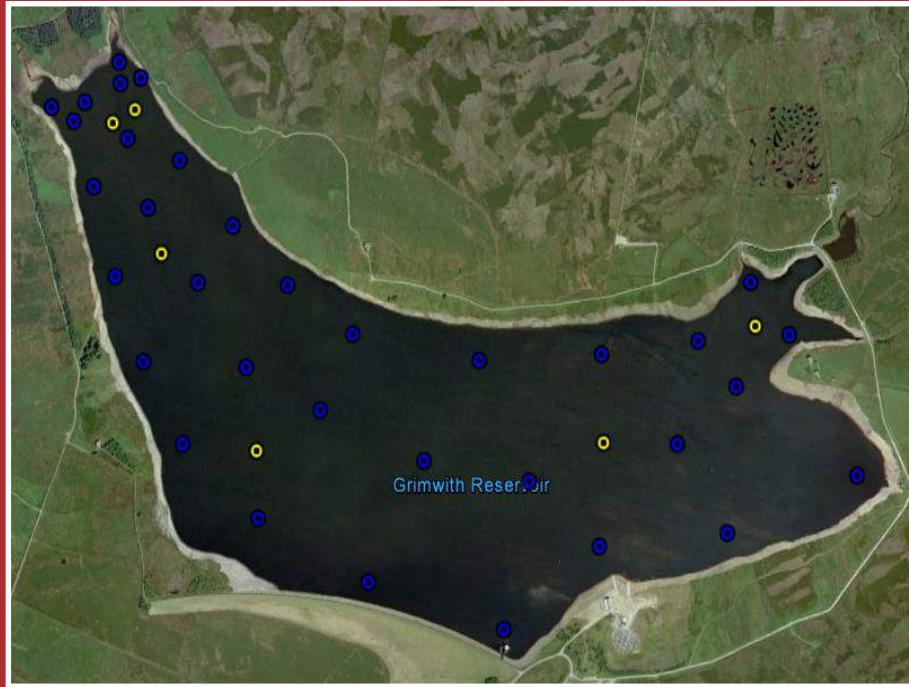


# Movement of brown trout in and between headwater tributaries and reservoirs



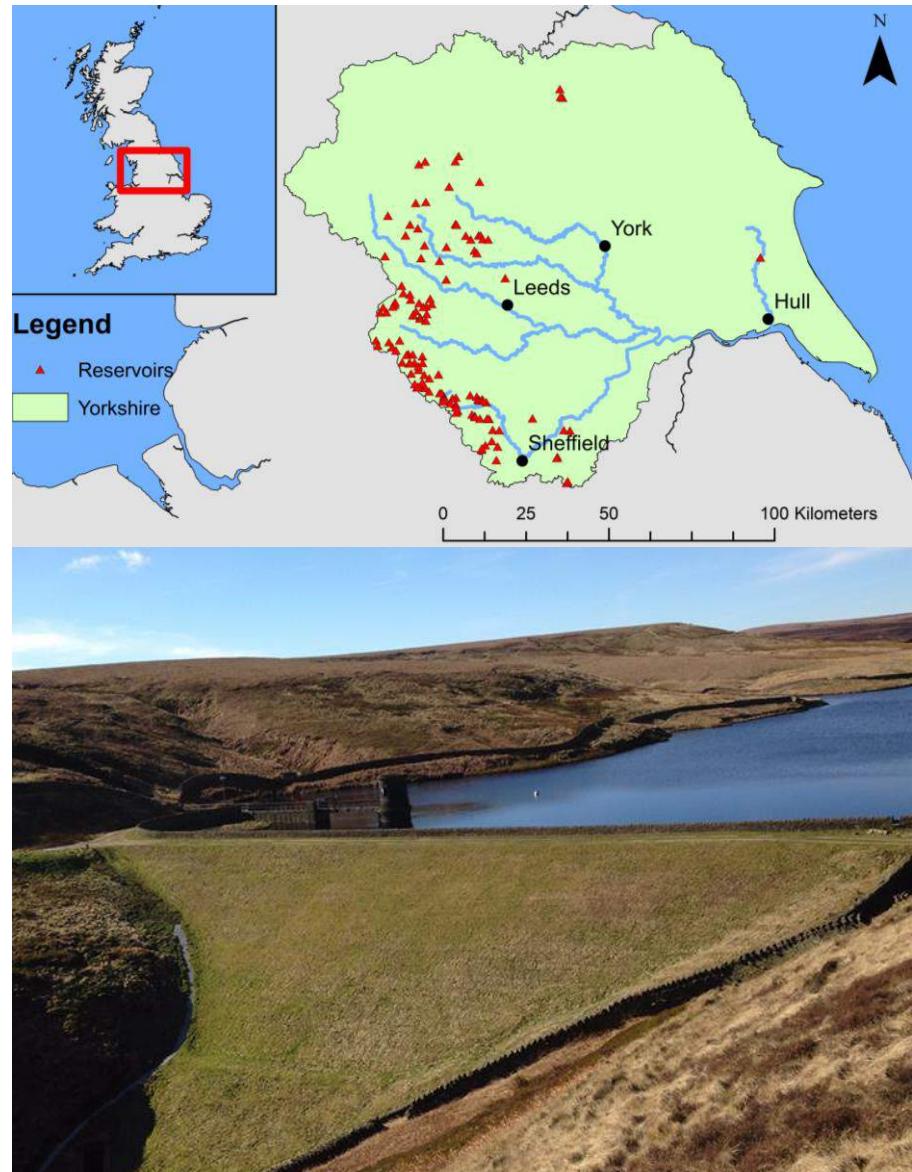
J.D. Bolland, L. Wallace, J.P. Harvey,

M. Tinsdeall, J.L. Baxter & I.G. Cowx



# Reservoirs in Yorkshire

- Over 120 reservoirs in Yorkshire
- Constructed since late 19<sup>th</sup> Century
- Water supply to over 5 million people
- Recreational value
- Compensation release to maintain river flow



## Aim

The aim of this investigation was to assess the spatial ecology and behaviour of brown trout in reservoirs and their tributaries, including those with barriers to movement.

## Objectives

- Investigate the spatial ecology of brown trout in a tributary upstream of a reservoir using radio telemetry.
- Investigate the timing and influence of flow, temperature and fish size on the upstream and downstream movements of brown trout between tributaries and reservoirs using fixed-location PIT telemetry.
- Investigate the behaviour and habitat use of brown trout in a reservoir, especially during the spawning period, using fine-scale acoustic telemetry.

