COMMUNITY ECOLOGY

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Raunkiaer's plant Classification : 1953.

on the basis position of perrenating buds.

1. Phanerogams (Phytes) : Perrenating buds present above the ground.

- Mega - more than 30 meter
- Meso - 8 - 30 meter
- Micro - 2 - 8 meter
- Nano - Less than 2 meter.

e.g. Trees, Shrubs, Herb, climbers lianas.

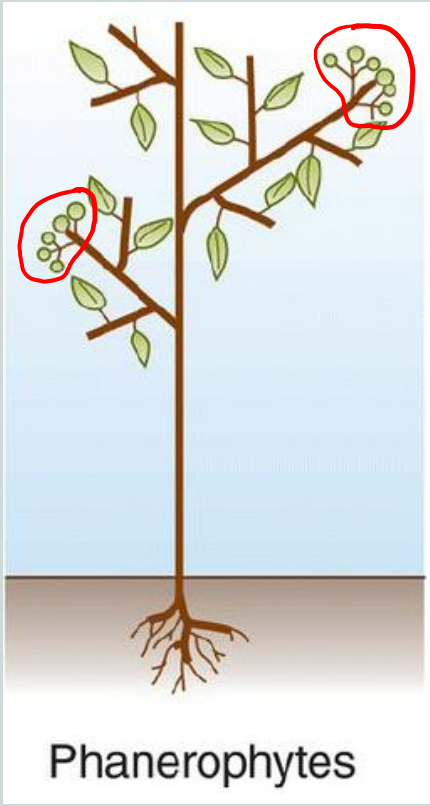
2. Chamaeophytes: Buds are very close to the ground.
   - High altitude
   - Semi-desert



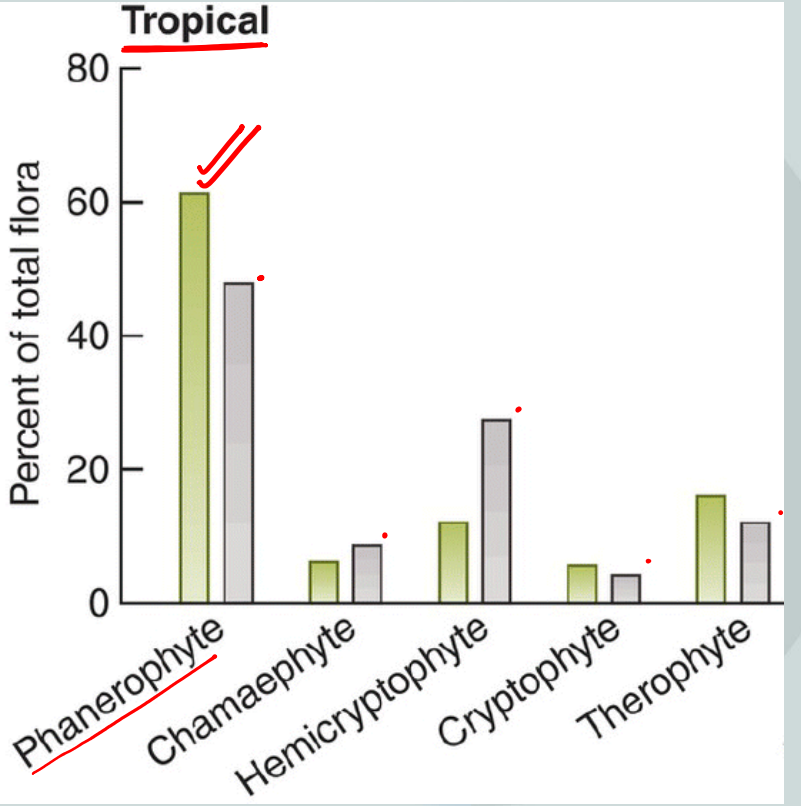
3. Hemi-cryptophytes: Buds are visible only in favourable envi. condition's.
   - Tundra
   - Dry grassland.

