Atkinson Dam
Aquatic Fauna Assessment
March 2019

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Cover photo: Atkinson Dam on the 6th of April 2019.

Contents

Tables

Figures

1. Introduction

Atkinson Dam is an earth-fill embankment dam across Buaraba Creek and a naturally formed lagoon. It is located near Clarendon in the south-east region of Queensland. The main purpose of the dam is to supply irrigation for farming land in the lower Lockyer Valley, but it is also a popular recreational lake, particularly for power boats, water skiing and jet skiing. Atkinson Dam also supports several freshwater fish species that are targeted by anglers. It is an un-gated dam, meaning that when it reaches 100 per cent capacity, water flows over the spillway and safely out of the dam.

At the time of this assessment the water level in Atkinson Dam was extremely low. Seqwater wishes to assess the potential for accessing remaining water in the dam for irrigation purposes due the extended dry conditions that have occurred over the 2018-2019 summer period across the region. Prior to the potential extraction of the remaining water Seqwater wishes to undertake an assessment of the potential impacts on aquatic fauna. This report represents that assessment.

Freshwater Ecology Consulting (FE) was commissioned by Seqwater to:

- assess aquatic fauna communities at the site and their significance under state and federal legislation
- undertake a risk assessment of the impacts of actively lowering the water levels in the lake on aquatic ecosystems
- identify circumstances that would lead to requiring the relocation of aquatic species
- identify a location where aquatic fauna can be relocated to if required
- provide indicative costs of relocating aquatic fauna
- assess a recommended minimum volume and depth of water to remain in place to sustain any remaining aquatic fauna

2. Desktop Assessment

A literature review was undertaken to assess the environmental values and aquatic fauna species that could occur in and adjacent to Atkinson Dam. The sources of information included:

- An Environmental Protection and Biodiversity Conservation (EPBC) Act Protected Matters Report
- A Wildlife Online search
- A review of the Atlas of Living Australia
- A review of online sources

All environmental matters and species searches were undertaken using a 10 km buffer radius from the central point of -27.4269 latitude and 152.4484 longitude which centres over the Atkinson Dam site. The only protected matters relevant to aquatic ecology assessments identified in the EPBC Act Protected Matters Report (Appendix A) was Australian lungfish (*Neoceratodus fosteri*) and Murray cod (*Maccullochella peelii*). Australian lungfish were also identified in the Wildlife Online search (Appendix B). No threatened aquatic species were identified in the Atlas of Living Australia search. While Australian lungfish are known to inhabit the Brisbane River downstream of Atkinson Dam, the closest record is more than 20 km downstream in Lockyer Creek. Furthermore, this distance is more than 11 km along Buaraba Creek which is highly ephemeral and thus the habitat is unlikely to be utilised by Australian lungfish. Atkinson Dam is not within the natural range of Murray cod which is only likely to be present if translocated and stocked for recreational angling purposes.

A review of information published on the internet suggests that there have been several attempts to stock other species of fish in Atkinson Dam over several years. This included the intensive stocking of southern saratoga (*Scleropages leichardti*). As the dam is prone to periodic drying, these stockings have been largely unsuccessful and in recent years fish stocks appear to have been largely comprised of species that have been able to recruit from Buaraba Creek during periods of high stream flow. The most commonly reported species in Atkinson Dam are eel-tailed catfish (*Tandanus tandanus*), spangled perch (*Leiopotherapon unicolor*) and longfin eels (*Anguilla reinhardtii*).

3. Field Assessment

3.1. Permits and approvals

Sampling was conducted under General Fisheries Permit No. 191062, scientific user permit WISP18336317 and Animal Ethics Approval No. CA 2017/02/1042 held by Freshwater Ecology. Each respective regulatory body was notified more than 48 hours prior to the commencement of fish collection.

3.2. Timing

Aquatic fauna sampling at Atkinson Dam was undertaken on the 6th of April 2019. Prior to the surveys there had been below average rainfall across the area. The monthly totals compared with the long-term averages of rainfall for the University of Queensland Gatton (BOM site 040082) are shown in Figure 1. Rainfall over all months were far below the monthly averages except October 2018 and March 2019.

