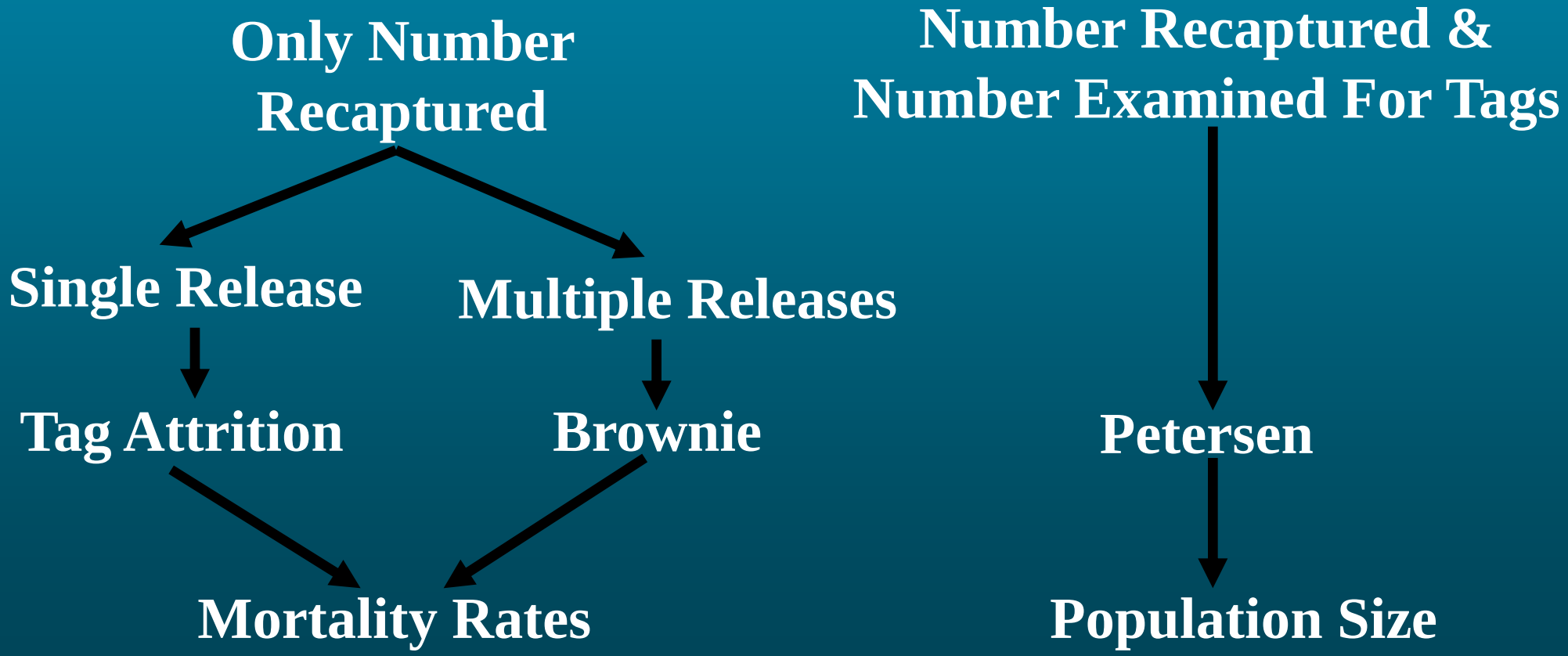
Fundamental Distinction In Experimental Design