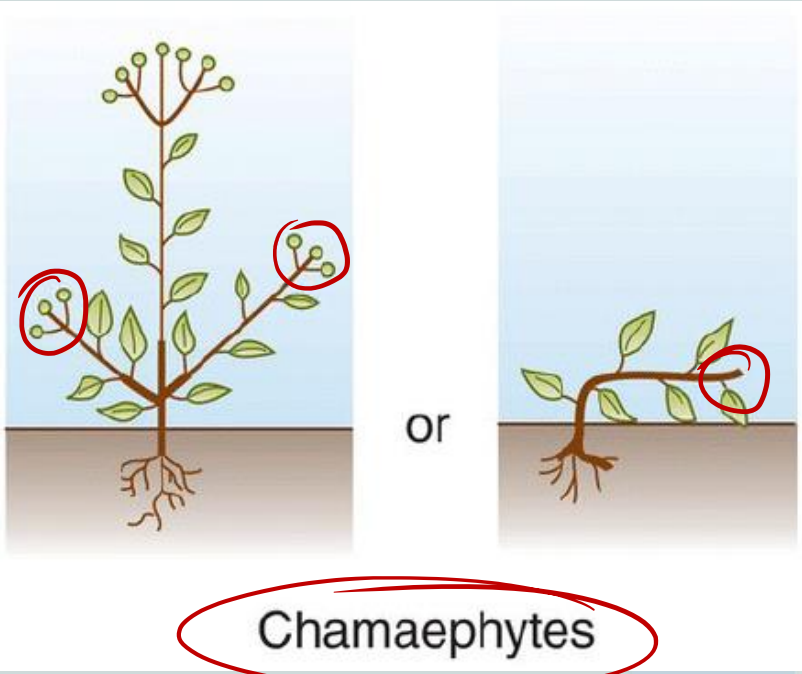
4. Cryptophytes: Underground perrenating buds. e.g. Bulb, Rhizome etc. (Geophytes)

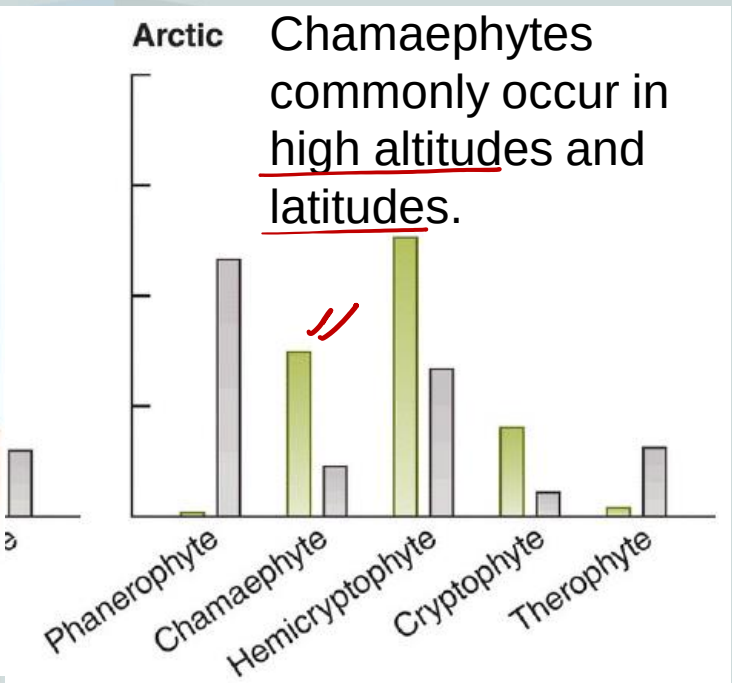
5. Therophytes: Seasonal plants.
   - Visible only in favourable season.



