

Mesa H Proposal

Blind Cave Eel (*Ophisternon candidum*) – summary update of inland Pilbara distribution – December 2019

The only described Australian species of Blind Cave Eel, *Ophisternon candidum*, is listed as vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* and the *Biodiversity Conservation Act 2016* (WA). The Blind Cave Eel was previously thought to be restricted to subterranean karstic caves on the Cape Range peninsula and karstic aquifers at Barrow Island off the Pilbara Coast.

During an annual stygofauna sampling in 2009 in the Bungaroo area (within the broader Robe River Catchment of the inland Pilbara), Biota Environmental Sciences collected a single Blind Cave Eel specimen from an iron ore exploration drill hole (BC186) within Bungaroo Creek (Biota 2009, Figure 1).

Ongoing sampling for the Blind Cave Eel since 2009 produced further positive records at an additional 7 locations, and was presented in the Mesa H ERD, drafted in 2018 / early 2019. Additional targeted sampling programs completed during 2019, since the ERD was released for public review, have now shown the species to be present at **8 additional sites along the Robe River**, bringing the total to **20 Blind Cave Eel records from 16 locations**. Specimen records and eDNA evidence have demonstrated that species occurs across the broader Robe River Catchment, spanning over 100km including Bungaroo Creek, Jimmawurrada Creek and with the majority of records now known along the Robe River (Biota 2019), which is consistent with the mechanism of distribution hypotheses of Moore et al. (2018).

From the targeted 2019 work, it is now understood that the saturated alluvium along the main channels of the Robe River, within the broader Robe River catchment is the major and core habitat for the species in the locality (i.e. true habitat critical to the survival of the species). This habitat will remain largely unaffected by the groundwater drawdown associated with the Mesa H project (Figure 1, Table 1).

In summary, the primary changes from what was known and presented in the Mesa H ERD (April 2019) include:

- **Records:**
 - **8 new records / 8 new sites** along the **Robe River**:
 - 2 specimens in pools within the Robe River
 - 6 eDNA records in the Robe River (5 pools, 1 bore)
 - DNA indicates that these new records are the same species (and same species as Cape Range with 1.5% divergence)

Current results to December 2019 are summarised below.