Basic Data to be Collected



Population Dynamics Model

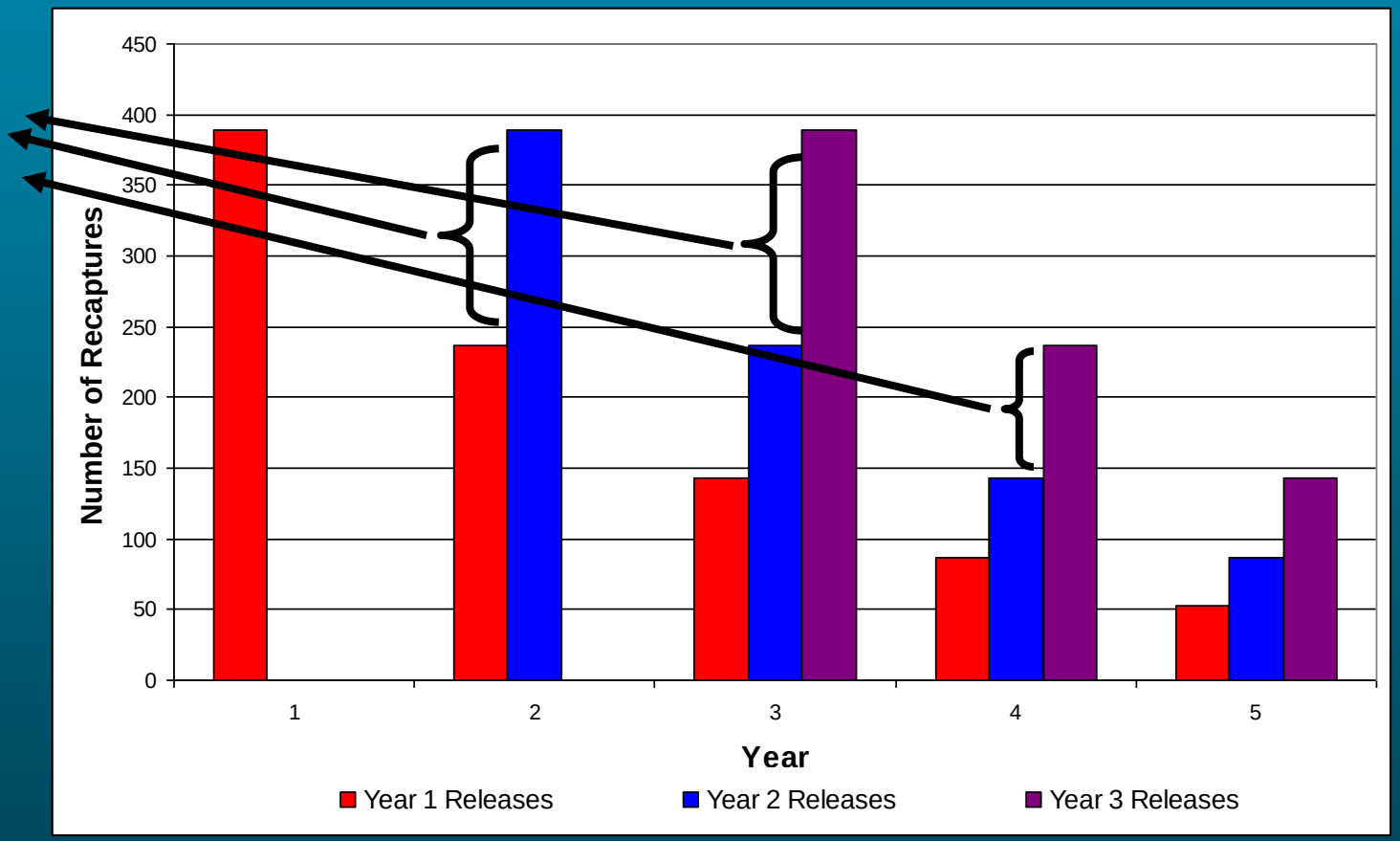
$$N_{i+1,t+1} = N_{i,t} \exp\ -F_{i,t} - M_{i,t}$$

$$E\ \ R_{i,t}\ \ = \frac{F_{i,t}}{F_{i,t} + M_{i,t}} N_{i,t}\ \ 1 - \exp\ -F_{i,t} - M_{i,t}$$

Same basic model for overall population and population of tag fish underlies Brownie and tag attrition approach (alternatively can use other formulations for relationship between F and M – e.g. seasonal fishery)

Brownie Approach

Difference due to Z in year i
(Ratio will remain same independent of reporting rate)



