



Primary
Industries

Fish tag retention design

A balancing act when all fish look the same

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Trial background

- Thousands of fish tagged in Murray River Fishways Assessment Project
- Not all are turning up in fishways
- Could tag retention be a problem for these fish?

Trial objective

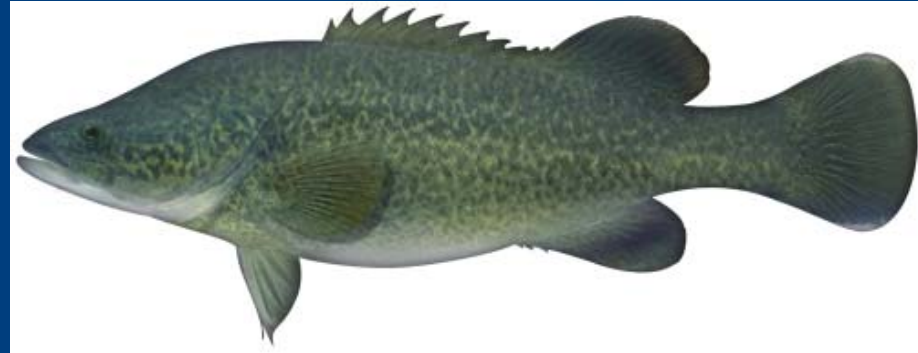
Determine the impact of tagging techniques on

- Growth of fish (length)
- Condition of fish (weight)
- Mortality
- Shedding rates

Main comparison of interest is between tagging treatments within species

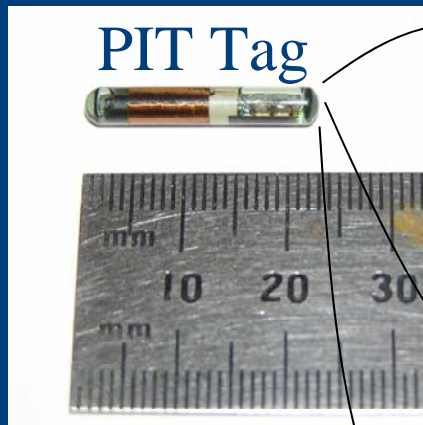
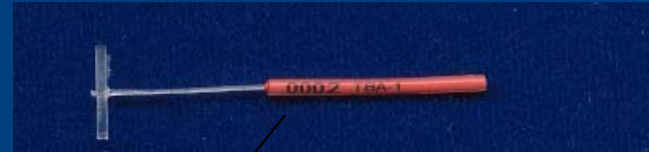
Trial specifications

- Three species



Trial specifications

- Five tagging treatments



Limitations

- 20 tanks available
- Single species per tank
- 250 fish of each species available
- Multiple operators to apply tags
- Fish anaesthetized in batches
- Minimize handling

Handling steps



Issues

- All fish look the same
- No method to identify individuals before treatment
- No information on size of individuals before treatment applied
- No method to identify treatment group if tag shed

Identifying treatment after shedding



Design parameters

- 50 fish per tank
- 5 tanks per species
- 15 tanks in 5 x 3 array
- 50 fish per anaesthetizing batch
- Tank and batch confounded
- 5 treatments per tank
- 5 tagging operators
- Species processed separately

