

Microevolution



Microevolution & Speciation

BIO1130 Organismal Biology
Université d'Ottawa / University of Ottawa

1
3:28 PM

In this lecture topic


- What is microevolution?
- Allele frequencies and evolution – Hardy-Weinberg.
- Sources of genetic variation in alleles.
- What is a species?

BIO1130 Organismal Biology
Université d'Ottawa / University of Ottawa

2
3:28 PM

Important stages in the history of Biology
20th century

- **Synthetic theory of evolution**
 - Population genetics and natural selection based on Mendelian genetics



Huxley
(1887-1975)

BIO1130 Organismal Biology
Université d'Ottawa / University of Ottawa

3
3:28 PM

Microevolution

Microevolution

- Evolutionary changes that result from changes in allele frequencies in a population, or in chromosome structure or numbers due to mutation and recombination.

BIO1130 Organismal Biology 4
 Université d'Ottawa / University of Ottawa 3:28 PM

Incomplete dominance – snap dragons

P - parental F₁ – Generation1 F₂ – Generation2

$C^R C^R$ Red $C^R C^R$ Pink $C^R C^R = 25\%$

X X $C^R C^R = 50\%$

$C^W C^W$ White $C^W C^W = 25\%$




BIO1130 Organismal Biology Figure 11.13
 Université d'Ottawa / University of Ottawa 5
 3:28 PM

punnet square

where you can see both the recessive and dominant allele in the

offspring.

Genotype and allele frequencies





Phenotype	Genotype	Number	Genotype frequency	Total C ^R alleles	Total C ^W alleles
	C ^R C ^R	450	450/1000 = 0.45	2x450 = 900	0x450 = 0
	C ^R C ^W	500	500/1000 = 0.50	1x500 = 500	1x500 = 500
	C ^W C ^W	50	50/1000 = 0.05	0x50 = 0	2x50 = 100
	Total	1000	0.45 + 0.50 + 0.05 = 1.0	1400 p = 0.7	600 q = 0.3

6
3:28 PM

Microevolution

Using the Hardy-Weinberg Principle

$p^2 + 2pq + q^2 = 1$

	C^R frequency $p=0.7$	C^W frequency $q=0.3$
C^R frequency $p=0.7$	 $C^R C^R = p^2$	 $C^R C^W = pq$
C^W frequency $q=0.3$	 $C^W C^R = pq$	 $C^W C^W = q^2$

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa 7
3:28 PM

hardy weinberg equation

state that in a population there is a given set of alleles.

Can predict the mix of alleles for the next generation by frequency of alleles in the first gen.


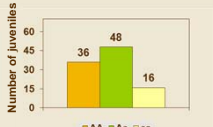
Allele frequencies in populations

(Each of the 20 adults produces 10 gametes)

Initial allele frequencies in gametes	
A 0.6	a 0.4

• A: $2 \times 36 + 48 = 120/200 = 0.6$
 • a: $48 + 2 \times 16 = 80/200 = 0.4$
 • Final = Initial frequency

Final allele frequencies	
A 0.6	a 0.4

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa 8
3:28 PM

Hardy-Weinberg principle's assumptions

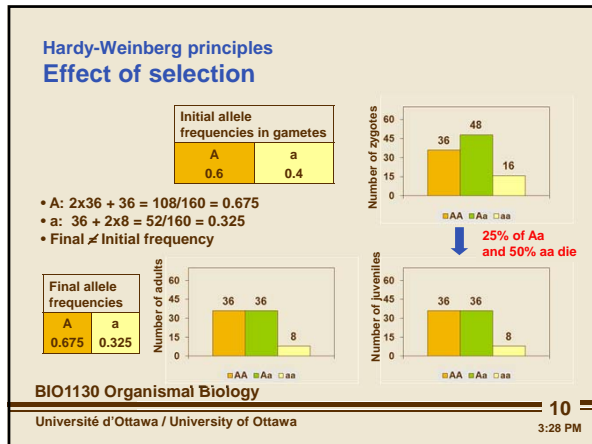
- No natural selection
- No mutation
- No genetic drift – population is large
- Gene flow
- Random mating

BIO1130 Organismal Biology

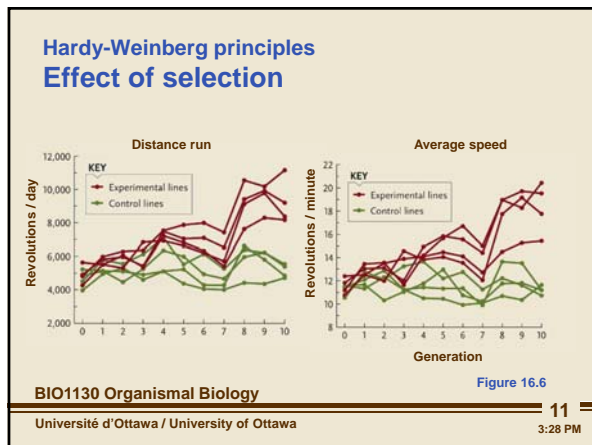
Université d'Ottawa / University of Ottawa 9
3:28 PM