# Langsett Reservoir (impact)

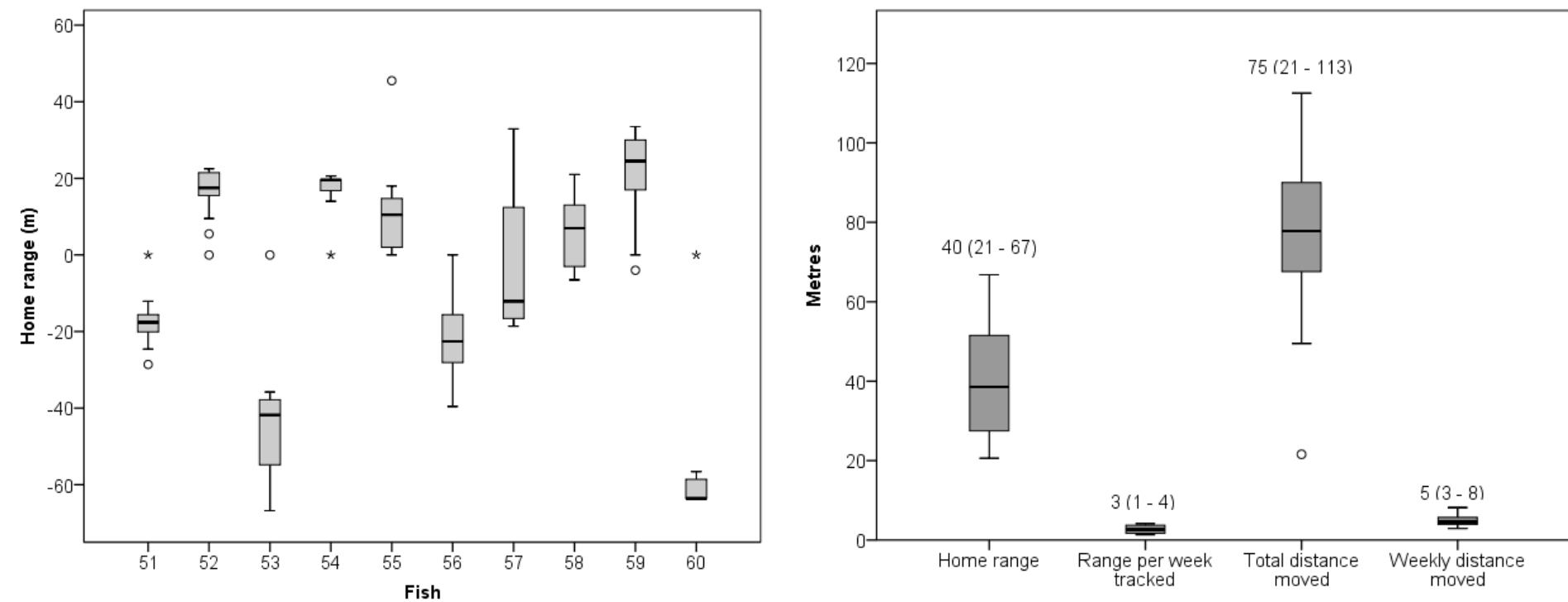


# Grimwith Reservoir (control)

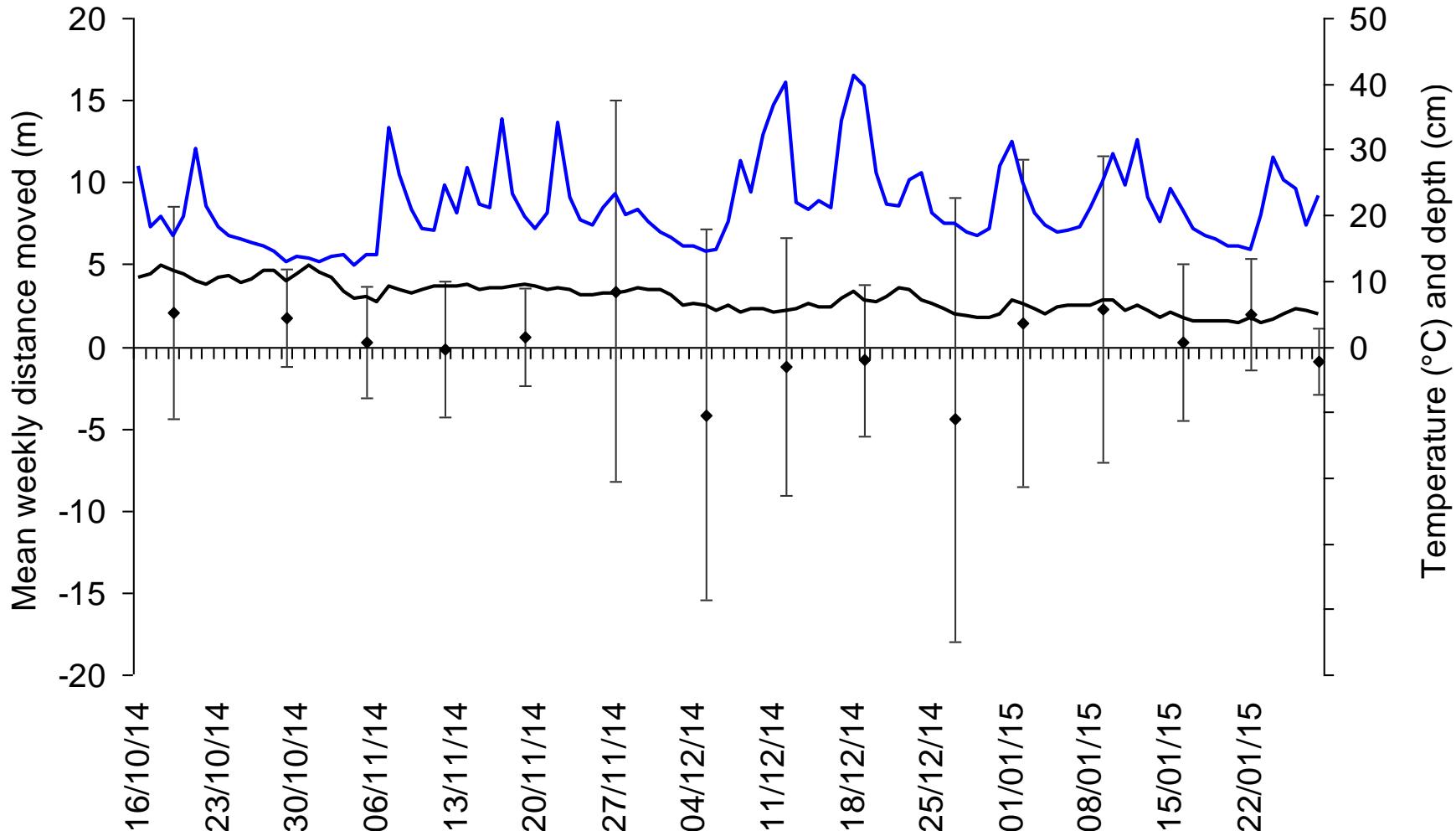


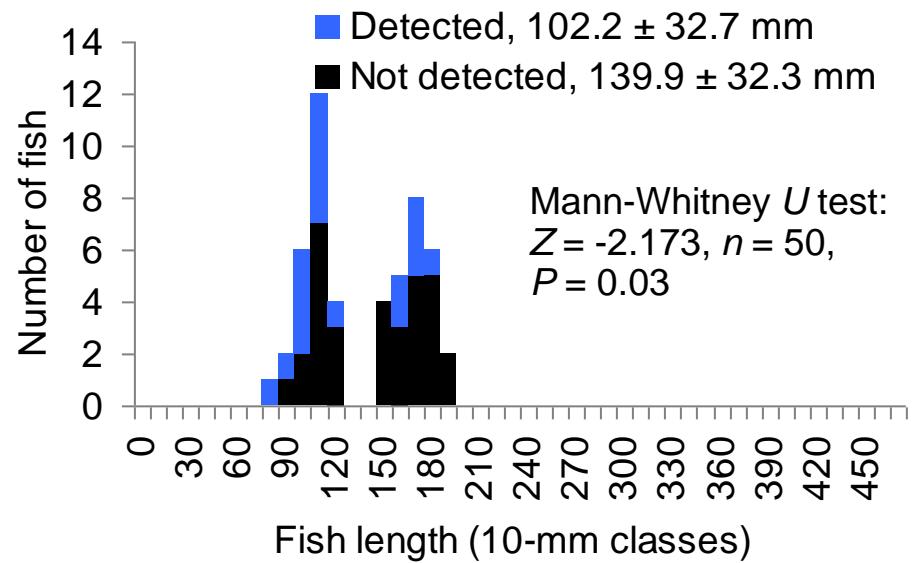
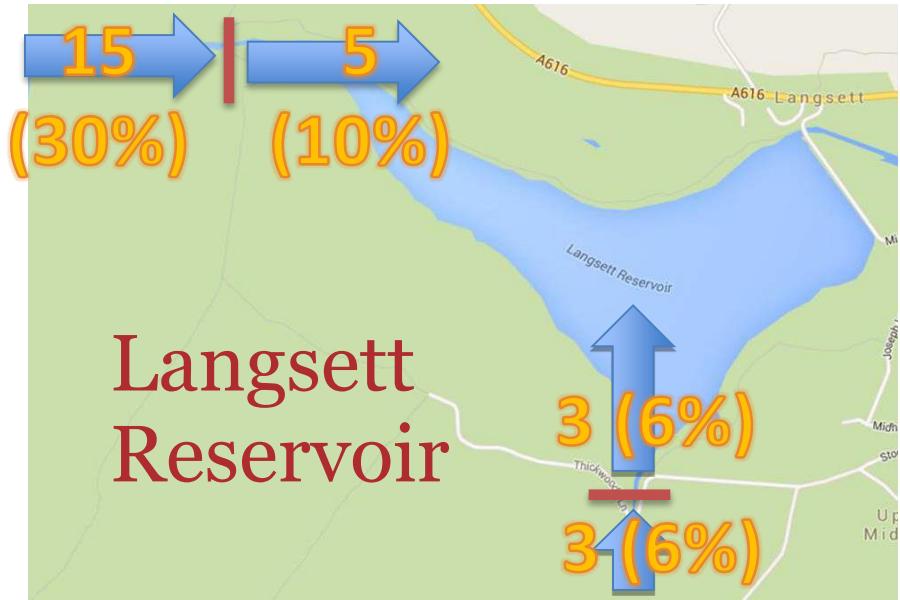
