

Exercise – Mark-Recapture

Answer the following questions with R code by creating (*and editing if you make a mistake*) an R script and iteratively running the code in RStudio.

1. Warren *et al.* (2004) examined the population of Rainbow Trout (*Oncorhynchus mykiss*) in the Upper Niagara Springs Pond in 2000. Fish were captured at two times by using an electrofishing unit attached to a driftboat. The capture histories of all fish examined in the two samples are recorded in **RBTroutUNSP.csv**. Load these data into a data frame in R and answer the following questions.

- (a) Create a summary of the capture histories.

```
> setwd("C:/aaaWork/Web/fishR/courses/Vermont2014/CourseMaterial/Exercises/")
> rbt <- read.csv("data/RBTroutUNSP.csv")
> str(rbt)
'data.frame': 173 obs. of 3 variables:
 $ fish : int  1 2 3 4 5 6 7 8 9 10 ...
 $ first : int  1 1 1 1 1 1 1 1 1 1 ...
 $ second: int  1 0 0 0 0 0 0 0 1 0 ...
> q2.ch <- capHistSum(rbt,cols=-1)
> q2.ch$caphist

01 10 11
99 63 11
```

- (b) From your capture history summary assign values to each of these symbols (M , n , m).

```
> q2 <- mrClosed(M=74,n=110,m=11,type="Chapman")
```

- (c) Construct an appropriate population estimate, with a 95% confidence interval, for Upper Niagara Springs pond in 2000.

```
> summary(q2)
      N
[1,] 693
> confint(q2)
      95% LCI 95% UCI
[1,]      402    1282
```

2. Mraz (1968) examined the population dynamics of young-of-the-year (YOY) Walleye (*Sander vitreus*) in an inland Wisconsin lake. In fall 1962, YOY Walleye were captured, marked, and returned to the lake on five sampling dates. On each date the number of fish caught, the number of caught fish that were previously marked, and the number of marked fish returned to the lake were recorded. These results are shown in the table below. Use these data to estimate, with 95% confidence interval, the initial population size with the Schnabel method.

Sample	Fish Caught	Recaptured	Returned Marks
1	321	–	321
2	412	45	412
3	178	55	178
4	415	93	415
5	367	113	–

```
> n1 <- c(321,412,178,415,367)
> m1 <- c(0,45,55,93,113)
> R1 <- c(n1[1:4],0)
> mr1 <- mrClosed(n=n1,m=m1,R=R1,type="Schnabel")
> summary(mr1)
      N
[1,] 3280
> confint(mr1)
      95% LCI 95% UCI
[1,]      2776      4009
```