

Rupert Duckworth Principal, Environmental Assessment Strategen-JBS&G

rduckworth@jbsg.com.au

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Dear Rupert

Re: Mulga East Pilbara leaf-nosed bat

ecologia was engaged by Strategen-JBS&G, on behalf of HPPL, to undertake targeted Pilbara leaf-nosed bat (PLnB) (*Rhinonicteris aurantia*) surveys within the Project Area (Mulga East and Malay Wells tenements and proposed Rail Alignment K corridor) to determine whether any PLnB roost sites occur within or in the vicinity of the Project Area for the purpose of supporting environmental approvals (i.e. Part IV EP Act, EPBC Act, Mining Act) for the future development of the Mulga East Iron Ore Project. Since April 2019 *ecologia* have undertaken several targeted PLnB surveys that have confirmed the presence of PLnB within the Project Area.

A gap analysis was completed and outlined 16 caves with the potential to be used as a diurnal roost remained unsurveyed within the Project Area. These caves were located outside of the main target valley. In March 2021, *ecologia* assessed these caves (Figure 1), with SM4 bat detectors placed in the entrance of each cave and set to record overnight for echolocation calls of PLnB and the ghost bat (*Macroderma gigas*). The collected data was provided to Dr Kyle Armstrong of Specialised Zoological for analysis and his summary report is provided in Appendix A (Specialised Zoological 2021).

Echolocation calls of the Pilbara leaf-nosed bat were recorded at one cave (MEC034) on 30 March 2021. Calls were recorded between 20:56 and 21:25 indicating this cave may be used as a nocturnal shelter (Priority 4). The call times indicate that this cave is unlikely to be used as a diurnal roost. No ghost bat calls were recorded during this survey.

In summary, between April 2019 and March 2021, SM4 bat detectors have been used to assess 268 sites including cave entrances, suspected flight paths and systematic trap sites at Mulga East with calls of the PLnB recorded at 103 sites. A total of 82 cave habitat assessments were completed and 44 caves were assessed as having the potential to be used as a PLnB diurnal roosting site. All 44 caves were surveyed for a minimum of one night and one cave (MEC016), was the site of a long-term bat detector (79 consecutive recording nights). There is some speculation surrounding the use of cave MEC016 as a transitory roost (Priority 3), however this can only be confirmed by using entrance sheeting. This option is not feasible/practical as the works would need to be undertaken on a night when a bat roosted diurnally (which was just one of the 79 recording nights).

PLnB calls were recorded consistently across all surveys and seasons indicating year-round foraging within the Project Area. However, none of the observations suggest the presence of a permanent diurnal roost (Priority



1) or a non-permanent breeding roost (Priority 2) within the Project Area. The year-round presence and call times recorded indicate that it is likely a diurnal roost occurs in the vicinity. Caves within the study area are likely to be used as nocturnal refuges (Priority 4) and although not considered critical habitat, are considered as important for persistence of the species in a local area (Threatened Species Scientific Committee 2016).

The Project Area was assessed as supporting Gullies (Priority 2), Rocky Outcrop (Priority 3), and Open Grassland and Woodland (Priority 5) foraging habitat. Rocky Hills and Drainage Lines within the Newman land system supports Priority 2 and Priority 3 foraging habitat while Drainage Lines (not within Newman land system) and Stony Spinifex Plains and Hillslopes support Priority 5 foraging habitat.

Best Regards,

Tim McCabe

Senior Ecologist/Zoologist

References

Specialised Zoological. 2021. Review of Pilbara leaf-nosed bat activity Mulga East Project. Unpublished report for Hancock Prospecting Pty Ltd.

Department of the Environment and Energy. 2016. Conservation Advice for *Rhinonicteris aurantius* (Pilbara form) (Pilbara Leaf-nosed Bat).





