***Handout* Kuliah Minggu 5 & 6 – EKOLOGI POPULASI**

Pokok Bahasan Kuliah:

PENGERTIAN POPULASI & INDIVIDU

- Pengertian **populasi**
- Pengertian **individu**:
  - Individu uniter
  - Individu moduler

PERSEBARAN & KELIMPAHAN POPULASI

- Faktor lingkungan sebagai pembatas persebaran geografis suatu spesies: contoh-contoh
- Pola persebaran populasi: acak, teratur, mengelompok
- Hubungan kerapatan populasi dan ukuran tubuh
- Faktor yang menentukan spesies mudah ditemukan (*common*) atau sulit ditemukan (*rare*):
  - sebaran geografis
  - toleransi terhadap habitat
  - ukuran populasi lokal

PERTUMBUHAN POPULASI

- Faktor-faktor yang memengaruhi ukuran populasi
- Pertumbuhan eksponensial dan logistik (dan persamaan matematisnya)
- Konsep daya dukung (*carrying capacity*)
- Faktor pembatas populasi: *density-dependent* dan *density-independent*

DINAMIKA POPULASI

- Pemencaran dan metapopulasi
- Tabel hidup: *time-specific* dan *age-specific*
- Kurva kesintasan: tipe I, II dan III
- Distribusi umur

STRATEGI HIDUP

- Strategi hidup dan strategi reproduksi
- Klasifikasi strategi hidup
  - Spesies terseleksi –*r* dan –*K* (Pianka 1970)
  - Strategi C-S-R pada tumbuhan (Grime 1979)
  - Klasifikasi strategi yang lain (mis. Winemiller 1992, Charnov 2002)

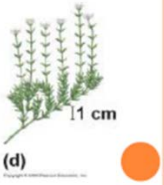
Sumber ilustrasi:

- Molles, M.C.Jr. 2008. Ecology: concepts and applications. 7th. Edition (atau edisi lainnya). McGraw-Hill, New York. Dari 4th edition (2008): **Gambar 9.10; 9.20; 11.8; 12.20; 12.22; 12.24. Tabel 10.1; 12.1**
- Stiling, P. 2012. Ecology: global insights and investigations. McGraw-Hill, New York: **Gambar 8.18; 9.5; 9.6; Tabel 9.2**
- Introduction to the Science of Ecology: *www.tarleton.edu/Faculty/higgins/401Notes8.pdf*
- http://selandonaendrablogspot.wordpress.com/2012/09/23/persebaran-fauna-di-indonesia/

UNITARY AND MODULAR ORGANISMS

- Unitary organisms – organisms appear as individual units with a definite growth form
  - most animals

- Modular organisms – organisms that have an indefinite growth form.
  - Aspen trees
  - Many grasses
  - Corals



