GMIT
INSTITIÚID TEICNEOLAÍOCHTA NA GAILLIMHE-MAIGH EO
GALWAY-MAYO INSTITUTE OF TECHNOLOGY

MARINE AND FRESHWATER RESEARCH CENTRE
LÁRIONAD TAIGHDE MARA AGUS FÍORUISCE

THE EFFECT OF TWO MARKING TECHNIQUES ON THE BEHAVIOUR OF THE WHITE-CLAWED CRAYFISH (*AUSTROPOTAMOBIUS PALLIPES*)

PRESENTED BY: MARTIN GAMMELL

RESEARCH BY: MICHAEL BEHAN

DATE: 06.03.2015

INTRODUCTION

- Mark-recapture methods are routinely used to estimate population sizes
  - Animals captured, marked and released
  - Proportion of marked animals captured in subsequent surveys used to estimate population size
- For unbiased estimates some assumptions must hold
  - Marks are not lost
  - Marking method does not affect survival
  - Marking method does not affect behaviour

Austropotamobius pallipes

Aim

- Examine the effects of two commonly used marking techniques on crayfish behaviour
  - Ablation
  - Cauterisation

METHODS: CAPTURE AND HOUSING

- *A. pallipes* collected from Nass branch of Grand Canal (NPWS Licence 100/2009)
  - November 2009, two nights
  - 5 crayfish traps, baited with cat food
  - 66 males and 1 female

Austropotamobius pallipes

- Males housed in two 1200 litre tanks connected to the same recirculating water supply
  - 33 males in each tank
  - Artificial shelters supplied for all animals

Table 1. Behaviour patterns used in this study (pilot observations, published ethograms).

Behaviour Pattern	Description
Locomotion	Any active movements, e.g. walking, climbing, building, digging and swimming.
Antennular exploration	Any use of the antennae and/or antennules on the tank surface, or to generate micro-currents in the water.
Rocking	Any active cleaning of the gills with other body parts, or the rocking action while walking that indicates cleaning of the gills.
Stroking	Any cleaning of the antennae or claws with the mouthparts, or any use of the chelipeds to clean body surfaces, including the antennae and antennules.

METHODS: EXPERIMENT

- 30 crayfish used in the experiment (10 crayfish per treatment group: random allocation)
  - Group 1: Control – lifted and held, but not marked
  - Group 2: Ablation – left and right side of uropod clipped with surgical scissors
  - Group 3: Cauterisation – carapace briefly touched with hot soldering iron

Observations

- Small experimental tank with 4 litres of water
- 20 minute observation period (one minute sample intervals, one-zero recording method)
- Treatment applied (Group 1, 2 or 3)
- Second 20 minute observation period
- No significant size difference between groups (One-way ANOVA, $F_{2,27} = 0.736$, $P = 0.488$)