hardy weinburg equilibrium = no microevolution

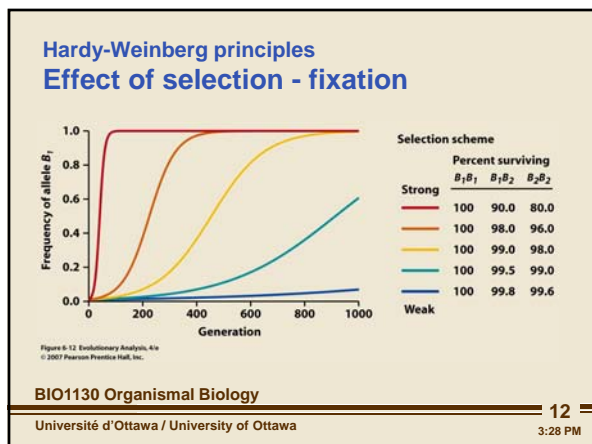
Microevolution



selection is a case of eliminating some of the alleles because they are not fit enough and are not passed through. Thus hardy equilibrium is not reached.



active mice breed with their own kind (also active). altering the genetics of the pool and selective and preventing certain groups from mating.



blue- not much change in frequency.
 red- can quickly eliminate an allele in a population. -high selection pressure.
 example crops: most alleles are fixed, genetic variability eliminated.

Microevolution

Hardy-Weinberg principles
Effect of selection – against recessive

Initial allele frequencies in gametes	
A	a
0.6	0.4

A: $2 \times 36 + 48 = 120/168 = 0.714$
a: $48 + 0 = 48/168 = 0.286$
Final \neq Initial frequency

Final allele frequencies	
A	a
0.714	0.286

Number of zygotes: AA=36, Aa=48, aa=16

Number of juveniles: AA=36, Aa=48, aa=0

All of aa die

BIO1130 Organismal Biology 13
 Université d'Ottawa / University of Ottawa 3:28 PM

individuals with aa do not pass their alleles on

Hardy-Weinberg principles
Effect of selection – against recessive

Frequency of lethal recessive allele vs Generation

Frequency of viable dominant allele vs Generation

BIO1130 Organismal Biology 14
 Université d'Ottawa / University of Ottawa 3:28 PM

never remove the gene from population.

is important because we don't lose the genetic variability from the population, only reduce the frequency.

Hardy-Weinberg principles
Effect of selection – for heterozygote

Frequency of viable allele vs Generation

BIO1130 Organismal Biology 15
 Université d'Ottawa / University of Ottawa 3:28 PM

heterozygote has an advantage. They are surviving better than the homozygote.

Microevolution

Hardy-Weinberg principles
Mutation – sickle cell

BIO1130 Organismal Biology Figure 14-21

16
Université d'Ottawa / University of Ottawa 3:28 PM

point mutation: one nucleotide changes.

RBC's change their shape.

Heterozygote :some RBC's are normal some of them are sickle shaped, sickle shaped do not load and transport oxygen.

Hardy-Weinberg principles
Effect of selection – for heterozygote

BIO1130 Organismal Biology Figure 16.14

17
Université d'Ottawa / University of Ottawa 3:28 PM

sickle cell anemia advantageous in areas with most cases of malaria.

liver will destroy sickle cells.

mechanism that destroys sickle cells also destroys malaria (if it has the disease)

if no sickle cell, liver does not remove malfunctioning cells.

heterozygous sickle cell is advantageous

Quantitative variation

BIO1130 Organismal Biology Figure 16.3

18
Université d'Ottawa / University of Ottawa 3:28 PM

most phenotypes are polygenetic

- not just one allele responsible for it.

extremely rare in populations to see a single allele.

cant use H-W with mixed genes.

Use normal curve and Standard deviation by looking at population and making distribution curve.

Microevolution

Selection with multiple loci traits

- Directional selection
- Stabilizing selection
- Disruptive selection



Figure 17.10 Evolutionary Analysis, 6/e
© 2007 Pearson Education, Inc.

19
3:28 PM

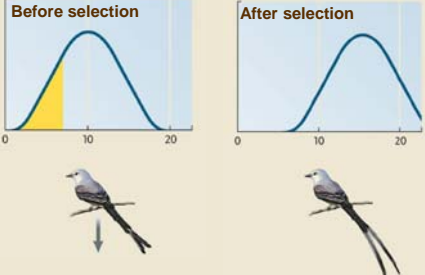
normal distribution with height.

measure characteristic in a population and see if normal distribution is

the same after some # of gen.

if both curves are the same, then no evolution.

Selection with multiple loci traits
Directional selection



BIO1130 Organismal Biology
Université d'Ottawa / University of Ottawa

Figure 16.9a
20
3:28 PM

tail on birds show fitness of mail birds. females will generally breed with

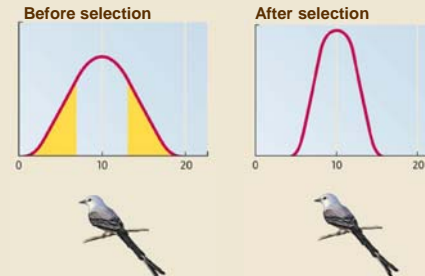
birds that have long tails.

the mean has shifted, <-- directional selection

shifts traits away from existing mean to the favoured extreme. it is very

common.

