Ord-East Kimberley Expansion Project – Weaber Plain Development Area

Gouldian Finch breeding survey (2021)

Prepared for:

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SUMMARY

The Weaber Plain Development Project (the Project) is an irrigated agricultural development located approximately 30 km north-north-east of Kununurra in Western Australia. The Project was approved by the former Department of Sustainability, Environment, Water, Population and Communities (now the Department of Agriculture, Water and the Environment) in 2011 under EPBC 2010/5491.

To satisfy Condition 6 of EPBC 2010/5491 and offset the potential impacts of the Project on the endangered Gouldian Finch (*Erythrura gouldiae*), a Gouldian Finch Conservation Plan was prepared. The Conservation Plan was prepared to ensure appropriate management of the Gouldian Finch and its habitat during construction and operation of the Project. An action arising from the Conservation Plan was to undertake Gouldian Finch counts of the breeding population within the Buffer Area and immediate surrounding reserves, with a target of no significant reductions in the breeding population of Gouldian Finches.

A total of 72 plots were surveyed for Gouldian Finches, comprising 39 plots within the five confirmed breeding areas and 33 plots within the buffer area and adjacent conservation reserves.

A single Gouldian Finch was recorded during the plot surveys, associating with a flock of Masked Finches and Long-tailed Finches. No Gouldian Finches were observed incidentally outside of the survey plots.

A total of 94 nest boxes were inspected for recent or historical sign of nesting Gouldian Finches. No Gouldian Finches were detected occupying available nest boxes, and no evidence was detected suggesting recent use.

The survey failed to record evidence of Gouldian Finch nesting activity within artificial nest boxes within the Project area. Additionally, no adult Gouldian Finches were observed visiting natural hollows, and no chicks were heard begging from natural hollows, during the two-hectare plot surveys. This represents the first breeding assessment to not record nesting activity within artificial nest boxes; however, an accurate assessment relating to nesting activity in natural hollows cannot be made due to natural hollows not being internally inspected.

The number of Gouldian Finches observed during the two-hectare plot surveys was the lowest total since monitoring commenced in 2011 and was comparable to the low counts observed during the non-breeding surveys in 2020.

A potential cause for the lack of observed nesting may be attributed to the loss of artificial nest boxes through degradation or other damaging processes. The resulting low proportion of nest boxes assessed as being in 'good' condition likely reduced the potential for nesting within the Project area. It is unknown whether the condition of the nest boxes has been degrading gradually, or whether a recent weather event may have caused sudden and widespread damage.

There were few limitations encountered during the survey that were expected to have impacted upon the results. As such, the survey was deemed adequate in providing an assessment of the breeding Gouldian Finch population in 2021.

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1. INTRODUCTION

1.1 Project description

The Weaber Plain Development Project (the Project) is an irrigated agricultural development located approximately 30 km north-north-east of Kununurra in Western Australia (Figure 1). The Project was approved by the Department of Sustainability, Environment, Water, Population and Communities in 2011 under EPBC 2010/5491 Condition 6.

To satisfy Condition 6 of EPBC 2010/5491 and offset the potential impacts of the Project on the endangered Gouldian Finch (*Erythrura gouldiae*), a Gouldian Finch Conservation Plan (herein the Conservation Plan) was prepared (Strategen 2014). The Conservation Plan was prepared to ensure appropriate management of the Gouldian Finch and its habitat during construction and operation of the Project. An action arising from the Conservation Plan was to undertake Gouldian Finch counts of the breeding population within the Buffer Area and immediate surrounding reserves, with a target of no significant reductions in the non-breeding population of Gouldian Finches (Strategen 2014).

1.2 Gouldian Finch distribution

The Gouldian Finch had a former distribution across most of northern Australia, but within the last century, its range has contracted to the Kimberley and Northern Territory, with records in Queensland increasingly infrequent (O'Malley 2006).

Gouldian Finches are found throughout most of the Kimberley, typically ranging as far south as the Dampier Peninsula in the west, the King Leopold Ranges and Barnett River in the central Kimberley, and Spring Creek in the eastern Kimberley (Storr 1980).

1.3 General habitat

Habitat is typically savannah woodland, characterised by rocky hills with hollow-bearing gums, adjacent to a diverse grass assemblage (O'Malley 2006). Throughout the year, Gouldian Finches disperse widely throughout these habitats, in response to seasonal changes in food availability (Dostine *et al.* 2001).

1.3.1 Breeding habitat

Gouldian Finches lay eggs between February to June near Wyndham (Brazill-Boast *et al.* 2010), and January to August at Newry Station (east of Kununurra) in the Northern Territory (Tidemann *et al.* 1999). In the East Kimberley, Gouldian Finches are known to nest in the cavity-bearing small-fruited bloodwood (*Corymbia dichromophloia*) and Darwin woollybutt (*Eucalyptus miniata*) over a ground layer story of a suitable foraging grass (e.g. *Sorghum stipoideum*), within 2 km of a permanent water source (Brazill-Boast *et al.* 2010; Brazill-Boast *et al.* 2011). Nest selection has been shown to be highly dependent on the structural characteristics of a cavity, as well as the abundance of suitable nest trees at the landscape level (Brazill-Boast *et al.* 2010; Brazill-Boast *et al.* 2011).

1.3.2 Non-breeding habitat

Outside the breeding season, Gouldian Finches disperse widely in grassy woodland in lowland areas, often adjacent to breeding habitat on hills (Dostine *et al.* 2001). Observations over successive wet seasons suggest Gouldian Finches follow seed resources provided by perennial grasses (Dostine *et al.* 2001).

