Acid avoidance behaviour in juvenile snapper, *Pagrus auratus*

Frederieke J. Kroon*, NSW Fisheries, Port Stephens Fisheries Centre, Private Bag 1, Nelson Bay NSW 2315, Australia
* new address: CSIRO Land & Water, Long Pocket Laboratories, 120 Meiers Road, Indooroopilly QLD 4068, Australia; e-mail frederieke.kroon@csiro.au

Office of Conservation

FISHERIES RESEARCH & DEVELOPMENT CORPORATION

INTRODUCTION

- The ecological effects of acute exposure to acid sulfate soil discharge have been well documented, however, less is known about the long-term impacts of chronic acid sulfate run-off
- Such run-off may create barriers to migration, thus affecting juvenile recruitment of migratory fish and prawn species
- If juveniles avoid streams with chronic acid sulfate run-off, partial or complete recruitment failure may occur in these streams
- As a result, the capacity of upstream habitats to act as nursery areas may be reduced, with potential effects on stock size
- Consequently, acid sulfate run-off could impact detrimentally on commercial and recreational fisheries

- **Objective:** To assess the behavioural response of recruiting juveniles to chronic, low concentration, acid sulfate run-off
- **Hypothesis:** Low concentrations of acid do not affect recruitment of migratory fish
- **Prediction:** Juvenile snapper avoid low concentrations of acid, when given a choice

SNAPPER, *PAGRUS AURATUS*

Distribution

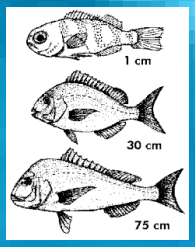
Figure 1 Snapper distribution (green) overlaps with acid sulfate soil catchments (red) in eastern Australia

Life history (eastern Australia)

Larvae
- in coastal waters; enter coastal estuaries and bays
- pelagic lifestyle
- metamorphosise at 12.0 – 13.3 mm

Juveniles and small adults
- in coastal estuaries and bays
- more benthic lifestyle
- sizes range from 65 – 195 mm

Adults
- occur in the warm temperate Indo-Pacific
- spawn in the ocean, in winter



Fisheries (eastern Australia)

Queensland
- Commercial (2000)
- catch 80 t --- value $600,000
- Recreational (1999)
- catch 316 t --- value ???

New South Wales
- Commercial (1999/2000)
- catch 283 t --- value $2,523,000
- Recreational (early '90)
- catch >180 t --- value ???

METHODS

Paired channels of a laboratory stream

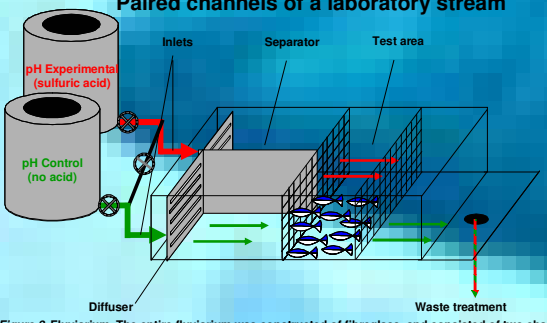


Figure 2 Fluviarium. The entire fluviarium was constructed of fibreglass, and consisted of two channels with a test area

Confirmation of lateral flow in test area

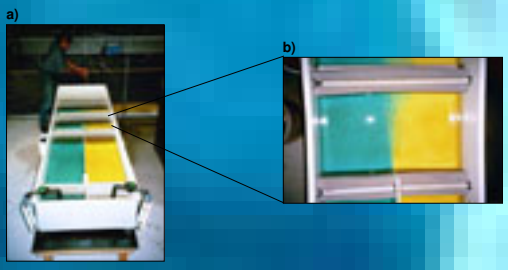


Figure 3 Fluviarium. (a) Testing the stability and sharpness of demarcation of the two water masses in the fluviarium, using dye tracers (food colouring), and, (b) detail showing demarcation within the test area

Protocol: --- Ten fresh juveniles in test area per trial --- Positions of individual fish videotaped continuously --- Each trial lasted 60 minutes --- Using videotape, number of individuals in each lateral half of test area was determined every minute, totalling 60 observations per trial --- Mean proportion of juveniles in experimental half of test area during trial provided an assessment of juveniles' preference for either of two water qualities.

RESULTS

Juvenile snapper avoid low concentrations of sulfuric acid

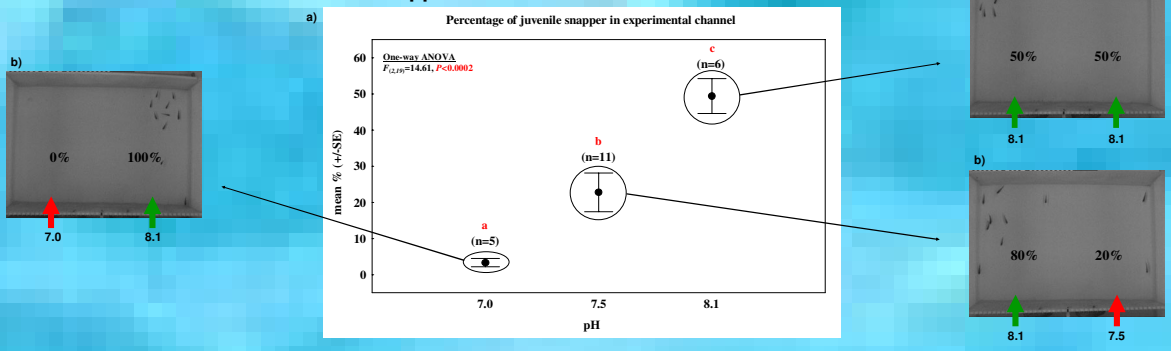


Figure 4 Snapper (a) Mean proportion of juveniles (+/- SE) in the experimental half of the test area plotted against corresponding acidity level (i.e. pH), and, (b) stills, showing the positions of juveniles in the test area during control and experimental trials. One-Way ANOVA's were performed on mean proportion of juveniles, with pH group as independent variable; n is the number of trials conducted.

SUMMARY

SNAPPER
1. Juvenile snapper avoid low concentrations of sulfuric acid, when given a choice;
2. Juvenile snapper avoid pH levels that are well within the magnitude of natural systems;
3. Acidic component of acid sulfate run-off alone has the potential to affect recruitment of juvenile snapper;
4. Such avoidance of acid sulfate run-off may reduce the proportion of potential nursery habitat used, with potential effect on stock size.

GENERAL
1. pH levels, preferred by juvenile snapper, are higher than usually aimed for in rehabilitation efforts.

ACKNOWLEDGEMENTS

I thank Robin Liley and Håkan Olsén for fluviarium suggestions, and all Fisheries Technicians at the Port Stephens Fisheries Centre who helped constructing the fluviarium. In particular, I am indebted to Graham Housefield for designing the set-up, fine-tuning it to perfection, and "keeping those fish swimming". This work is part of grant no. 1998/215 from the Australian "Fisheries Research and Development Corporation". Their support is gratefully acknowledged.