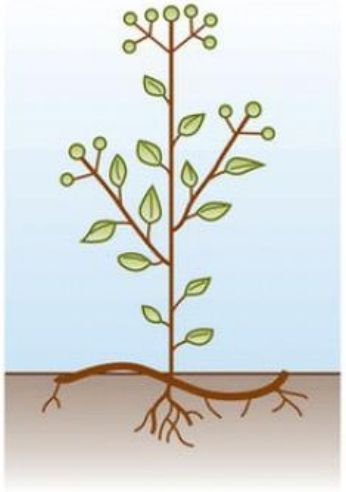
Phanerophytes



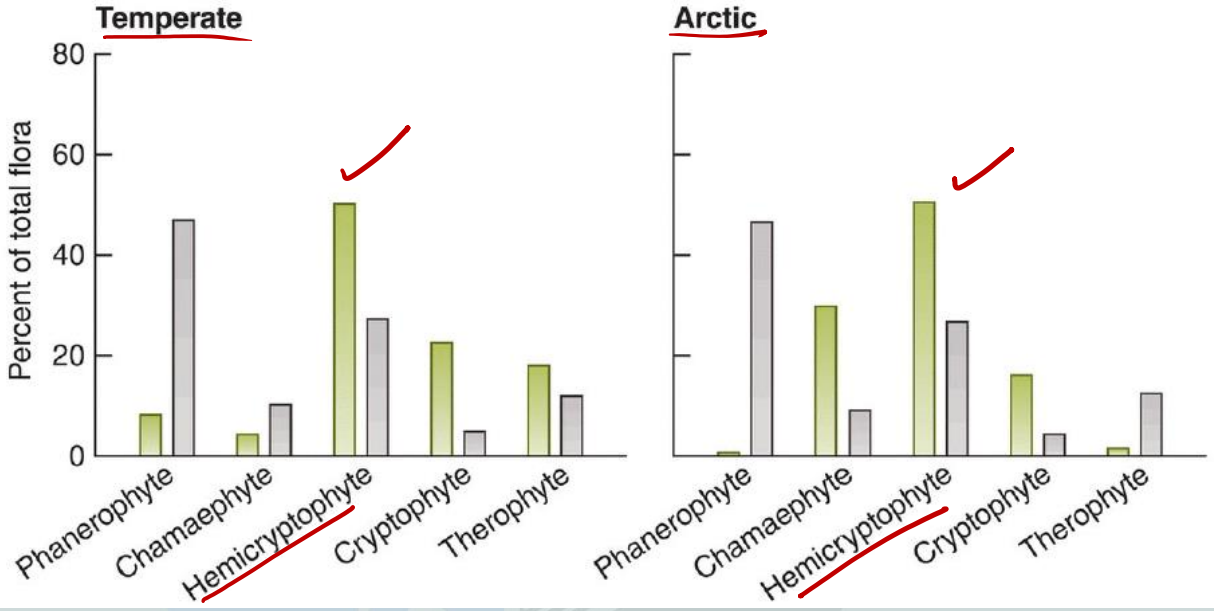


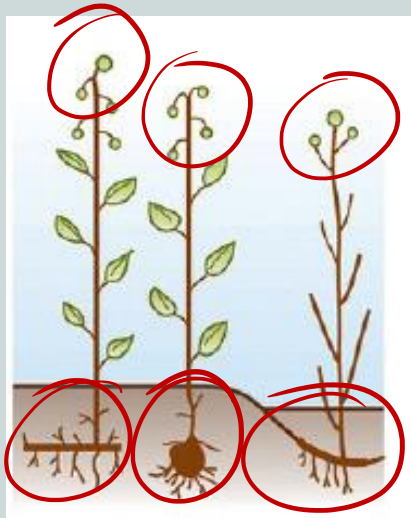


Chamaephytes commonly occur in high altitudes and latitudes.



