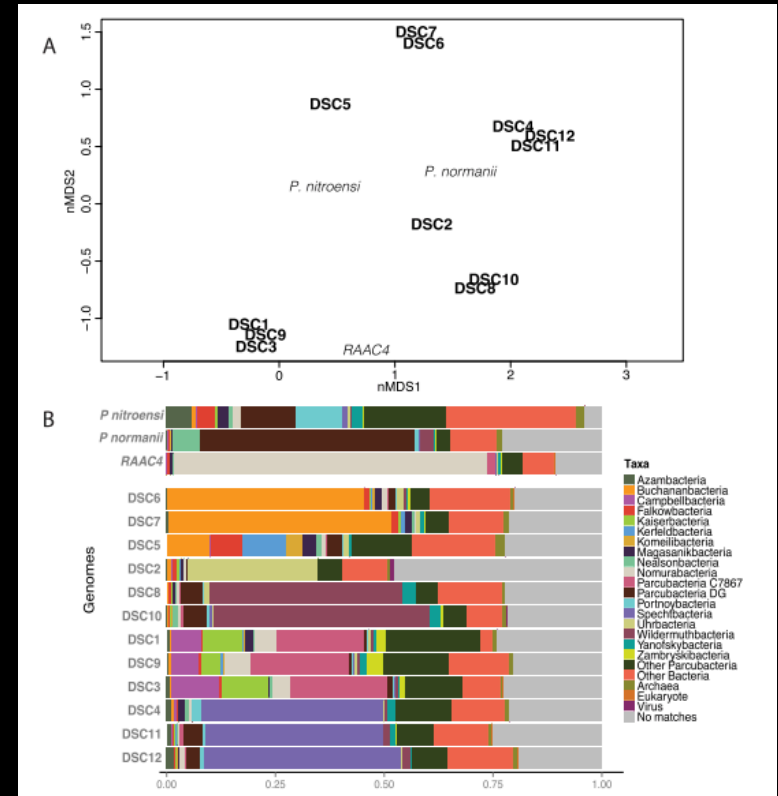


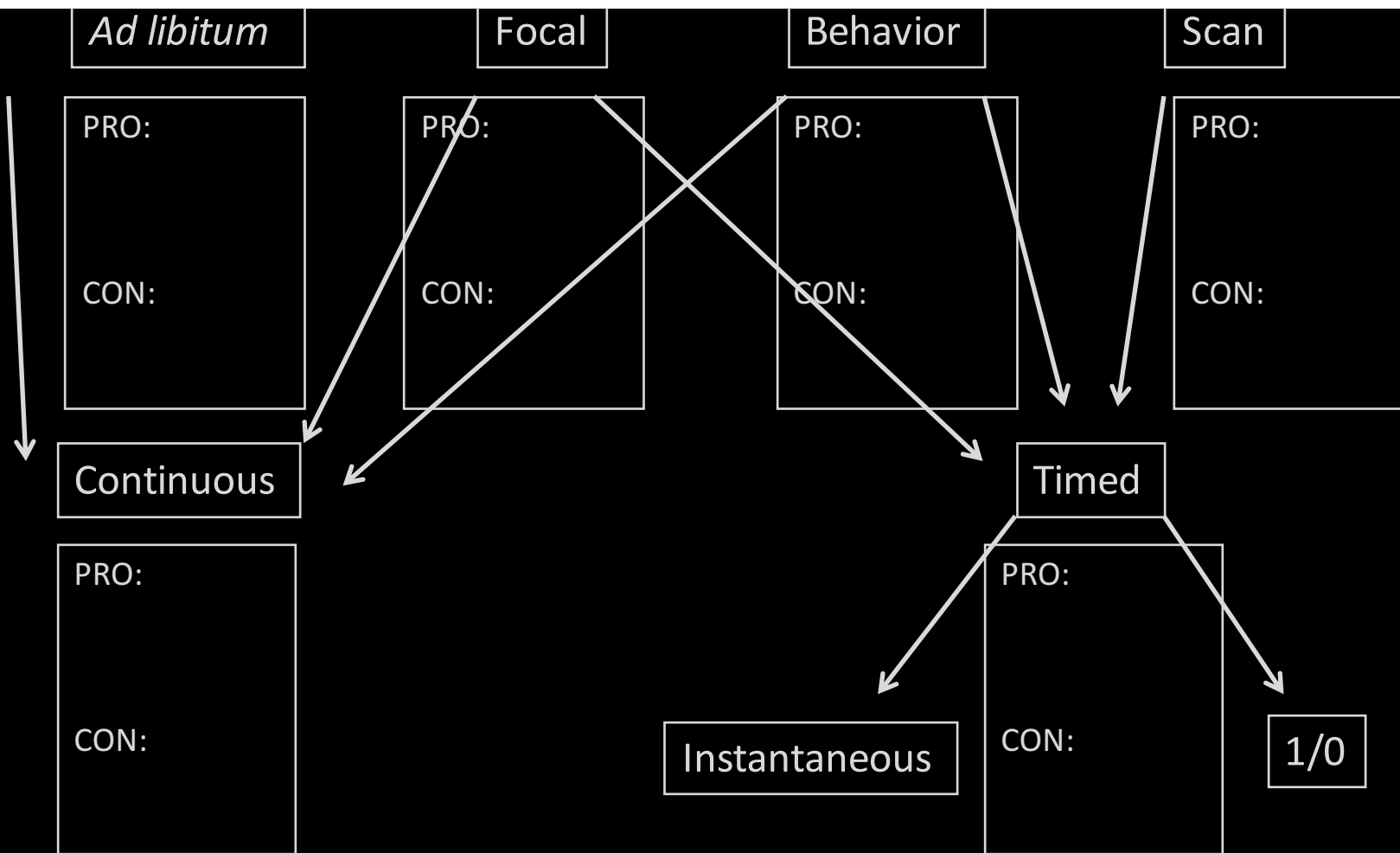
“Going Deeper: Microbial Diversity and Metabolic Potential in the Marine Deep Biosphere”