RESULTS: ANTENNULAR EXPLORATION & ROCKING

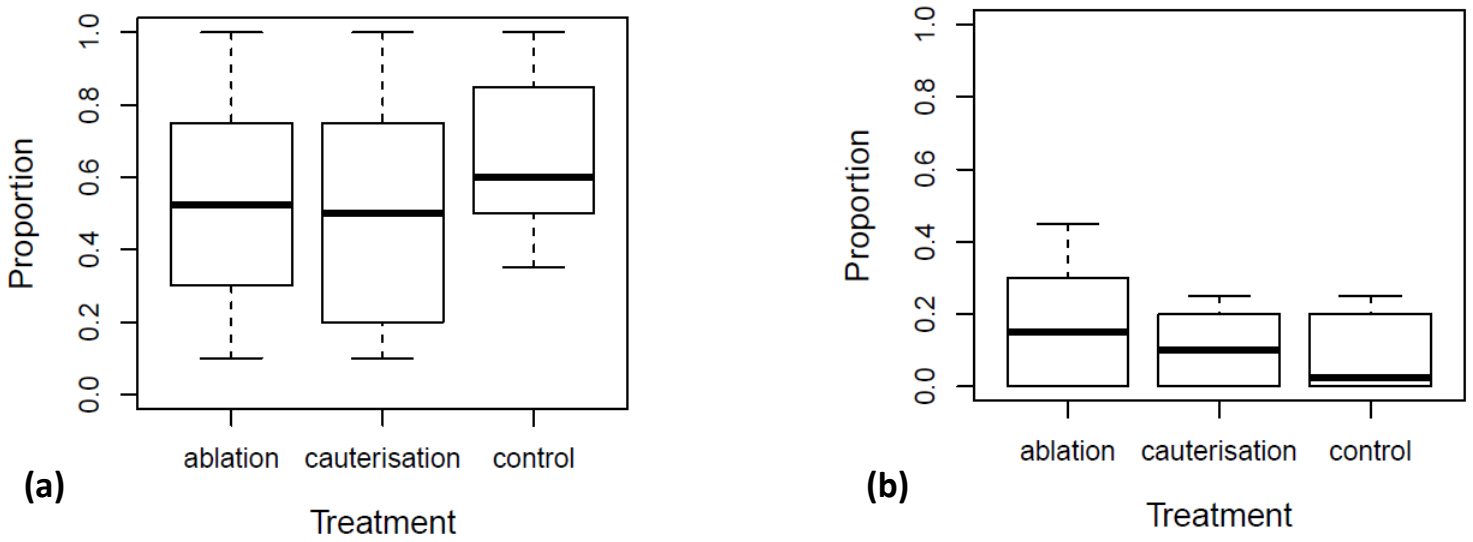

Figure 1. Proportion of sample intervals during which (a) Antennular Exploration and (b) Rocking occurred, for the three different levels of marking treatment (Ablation, Cauterisation, Control).

- Type of marking treatment did not affect antennular exploration behaviour (Likelihood ratio test: Chi-square=22.909, df=2, P=0.068)
- Type of marking treatment did not affect rocking behaviour (Likelihood ratio test: Chi-square=5.657, df=2, P=0.341)

RESULTS: LOCOMOTION

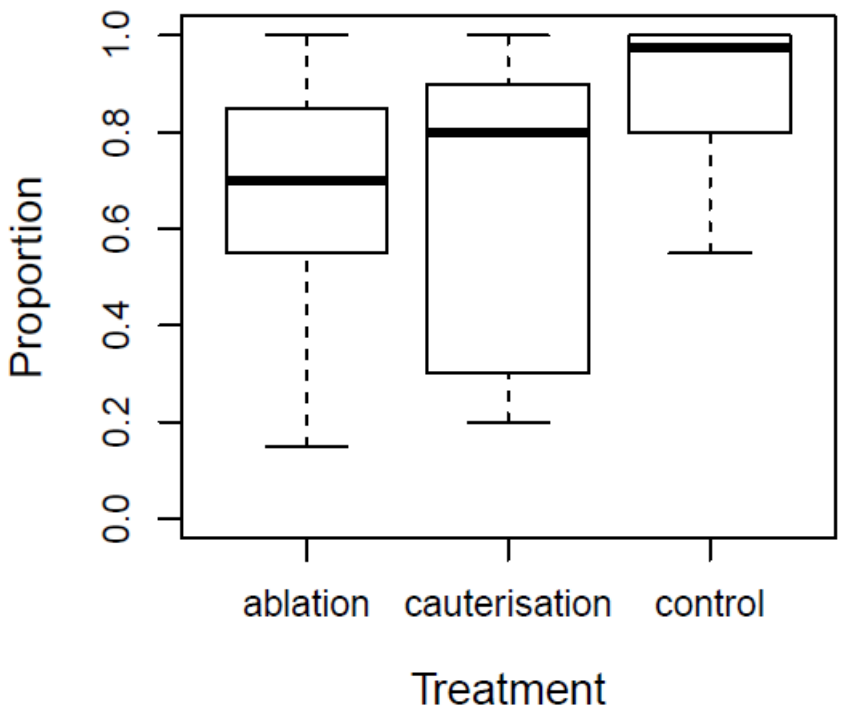

Figure 2. Proportion of sample intervals during which Locomotion occurred, for the three different levels of marking treatment (Ablation, Cauterisation, Control).

