Insectivorous bats of the Sunshine Coast area: a guide to their identification, ecology, and distribution

Version 1, 9th May 2022

The eastern horseshoe bat, *Rhinolophus megaphyllus* is one of the most distinctive-looking of the region's bats, and has the most distinctive call of any of the local bat species

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All photographs of live bats by Bruce Thomson

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About this guide

This manual has been developed to support Land for Wildlife members with an interest in microbats in the Sunshine Coast area, however anybody within the south-east Queensland NRM region with an interest in this fascinating group of animals, should find this guide useful.

Recent research has revealed that the microbats don't form a single evolutionary unit, and in fact, some microbat families are more closely related to the fruit bats than to other microbats. One such group on the Sunshine Coast is the horseshoe bats, the least fruit bat looking of any bat group! The group of bats including fruit bats and horseshoe bats is technically named the Vespertilioniformes, the other bat families (the classic microbats) the Pteropodiformes (James and Kirsch 2006). However, for the purposes of this guide, we will continue to use the term microchiroptera as a loose collective term for all of the echolocating bats. It is this group that this guide deals with.

This guidebook consists of several sections. The first section, **A checklist of bats** summarises data provided in later sections and provides a concise list of the bat species present in the area, their echolocation call parameters, and habitats. The checklist follows the taxonomy proposed by the Australian Bat Society (Armstrong *et al.* 2020).

Species Accounts provides a species-by-species description of all microbats recorded from the Sunshine Coast region, including a pictorial and written description of each bat and its echolocation call. All call sequences illustrated below were collected in the Sunshine Coast area and in most cases were generated using the Echometer Touch bat detector hardware and app (https://www.wildlifeacoustics.com/). **The species are arranged in order of increasing frequency of their echolocation call.** All illustrated call sequences are displayed in compressed mode.

The ecology of each species is also briefly described including distribution maps created especially for this guidebook from Atlas of Living Australia species records downloaded in April and May 2022, and a summary of habitats, food and roosting requirements gleaned from several sources including (Van Dyck and Gynther 2008, Churchill, 2008).

The habitats of bats of the Sunshine Coast section offers images of some sites which have been surveyed for bats, and a list of the bats that inhabit each. This is by no means a comprehensive list of habitat types, nor does it profess to be limiting in terms of the bat community which may occur in any one site. Rather this section is included to provide a broad brush strokes perspective of the species richness of bat communities across the Sunshine Coast.

The Sunshine Coast Land for Wildlife program lends Echometer Touch bat detectors to its members so that they can undertake bat surveys on their own land. This guidebook therefore provides an illustrated **Step by step guide to using your Echometer Touch bat detector**, which in combination with the previous sections of this guide, will speed you on your journey to documenting and appreciating the microbat community on your property.

Introduction

The microbats are a diverse group of quite unrelated bat species, all of which are defined by their ability to echolocate. This ability distinguishes them from the fruit bats or flying foxes (otherwise known as megabats). In general microbats are also much smaller than the megabats (although in south-east Queensland one megabat, the eastern blossom bat *Syconycteris australis* is as small as a microbat).

Unlike the large and conspicuous flying foxes, the small size, communication beyond the range of human hearing, lack of obvious markings in most species, and their habit of roosting in discrete places, means that microbats are easily overlooked and poorly understood. It is often surprising then to be confronted with the fact that microbats make up some 20% of all the worlds mammals. In the Sunshine Coast and most of Queensland microbats often make up half of the native mammal species present at any site!

The 22 species of bats inhabiting the Sunshine Coast area are reasonably well known, even though their fine scale distribution and ecology remains only poorly so. Most of these species can be readily distinguished in the hand using the identification keys in Churchill (2008) and Van Dyck *et al.* (2011). Identification by their echolocation calls offers a more accessible insight into their presence and identity, and is straight forward for some species. Echolocation calls of some species remain problematic, as described below. For further insight into the identification of echolocation calls, the reader is referred to Reinhold *et al.* (2001), and Pennay *et al.* (2004).

Thankfully, the echolocation calls of microbats render them easily detected, and in many cases, easily identified. It is essential to use a consistent descriptive language to describe these echolocation calls. Important terminology used in this guide includes;

- **characteristic frequency**, the frequency of the characteristic point, which is the last point of the flattest section of the pulse (Pennay *et al.* 2004),
- **pulse interval,** the time from the beginning of one pulse to the beginning of the next (Pennay *et al.* 2004),
- **pulse,** and individual call unit,
- **call sequence,** a string of pulses emitted in a burst by a calling bat.

The shape of pulses within a call sequence is an important feature used for identifying the calls of some species. A terminology for pulse shapes is shown in the figure from Pennay et al. (2004), reproduced below.

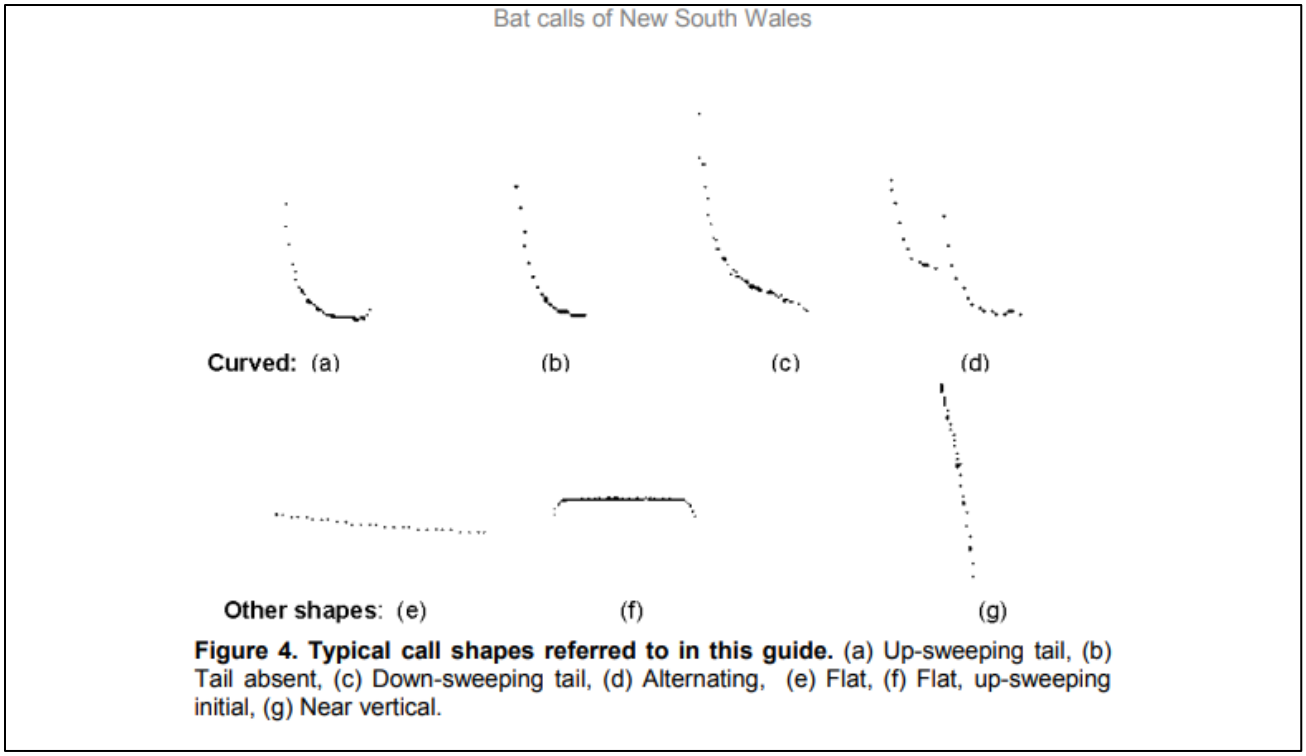


Figure 4. Typical call shapes referred to in this guide. (a) Up-sweeping tail, (b) Tail absent, (c) Down-sweeping tail, (d) Alternating, (e) Flat, (f) Flat, up-sweeping initial, (g) Near vertical.