Rosa León Zayas, Willamette University



Oregon Zoo Conservation & Research






Which to watch (sampling)
and
when to watch it (recording)

Altman (1974) Behavior 49:227-266

Get to know your animal
ad libitum sampling



Rodrigues bat

Straw
fruit bat

Egyptian
fruit bat



Sleeping

upside down from hind legs
wings folded eyes closed

Hanging

upside down from hind legs
eyes open possible wing
and head movement

Grooming

upside down from hind legs
picking through fur of self or other

Walking

upside down using all 4
legs (?), or just hind two to locomote

Flying

no contact with solid surface

Eating

within one body length of
food source, visible chewing

Fighting

combined behavior, scratching,
biting, with physical contact with another

Other

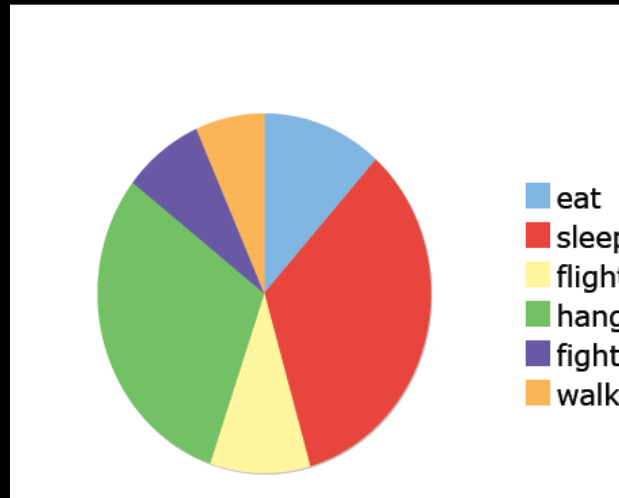
anything that does not fit the above

task 1: construct an ethogram

Oregon Zoo Bat Exhibit - Ethogram Study 2006



SCAN SAMPLE - instantaneous recording							
Entire Cage Record each observed instance							
	eat	sleep	flight	hang	fight	walk	total
obs1	12	35	10	31	8	7	103
obs2	18	45	12	17	6	8	106
mean	15	40	11	24	7	7.5	