F= 0.3
M=0.2

1600 Releases Each Year for 3 Years

Brownie Approach

Release Age	Number of releases	Expected number of returns from age class *i*			
		1	2	3	4
1	N_1	$N_1 u_1$	$N_1 S_1 u_2$	$N_1 S_1 S_2 u_3$	$N_1 S_1 S_2 S_3 u_4$
2	N_2		$N_2 u_2$	$N_2 S_2 u_3$	$N_2 S_2 S_3 u_4$
3	N_3			$N_3 u_3$	$N_3 S_3 u_4$

$$S_i = \exp\ -F_i - M_i$$

$$u_i = \frac{F_i}{F_i + M_i}\ 1 - S_i$$

Brownie Approach

Release Age	Number of releases	Expected number of returns from age class *i*			
		1	2	3	4
1	N_1	$N_1 u_1$	$N_1 S_1 u_2$	$N_1 S_1 S_2 u_3$	$N_1 S_1 S_2 S_3 u_4$
2	N_2		$N_2 u_2$	$N_2 S_2 u_3$	$N_2 S_2 S_3 u_4$
3	N_3			$N_3 u_3$	$N_3 S_3 u_4$

$$S_i = \exp\ -F_i - M_i$$

$$u_i = \frac{F_i}{F_i + M_i}\ 1 - S_i$$

Brownie Approach

Release Age	Number of releases	Expected number of returns from age class *i*			
		1	2	3	4
1	N_1	$N_1 u_1$	$N_1 S_1 u_2$	$N_1 S_1 S_2 u_3$	$N_1 S_1 S_2 S_3 u_4$
2	N_2		$N_2 u_2$	$N_2 S_2 u_3$	$N_2 S_2 S_3 u_4$
3	N_3			$N_3 u_3$	$N_3 S_3 u_4$

$$S_i = \exp\ -F_i - M_i$$

$$u_i = \frac{F_i}{F_i + M_i}\ 1 - S_i$$

ITOC TAGGING DATA

- releases aggregated by month and estimated age using Alain's growth curve
- For each age/month event predict number of recaptures for each month
- Only used releases for ages 0, 1, 2 and 3
- Only used recaptures through age 4
- Reporting rate for PS returns estimated by assuming 100% for at sea recovery and seeding estimates for those not recaptured at sea.

ITOC TAGGING DATA

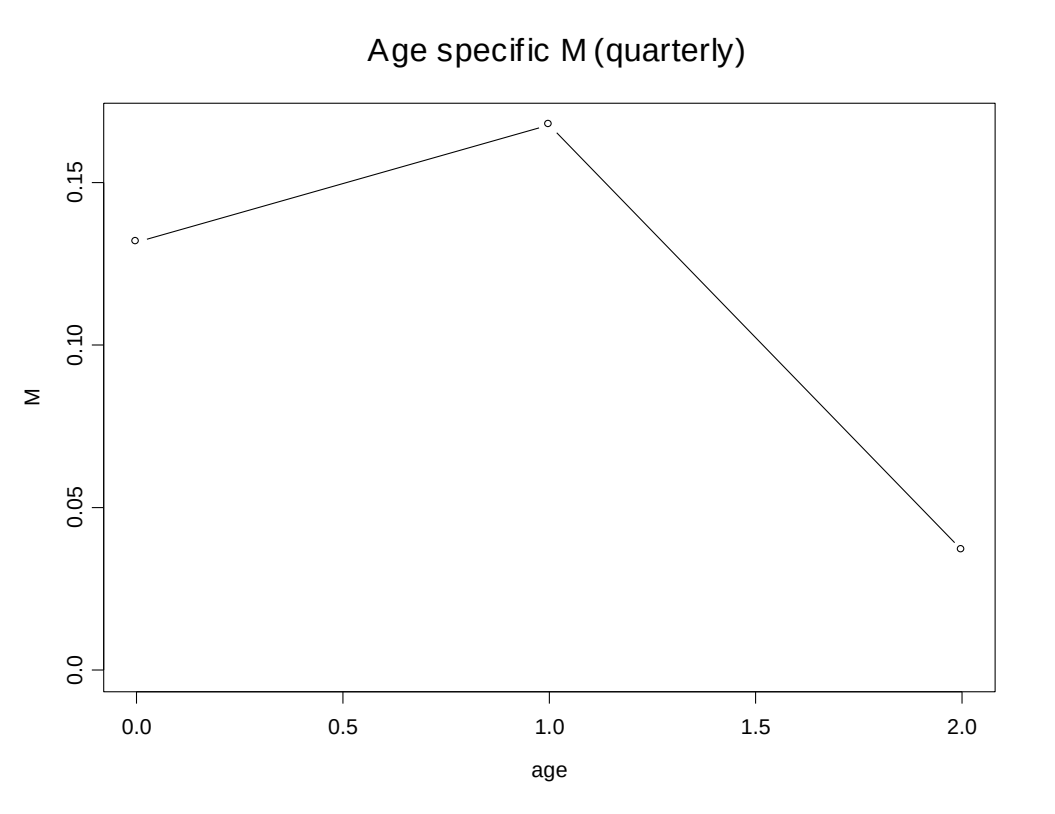
- Reporting rate for other fisheries assumed to be zero – i.e. model predicting the number of PS recaptures
- Overall reporting rate estimated by scaling PS reporting rate by proportion of the catch by age in a year caught by PS fishery – yields age and year specific estimates
- No account of tag loss
- Various parameterizations examined for M and F
- Significant best fit was for age specific M for ages 0, 1 and 2+ (but age specific M's are likely to have high CVs)
- Significant best fit was for F separable by age and overall F's levels varying monthly