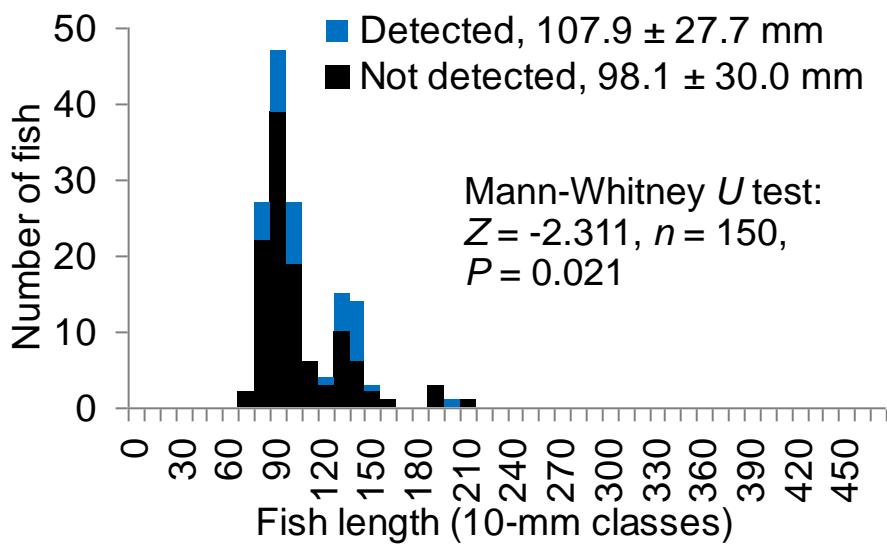
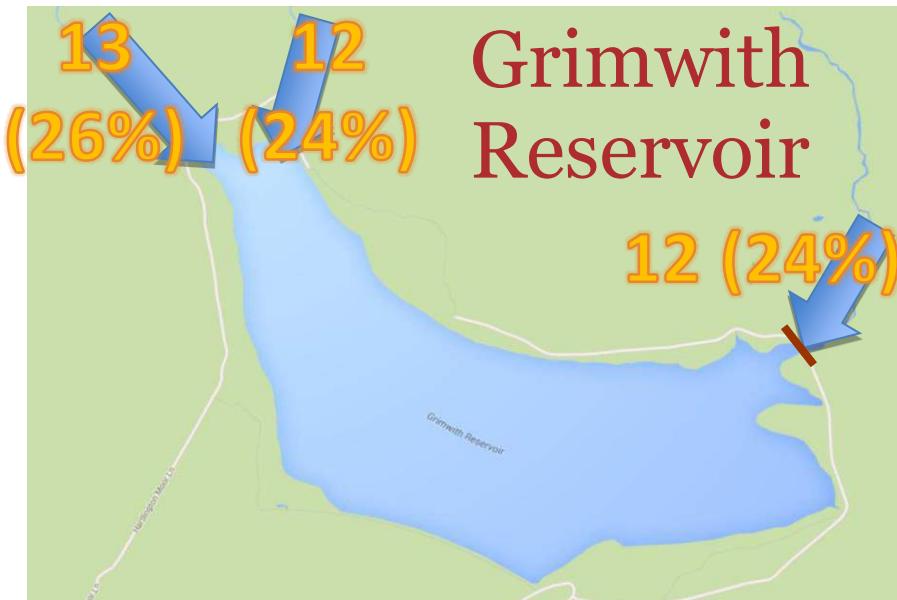
# Adult fish movements in a tributary

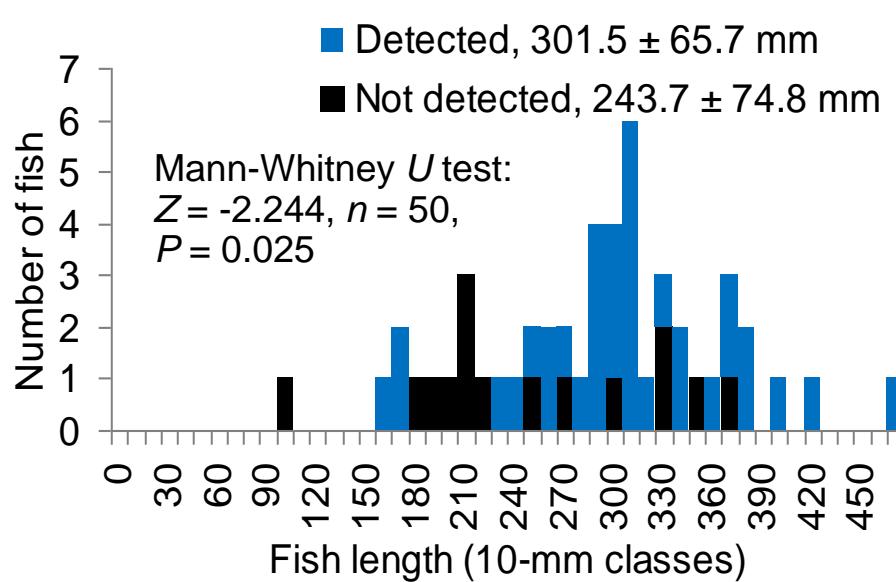
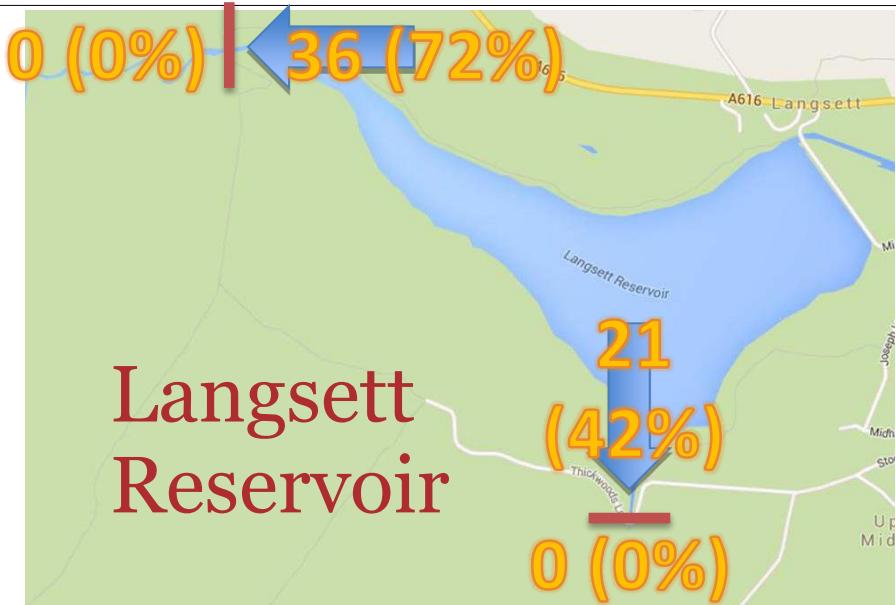
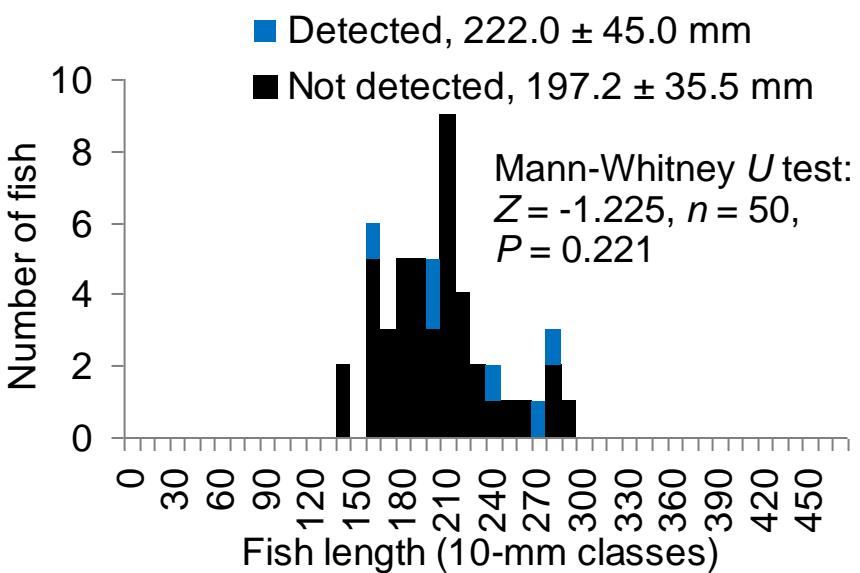