463 SCARBOROUGH BEACH ROAD, OSBORNE PARK, WA 6004 PH: +61 (08) 6168 7200 ACN 088 821 425 • ABN 63 088 821 425 www.ecologia.com.au

Appendix A



Acoustic analysis and bat call identification from Mulga East, Western Australia

Prepared for Ecologia Environment Pty Ltd

Version 7 May 2021

SZ project reference SZ565

Prepared by Dr Kyle Armstrong and Yuki Konishi

Specialised Zoological ABN 92 265 437 422 Tel +61 (0)404 423 264 kyle.n.armstrong@gmail.com http://szool.com.au



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This report should be included as an appendix in any larger submission to Government, and cited as:

Specialised Zoological (2021). Acoustic analysis and bat call identification from Mulga East, Western Australia. Unpublished report by Specialised Zoological for Ecologia Environment Pty Ltd, 7 May 2021, project reference SZ565.

Summary

Bat identifications from acoustic recordings are provided from the Mulga East project area, in the Pilbara region of Western Australia. The identification of bat species from full spectrum WAV-format recordings of their echolocation calls was based on measurements of characteristic frequency, observation of pulse shape, and the pattern of harmonics.

The analysis scope required was limited to two bat species of conservation significance: Ghost Bat *Macroderma gigas* (Megadermatidae) and Pilbara Leaf-nosed Bat *Rhinonicteris aurantia* (Rhinonycteridae)

The Pilbara Leaf-nosed Bat was detected at one of the 16 recording sites: MEC034 (unit MDSM4-07 on 2021-03-30). Four echolocation sequences were recorded between 20:56 and 20:58; and seven sequences between 21:18 and 21:25 (**Tables 1** and **2**; **Figure 1**). These identifications were unambiguous, and the calls of the Pilbara Leaf-nosed Bat were easily distinguishable from other ultra-high frequency (>100 kHz) signals attributable to Finlayson's Cave Bat *Vespadelus finlaysoni*. No other detections of the Pilbara Leaf-nosed Bat were evident in the recordings.

The Ghost Bat was not detected. There were numerous calls present that resemble echolocation calls of this species, but all examples were instead attributable unambiguously to the Common Sheath-tailed Bat *Taphozous georgianus* (**Figure 1**).

Methods

The data provided were recorded in full spectrum WAV format with Wildlife Acoustics Song Meter bat detectors (sampling rate 384 kHz).

A multi-step acoustic analysis procedure developed to process large full spectrum echolocation recording datasets from insectivorous bats (Armstrong and Aplin 2014; Armstrong et al. 2016) was applied to the recordings made on the survey. Firstly, the WAV files were scanned for echolocation calls of the two bat species of conservation significance using species-specific parameter sets in the software SCAN'R version 1.8.3 (Binary Acoustic Technology), which also provides measurements (SCAN'R parameters) from each putative bat pulse. The measurement outputs were then used to determine if putative bat pulses measured in SCAN'R could be identified as the target species. This was done using a custom [R] language script that performed three tasks:

1. undertook a Discriminant Function Analysis on training data comprising representative calls from cave roosting bats of the Pilbara;

2. from the measurements of each putative bat pulse from SCAN'R, calculated values for the first two Discriminant Functions that could separate the echolocation call types derived from the analysis of training data, and plotted these resulting coordinates over confidence regions for the defined call types; and

3. facilitated an inspection in a spectrogram of multiple examples of each call type for each recording night by opening the original WAV files containing pulses of interest in Adobe Audition CS6 version 5.0.2.