ITOC TAGGING DATA

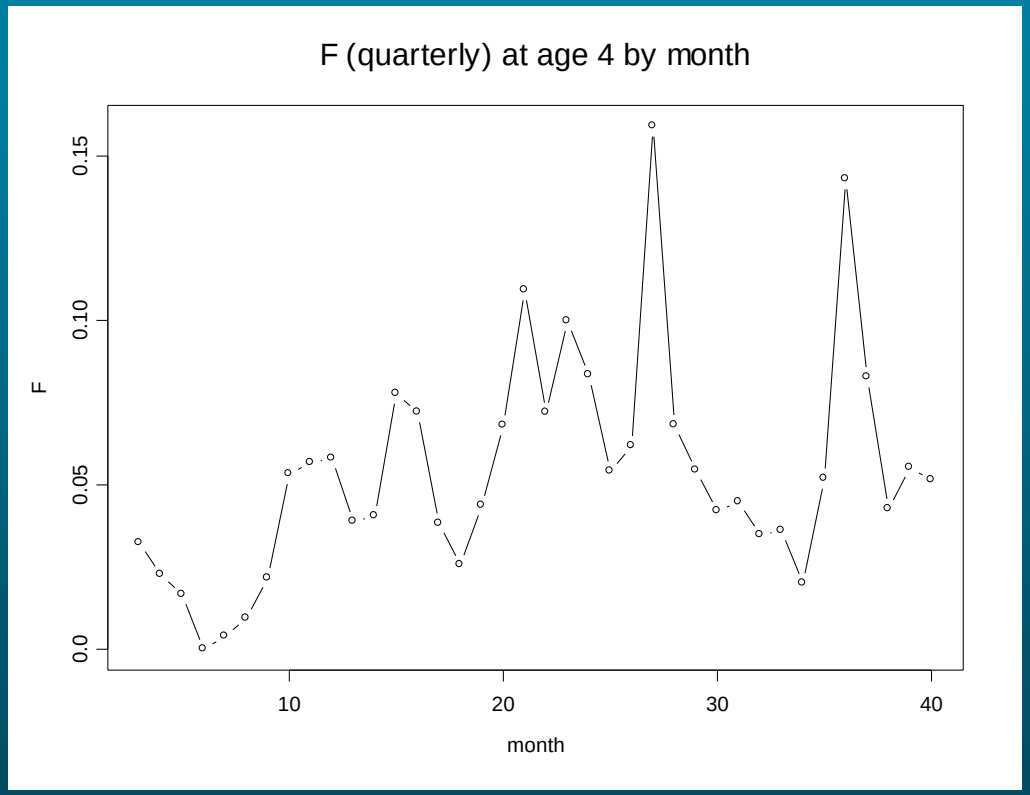
- Reporting rate for other fisheries assumed to be zero – i.e. model predicting the number of PS recaptures
- Overall reporting rate estimated by scaling PS reporting rate by proportion of the catch by age in a year caught by PS fishery – yields age and year specific estimates
-

