

IMPACTS OF BARRIERS AND FISHWAYS ON SAWFISH – WHEATSTONE SAWFISH OFFSET MAY 2015 ANNUAL UPDATE



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Report to WAMSI and Chevron Australia



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Centre for Fish & Fisheries Research

Milestones

To date, all milestones have been met, as recorded within the agreement between WAMSI and Murdoch University for the April 2014 – May 2015 period. Results from these milestones are presented below according to their respective numbers (Table 1).

Table 1. Project milestones and expected dates of completion

Ref	Milestones / Major activities	Expected Date of Completion	Date of completion
Year 1	April 2013 – June 2014		
	2. Prioritisation of barriers for sawfish		
1/5	<i>Habitat assessment and sawfish presence</i>	June 2014	April 2014
1/6	<i>Report</i>	December 2014	March 2015
	3. Monitoring of sawfish below specific barriers		
1/7	<i>Monitoring of sawfish below specific barriers, trap and haul commences</i>	November 2015	Commenced Aug. 2013; in progress
Year 2	July 2014 – June 2015		
	Monitoring of sawfish below specific barriers	June 2015	
	<i>Telemetry studies between late dry and late wet season</i>	November 2015	Commenced Aug. 2013; in progress
	4. Exploring 'trap and haul'		
	<i>Field work, literature review completed</i>	June 2015	Commenced Aug. 2013; in progress

1/5,6) Habitat assessment and sawfish presence

In July 2014, this study reported on six barriers in Western Australia that are likely to have the greatest impact on the largetooth sawfish (*Pristis pristis*) (Morgan *et al.* 2014a). These barriers included the river crossing/weir on the Ashburton River, Myroodah Crossing and the

Camballin Barrage on the Fitzroy River, and Ivanhoe Crossing, Lake Kununurra Diversion Dam and the Lake Argyle Dam on the Ord River.

In December 2014, this study reported on the presence of sawfish within the systems where these high priority barriers are located (Morgan *et al.* 2014b). Presence of sawfish was determined through gill net and hook and line methods during field trips in April and October 2013 and 2014 in the Fitzroy River and Ashburton River. Sampling did not occur in the Ord River, as sufficient evidence of sawfish presence was documented in the available literature. This report also assessed the habitat found within each of these rivers in order to determine the suitability of the environment to sawfish. The Fitzroy River is a known nursery, which has a relatively large and healthy population of juvenile *P. pristis*, and was used as the standard in which the Ord and Ashburton River parameters were compared.

The results of this study demonstrated that *P. pristis* do use each of the three systems, but to varying degrees. While the Fitzroy River is well studied and known to contain a relatively large number of *P. pristis* year round, only two *P. pristis* have been recorded in the lesser studied Ashburton River and the Ord River. The habitat assessments of these rivers demonstrated that all three rivers contained similar prey items, which included species known to be fed upon by *P. pristis*. The abiotic factors of the Fitzroy River and Ord River were also similar, but differed in the amount of discharge experienced during years with relatively high and low precipitation, due to the regulation of flows of the Ord River (increased discharge in years/months with low precipitation, and decreased discharge in years with high precipitation). A reduction in wet season flow levels on the Ord River may negatively impact *P. pristis*, as discharge has been observed to be positively correlated with relative abundance of *P. pristis* in the freshwater pools of the Fitzroy River.

The Ashburton River was observed to vary the most of the three rivers. The Ashburton was found to experience the coldest temperatures (2-3° C cooler in the winter months than in the Fitzroy River). In addition, the wet season on the Ashburton River was greatly contracted and discharge levels were significantly smaller than observed in the Fitzroy River.

In the report it was concluded that the relatively low abundance of *P. pristis* in the Ashburton River and Ord River may be due to the decreased water temperature, decreased discharge and obstruction of movement by barriers in the Ashburton River, and due to the altered flow

regime and/or obstruction of movement by barriers in the Ord River. While it is believed that installation of fishways in all rivers would provide *P. pristis* with access to additional habitat, and would prove to be highly beneficial in the Fitzroy River, it is uncertain at this time how beneficial a fishway would be to *P. pristis*, on a population scale, in at least the Ashburton River. At a minimum, it would likely give visiting juvenile *P. pristis* greater access to resources in the lower pools of the Ashburton River for a couple months of the year, until natural barriers begin to form from a decrease in river depth.