Figure from Pennay *et al.* 2004.

Identification of pulse shape and frequency also requires an understanding of the role of that pulse in an observed call sequence. Pulses are typically referred to as being either search phase (while the bat is scanning the environment), attack phase (as the bat approaches a prey item) or feeding buzz (in the final approach). Bat call identification generally uses search phase pulses for identification, although the feeding buzz can be very useful for confirming identification of some genera (e.g. bent-wing bats *Miniopterus*).

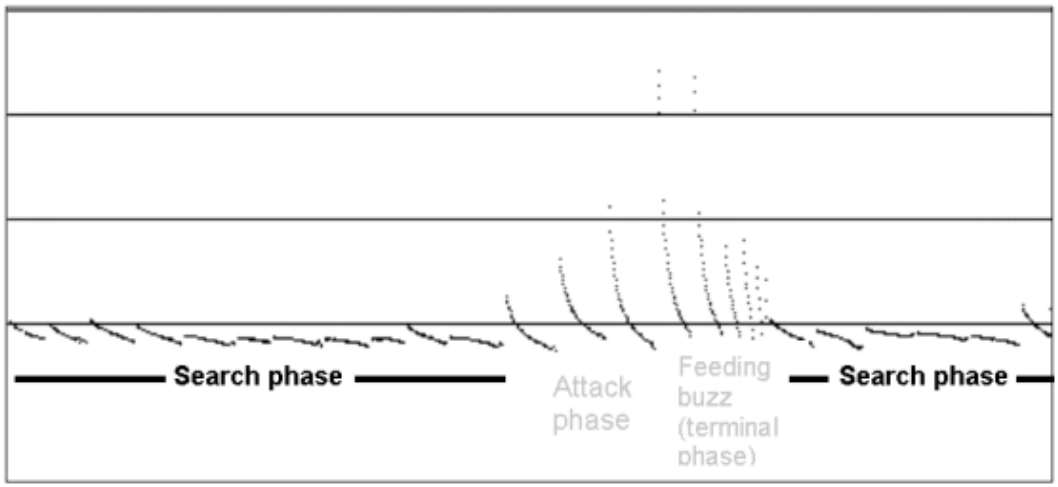


Figure 5. Phases of a *Mormopterus* species 4 call sequence, illustrating search phase pulses used for identification in this guide.

Figure from Pennay *et al.* 2004.

For more terminology and definitions, and caveats around selecting pulses for identification, please refer to Reinhold *et al.* (2001), and Pennay *et al.* (2004).

A checklist of the microbats of the Sunshine Coast area

Family	Scientific Name	Common Name	Characteristic frequency kHz	ID Comments
Molossidae	*Austronomus australis*	white-striped free-tailed bat	**10-12**	No other bat calls at such a low frequency
Emballonuridae	*Saccolaimus flaviventris*	yellow-bellied sheath-tailed bat	**18-21**	No other bat calls at this frequency
Molossidae	*Ozimops lumsdenae*	free-tailed bat	**22-23**	No other bat calls at this frequency
Vespertilionidae	*Chalinolobus gouldii*	Gould's wattled bat	**28-31**	Highly variable signal depending on environmental clutter
Molossidae	*Micronomus norfolkensis*	Eastern coastal free-tailed bat	**31-35**	A distinctive call. Flat pulses which alternate in frequency.
Molossidae	*Ozimops ridei*	eastern free-tailed bat	**30-35**	Characteristic peak in pulse frequency in each call sequence
Vespertilionidae	*Scoteanax rueppellii*	greater broad-nosed bat	**33-35**	Difficult to distinguish from *S orion* - Q35
Vespertilionidae	*Scotorepens orion*	south-eastern broad-nosed bat	**34-36**	Difficult to distinguish from *S rueppellii* - Q35
Vespertilionidae	*Scotorepens sp (Parnaby)*	Parnaby's broad-nosed bat	**36-41**	Difficult to distinguish from *C nigrogriseus* – Q40
Vespertilionidae	*Chalinolobus nigrogriseus*	hoary wattled bat	**37-39**	Difficult to distinguish from *Scotorepens* sp (Parnaby) – Q40
Miniopteridae	*Miniopterus orianae*	Large bent-wing bat	**43-46**	No other bat calls at this frequency and has a down-sweeping tail to each pulse
Vespertilionidae	*Vespadelus darlingtoni*	Large forest bat	**42-45**	Can be confused with *M. orianae*, however this species lacks the former down-sweeping tail.
Vespertilionidae	*Chalinolobus morio*	chocolate wattled bat	**47-52**	Can potentially be confused with *V. troughtoni*, but lacks the former down-sweeping tail.

Vespertilionidae	*Vespadelus troughtoni*	eastern cave bat	**48-54**	Can't be distinguished from *V. pumilus* if call frequency 50-54kHz - call *Vespadelus* sp
Vespertilionidae	*Vespadelus pumilus*	eastern forest bat	**50-57**	Can't be distinguished from *V. pumilis* if call frequency 50-54kHz - call *Vespedalus* sp
Miniopteridae	*Miniopterus australis*	little bent-wing bat	**57-62**	The only species which calls at this frequency. Some overlap with *V. pumilis* at some sites, but can be distinguished by down-sweeping tail
Rhinolophidae	*Rhinolophus megaphyllus*	eastern horseshoe-bat	**67-71**	The only bat with a constant frequency call. Can not be mistaken for any other species.
Vespertilionidae	*Myotis macropus*	large-footed myotis	**35-80**	Near vertical pulse 70-80 kHz dropping to 35-40 kHz. Can be difficult to distinguish from *Nyctophilus* spp but inter-pulse interval of <75ms.
Vespertilionidae	*Nyctophilus bifax*	northern long-eared bat	**45-110**	Near vertical 70-80 kHz dropping to 35-45 kHz. Can be difficult to differentiate from *M. adversus*, but call interval >95ms. *Nyctophilus* spp. Cannot be differentiated by echolocation call.
Vespertilionidae	*Nyctophilus geoffroyii*	lesser long-eared bat	**35-80**	Near vertical 70-80 kHz dropping to 35-45 kHz. Can be difficult to differentiate from *M. adver*sus, but call interval >95ms. *Nyctophilus* spp. Cannot be differentiated by echolocation call.