1.4 Key threats

The Gouldian Finch is an example of an obligate granivore than has experienced a significant reduction in range (Franklin 1999). Seed shortages at the end of the dry season or early wet season (i.e. November – January), potentially brought about by grazing pressure and altered fire regimes, has likely contributed to their declines (Franklin 1999; O'Malley 2006). Commercial trapping of wild finches throughout much of the Kimberley region until 1986 coincided with major population declines of the Gouldian Finch, particularly in the late 1970s (Franklin *et al.* 1999).

1.5 Conservation status

The Gouldian Finch is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (Department of Agriculture, Water and the Environment 2021). The taxon is also listed as Endangered under the Nature Conservation Act 1992 in Queensland (Queensland Government 2021), Vulnerable under the Territory Parks and Wildlife Conservation Act 2000 in the Northern Territory (Northern Territory Government 2012), and Priority 4 on the DBCA Priority Flora and Priority Fauna List in Western Australia (Department of Biodiversity, Conservation and Attractions 2019). The Action Plan for Australian Birds (Garnett *et al.* 2011) lists the Gouldian Finch as Near Threatened.

2. METHODS

2.1 Gouldian Finch breeding surveys

A total of 72 plots were surveyed for Gouldian Finches, comprising 39 plots within the five confirmed breeding areas and 33 plots within the buffer area and adjacent conservation reserves (Table 1, Figure 2). The location of each plot was pre-determined prior to the survey.

Each plot was two-hectares in area, and observers would search each plot for a total of 20 minutes. Only birds recorded within each two-hectare plot were recorded (with birds detected outside each plot recorded as incidentals). Surveys were conducted between 5:30 am and 9:30 am.

Where Gouldian Finches were detected, the following attributes were recorded:

- GPS location
- Count of the number of individuals
- Assessment of age classes and sex
- Activity of birds (e.g. foraging, nest building, attending nest, drinking, flyover etc)
- If foraging, species of grass they were feeding on

Table 1. Effort expended during the March 2021 Gouldian Finch breeding survey

Area	Two-hectare / 20 min plots	Person hours (hr:min)
Breeding	39	13:00
Buffer	33	11:00
Total	72	24:00

2.2 Gouldian Finch nest assessments

Nest boxes were inspected following the survey plots. A 3.6 m extension ladder was carried to each nest box location. The ladder was then placed securely against a tree and each nest box was inspected using a 8mm endoscopic inspection camera that connected to an Apple iPhone via Wi-Fi for viewing on screen by a person stationed on the ground.

Each nest box was assessed for: use by Gouldian Finches; the condition of the box; and whether competing occupants (i.e. non-Gouldian Finches) were using the box.

The locations of 158 natural hollows identified during previous surveys were not attainable prior to the survey. Internal inspections of natural hollows within the Project area from 2014 – 2018 have not recorded nesting activity, with Gouldian Finch breeding having only been recorded in artifical nest boxes during this period (Save the Gouldian Fund 2018). Natural hollows opporuntistically located during the two-hectare plot surveys in the current survey were watched for visiting adult Gouldian

Finches, and attention was given to detecting begging chicks calling from within hollows, which can be heard from a distance of 50 – 100 m away (Save the Gouldian Fund 2018). However, no natural hollows were internally inspected using the endoscopic camera due to a lack of Gouldian Finches observed in the surveyed areas (that may be indicative of local breeding), as well as the unavailabilty of location data for previously identified natural hollows.

2.3 Survey timing

The Gouldian Finch breeding survey was conducted between the 5th and 11th of March 2021, as per the monitoring regime noted in Table 3 of the Conservation Plan (Strategen 2014). All previous breeding surveys (e.g. Save the Gouldian Fund 2018) within the Project area have estimated the first egg-laying by Gouldian Finches to have occurred between mid-late February each year.

Rainfall at Kimberley Research Station (Kununurra) (Department of Primary Industries and Regional Development 2021) in the 12 months prior to the survey was slightly above the long-term average (Figure 1).