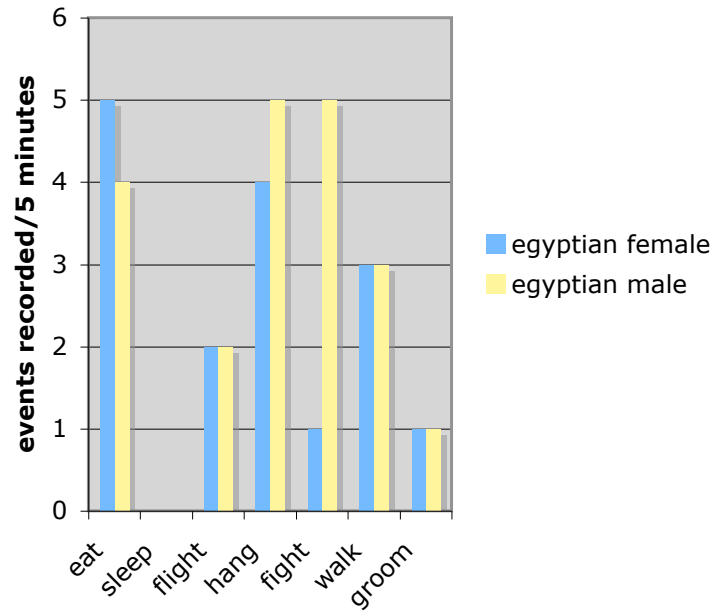
Oregon Zoo Bat Exhibit - Ethogram Study 2006



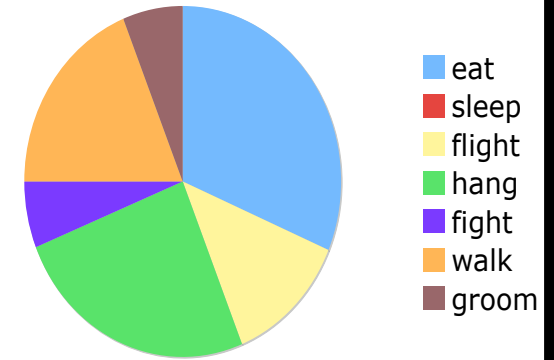
Egyptian Fruit Bat

FOC

Male/Female Behaviors



egyptian female



Recording - Events

the I recorded

	eat	sleep	flight	hang	fight	walk	groom	notes
animal 1 egyptian female	5	0	2	4	1	3	1	fight(?)back away
animal 2 egyptian male	4	0	2	5	5	3	1	

Oregon Zoo Bat Exhibit - Ethogram Study 2006

Attempt at being a human event recorder

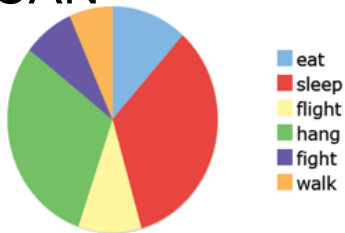


Egyptian Fruit Bat

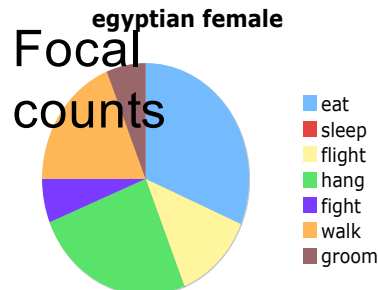
Focal Sampling - Continual Recording - Durration

	eat	sleep	flight	hang	fight	walk	groom
animal 1 egyptian female	25	0	0	1	195	0	53
animal 2 egyptian male	8	0	0	2	160	10	72

