Ensuring Quality of Subsamples of Large Catches of Fish

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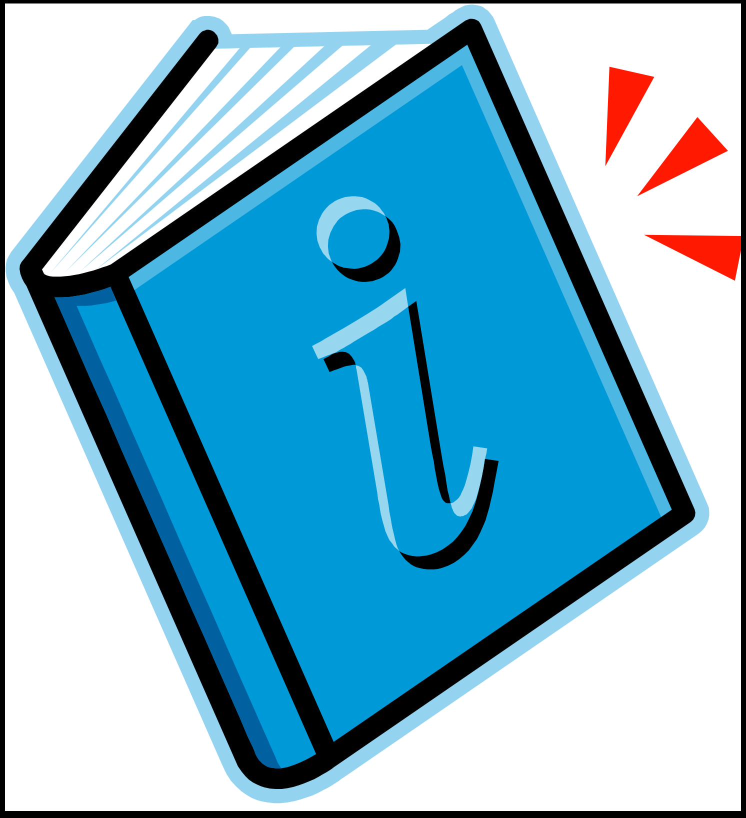
Source

N. Am. J. Fish. Manage. 32: 1033-1038 (2012).



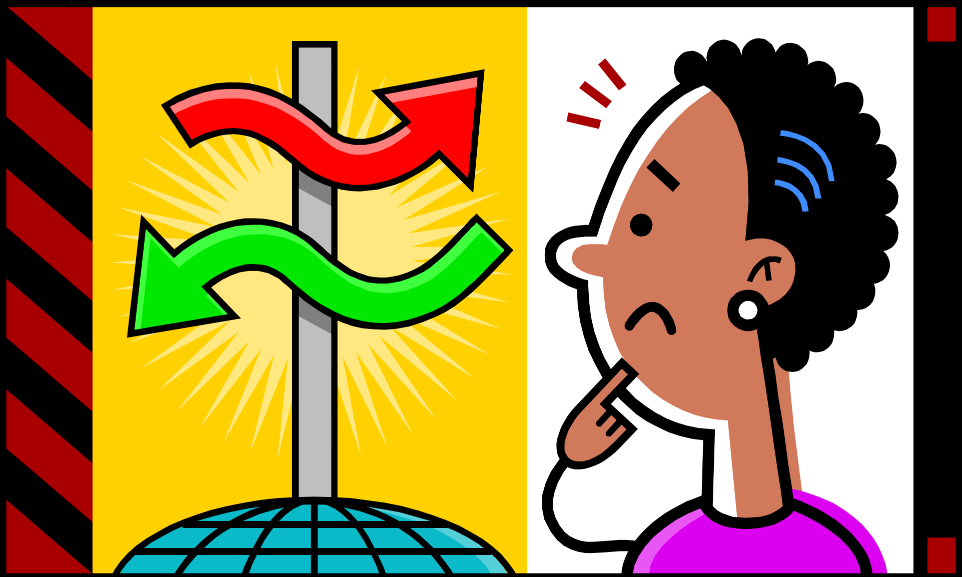
Problem 1: How to take unbiased subsamples of large catches of fish?

