b)
~ 3 weeks
Apple tree
Hawthorn tree
Start spring
Onset of winter
Apple pupae face longer prewinter period in soil



i = Infective Stage
d = Diagnostic Stage
CDC
SAFER · HEALTHIER · PEOPLE™
http://www.dpd.cdc.gov/dpdx
Human Liver Stages
Liver cell
Infected liver cell
2
A
Exo-erythrocytic Cycle
4 Ruptured schizont
3 Schizont
Mosquito Stages
12 Ruptured oocyst
Release of sporozoites
1 Mosquito takes a blood meal (injects sporozoites)
11 Oocyst
C
Sporogonic Cycle
10 Ookinete
8 Mosquito takes a blood meal (ingests gametocytes)
Macrogametocyte
Microgamete entering macrogamete 9
Exflagellated microgametocyte
Human Blood Stages
5
Immature trophozoite (ring stage)
B
Erythrocytic Cycle
Mature trophozoite
6 Ruptured schizont
Schizont
P. falciparum
7 Gametocytes
P. vivax
P. ovale
P. malariae
7 Gametocytes



Great Basin bristlecone pine
>1000 yr lifespan
(“Methusela” 4,838 years old)

30-40 day lifespan
(but as high as 80-153d!)

con•straint | kənˈstrānt |

noun

a limitation or restriction: *the availability of water is the main* ***constraint on*** *food production | time constraints make it impossible to do everything.*

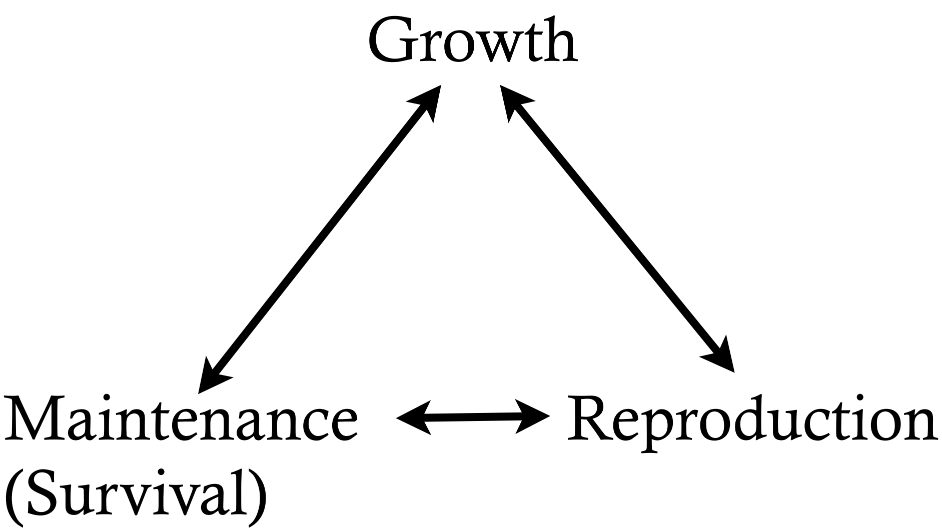
• stiffness of manner and inhibition in relations between people: *they would be able to talk without constraint.*

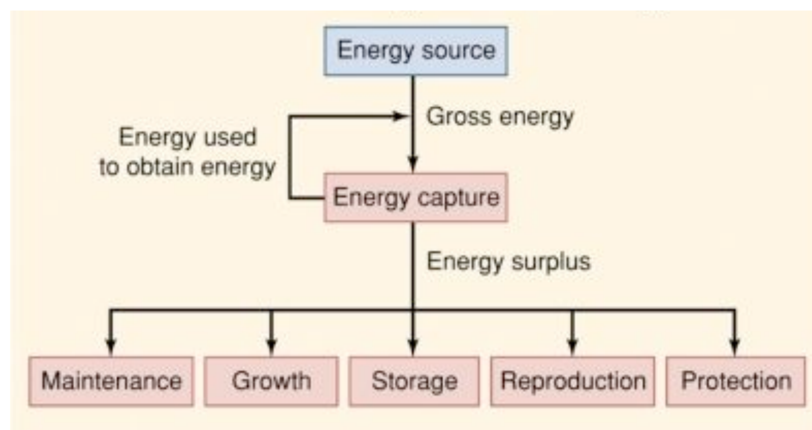
ORIGIN late Middle English (in the sense ***'coercion'***): from Old French ***constreinte***, feminine past participle of ***constraindre*** (see CONSTRAIN) .

trade-off | ˈtreɪd ˌɔf |

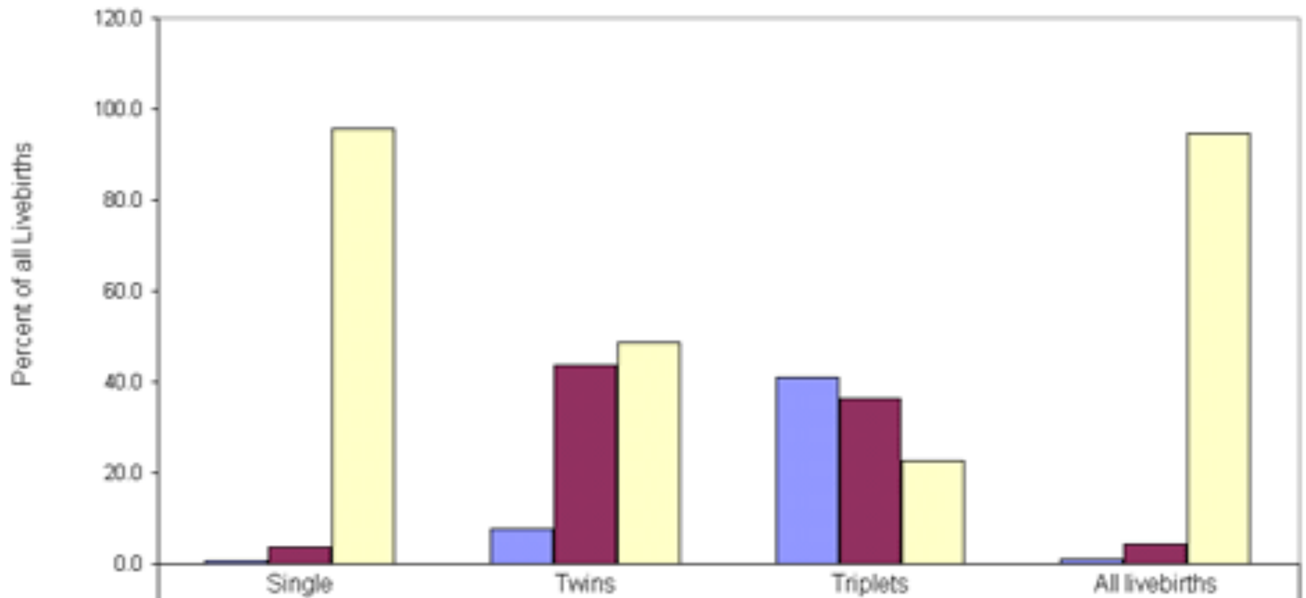
noun

a balance achieved between two desirable but incompatible features; a compromise: *a trade-off between objectivity and relevance.*






dreamstime.com



	Single	Twins	Triplets	All livebirths
below 1500 gm	0.7	7.6	40.9	0.9
1500-2499 gm	3.7	43.7	36.4	4.5
2500gm & over	95.6	48.7	22.7	94.6

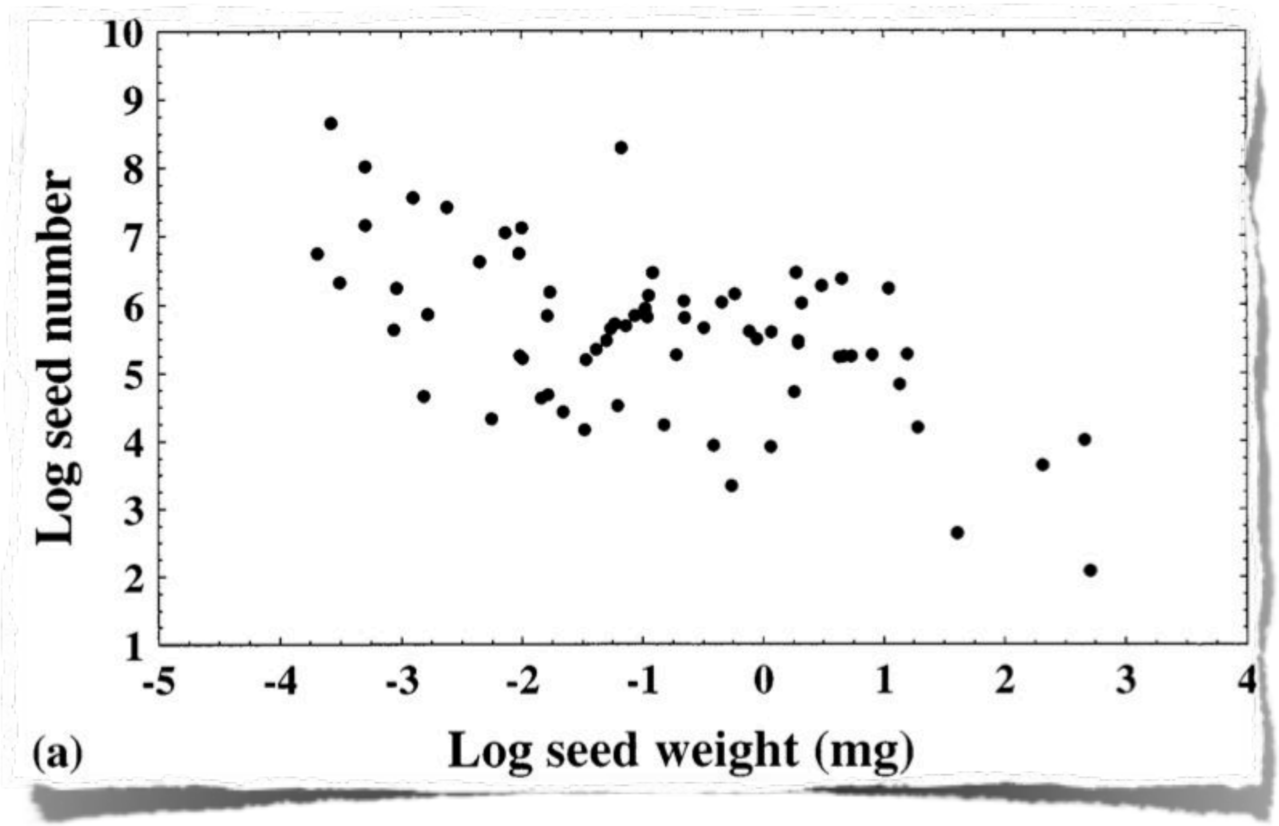
Type of Birth

Source: Ontario Ministry of Health, HELPS 1-Y2K, Live Births Database, and Population Estimates Database, June 1999 release

A comparative study of seed number, seed size, seedling size and recruitment in grassland plants

OIKOS 88: 494–502. Copenhagen 2000

Anna Jakobsson and Ove Eriksson



A comparative study of seed number, seed size, seedling size and recruitment in grassland plants