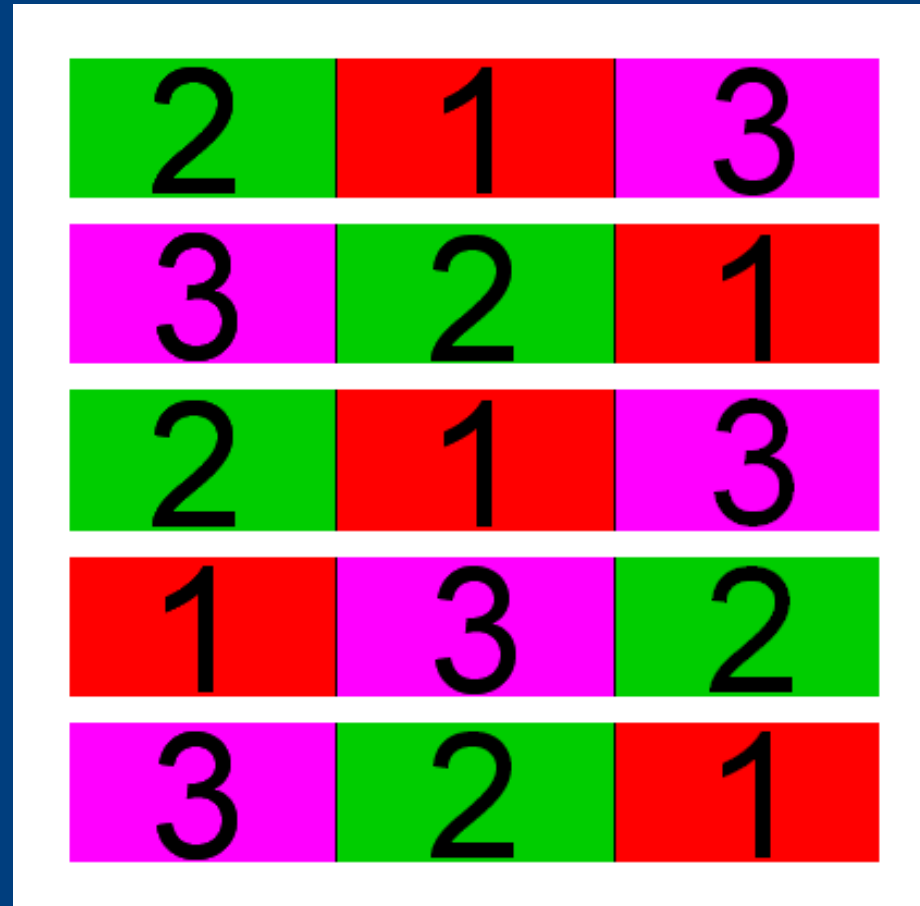
DiGGer

- Design search program
- Allows complex blocking and correlation of experimental units
- Allows for flexible specification of design and replicate layout
- Treatments may be unequally replicated
- Available as R package or stand alone