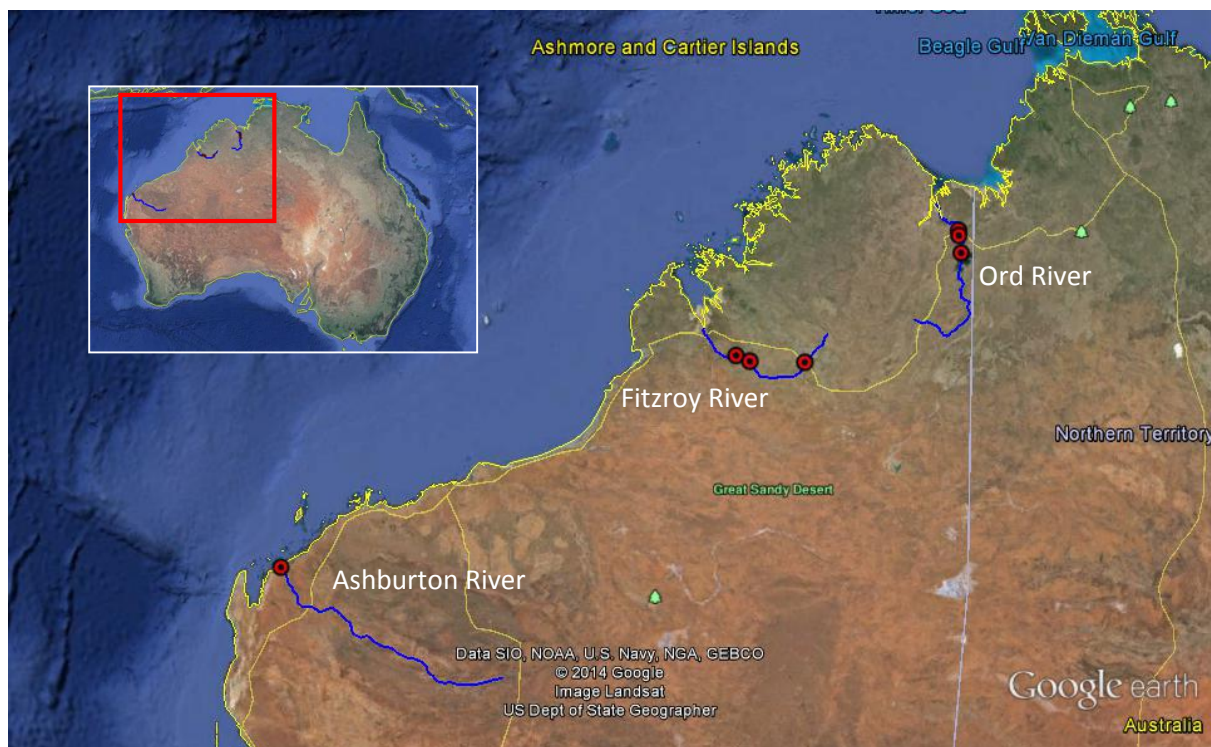


Figure 1. Map of the Ashburton, Fitzroy and Ord rivers in Western Australia (represented by blue lines). Red dots represent human-made instream barriers. The entirety of the Fitzroy River is not mapped, only the region that is accessible to sawfish is displayed.

1/7) Monitoring of sawfish below specific barriers, trap and haul commences

Monitoring of sawfish below specific barriers

This study commenced tagging of *P. pristis* in the Fitzroy River, Western Australia. Efforts to tag *P. pristis* in the Ashburton River were also carried out in 2014, but no animals were captured. Since 2013, 24 *P. pristis* ranging between 1011 and 2510 mm total length (TL) were captured, and an additional 7 were recaptured at least once in the Fitzroy River. Of

these, 25 were tagged with Vemco V-13 acoustic transmitters (Table 2). These tags transmit an acoustic signal at a random interval approximately every one to two minutes, which can be recorded by moored acoustic receivers. A total of 19 Vemco VR2W acoustic receivers have been deployed throughout the entirety of the Fitzroy River (Figure 2). Multiple receivers have been placed in pools located above and below instream barriers to better monitor the behaviour, mortality and movements of these fish in accordance with the presence of the barriers and changes in river flow and stage height. A single receiver was also placed in Snake Creek, an anabranch of the Fitzroy River (see Figure 2), to determine if sawfish are utilising this area as a bypass of Myroodah Crossing and the Camballin Barrage.