Large fish surveys

Different S.S. methods

Among agencies

Among crew members



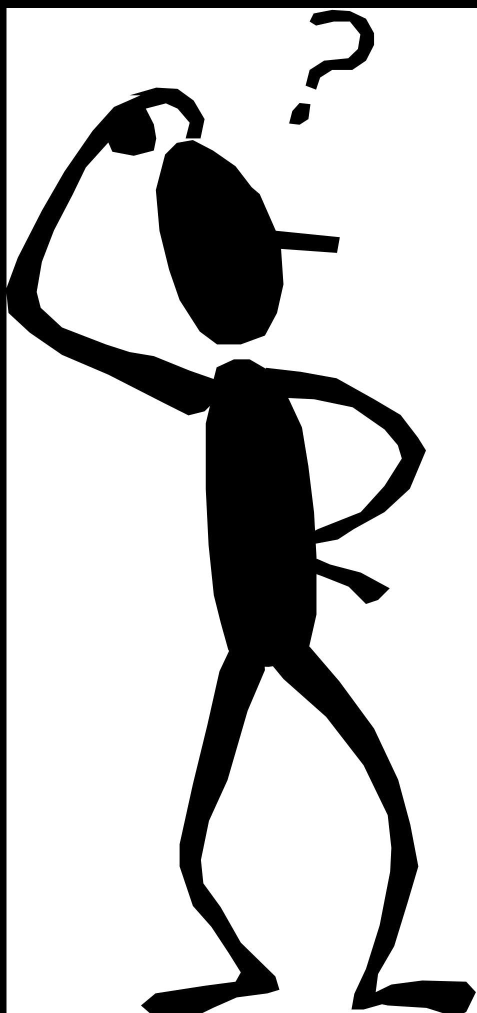
Who cares?

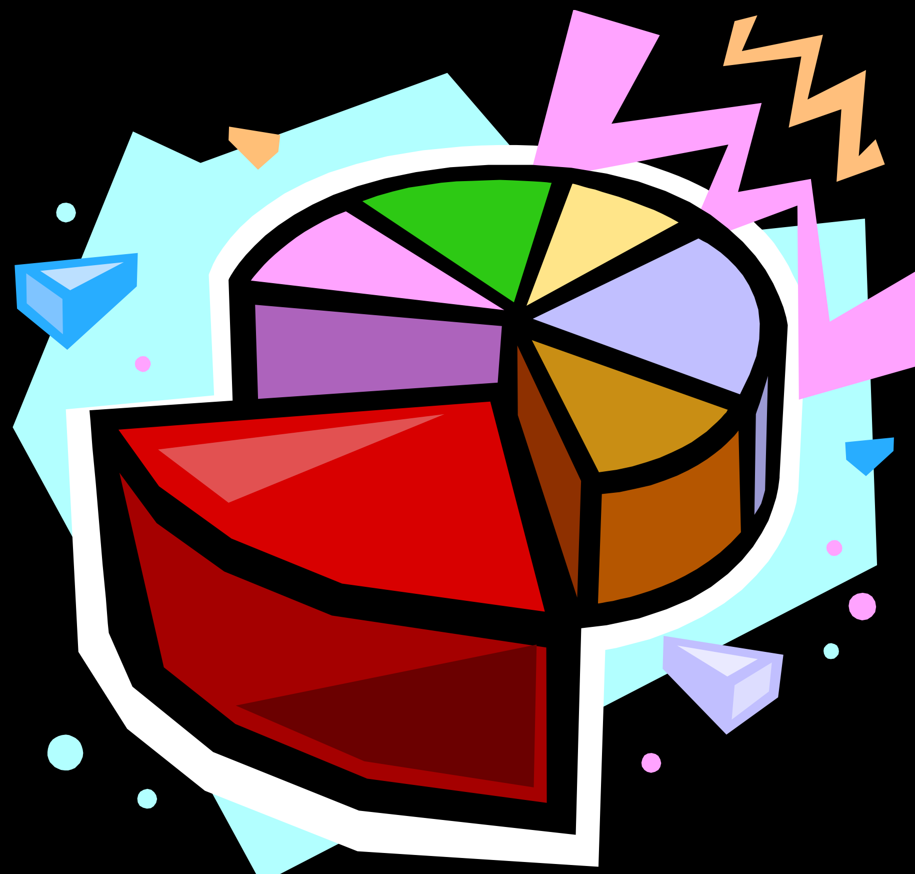
Data from fish surveys used to determine catch quotas and standing stock.

Error can mean $$$$$

Interpretation of inter-agency data?

Problem 2: How good are the estimates of the subsample?





In Practice

Remove large, rare fish. Then

- **“By eye”: Take “random” area or volume of sample**
- **“Divide” sample (better)**

“By Eye” Methods:

Spread out catch and

- **Take “random” shovel fulls**
- **Take “random” area**
- **Collect “random” volume**

Drawbacks

“By eye”:

- Not repeatable
- Sample not mixed evenly
- Often observer bias

“Divide” Sample Methods:

Pour catch over adjacent tubs.
Select one at random.