Selection with multiple loci traits
Stabilizing selection



BIO1130 Organismal Biology
Université d'Ottawa / University of Ottawa

Figure 16.9b
21
3:28 PM

getting rid of variation around the mean trait.

individuals express intermediate phenotypes

have the highest relative fitness. by

eliminating phenotypic extremes, stabilizing

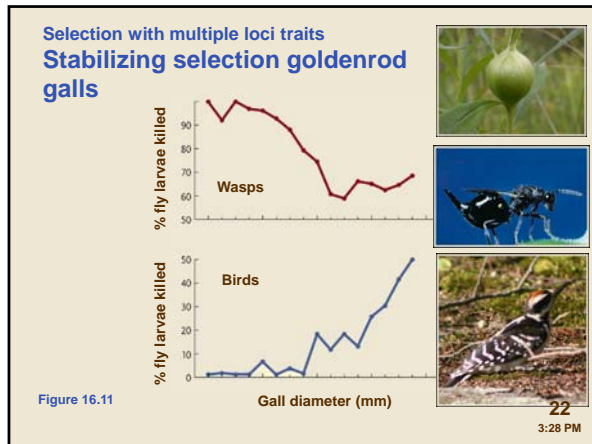
selection reduces genetic and phenotypic

variation and increases frequency of

intermediate phenotypes. Most common

type of natural selection.

Microevolution



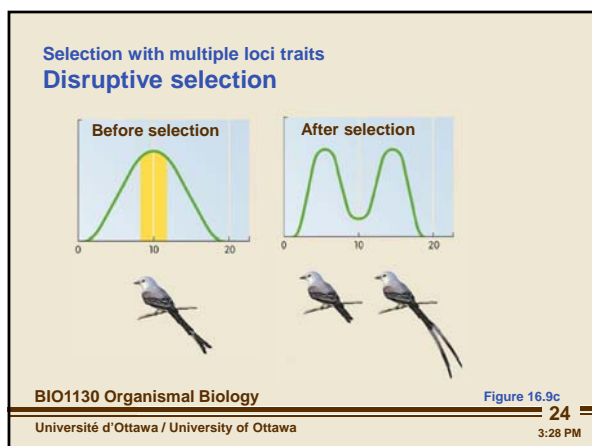
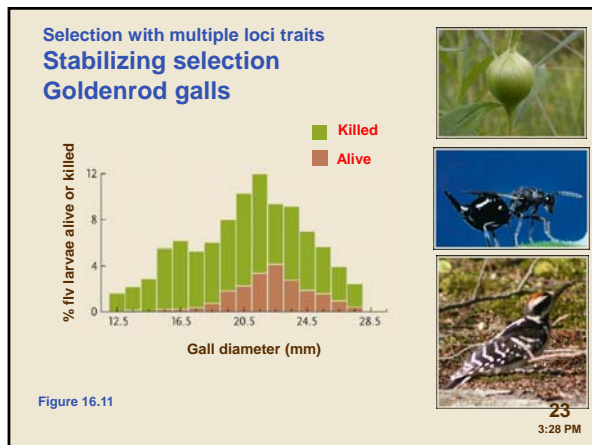
wasps can best attack the maggots while they are inside the small galls.

when the Galls are big, woodpeckers attack the maggots.

small galls and big galls are removed from population.

optimum gall size- too big for wasp, too small for birds.

stabilizing selection around intermediate gall size.



stabilize and go remove the middle of the distribution curve.

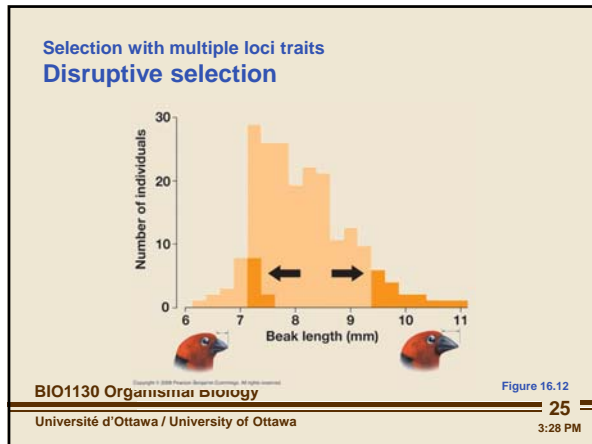
potential for new organism or species. when extreme phenotypes have

higher relative fitness than the intermediate phenotype. alleles

producing extreme phenotypes become more common promoting

polymorphism. less common.

Microevolution



Darwin's finches.

beak size becomes correlated with seed size. full range of beak sizes

because all types of seeds were available. 3 year Drought took place

and the smallest and biggest birds with beaks survived. the middle

died.