OIKOS 88: 494–502. Copenhagen 2000

Anna Jakobsson and Ove Eriksson

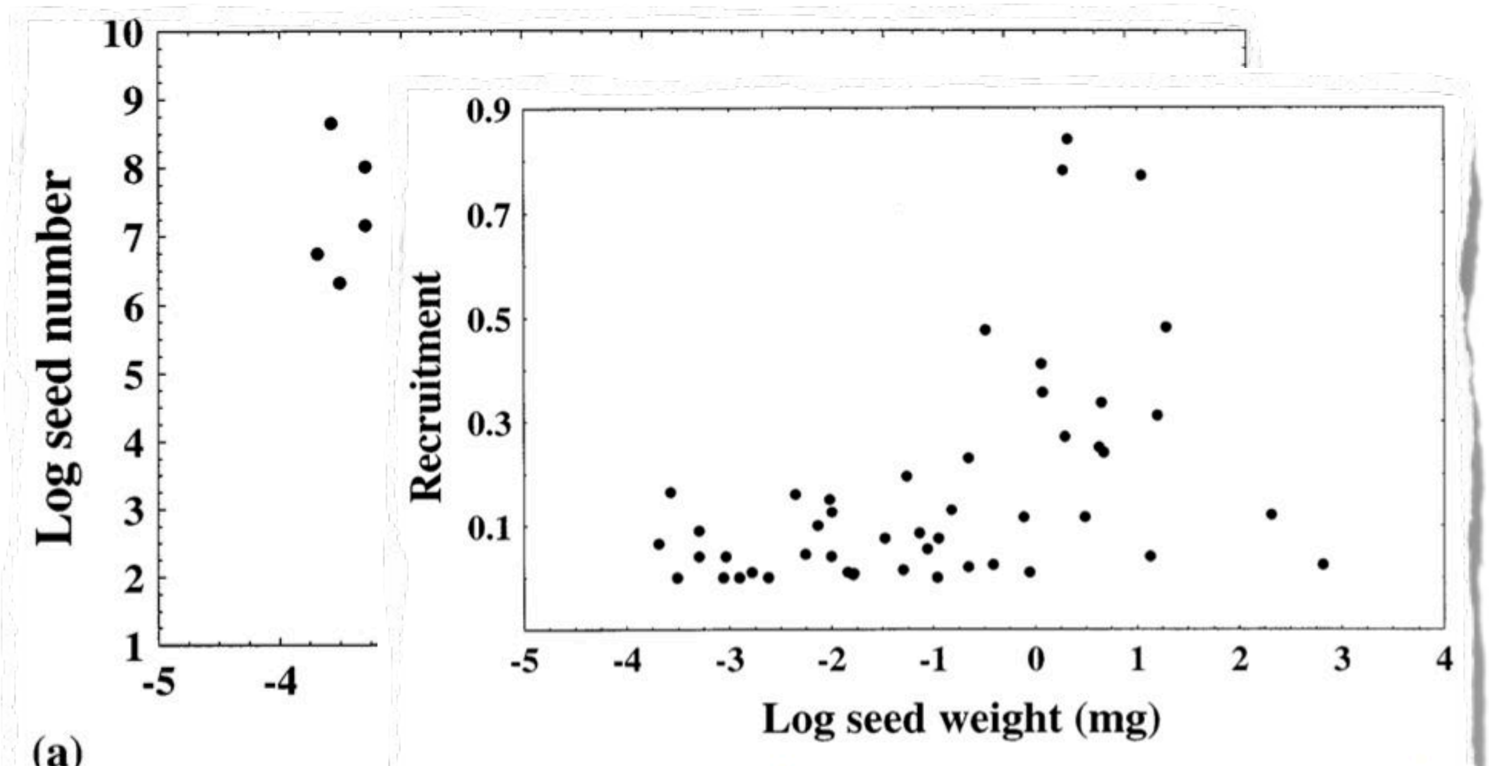


Fig. 4. The relationship between recruitment success and log seed weight in 50 species inhabiting semi-natural grasslands ($y = 0.218 + 0.062x$, $r^2 = 0.21$, $p < 0.001$). Recruitment was defined as the total number of recruits/total number of seeds sown. The three species with very high recruitment values are *Anthriscus sylvestris*, *Lotus corniculatus* and *Ranunculus acris*.

A comparative study of seed number, seed size, seedling size and recruitment in grassland plants

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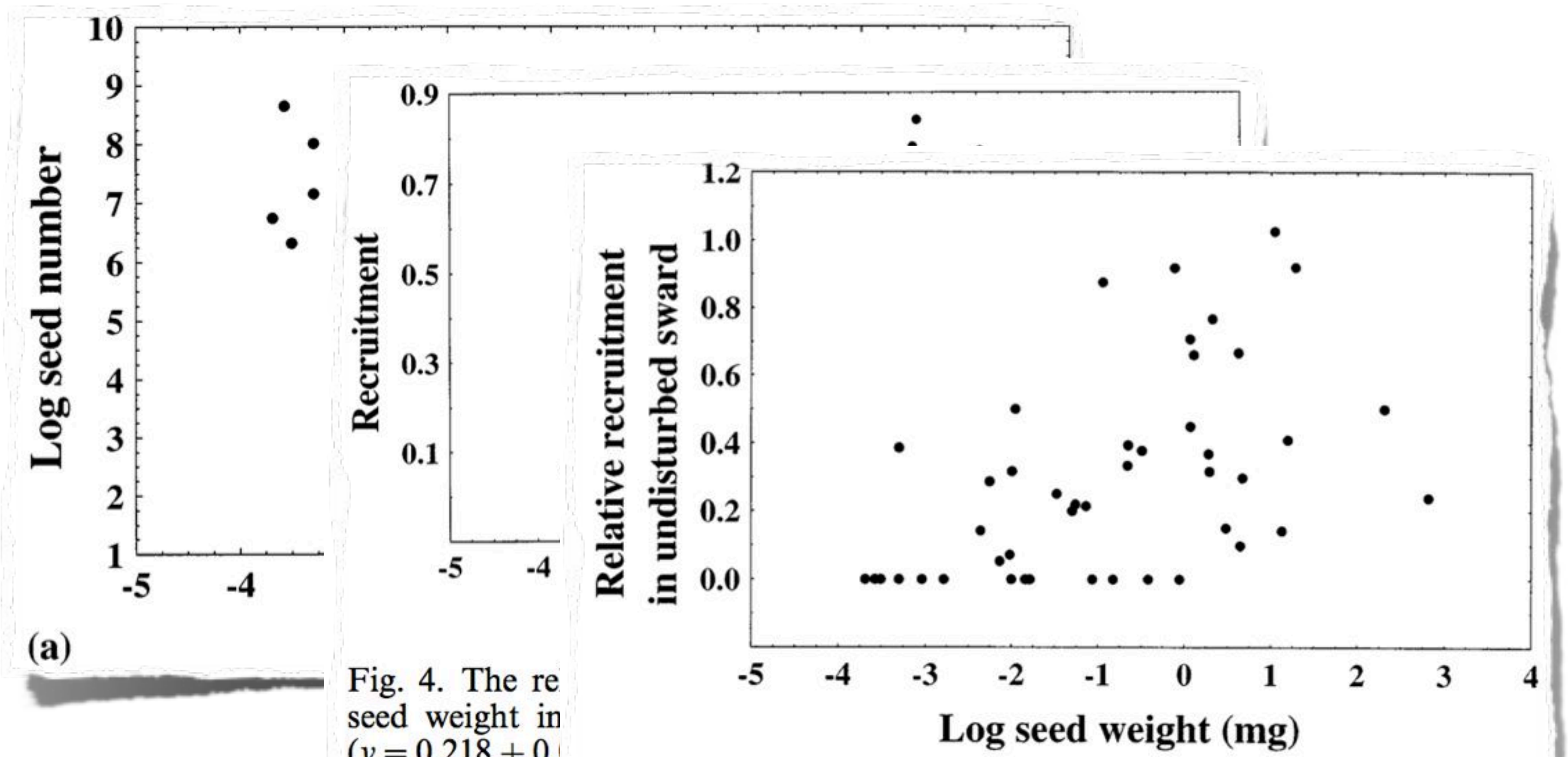


Fig. 4. The re
seed weight in
($y = 0.218 + 0.$
defined as the
sown. The thr
Anthriscus sylv

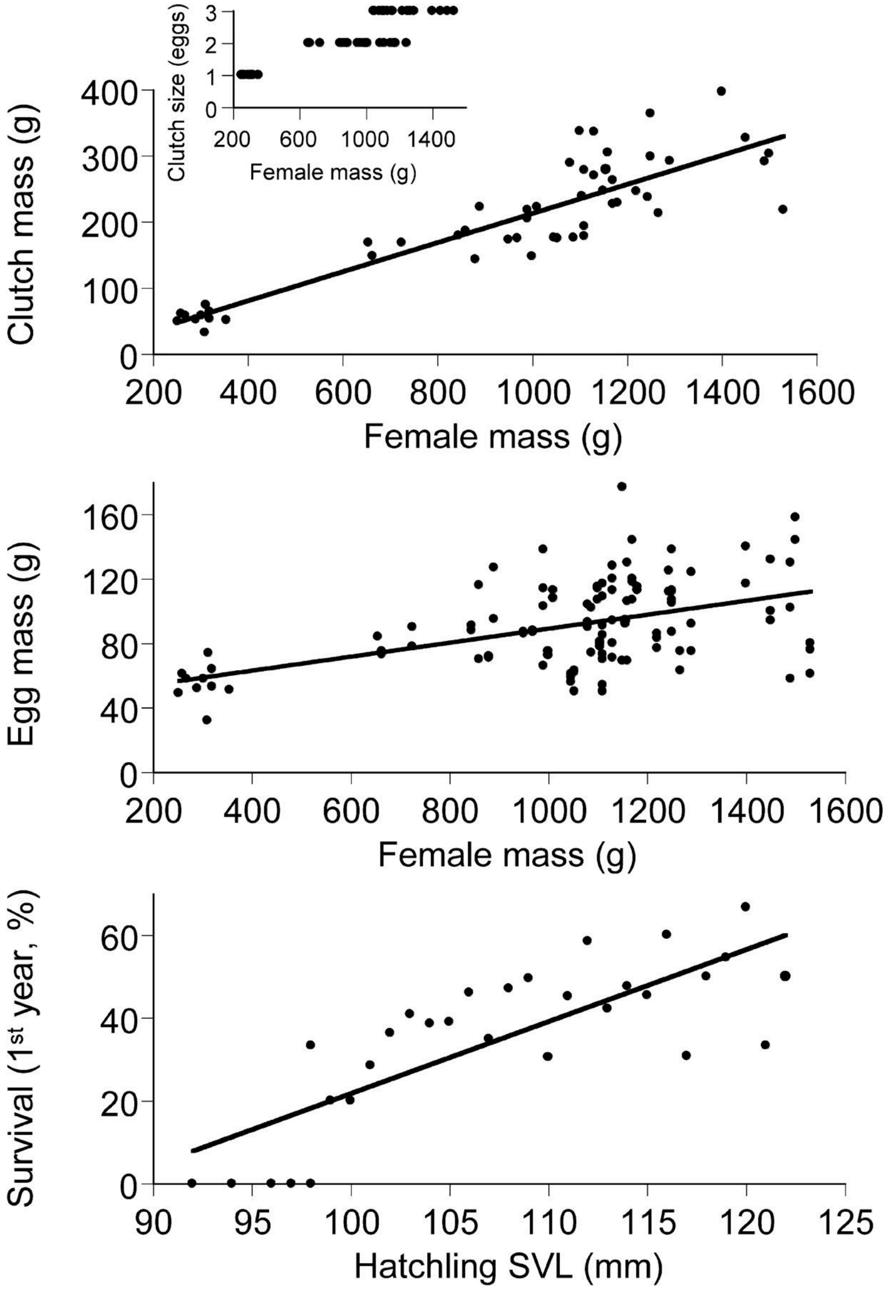
Fig. 5. The relationship between relative recruitment in undisturbed sward and log seed weight in 45 species inhabiting semi-natural grasslands ($y = 0.37 + 0.095x$, $r^2 = 0.26$, $p = 0.0003$).

A comparative study of seed number, seed size, seedling size and recruitment in grassland plants

OIKOS 88: 494–502. Copenhagen 2000

Anna Jakobsson and Ove Eriksson

In this study we analyse relationships between seed number, seed size, seedling size and recruitment success in grassland plants. The often hypothesised trade-off between seed size and seed number was supported by a cross-species analysis and by an analysis of 35 phylogenetically independent contrasts, derived from a data-set of 72 species. Apart from among-species relatedness, we also controlled for possible confounding effect of plant size that may influence both seed size and seed number. A sowing experiment with 50 species was performed in the field. The seeds were sown in a grassland and subjected to two treatments, disturbance and undisturbed sward. Evidence for seed-limited recruitment was obtained for 45 of the species. Disturbance had a significant, or nearly significant, positive effect on recruitment for 16 of the 45 species. The relative recruitment in undisturbed sward increased with increased seed size, and both recruitment success and seedling size were positively related to seed size. We suggest that a trade-off between competitive ability and number of recruitment opportunities follows from the trade-off between seed size and seed number, through a causal chain from seed size via seedling size to recruitment success. The relationships between seed size, seed number and recruitment may be an important underlying mechanism for abundance and dynamics of plant species in grassland vegetation. This is an example of a direct link between evolutionary life-history theory, and theory of plant community structure.