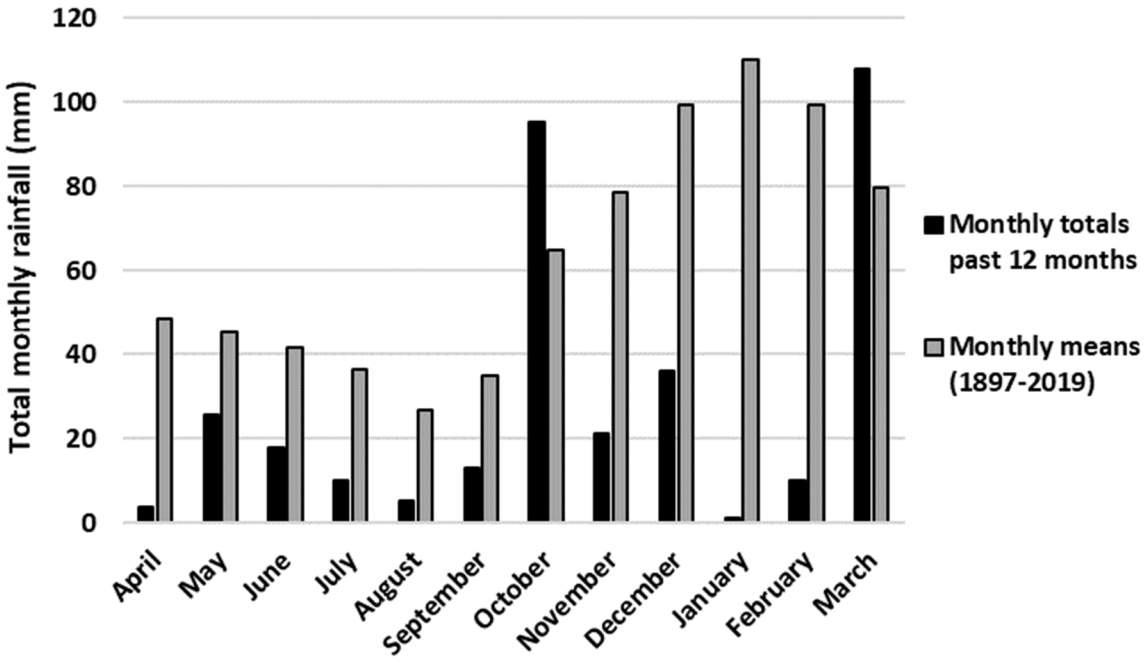

Figure 1: **Total monthly rainfall collected at University of Queensland Gatton in the twelve months preceding sampling and mean monthly averages**

3.3. Aquatic habitat at the time of sampling

At the time of sampling the dam water levels were extremely low. A circumnavigation followed by transect passes across the lake determined that the greatest depth in the lake was 1.1 metres, with much of the lake averaging approximately 0.5 metres depth. There was very little submerged habitat across the lake and no aquatic macrophytes noted. The water was relatively turbid (122 NTU) with a phytoplankton bloom noted with accumulations of surface scum in downwind areas of the lake.

3.4. Aquatic fauna sampling methods

Native fish and turtles were returned to the water while exotic species were euthanised humanely and disposed of in an appropriate manner, in accordance with FE's animal ethics, fisheries and scientific collection permits.

Boat Electrofishing

Boat electrofishing was the primary method of sampling both fish and turtles. The electrical conductivity of the water at the time of sampling (560 µS/cm) was conducive to effective electrofishing. All boat electrofishing was conducted in accordance with the Australian Code of Electrofishing Practice (NSW Fisheries 1997). A total of 10 electrofishing shots were conducted across the waterbody, with a zig zag in and out of the banks around the entire perimeter where suitable depth permitted (i.e. > 0.5 metres depth). The final electrofishing operation was undertaken through the middle of the lake. These 10 electrofishing operations covered most of the waterbody. Each electrofishing operation was undertaken over 5 minutes with between 135 and 204 seconds electrofishing 'on-time' (time that electricity was applied to the water column) using the electrofisher settings 240V, 120 pulses per second, 20% duty cycle and 40 amps.