Design Step 1 – Allocate species to tanks



Allocating species to tanks



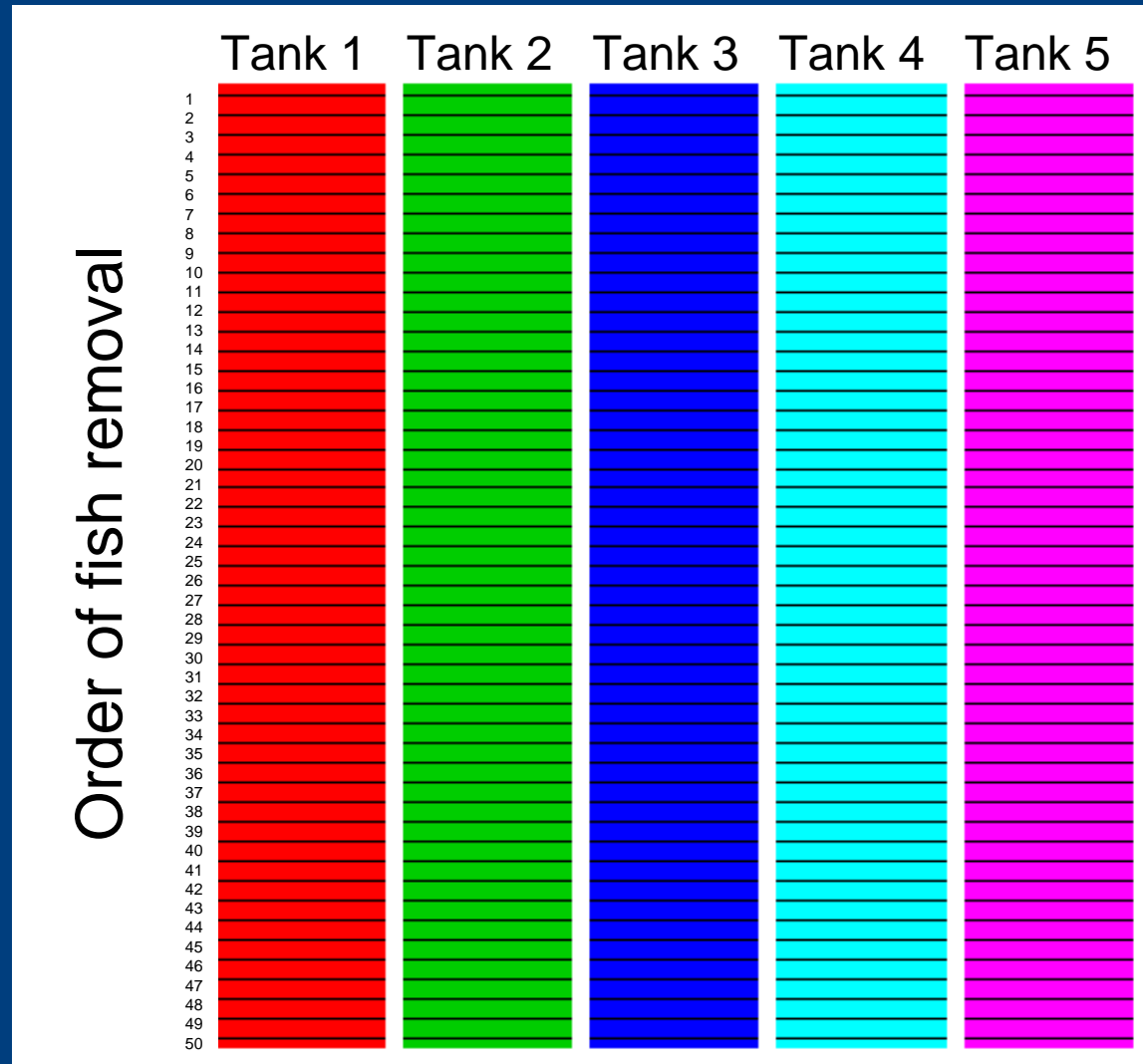
Design Step 2 – Allocate tagging treatments to fish