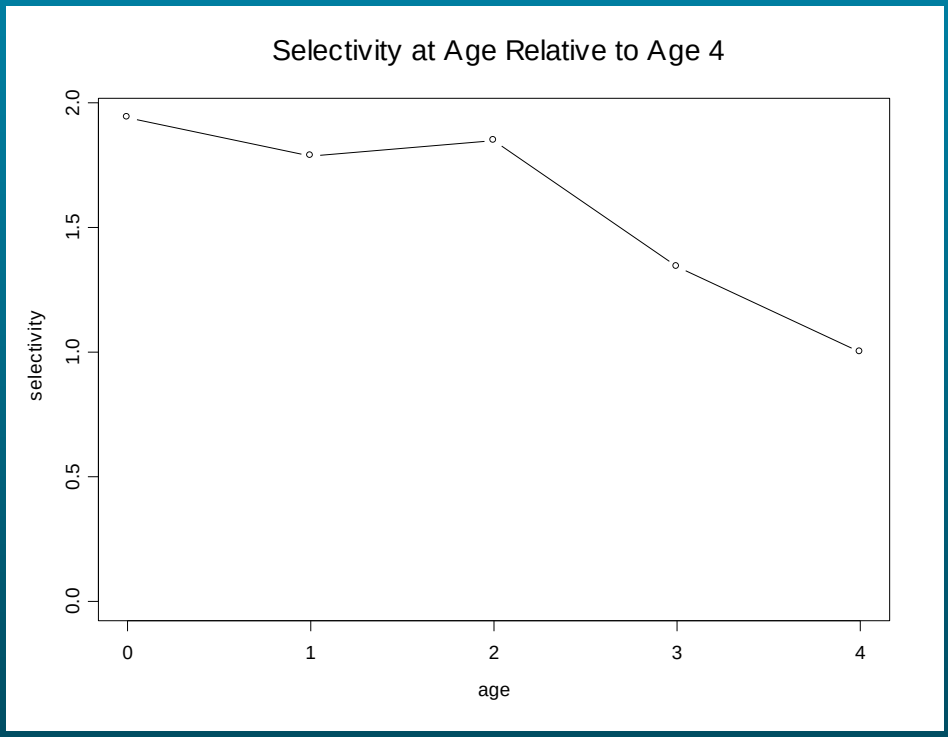
	0	1	2	3
2005.00	0.59	0.64	0.30	0.37
2006.00	0.84	0.70	0.24	0.36
2007.00	0.79	0.63	0.32	0.32