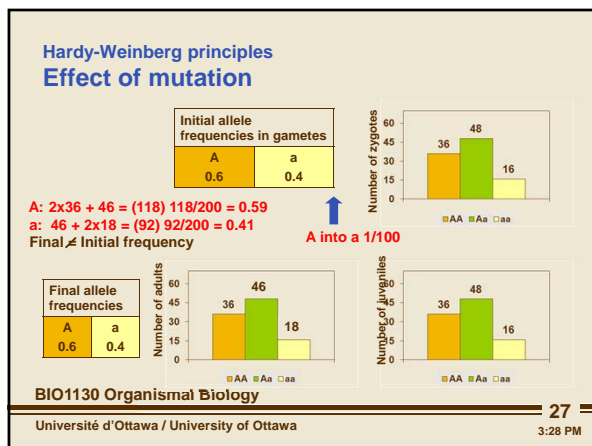
Hardy-Weinberg principle's assumptions

- No natural selection
- No mutation
- No genetic drift – population is large
- Gene flow
- Random mating

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa

26
3:28 PM



Microevolution

Hardy-Weinberg principles
Mutation

- Beneficial
- Neutral
- Deleterious

BIO1130 Organismal Biology Figure 16-20

Université d'Ottawa / University of Ottawa 28
3:28 PM

mutations are primarily neutral/ have no effect.

Genetic code

	U	C	A	G
U	UUU Phe UUC Phe UUA Leu UUG Leu	UCU Ser UCC Ser UCA Ser UCG Ser	UAU Tyr UAC Tyr UAA UAG	UGU Cys UGC Cys UGA UAG UGG Trp
C	CUU Leu CUC Leu CUA Leu CUG Leu	CCU Pro CCC Pro CCA Pro CCG Pro	CAU His CAC His CAA His CAG His	CGU Arg CGC Arg CGA Arg CGG Arg
A	AUU Ile AUC Ile AUA Ile AUG Met	ACU Thr ACC Thr ACA Thr ACG Thr	AAU Asn AAC Asn AAA Lys AAG Lys	AGU Ser AGC Ser AGA Ser AGG Ser
G	GUU Val GUC Val GUA Val GUG Val	GCU Ala GCC Ala GCA Ala GCG Ala	GAU Asp GAC Asp GAA Asp GAG Asp	GGU Gly GGC Gly GGA Gly GGG Gly

KEY
Ala = alanine
Arg = arginine
Asn = asparagine
Asp = aspartic acid
Cys = cysteine
Gln = glutamine
Glu = glutamic acid
Gly = glycine
His = histidine
Ile = isoleucine
Leu = leucine
Lys = lysine
Met = methionine
Phe = phenylalanine
Pro = proline
Ser = serine
Thr = threonine
Trp = tryptophan
Tyr = tyrosine
Val = valine

BIO1130 Organismal Biology Figure 14-5

Université d'Ottawa / University of Ottawa 29
3:28 PM

many codons code for same amino acids

many occur from chromosomal rearrangements

Hardy-Weinberg principles
Mutation

- Point mutations (the red big fly had one red eye)
 - Silent
 - Missense (thr one big fly had one red eye)
 - Nonsense (the one big)
 - Frame shift (the one rbi gfl yha don ere dey)
- Chromosomal mutations

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa 30
3:28 PM

nonsense: codon turns into termination codon. not going to get the full sequence.

frame shift: reading is out of order causing everything else to be out of order as well.

silent: no affect

Microevolution

Hardy-Weinberg principles
Mutation

- Point mutations
- Chromosomal mutations
 - Inversions
 - Translocation
 - Deletion
 - Duplication
 - Crossing over
 - Polyploidy
 - Genome duplication

Inversion

Translocation

BIO1130 Organismal Biology
Université d'Ottawa / University of Ottawa

31
3:28 PM

when the pact breaks, most of the time it is fixed perfectly, but

sometimes it is not and causes inverse mutation.

translocation: break on 2 separate chromosomes

Hardy-Weinberg principles
Mutation

- Point mutations
- Chromosomal mutations
 - Inversions
 - Translocation
 - Duplication
 - Deletion
 - Crossing over
 - Polyploidy
 - Genome duplication

Deletion

Duplication

BIO1130 Organismal Biology
Université d'Ottawa / University of Ottawa

32
3:28 PM

deletion: things get lost.

Hardy-Weinberg principles
Chromosomal mutations – crossing over

paternal

maternal

mixed maternal

and paternal

BIO1130 Organismal Biology
Université d'Ottawa / University of Ottawa

33
3:28 PM

ends break and arms are exchanged.

genetic information material is swapped between chromosomes.

Microevolution

Hardy-Weinberg principles
Chromosomal mutations – polyploidy

$2n = 6$ Meiosis Self-fertilization $4n = 12$

BIO1130 Organismal Biology Figure 18-24

34
Université d'Ottawa / University of Ottawa 3:28 PM

meiosis has failed. doubling of chromosome number. Gametes fuse,
double chromosomes. (polyploidy)

Hardy-Weinberg principles
Chromosomal mutations – polyploidy

Species A $2n=6$ Meiosis Fertilization Mitosis Meiosis Self-Fertilization Tetrapod zygote $2n=12$

Species B $2n=6$ Meiosis

BIO1130 Organismal Biology Figure 18-25

35
Université d'Ottawa / University of Ottawa 3:28 PM

Hardy-Weinberg principle's assumptions

- No natural selection
- No mutation
- No genetic drift – population is large
- Gene flow
- Random mating

BIO1130 Organismal Biology 36

Université d'Ottawa / University of Ottawa 3:28 PM

Microevolution

Hardy-Weinberg principles
Genetic drift

Initial allele frequencies in gametes

A	a
0.6	0.4

Drift

Number of zygotes

AA	Aa	aa
31	49	20

- A: $2 \times 31 + 49 = 111/200 = 0.555$
- a: $49 + 2 \times 20 = 89/200 = 0.445$
- Final \neq Initial frequency

Final allele frequencies

A	a
.555	.445

Number of adults

AA	Aa	aa
31	49	20

Number of juveniles

AA	Aa	aa
31	49	20

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa

37 3:28 PM

didn't get accurate sample of the population that was there.