Repeat as needed.

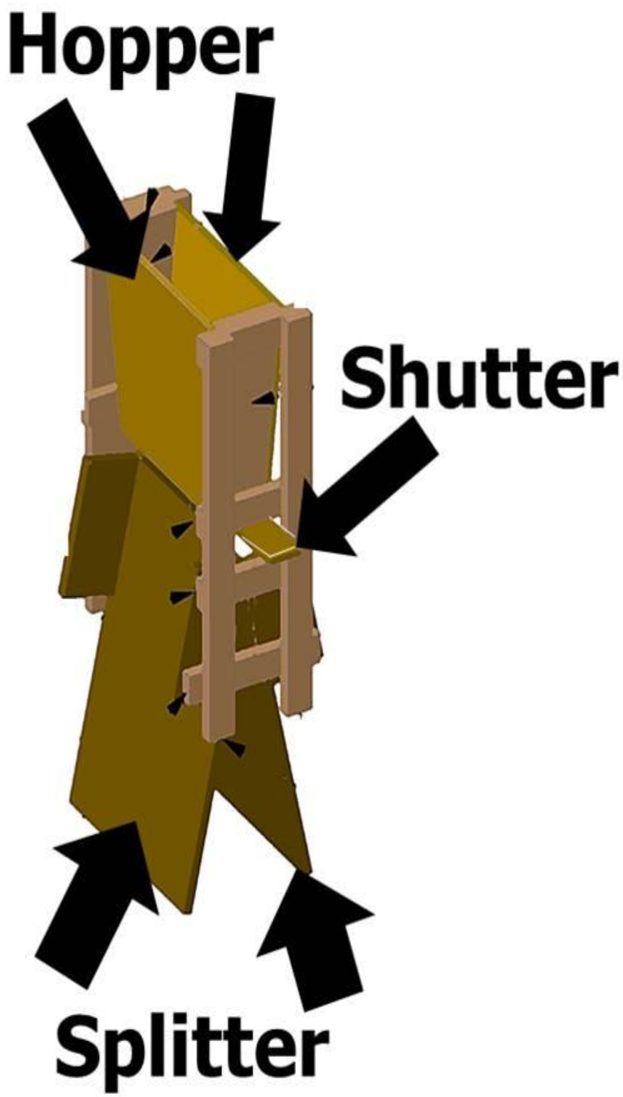
Drawbacks

"Divide" sample:

- Difficult when rough
- Cumbersome
- "Pouring" variance

Solution--Splitter apparatus

- Repeatable, quantifiable
- Easy to use, build
- Defendable



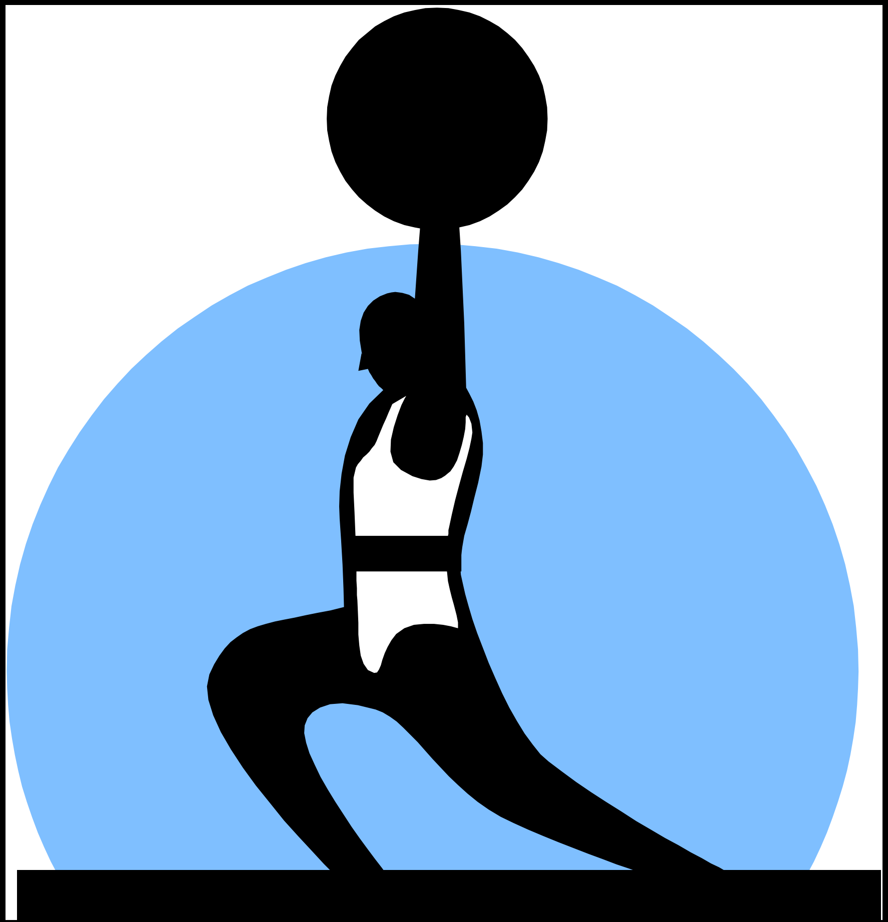
Gravity-fed
Removable shutter

1. **Place fish in hopper.**
2. **Open shutter.**
3. **Sample divides.**

Procedure

1. Remove large, rare species
2. Mix sample
3. Pour sample in hopper
4. Remove shutter
5. Determine side to “keep”
6. Repeat steps 3-5 as needed

Performance of Apparatus: Methods



2000 fish

60% emerald shiner (n = 1200)

25% white perch (n = 500)

10% trout-perch (n = 200)

5% round goby (n = 100)

Representative of bottom trawl catches in western Lake Erie

Single splits (i.e., ~ 50%)

Three replicates

Quantify error in estimating

Number

Proportion

From 1-split subsample

Estimate number of each species (n_i) using ratio of mass of total sample : mass of subsample

$$n_i = n_{i,j} \cdot ([m_j + m_k]/m_j),$$

where

$n_{i,j}$ = no. species *i* in subsample

m_j = mass of subsample

m_k = mass of fish in portion of sample not counted

Error estimating number

$$EN_i = (n_i - N_i) / N_i$$

where

N_i = known no. species i (total sample)

and

n_i = estimated no. species i (subsample)