ITOC TAGGING DATA

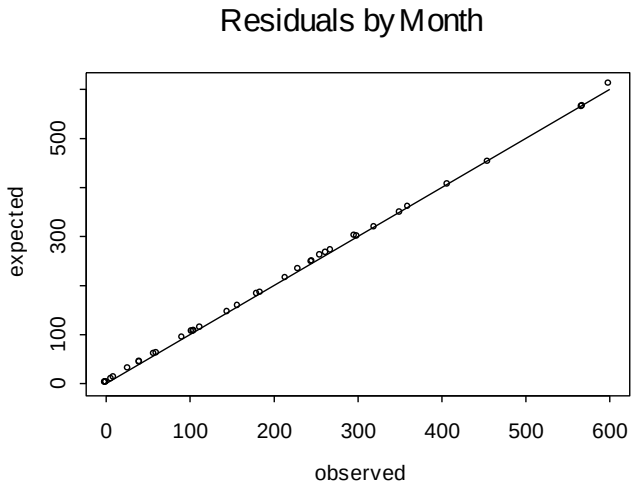


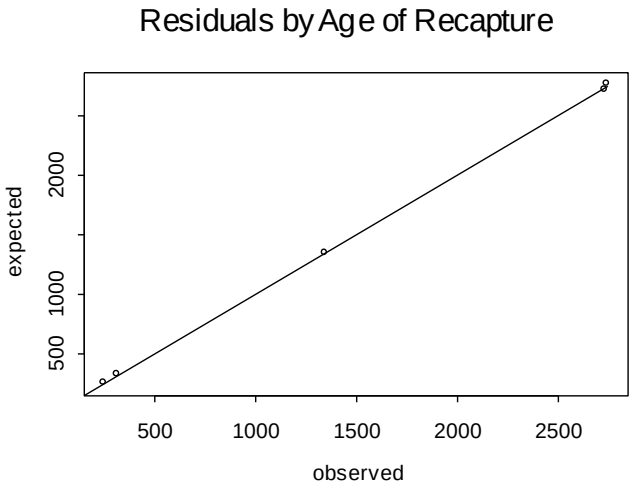
ITOC TAGGING DATA