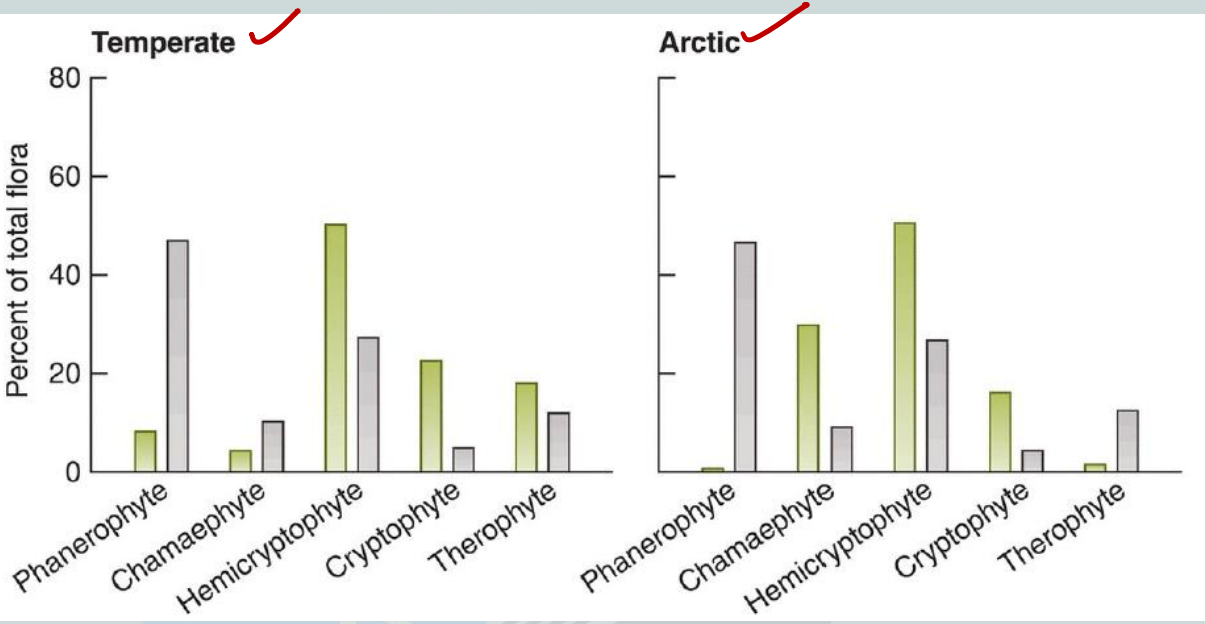
Hemicryptophytes

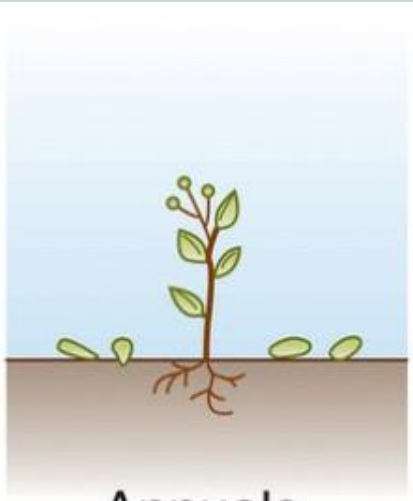




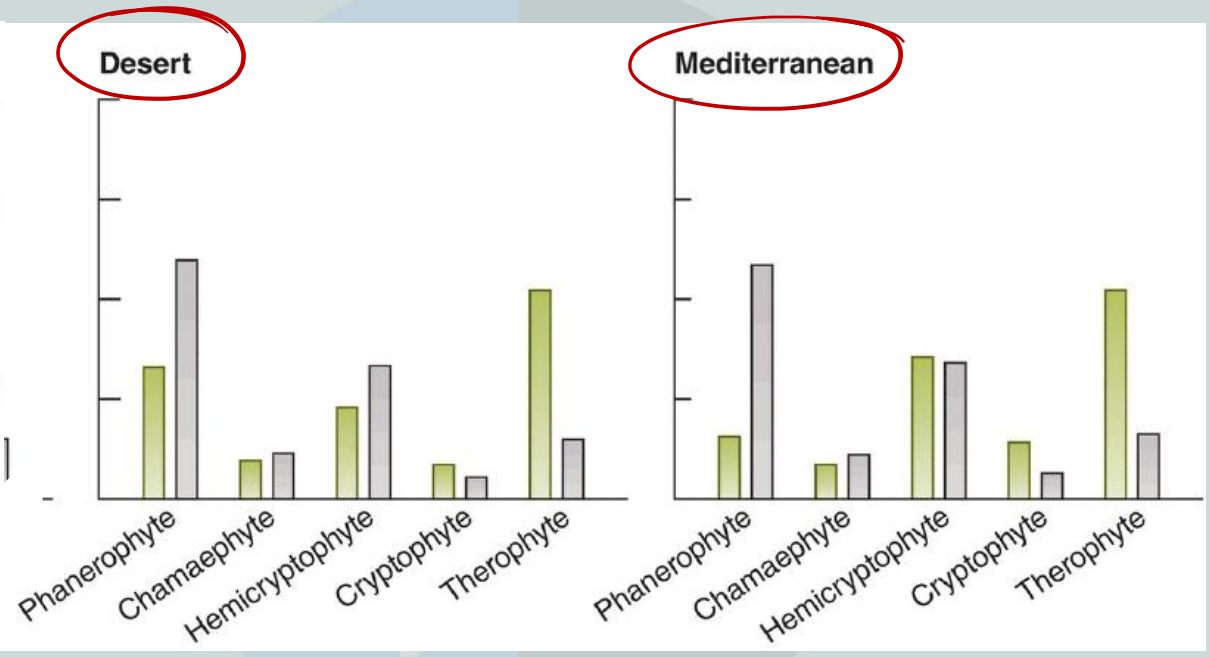
Cryptophytes

(Geophytes)