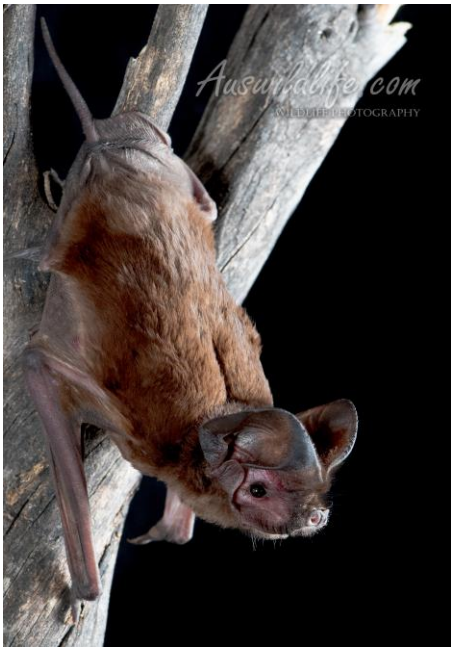
Vespertilionidae	*Nyctophilus gouldi*	Gould's long-eared bat	**35-80**	Near vertical 70-80 kHz dropping to 35-45 kHz. Can be difficult to differentiate from *M. adver*sus, but call interval >95ms. *Nyctophilus* spp. Cannot be differentiated by echolocation call.
Vespertilionidae	*Phoniscus papuensis*	golden-tipped bat	**40-160**	Near vertical 120 dropping to 80 kHz. Can only be detected at extremely close range <1m.

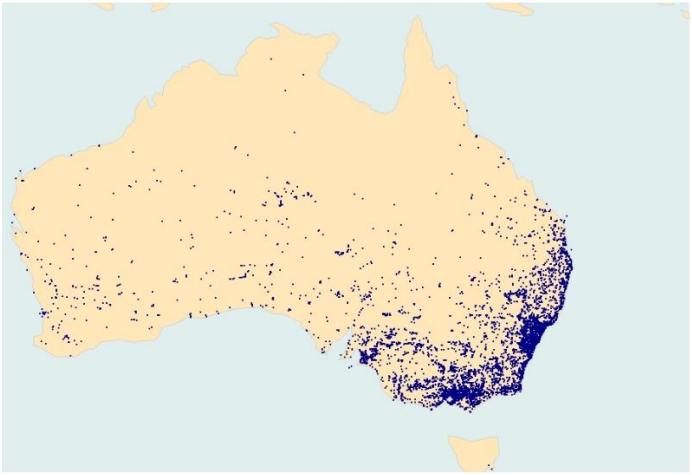
Species Accounts (arranged by ascending echolocation frequency)

These species accounts include summarized information from Churchill (2008), Van Dyck and Strahan (2008), Reinhold *et al.* (2001) and unpublished information of the authors. Distribution maps are derived from the Atlas of Living Australia records, downloaded April and May 2022 and plotted using r-packages *ggplot2* (Whickam 2016), *rnaturalearth* (South 2017).

White-striped free-tailed bat *Austronomus australis* (F. Molossidae)

Superseded names: *Tadarida australis*





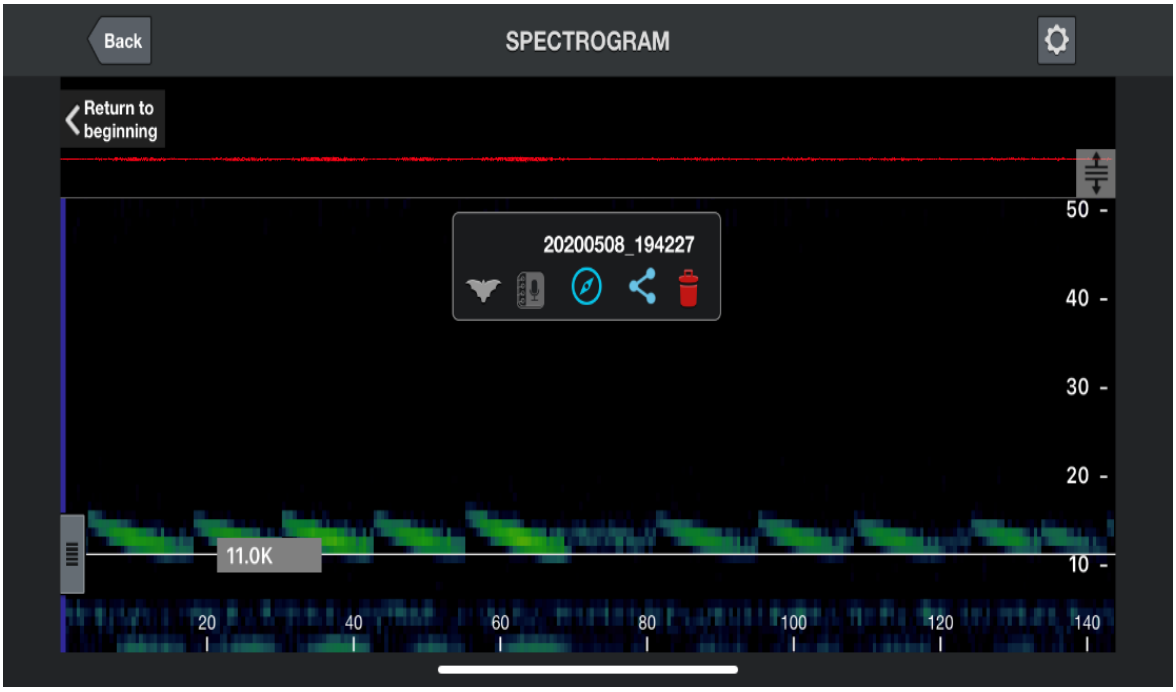
Identification Fore arm: 60.6mm; Weight: 37.6g. This is one of the larger species in the area. It is a very distinctive bat. It has large rounded ears which don't join in the center of the head. It has a white stripe running from the armpit to the groin, and sometimes a white chest patch. Despite its relative commonness, it is rarely seen in the hand due to its usual activity zone well above the tree tops, and the fact that it doesn't use buildings as roost sites. This bat is readily detectable by its audible metallic clicking call which can be heard without the aid of a bat detector from 100s of metres away.

Echolocation Call Flattish or curved. To the human ear, this consists of a series of discrete metallic clicks. Once you learn this audible call you will hear it everywhere you go! On your bat detector screen, the call is also immediately recognizable by its low frequency, the

lowest of any Australian bat species, at between 11-13 kHz. The search phase call typically appears as a straight line but may also appear slightly curved in active search phase.

Distribution and habitat: This is one of the most widespread species on the Sunshine Coast. It has a fast, direct flight and as such it utilises open spaces including paddocks and extensive clearings and the clear spaces above the tree canopy and above houses in urban areas. The species can therefore be found in all habitats including urban areas, farmlands, and the open space above the canopy of heathland, open forests and rainforests.