Limitations

The identifications presented in this report have been made within the following context:

- 1. The identifications made herein were based on the ultrasonic acoustic data recorded and provided by a 'third party' (the client named on the front of this report).
- 2. The scope of this report extended to providing information on the identification of bat species of conservation significance in bulk ultrasonic recordings. Further comment on these species and the possible impacts of a planned project on bat species were not part of the scope.
- 3. In the case of the present report, the recording equipment was not set up and supplied by Specialised Zoological. The equipment was operated by the third party during the survey.
- 4. Other than the general location of the study area, Specialised Zoological has not been provided with detailed information of the survey area, has not made a visit to observe the habitats available for bats, nor have we visited the specific project areas on a previous occasion.
- 5. Specialised Zoological has had no input into the overall design and timing of this bat survey, recording site placement, nor the degree of recording site replication.
- 6. While Specialised Zoological has made identifications to the best of our ability given the available materials, and reserves the right to re-examine the data and revise any identification following a query, it is the client's and / or proponent's responsibility to provide supporting evidence for any identification, which might require follow-up trapping effort or non-invasive methods such as video recordings. Specialised Zoological bears no liability for any follow-up work that may be required to support an identification based initially on the analysis of acoustic recordings undertaken and reported on here.
- 7. There are a variety of factors that affect the 'detectability' of each bat species, given the frequency, power and shape characteristics of their calls. Further information on the analysis and the various factors that can impinge on the reliability of identifications can be provided upon request.
- 8. The analysis of ultrasonic recordings is one of several methods that can be used to survey for bats, and comprehensive surveys typically employ more than one method. The Ghost Bat can be detected reliably from video recordings made at a cave entrance. If there is any ambiguity or doubt around the presence of this species from the analysis of acoustic recordings, then it can be helpful to follow up relevant sites with surveys based on video recordings.



References

- Armstrong, K.N. and Aplin, K.P. (2014). Identifying bats in an unknown acoustic realm using a semi-automated approach to the analysis of large full spectrum datasets. Oral presentation at the 16th Australasian Bat Society Conference 22–25 April 2014, Townsville, Queensland. *The Australasian Bat Society Newsletter* 42: 35–36.
- Armstrong, K.N., Aplin, K.P. and Crotty, S. (2016). A pipeline and app for massive filtering, and assisted inspection of enormous acoustic datasets. Poster presentation at the 17th Australasian Bat Society Conference, 29 March-1 April 2016, Hobart, Tasmania, Australia. *The Australasian Bat Society Newsletter* 46: 51.

Table 1. Recordings analysed for the presence of the Ghost Bat and Pilbara Lef-nosed Bat (ND: not detected; R: recorded as present).

			M. gigas	R. aurantia
Detector prefix	Site	Date (night of)		
MDSM4-06	MEC001	2021-03-30	ND	ND
MDSM4-02	MEC011	2021-03-29	ND	ND
MDSM4-03	MEC018	2021-03-29	ND	ND
MDSM4-05	MEC019	2021-03-29	ND	ND
MDSM4-03	MEC020	2021-03-30	ND	ND
MDSM4-07	MEC034	2021-03-30	ND	R
MDSM4-02	MEC045	2021-03-30	ND	ND
MDSM4-04	MEC054	2021-03-30	ND	ND
MDSM4-01	MEC055	2021-03-30	ND	ND
MDSM4-05	MEC057	2021-03-30	ND	ND
MDSM4-05	MEC058	2021-03-31	ND	ND
MDSM4-02	MEC059	2021-03-31	ND	ND
MDSM4-06	MEC075	2021-03-29	ND	ND
MDSM4-07	MEC076	2021-03-29	ND	ND
MDSM4-04	MEC077	2021-03-29	ND	ND
MDSM4-01	MEC078	2021-03-29	ND	ND

Table 2. List of WAV files containing echolocation pulses of the Pilbara Leaf-nosed Bat.

MDSM4-07_20210330_205636.wav
MDSM4-07_20210330_205643.wav
MDSM4-07_20210330_205722.wav
MDSM4-07_20210330_205733.wav
MDSM4-07_20210330_211859.wav
MDSM4-07_20210330_211907.wav
MDSM4-07_20210330_212009.wav
MDSM4-07_20210330_212018.wav
MDSM4-07_20210330_212100.wav
MDSM4-07_20210330_212542.wav
MDSM4-07_20210330_212549.wav





Figure 1. Representative call sequence portions of two bat species identified.

