Assumptions for Mark and Recapture Studies

Each type of sampling has a set of assumptions. These are things that are believed to be true. Mark and recapture studies have a number of different assumptions, but for our experiment we will only consider the assumptions below:

1) Each individual has an equal chance of being captured.
2) Marking does not influence an individual's chance of being recaptured.
3) Births and immigration do not occur between the marking and recapture efforts.
4) Marks are not lost between capture and recapture.

Answer the questions below.

1. Assumption #1 is almost never true. Explain how the chance of capture is not the same for all individuals. How would you minimize this problem?

-age may influence the ease at which an individual is caught (old/young may be easier to catch)

-some individuals may be sick; making them easier to catch

-some individuals may be better adapted than others (better camouflage, faster, more aggressive, etc.) making them harder to catch

This problem could be minimized by:

-a random sampling plan (not just sampling those that are easy to catch)

-sampling only individuals of a certain age (perhaps middle aged individuals)

-if you catch an individual that appears sick it should be released and another individual should be tagged instead

2. Think about assumption #2 '*Marking does not influence an individual animal's chance of being recaptured*'. Describe how being captured and marked could (a) increase and (b) decrease an individual's chance of recapture.

(a) Increase

-the tag may slow down the individuals making it easier to catch (the tag may be awkward or it may have injured the individual)

-the individual may be easier to see due to its tag (perhaps the tag is colourful) and therefore be easier to catch

-the individual may be attracted to researchers because they associate researchers with food (example: mice may be drawn to cheese provided by the researcher)

-the tagged individuals may not have moved far from the original site (either injured, traumatized, or it just normally does not stray far from the site) increasing the probability that it would be caught again at the same sampling site

(b) Decrease

- the tagged individual may be afraid of researchers and therefore avoid being in the same area as them

- the tagged individual may learn to avoid traps based on past experience

- the tagged individual may be more aggressive which would decrease its chance of being caught again

-the tagging may have killed the individual and as such it would not be caught again

3. Think about assumption #3 *'Births and immigration do not occur between the marking and recapture efforts'*. How might a researcher attempt to make sure that the assumption is met?

-avoiding sampling during times of reproduction

-build a barrier (fence, net, etc.) to ensure that no immigration is possible (or to minimize the chance)

-monitor movement of individuals by using some kind of surveillance (video cameras)

4. Think about assumption #4 '*Marks are not lost between capture and recapture'*. How can an ecologist make sure that this assumption is met? What would happen to the population estimate if marks were lost?

-utilize tags that have been shown to work well for the individual being studied

- use internal tags which are more difficult to lose

-track the movement of individuals and monitor them to ensure their tags are secure

If marks were lost then the estimate of the population size would be inaccurate; the estimate would be greater than the actual population size

See the example for clarification:

$$N = \frac{(C*M)}{R}$$

N = Estimated population size
C = Total number of individuals recaptured
M = Number of individuals initially marked
R = Number of marked recaptured

Scenario 1 (no lost tags)

C=100

M =20

R =7

N= (C*M)/R

=286

Scenario 2 (tags lost)

C=100

M =20

R =3

N= (C*M)/R

=667