Martin Wikelski and L. Michael Romero
Body Size, Performance and Fitness in Galapagos Marine Iguanas
Integr. Comp. Biol. (2003) 43(3): 376-386
doi:10.1093/icb/43.3.376

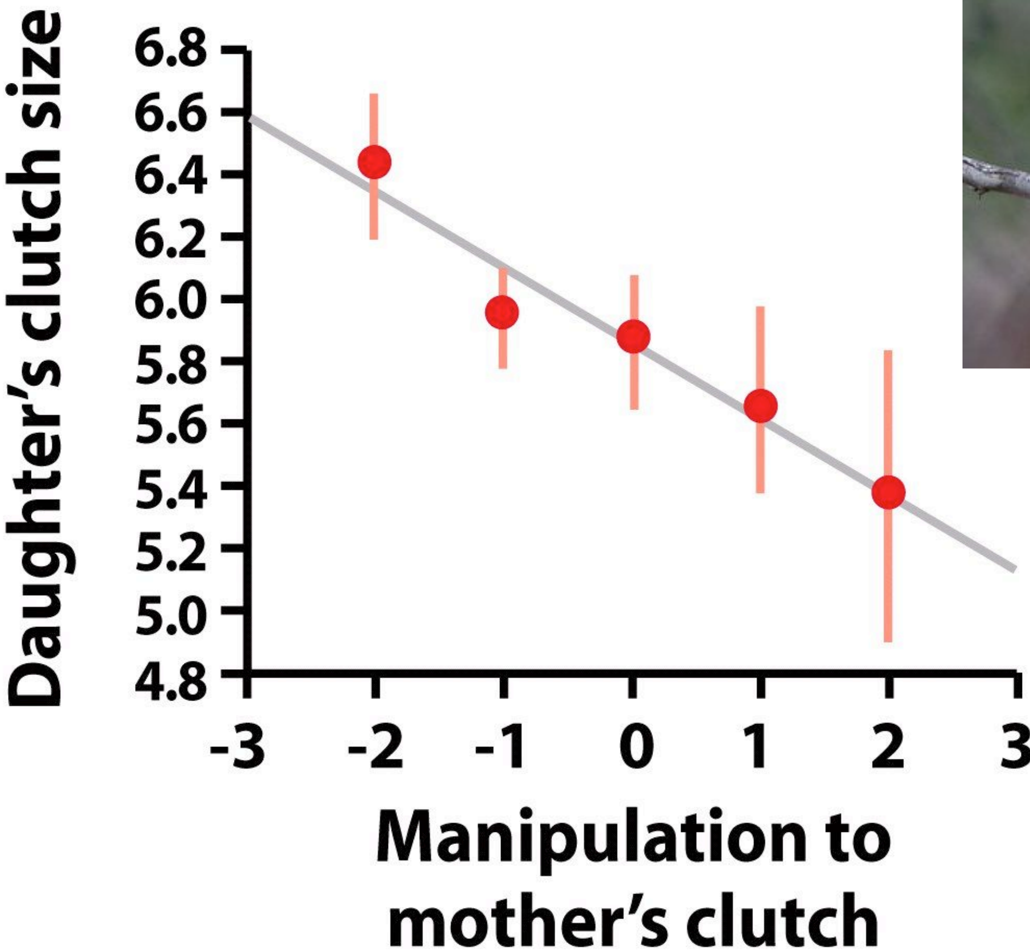
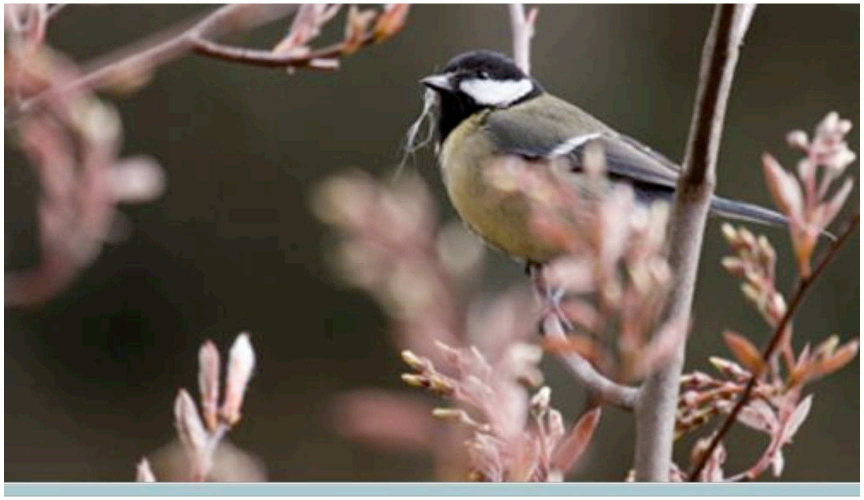
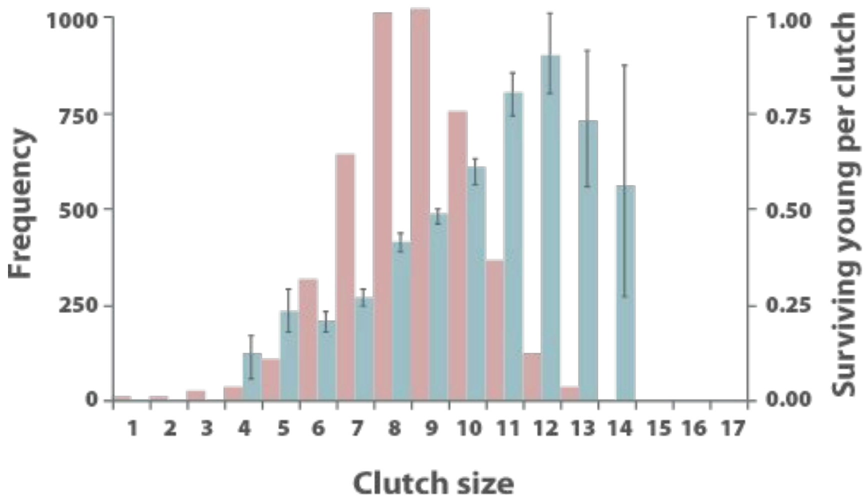


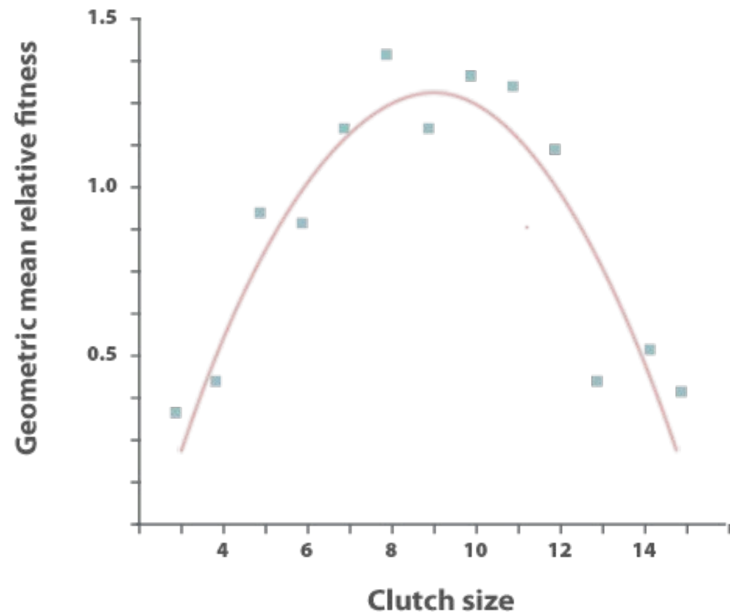
Figure 13-21 Evolutionary Analysis, 4/e

Section 1, Page 9 & 10





Frequency distribution of clutch size (red bars) for 4489 great tit clutches in Wytham Wood, Oxford, England between 1960 and 1982 and mean (±1 standard error) number of young per clutch surviving to at least 1 year per clutch (blue bars) as a function of clutch size. (From Boyce and Perrins, 1987).



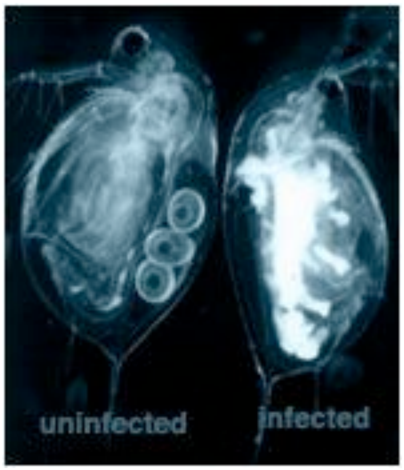
Geometric mean of modeled relative fitness as a function of clutch size between 1960 and 1982. A least-squares fit of quadratic line through fitness values indicates an optimum clutch size of ~9 eggs.

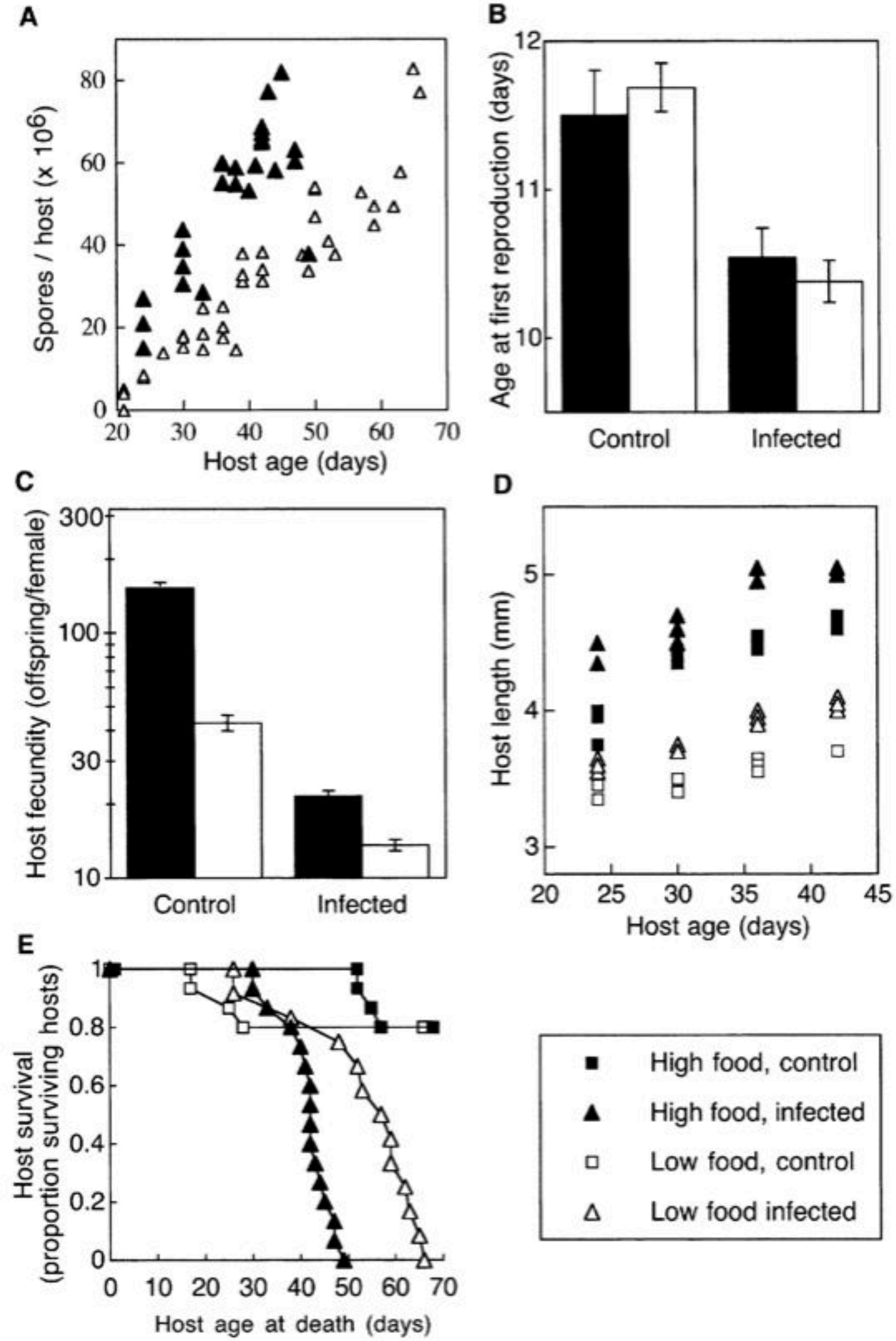
$$G = \sqrt[n]{x_1 x_2 \cdots x_n},$$

The Evolution of Virulence When Parasites Cause Host Castration and Gigantism

VOL. 164, SUPPLEMENT THE AMERICAN NATURALIST NOVEMBER 2004

Dieter Ebert,[1,2,*] Hans Joachim Carius,[1] Tom Little,[1,3] and Ellen Decaestecker[1,4]