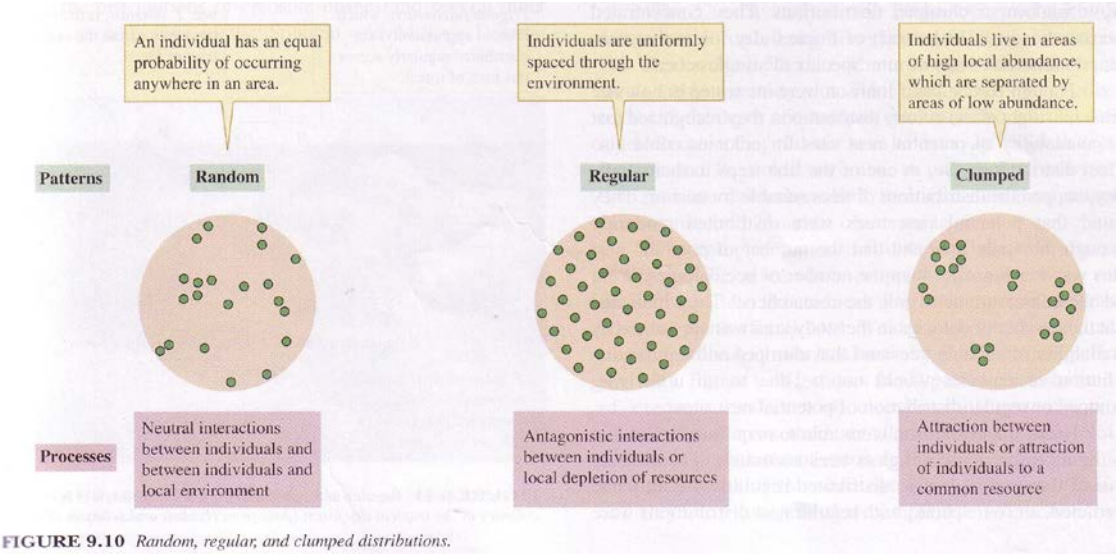


FIGURE 9.10 *Random, regular, and clumped distributions.*

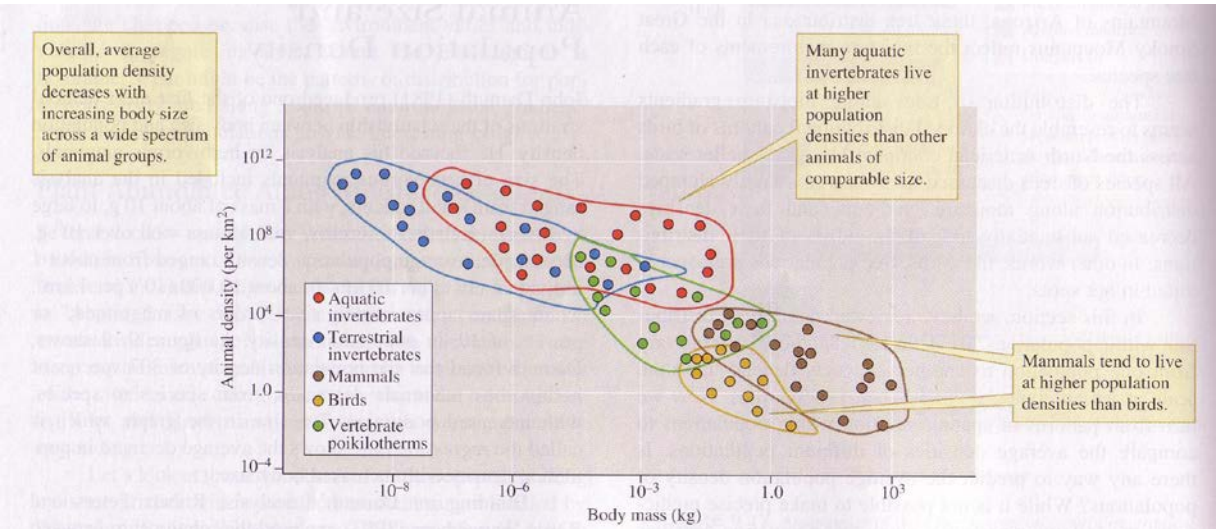
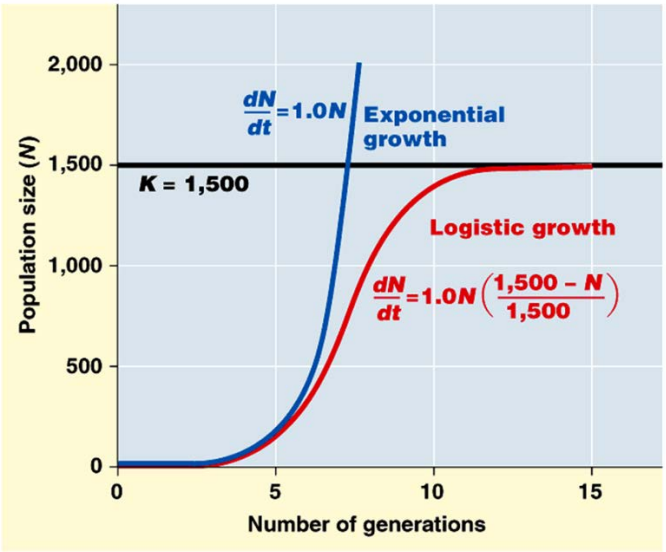


FIGURE 9.20 *Animal size and population density (data from Peters and Wassenberg 1983).*