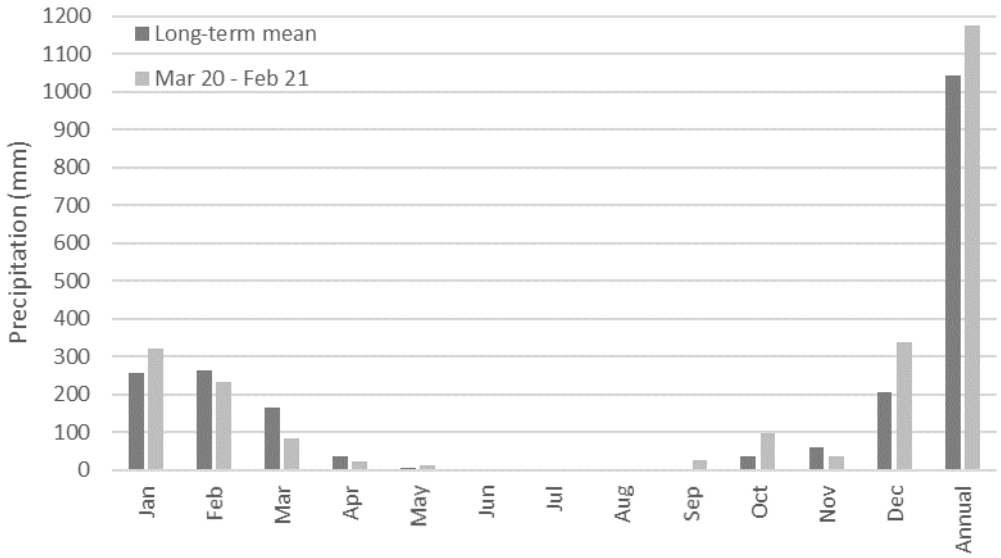


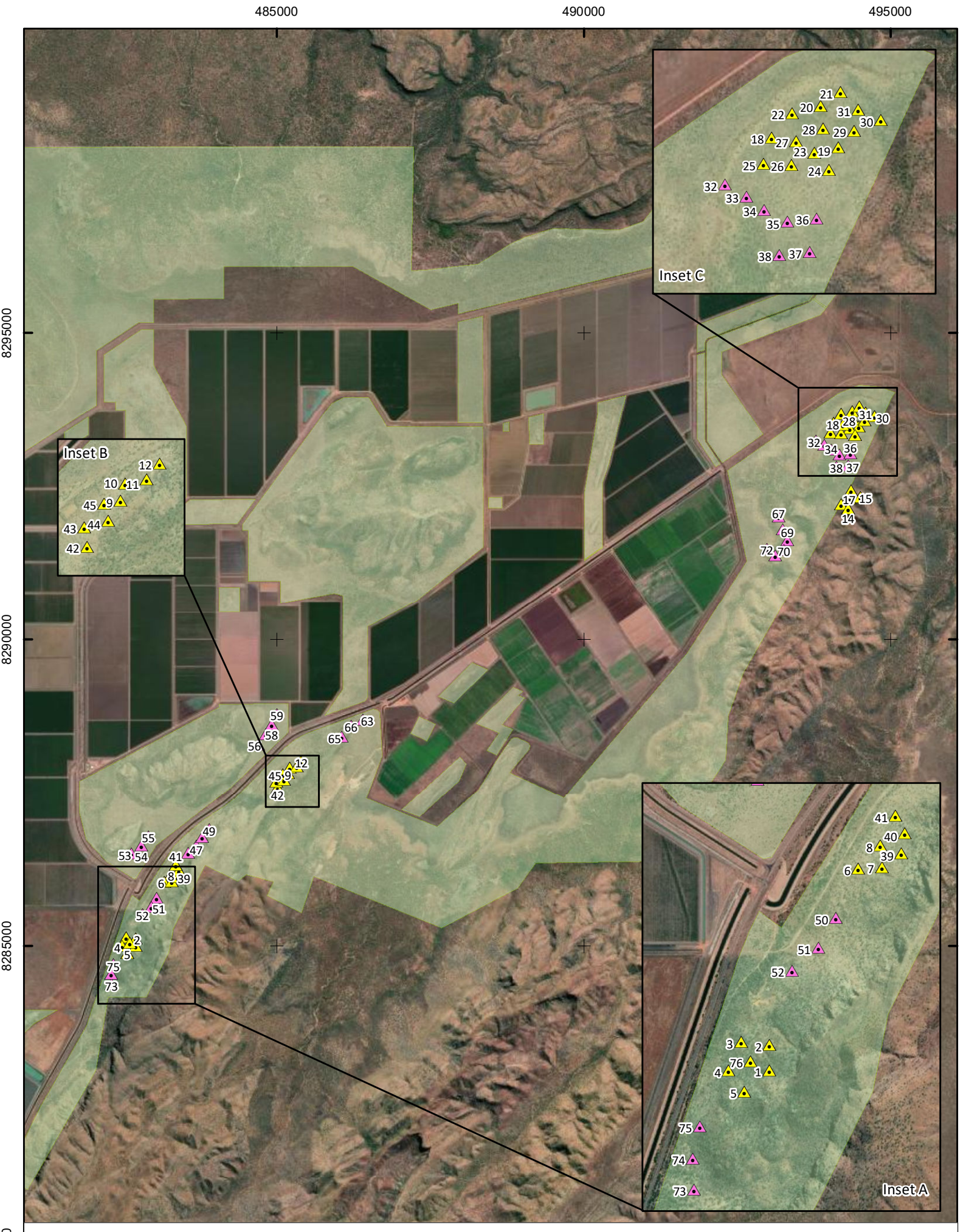
Figure 1. Long-term mean rainfall comparison with 12 months prior to survey at Kimberley Research Station.

2.4 Survey team

The Gouldian Finch breeding survey described in this document was planned and coordinated by Nigel Jackett. The two-hectare plot surveys and nest assessments were conducted by George Swann and Adrian Boyle. The qualifications and experience of the team are provided in Table 2.

Table 2. Project staff, qualifications, and experience

Name	Position	Qualifications	Professional experience
Nigel Jackett	Project leader, Ornithologist	BSc (Hons)	15 years
George Swann	Ornithological consultant	-	29 years
Adrian Boyle	Ornithological consultant	-	21 years


485000
490000
495000
8295000
8290000
8285000
8280000
Inset A
Inset B
Inset C
2ha plot (breeding)
2ha plot (buffer)
Buffer area
Location of Gouldian Finch breeding plots
Figure 2.
Date drawn: 05/06/21
Map Datum: GDA 1994
Zone: 52
N
0 0.75 1.5
km
1:75,000

3. RESULTS

3.1 Gouldian Finch breeding surveys

A total of 72 plots were surveyed for Gouldian Finches, comprising 39 plots within the five confirmed breeding areas, and 33 plots within the buffer area and adjacent conservation reserves.