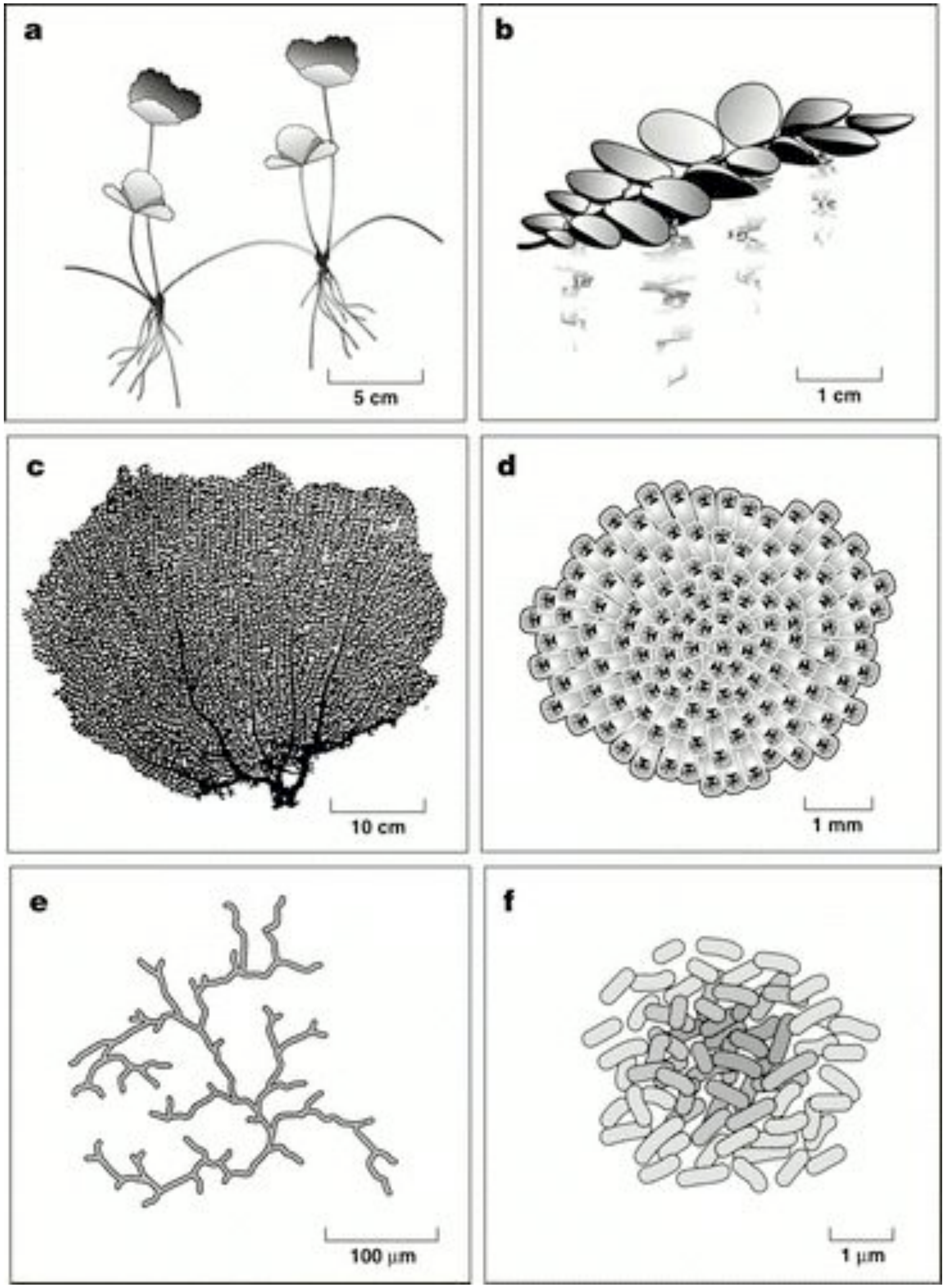
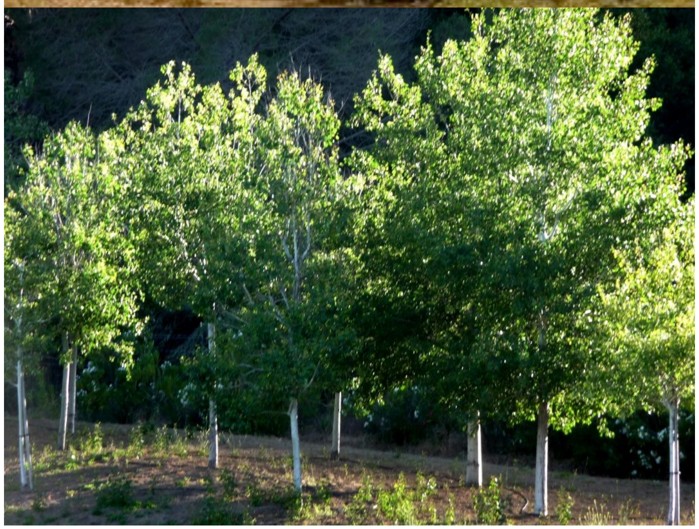
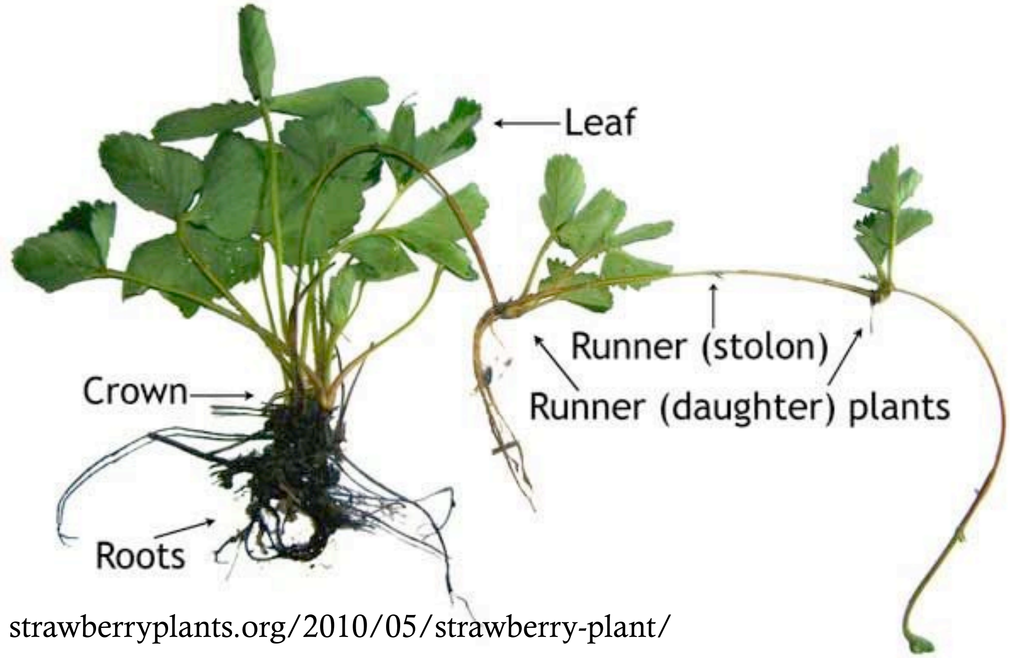



Figure 1 Some modular macroorganisms and microorganisms. (a) A clonal terrestrial plant (strawberry); (b) a clonal, floating aquatic plant (Salvinia sp.); (c) a sea fan coral (Gorgonia sp.); (d) a colonial bryozoan (Membranipora sp.); (e) mycelium of a fungus; (f) microcolony of bacteria. [From Andrews (7) with permission from the American Society for Microbiology.]

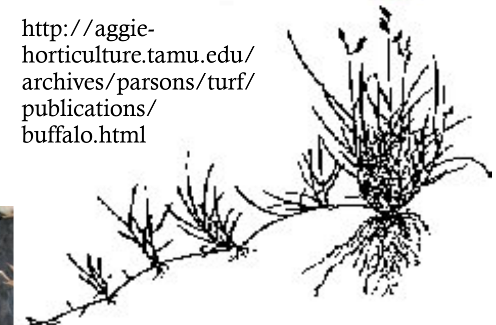
BACTERIA AS MODULAR ORGANISMS
Annual Review of Microbiology
Vol. 52: 105-126 (Volume publication date October 1998)
DOI: 10.1146/annurev.micro.52.1.105
John H. Andrews



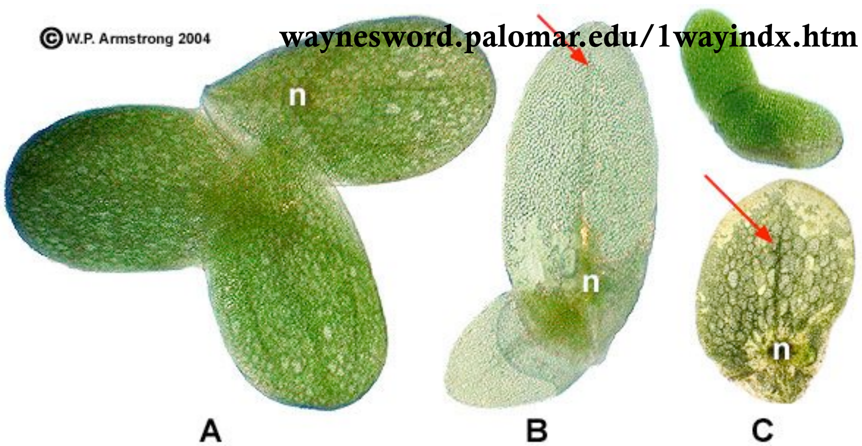


strawberryplants.org/2010/05/strawberry-plant/

http://aggie-horticulture.tamu.edu/archives/parsons/turf/publications/buffalo.html