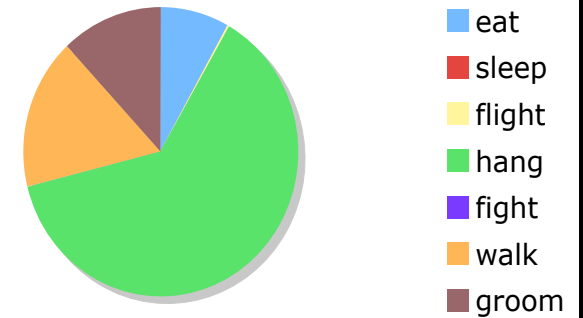
SCAN



Focal counts



Egyptian Female -time budget

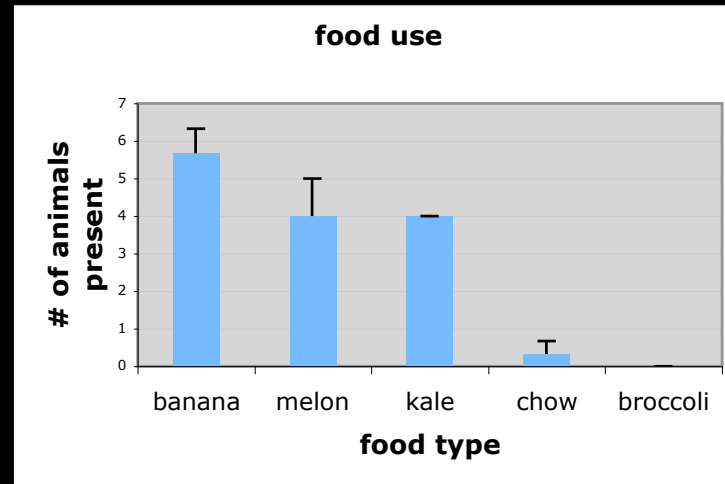


Oregon Zoo Bat Exhibit - Ethogram Study 2006



Behavior sampling

	obs 1	obs 2	obs 3	mean	STDER	available
banana	7	5	5	5.6667	0.6667	12
melon	3	3	6	4	1	12
kale	4	4	4	4	0	5
chow	0	0	1	0.3333	0.3333	2
broccoli	0	0	0	0	0	4
				14		35

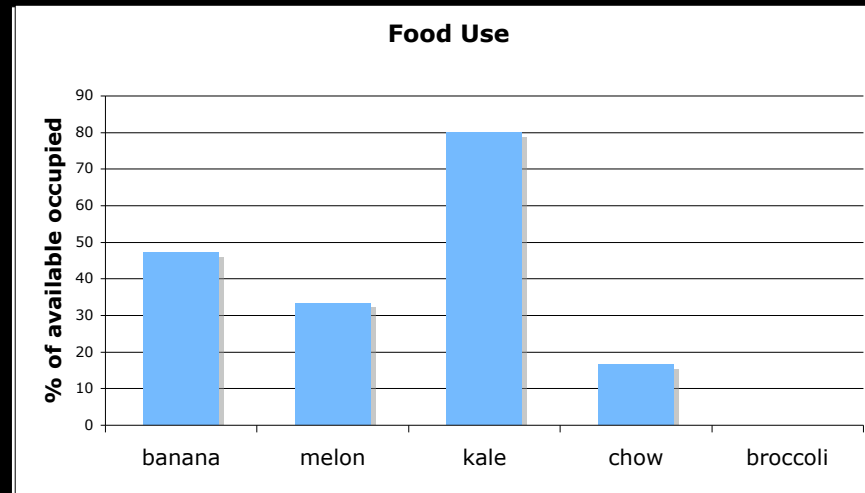


Oregon Zoo Bat Exhibit - Ethogram Study 2006



Behavior sampling

	obs 1	obs 2	obs 3	mean	STDER	available
banana	7	5	5	5.6667	0.6667	12
melon	3	3	6	4	1	12
kale	4	4	4	4	0	5
chow	0	0	1	0.3333	0.3333	2
broccoli	0	0	0	0	0	4
				14		35



normalized to food availability

Grant Proposal

- 1) Clear statement of goal or hypothesis
- 2) Brief background of the problem or animal
- 3) Justify the zoo setting and particular animal/enclosure
- 4) Propose observation methods to collect necessary data
- 5) Include one figure to demonstrate feasibility

Remember, this is a sales pitch

Be emphatic

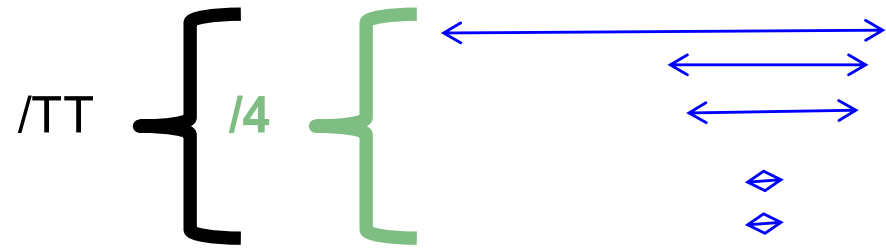
Emphasize the importance

but be accurate



Don't forget to attach
Your field notes to your
Lab notebook!