A single Gouldian Finch was recorded during the plot surveys (Table 3, Figure 3). The Gouldian Finch was loosely associated with a flock of 10 Masked Finches and 46 Long-tailed Finches, and had not been previously banded.

No Gouldian Finches were observed incidentally outside of the designated survey plots.

Table 3. Gouldian Finches recorded during survey

Date	Time	Plot No.	Breeding Area No.	Latitude	Longitude	Count	Comments
06/03/2021	06:15	31	5	-15.43375	128.94963	1	black-faced adult male; associating with Masked and Long-tailed Finches

3.2 Gouldian Finch nest assessments

A total of 94 nest boxes were inspected for recent or historical sign of nesting Gouldian Finches. A total of 23 nest boxes were not able to be located due to the unavailability of GPS coordinates.

The condition of each nest box was assessed, with the majority of nest boxes considered damaged or unavailable for Gouldian Finch nesting attempts (Figure 4, Appendix 2). Damage consisted of missing log entrances, missing or broken nest boxes, separated log entrances and nest boxes, boxes that had slipped from their wire holding and were hanging vertically, and boxes located on the ground as a result of the host tree having fallen. Of the 22 still available to the Gouldian Finches, 15 boxes were occupied by other species such as frogs, goannas, spiders, termites and ants (Figure 5). No Gouldian Finches were detected occupying available nest boxes, and no evidence was detected suggesting recent use.

Table 4. Comparison of nest box use by Gouldian Finches from 2014 – 2021

Nest assessment	**2014**	**2015**	**2016**	**2017**	**2018**	**2019***	**2020***	**2021**
Active nest boxes	9	26	32	41	23	-	-	0
Available nest boxes	120	120	120	120	120	-	-	22
Utilisation (%)	**7.5**	**21.7**	**26.7**	**34.2**	**19.2**	**-**	**-**	**0**

* No nest assessments were conducted in 2019 or 2020; Table assumes 120 nest boxes were available from 2014-2018

Gouldian Finch
Long-tailed Finch
Masked Finch
Breeding area
Buffer area

Location of Gouldian Finch recorded during survey

Figure 3.
Date drawn: 09/06/21
Map Datum: GDA 1994
Zone: 52

N

0 0.5 1 km

1:55,000

Figure 4. Examples of degraded nest boxes

Figure 5. Examples of inhabitants observed within available nest boxes (L: *Varanus scalaris*; R: *Litoria caerulea*)

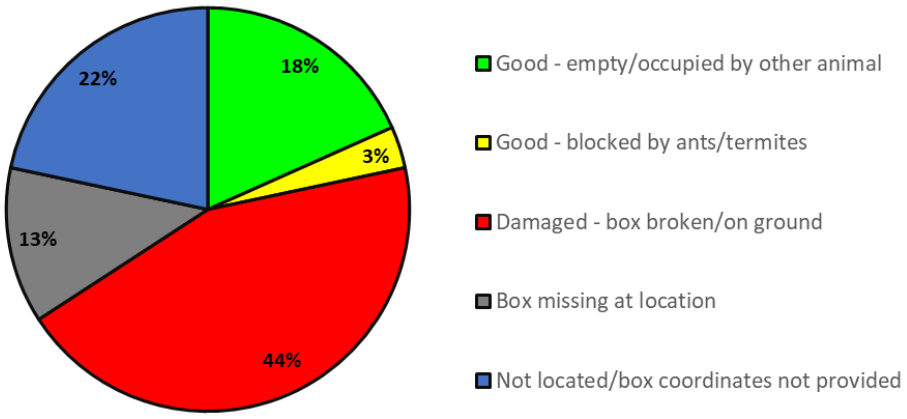


Figure 6. Condition of nest boxes assessed during survey

A Generalised Additive Modelling (GAM) approach was used to assess trends in nesting activity by Gouldian Finches within the Project area (Figure 7). This approach has the advantage that it can be used to identify non-linear trends, and that it generates smoothed indices of nesting activity that are robust to missing data (e.g. missing data from 2019 and 2020 in this study) or large short-term fluctuations.

The results of the GAM suggest nesting activity within the Project area initially declined, until the introduction of nest boxes in 2013 that resulted in an increase to baseline levels. However, the trend since 2017 suggests nesting activity has steeply declined, although it should be noted that confidence is low due to the aforementioned missing data.