waynesword.palomar.edu/1wayindx.htm



Population Age Structure

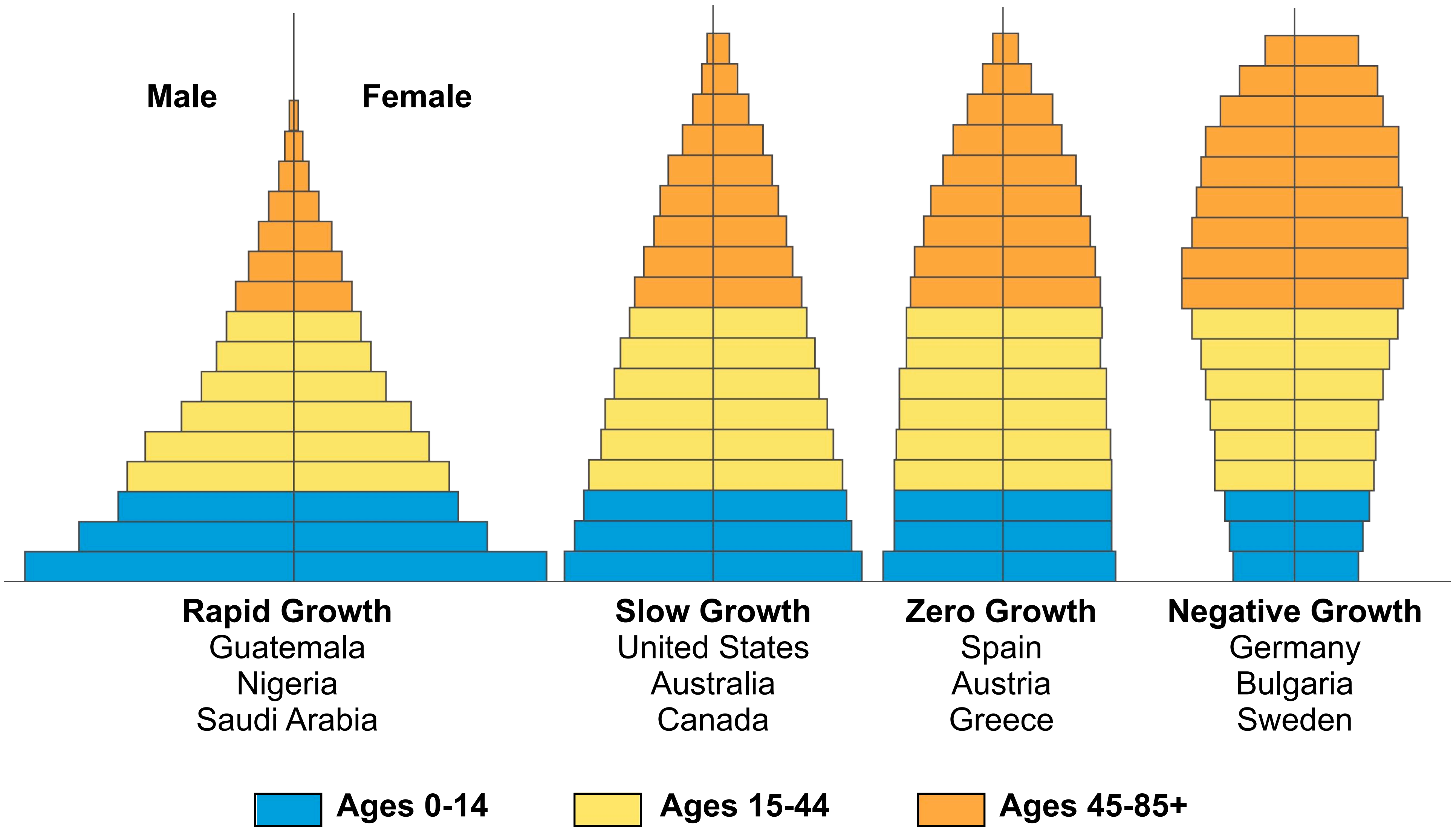
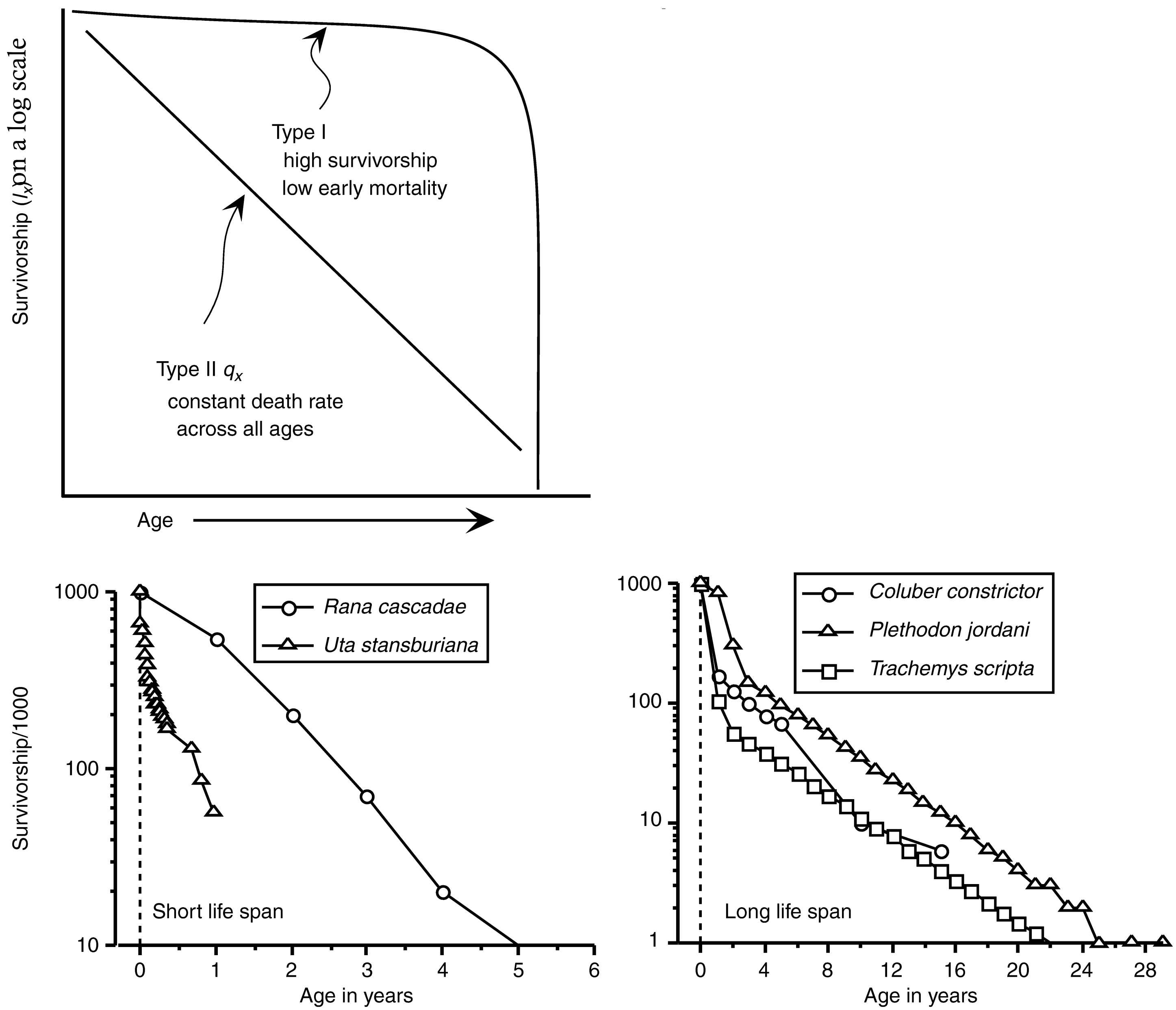
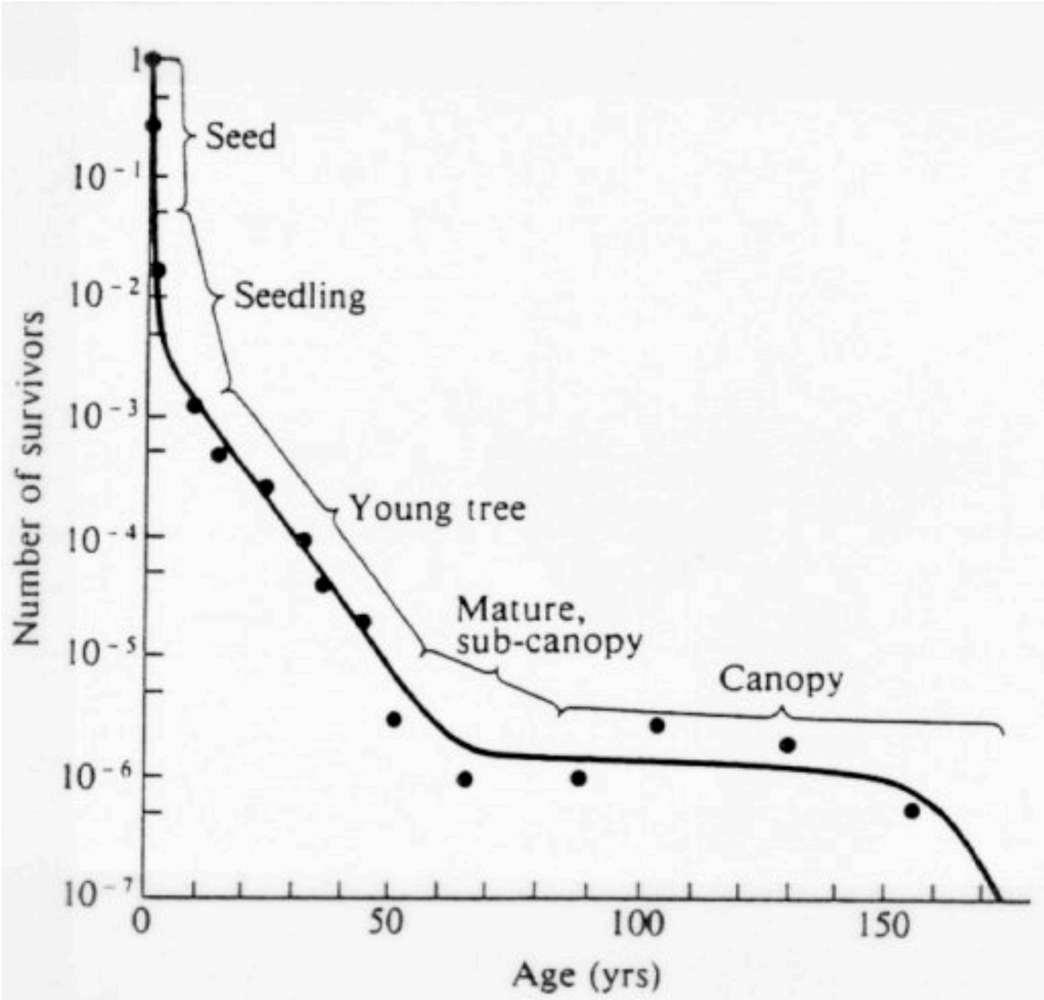


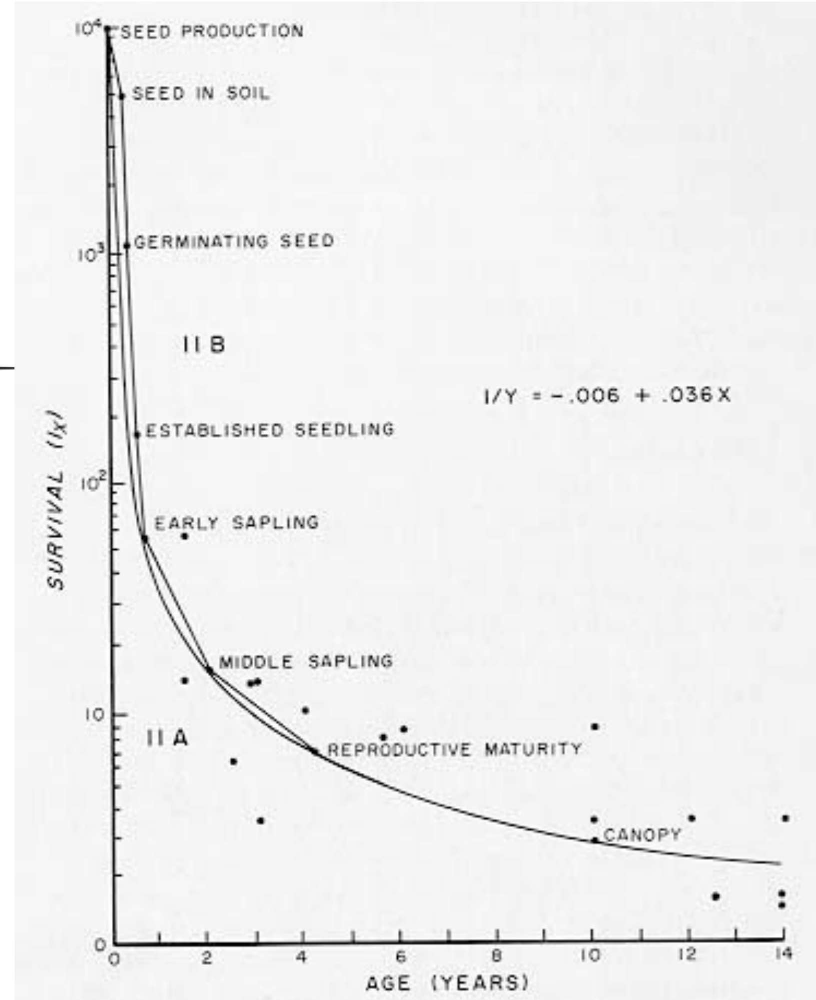
Figure 4.32 Top: Hypothetical survivorship curves for animal populations (see text). Bottom: Representative survivorship curves for amphibians and reptiles with short life spans (left) and long life spans (right). Although the lower graphs are superficially similar, note the great difference in age scale.
Data from the following: Amphibians—*Pj*, Hairston, 1983; *Rc*, Briggs and Storm, 1970; Reptiles—*Cc*, Brown and Parker, 1984; *Ts*, Frazer et al., 1990; *Us*, Tinkle,



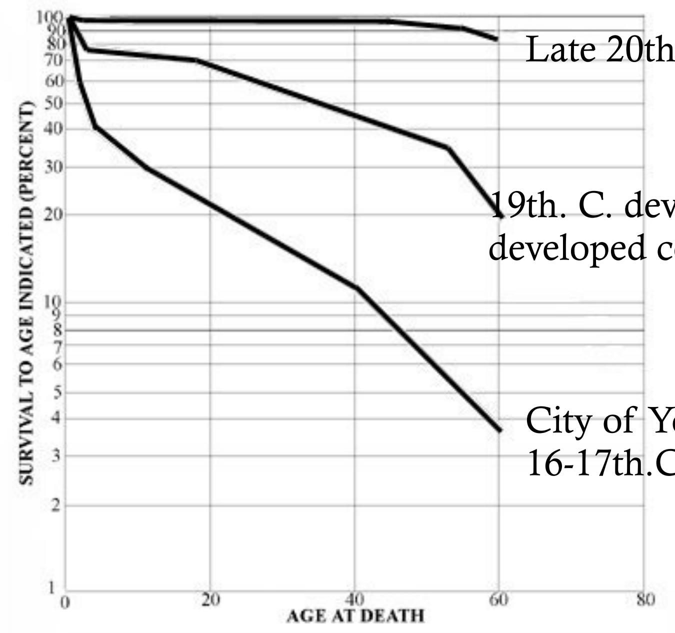

© 2005 Michael F. Benard

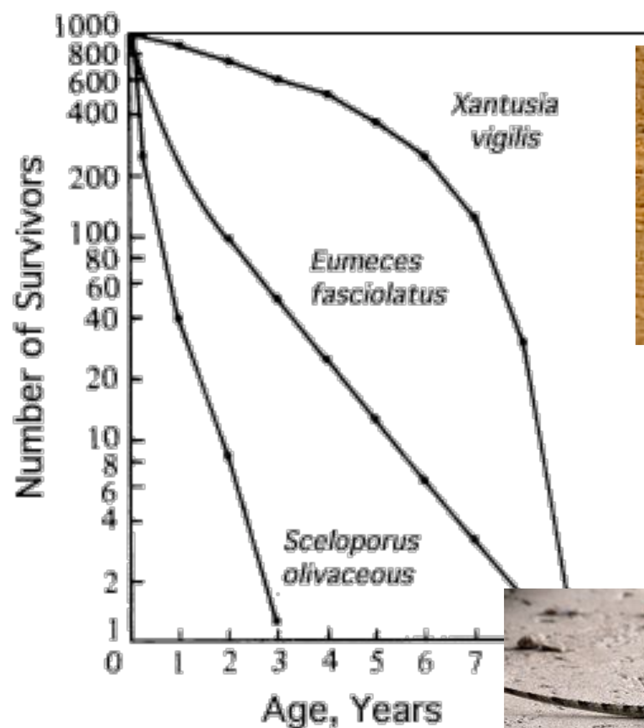


Gutsell S.L. and Johnson E.A. 1998. What can be learned about forest dynamics from the age distribution of trees?. Pages 217-226, in Tested studies for laboratory teaching, Volume 19. (S. J. Karcher, Editor). Proceedings of the 19th Workshop/Conference of the Association for Biology Laboratory Education (ABLE), 365 pages.



http://www.na.fs.fed.us/pubs/silvics_manual/volume_2/cecropia/peltata.htm


SURVIVAL TO AGE INDICATED (PERCENT)
AGE AT DEATH
Late 20th.C. developed country.
19th. C. developed country/ 20th.C. less developed country
City of York (England), 16-17th.C.