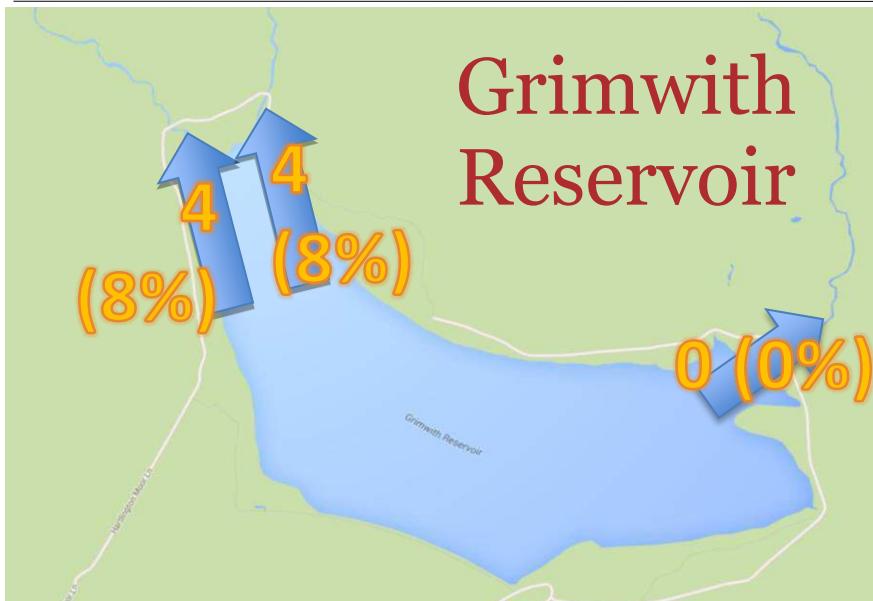
Fish length (mean $\pm$ SD (range), mm)	Fish mass (mean $\pm$ SD (range), g)	Tag / body wt ratio (mean (range), %)
$186.4 \pm 22.2$ (164 – 227)	$82.8 \pm 28.5$ (55 – 134)	1.3 (0.7 – 1.7)