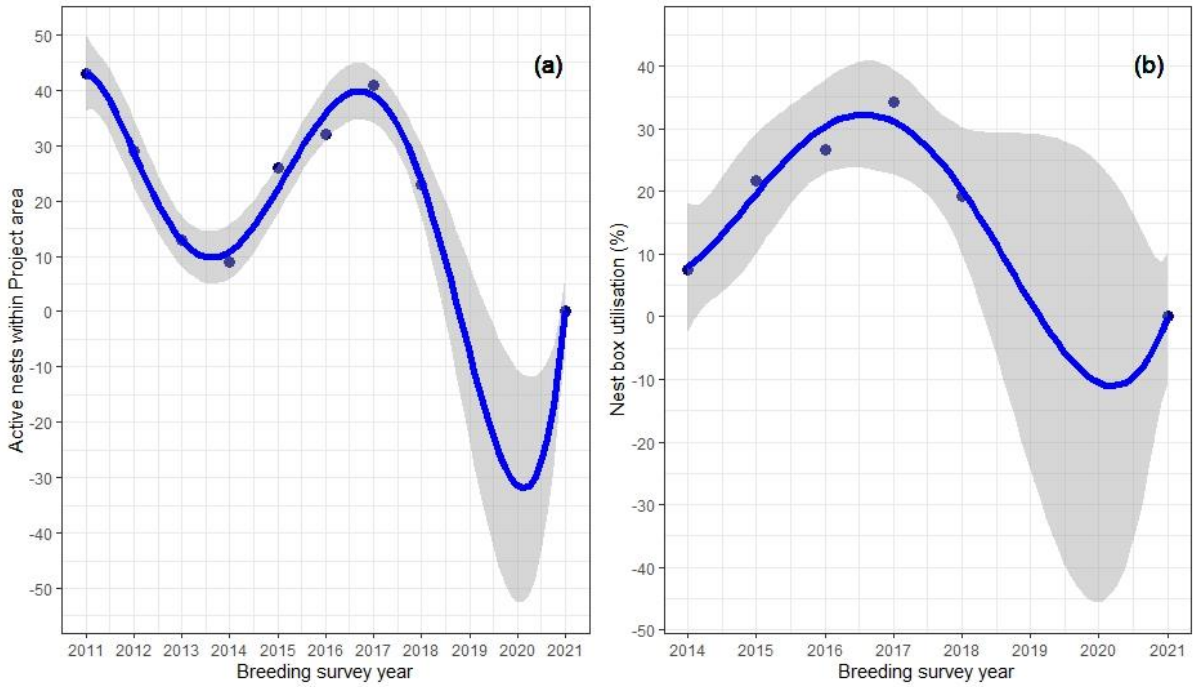


Figure 7. Generalised Additive Models for (a) active nests, and (b) nest box use. Dots represent actual values for each year, while shading represents confidence limits.

4. DISCUSSION

The 2021 Gouldian Finch breeding survey failed to record evidence of Gouldian Finch nesting activity within artificial nest boxes within the Project area. Additionally, no adult Gouldian Finches were observed visiting natural hollows, and no chicks were heard begging from natural hollows, during the two-hectare plot surveys. This represents the first breeding assessment to not record nesting activity within artificial nest boxes; however, an accurate assessment relating to nesting activity in natural hollows cannot be made due to natural hollows not being internally inspected.

The number of Gouldian Finches observed during the two-hectare plot surveys was the lowest total since monitoring commenced in 2011 and was comparable to the low counts observed during the non-breeding surveys in 2020 (Jackett 2021).

A potential cause for the lack of observed nesting may be attributed to the loss of artificial nest boxes through degradation or other damaging processes. The resulting low proportion of nest boxes assessed as being in 'good' condition likely reduced the potential for nesting within the Project area. It is unknown whether the condition of the nest boxes has been degrading gradually, or whether a recent weather event may have caused sudden and widespread damage.

Brazill-Boast *et al.* (2013) demonstrated Gouldian Finches have greater reproductive success when high quality nest sites are available, including custom-built nest boxes. Gouldian Finches that selected nest boxes typically commenced nesting earlier in the season and fledged a greater number of offspring than those that selected natural hollows (Brazill-Boast *et al.* 2013). Although all previous annual surveys have estimated egg-laying to have first occurred in February, it is possible that the lack of available nest boxes may have delayed egg-laying within the Project area. However, despite internal inspections of natural hollows between 2014 – 2018 (Save the Gouldian Fund 2018), there have been no observations of Gouldian Finches using natural hollows within the Project area. It is unknown whether Gouldian Finches that previously selected nest boxes up until 2018 would now occupy nearby natural hollows in their absence.

Rainfall totals for the 12 months prior to the March 2021 survey were considered above the long-term average. Freshwater was not deemed a limiting resource, as much of the lower-lying areas close to the breeding areas were inundated, and water is permanently present within the adjacent irrigated agricultural development area. Important food resources required for breeding (e.g. sorghum) should therefore have been available during the current survey, permitting nesting during this period. However, the lack of observed Gouldian Finches (and subsequent nesting activity) during the current

survey may indicate a shortage of required grass seeds being available within a suitable proximity of the confirmed breeding areas.

The Masked Finch (*Poephila personata*) and Long-tailed Finch (*P. acuticauda*) are two grass finch species that regularly co-occur with Gouldian Finches (Woinarski and Tidemann 1992; Franklin *et al.* 1998). Both species were recorded during the survey in both the breeding and buffer areas, and the observed Gouldian Finch was in the presence of both species. Without knowledge of typical counts of these associated species, it is not possible to assess whether their populations were also below average or were typical for that time of year, which may reflect food or other resource availability. Including these two species (or potentially all finch species) in future breeding and non-breeding counts may provide further contextual information relevant to the local occurrence of Gouldian Finches. Such counts could be incorporated into the current two-hectare plot surveys for Gouldian Finch, requiring minimal additional time or effort.

5. SURVEY LIMITATIONS

The potential limitations of the survey are listed in Table 5. Given the few limitations encountered, the objectives of the 2021 breeding survey are considered to have been met.