Number of Survivors
Age, Years
Xantusia vigilis
Eumeces fasciolatus
Sceloporus olivaceous


Desert night lizard


Texas spiny lizard

FACTORS AFFECTING POPULATION FLUCTUATIONS IN LARVAL AND ADULT STAGES OF THE WOOD FROG (*RANA SYLVATICA*)[1]

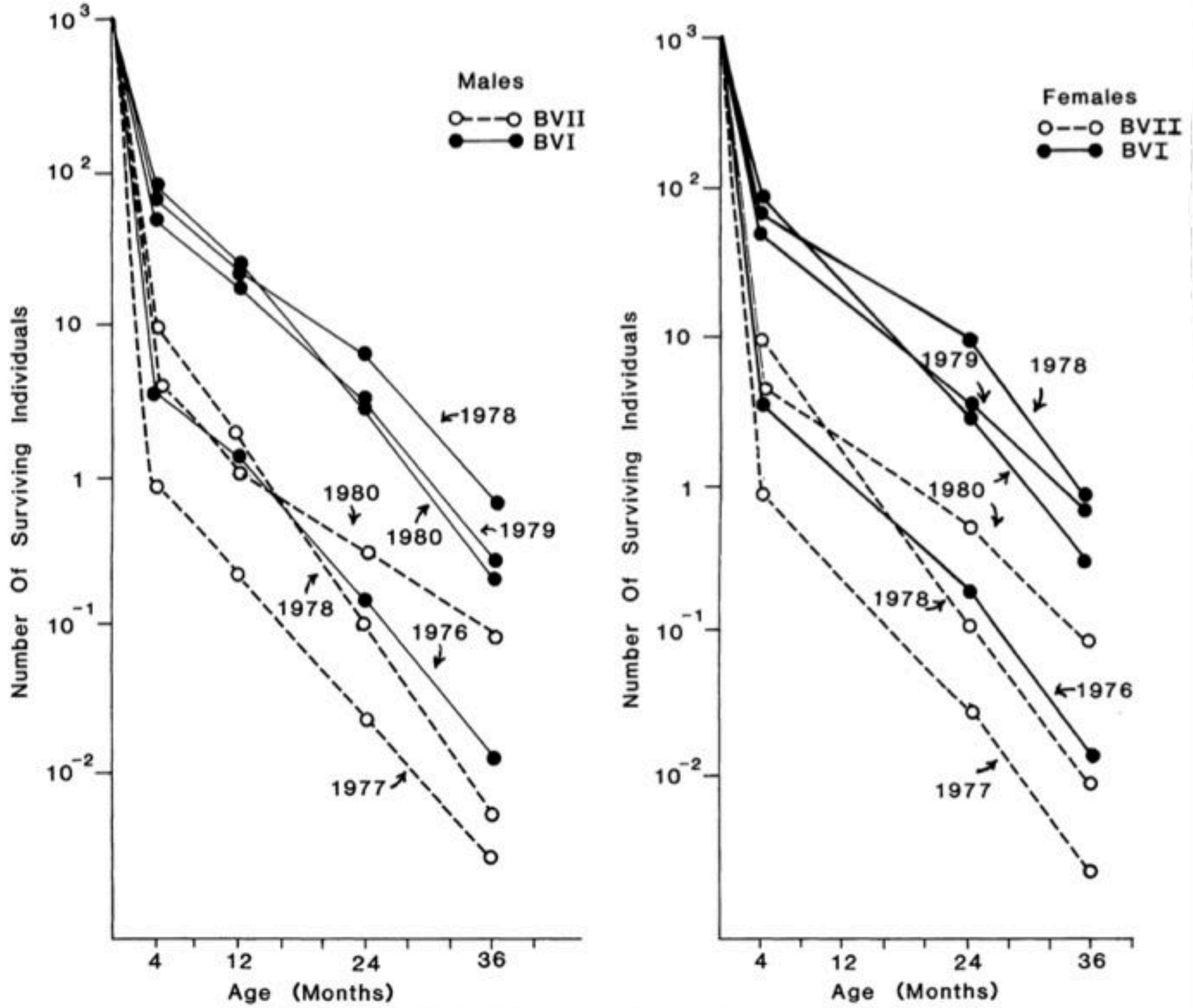


FIG. 3. Survivorship curves for males and females (1976–1980).

FACTORS AFFECTING POPULATION FLUCTUATIONS IN LARVAL AND ADULT STAGES OF THE WOOD FROG (*RANA SYLVATICA*)[1]

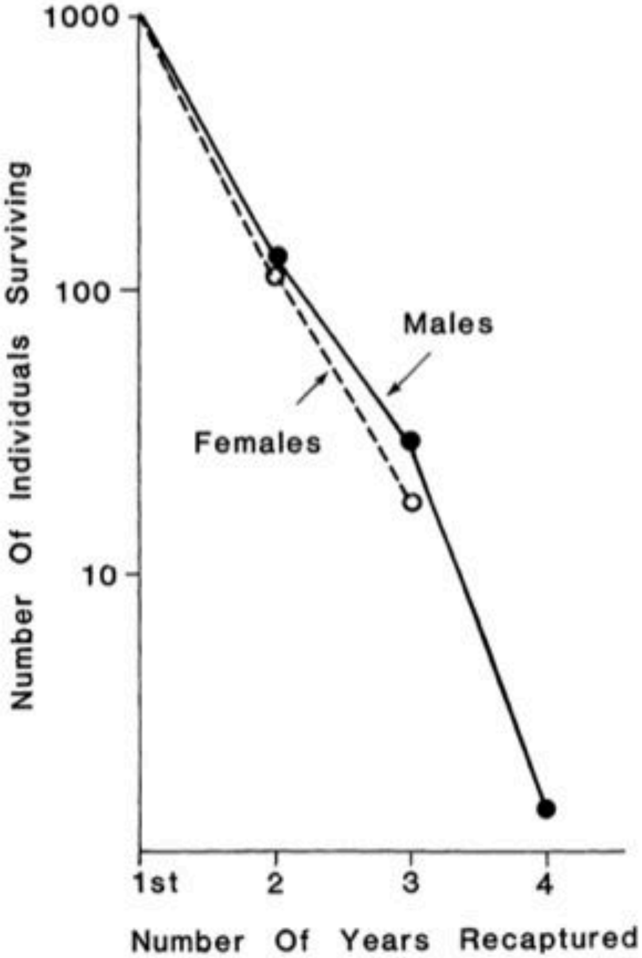
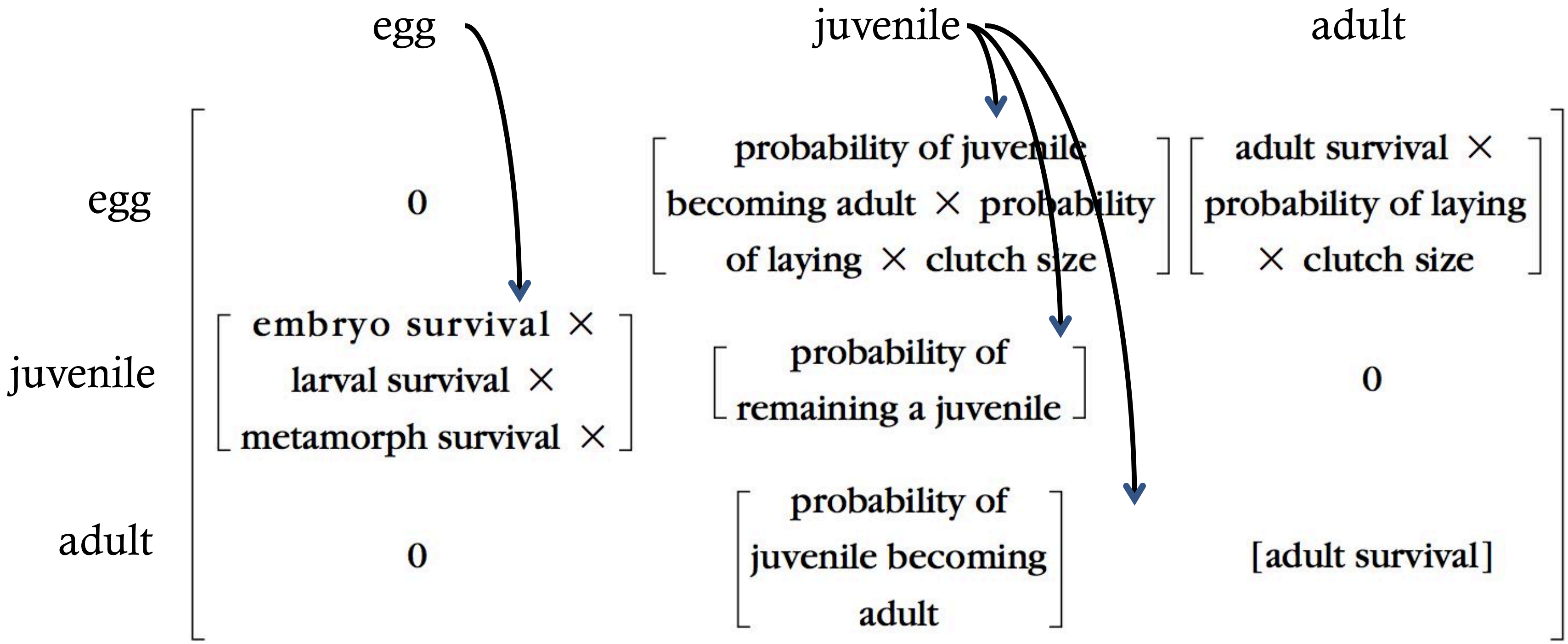


FIG. 4. Survivorship curves based on individuals initially marked as adults. Each point represents the mean number of males and females surviving from BVI and BVII ponds for the period 1977–1982, standardized to an initial number of 1000.

TABLE 2. Life table analysis including measures of net replacement rates (R_0), and generation times (G) for wood frogs from BVI and BVII pond for 1976–1980. Fecundity data (number of eggs per female) are taken from Berven 1988.

Year	Age	l_x	m_x	$l_x m_x$	R_0	G
1976	0	1.0000	0	0.000		
	1	0.0012	0	0.000		
	2	0.000212	287	0.061		
	3	0.000016	390	0.006	0.067	2.09
1977*	0	1.0000	0	0.0000		
	1	0.00024	0	0.0000		
	2	0.000032	289	0.0092		
	3	0.00000035	371	0.0001	0.0093	2.01
1978	0	1.0000	0	0.0000		
	1	0.0298	3.34	0.0998		
	2	0.0183	373	6.8408		
	3	0.0016	344	0.5504	7.49	2.06
1979	0	1.0000	0	0.0000		
	1	0.0163	15.8	0.2574		
	2	0.0035	333	1.1655		
	3	0.0008	301	0.2408	1.66	2.11
1980	0	1.0000	0	0.0000		
	1	0.02197	1.04	0.0229		
	2	0.00314	286	0.8983		
	3	0.00039	352	0.1375	1.06	2.10
1980*	0	1.0000	0	0.0000		
	1	0.00177	21.7	0.0384		
	2	0.00053	325	0.1722		
	3	0.00008	352	0.0275	0.238	1.96

* BVII pond.



What Is Missing in Amphibian Decline Research: Insights from Ecological Sensitivity Analysis

ROMAN BIEK,* W. CHRIS FUNK,† BRYCE A. MAXELL,*‡ AND L. SCOTT MILLS*

Ecology, 68(5), 1987, pp. 1412–1423

A STAGE-BASED POPULATION MODEL FOR LOGGERHEAD SEA TURTLES AND IMPLICATIONS FOR CONSERVATION[1]

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AND

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Biology Department, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts 02543 USA

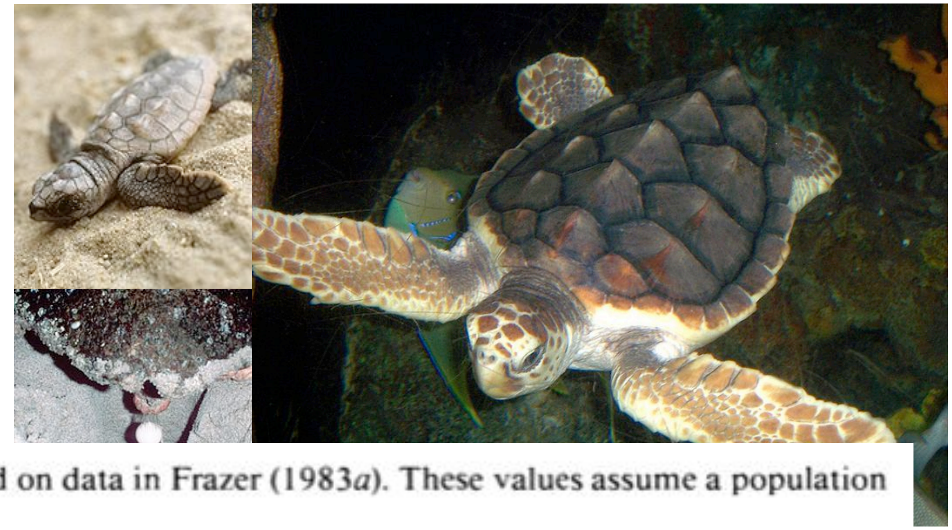

TABLE 3. Stage-based life table for loggerhead sea turtles based on data in Frazer (1983*a*). These values assume a population declining at ≈3%/yr.