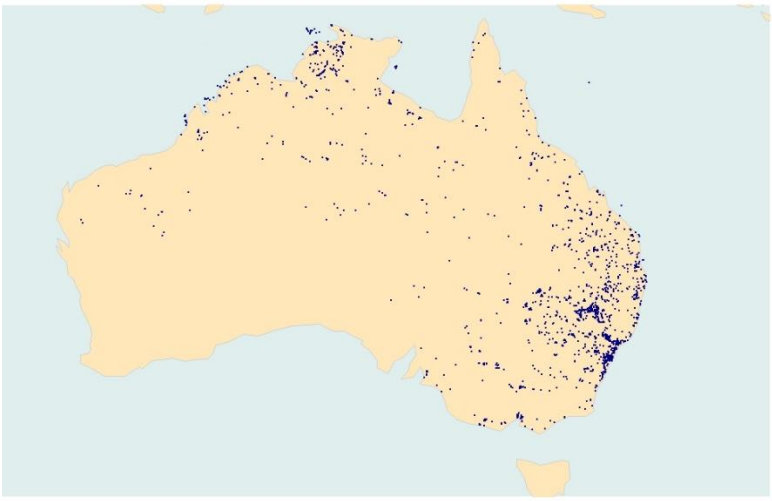
Ecology This species spends the day in roosts in the hollow trunks of large Eucalyptus trees. It feeds on beetles, moths and grasshoppers, and also feeds on ground insects suggesting that it is occasionally active on the ground.



EchoMeter Touch screen shot, full spectrum, compressed mode. Characteristic feature: flat-curved, frequency 10-12kHz.

Yellow-bellied sheath-tailed bat *Saccolaimus flaviventrus* (F. Emballonuridae)

Superseded names: *Taphozous flaviventrus*

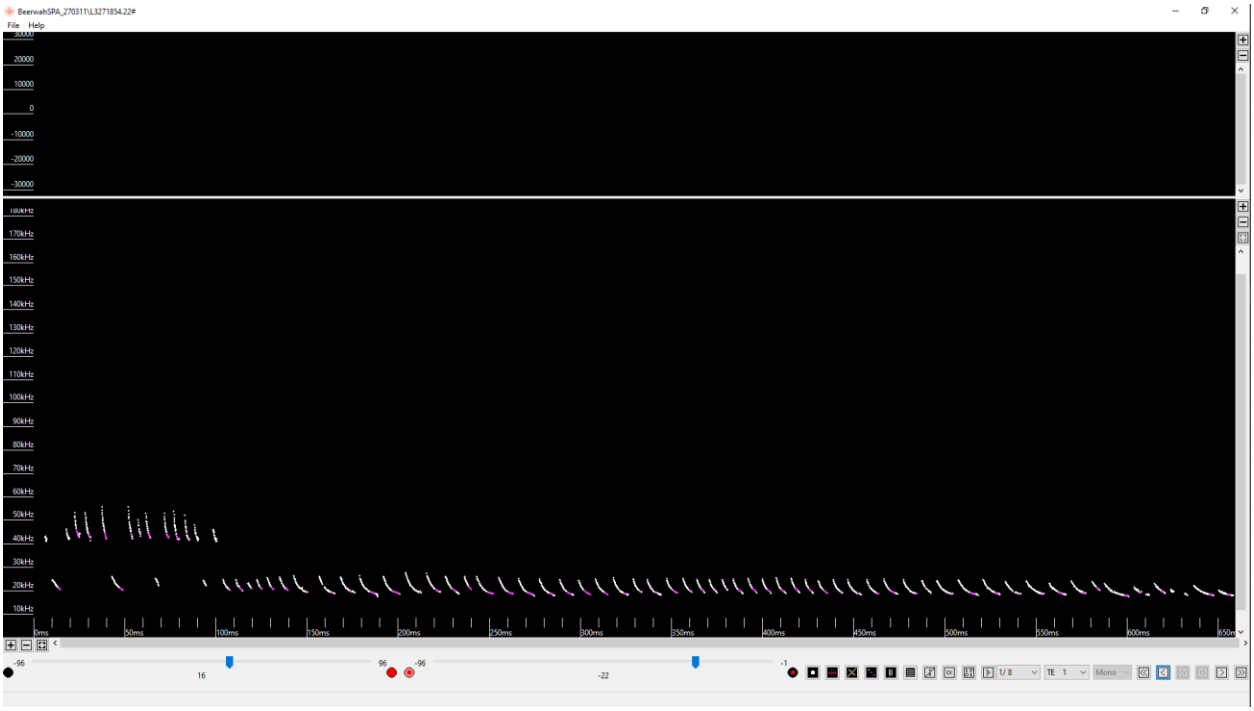


Identification Forearm: 75mm; Weight: 44g. This large bat species is distinguished from all others in the region by its relatively large size, relatively slow wing beat and white, cream or yellow belly fur which is visible in torchlight. This species has relatively larger eyes than most microbats in the area. *S. flaviventris* can often be identified by its behaviour as it frequently engages in noisy dog fights with others of its species. These quarrels are accompanied by high pitched vocalisations and the sound of its wings "tearing" the air.

Echolocation Call The call of this bat is audible to the human ear at the 1st harmonic. Its audible call is a repeated chirp, delivered more quickly than *A. australis*. On your bat detector/computer screen, the call is recognizable by its frequency range with search phase calls typically falling from the low 20kHz to the high teens. Echolocation sequences of *Saccolaimus* do not have the increasing steepness in pulses exhibited by *O. lumsdenae* (below).

Distribution and habitat This species occurs is a swift, direct flier. It hunts in open spaces in cleared habitats and open woodlands and shrublands. At least some populations migrate south during the summer. Widely distributed but not common on the Sunshine Coast.

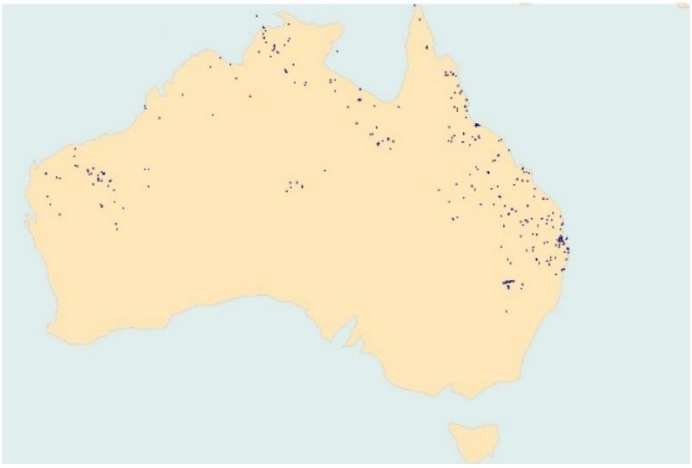
Ecology This species roost in tree hollows and occasionally in ground hollows and beneath ground debris in some localities. Beetles are a favored food, but all flying insects are consumed.



Anabat SD2 recording, zero-crossings rendered in F7 scale, AnalookW in compressed mode. Characteristic feature: curved, frequency 18-21kHz.