Table 5. Survey limitations

Limitation	Relevant (yes/no)	Comment
Competency/experience of the consultant carrying out the survey	No	The consultants have extensive experience conducting avifauna surveys throughout the Kimberley region, including previous experience within the Weaber Plain Development Area.
Scope (what faunal groups were sampled and were some sampling methods not able to be employed because of constraints such as weather conditions)	No	The survey replicated previous sampling techniques deemed suitable for monitoring the Gouldian Finch. These included 2ha/20 min survey plots, and searches of and inspections of potential nesting sites.
Proportion of fauna identified, recorded and/or collected	No	All birds detected during the survey were identified to species level.
Sources of information e.g. previously available information (whether historic or recent) as distinct from new data	No	The survey was consistent with previous surveys within the Weaber Plain Development Area, for which previous reports were available for context.
Proportion of the task achieved and further work which might be needed	Yes	A total of 39 plots in the Breeding area, and 33 plots in the Buffer area were surveyed, consistent with previous annual monitoring within the Weaber Plain Development Area. A total of 94 of the 120 nest boxes were assessed for use by Gouldian Finches. Those not inspected could not be located due to the unavailability of GPS coordinates for those nest boxes. Additionally, those nest boxes inspected will require future replacement or maintenance for breeding to be successful. No natural hollows were internally inspected during the current survey.
Timing/weather/season/cycle;	No	The objective of the survey was to assess the Gouldian Finch population within the Weaber Plain Development during the breeding period. The March timing of the survey was nearing the end of the wet season, and consistent with the local breeding period, with previous surveys indicating the first eggs are laid in February.
Disturbances (e.g. fire, flood, accidental human intervention etc.) which affected results of survey.	No	There were no recent disturbances that may have impacted upon the results of the survey.
Intensity (in retrospect, was the intensity adequate)	No	The 39 plots within the Breeding areas and 33 plots within the Buffer area were consistent with previous surveys to count Gouldian Finches within the Weaber Plain Development Area.
Completeness (e.g. was relevant area fully surveyed)	No	All five Breeding areas were surveyed comprehensively, and habitats like those within the Breeding areas were surveyed within the Buffer area.

Limitation	Relevant (yes/no)	Comment
Resources (e.g. degree of expertise available in animal identification to taxon level)	No	The Gouldian Finch is a readily identified species in all age classes and has a distinctive call. The consultants have extensive experience surveying for Gouldian Finches.
Remoteness and/or access problems	No	All pre-selected sites could be accessed during the survey, although heavy rainfall reduced vehicle access at some sites and required greater time spent walking to sites.
Availability of contextual (e.g. biogeographic) information on the region	No	The Victoria Bonaparte biogeographic region has been extensively surveyed, including multiple fauna surveys within the Weaber Plain Development Area.

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Appendix 1a. Results of survey plots: breeding areas

Species	Breeding area 2ha/20 min plot survey																																												
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	39	40	41	42	43	44	45	72
Brown Quail																									2						1								
Black-necked Stork																	1																						
Australian White Ibis																									4														
Eastern Cattle Egret									45																					18									
Great Egret			2																		1																		
Intermediate Egret																														1									
Little Egret																					1										1								
Brown Goshawk																						1		1		1													1
Black Kite			2																			1		1	1					1									
Whistling Kite				1											1					1																			
White-bellied Sea-eagle																																2							
Brolga																					1																		
Red-backed Buttonquail																									1														
Chestnut-backed Buttonquail																							2	1				2											
Button-quail sp.																				1																			
Crested Pigeon																															2								
Peaceful Dove		2		1		5	2	1	1	2	1		2	5		3	2	12	2	3	3	4	1	3	1	2	2	4	3	1	8	6	1		2		2	3	
Bar-shouldered Dove	2	2	2	2	1	4		1			2	1		2		2	2	2		2	2	2		1		4	1										2	1
Pheasant Coucal				1		1		1										1	1	1	2				1													
Horsfield's Bronze-Cuckoo														1																					1				
Brush Cuckoo												1						1							1										2	1			

Species	Breeding area 2ha/20 min plot survey																																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	39	40	41	42	43	44	45	72
Tawny Frogmouth																																	2						
Australian Owlet-nightjar								1																															
Oriental Dollarbird					2	1					1	1																		1									
Blue-winged Kookaburra	1									1					1		1	2		3	7	4	1			2	1	3	1		1								
Sacred Kingfisher				1											1																								
Red-tailed Black-Cockatoo		5												2				2										2		2									
Galah														4				4		1	4	2			5	4					1								
Little Corella																					1										6								
Red-collared Lorikeet	4	4											15																						2				
Red-winged Parrot	2		2			1				2								1	2							4					2								2
Great Bowerbird				1																										1							1		
Black-tailed Treecreeper														1											1														
Red-backed Fairywren														4				2	3																				
Banded Honeyeater																																				1			
Brown Honeyeater				4		3				1			1	2		1	2															1		1	3		2	4	1
Little Friarbird						4	1	1		1			1	1		1			1		1	1		1						2	2		1	1	1		1	2	
Silver-crowned Friarbird				1	1	4	1																									1	2		1				
Blue-faced Honeyeater																																				2			
White-throated Honeyeater	2	1	1	1	2								2	1																					2				2
Rufous-throated Honeyeater																		3							1														
Yellow-throated Miner			2			1																																	2