- Type of marking treatment affected locomotion behaviour (Likelihood ratio test: Chi-square=55.654, df=2, P=0.004, FDR-adjusted P=0.007)
- Crayfish subjected to Ablation and Cauterisation displayed locomotion behaviour at significantly lower rates than Control animals (P=0.024 and P=0.009 respectively)
- No significant difference in frequency of locomotion by animals subjected to Ablation and Cauterisation (P=0.409)

RESULTS: STROKING

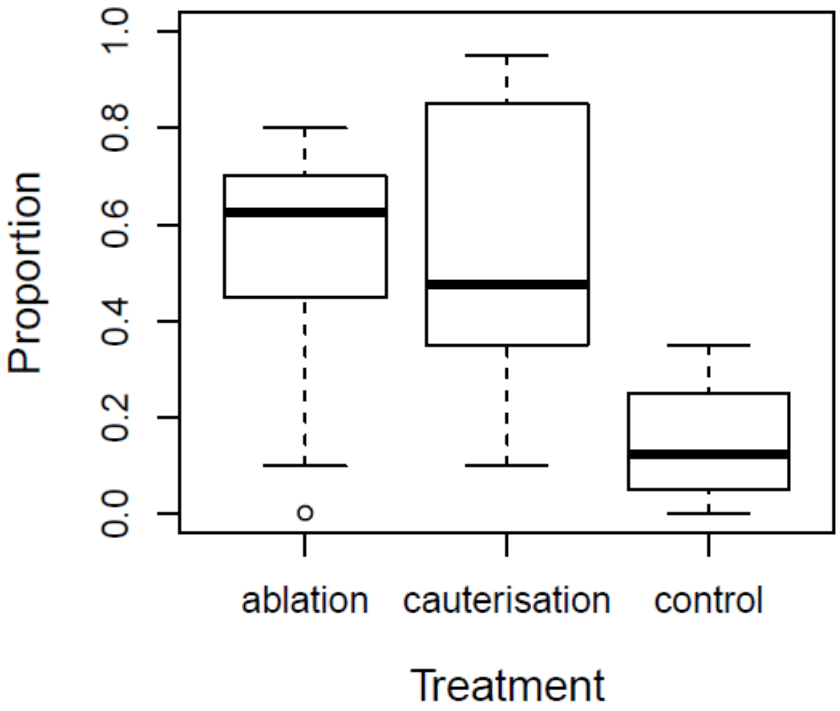

Figure 3. Proportion of sample intervals during which Stroking occurred, for the three different levels of marking treatment (Ablation, Cauterisation, Control).

- Type of marking treatment affected stroking behaviour (Likelihood ratio test: Chi-square=96.797, df=2, P<0.001, FDR-adjusted P<0.001)
- Crayfish subjected to Ablation and Cauterisation displayed stroking behaviour at significantly higher rates than Control animals (P=0.004 and P=0.001 respectively)
- No significant difference in frequency of stroking by animals subjected to Ablation and Cauterisation (P=0.494)

CONCLUSIONS

- Both marking procedures altered the behaviour of crayfish
  - Marked crayfish performed locomotion behaviour at significantly lower rates than control animals
  - Marked crayfish performed stroking behaviour at significantly higher rates than control animals
- Both marking procedures do not meet one of the assumptions of mark-recapture studies
  - May lead to biased estimates of population size in mark-recapture studies of crayfish

- We only examined crayfish behaviour immediately post-marking, and only using two marking techniques
- Future work
  - Short-term and long-term behavioural responses to marking
  - Examine more marking techniques (e.g. VIE tags, PIT tags)

ACKNOWLEDGEMENTS

- Bill Brazier for assistance in the field and laboratory
- Paul McLoone and Sean Rooney (Inland Fisheries Ireland)
- Julian Reynolds (Trinity College Dublin)
- Ciara Flynn (National Parks and Wildlife Service)
- Ian O'Connor and Pat Dinneen (Galway-Mayo Institute of Technology)
- The Total Energy for Sustainable Aquaculture (TESSA) team (Galway-Mayo Institute of Technology)
- The Licensing Department of the National Parks and Wildlife Service
- The Canals Section of Waterways Ireland.