Figure 2. Locations of instream barriers (red dots) and acoustic receivers (yellow dots) on the Fitzroy River, Western Australia. The dark blue line represents the Fitzroy River; the light blue line represents Snake Creek. Image sourced from Google Earth.

Table 2. Catch data of *Pristis pristis* captured in the Fitzroy River in 2013 and 2014.

Date	Location	Rototag #	Acoustic ID #	Sex	TL (mm)
10-Aug-12	Camballin Pool	PPMN0812	1143402	F	820
11-Aug-12	Camballin Pool	M414	1143410	F	1870
3-Jun-13	Telegraph Pool	M1118 R*	-	F	-
18-Aug-13	Camballin Pool	M332	1167478	M	1885
18-Aug-13	Camballin Pool	PPMN0813	1167477	F	2280
20-Aug-13	Camballin Pool	M418	1167484	F	2063
20-Aug-13	Lwr Myroodah Crs.	M432	1167487	F	2310
21-Aug-13	Telegraph Pool	M318	1167474	F	2345
22-Aug-13	Telegraph Pool	M294	1167479	F	2247
22-Aug-13	Telegraph Pool	M423	1167485	M	1925
22-Aug-13	Telegraph Pool	M433	1167486	M	2093
22-Aug-13	Telegraph Pool	M322	-	M	1701
22-Aug-13	Telegraph Pool	M365	-	F	2190
30-Oct-13	Camballin Pool	M366	1167481	M	2510
30-Oct-13	Camballin Pool	M1101	1167482	M	1780
23-Jul-14	Lwr Barrage Pool	M446	11830000	M	2030
24-Jul-14	Lwr Barrage Pool	M375	1183004	F	2020
25-Jul-14	Camballin Pool	M372	1183003/1194190	F	2093
25-Jul-14	Camballin Pool	M380	1183004	M	1835
26-Jul-14	Camballin Pool	M372 R*	1183003/1194190*	F	2093
26-Jul-14	Camballin Pool	M385	1183005	F	2145
29-Jul-14	Snag Pool	M384	1183006	M	1023
30-Jul-14	Pandanus Pool	M383	1194191	M	1011
30-Jul-14	Pandanus Pool	M390	1194193	M	1594
30-Jul-14	Pandanus Pool	M395	-	M	1940
1-Aug-14	Lwr Myroodah Crs.	M438	-	M	-
1-Aug-14	Lwr Myroodah Crs.	M448	-	M	2058
2-Aug-14	Lwr Myroodah Crs.	M1188 R*	1183008/1194192	M	2062
3-Aug-14	Lwr Myroodah Crs.	M438 R*	1167483	M	-
21-Sep-14	Cuttings	M413 R*	-	M	2140
5-Oct-14	Upr Barrage Pool	M339	1200103	F	1860
6-Oct-14	Camballin Pool	M380 R*	1183004*	M	1835
9-Oct-14	Telegraph Pool	M324	1167476	F	2238
9-Oct-14	Telegraph Pool	M441	1167480	M	1978
10-Oct-14	Lwr Myroodah Crs.	M1188 R*	1183008/1194192*	M	2111
11-Oct-14	Lwr Myroodah Crs.	M438 R*	1167483*	M	2116
12-Oct-14	Lwr Myroodah Crs.	M1188 R*	1183008*	M	2111
12-Oct-14	Lwr Myroodah Crs.	M448 R*	1200100	M	2105