Annuals
(therophytes)



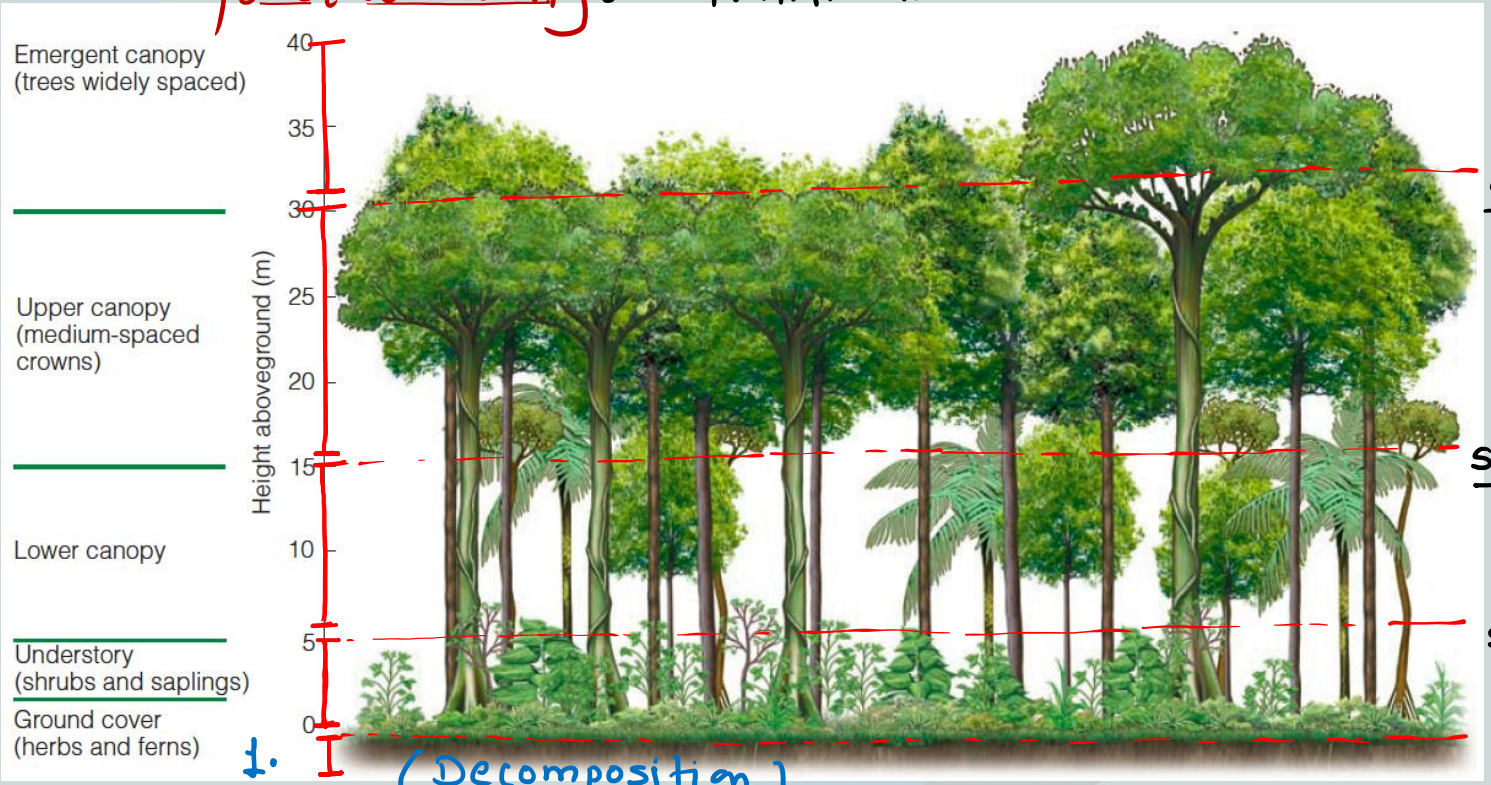
Distribution (percentage) of growth forms for various representative communities based on the Raunkaier system[a]