Hardy-Weinberg principles
Genetic drift

Population size = 4

Frequency of allele A_1

Population size = 400

Frequency of allele A_1

Generation

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa

38 3:28 PM

loss of genetic variation when we subset a population.

big pop- don't lose the variation

Hardy-Weinberg principles
Genetic drift – bottleneck effect

Parent population

Bottleneck (drastic reduction in population)

Surviving individuals

Next generation

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa

39 3:28 PM

next gen. only a subset of genetic variation that was there.

bottleneck effect is the dramatic reduction of the population.


(elephant seal, american buffalo)

stressful factor such as disease, hunting etc... dramatically

reduces population. This reduces genetic variation

Microevolution

Hardy-Weinberg principles
Genetic drift – Founder affect



BIO1130 Organismal Biology
Université d'Ottawa / University of Ottawa

40
3:28 PM

bottleneck effect, smaller population is in its original location.

Founder effect, smaller population is isolated from other groups, can

react differently to the new environment

(new spiders in NYC after sandy)

consequence of founding: genetic disorders because of loss of genetic

variation... (this area in quebec, entire population made from 600

individuals) when a small population recolonizes. only carry small

sample of parent genetic variation. chance of some alleles may be

missing.

new genes added to the population that gets integrated but doesnt add

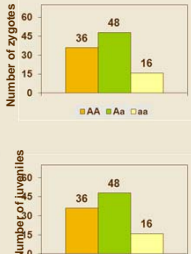
up properly, Thus, no HW equilibrium

Hardy-Weinberg principles
Gene flow - migration

Initial allele frequencies in gametes	
A	a
0.6	0.4

- A: $2 \times 36 + 48 = 120/250 = 0.48$
- a: $48 + 2 \times 41 = 130/250 = 0.52$
- Final \neq Initial frequency

Final allele frequencies	
A	a
0.48	0.52



Number of zygotes: AA=36, Aa=48, aa=16

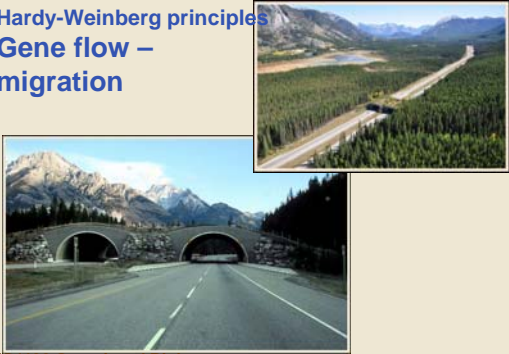
Number of juveniles: AA=36, Aa=48, aa=16

25 aa individuals

BIO1130 Organismal Biology
Université d'Ottawa / University of Ottawa

41
3:28 PM

Hardy-Weinberg principles
Gene flow – migration



BIO1130 Organismal Biology
Université d'Ottawa / University of Ottawa

42
3:28 PM

from fragmented habitat. isolation of population, cause bottleneck

effect. conservation tries to reconnect these fragmented habitats

causing migration of organisms causing genetic variability of 2

population becomes genetic variability of 1 population.

(Y to Y project)

Microevolution

Hardy-Weinberg principle's assumptions

- No natural selection
- No mutation
- No genetic drift – population is large
- Gene flow
- Random mating

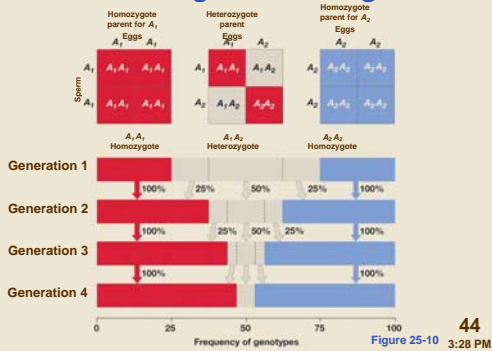
BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa

43

3:28 PM

Hardy-Weinberg principles Nonrandom mating - Inbreeding



44

3:28 PM

consequence of inbreeding: after 5 or 6 generation of inbreeding, the

Heterozygosity disappears.

no microevolution

individuals that are genetically related mate with each other.

Hardy-Weinberg principles Nonrandom mating - Sexual dimorphism



45

3:28 PM

sexual dimorphism- differences in males and females is visibly clear.

Females have limited number of eggs that they can produce... same

with insects and animals. she invests alot of energy and time.

male produces sperm little or no energy for ever that want to reproduce

forever, females have to decide carefully to pick a male for best sperm.

males have signals and reactions that try to say they have the best

sperm. (dances, fights, fitness). After that, the females can tell which

male is the most fit for mating.