Species	Breeding area 2ha/20 min plot survey																																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	39	40	41	42	43	44	45	72
White-gaped Honeyeater				1														1																						
Yellow-tinted Honeyeater																					1									3										
Striated Pardalote				2		1			1							1		2	1		1					1		1									1		
Weebill	2	2		2	1	3				2	1	2	2	2			1								1										2	2	2		
Grey-crowned Babbler														4	4			1	6			4			4			3	2	2	6						5		
Black-faced Woodswallow															2	5											2	3											
Silver-backed Butcherbird				1			1																																
Pied Butcherbird	1								2									1				2				1													
Black-faced Cuckooshrike																1								1	1						1						1		
White-bellied Cuckooshrike		1			1						1				2			1				2	1					2			1					1			
White-winged Triller																			1																				
Varied Sittella																			2																				
Rufous Whistler											1		1		1		1	5	1				1	1			2	4						1	1		1		
Grey Shrikethrush														1	1	1	1													2									
Olive-backed Oriole						1																																	
Willie Wagtail													1		1		1		1									1												
Northern Fantail																																							
Magpie-lark				1														4				3				1													
Torresian Crow																																							1
Jacky Winter																1		1									1	1											
Golden-headed Cisticola				1																	1																		

Species	Breeding area 2ha/20 min plot survey																																											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	39	40	41	42	43	44	45	72
Mistletoebird			1		1																																				
Masked Finch																		2							2			1			10								
Long-tailed Finch																6			1			5						11		2	46								
Double-barred Finch	1																					3																	
Gouldian Finch																															1								
Yellow-rumped Mannikin																		4																					
Chestnut-breasted Mannikin																		4																					

Appendix 1b. Results of survey plots: buffer areas and incidentals

Species	Buffer area 2ha/20 min plot survey																																												
	32	33	34	35	36	37	38	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	32	33	34	35	36	37	38	46	47	48	49	50	Incidental
Green Pygmy-goose																								1																						
Black-necked Stork																														2																
Australian White Ibis		22																		9																22										
Glossy Ibis		35															10																			35										
Nankeen Night Heron																		1																												
Eastern Cattle Egret				70																																		70								
Great Egret																					1										1															
Brown Goshawk												1					1																													1
Black Kite			1									1						1			1											1	1				1									1
Whistling Kite											1							1		4		1	1	1																					1	
Red-backed Button-quail	2																		1	1	2				1			1							2											
Chestnut-backed Button-quail				1																																		1								
Masked Lapwing																					3																									
Peaceful Dove	4	4	5	1	2	3	4		3		3	2	7	6	2			5	5	2	3	1	10	4	3	4	10		4	4	5	6	2		4	4	5	1	2	3	4		3		3	2
Bar-shouldered Dove			1	1	1			2	1	3	1	2	2	6	3	3	3	2	4	2	4	1		3	2		1			2	3	3	4				1	1	1			2	1	3	1	2

Species	Buffer area 2ha/20 min plot survey																																												
	32	33	34	35	36	37	38	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	32	33	34	35	36	37	38	46	47	48	49	50	Incidental
Pheasant Coucal														1											1						1	1		1												
Oriental Dollarbird																1																1	1													
Blue-winged Kookaburra																		2	2	2			1		2				1		3	2		1												
Sacred Kingfisher																					1	1	2	1																						
Brown Falcon					1																																		1							
Red-tailed Black-Cockatoo		2		2	2	3																2				9	2		1					2		2		2	2	3						
Galah		2			2	3																														2			2	3						
Little Corella																2																														
Red-collared Lorikeet				2														2	2	4							6			8								2								
Red-winged Parrot		2	3	1				1							2								2													2	3	1				1				
Great Bowerbird								2		2	1	1			1	1			2				1		1					1	1											2		2	1	1
Black-tailed Treecreeper		1		1	2		3																													1		1	2		3					
Red-backed Fairywren										3							4				2																							3		
Brown Honeyeater	3							1	1	3	1	4	2				1							1					2		2	1	3		3							1	1	3	1	4
Little Friarbird	1		1	1	1	1	1	2	2				1	1	1	1										2	1	3	2	4	1				1		1	1	1	1	1	2	2			
Silver-crowned Friarbird								1		1			1	2												1	1		1	2												1		1		
Blue-faced Honeyeater				2							1																					2	1					2							1	

Species	Buffer area 2ha/20 min plot survey																																												
	32	33	34	35	36	37	38	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	32	33	34	35	36	37	38	46	47	48	49	50	Incidental
White-throated Honeyeater	1	1					2	1					1			2				1	1		2				1						1		1	1					2	1				
Rufous-throated Honeyeater							4													3	3									2			1								4					
Yellow-throated Miner												3		3																	1															3
White-gaped Honeyeater															1						2										1	1														
Yellow-tinted Honeyeater																											2						1													
Striated Pardalote								1	1	1	1	3	2	2									1									1	1									1	1	1	1	3
Weebill	2		2	2	2	2					1	2																2							2		2	2	2	2					1	2
White-throated Gerygone																							1																							
Grey-crowned Babbler								2	3	1	1		2												2		3	3														2	3	1	1	
Black-faced Woodswallow																					3																									
Silver-backed Butcherbird												1	1																																	1
Pied Butcherbird								3	2		5														2	1	1	4	2	4			1	1								3	2		5	
Black-faced Cuckooshrike							3						1				1			2			2	6						1			1								3					
White-bellied Cuckooshrike							1												1		1																				1					
Common Cicadabird																															1															
Rufous Whistler	1					1	1					1			1			1	1	1	1		2			1	2		1						1					1	1					1