States vs. Events



Types of Measures

Count

Frequency (rate) = **count/time**

Intensity (local rate) = **count/duration**

Latency

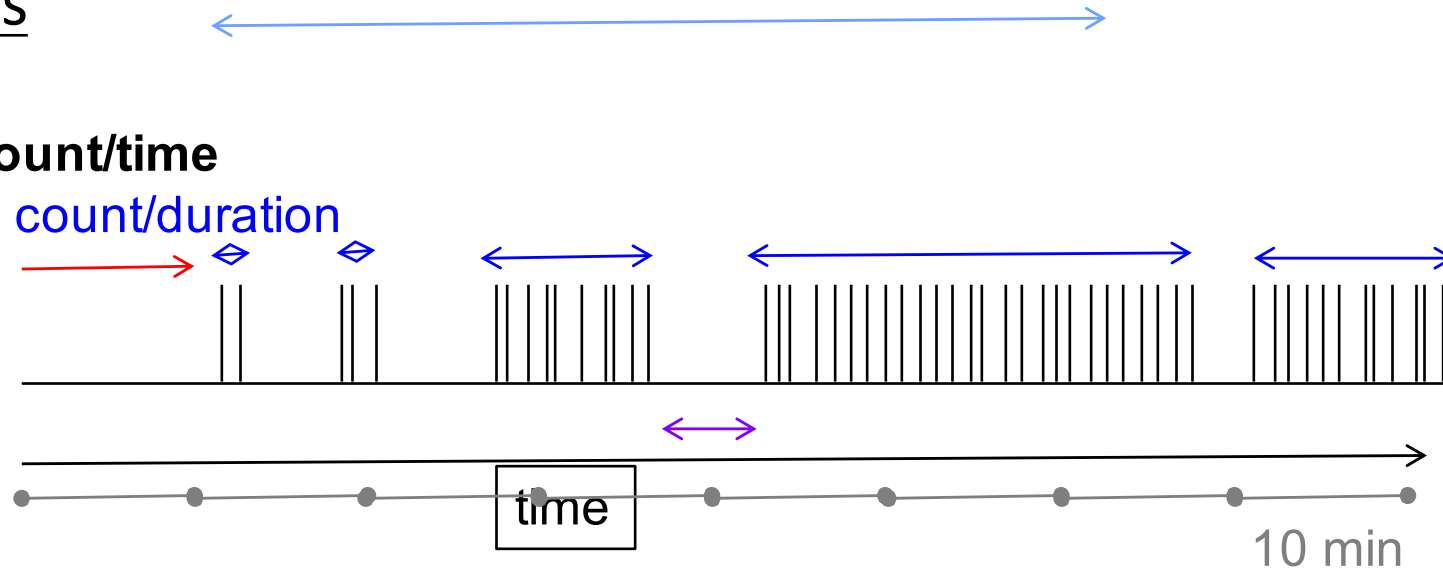
Duration

Total

Mean

Proportion of time

Interval



Don't write here

$$\text{Count} = 2+3+10+25+(12) = 52$$

$$\text{Frequency} = 52/83 = 0.63 \text{ events/minute}$$

$$\text{Duration TT} = 52 \text{ mins}$$

$$\text{Local Frequency} = 52/52 = 1/\text{minute} \text{ (this animal is ridiculously regular)}$$