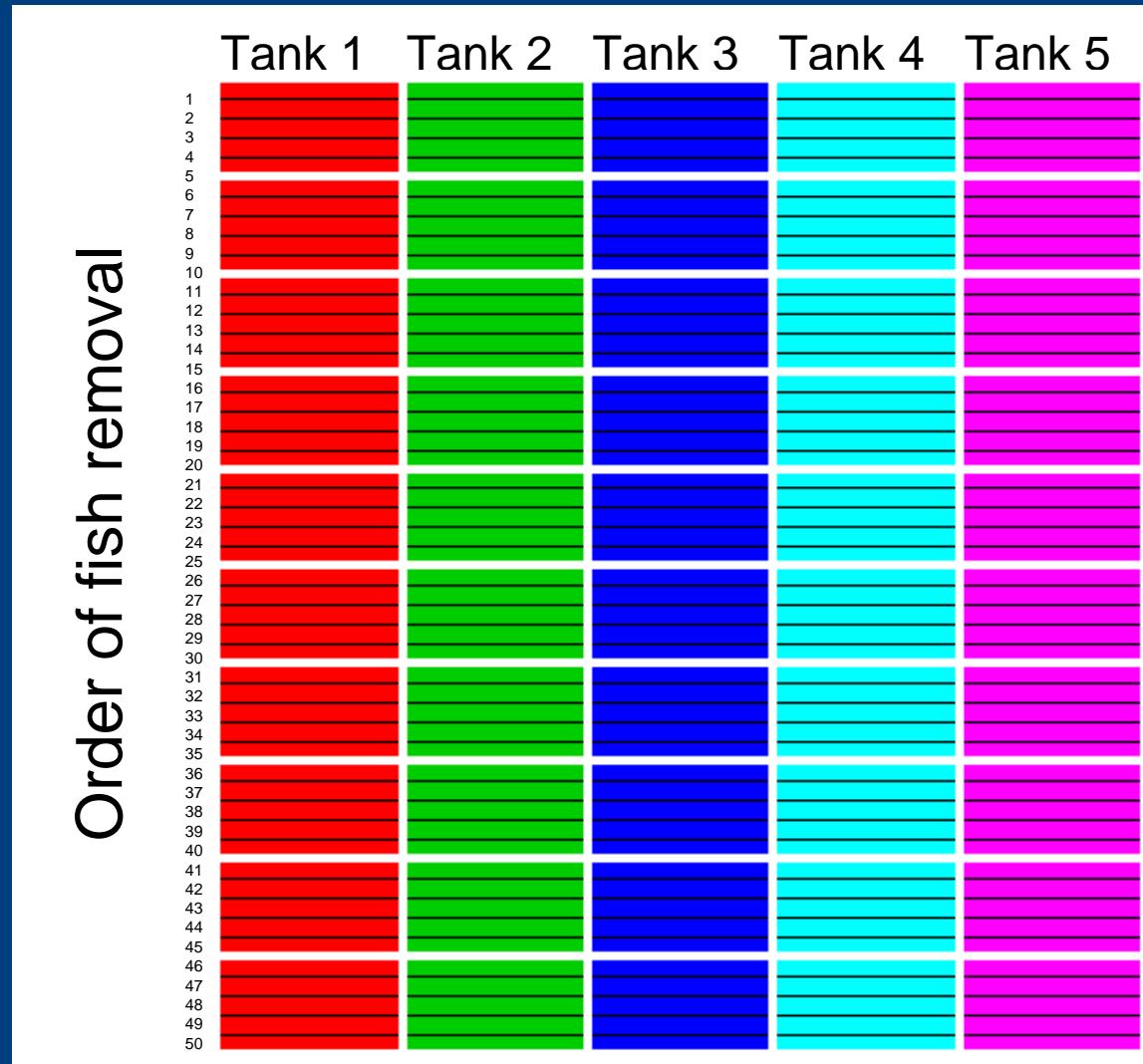
Allocating tagging treatments

- Allocate treatments based on order fish removed from anaesthetising tank
- Blocking structure for groups of 5 fish (tagblock)
- Five operators used within each block
- Each operator applies 2 of each tag type per tank

