

Downstream passage of fish in Queensland

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To date, very little research has been undertaken on the passage of fish through fishways in the Queensland portion of the Murray-Darling Basin. In 2001 the Natural Heritage Trust funded a project for the Queensland Fisheries Service to identify factors contributing to delays in fish passage at fishways (Berghuis and Broadfoot in press). The project utilised radio-tracking and PIT tagging methodologies to identify triggers for upstream migrations in the vicinity of Boggabilla weir on the Macintyre River near Boggabilla (Qld/NSW border). Adult and sub-adult golden perch (*Macquaria ambigua*) were radio and PIT tagged, other species such as freshwater catfish (*Tandanus tandanus*), Murray cod (*Maccullochella p. peelii*), silver perch (*Bidyanus bidyanus*), juvenile golden perch and European carp (*Cyprinus carpio*) were PIT tagged. Monitoring of the behaviour radio-tagged fish below Boggabilla Weir and the migration of PIT tagged fish through the associated vertical-slot fishway was undertaken using remote listening stations and automatic PIT tag readers from October 2001 to February 2003. Over the life of the project a total of 75 fish were radio-tagged and 881 fish were PIT tagged. The greatest downstream migration recorded was by a radio-tagged adult golden perch that travelled 90km downstream of the original release point. A total of 43 PIT tagged fish migrated upstream through the fishway, no fish were detected migrating downstream through the fishway nor were they detected or recaptured downstream of the weir. However it is likely that the downstream migration of fish is important at this site and the ability of the weir to effectively and safely pass fish should be further investigated.

In coastal southern Queensland, ten fish species have been documented actively migrating downstream through vertical-slot fishways (Table 1). Documented downstream migrations were highly seasonal and considered to be related to spawning for catadromous species or to facilitate the shedding of freshwater parasites in a marine environment (Stuart and Berghuis 2002) (QFS unpublished data).

In a study of downstream fish migration at the Ned Churchward Weir fishlock 50km upstream of the Burnett River estuary, the catadromous striped mullet displayed two migratory strategies according to seasonal conditions. During summer periods with lower than average river flow, large numbers of adult fish congregated upstream of the weir immediately following the first post-autumn drop in water temperature. However, during seasons when late summer flood flows occurred, striped mullet actively migrated downstream over the weir. A number of PIT tagged fish including adult Queensland lungfish (*Neoceratodus forsteri*) that were originally tagged upstream of the weir were identified downstream of the weir following a relatively minor flood flow. During the same flow event a substantial number of dead fish were observed downstream of the weir after flows had subsided. A small number of PIT tagged fish were detected migrating downstream through the fishlock after flows subsided. However, entrance conditions at the fishlock were considered sub-optimal and recommendations were made to potentially improve passage for downstream migrating fish (Berghuis and Broadfoot 2004).

Table 1. Fish species documented migrating downstream through vertical-slot fishways in Southern Queensland.

Common name	Species
yellow-finned bream	(<i>Acanthopagrus australis</i>)
estuary perchlet	(<i>Ambassis marianus</i>)
long-finned eel	(<i>Anguilla reinhardtii</i>)
blue catfish	(<i>Arius graeffei</i>)
snub-nose garfish	(<i>Arrhamphus sclerolepis</i>)
empire gudgeon	(<i>Hypseleotris compressa</i>)
striped mullet	(<i>Mugil cephalus</i>)
bullrout	(<i>Notesthes robusta</i>)
flathead gudgeon	(<i>Philypnodon grandiceps</i>)
spotted scat	(<i>Scatophagus argus</i>)

The provision of safe passage of fish over spillways has been given little regard when constructing weirs and dams throughout Australia. Given the evidence demonstrating volitional downstream migrations by adult fish, the provision of effective downstream passage requires substantial further investigation. Whilst the passage of fish through fishways would be preferable to passage over the spillway, under most conditions it is unlikely to be practical. When determining the environmental impact of weirs and dams, the effect on aquatic fauna that are injured or killed as they wash over spillways should be considered. Unfortunately water resource development is continuing despite the absence of knowledge on appropriate designs for the safe downstream passage of fish.

References

Berghuis, A.P., & Broadfoot, C.D 2004. Downstream passage of fish at Ned Churchward Weir fishlock, Queensland Fisheries Service, Bundaberg. Report to the Dept. of State Development.: 18.

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