SHORT COMMUNICATION

Bats detected at Roleystone, Western Australia

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INTRODUCTION

Micro bats had been seen foraging under streetlights and occasionally found dead as a result of vehicle collisions in Roleystone, suburban Perth or in the case of the white-striped free-tailed bat (*Austronomus australis*), heard passing overhead. The aim of the study was to determine which species were present in the area and in which season of the year, using bat call identification.

METHODS

The study site, located at -32.1127°S, 116.0775°E was in a garden setting in Roleystone, a residential suburb of Metropolitan Perth located some 30 km southeast of the CBD, near the margin of the Darling Scarp in the Jarrah Forest bioregion, in Western Australia. Residential blocks are mostly about 2000 m^2 (0.2 ha) and many retain remnants of the original forest tree flora, principally the Myrtaceous species, Jarrah, *Eucalyptus marginata* and Marri, *Corymbia calophylla* although cultivated, non-locally indigenous, eucalypts, and exotic trees are common. Understories largely comprise cultivated shrubs, including Australian natives and exotic species. The insertion of houses and other structures including roads, has created gaps in the tree canopy. Small reserves of approximately 2 ha, that retain examples of the original flora are scattered throughout the area, with one within 400 m of the study site.

The study was undertaken between January 2021 and May 2023. Wildlife Acoustics Songmeter full spectrum ultrasonic recorders (a SM2BAT coupled to a SMX-US omnidirectional ultrasonic microphone, and a SMminiBAT, which has an internal microphone) set to a sampling rate of 384 kHz were used to capture and record bat ultrasonic pulse sequences (Table 1). The detectors were attached to wooden poles <1 m above ground level and were not directly influenced by street lighting. Both recorders were activated from dusk to dawn for three successive nights. The location of the SM Mini detector was changed by about 5 m in 2023 to avoid developing overhead vegetation clutter. To avoid damaging equipment, detectors were not deployed on nights when rain was forecast. Kaleidoscope 5.6.0 (Wildlife Acoustics) was used to extract bat echolocation sequences from the recordings in pulse code modulation wave format (.wav). Syntrillium Cool Edit 2000, now Adobe Audition 2 (Adobe Systems, USA), was used to display each echolocation sequence in spectral view and measure pulse parameters such as peak frequency, fineness-of-tuning, duration, repetition rate and shape, as described in McKenzie et al. (2019, 2020). Sequences were identified to species against reference sequence data in the author's own library of calls and reported in Bullen and McKenzie (2002) and Webala et al. (2010).

RESULTS

Eight bat species were detected. Two were molossid species in the genera *Austronomus* and *Ozimops*. The remaining six species were Vespertilionids from four genera, *Chalinolobus*, *Falsistrellus*, *Nyctophilus* and *Vespadelus*, The species recorded and the seasons in which they were detected are shown in Table 2.

TABLE 1 The month, year and season when bat detectors were deployed and the detector model used on each occasion.

Date	Season	Detector model
2021 January	Summer	SM2 bat detector
2021 August	winter	SM2 bat detector
2021 October	Spring	SM2 bat detector
2021 December	Summer	SM2 bat detector
2022 July	Winter	SM2 bat detector
2022 June	Winter	SM2 bat detector
2022 November	Spring	SM Mini
2022 December	Summer	SM Mini
2023 March	Autumn	SM Mini
2023 April	Spring	SM Mini
2023 May	Autumn	SM Mini

TABLE 2 Bat species recorded: 'Aa' *Austronomus australis*; 'Cg' *Chalinolobus gouldii*; 'Cm' *Chalinolobus morio*; 'Fm' *Falsistrellus mackenziei*; 'Ok' *Ozimops kitcheneri*; 'Ng' *Nyctophilus geoffroyi*; 'Nh' *Nyctophilus holtorum*; 'Vr' *Vespadelus regulus*.

Dates (n=12)	Seasons (n=4)	Species	Aa	Cg	Cm	Fm	Ok	Nh	Ng	Vr
2021 Dec	Summer	6	1	1	*	1	1	*	1	1
2022 Dec	Summer	7	1	1	*	1	1	1	1	1
2021 Jan	Summer	7	1	1	1	1	1	*	1	1
2023 Mar	Autumn	4	*	1	*	*	1	*	1	1
2023 Apr	Autumn	4	*	1	*	*	1	*	1	1
2023 May	Autumn	4	*	1	*	*	1	*	1	1
2022 Jun	Winter	0	*	*	*	*	*	*	*	*
2022 Jul	Winter	3	*	1	*	*	1	*	*	1
2021 Aug	Winter	3	*	1	*	*	1	*	*	1
2021 Oct	Spring	6	1	1	*	1	1	*	1	1
2022 Nov	Spring	6	1	1	*	1	1	*	1	1
Totals			**5**	**10**	**1**	**5**	**10**	**1**	**8**	**10**

The presence of *N. holtorum* was based on two sequences recorded about an hour apart on the same night; each sequence comprised pulses between 49 and 53 kHz as well as a sub-sequence of three to four departure pulses at just over 60 kHz which distinguishes its search mode echolocation sequences from *N. major* and *N. geoffroyi* (Bullen and McKenzie 2002).

DISCUSSION

Maps showing the known distributions of Western Australian bats are available from Australian Bat Society (2021). All eight species detected were within their known ranges, although, *F. mackenziei* was at the northern edge of its known distribution. The study site is within the known range of only one Vespertilionid species that was not detected, *Nyctophilus major*.

The apparent absence of *A. australis* in autumn and winter is consistent with movements demonstrated by Bullen and McKenzie (2005) who showed that, in Western Australia the species is a partial migrant expanding its range northwards in autumn when temperatures and atmospheric enthalpy in tropical regions are falling, and contracting southwards in spring when those parameters increase. A similar seasonal pattern of presence-absence was evident in *F. mackenziei,* but clearly for different reasons as the study site is at the northern limit of its distribution. *C. morio* and *N. holtorum* were apparently rare as they were detected only once (in summer), but the other four species, *C. gouldii*, *N. geoffroyi*, *O. kitcheneri* and *V. regulus*, were detected on most occasions in all seasons.

Autumn and winter, when night temperatures were low, corresponded with detection of fewer foraging bat species probably because there was little reward for foraging on colder nights. Casual night time observations of insects attracted to outside lights at the study site (by ANS) showed more flying insects in the warmer months than in colder months, a pattern that corresponded with diversity of foraging bat species.

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