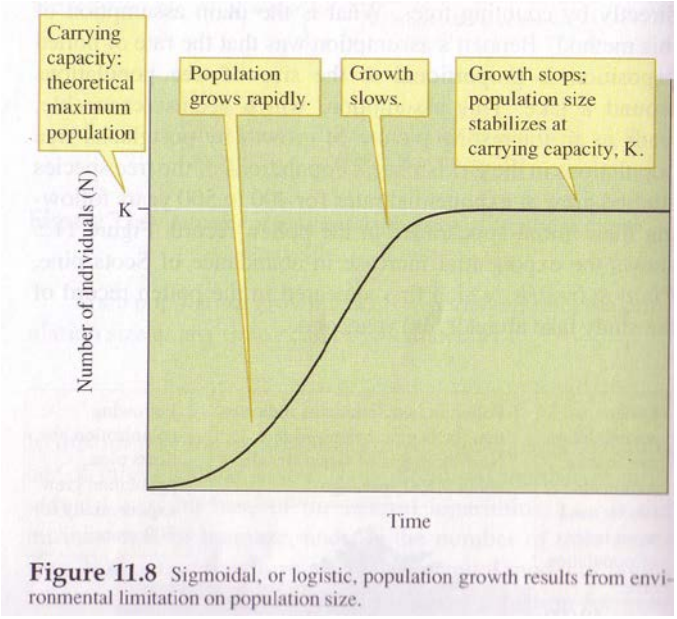


Figure 11.8 Sigmoidal, or logistic, population growth results from environmental limitation on population size.

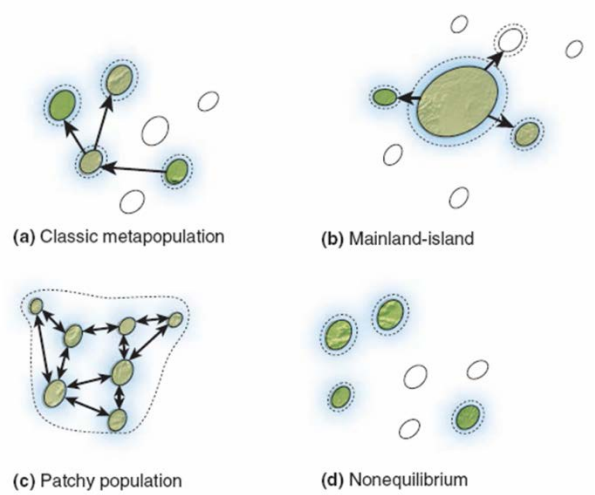


Figure 8.18 **Different kinds of metapopulations.** Closed circles represent habitat patches; filled = occupied; unfilled = vacant. Dashed lines indicate the boundaries of "populations." Arrows indicate migration (colonization). **(a)** Classic metapopulation. **(b)** Core-satellite metapopulation (common). **(c)** Patchy population. **(d)** Nonequilibrium metapopulation (differs from (a) in that there is no recolonization) often happens as part of a general regional decline. (Modified from Harrison, 1991.)

Table 9.2 **Static life table for the Dall mountain sheep, *Ovis dalli*, based on the known age at death of 608 sheep dying before 1937.***

Age class	Number alive	Number dying	Proportion surviving	Mortality rate	Average no. alive in age class	Total years lived	Life Expectancy
x	n_x	$d_x = (n_x - n_{x+1})$	$l_x (= n_x/n_0)$	$q_x (= d_x/n_x)$	$L_x (= n_x + n_{x+1})/2$	$T_x = \Sigma L_x$	$e_x (= T_x/n_x)$
0–1	1000	199	1.000	.199	900.5	7053	7.0
1–2	801	12	0.801	.015	795	6152.5	7.7
2–3	789	13	0.789	.016	776.5	5357.5	6.8
3–4	776	12	0.776	.015	770	4581	5.9
4–5	764	30	0.764	.039	749	3811	5.0
5–6	734	46	0.734	.063	711	3062	4.2
6–7	688	48	0.688	.070	664	2351	3.4
7–8	640	69	0.640	.108	605.5	1687	2.6
8–9	571	132	0.571	.231	505	1081.5	1.9
9–10	439	187	0.439	.426	345.5	576.5	1.3
10–11	252	156	0.252	.619	174	231	0.9
11–12	96	90	0.096	.937	51	57	0.6
12–13	6	3	0.006	.500	4.5	6	1.0
13–14	3	3	0.003	1.00	1.5	1.5	0.5

*Data are expressed per 1,000 individuals.