Microevolution

Hardy-Weinberg principles
Nonrandom mating - sexual selection

- **Sexual selection**
 - On males – female choice
 - On males – competition
 - Combat
 - Sperm competition
 - Infanticide

BIO1130 Organismal Biology 46
Université d'Ottawa / University of Ottawa 3:28 PM

Hardy-Weinberg principles
Sexual selection
female choice

riflebird
Tail feathers

Tail Feather Type	Mean number of mates/male
Shortened	~0.5
Normal	~0.8
Lengthened	~1.8

Figure 16-13

BIO1130 Organismal Biology 47
Université d'Ottawa / University of Ottawa 3:28 PM

birds with long tails are more likely to mate with females.

were not going to get HW equilibrium because most of the same trait is

passed on to next generation (long tails), selective advantage.

this is non-random mating.

Hardy-Weinberg principles
Sexual selection
Male competition - combat

Lifetime reproductive success: Number of offspring weaned	Percentage of males born
0	~90
1-10	~5
11-20	~2
41-50	~1
81-100	~1

Seals V1
Seals V2

BIO1130 Organismal Biology 48
Université d'Ottawa / University of Ottawa 3:28 PM

<-- elephant seals.


1 male mating with almost all of females.

males fight each other to show they are the most fit and deserve to

mate.

Microevolution

Hardy-Weinberg principles
Sexual selection
Male competition - combat



Percentage of females born


Lifetime reproductive success: Number of offspring weaned	Percentage of females born
0	75
1-10	40
11-20	10
41-50	5
81-100	2

Lifetime reproductive success: Number of offspring weaned

BIO1130 Organismal Biology 49
Université d'Ottawa / University of Ottawa 3:28 PM

Hardy-Weinberg principles
Sexual selection
Male competition – sperm competition

Copulatory wheel



BIO1130 Organismal Biology 50
Université d'Ottawa / University of Ottawa 3:28 PM

male scrapes and cleans out the females seminal vesicle full of sperm
from another organism and puts his inside to make sure his sperm is
fertilized. indirect male competition.

Hardy-Weinberg principles
Sexual selection
Male competition – infanticide



BIO1130 Organismal Biology 51
Université d'Ottawa / University of Ottawa 3:28 PM

1 dominant male with 5-6 females <-- social structure.
male is not related to the others. when the new dominant male
replaces the old one, it kills any cubs that were tied to the old male and
replaces them with his own.

Microevolution



Speciation

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa

52
3:28 PM

aprox 8.7 million different types of organisms living on Earth.

found constant algorithm across the Linneaus class system. K P C O F G S.

7 million undiscovered.

will take couple of thousand years to identify 7 million because it took 200 some years since taxonomy to identify 1.3 million.

Species concepts – what is a species?

- **Biological species**
- **Phylogenetic species**
- **Ecological species**
- **Morphospecies**

Species are groups of actually or potentially interbreeding populations, which are reproductively isolated from other such groups.

Ernst Mayer (1942)

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa

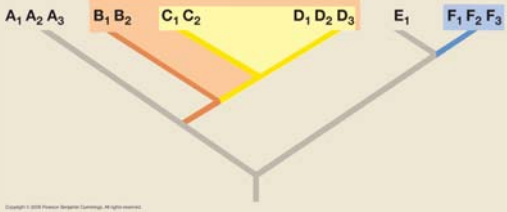
53
3:28 PM

some mechanism that prevents them from breeding with each other.

name of specie can be a problem: commodity called canola, was called rape seed and they used that for lamp oil, car engines etc... now it was said it was toxic to humans because of acid it contained. Canada food couldn't use it because it was banned to use it as food commodity so they requested name change for this new substance.

biological species definition excludes bacteria and archea. ex: e-coli is not valid under biological. cant use fossils.

Species concepts
Phylogenetic species



BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa

54
3:28 PM

end of the cladistic ex: D1D2D3 can be seen as phylogenetic species.


Cladogram can never stop branching.

question is where do we stop branching?

DEFINITION: species as a group of organisms bound by a unique ancestry.

Microevolution

Species concepts
Morphospecies



Yellow throated warbler Yellow rumped warbler

Figure 18.4

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa

55
3:28 PM

distinguished based on morphology.

Species concepts

- Biological species
- Phylogenetic species
- Ecological species*
- Morphospecies

BIO1130 Organismal Biology

Université d'Ottawa / University of Ottawa

56
3:28 PM

ecological species: sloppy form of species. species grouped together

based on environment/geographic. not considered as a concept.

Subspecies: species that can breed but are isolated from each other.

i.e wolfs are ancestors of dogs but were considered different.

(interbreed)

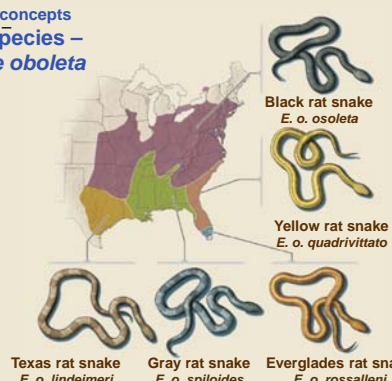
isolating mechanism drives a population to become a separate

species but there is still an opportunity for breeding.