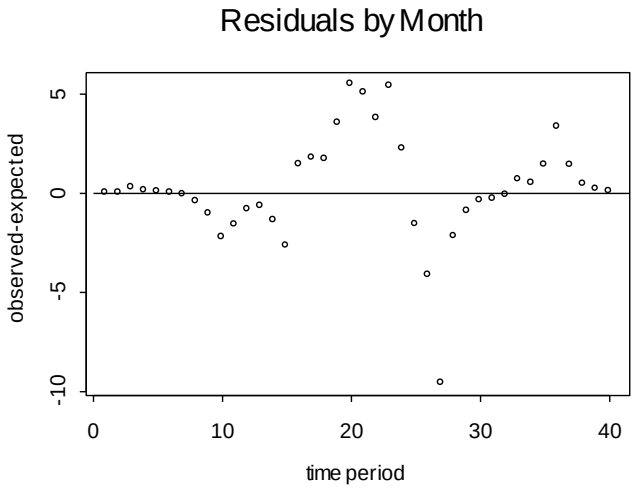


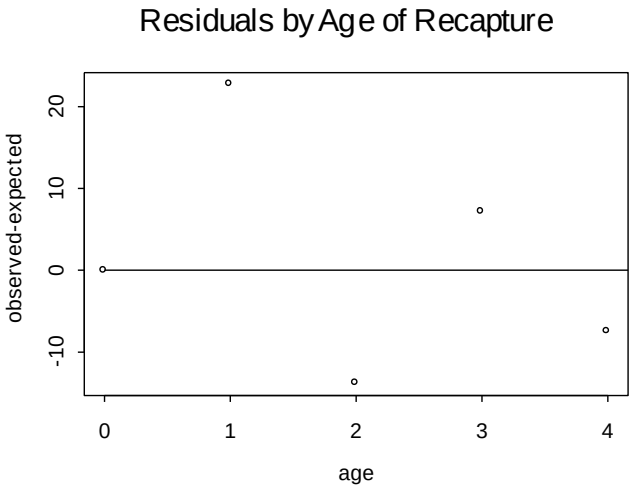


ITOC TAGGING DATA

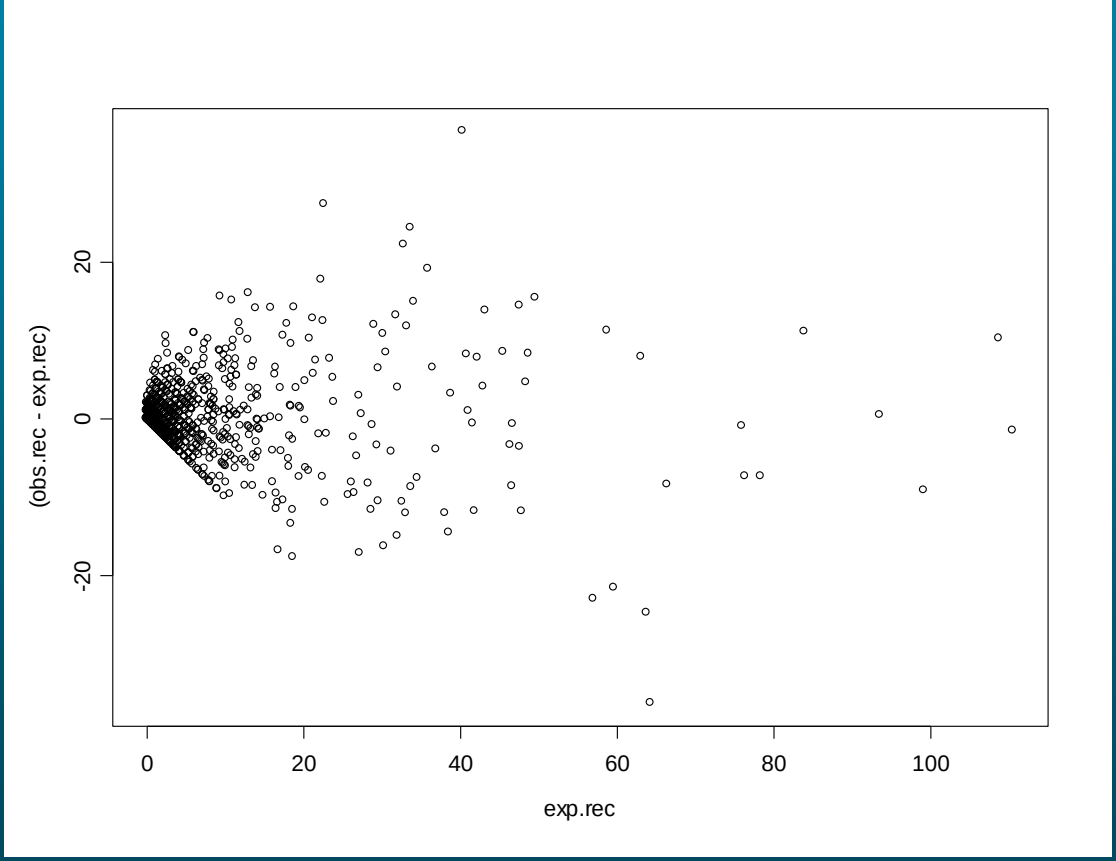