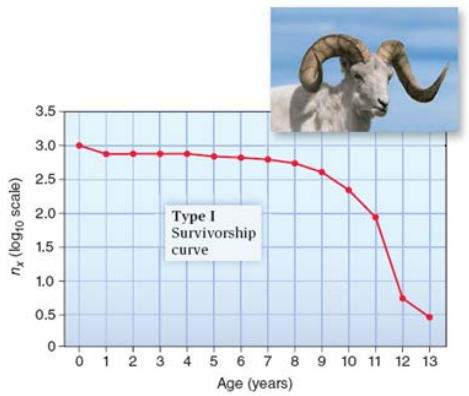


Figure 9.6 **Survivorship curve for the Dall mountain sheep, *Ovis dalli*.**

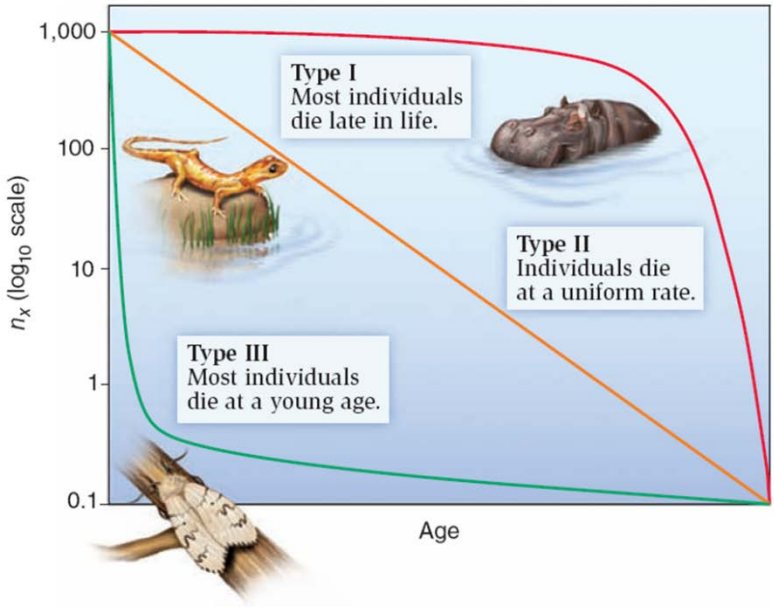


Figure 9.5 Idealized survivorship curves.

Table 10.1

Combining survivorship with seed production by *P. drummondii* to estimate net reproductive rate, R_0

Age (days) x	Number surviving to day x n_x	Proportion surviving to day x l_x	Average number of seeds per individual during time interval m_x	Multiplication of l_x and m_x $l_x m_x$
0–299	996	1.0000	0.0000	0.0000
299–306	158	0.1586	0.3394	0.0532
306–13	154	0.1546	0.7963	0.1231
313–20	151	0.1516	2.3995	0.3638
320–27	147	0.1476	3.1904	0.4589
327–34	136	0.1365	2.5411	0.3470
334–41	105	0.1054	3.1589	0.3330
341–48	74	0.0743	8.6625	0.6436
348–55	22	0.0221	4.3072	0.0951
355–62	0	0.0000	0.0000	0.0000

Each individual leaves an average of 2.4177 offspring.

Data from Leverich and Levin 1979.

$$R_0 = \sum l_x m_x = 2.4177$$

The value of R_0, which is greater than 1.0, indicates that this population of *P. drummondii* is growing.

Summing the final column yields R_0, the net reproductive rate per individual.

Table 12.1

Characteristics favored by *r* versus K selection

Population attribute	*r* selection	K selection
Intrinsic rate of increase, r_m	High	Low
Competitive ability	Not strongly favored	Highly favored
Development	Rapid	Slow
Reproduction	Early	Late
Body size	Small	Large
Reproduction	Single, semelparity	Repeated, iteroparity
Offspring	Many, small	Few, large

Source: After Pianka 1970.

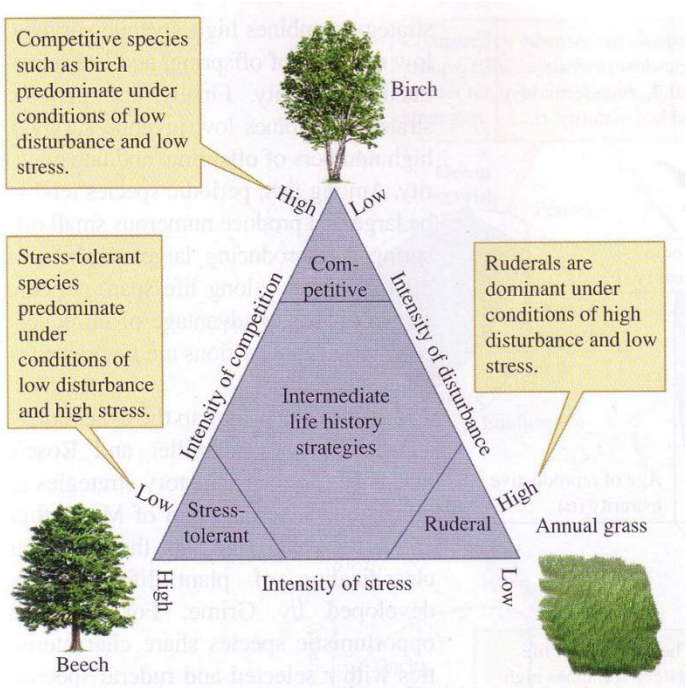


Figure 12.20 Grime's classification of plant life history strategies (after Grime 1979).