Stage number	Class	Size* (cm)	Approximate ages (yr)	Annual survivorship	Fecundity (no. eggs/yr)
1	eggs, hatchlings	<10	<1	0.6747	0
2	small juveniles	10.1–58.0	1–7	0.7857	0
3	large juveniles	58.1–80.0	8–15	0.6758	0
4	subadults	80.1–87.0	16–21	0.7425	0
5	novice breeders	>87.0	22	0.8091	127
6	1st-yr remigrants	>87.0	23	0.8091	4
7	mature breeders	>87.0	24–54	0.8091	80

* Straight carapace length.

TABLE 4. Stage-class population matrix for loggerhead sea turtles based on the life table presented in Table 3. For the general form of the matrix and formulae for calculating the matrix elements see Theoretical Population Projections.

0	0	0	0	127	4	80
0.6747	0.7370	0	0	0	0	0
0	0.0486	0.6610	0	0	0	0
0	0	0.0147	0.6907	0	0	0
0	0	0	0.0518	0	0	0
0	0	0	0	0.8091	0	0
0	0	0	0	0	0.8091	0.8089

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AND

HAL CASWELL
Biology Department, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts 02543 USA

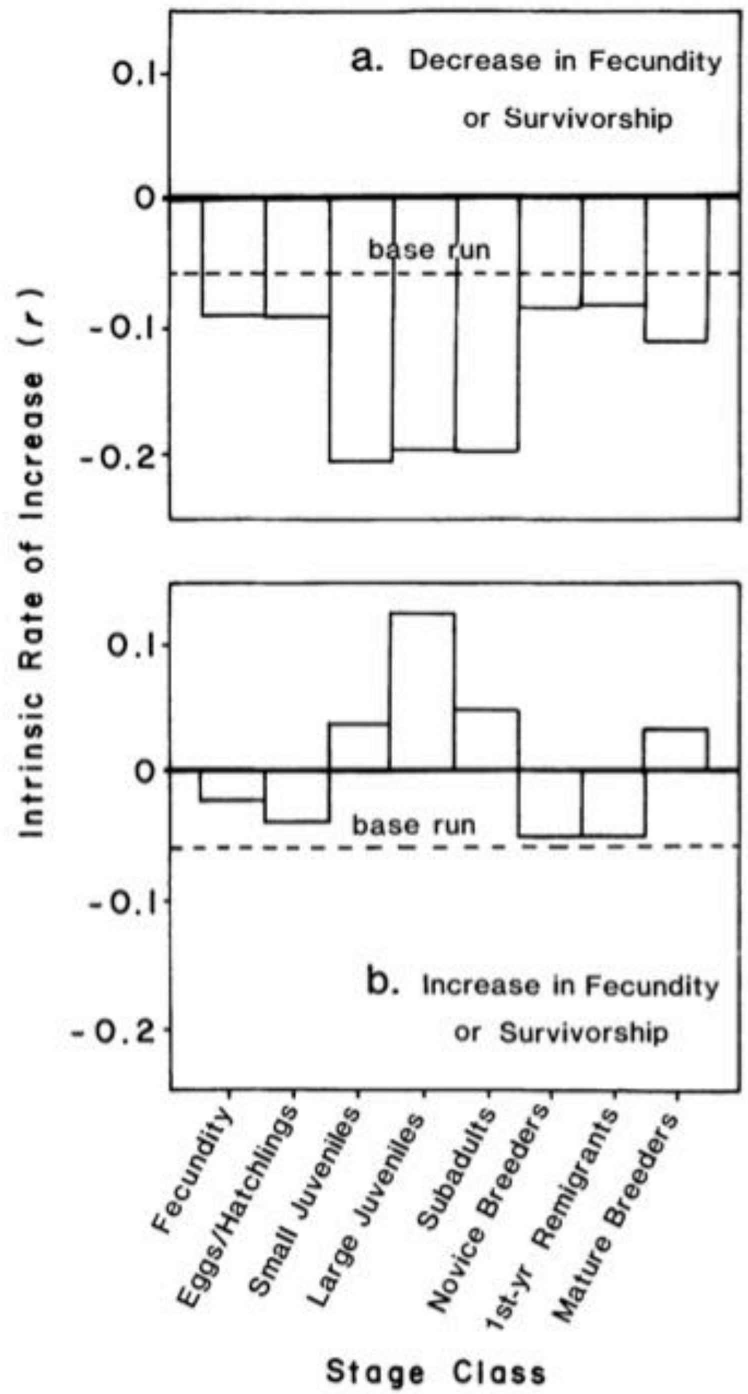

FIG. 1. Changes in rate of increase r resulting from simulated changes in fecundity and survival of individual life history stages in the loggerhead population matrix (remaining components held constant). The dashed line represents the r determined in the baseline run on the initial matrix. (a.) Simulations represent 50% decreases in fecundity or survivorship. (b.) Simulations represent a 50% increase in fecundity or an increase in survivorship to 1.0. Stages 2–4 (juveniles and subadults) show the strongest response to these simulated changes. (Specific calculations are presented in Crouse 1985.)

Ecology, 68(5), 1987, pp. 1412–1423

A STAGE-BASED POPULATION MODEL FOR LOGGERHEAD SEA TURTLES AND IMPLICATIONS FOR CONSERVATION[1]

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AND

HAL CASWELL
Biology Department, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts 02543 USA

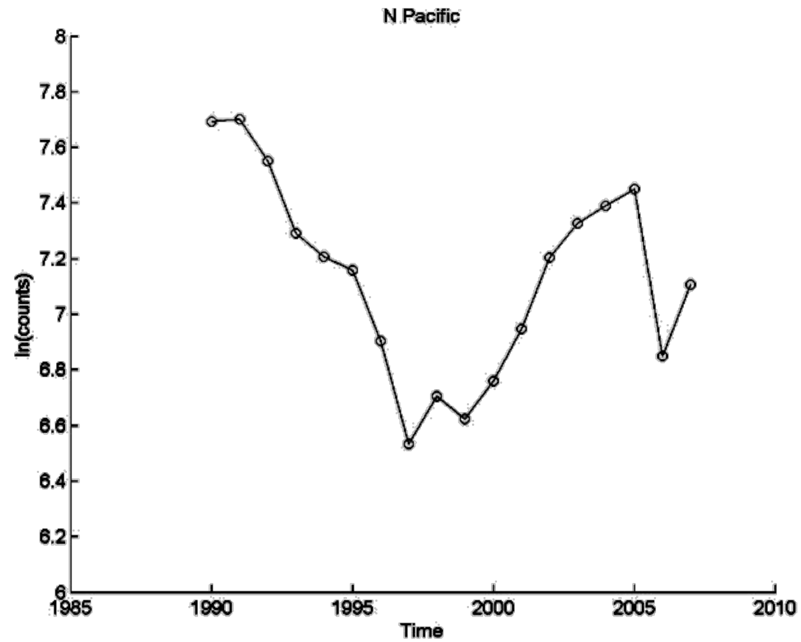
The Trawl Efficiency Device (or Turtle Excluder Device, TED) mentioned earlier can be installed in existing trawls and virtually eliminates the capture and drowning of marine turtles (Siedel and McVea 1982 and C. Oravetz, *personal communication*). The TED has the added advantage of eliminating other large objects (bycatch) from the trawl, thereby improving the hydrodynamics of the trawl and improving fuel efficiency (Anonymous 1983). Easley (1982) found that a small but significant increase in the shrimp caught in paired tests resulted in an economic advantage to larger vessels installing the device. Smaller and lighter versions of the TED are currently being tested for performance and durability (C. Oravetz 1985 and *personal communication*). Increased use of TEDs in the trawl fishery might provide advantages to both the fishery *and* threatened loggerhead populations.

LOGGERHEAD SEA TURTLE *(CARETTA CARETTA)*
2009 STATUS REVIEW
UNDER THE U.S. ENDANGERED SPECIES ACT

LOGGERHEAD BIOLOGICAL REVIEW TEAM

Therese A. Conant, Peter H. Dutton, Tomoharu Eguchi, Sheryan P. Epperly, Christina C. Fahy, Matthew H. Godfrey, Sandra L. MacPherson, Earl E. Possardt, Barbara A. Schroeder, Jeffrey A. Seminoff, Melissa L. Snover, Carrie M. Upite, and Blair E. Witherington

August 2009



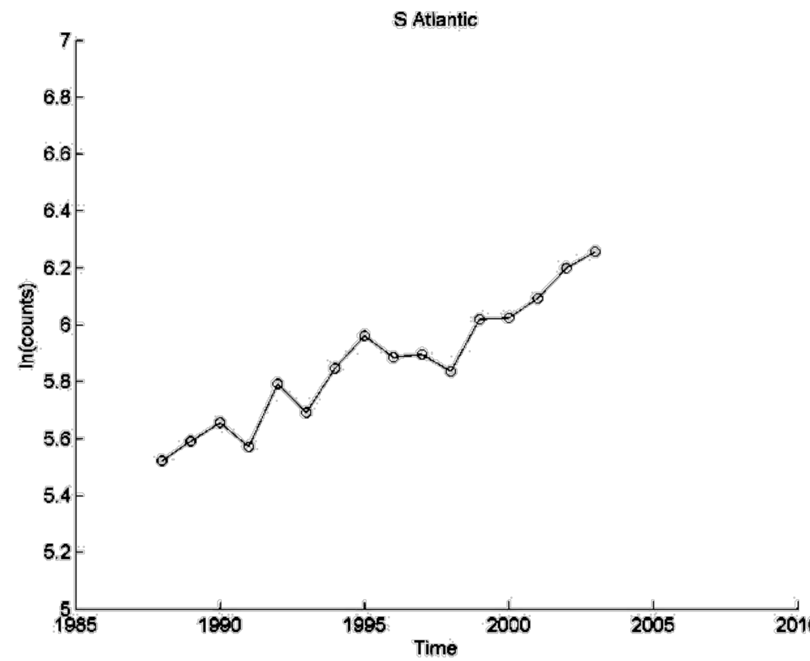
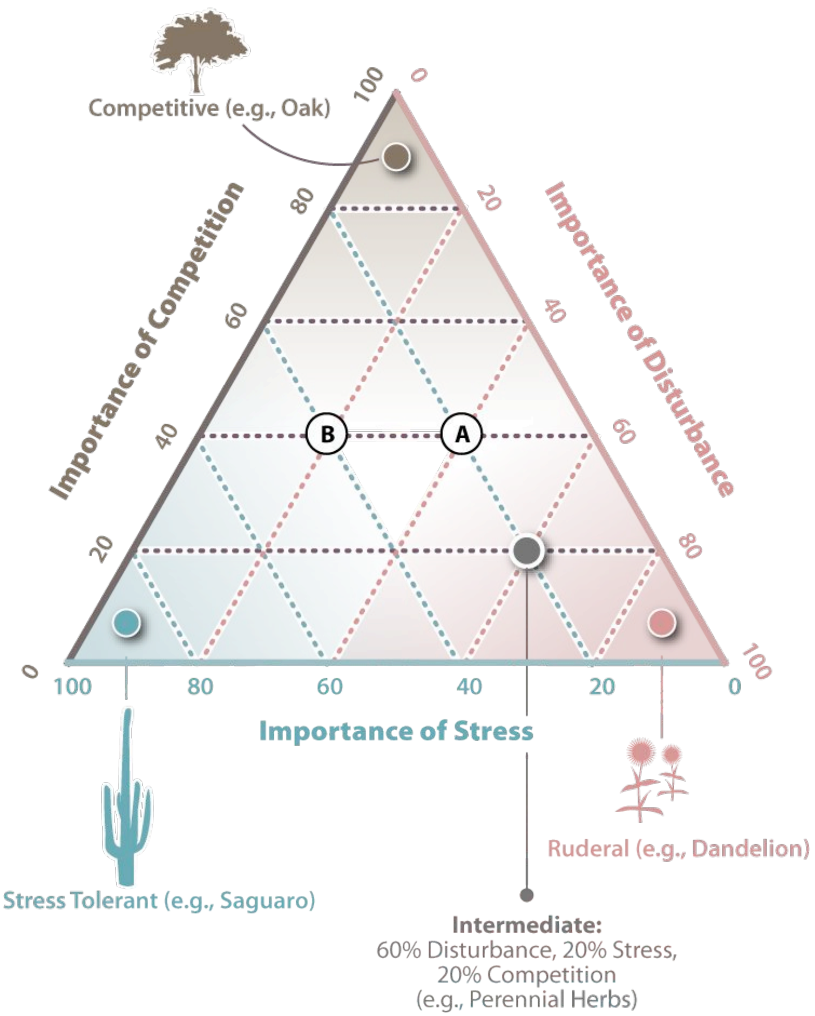
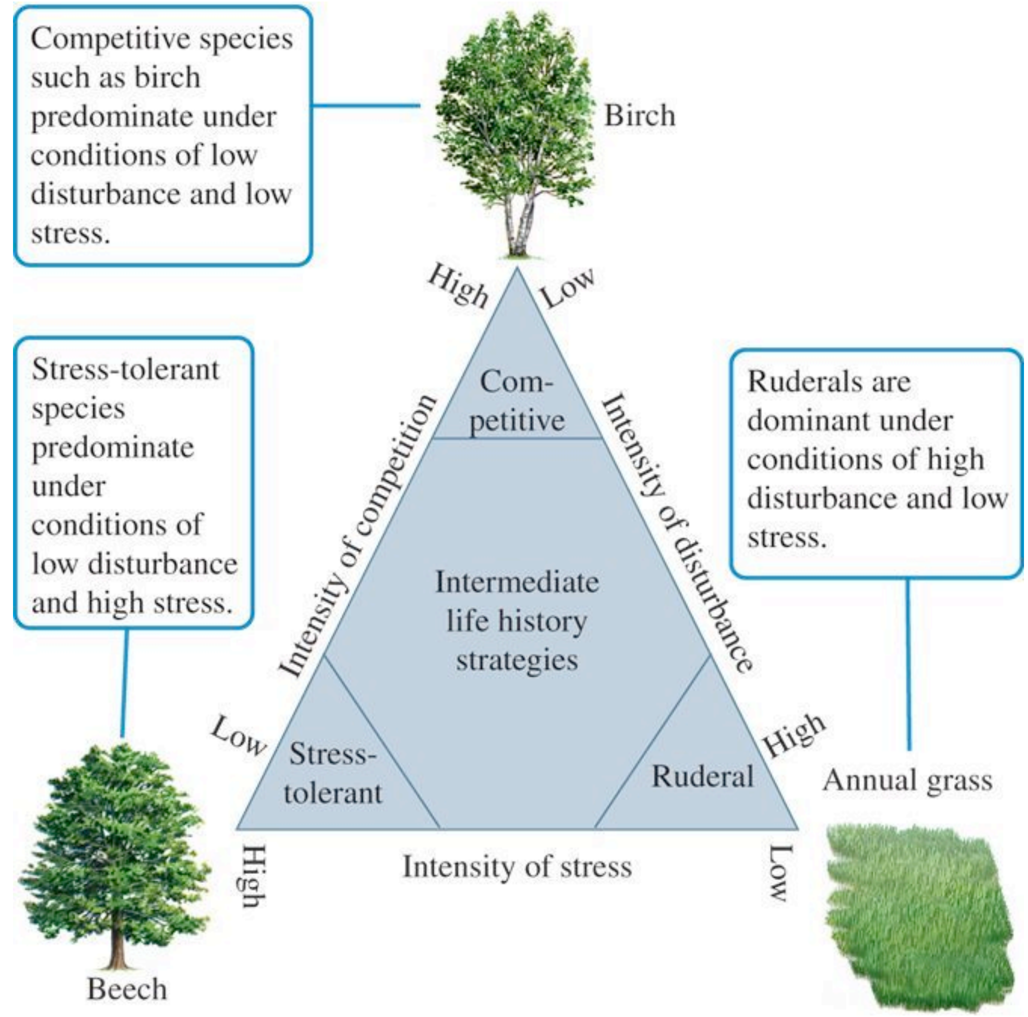