	Phanerophytes	Chamaephytes	Hemicryptophytes	Cryptophytes	Annuals
World average	46	9	26	6	13
Tropical rainforest	96	2	0	2	0
Subtropical forest	65	17	2	5	10
Warm-temperate forest	54	9	24	9	4
Cold-temperate forest	10	17	54	12	7
Tundra	1	22	60	15	2
Mid-temperate mesophytic forest	34	8	33	23	2
Oak woodland	30	23	36	5	6
Dry grassland	1	12	63	10	14
Semidesert	0	59	14	0	27
Desert	0	4	17	6	73

Structure of Community :

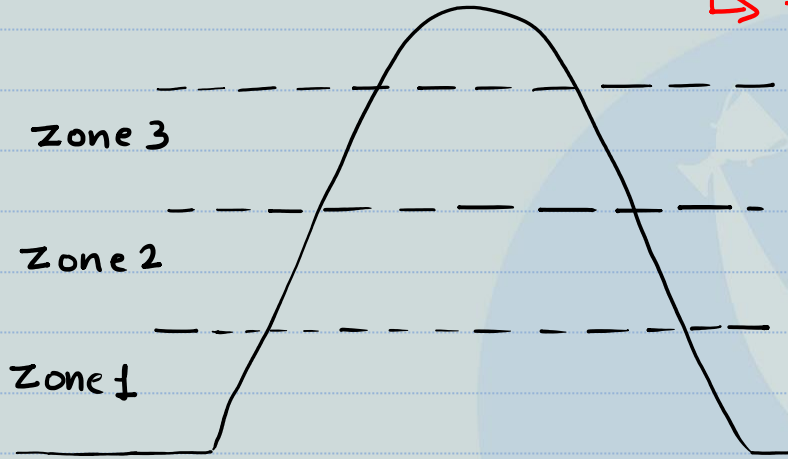
- Vertical approach : e.g. forest - Stratification
- Horizontal approach : e.g. Communities with altitude and depth.
  e.g. Mountain's and Lake.
  - zonation.

forest Community : Stratification.

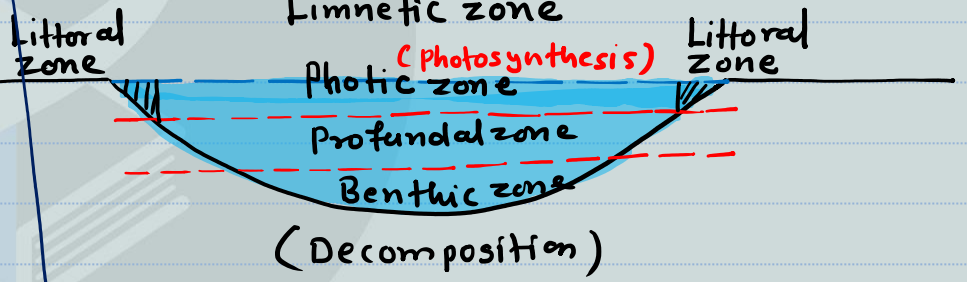


1. (Decomposition)

↳ "Zonation"



"Lake"



Community services

The following lists represent samples of each:

- Provisioning services
  - food (including seafood and game), crops, wild foods, and spices
  - water
  - pharmaceuticals, biochemicals, and industrial products
  - energy (hydropower, biomass fuels)

- Regulating services
  - carbon sequestration and climate regulation
  - waste decomposition and detoxification
  - purification of water and air
  - crop pollination
  - pest and disease control

- Supporting services
  - nutrient dispersal and cycling
  - seed dispersal
  - Primary production

- Cultural services
  - cultural, intellectual and spiritual inspiration
  - recreational experiences (including ecotourism)
  - scientific discovery

#Quantitative traits#

1. Species frequency: Measure of occurance.

$$\text{Sp. freq.} = \frac{\text{Sample's in which sp. is occured}}{\text{total Sample studied.}} \times 100$$

2. Species density: No. of indi. of any species per unit area.

$$\text{Sp. density} = \frac{\text{Total number of Species}}{\text{Total area studied.}}$$

3. Species abundance: No. of species in habitable area / sample.

$$\text{Sp. Abundance} = \frac{\text{Total no. of species}}{\text{Habitable area}}$$