Error estimating proportion

$EP_i = (n_{i,j} / [\text{total subsample}]) - P_i$

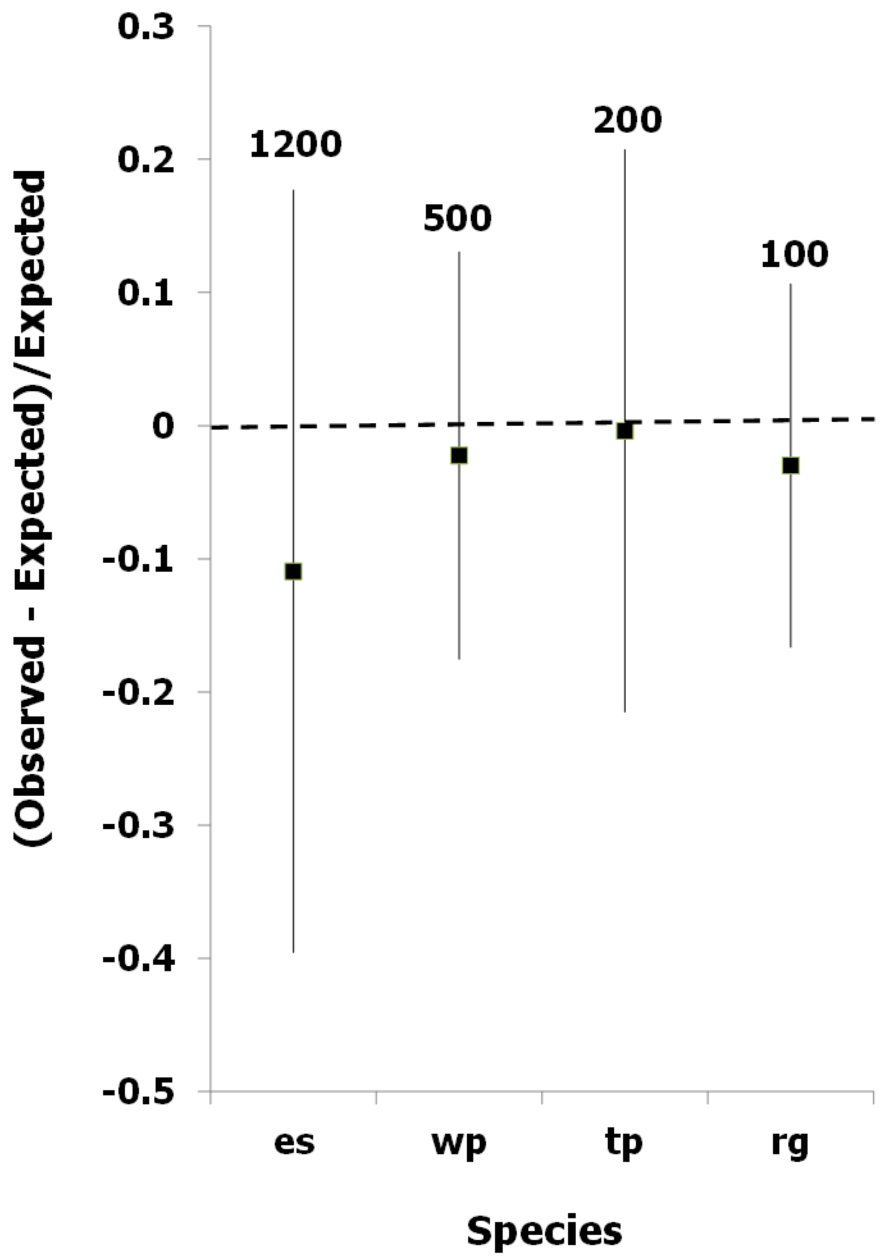
where

$n_{i,j}$ = no. species *i* in subsample

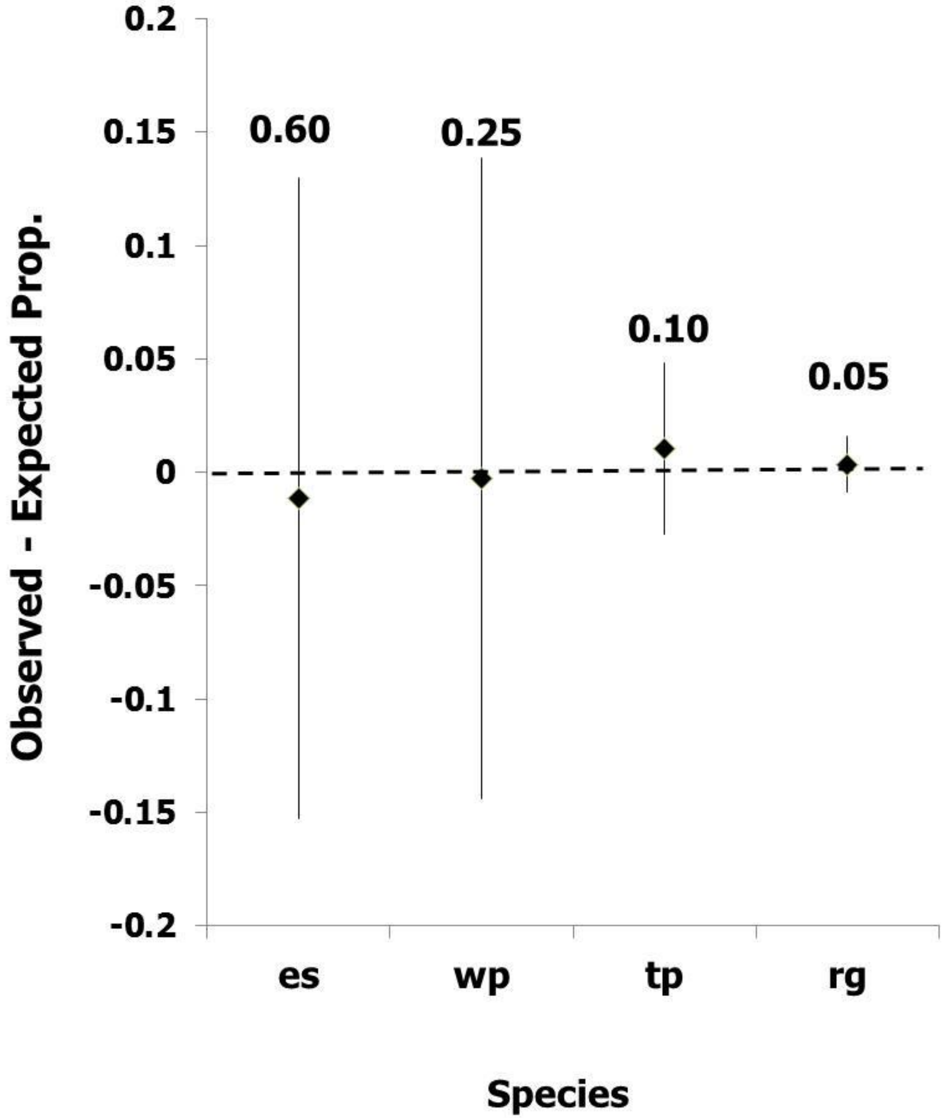
P_i = known prop. species *i* in total sample

Results

Error estimating number



Error estimating prop.