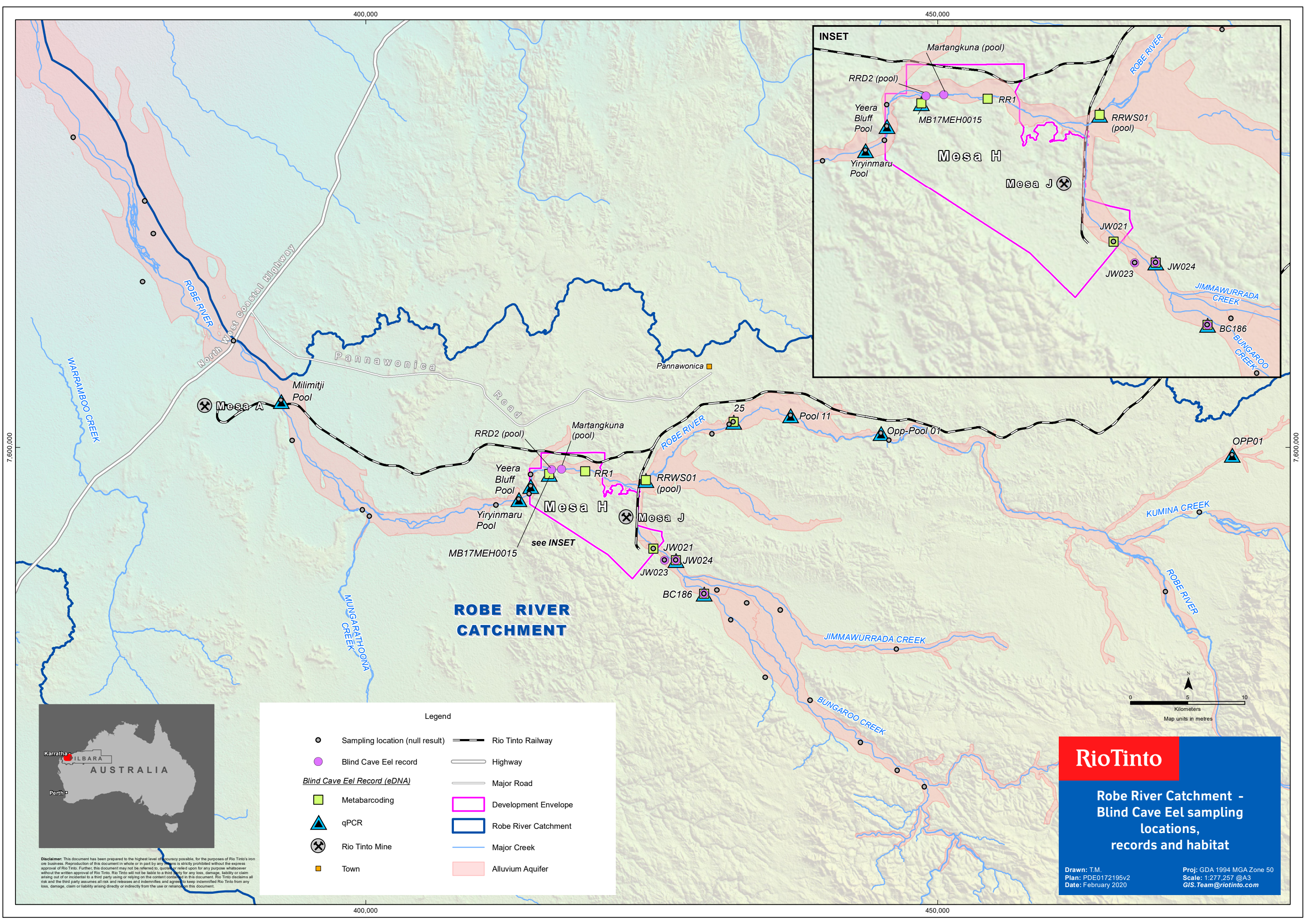
- **Records:**
 - **Total of 20 records from 16 sites** (Figure 1 and Table 1) – **8 bores / 8 pools**
 - 8 records from 4 sites in Jimmawurrada Creek – impact areas
 - 12 records from 12 sites in the Robe River – majority (8) of which are pools
 - 6 sites limited or negligible impact (1 bore has been impacted for 37 years)
 - 6 reference sites (non-impact)
- **Range extent:** has increased from 26km (as presented in the ERD) to **103 km**
- **Sampling history:**
 - The Jimmawurrada and Bungaroo Creek areas have been subject to 10 years of stygobitic fauna sampling since 2009 (25 phases)
 - The Robe River alluvial aquifer has only been subject to 5 phases of stygobitic fauna sampling over 3 years (2015 – 2017); and 3 phases of targeted eDNA Blind Cave Eel sampling (eDNA methods trial in 2018 and 2 targeted phases in 2019)

- **Geology / Hydrogeology:**

- Habitat is understood to primarily be associated with the Robe River Catchment alluvial aquifers – an inter-connected habitat with no geological / hydrological barriers. The Channel Iron Deposits (CID) below sections of the alluvial aquifer (and patches of calcretes) appear to also provide habitat – potentially refugia habitat
- The majority of records have been found in semi-permanent to permanent pools in the Robe River
- The species continues to be recorded from both groundwater and surface pool habitats despite the 2017-2019 period (and more broadly the last decade) representing a long-term low rainfall period for the Robe River Catchment
- Habitat connectivity and wider distribution within the Robe River catchment is also supported by distribution patterns observed in other stygofauna species, with some taxa sympatric with the Blind Cave Eel on Cape Range and Barrow Island also present in the headwaters of the Robe River, including prey items known from Cape Range (Biota 2019)
- The greatest known depth to the water table in which a Blind Cave Eel specimen has been sampled to date is approximately **11.6 mbgl** (Table 2), within river alluvium, based on available hydrogeological data