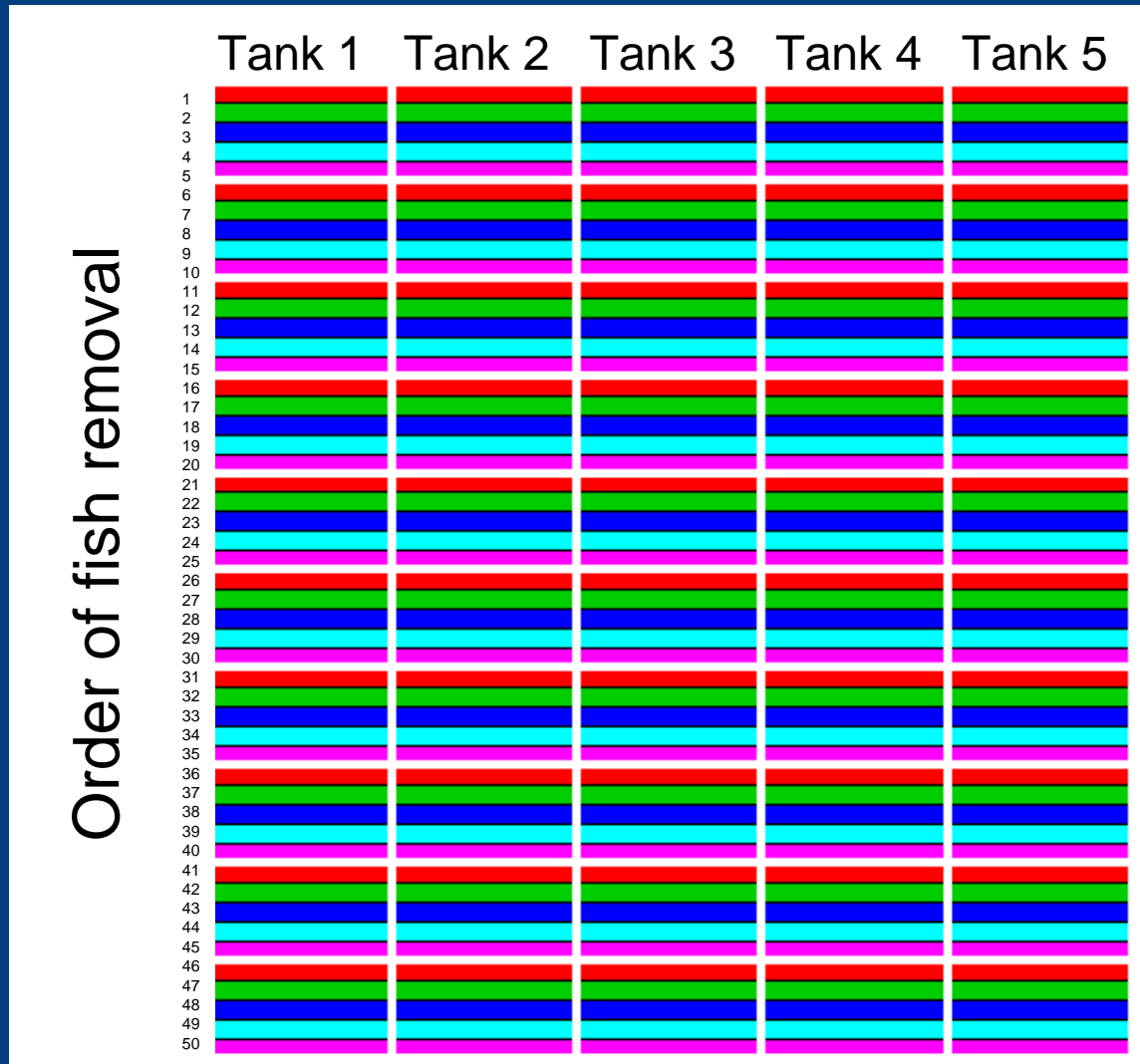
Design layout



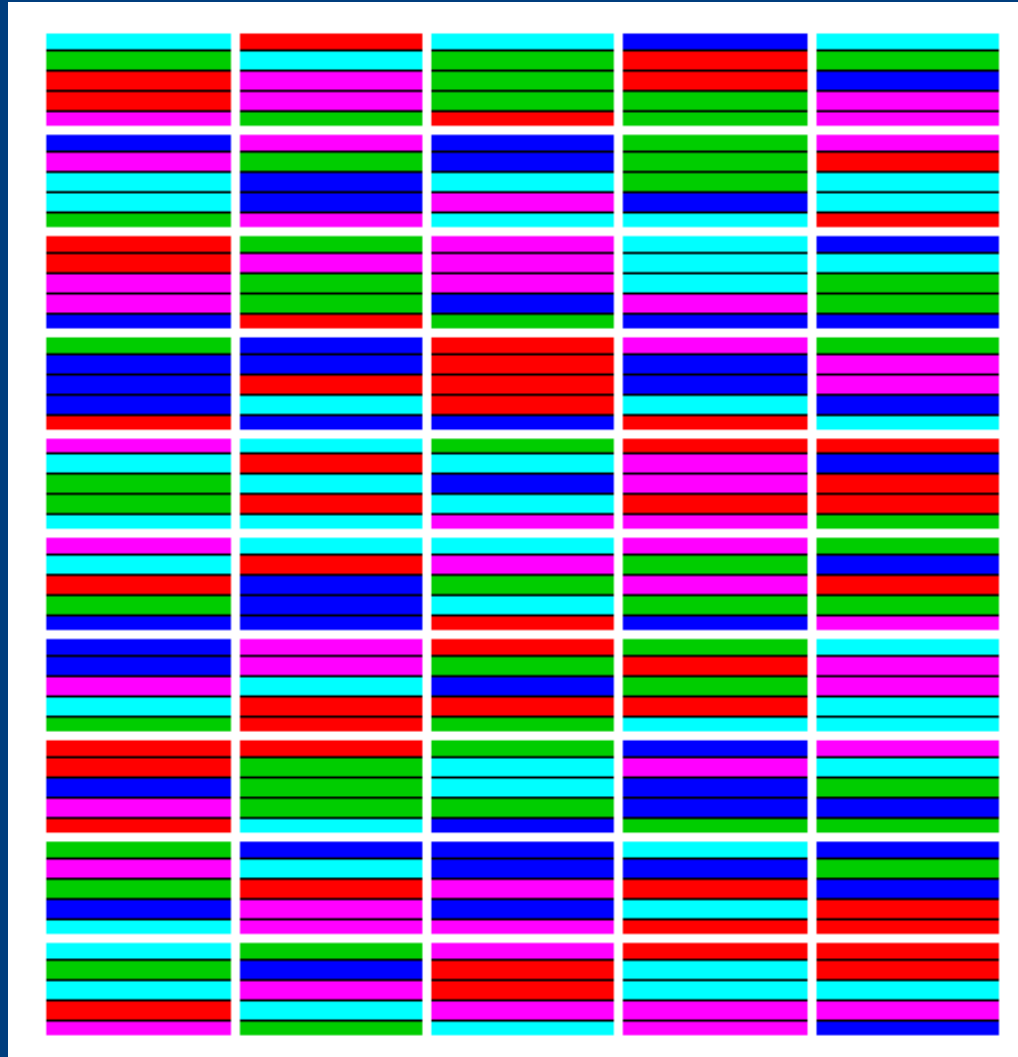
Design layout



Design layout



Initial design

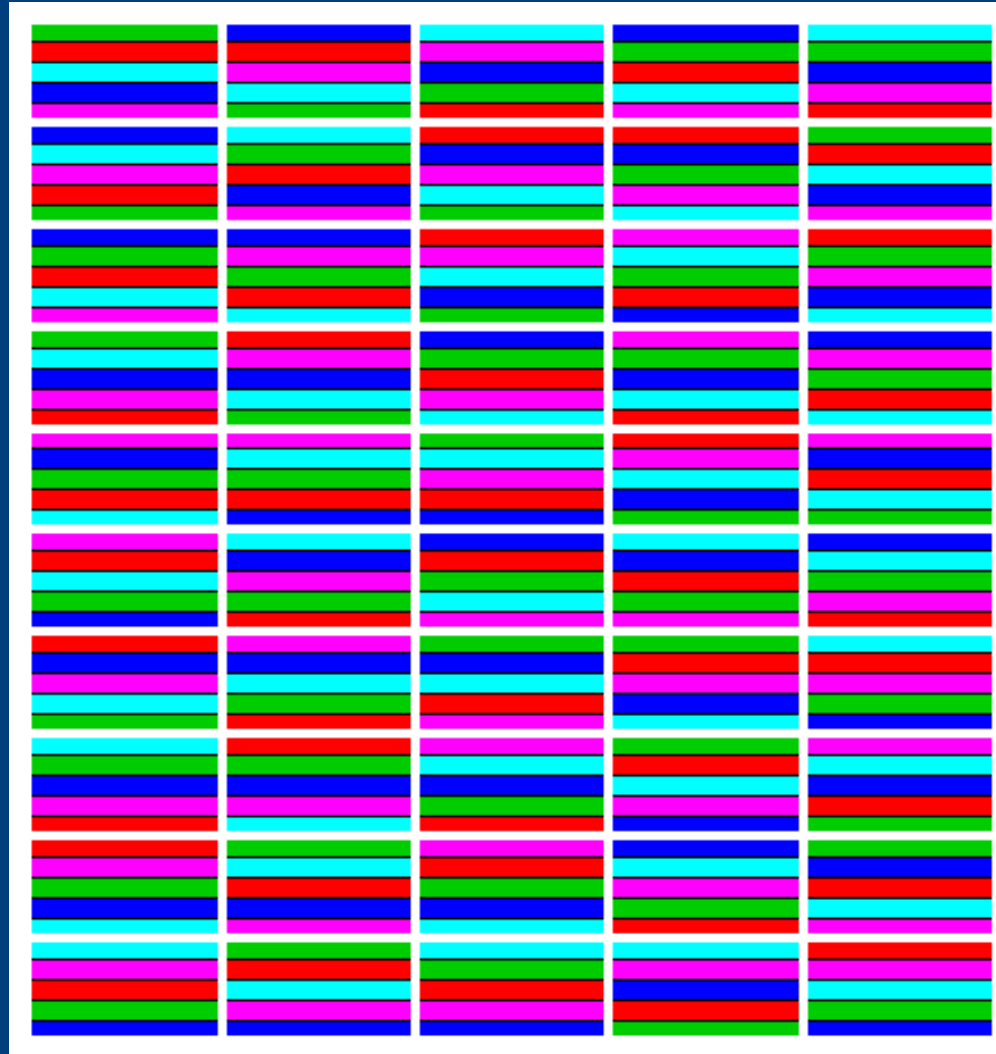


Swap Matrix



Allocating tagging treatments

Allocating tagging treatments



Tank	Fish	Operator	Treatment
1	1	1	shoulder
1	2	2	chest
1	3	3	dart
1	4	4	gut
1	5	5	control
1	6	1	chest
1	7	2	shoulder
1	8	3	control
1	9	4	dart
1	10	5	gut
1	11	1	chest
1	12	2	gut
1	13	3	shoulder
1	14	4	dart
1	15	5	control
1	16	1	dart
1	17	2	control
1	18	3	gut
1	19	4	shoulder
1	20	5	chest
1	21	1	gut
1	22	2	dart
1	23	3	chest
1	24	4	control
1	25	5	shoulder

Balancing

- Potential impact of fish size on tagging effect
- No information regarding size range of each species available
- No information on individual fish weights
- Ideally want similar distribution of sizes for each tagging treatment