sub species

Species concepts
Ring species –
Elaphe oboleta

Figure 19.12



Black rat snake
E. o. osoleta

Yellow rat snake
E. o. quadrivittata

Texas rat snake
E. o. lindeimeri

Gray rat snake
E. o. spiloides

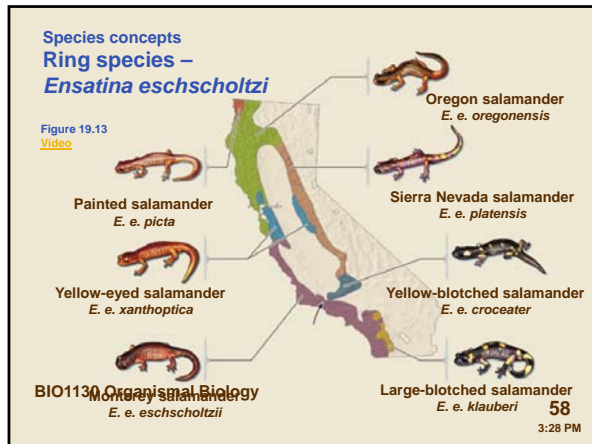
Everglades rat snake
E. o. rossalleni

57
3:28 PM

slowly change in functionality and appearance as they adapt to

different environments. if joined, they can still interbreed.

Microevolution



isolation between the physical barrier caused subspeciation.

one side the salamanders acquired camouflage which blended them

into their environment so they could survive and produce offspring.

on the other side, salamanders changed in color showing they are

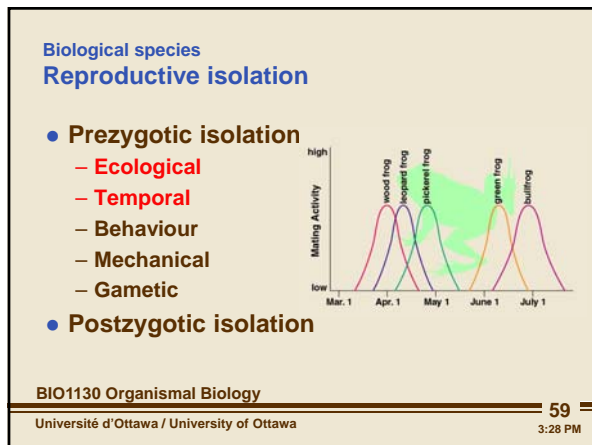
poisonous (advertise with bright colouration). these are less likely to

survive compared to the others

the 2 groups have changed so much they are about to become different

species. gradual change, divergence and isolation at play.

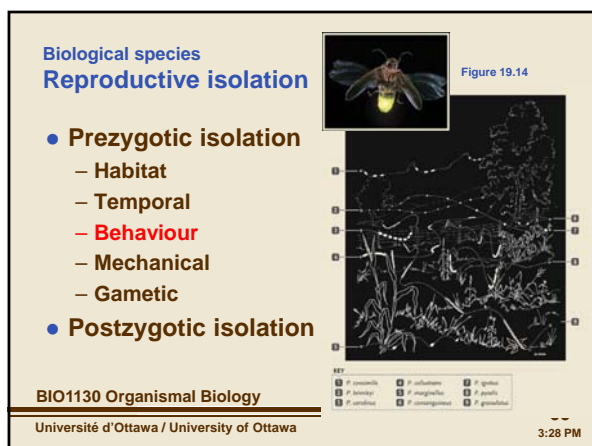
can interbreed, hybrid does not have colouration that will help it survive.



ecological: ecologically could not come into contact with each other

thus cannot mate. different environment.

Temporal: reproductive cycle at different times of the year or day.



flash intermittent signals, specie specific. Each specie has different

signals. Females only look for the right signal so only same specie

come together.

problem: some females pretend to be from other species by sending

their own signals (not their own language) to lure in the male and eat

them to receive protein. they will then call in for their male specie.

Microevolution

Biological species
Reproductive isolation

- **Prezygotic isolation**
 - Habitat
 - Temporal
 - Behaviour
 - **Mechanical** comit orchid
 - Gametic
- **Postzygotic isolation**




Figure 19.15


BIO1130 Organismal Biology
Université d'Ottawa / University of Ottawa

61
3:28 PM

differences in the structure of copulatory organs
prevent successful mating between individuals of
different species

Biological species
Reproductive isolation

- **Prezygotic isolation**
 - Habitat
 - Temporal
 - Behaviour
 - **Gametic**
- **Postzygotic isolation**



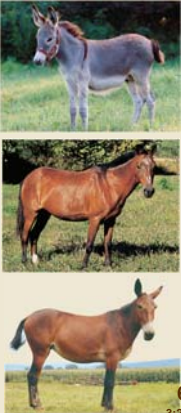
BIO1130 Organismal Biology
Université d'Ottawa / University of Ottawa

62
3:28 PM

eggs that will not be fertilized by any sperm. Can only recognize the
specie sperm and then fertilize.