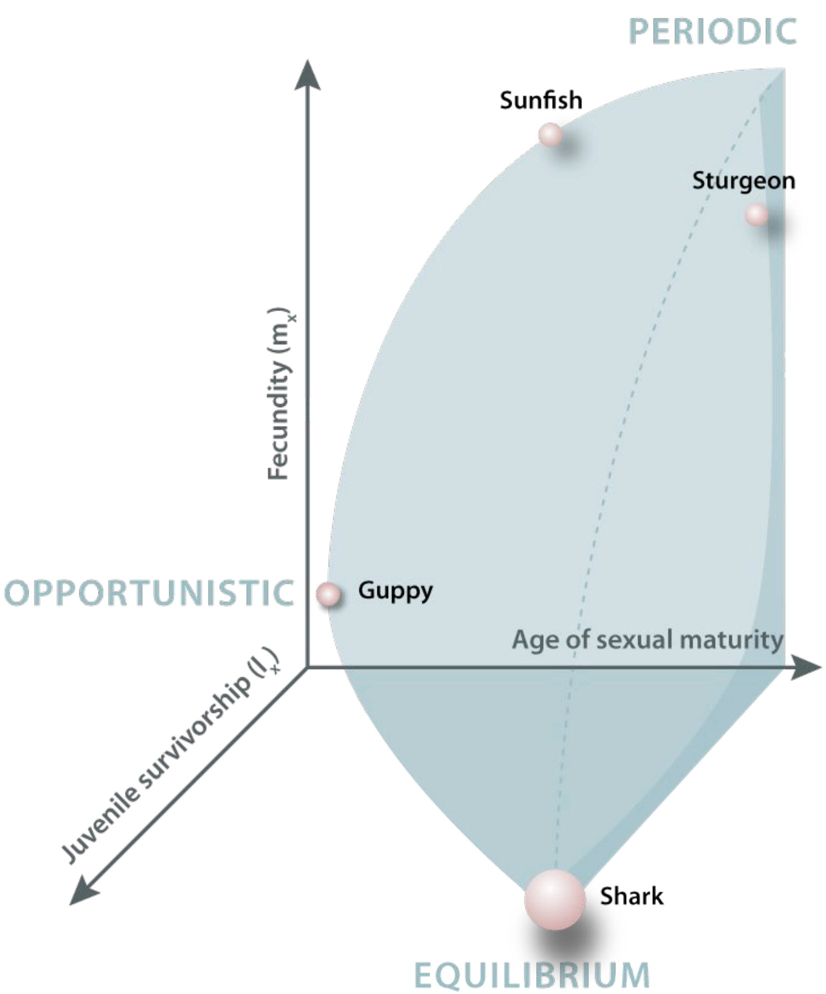
Figure 5. Change in the number of nesting females at nesting beaches for the South Atlantic Ocean DPS. The number of nesting females was computed from the observed number of nests divided by the mean clutch frequency (5 yr^{-1}; Table 1).

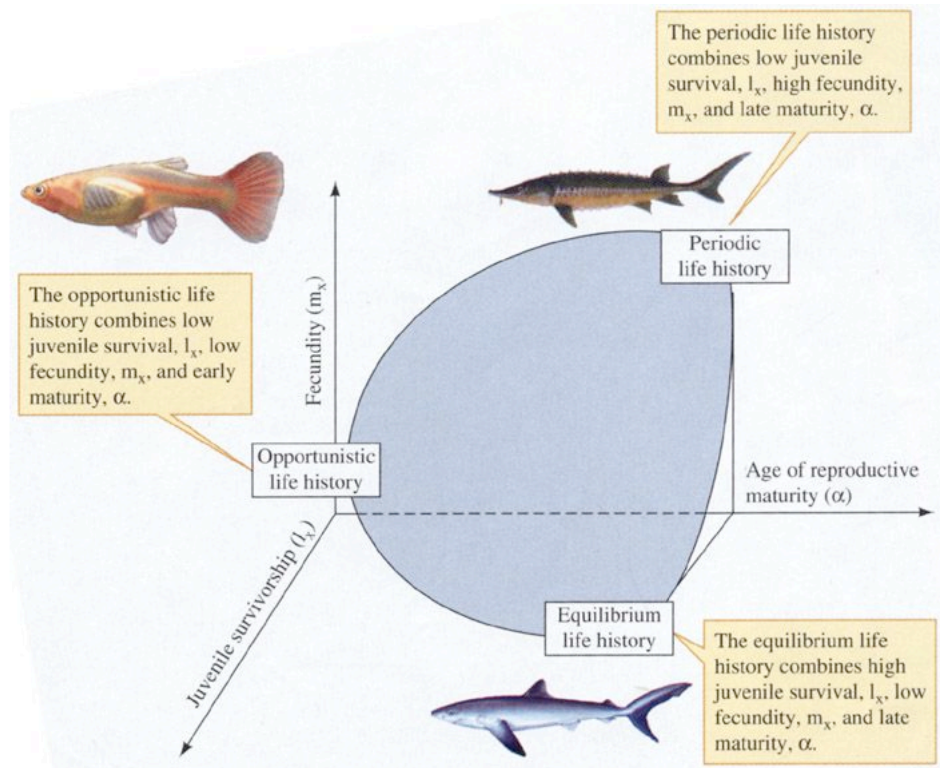
	r **Unstable environment, density independent**	K **Stable environment, density dependent interactions**
size	Small	Large
Investment / offspring	Low	High
# offspring	Many	Few
Mature	Early	Late
Life span	Short	Long
Freq. reproduction	Semelparous	Iteroparous
Survival across ages	Type III	Type I or II
Competition	Often lax	Often intense



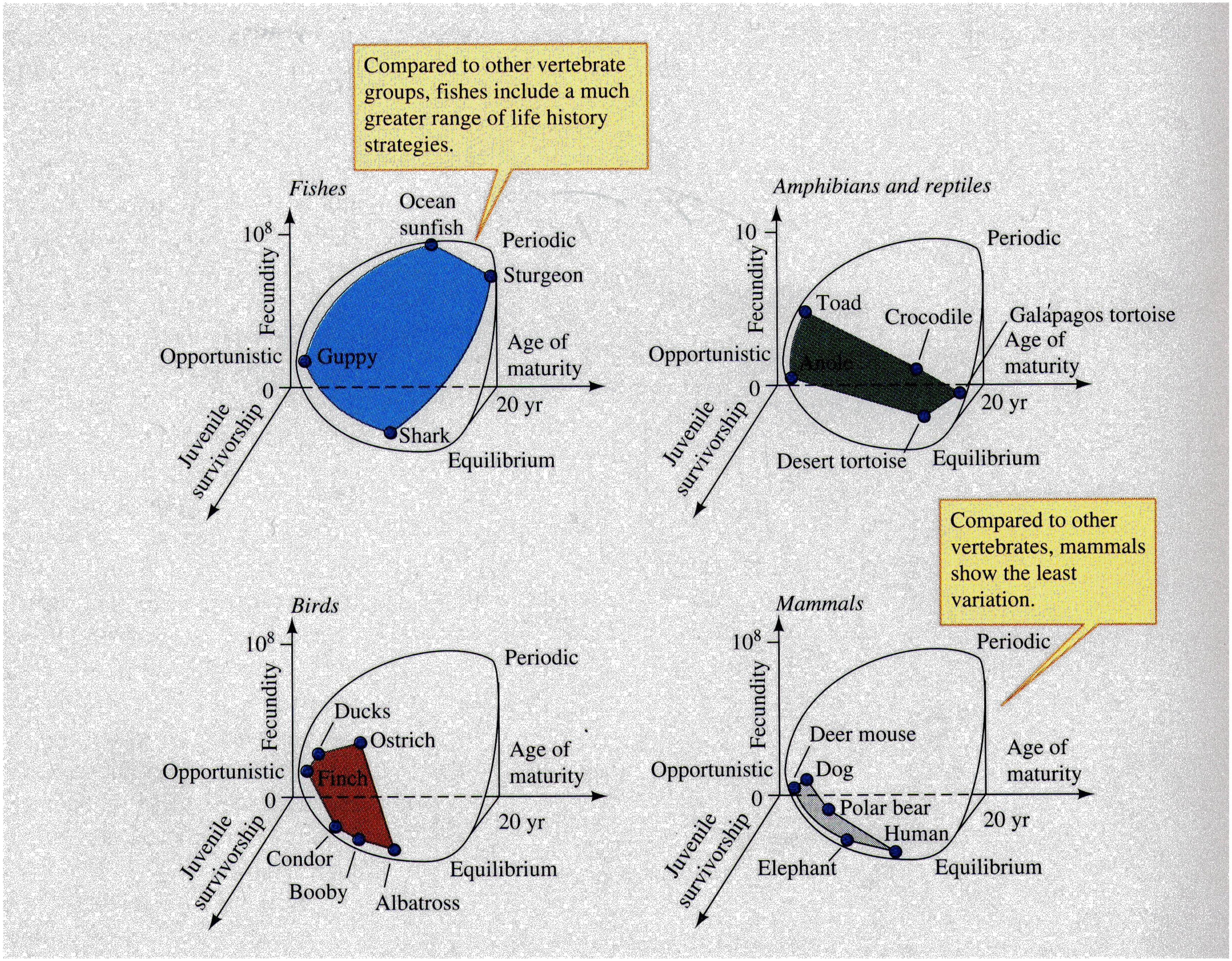


ꕥGrime's life history strategy classification. Plants allocate resources depending on the importance of disturbance, stress and competition. Relative importances sum to 100%.





꧂The classification system of Winemiller and Rose, which groups species according to three life history parameters.



http://www.zo.utexas.edu/courses/Thoc/PopGrowth.html