Northern free-tailed bat *Ozimops lumsdenae* (F. Molossidae)

Superseded names: *Mormopterus beccarii, Mormopterus lumsdenae*

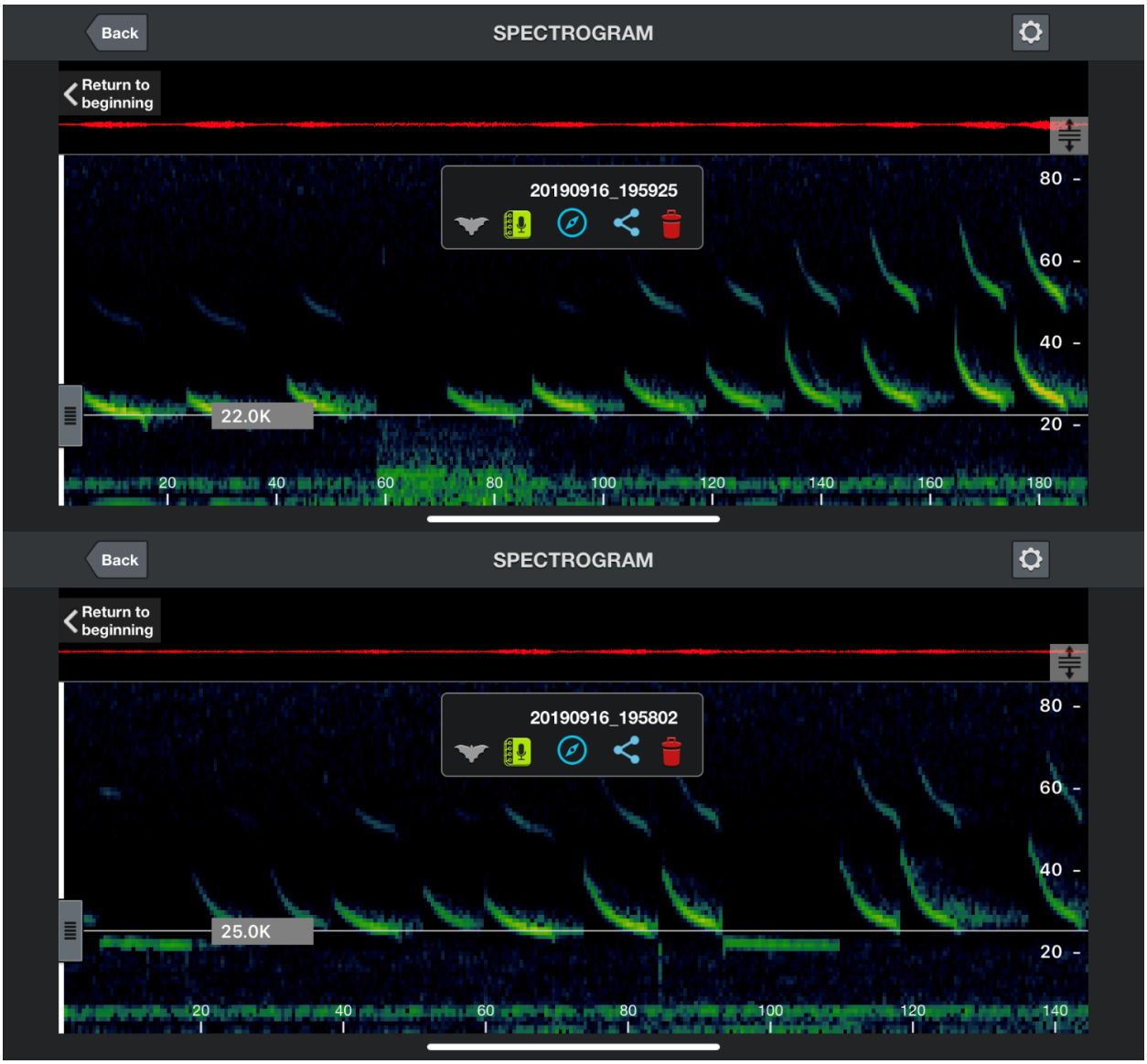


Identification Forearm: 38.7mm; Weight: 14.6g. This species is the heaviest member of its genus.

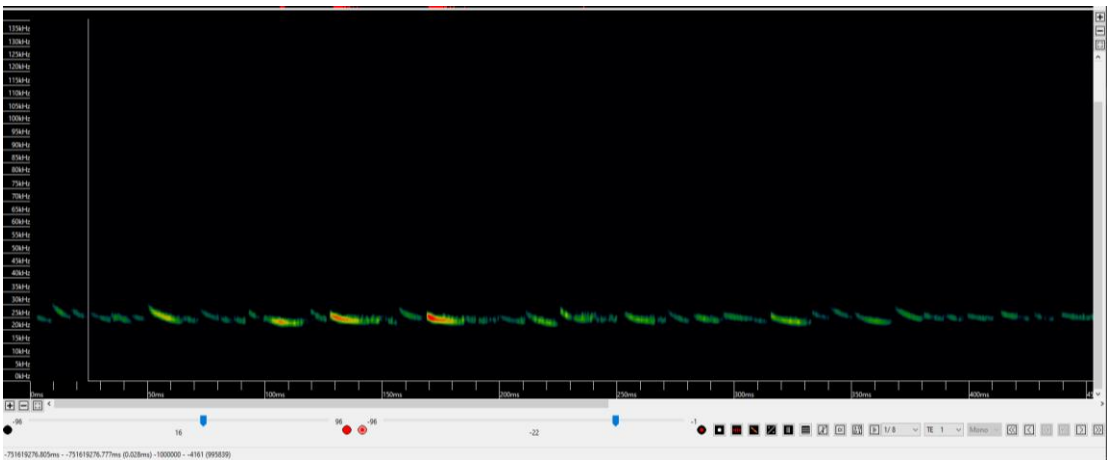
Echolocation Call Characteristic frequency 22-23 kHz. Can be confused with *S. flaviventris* whose calls are similar but usually occur at a slightly lower frequency than *O. lumsdenae*. This is the only bat species in the area which calls at this frequency.

Distribution and habitat This is a widespread bat but not as common on the Sunshine Coast as it is further north in Queensland. It is a species of open spaces and is found flying over grasslands, wallum, open forests and above the rainforest canopy. It has a quick direct flight and appears incapable of making abrupt turns in flight.

Ecology *O. lumsdenae* roosts in tree hollows, ceiling spaces in occupied and abandoned buildings and under the steel caps of timber power poles. It can tolerate very high daytime temperatures in the spaces. It feeds primarily on flying moths and beetles but other flying insects are also known from the diet. In some areas, ground insects are common in the stomach suggesting that this species sometimes hunts on the ground. Like all members of its family, it is very agile on the ground.



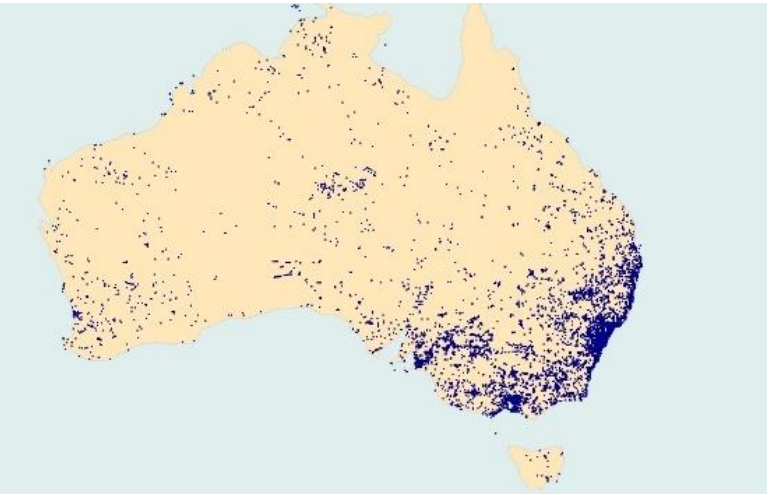
EchoMeter Touch screen shot, full spectrum, compressed mode. Characteristic feature: frequency 22-23kHz.