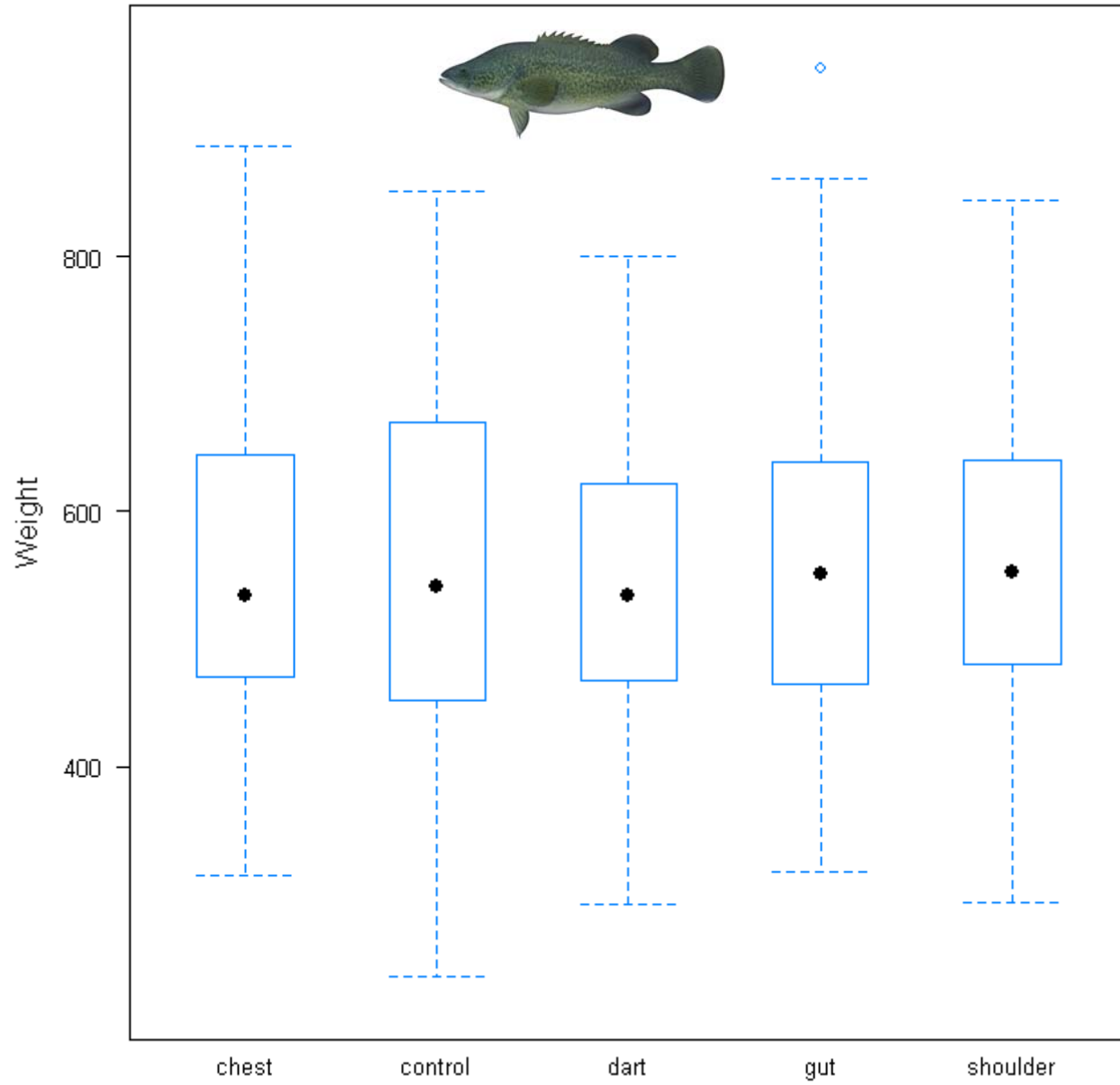
Monitoring weight for balancing

Tank	Fish	Operator	Treatment	trtno	Weight
2	1	1	dart	1	503
2	2	2	chest	4	595
2	3	3	gut	2	465
2	4	4	control	3	379
2	5	5	shoulder	5	481
2	6	1	shoulder	5	664
2	7	2	control	3	563
2	8	3	dart	1	465
2	9	4	chest	4	585
2	10	5	gut	2	418

Minimum	1st quartile	Median	3rd quartile	Maximum
294	465	524.5	592.5	777
Weight categories				
Trt	<1st quartile	1stq<=x<median	median<=x<3rdq	>=3rdq
1 - dart	2	4	2	2
2 - gut	3	2	2	3
3 - control	3	3	2	2
4 - chest	2	2	3	3
5 - shoulder	2	2	3	3
Total	12	13	12	13

Monitoring weight





Outcomes

- Design met practical requirements
- Design addressed identified issues
- Satisfied researcher
- Preliminary results look promising

Golden Perch - Cumulative Shedding Rate