Species	Buffer area 2ha/20 min plot survey																																													
	32	33	34	35	36	37	38	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	32	33	34	35	36	37	38	46	47	48	49	50	Incidental
Grey Shrikethrush		1			1																					1										1			1							
Sandstone Shrikethrush																																		1												
Olive-backed Oriole														1																																
Willie Wagtail					1		1																																1		1					
Northern Fantail																											1																			
Magpie-lark											3				1								2																						3	
Leaden Flycatcher							1																																		1					
Paperbark Flycatcher												1							1																											1
Torresian Crow														1		1	2								3						1	5	3													
Jacky Winter		1																																		1										
Golden-headed Cisticola											1				1			2	1	3	3			2						1															1	
Mistletoebird	1		1									1			1																				1		1									1
Star Finch																				5	2																									
Masked Finch							4											1																							4					
Long-tailed Finch	2	1			2		2														2														2	1			2		2					
Double-barred Finch												2						12																												2

Appendix 2. Location and condition of assessed nest boxes

BoxID	Latitude	Longitude	Condition
O101	-15.51	128.8387	Damaged
O102	-15.4421	128.9406	Damaged
O103	-15.4448	128.942	Damaged
O104	-15.4907	128.8604	Missing
O105	-15.4461	128.9426	Good
O107	-15.4457	128.9417	Missing
O108	-15.444	128.941	Damaged
O109	-15.4389	128.9384	Missing
O110	-15.4407	128.941	Missing
O111	-15.4475	128.9428	Damaged
O112	-15.4904	128.8596	Damaged
O113	-15.4427	128.9407	Damaged
O114	-15.4347	128.9479	Damaged
O115	-15.5092	128.839	Damaged
O116	-15.5102	128.839	Missing
O117	-15.5094	128.8389	Good
O118	-15.4361	128.9468	Good
O120	-15.4404	128.9393	Damaged
O122	-15.4361	128.947	Damaged
O123	-15.4897	128.8603	Missing
O124	-15.4365	128.9465	Damaged
O125	-15.439	128.94	Good - blocked
O128	-15.4438	128.9404	Good
O129	-15.4365	128.9468	Damaged

BoxID	Latitude	Longitude	Condition
O130	-15.4449	128.9415	Damaged
O131	-15.4386	128.9385	Good - blocked
O132	-15.4393	128.9401	Missing
O134	-15.44	128.9406	Damaged
O135	-15.4468	128.9421	Damaged
O136	-15.4407	128.9389	Damaged
O137	-15.4438	128.9415	Damaged
O139	-15.4905	128.8595	Damaged
O140	-15.5103	128.8396	Damaged
O142	-15.4416	128.9405	Damaged
O143	-15.4356	128.9474	Good
O144	-15.4408	128.9404	Good - blocked
O145	-15.5092	128.8395	Damaged
O146	-15.5125	128.838	Missing
O147	-15.5103	128.8392	Damaged
O148	-15.4474	128.9424	Missing
O149	-15.5096	128.8394	Good
O150	-15.4467	128.9427	Damaged
O151	-15.512	128.8377	Good
O152	-15.441	128.9396	Missing
O153	-15.5096	128.8396	Good
O154	-15.4395	128.9389	Damaged
O156	-15.4456	128.9426	Damaged
O157	-15.4431	128.9407	Damaged

BoxID	Latitude	Longitude	Condition
O159	-15.4383	128.9392	Missing
O161	-15.449	128.942	Damaged
O162	-15.4429	128.9412	Good - blocked
O163	-15.4472	128.9416	Missing
O164	-15.4891	128.8601	Good
O165	-15.447	128.9427	Damaged
O166	-15.4464	128.942	Damaged
O169	-15.4445	128.9405	Damaged
O170	-15.4354	128.9479	Damaged
O172	-15.4894	128.8598	Good
O173	-15.44	128.9389	Damaged
O174	-15.5119	128.8376	Good
O175	-15.4365	128.9461	Good
O176	-15.4487	128.9421	Damaged
O177	-15.4341	128.9463	Good
O178	-15.4333	128.9484	Good
O179	-15.4473	128.941	Missing
O180	-15.4352	128.9479	Damaged
O181	-15.5126	128.8377	Damaged
O184	-15.4363	128.946	Damaged
O188	-15.4339	128.9486	Damaged
O190	-15.4341	128.9486	Damaged
O191	-15.5126	128.8374	Damaged
O193	-15.4325	128.948	Missing

BoxID	Latitude	Longitude	Condition
O194	-15.4335	128.9465	Good
O196	-15.4325	128.948	Damaged
O197	-15.4391	128.939	Damaged
O200	-15.4357	128.9455	Damaged
O201	-15.4465	128.9426	Damaged
O202	-15.4902	128.8603	Damaged
O203	-15.4907	128.86	Good
O204	-15.4329	128.9482	Damaged
O205	-15.5117	128.8376	Good
O206	-15.4345	128.9464	Good
O208	-15.4343	128.9484	Good
O210	-15.51	128.8395	Damaged
O211	-15.5114	128.8377	Damaged
O213	-15.5118	128.8373	Damaged
O215	-15.5098	128.8389	Missing
O216	-15.5098	128.8386	Damaged
O218	-15.5122	128.8378	Good
OXXX	-15.435	128.9473	Good
OXXX	-15.4359	128.9459	Good
OXXX	-15.5114	128.8375	Damaged
OXXX	-15.4355	128.9467	Damaged
OXXX	-15.433	128.9474	Damaged