

## USING ENVIRONMENTAL FLOW RELEASES TO TRIGGER AUSTRALIAN GRAYLING *PROTOTROCTES MARAENA* SPAWNING BEHAVIOUR IN THE THOMSON RIVER, SOUTH EASTERN AUSTRALIA

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Monitoring fish movement can be used to test the effectiveness of environmental flow releases designed to trigger spawning behaviour. Environmental flow releases have been used to enhance Australian grayling *Prototroctes maraena* spawning in regulated rivers in south-eastern Australia and knowledge of their effectiveness is required to conserve this threatened species. Australian grayling were thought to spawn in the mid-reaches of coastal rivers; however, a recent study demonstrated the species undergoes a downstream spawning migration during increases in river discharge to spawn in freshwater areas close to the estuary in the Bunyip River [1]. This project was undertaken to determine whether Australian grayling undergo downstream spawning migrations in the Thomson River, south eastern Australia, where they migrate and whether migrations can be triggered by environmental flow releases. This work is reported fully in Amtstaetter et al. [2].

Two environmental flow releases occurred in 2012 and 2013 and one in 2014 during the Australian grayling spawning period. These releases increased river discharge from 150 to 800 MLd<sup>-1</sup>, maintaining the peak for four days. Australian grayling movement was monitored using acoustic telemetry with 14 fish implanted with transmitters in 2012 and 24 in 2013. Drift netting was used in 2013 and 2014 to collect eggs or larvae and verify whether spawning took place. Generalised linear models with a binomial distribution were used to investigate the relationships between the timing of individual movements with water temperature and environmental flow releases.

Adult Australian grayling undertook downstream spawning migrations to the lower Thomson River, coinciding with environmental flow releases. Eight fish with transmitters rapidly migrated long distances (62 to 140 km) to the lower Thomson River. Seven of these fish migrated during the first environmental flow release (Figure 1). One fish migrated prior to flow releases, on a small natural increase in flow. There was a significant relationship between the timing of migrations and flow releases ( $Z = 2.66$ ;  $P = 0.008$ ). Australian grayling eggs were captured at the downstream locations where adults migrated.

The findings of this study support the use of environmental flow releases to trigger spawning migrations by Australian grayling. We recommend that managed environmental flow releases continue to be provided in the Thomson River to trigger downstream migrations and spawning by this species. In addition, appropriate timing of flow releases to trigger spawning behaviour was discerned by this study (late April to mid-May). Environmental water managers are using this knowledge to inform their annual planning and prioritisation of environmental flow events. Future monitoring work will investigate changes in spawning output in response to variations in the magnitude or duration of environmental flow releases. These findings can be used in an existing

adaptive management framework to refine the delivery of environmental flow releases and define a range of flows that will trigger migration and spawning.