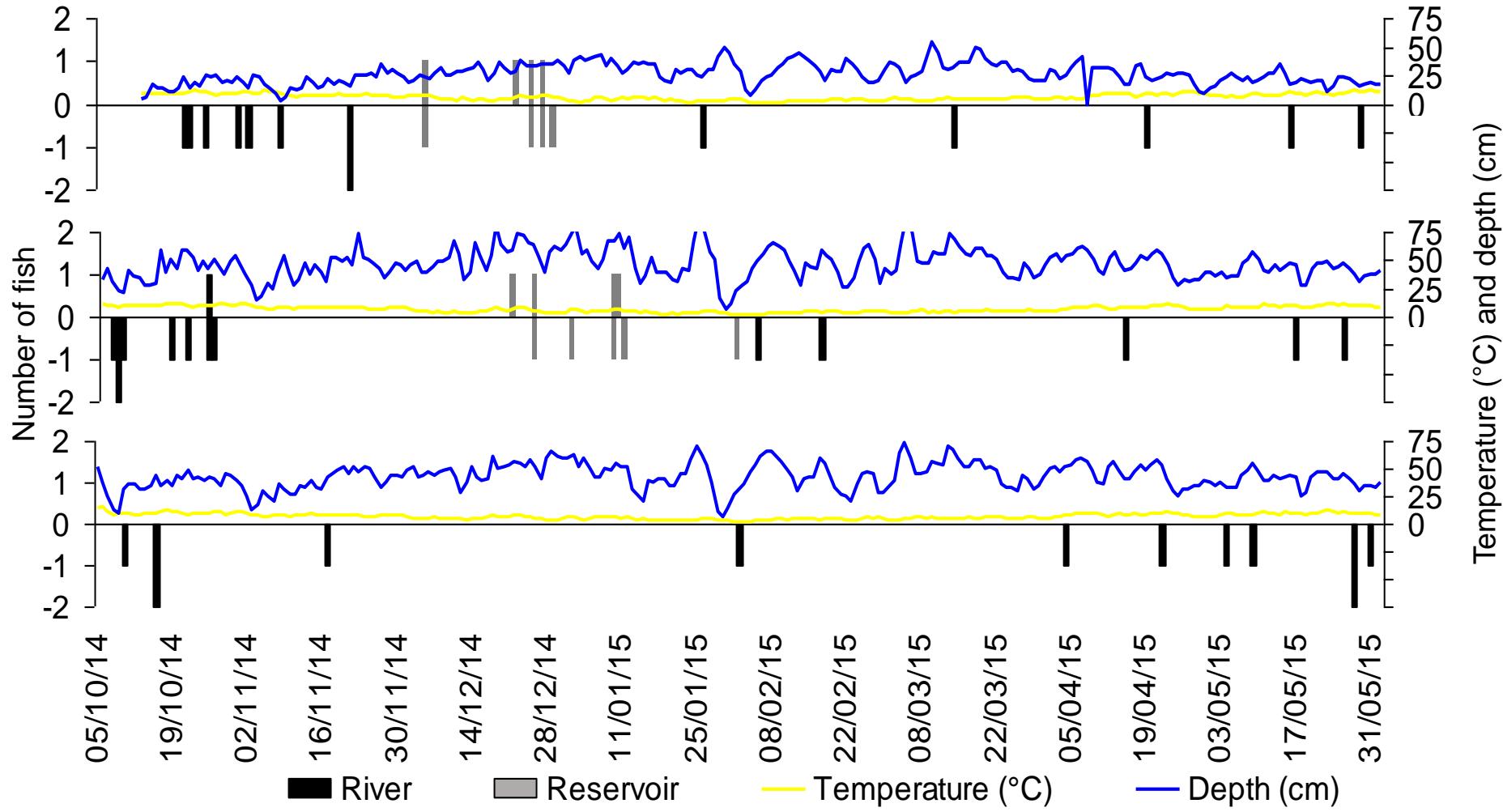
# Influence of flow and temperature



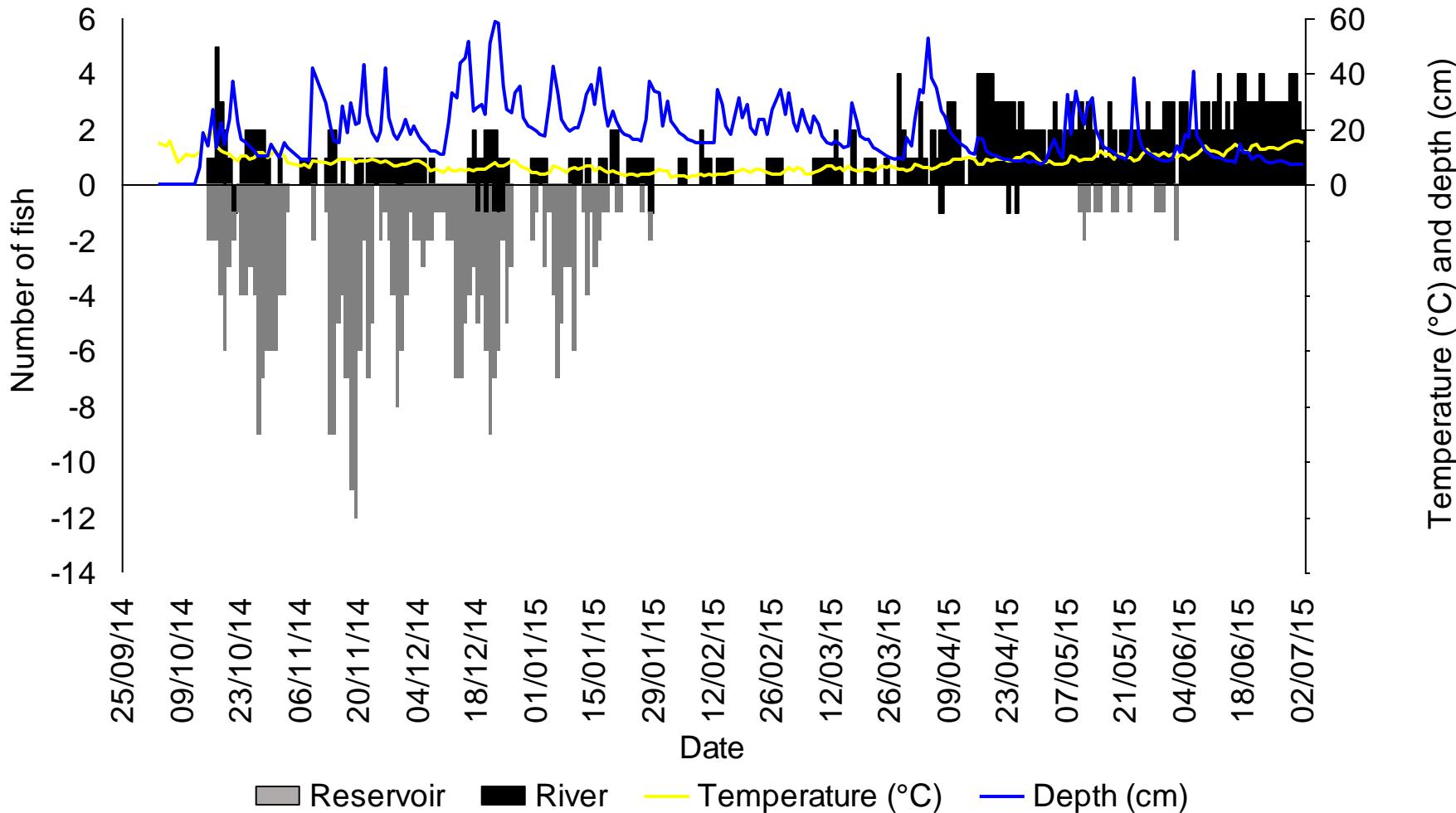




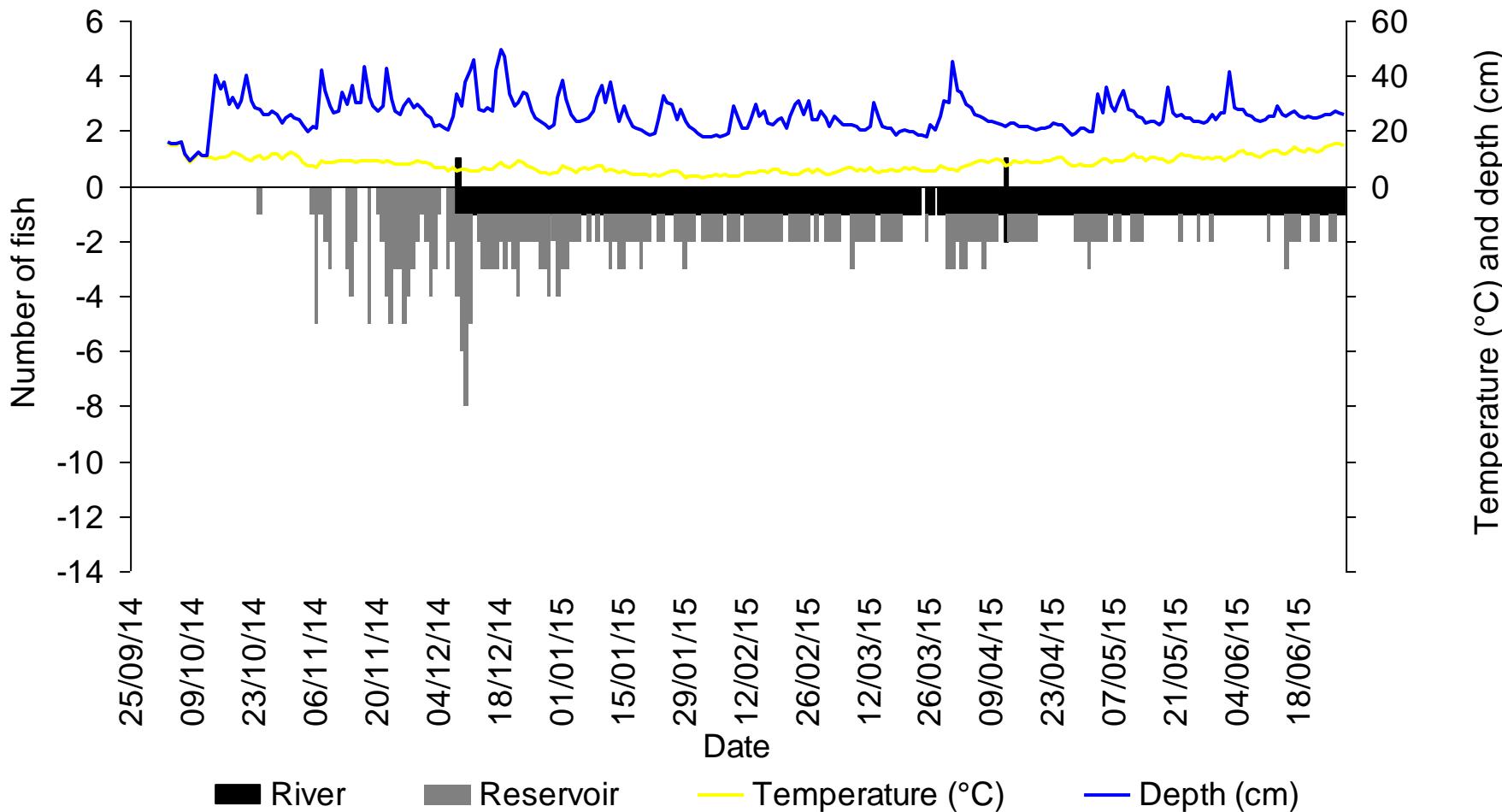
# Daily movements between Grimwith Reservoir and tributaries