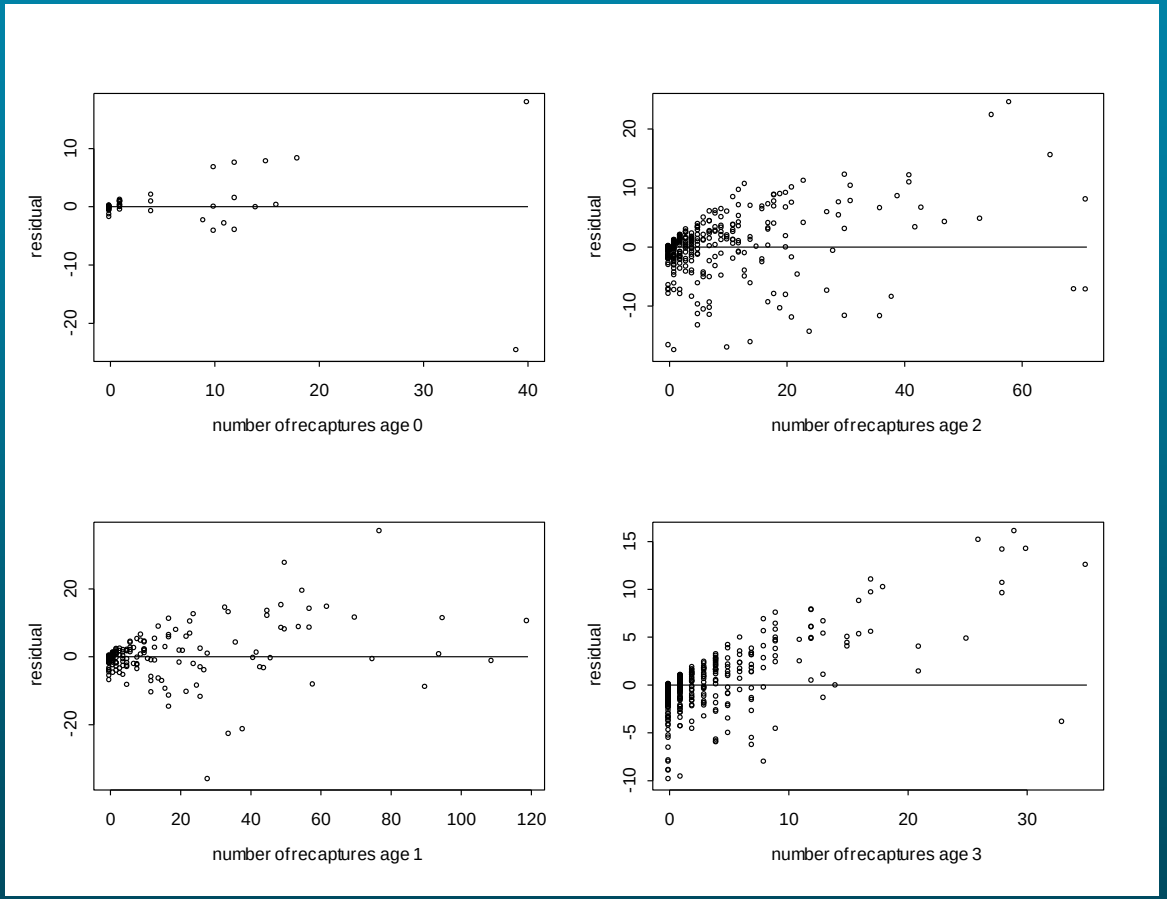
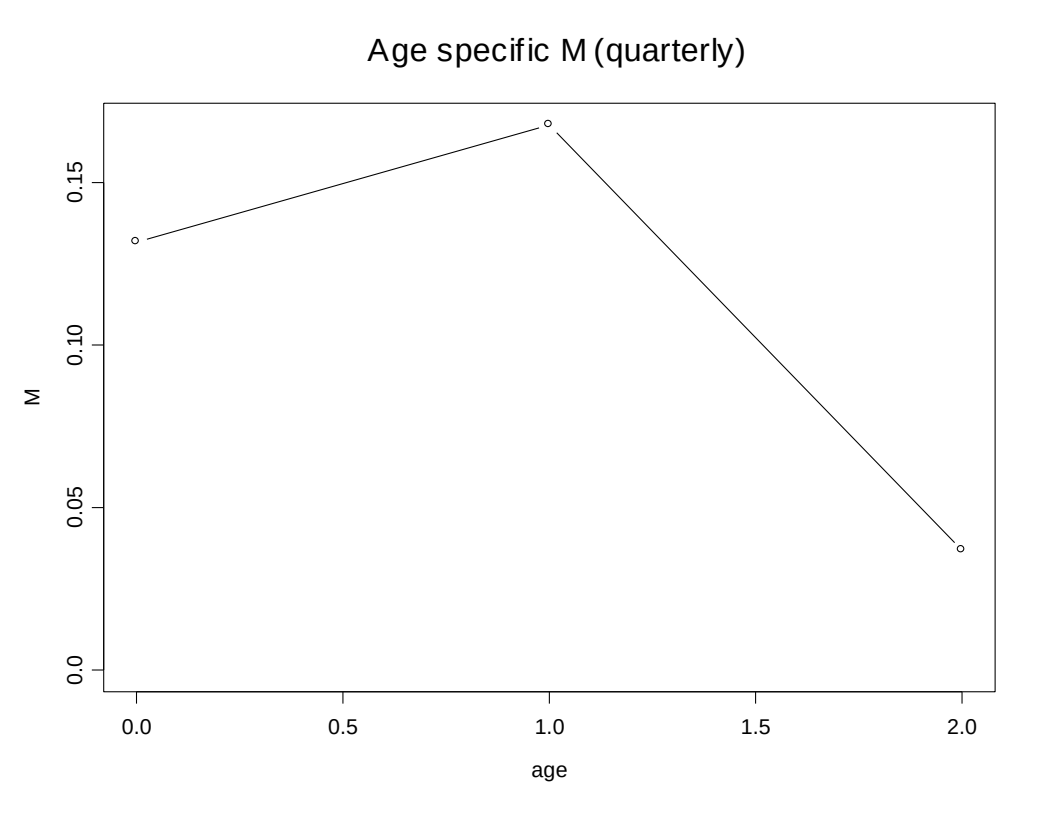




ITOC TAGGING DATA



ITOC TAGGING DATA



ITOC TAGGING DATA