DIVERSITY INVENTORY

- how many taxa of organisms are there?

- how many in each of the various groups?

what is the quantitative composition of the world's biota?

what should we count?

….what is a species?

12 1

- recall that "species" is not a standard unit

[morphological; biological]

- depends on kind of organism

[available characteristics]

-depends on analysis methods

[molecules; cells; physiology; anatomy]

mostly morphology + physiology

12 2

so bearing in mind this imprecision….

how many species are known?

most estimates are in the order of 10^6

working total = 1.65×10^6

(used in pie-diagrams)

certainly an underestimate

WHY?

12 3

-large, familiar, groups almost entirely known

(though not quite….)

-but most groups probably hugely more numerous than we yet know

e.g. BACTERIA
PROTISTS
FUNGI
NEMATODES
MITES
INSECTS

12 4

-some kinds of habitats are barely known

OCEANS - floors & abyss; vents

TROPICAL FOREST CANOPY
7% vs. >50%; 50-100m.

SOILS
(and deeper…)

OTHERS' BODIES
"entire universes…."

12 5

how many species do we THINK there are?

estimates vary from 10^7 to 10^{11}

(meaning of these numbers)

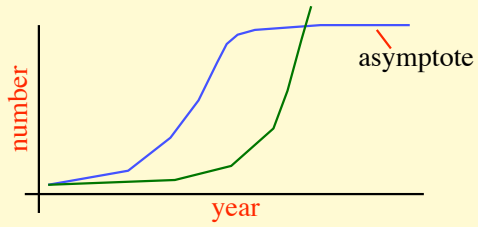
we have little help in choosing among them

but there could *easily* be 10x to 100x what we currently know

12 6

where do estimates come from?

some have tried to use description-rate



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others have used extrapolation
from detailed regional studies

e.g. Erwin's studies of canopy arthropods
in C. & S. America
insecticide "bug-bomb"

163 spp. beetles exclusive to ***Luehea***

50,000 forest tree species

if ***Luehea*** typical…..

>8x10⁶ spp. tropical canopy beetles

12 8

in many studies, beetles represent **40%**
of all arthropod species

so all tropical canopy arthropods
= 20 x 10⁶ species

canopy spp. = 2x ground spp.

so tropical arthropods = 30 x 10⁶ spp.

Erwin claims 50-100 x 10⁶ spp.
arthropods worldwide in all habitats

12 9

how are taxa distributed among groups?

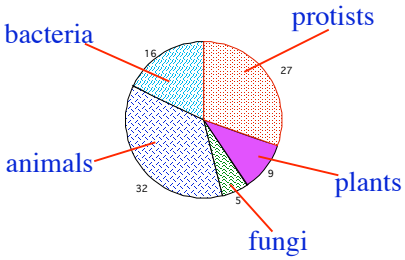
(recall Q of classifications)

following figures based on figures from World Conservation Monitoring Centre

answer depends on what you count

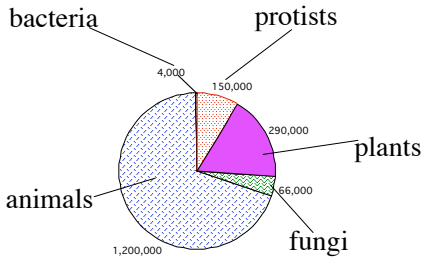
12 10

Earth's biota:
the five kingdoms, counting phyla



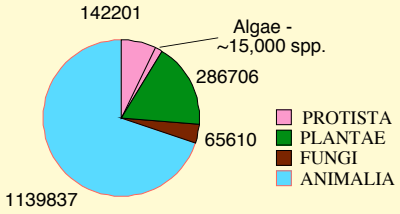
12 11

the same,
but counting species



12 12

Eukaryote kingdom composition by species

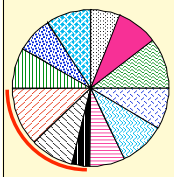


12 13

ANIMAL DIVERSITY

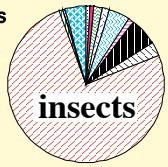
counting…….

ORDERS



Porifera
Radiata
Acoelomates
Pseudocoelomates
Mollusca
Annelida
Chelicerata
Crustacea
Uniramia
Echinodermata
Other coelomates
Chordata

SPECIES



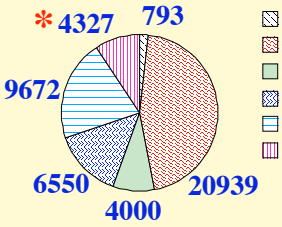
420

10^6+

N.B. arthropods

12 14

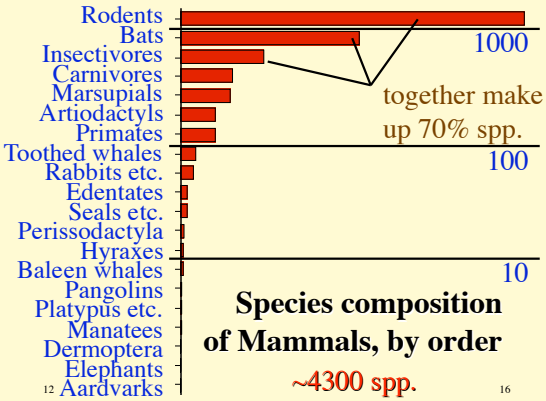
Species composition of the vertebrates by class



Chondrichthyes
Osteichthyes
Amphibia
Reptilia
Aves
Mammalia

~47,000 spp.

12 15



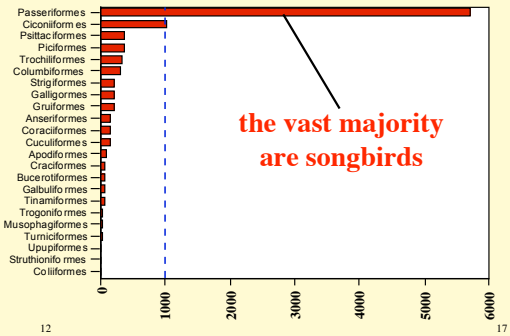
together make up 70% spp.

Species composition of Mammals, by order

~4300 spp.

12 16

…and now the Birds - ~9500 spp.



the vast majority are songbirds

12 17

by now, most of you will have noticed *a pattern* in species abundances…….

just **a few** groups contain **most** of the species

but **most** groups contain **few** of the species

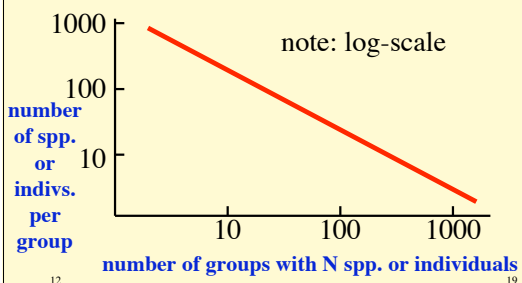
species abundance is highly skewed among groups

this is a very general pattern in ecology, found at most scales of analysis

12 18

few groups are sp.-rich; most are sp.-poor

this is so regardless of total numbers



12 19

NEXT CLASS:

Global patterns in Species Richness

12 20