Unbaited Box Trapping

Box trapping is a passive fish sampling technique that targets small bodied pelagic and benthic species which are often under recorded by boat electrofishing. Ten unbaited box traps were set for 3 hours in the shallow margins. Extensive field survey experience by FE staff has shown most fish enter traps within the first 30 minutes.

Turtle Trapping

Four turtle nets (baited with sardines) were set for 5 hours. Traps were baited with sardines and buoyed to prevent drowning of air breathing vertebrates.

Bird Observations

While targeted surveys of bird assemblages were not undertaken, all observations were recorded and provided where a positive identification was possible.

3.5. Fish assemblages

The fish assemblages in Atkinson Dam at the time of the April 2019 assessment were low in diversity and abundance (Table 1). It should be noted that the surveys represent relative abundance and not absolute numbers of fish and turtles in the waterbody at the time of the survey. The largest biomass of fish present was the longfin eels (*Anguilla reinhardtii*) which were comprised mostly of extremely large individuals (> 1 metre in length and large in girth). While eel-tailed catfish (*Tandanus tandanus*) have been reported from Atkinson Dam, none were recorded in the April 2019 surveys. Similarly, the abundance of spangled perch (*Leiopotherapon unicolor*) was extremely low. This may have been a result of the lowered water levels increasing the success of avian predation on fishes in the waterbody.

Table 1: Fish and turtle diversity and abundance in Atkinson Dam in April 2019. Exotic fish species denoted in red

Common name	Scientific name	Boat Efish	Box traps	General observations
Longfin eel	*Anguilla reinhardtii*	40	-	Only two smaller specimens, most well over 1 meter and thick bodied
Mosquito fish	*Gambusia holbrooki*	-	7	Very abundant in very shallow margins
Firetail gudgeon	*Hypseleotris galii*	16	2	Dispersed through the lake but not highly abundant
Spangled perch	*Leiopotherapon unicolor*	1	-	Rare
Sea mullet	*Mugil cephalus*	2	-	Extremely large specimens, one measured was 575mm fork length
Bony bream	*Nematalosa erebi*	22	-	Dispersed through the lake but not highly abundant
Turtles	-	23	-	Several confirmed identifications were all sawshell turtles (*Myuchelys latisternum*)

3.6. Turtles

All turtles recorded were observed during boat electrofishing operations (a total of 23 specimens). No turtles were recorded in the turtle traps. While not all specimens were seen closely enough to identify, all were short-necked species and those that could be confidently identified were saw-shelled turtles (*Myuchelys latisternum*).

3.7. Birds

A total of 17 water bird species were noted in Atkinson Dam during aquatic fauna sampling (Table 2).

Table 2: Incidental observations of birds in Atkinson Dam in April 2019

Common name	Scientific name	Notes
Oriental Darter	*Anhinga novaehollandiae*	2 individuals observed
Eastern Great Egret	*Ardea modesta*	1 individual observed
Hardhead	*Aythya australis*	A group of 6 observed
Black Swan	*Cygnus atratus*	Approximately 30 observed
Whistling Kite	*Haliastur sphenurus*	3 individuals observed
Great Cormorant	*Phalacrocorax carbo*	1 individual observed
Royal Spoonbill	*Platalea regia*	A group of 3 observed
Masked Lapwing	*Vanellus miles*	A single pair observed
Black-winged Stilt	*Himantopus himantopus*	Approximately 12 observed
Yellow-billed Spoonbill	*Platalea flavipes*	8 individuals observed in two groups
White-bellied Sea-eagle	*Haliaeetus leucogaster*	One pair observed
Gull-billed Tern	*Gelochelidon nilotica*	2 individuals observed
Red-necked Avocets	*Recurvirostra novaehollandiae*	2 groups with a total of approximately 100 individuals observed
Australasian Grebe	*Tachybaptus novaehollandiae*	Approximately 30 observed
Australian Pelican	*Pelecanus conspicillatus*	2 individuals observed
Grey Teal	*Anas gracilis*	2 groups with a total of approximately 200 individuals observed
Glossy Ibis	*Plegadis falcinellus*	1 individual observed

4. Legislative Framework

There is a range of federal and state legislation that protect Australian aquatic native fauna. This includes but is not limited to the following legislation described in Table 3.