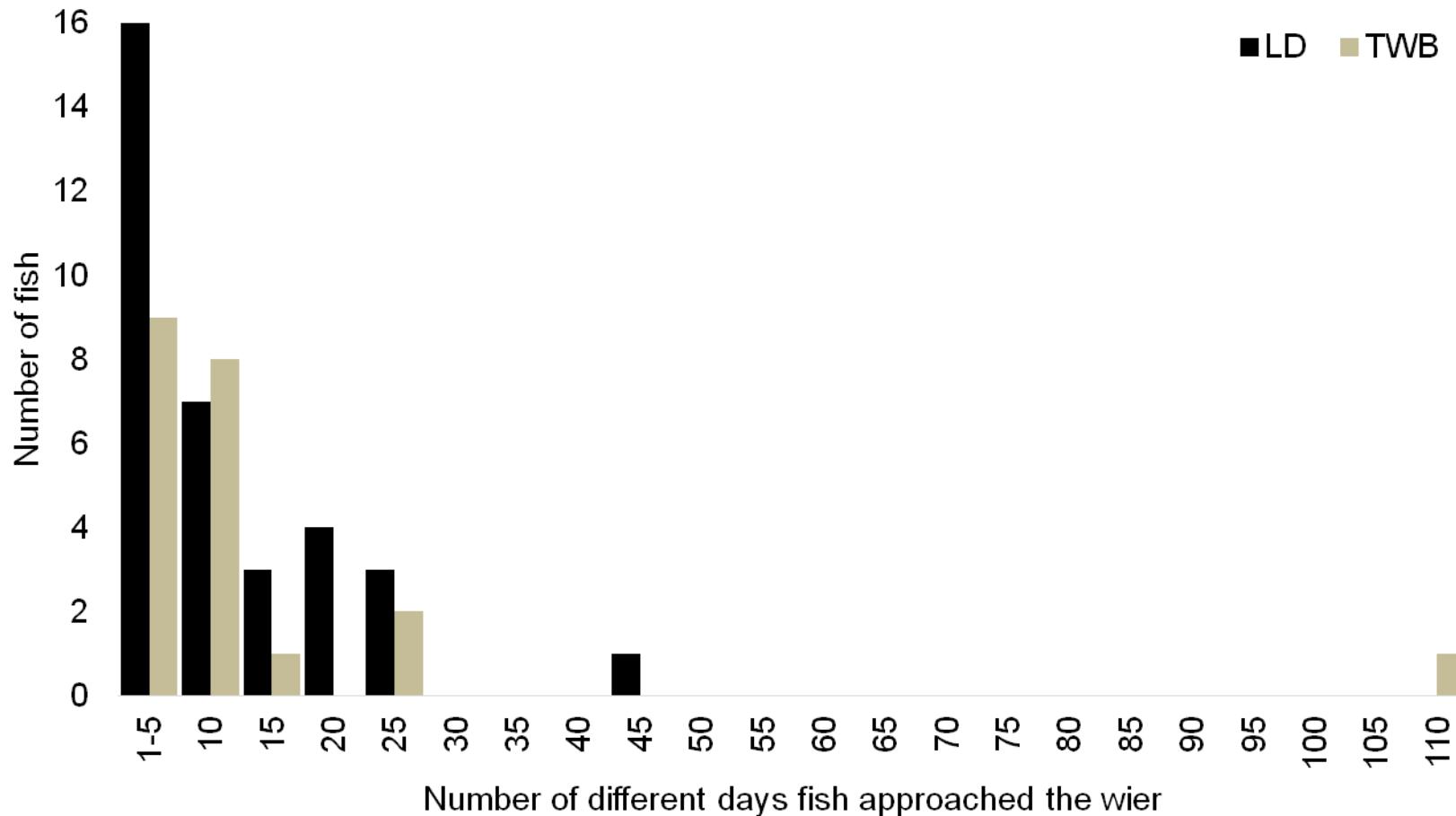
# Daily approaches to weir on Little Don, Langsett Reservoir



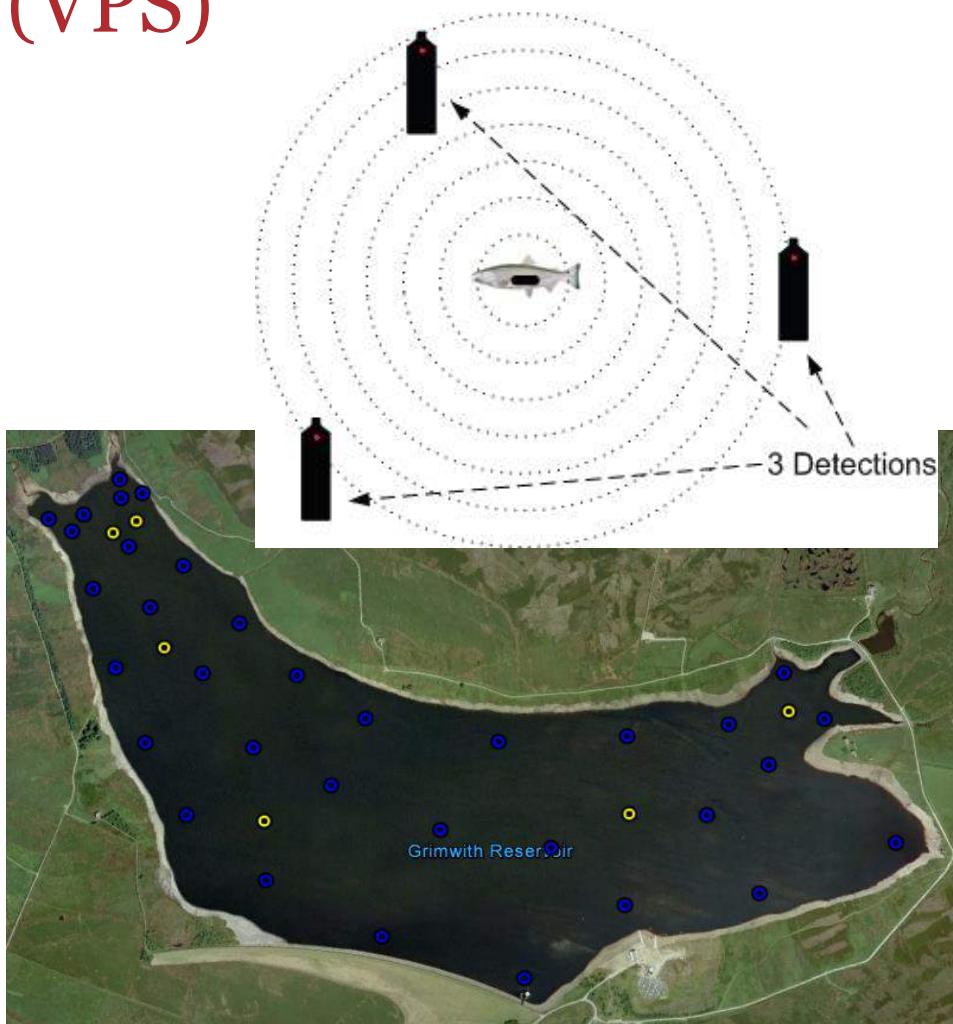
# Daily approaches to weir on Thickwoods Brook, Langsett Reservoir