Mean error estimating number

em. shiner	-0.109
white perch	-0.022
trout-perch	-0.004
round goby	-0.030

Not sig. diff. from 0

Mean error estimating prop.

em. shiner	-0.011
white perch	-0.003
trout-perch	0.010
round goby	0.004

Not sig. diff. from 0

Discussion

Apparatus performed well

- EN_i and EP_i ~ 0
- ABS (mean EN_i) $\leq$ 3% for 3 spp.
- ABS (mean EP_i) $\leq$ 1.1% for all spp.

EN_i for em. shiner >3X others

Potential sources:

- 27% mass but 60% number
- Tended to stick to other fish

Suggest em. shiner did not mix uniformly

Apparatus

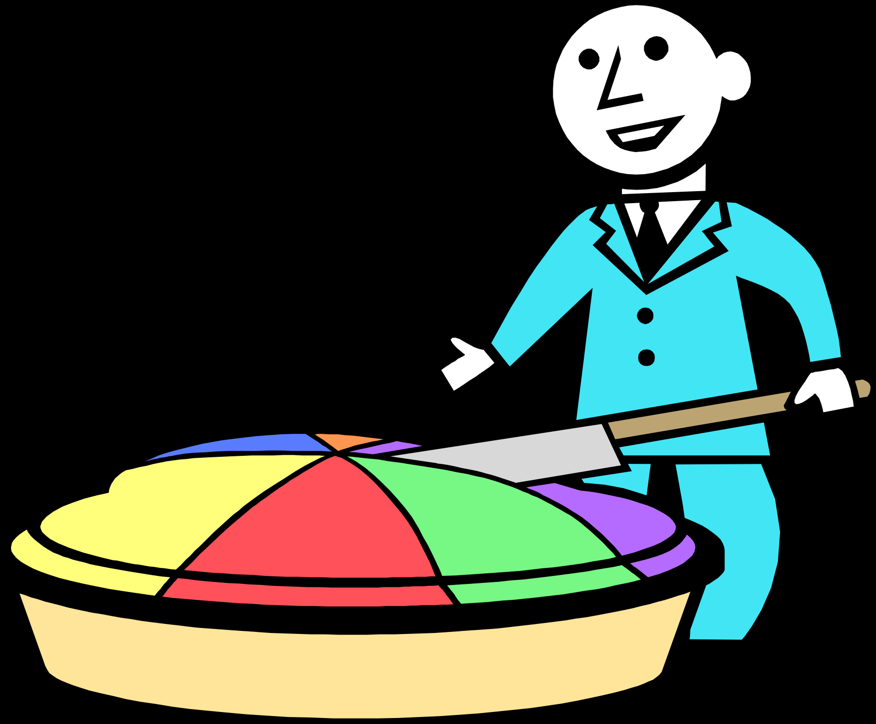
Height comfortable

Wood prototype: $30 & 3 hrs.

User can split when ready

Many other uses (solids)

Sample can be divided into whatever fraction $(\sim 1/2)^n$ is practical to assess..........



Small subsamples quicker to assess

BUT

errors (EN_i & EP_i) in a sample containing several species typically increase with smaller subsamples.

Exercise caution when determining how much to divide sample.

Future Studies

When, how much to subsample?

Species-specific errors

Economic consequences

Shnorhagal em

Asante

Paylla

Xie xie

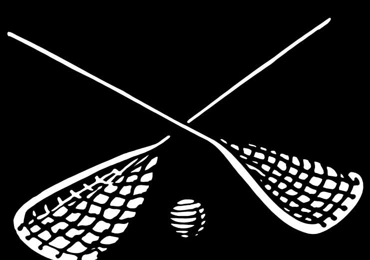
Enkosi

Dhanyawad

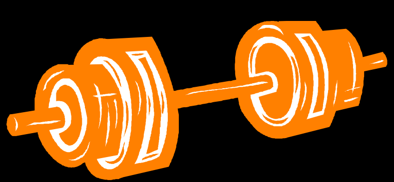
Qujannamiik

Mahalo

Merci



Thank you



Questions?

"Even in failure there can be Nobility! But failing to try brings only shame!"
The Silver Surfer