* Recapture

Tag data recorded by the acoustic receivers was downloaded in July and October 2014, and is scheduled to be downloaded again in July 2015. Since 2013, 22 *P. pristis* have been monitored for between 1 and 503 days, which includes two tags that were deployed in 2012 (four tags were deployed after the last download). The period that a sawfish is monitored is dependent upon the time that a sawfish is within range of a receiver (~300 m radius), battery life of the transmitter and retention time of the tag. In 2014, a percentage of the tags were implanted into the peritoneal cavity of captured sawfish to increase duration of tag retention. The battery life of these tags was also increased by decreasing the interval in which the tags transmit. These efforts should result in a six-fold increase in the period in which they are monitored (noting most sawfish are monitored for ~6 months due to premature tag shedding, and the battery life of the implanted tags is ~3 years), assuming they don't emigrate from the river system. Preliminary results of data downloaded from receivers were discussed in Morgan *et al.* (2014b), and demonstrated *P. pristis* to move over Myroodah Crossing (a low relief barrier) at a stage height of over 11.1 m and over the Camballin Barrage (a small weir) at a stage height of over 12.6 m. Stage height in these areas ranges roughly between 9.5 and 10.5 during the dry season, depending on the month and year (Water Information database, 2014). Final analyses of the acoustic monitoring data will be provided in the 2016 final report.

Trap and Haul

Two of the internally tagged *P. pristis* were captured in the pool immediately below the Camballin Barrage and released into the pool immediately upstream of the barrage in July 2014 as part of the 'Trap and Haul' study (Figure 3). The aim of this study is to determine if it is beneficial and feasible to manually move juvenile sawfish from pools downstream from obstructing barriers to pools immediately upstream of the barriers. Similar to all acoustic monitoring data, the results from this study are preliminary. From the downloaded data, one *P. pristis* was monitored for less than a week before transmissions ceased for unknown reasons, while the second was monitored to remain in the lower half of the pool (a shallow run separated the lower and upper halves of the 13 km pool) for the entirety of the dry season. Trap and haul efforts will be continued in 2015, if sawfish can be located downstream of the barrage.



Figure 3. Largetooth sawfish (*Pristis pristis*) being released upstream of the Camballin Barrage during investigations into the efficacy of a trap and haul program.

Specialised accelerometer tags are also planned to be deployed on *P. pristis* in 2015 to better understand the activity patterns and swimming performance of the species. Results from this data will allow us to provide information on what flow levels would be appropriate for sawfish fishways. Swim trials with *P. pristis* will also compliment this data, and will provide more in-depth knowledge on the full potential of the swimming abilities of *P. pristis*. Efforts are underway to temporarily relocate a few young of the year *P. pristis* to a research facility so that swim trials can be conducted under controlled conditions.

Outputs

Along with the field research conducted in 2013 and 2014, the authors of this study have presented much of the acquired data in various scientific presentations, public outreach events and scientific manuscripts. These outputs include:

- Three scientific presentations on sawfish and the impacts of barriers on sawfish.
 - Beatty *et al.* 2014. Vulnerability of Western Australian fishes to changing flow. Presented at Australian Society of Fish Biology, Darwin, Australia.
 - Whitty *et al.* 2014. Fitzroy River Sawfish Program: Influence of river discharge and barriers on the relative abundance and fitness of juvenile largetooth sawfish (*Pristis pristis*). Presented at Sharks International, Durban, South Africa.
 - Morgan *et al.* 2014. Detection of juvenile green sawfish *Pristis zijsron* habitat in Western Australian waters. Presented at Sharks International, Durban, South Africa.

- Public outreach presentations on sawfish in Western Australia.
 - Whitty (2014). Presentation on sawfish in the Fitzroy River given to the Derby Land Care group in Derby, Western Australia
 - Morgan (2014). Presentation on sawfish and fishes of the Pilbara given to the Onslow Primary School in Onslow, Western Australia.
 - Presentation on sawfish given to the John Tonkin College in Mandurah, Western Australia.

- Scientific peer reviewed articles
 - Morgan *et al.* (2015). Discovery of a pupping site and nursery for critically endangered green sawfish *Pristis zijsron*. *Journal of Fish Biology* **86**, 1658-1663.
 - Whitty *et al.* (draft). Movements and microhabitats: heterogeneous habitat use of the largetooth sawfish *Pristis pristis* in an intermittent riverine environment.

- Article discussing the project and recent findings published on WAMSI's and the Sawfish Conservation Society's websites.

- Distributed sawfish identification brochures, with details on how to report a sawfish encounter in northern Western Australia

References

Morgan D, Whitty J, Allen M, Beatty S, Keleher J. 2014a. Impacts of barriers and fishways on sawfish – Wheatstone sawfish offset 2014 annual report. Freshwater Fish Group and Fish Health Unit, Murdoch University Report to Western Australian Marine Science Institution and Chevron Australia.

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