Anabat Swift recording, full spectrum rendered in Kaleidoscope Lite. Compressed view.

Gould's Wattled bat *Chalinolobus gouldii* (F. Vespertilionidae)

Superseded names: no recent alternative names



Identification Forearm; 41.2mm, Weight 9.8g. In the hand, this species is distinguished from all other microbats in the area by its combination of high rounded skull, fleshy lobes at the corners of the mouth and along the lower lip (the wattles that give it its common name), and the distinctive blackish fur on the head, contrasting with paler brown fur over the rest of the body.

Echolocation Call Characteristic frequency is 28-31 kHz. There is often no tail to the call, but occasionally with an up-sweeping tail. In long sequences, individual call pulses often alternate in frequency with every second pulse stepped-up by about 2 kHz. Calls are usually flatter and non-alternating in open areas such as paddocks and urban areas, and steep and alternating in cluttered environments (e.g. forest).

Distribution and habitat This is one of the most widespread and adaptable of Australia's microbats. In the Sunshine Coast area it occurs in small numbers at most coastal and

hinterland areas. It is found in wet and dry sclerophyll forests, woodland, heath, farmland and urban areas and above the canopy in rainforests.

Ecology Small colonies up to 30 roost in tree hollows and sometimes under house roofs. It will also use bird nests, bat boxes and rolled up canvas blinds as roost sites. Diet is very broad including a range of mostly flying insects.

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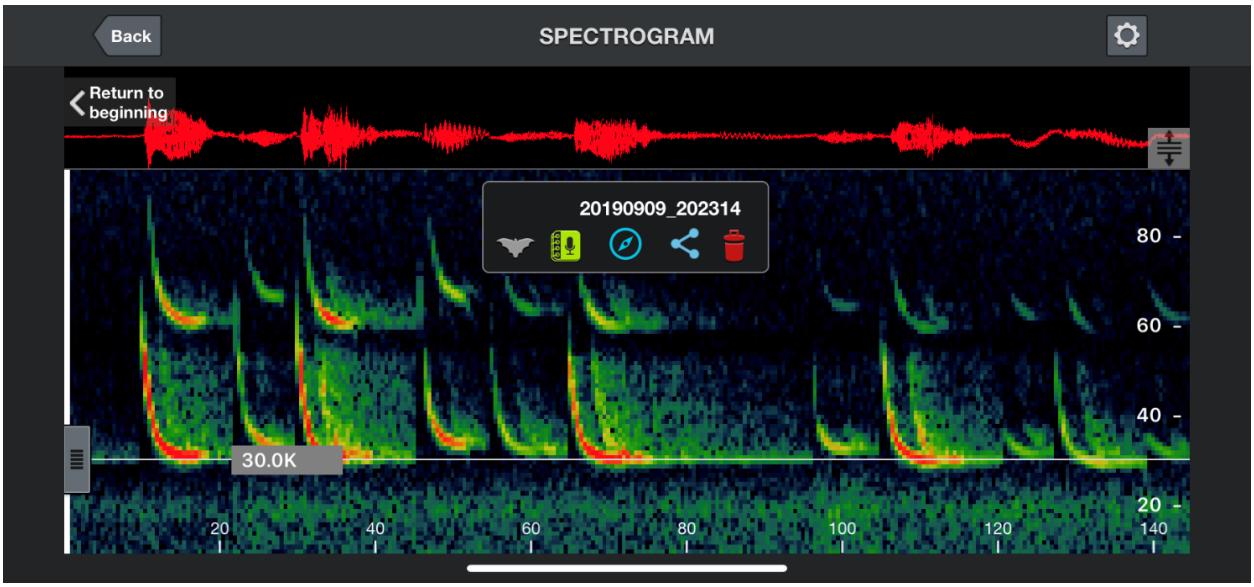
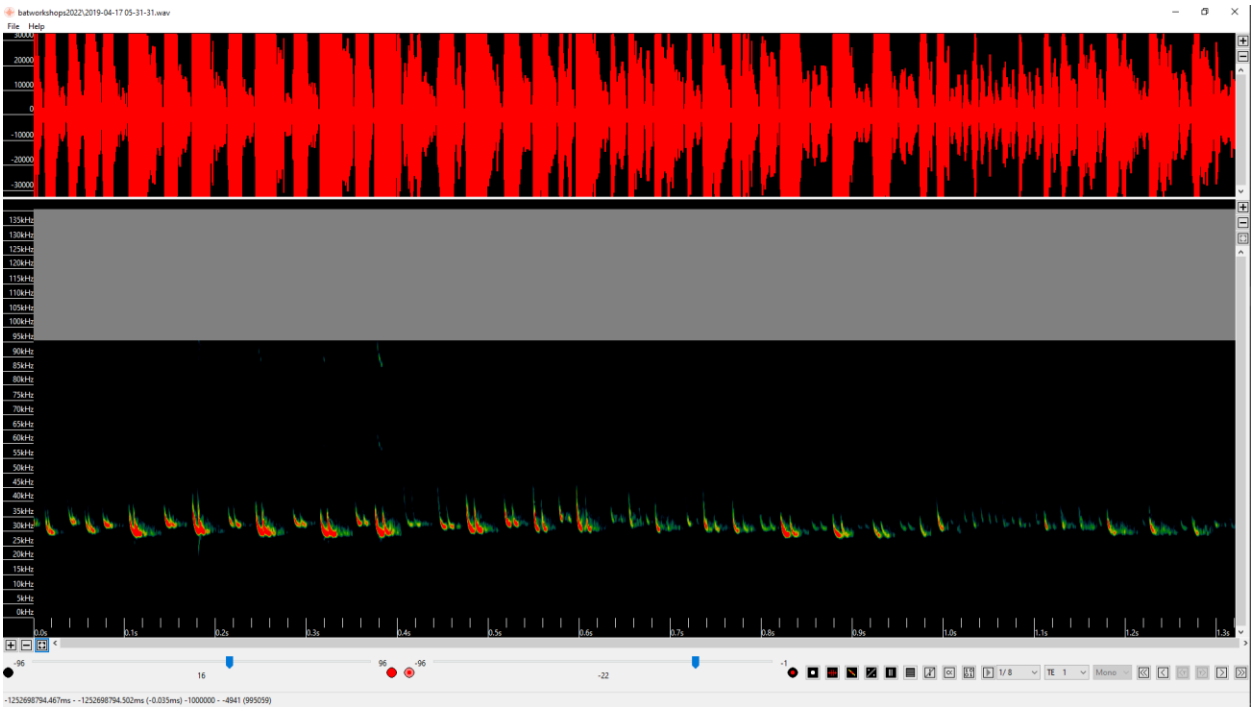