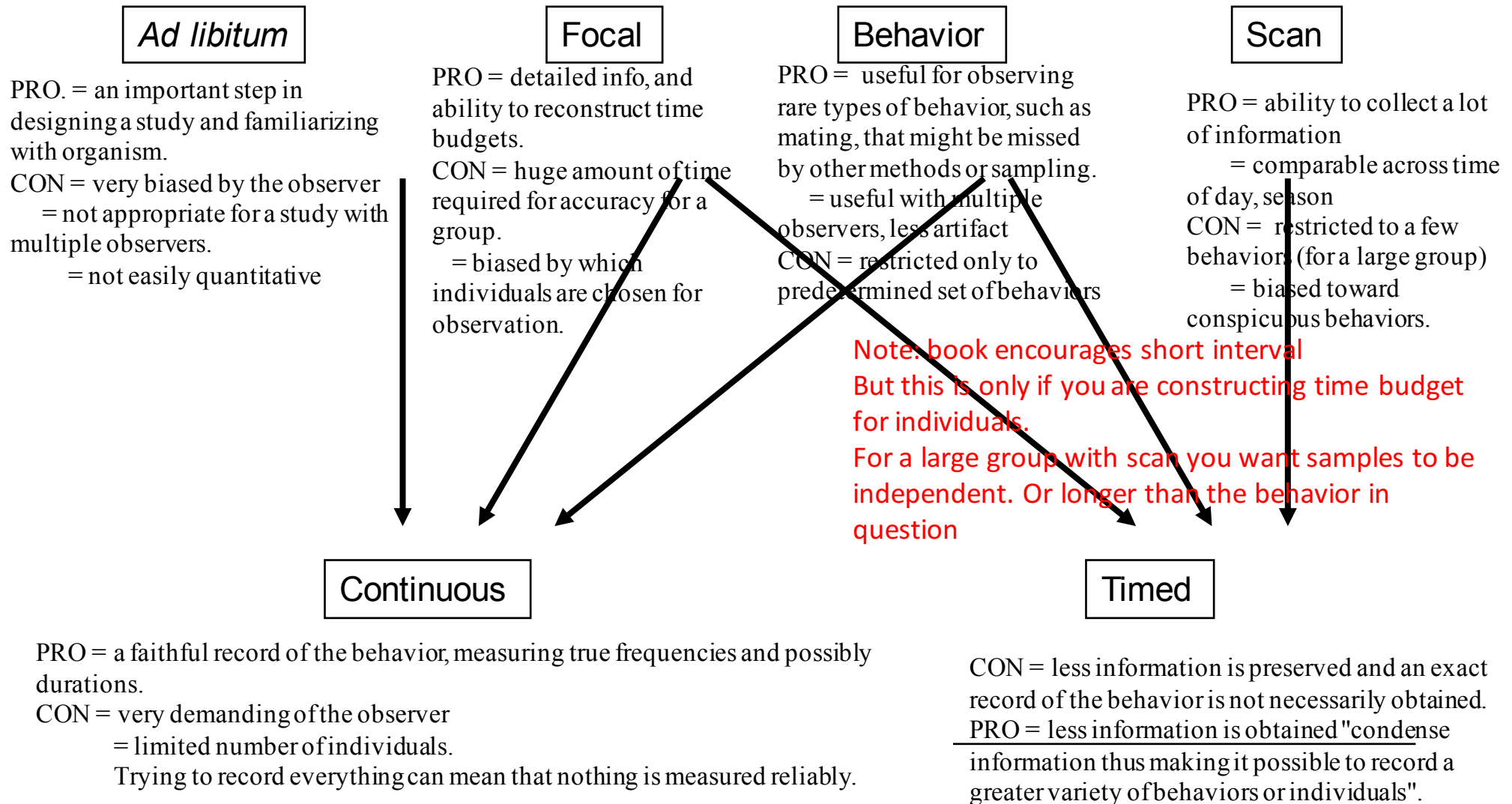
$$\text{Average Duration} = 52/4 = 13 \text{ (could be done for interval)}$$

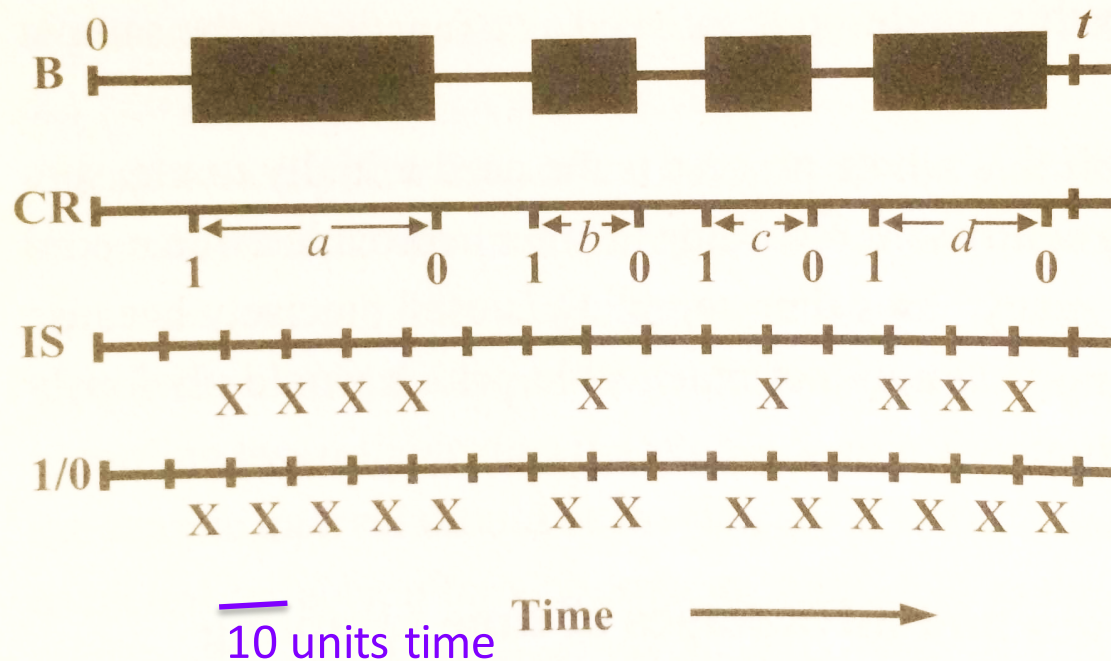
Which duration should we measure? Which intervals should we measure?