Table 3: Relevant Aquatic Fauna Legislation and description

Legislation	Description
Queensland *Environmental Protection Act 1994* (EP Act)	The environmental values of waterways in Queensland are protected under the EP Act and the subordinate Environmental Protection (Water) Policy (EPP Water). Aquatic fauna contributes to the environmental values of waterways through ecological interactions and biological integrity.
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	The EPBC Act is a federal piece of environmental legislation managed by the Department of the Environment and Energy (DEE). The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places — defined in the Act as matters of national environmental significance (MNES). The seven matters of national environmental significance (MNES) to which the EPBC Act applies are; world heritage sites, national heritage places, wetlands of international importance (also known as 'Ramsar' wetlands), nationally threatened species and ecological communities, migratory species, marine areas, and nuclear actions.
Queensland *Nature Conservation Act 1992* (NC Act)	The NC Act provides legislative protection of Queensland's threatened biota. It is aimed at the conservation of biological diversity, ecologically sustainability, and international criteria developed by the World Conservation Union for establishing and managing protected areas. The NC Act provides a framework for the management of protected species listed under the Nature Conservation (Wildlife) Regulation 2006.
Queensland *Fisheries Act 1994*	The main purpose of the Fisheries Act is to provide for the use, conservation and enhancement of the community's fisheries resources and fish habitats in a way that seeks to apply the principles of ecologically sustainable development. Environmental values protected under the Act are; • fish habitats, • fish movement and migration (regulation of waterway barriers) and, • commercial, recreational and indigenous fishing.
Biosecurity Act 2014 (Biosecurity Act)	The Biosecurity Act provides a framework for an effective biosecurity system for Queensland, to ensure the safety and quality of agricultural inputs, and to align responses to biosecurity risks in the state with national and international obligations. Under the Biosecurity Act, pest species must not be kept, fed, given away, sold, or released into the environment without a permit. Under the act, everyone has a general biosecurity obligation (GBO) to take reasonable and practical steps to minimise the risks associated with restricted plants and animals.

5. Risk Assessment

Ecological Risk is determined by measuring two components of a stressor;

- the consequences (also measured as impacts) of an adverse event; and
- the likelihood or probability of the event occurring.

In the case of Atkinson Dam the stressor is the reduction/removal of the remaining water. This could occur by either of two processes;

- actively lowering of the water levels, and
- by natural drawdown due to evaporation that is not being replaced with inflows.

The consequences of the stressor in this case is the death of aquatic fauna, for which the likelihood is very high for the active lowering of the water levels, and high for natural drawdown (unless a significant rainfall event occurs across the region).

While the consequences for reduction / removal of the remaining water in Atkinson Dam are high to very high, the mitigation option (aquatic fauna salvage) is relatively straightforward due to the low abundances of aquatic fauna present in the waterbody.

6. Management Options

The water levels in Atkinson Dam are currently at a level that are at a minimum for sustaining the remaining aquatic fauna. If active lowering of the water levels is undertaken, then aquatic fauna salvage will be required. This procedure should demonstrate due diligence and satisfy obligations under the relevant legislative frameworks (refer Section 4).

6.1. Aquatic fauna recovery

Aquatic fauna salvage should be conducted in line with Seqwater's Aquatic Fauna Stranding and Salvage Guideline (Seqwater 2019) which operates in accordance with, and expands on, the Queensland Department of Agriculture and Fisheries Guidelines for Fish Salvage (DAF 2019). This document outlines all the requirements and steps required to undertake aquatic fauna salvage on Seqwater owned and maintained infrastructure (including storages). The current report represents an initial site assessment which is one of the critical components of the guidelines. The following information should also be considered in the development of a site-specific aquatic fauna salvage plan for Atkinson Dam.

Aquatic fauna species

At the time of the April 2019 survey the fish and turtle communities in Atkinson Dam consisted of few species that were present in relatively low abundance. Longfin eels were the most abundant fish species, and the most significant contributor to biomass. Aquatic fauna salvage efforts would be best directed at the most abundant species; longfin eels and turtles (possibly various species). However, all reasonable effort should be made to salvage and relocate all aquatic fauna species.