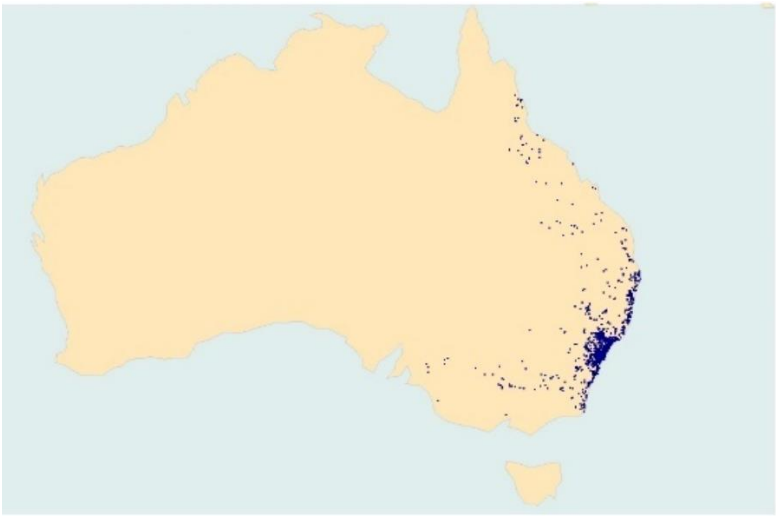
EchoMeter Touch screen shot, full spectrum, compressed mode. Characteristic feature: flat-curved, frequency 30kHz, often alternating pulses at different frequencies.



Anabat Swift recording, full spectrum rendered in Kaleidoscope Lite. Compressed view. This view demonstrates the alternating frequencies of every second pulse. The double pulses are an artefact of echos off water surface.

Ride's free-tailed bat *Ozimops ridei* (F. Molossidae)

Superseded names: *Mormopterus ridei, Mormopterus sp. 2*

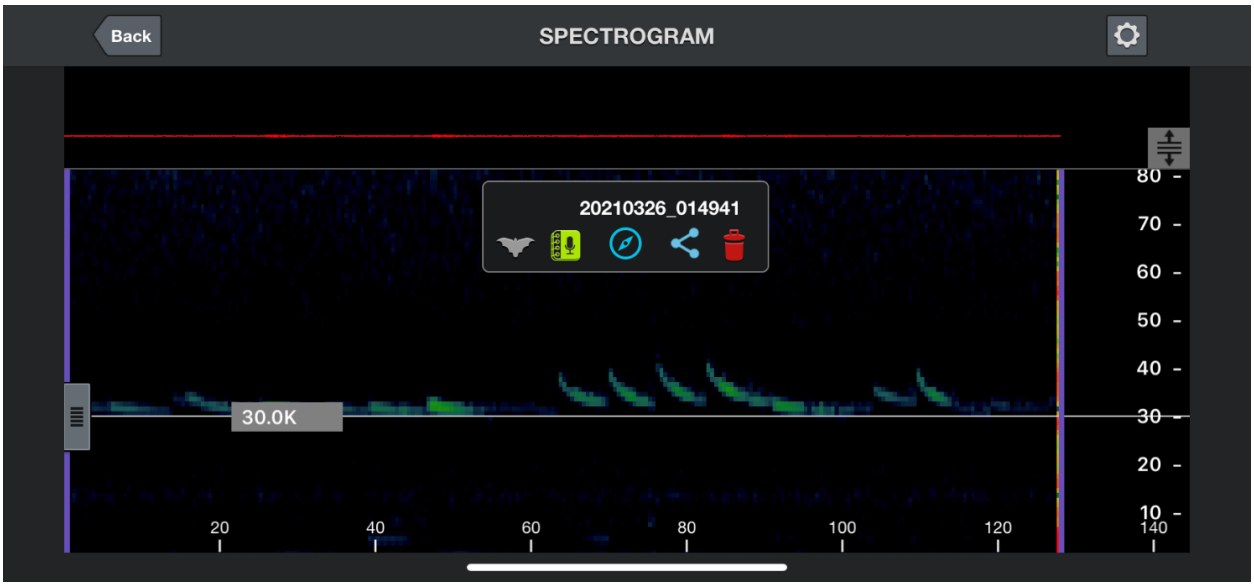


Identification Forearm 33mm; Weight 9g. Typical of its family, this bat has a free tail, large ears and fleshy wrinkled lips.

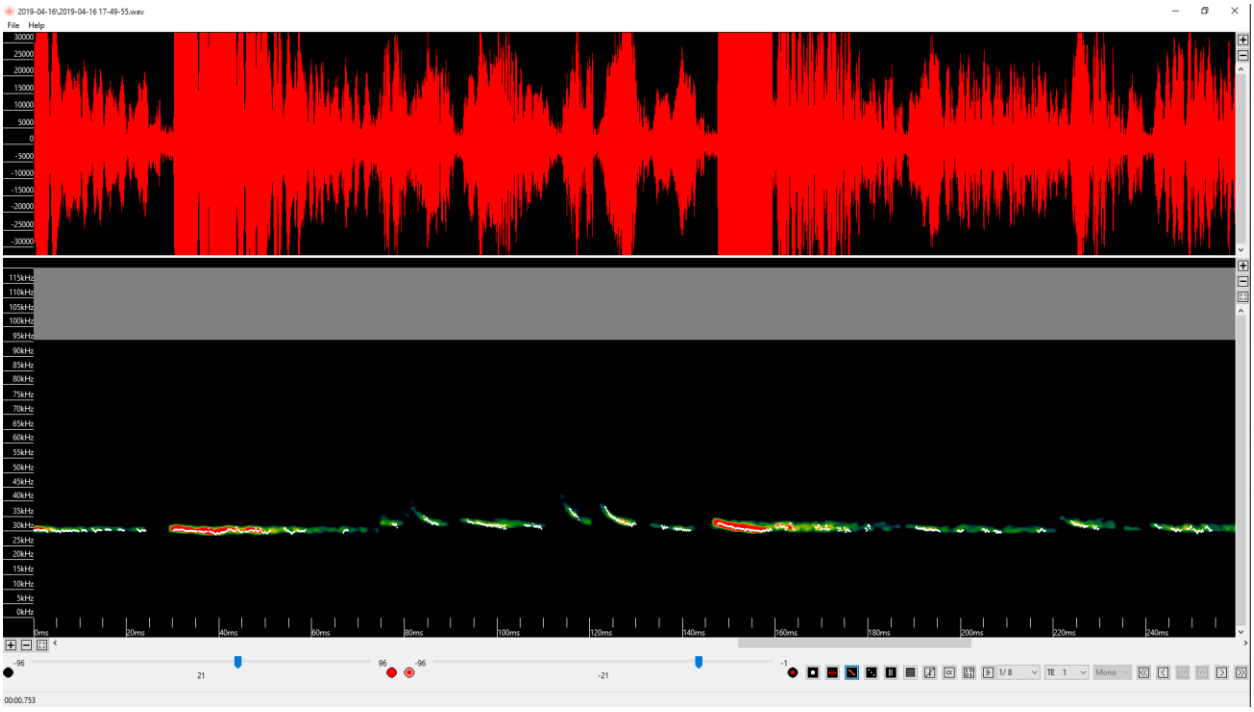
Echolocation Call Characteristic frequency 30-35 kHz. Poor call sequences can be confused with calls of *C. gouldii*, however in good sequences the pattern of flat and steep pulses in most sequences distinguishes it from Gould's wattled bat.