Species	No. of Quadrates studied										Percentage Frequency
	1	2	3	4	5	6	7	8	9	10	
A	✓	✓	✓	✓	✓	✓	✓	✓	–	✓	$\frac{09}{10} \times 100 = 90\%$
B	✓	✓	✓	–	–	✓	✓	–	–	✓	$\frac{06}{10} \times 100 = 60\%$

Table 5.3 *Raunkiaer's normal biological spectrum for phanerogamic flora*

Life forms	% Occurrence
Phanerophytes	46
Hemicryptophytes	26
Therophytes	13
Chamaephytes	09

He generalised his findings in the *law of frequency*

$$A > B > C = D < E$$

"Low freq. species percentage occurance is high in the community."

aunkaier's frequency classification of plant communities

Class	Species with frequency range (%)	Expected % of total occurrence in the community
A	1—20	53
B	21—40	14
C	41—60	9
D	61—80	8
E	81—100	16

Species	No. of indi. in different Quadrates each of 1 square meter size										Total	Density
	1	2	3	4	5	6	7	8	9	10		
A	5	4	7	–	1	3	9	2	8	5	44/10	4.4 / meter sq.
B	5	4	5	4	3	2	1	–	–	–	24/10	2.4/meter sq.

$$\text{Relative freq.} = \frac{\text{Freq. of particular species}}{\text{Total freq. of all the species}} \times 100$$

$$\text{Relative density} = \frac{\text{density of particular species}}{\text{Total density of all the species}} \times 100$$

$$\text{Relative Abundance} = \frac{\text{Abundance of particular species}}{\text{Total Abundance of all the species}} \times 100$$

Important value index :

$$IVI = R.F + R.D + R.A.$$

Diversity index

Based on:

- Species richness
- Species abundance / Evenness
- Species dominance

Dominance index

"D"

- Simpson index (Widely used)

D ranges between 0 and 1.
D = 0 represents : infinite diversity
D = 1 represents : no diversity

- **Gini–Simpson index (1 - D)**
- **Berger-Parker index**

Evenness index (H)

(Information statistic indices)

- Shannon-Weiner Index

The value of ***H*** ranges from 0 to H_{max}.

I.