Sampling & Recording Rules (please read the book and fill this in on your own.)

(This should be used to check yourself, not as the main source of information)

Sampling = which subject to watch and Recording = when to watch them





Continuous recording time:

$$a+b+c+d = 39 + 26 + 12 + 28 = 95 \text{ units}$$

$$\text{Mean duration} = 95/4 = 23.8$$

$$\text{Proportion of time} = 95/160 \text{ (total time)} = .59 \text{ or } 59\%$$

Instantaneous Sampling:

$$9 \text{ of } 16 \text{ time Points} = 0.56 \text{ or } 56\%$$

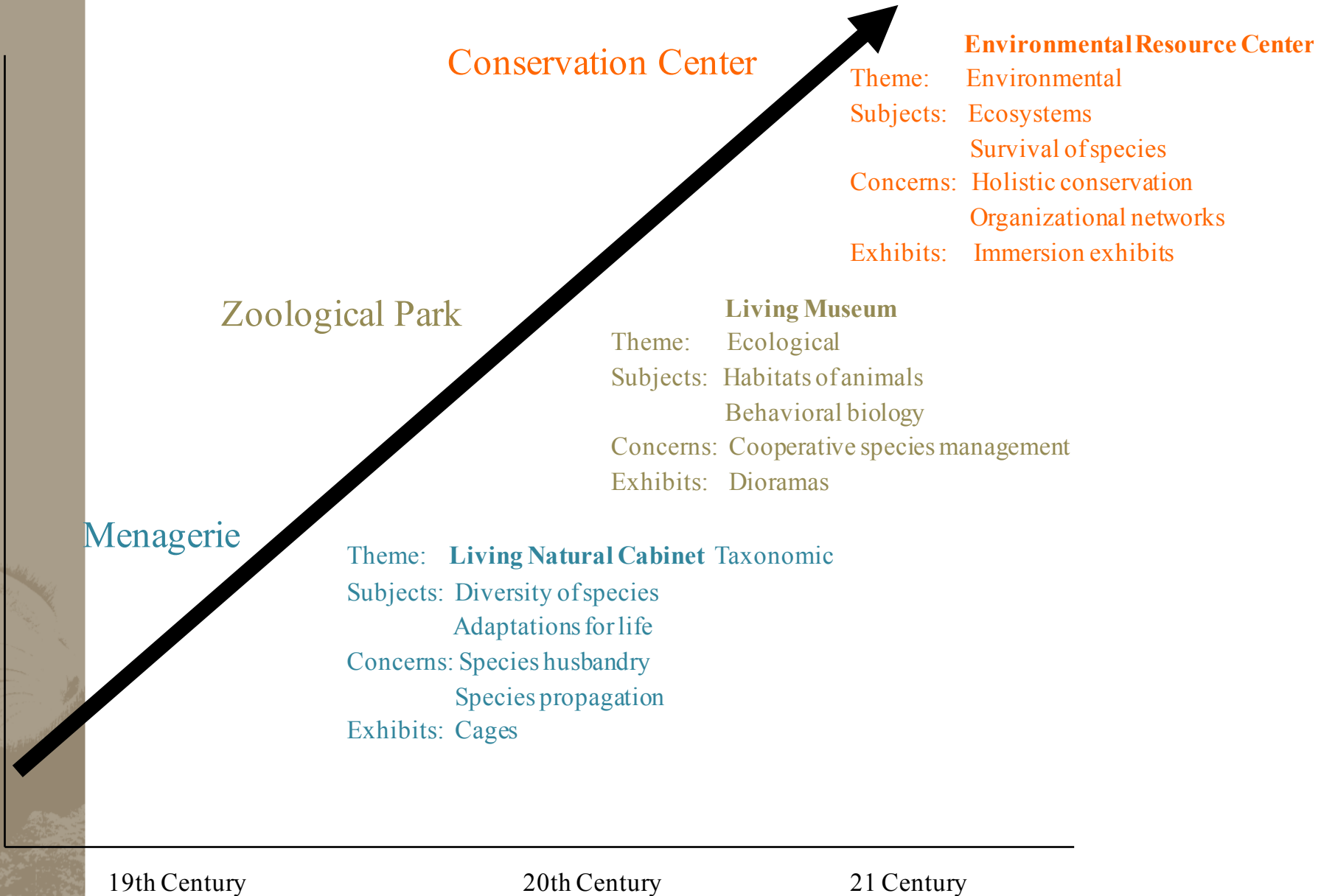
$$1/0 \text{ sampling it is } 13 \text{ of } 16 \text{ time BINS} = 0.81 \text{ or } 81\%$$

Note: book encourages short interval
 But this is only if you are constructing time budget for individuals.
 For a large group with scan you want samples to be independent
 (i.e. longer than the behavior being observed).