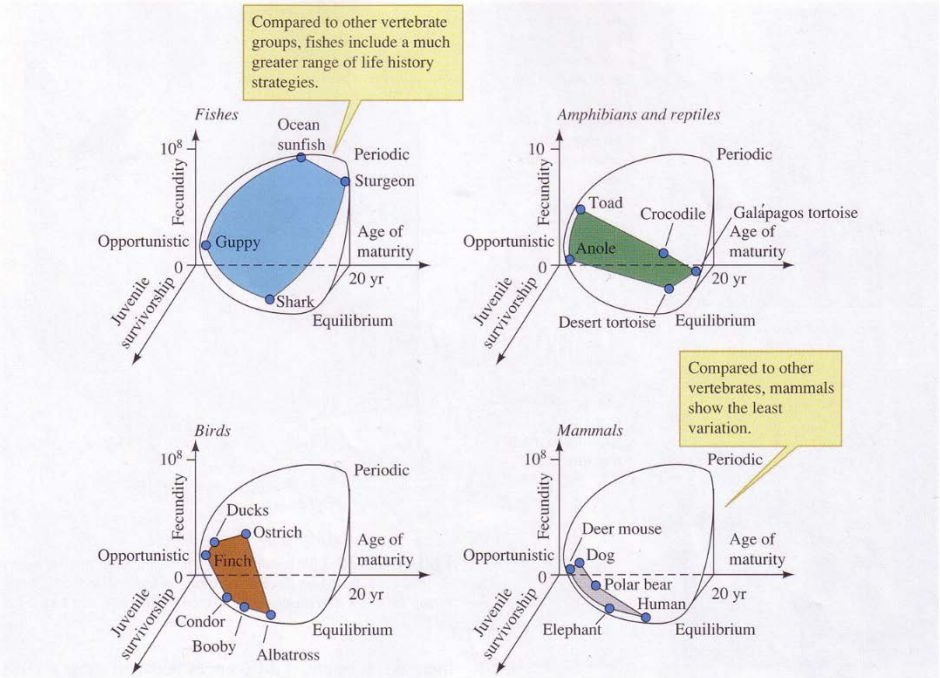


Figure 12.22 Variation in life histories within vertebrate animals (after Winemiller 1992).

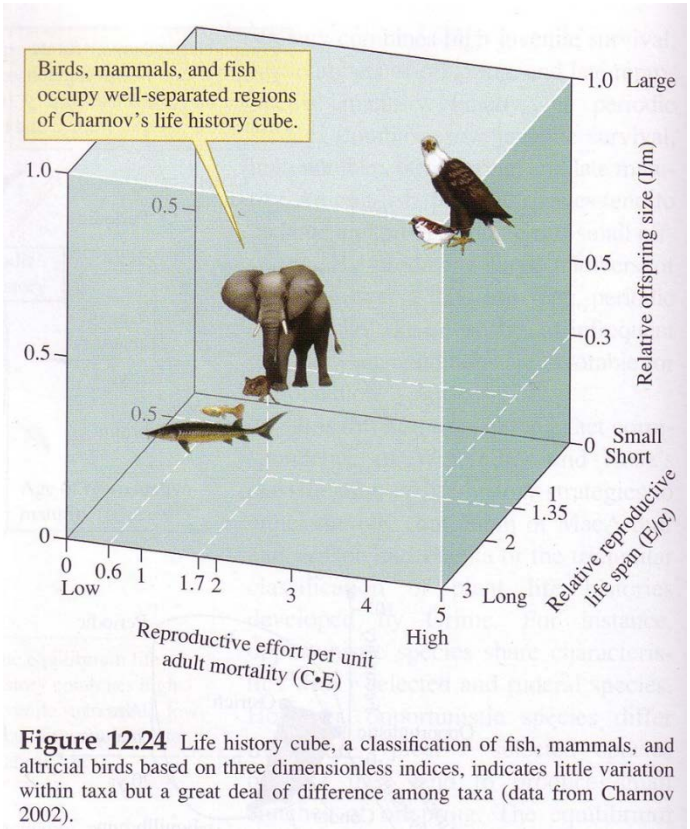


Figure 12.24 Life history cube, a classification of fish, mammals, and altricial birds based on three dimensionless indices, indicates little variation within taxa but a great deal of difference among taxa (data from Charnov 2002).