Simpson's Index of Diversity

- $D = 1 - \Sigma (P_i)^2$

Simpson's Index

- $D = \Sigma (P_i)^2$

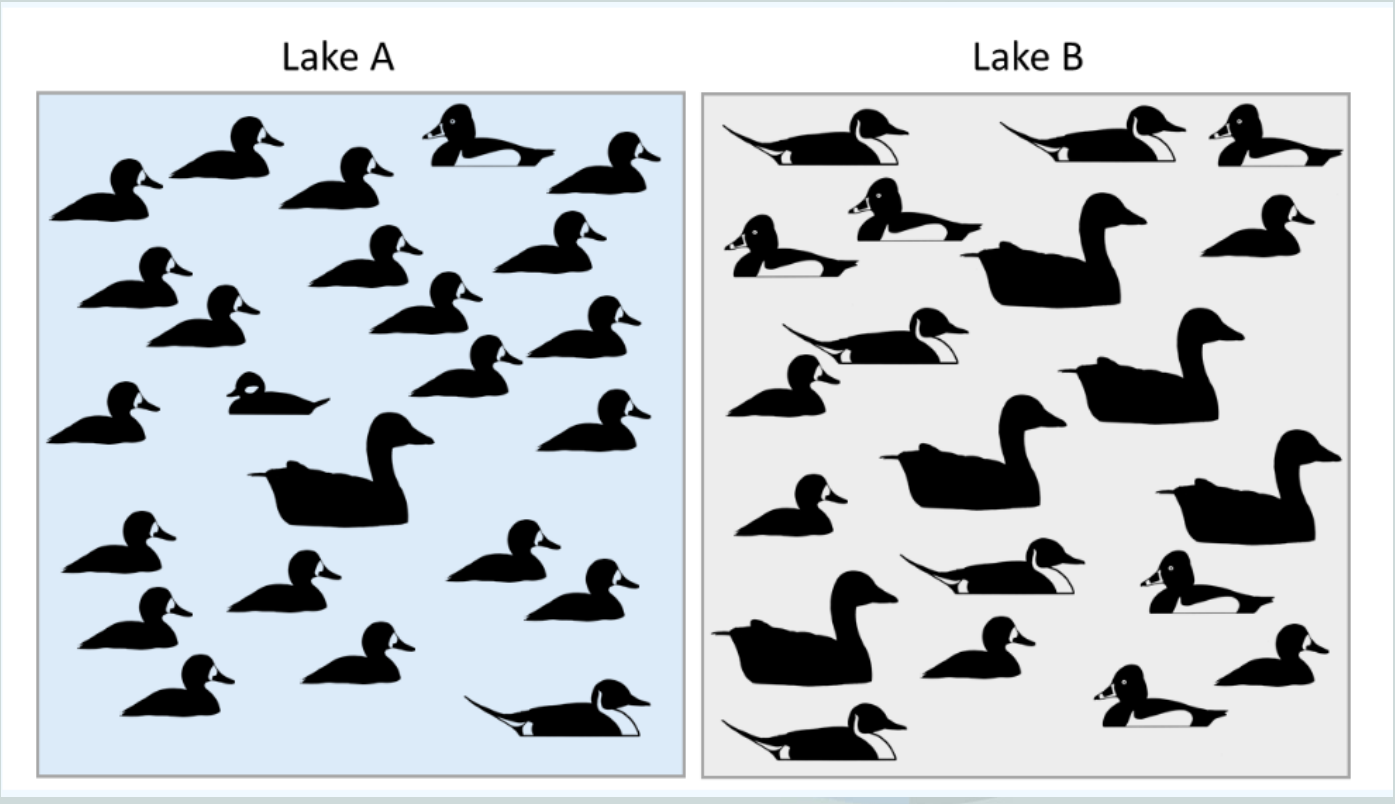
Gini - simpson's Index

- 1 - D

II.

Shannon - Weiner index (H)

- $H = \sum Pi \log Pi$


Lake A
Lake B

$$D = \sum (Pi)^2$$

$$\frac{n}{N} = Pi$$

Lake-A

$D = 0.71$

Dominance

Lake-B

$D = 0.2$

Species diversity

Simpson's Index

	Species (i)	Lake A			Lake B		
		count (n_i)	n_i/N	$(n_i/N)^2$	count (n_i)	n_i/N	$(n_i/N)^2$
	1.	1	1/25 = 0.04	0.0016	5	5/25 = 0.2	0.04
	2.	1	1/25 = 0.04	0.0016	5	5/25 = 0.2	0.04
	3.	1	1/25 = 0.04	0.0016	5	5/25 = 0.2	0.04
	4.	1	1/25 = 0.04	0.0016	5	5/25 = 0.2	0.04
	5.	21	21/25 = 0.84	0.7056	5	5/25 = 0.2	0.04
	S = 5	N = 25	$D = \sum_{i=1}^{S} \left(\frac{n_i}{N}\right)^2$	0.71	N = 25	$D = \sum_{i=1}^{S} \left(\frac{n_i}{N}\right)^2$	0.2

Shannon index (H):

H = 0.661
Lake = A

H = 1.61
Lake = B

Species evenness ↑
↓
Species diversity.

$$H = -\sum p_i \cdot \ln p_i$$

Shannon-Weiner Index

Species (i)	Lake A				Lake B			
	count (n_i)	p_i	$\ln(p_i)$	$p_i * \ln(p_i)$	count (n_i)	p_i	$\ln(p_i)$	$p_i * \ln(p_i)$
 1	1	0.04	-3.219	-0.129	5	0.2	-1.609	-0.322
 2	1	0.04	-3.219	-0.129	5	0.2	-1.609	-0.322
 3	1	0.04	-3.219	-0.129	5	0.2	-1.609	-0.322
 4	1	0.04	-3.219	-0.129	5	0.2	-1.609	-0.322
 5	21	0.84	-0.174	-0.146	5	0.2	-1.609	-0.322
S = 5	N = 25	$H = -\sum_{i=1}^{S} p_i * \ln p_i$		0.661	N = 25	$H = -\sum_{i=1}^{S} p_i * \ln p_i$		1.61

The following table shows the number of individuals of each species found in two communities:

Community	Species			
	A	B	C	D
C1	25	25	25	25
C2	80	05	05	10

Species richness can be measured with the:

1. abundance of species in an area.
2. number and the abundance of species in an area.
3. number of species in an area.
4. density of species in an area.

HAPPY LEARNING

THANKS

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