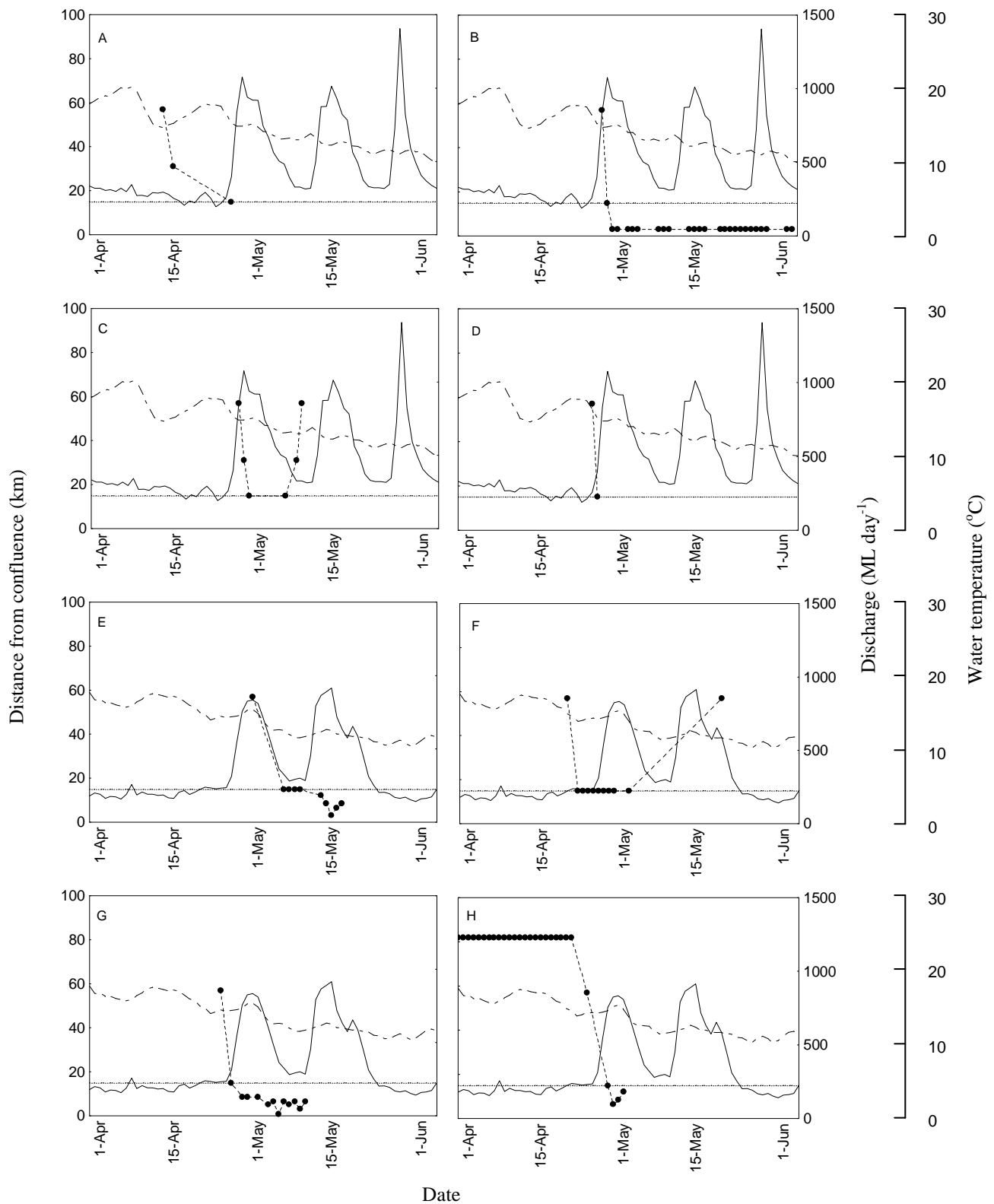


Figure 1. Movements of adult Australian grayling, river discharge (solid line) and water temperature (dashed line) in 2012 (A to D) and 2013 (E to H) in the Thomson River. The horizontal dotted line represents a location 15 km upstream of the confluence with the Latrobe River and the black circles with a connecting dashed line

represent detections. These dashed lines connect consecutive detection points for visual clarity and their slope represents the average movement over the period. This figure is reproduced from Amtstaetter *et al.* [2].

## ACKNOWLEDGMENTS

David Stork (West Gippsland Catchment Management Authority) coordinated funding for the project, which was completed as part of the Victorian Environmental Flows Monitoring and Assessment Program. We thank the following staff at the Arthur Rylah Institute for Environmental Research (ARI) for assistance with this project: Renae Ayres, Ruby Campbell-Beshomer, David Dawson, Lauren Dodd, Wayne Koster, John Mahoney, Paul Moloney (biometrician) and Mike Nicol. Andrew Bennett and John Koehn from ARI provided useful comments on an earlier version of this document. Jane Hughes and Kathryn Real from Griffith University and Anthony von Rooyen and Andrew Weeks at Cesar Pty. Ltd. were involved with egg identification using genetic techniques. We thank numerous land owners for access to the river.

## REFERENCES

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- [2] Amtstaetter F., O'Connor J, and Pickworth A., Environmental flow releases trigger spawning migrations by Australian grayling *Prototroctes maraena*, a threatened, diadromous fish, *Aquatic Conservation: Marine and Freshwater Ecosystems*, DOI: 10.1002/aqc.2570.