Proposed methodology

A site-specific aquatic fauna salvage plan for Atkinson Dam should be developed in consultation with Seqwater.

As outlined in the Seqwater Aquatic Fauna Salvage Guideline all attempts should be made to recover fauna prior to dewatering activities. Numbers of longfin eels can be effectively reduced prior to the commencement of active water level lowering using baited fyke nets. Consideration was given to allowing commercial eel harvesting operators access the site. However, there are no known eel commercial harvest fishery licences that cover Atkinson Dam and communications with DAF staff suggested an extension of licence conditions to include Atkinson Dam would not likely be granted. Therefore, the salvage of eels and turtles prior to commencement of active water level lowering should be undertaken by suitably qualified aquatic ecologists. Similarly, baited turtle traps should be used to reduce the numbers of turtles remaining in the reduced waterbody. Baited fyke nets and turtle traps should be undertaken over at least 2 nights and one day.

Once the dewatering commences seine netting and active dip netting should be the primary methods of aquatic fauna capture and salvage.

Aquatic fauna should be transported to the predetermined release sites in conditions consistent with the Seqwater Aquatic Fauna Salvage Guidelines. This includes monitoring stocking rates, aquatic fauna behaviour and water quality during storage and transport.

Release sites

The longfin eels in Atkinson Dam were typically of a large size that could have a negative impact on other aquatic fauna if released into the smaller waterways nearby (i.e. Buaraba and Lockyer Creeks). Therefore, it is proposed that they are released into the lower Brisbane River which is a 30-40 minute drive from Atkinsons Dam. This reach of the river would be more capable of sustaining an influx of large predators and would ensure that the eels have the opportunity to migrate downstream to breed. All other fish species could be released a suitable identified site downstream in Lockyar Creek or the Brisbane River.

Dependent on the final number salvaged, turtles could be released over a range of sites in Lockyar Creek, Brisbane River and Lake Wivenhoe to minimise the potential negative impacts of locally increasing populations beyond their carrying capacity.

Permits and approvals

Prior to commencement of activities a review of the permit requirements should be undertaken to ensure that any activities are compliant with current regulations and requirements (as these can change over time). The following section outlines the permit requirements at the time of development of this guideline.

General Fisheries Permit – This permit is issued by the Department of Agriculture and Fisheries (DAF) and is required to engage in activities not normally allowed under fisheries legislation (such as collection of no-take species). Under Proposed Activities the permit holder must be approved for fish salvage, relocation and harvesting of noxious species. The permit holder must give the local office of the Queensland Boating and Fisheries Patrol at least 48 hours' notice prior to any salvage activities commencing.

Animal Ethics Approval – This approval is issued by the Animal Ethics Committee (AEC) and needs to have fish salvage and re-location specified under the authorized activities. Prior to the commencement of any activities, the permit holder is required to; advise the AEC of dates and locales of such surveys, and ensure all personnel involved are included in the original approval or have been added to the approval via an amendment.

Rehabilitation Permit – This permit is issued by Department of Environment and Science (DES). The permit is required for aquatic fauna salvage and relocation of any species listed under the Nature Conservation Act (1992). Where there is the potential (however unlikely) that any species protected under the NC Act could occur at a site that aquatic fauna salvage is required then staff or contractors undertaking aquatic fauna salvaging will require this permit. Notification need to be made prior to the commencement of activities by contacting the Permits And Licence Management (PALM) division of DES.

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7. References

DAF (2018). Guidelines for fish salvage. Department of Agriculture and Fisheries. https://www.daf.qld.gov.au/business-priorities/fisheries/habitats/policies-guidelines/factsheets/guidelines-for-fish-salvage Last updated December 2018.

NSW Fisheries (1997). The Australian Code of Electrofishing Practice. NSW Fisheries Management Publication No. 1.

Seqwater (2019). Aquatic Fauna Stranding and Salvage Guidelines. Internal document.

Appendix A – Protected Matters Search

Appendix B – Wildlife Online Search