Biological species
Reproductive isolation

- **Prezygotic isolation**
- **Postzygotic isolation**
 - Hybrid inviability
 - Hybrid sterility
 - Hybrid breakdown



63
3:28 PM

hybrid inviability: egg will never develop. egg and sperm may fertilize
but will not undergo maturation. usually die as embryos or early stage
in life. development instructions from parents may be incompatible.

sterility: mules are sterile, can never reproduce. parent species differ in
the number or structure of chromosomes which cannot pair properly
during meiosis.

breakdown: Salamanders, hybrids, missing vital information to survive

Microevolution

Allopatric Speciation - Vicariance

BIO1130 Organismal Biology Figure 19.16

Université d'Ottawa / University of Ottawa 64
3:28 PM

allopatric: environment separation and over time will lead to different speciation. once barrier is removed, cannot reproduce.

after separation of gondwana- mammals in Africa and birds evolved in south America

happens in 2 steps. 1) geographic isolation (pop geographically isolated from the rest) 2) reproductive isolation. in their new group they reproduce, experience mutation and natural selection and genetic drift, may accumulate genetic differences that isolate them reproductively.

Allopatric Speciation - Dispersal

BIO1130 Organismal Biology Figure 19.18

Université d'Ottawa / University of Ottawa 65
3:28 PM

population moves to different area and evolves into different specie.

Grylloblattid – Ice age vicariance

Video

BIO1130 Organismal Biology 66

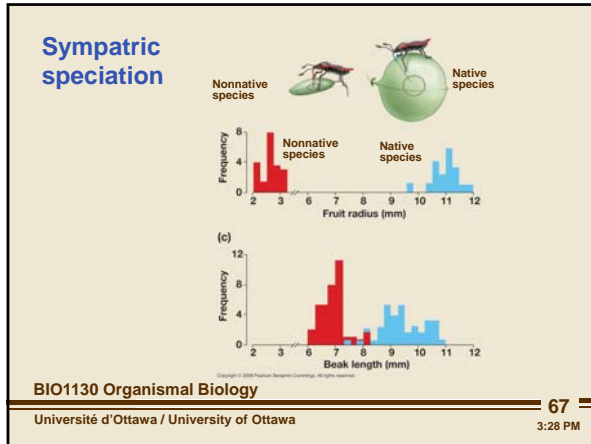
Université d'Ottawa / University of Ottawa 3:28 PM

survivor of the last ice age.

lives on top of highest mountain peaks that poke through the ice.

adapted to temperature. If its body temperature raises above 7 degrees it will cook and die. can still function below 5-15 degrees and will not freeze. They are isolated on mountains, each mountain has different specie of this insect.

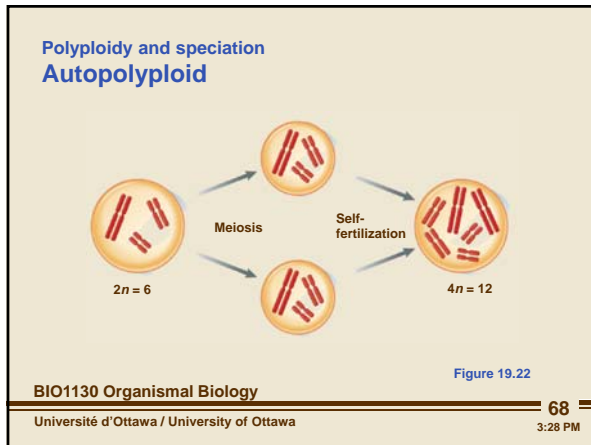
Microevolution



when a nonnative specie accidentally was introduced, it fed on small seeds whereas the natives fed on large seeds.

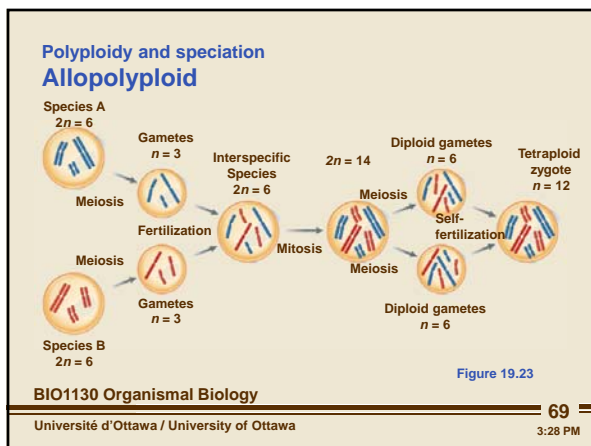
can be a type of reproductive isolating mechanism.

cannot replicate with one another even when they are sharing the same environment at the same time. as well as with food.

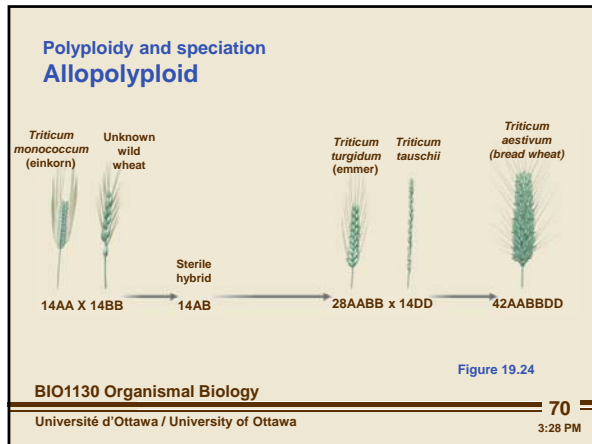


meiosis doesnt produce haploid gametes.

joins to make poliploid cell.



Microevolution



polyploid from 3 different species of Triticum.

3rd specie was never found and is missing

allopoloid did not disperse its seeds rather than using wind.