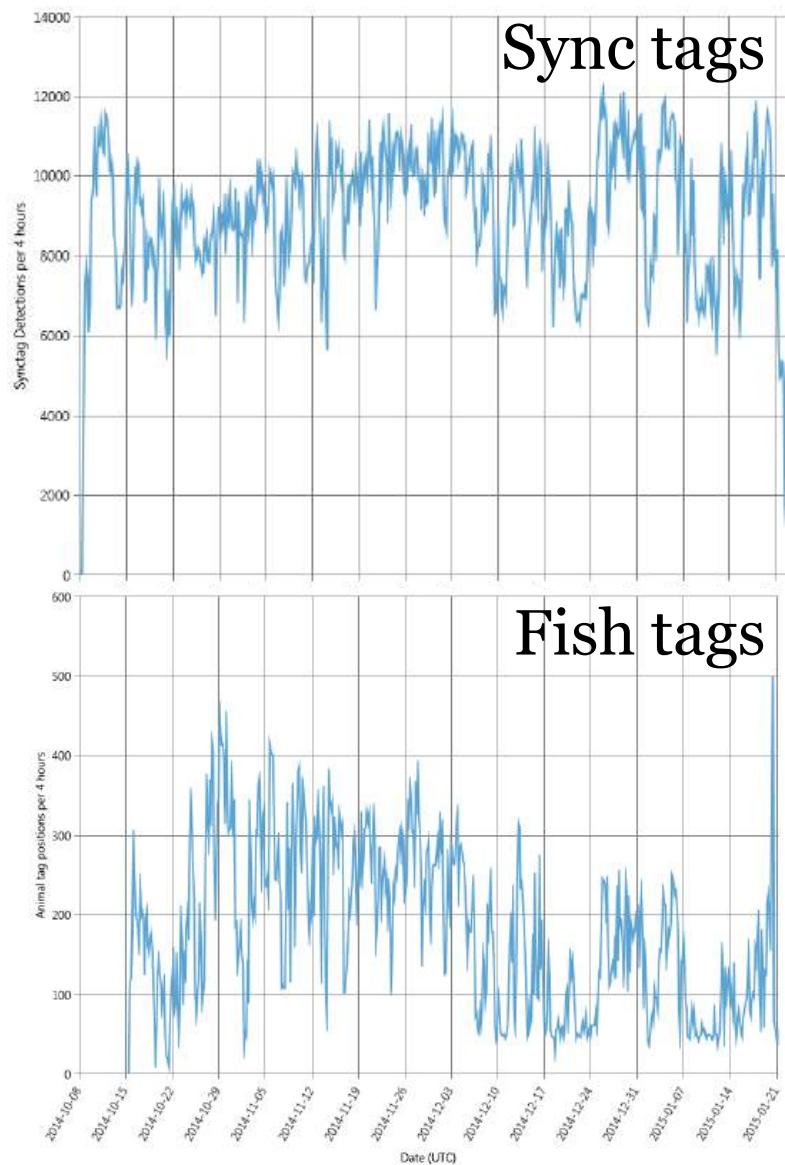
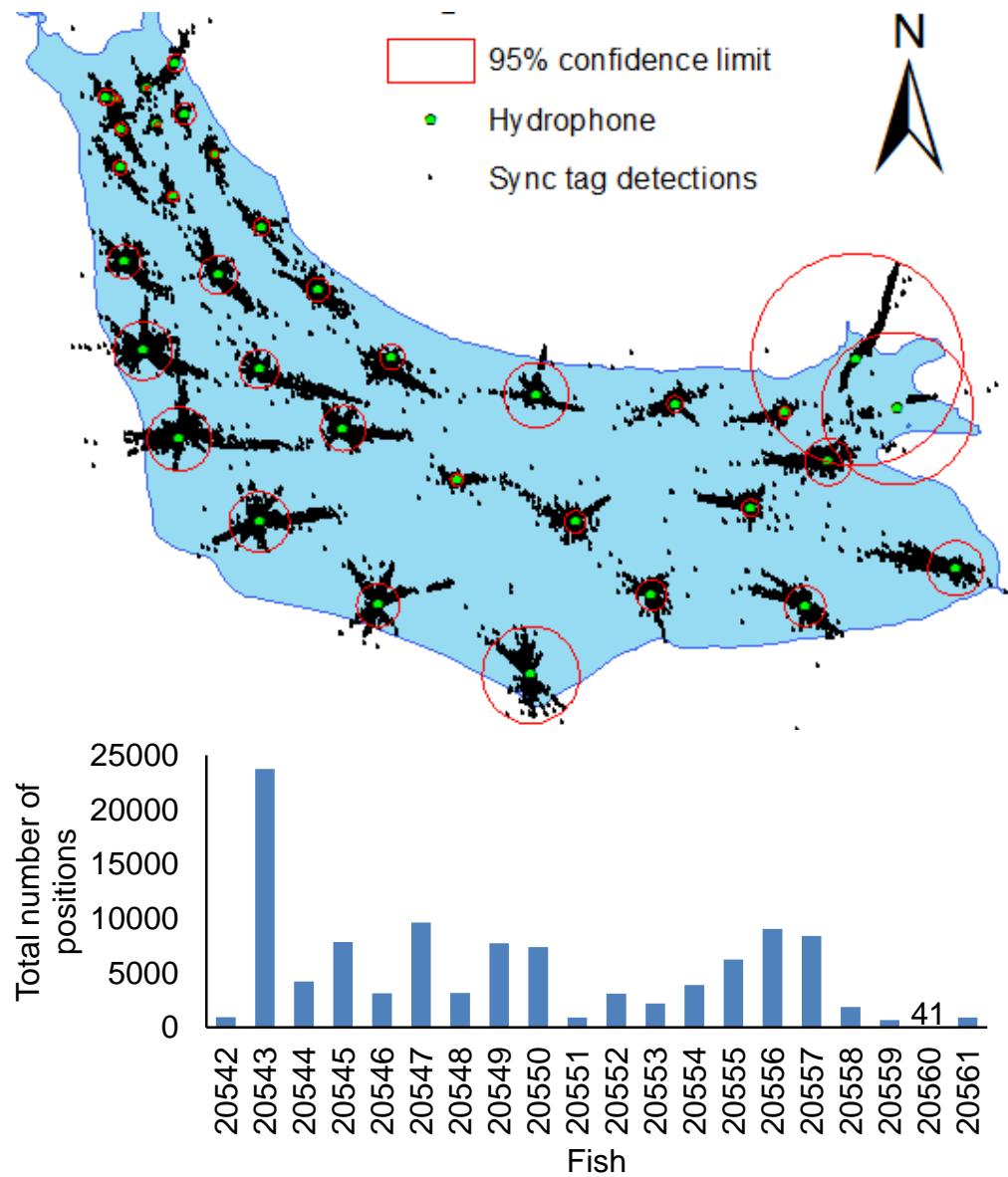