Oregon Zoo Conservation & Research

David Shepherdson Ph.D.

Evolution



AZA Mission

“The Association of Zoos and Aquariums envisions a world where, as a result of the work of accredited zoos and aquariums, all people respect, value and conserve wildlife and wild places.”



Oregon Zoo

“The Oregon Zoo inspires the community to respect animals and take action on behalf of the natural world...”

“Caring now for the future of wildlife”



Zoo Conservation Roles

- Animal welfare
- Species recovery
- Education/outreach - behavior change
- Science
- Citizen Science
- Funding
- Stimulate discussion and dissemination



Animal Welfare

The physical and psychological state of non-human animals



Animal Welfare

The Five Freedoms are:

- Freedom from thirst and hunger – by ready access to fresh water and a diet to maintain full health and vigor
- Freedom from discomfort – by providing an appropriate environment including shelter and a comfortable resting area
- Freedom from pain, injury, and disease – by prevention or rapid diagnosis and treatment
- Freedom to express most normal behavior – by providing sufficient space, proper facilities, and company of the animal's own kind
- Freedom from fear and distress – by ensuring conditions and treatment which avoid mental suffering



Measures of Poor Welfare

- Reduced life span
- Inability to grow or breed
- Injury
- Disease
- Physiological attempts to cope
- Behavioral attempts to cope



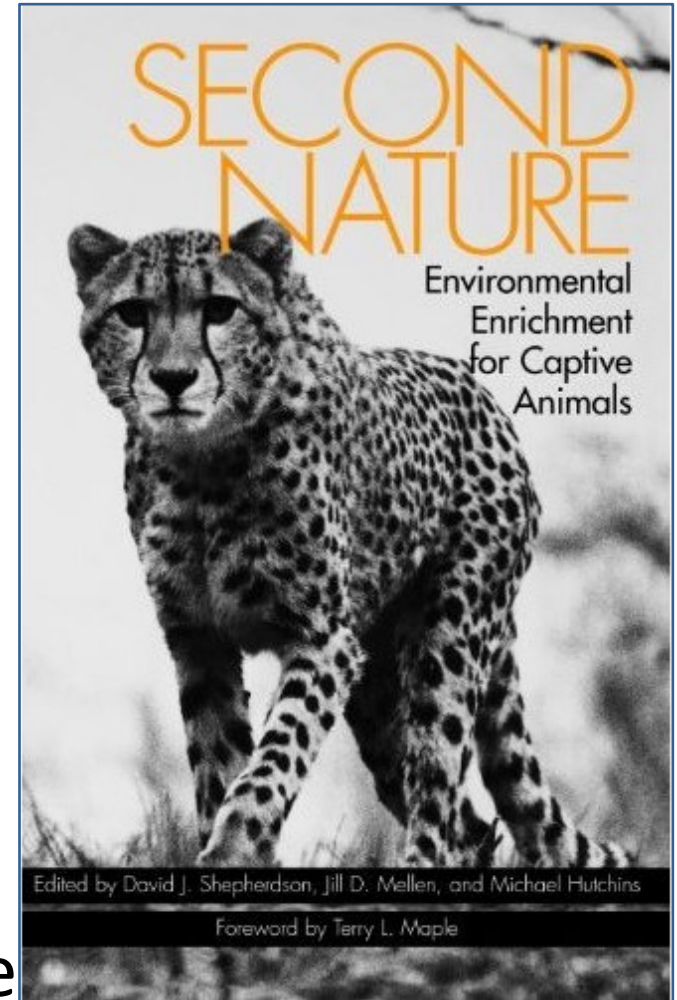
Good Welfare Measures

- Diversity of Normal Behaviors
- Expression of preferred behaviors
 - Exploration
 - +Social behavior
 - Play
- Behavioral indicators of pleasure
 - Anticipation
 - Vocalizations



Concepts Guiding Environmental Enrichment

- Mimicking nature (?)
- Meeting behavioral needs
- Information seeking
- Increasing complexity
- Increasing sensory stimulation
- Giving the animal control/contingency
- The Challenge of challenge



Examples

Functional Realism