- **References:**

- Biota (2009) *Greater Bungaroo Stygofauna Assessment*. Unpublished report prepared for Rio Tinto Iron Ore, Biota Environmental Sciences
- Biota (2019) *Blind Cave Eel Targeted Survey Interim Report and Assessment*. Unpublished report prepared for Rio Tinto Iron Ore., Biota Environmental Sciences, Western Australia, December 2019
- Moore, G., W. F. Humphrey, and R. Foster (2018). New populations of the rare subterranean blind cave eel *Ophisternon candidum* (Synbranchidae) reveal recent historical connections throughout north-western Australia. *Marine and Freshwater Research*.



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Legend

	Sampling location (null result)		Rio Tinto Railway
	Blind Cave Eel record		Highway
Blind Cave Eel Record (eDNA)			
	Metabarcoding		Major Road
	qPCR		Development Envelope
	Rio Tinto Mine		Robe River Catchment
	Town		Major Creek
			Alluvium Aquifer

Robe River Catchment - Blind Cave Eel sampling locations, records and habitat

Drawn: T.M.
Plan: PDE0172195v2
Date: February 2020

Proj: GDA 1994 MGA Zone 50
Scale: 1:277,257 @A3
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Table 1: Blind Cave Eel distribution (December 2019)

	Site	Year	Record Type	Bore	Pool	Impact
Jimma - Bungaroo	BC186	2009 2017	Specimen eDNA	X		X
	JWO23	2016	Specimen	X		X
	JWO24	2017 2017 2018 2018	Specimen eDNA Specimen Specimen	X		X
	JWO21	2017	eDNA	X		X
Robe River	Control (RRWS01)	2017	eDNA		X	-
	25	2017	eDNA	X		town water bore
	MB17MEH0015	2017	eDNA	X		limited
	RR1	2017	eDNA	X		negligible
	RRD2	2018	Specimen		X	negligible
	Milimitji Pool	2019	eDNA		X	-
	Martangkuna Pool	2019	Specimen		X	negligible
	Yirynamaru Pool	2019	eDNA		X	-
	Yerra Bluff Pool	2019	eDNA		X	-
	Opportunistic Pool 02	2019	eDNA		X	negligible
	Pool 11	2019	eDNA		X	-
	Opportunistic Bore 01 (OPP01)	2019	eDNA	X		-

Table 2: Bore data containing positive records of the Blind Cave Eel

Site	Site Type	Easting	Northing	Date	Top of casing (mRL)	Water table level (mRL)	Water Depth (Meters below ground – from TOC)	Hole Depth	Cased depth (mbgl)	Slotted Interval (mbgl) (Geology)	Record Type
BC186	Bore	429578	7587212	7/11/2009	181.98	179.25	2.73	42	<1m	Casing broken from 1m (CID)	Specimen
				12/12/2017		173.59	8.39				eDNA positive
JWO23	Bore	426138	7590140	22/09/2016	171.42	159.86	11.56	21.7	21.7	6.7 – 21.7 (alluvium)	Specimen
JWO24	Bore	427126	7590154	1/09/2017	169.72	161.26	8.64	23.7	N/A	N/A	Specimen
				12/12/2017		160.61	9.11				eDNA positive
				1/06/2018		159.68	10.04				Specimen
				30/09/2018		158.06	11.66				Specimen
JWO21	Bore	424138	7589754	10/05/2017	165.56	155.61	9.95	33.7	33.7	5.5 – 33.7	eDNA positive
25	Bore	432152	7602229	12/12/2017	169.6	166.06	3.54	24	N/A	N/A	eDNA positive
MB17MEH0015	Bore	416041	7597690	12/12/2017	132.9	124.09	8.81	36	30	12 – 30 (alluvium)	eDNA positive
RR1	Bore	419176	7597904	12/12/2017	134.5	131.43	3.07	17.2	16.95	0.75 - 16.95	eDNA positive
Opportunistic Bore 01 (OPP01)	Bore	475760	7599356	31/10/2019	N/A	N/A	N/A	N/A	N/A	N/A	eDNA positive