# Number of different days fish approached the weirs upstream of Langsett

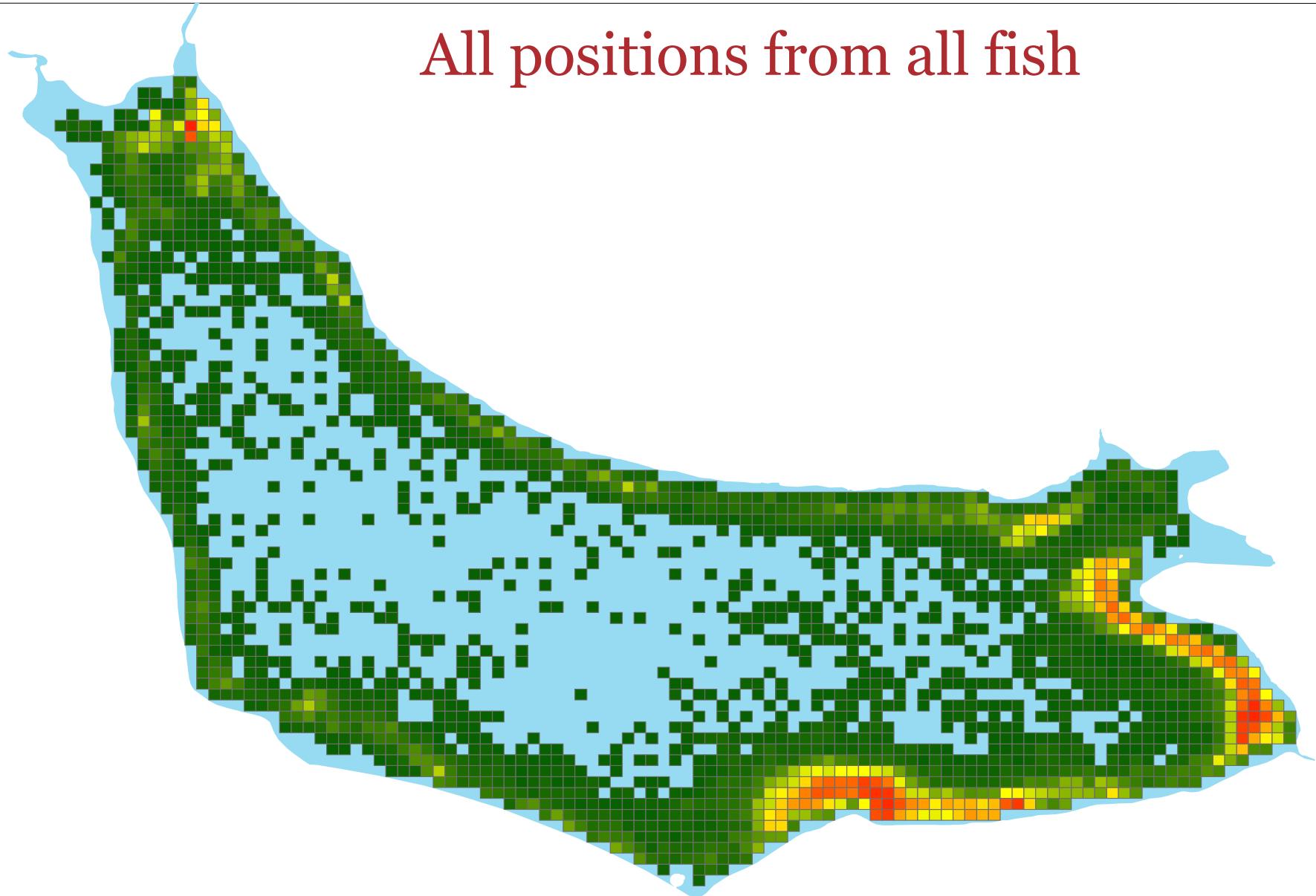


# Habitat use and movements of fish in the reservoir (VPS)



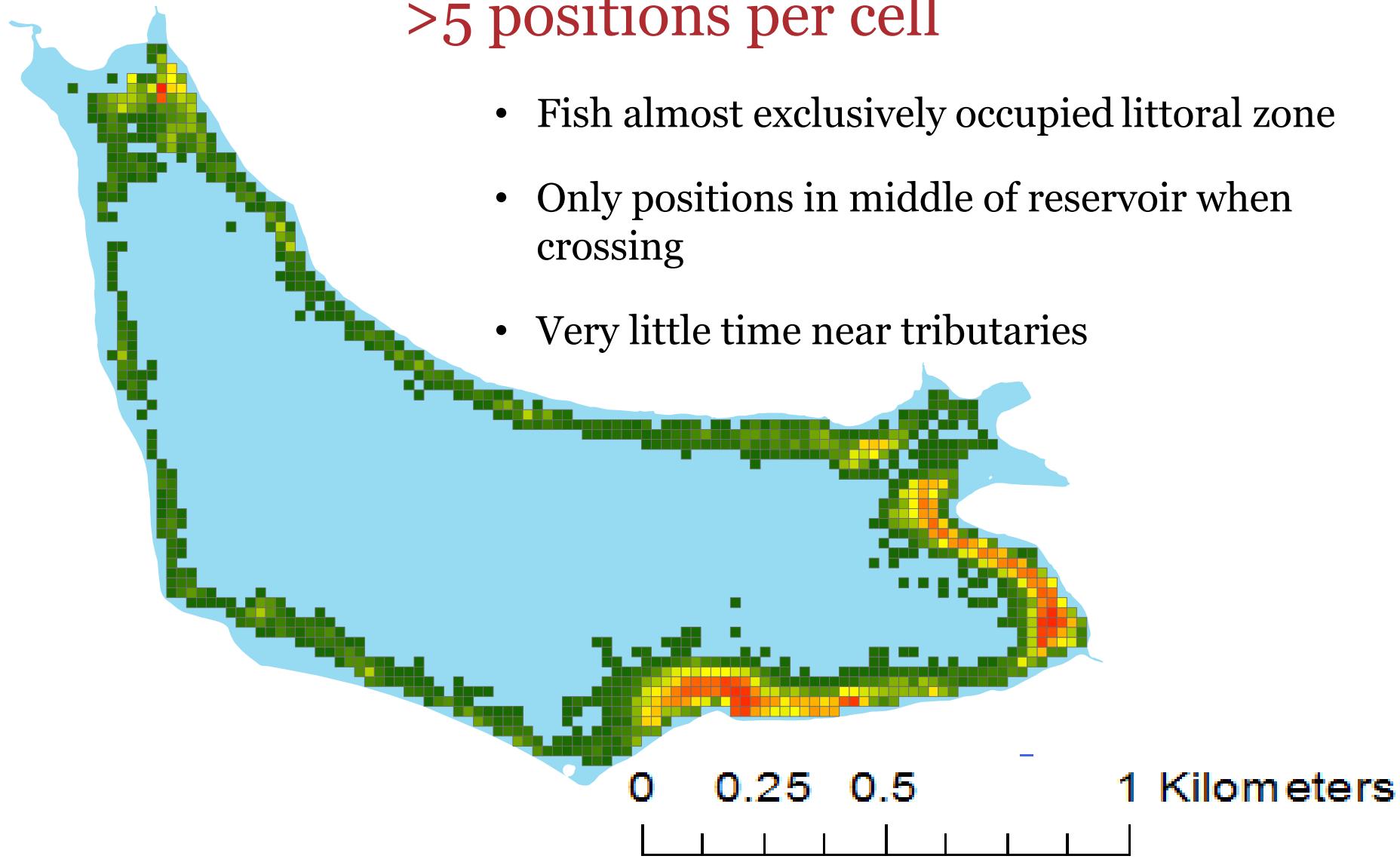


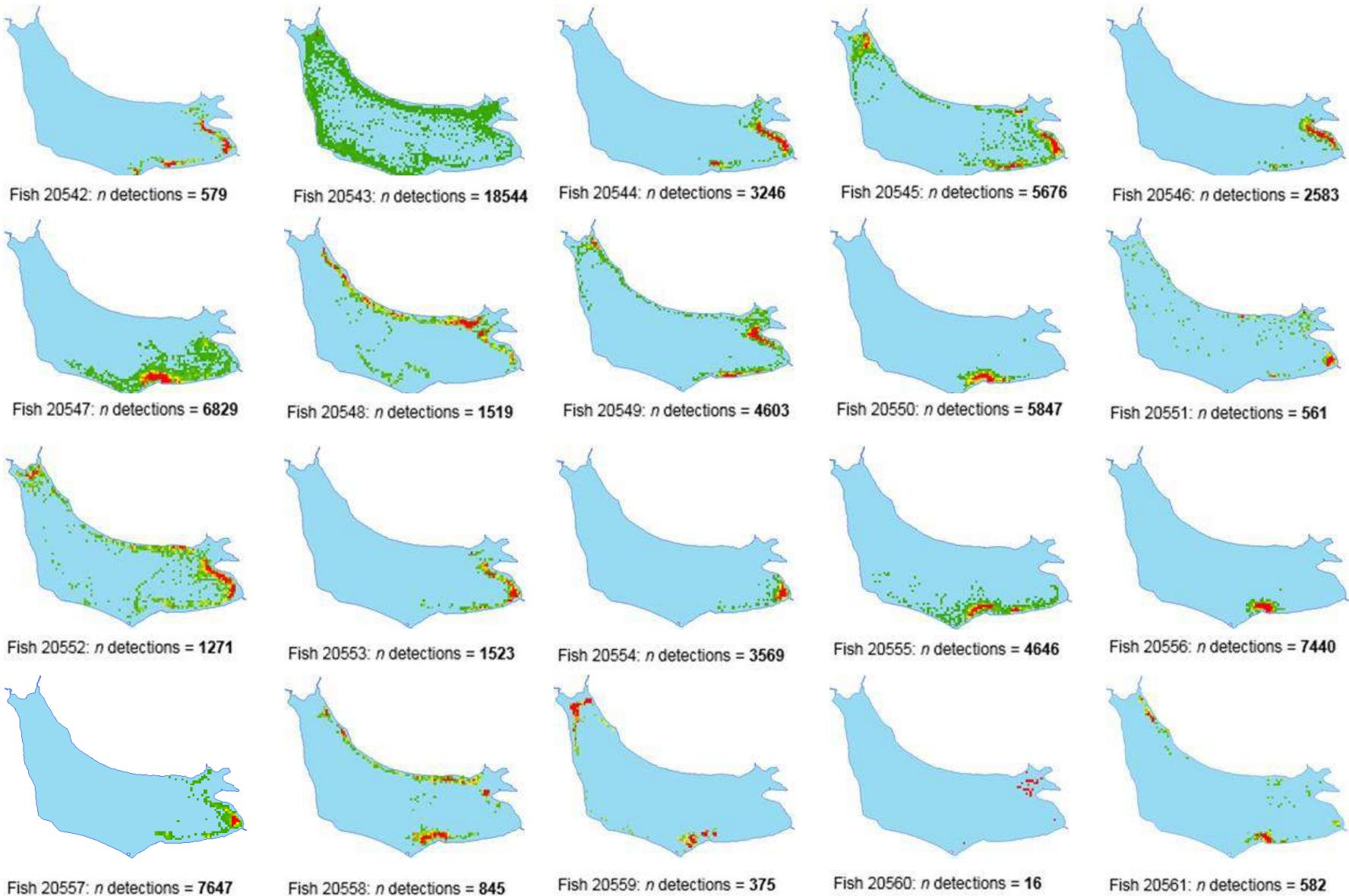
# All positions from all fish



## >5 positions per cell

- Fish almost exclusively occupied littoral zone
- Only positions in middle of reservoir when crossing
- Very little time near tributaries





# Conclusions

- Radio tagged adult fish in a headwater tributary occupied small home ranges and moved very little, including during spates.
- 6-26% of PIT tagged fish moved from the tributaries into the reservoir, predominantly in autumn and spring.
- A large weir prevented 66% of downstream moving PIT tagged fish entering the reservoir.
- Fish in the reservoirs moved / attempted to move into tributaries, from October-January, probably to spawn.
- Large barriers prevented 100% of upstream moving fish entering tributaries.
- Fish in reservoirs almost exclusively occupied littoral zone, generally not near tributaries, though variability been fish was observed.