Distribution and habitat Like all members of its family it is a relatively fast and non-manoeuvrable bat which flies in the open spaces above and around emergent trees. It occurs in bushland and urban areas where it is known to forage around street lights. This appears to be the more common species of Mollosid on the Sunshine Coast.

Ecology This species roosts in tree hollows and buildings, but also utilizes shedding bark and cracks in posts and trunks.



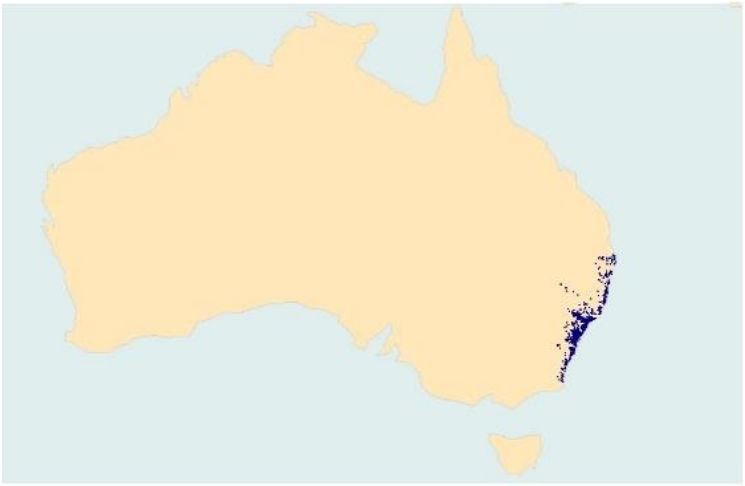
EchoMeter Touch screen shot, full spectrum, compressed mode. Characteristic feature: frequency 28-34kHz, slope of pulses in a sequence is variable.



Anabat Swift recording, full spectrum rendered in Kaleidoscope Lite. Compressed view. Characteristic feature: frequency 28-34kHz, slope of pulses in a sequence is variable.

Eastern coastal free-tailed bat *Micronomus norfolkensis* (F. Molossidae)

Superseded names: *Mormopterus norfolkensis*

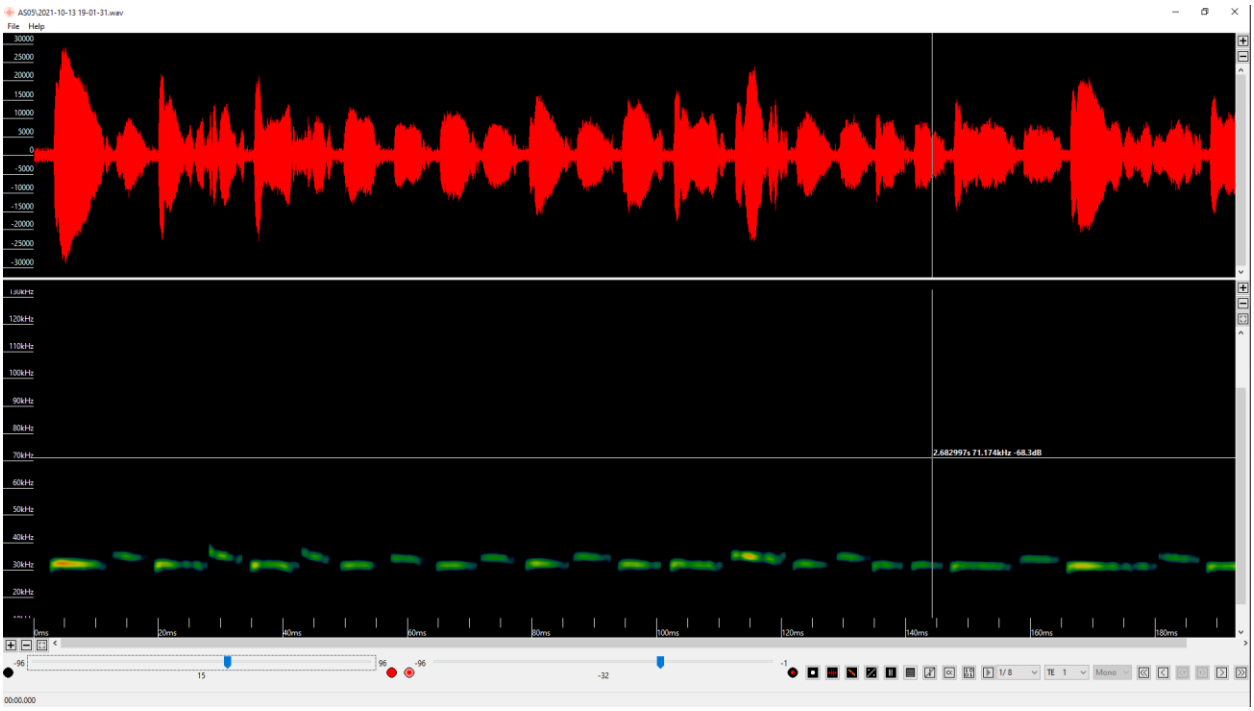


Identification Forearm 37.3mm, Weight 7.8g. This bat has the typical freetail of other members of its Family.

Echolocation Call This species has a distinctive call with flat pulses which alternate by several kHz.

Distribution and habitat: This bat occurs at the northern end of its range on the Sunshine Coast and is rarely encountered here. It is a species of ridge lines and is usually confined to the cool hinterland wet sclerophyll forests, especially the Conondale Range and forested parts of the Blackall Range. This bat forages in the spaces between emergent trees and over broad expanses of water.

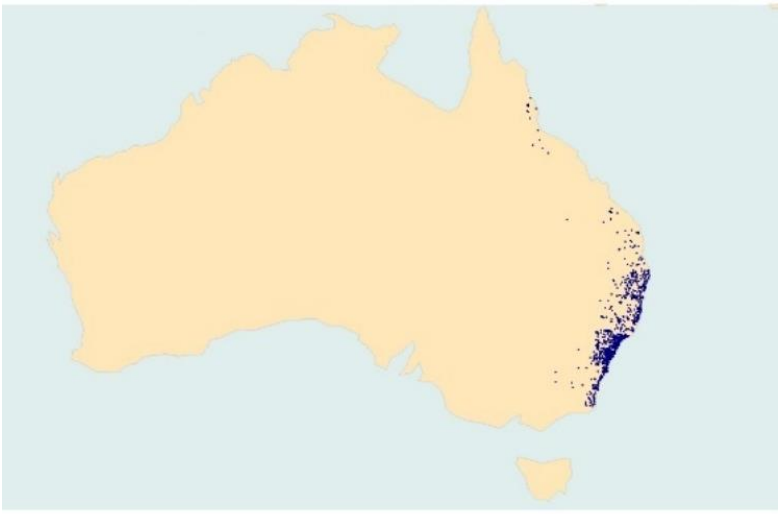
Ecology The east-coast free-tailed bat roosts in tree hollows of large trees, and rarely, in buildings or other human structures. The diet is not known.



Anabat Swift recording, full spectrum rendered in Kaleidoscope Lite. Compressed view. Characteristic feature: flat, frequency around 30kHzkHz, often alternating pulses at different frequencies.

Greater broad-nosed bat *Scoteanax rueppellii* (F. Vespertilionidae)

Superseded names: *Nycticeius rueppellii*

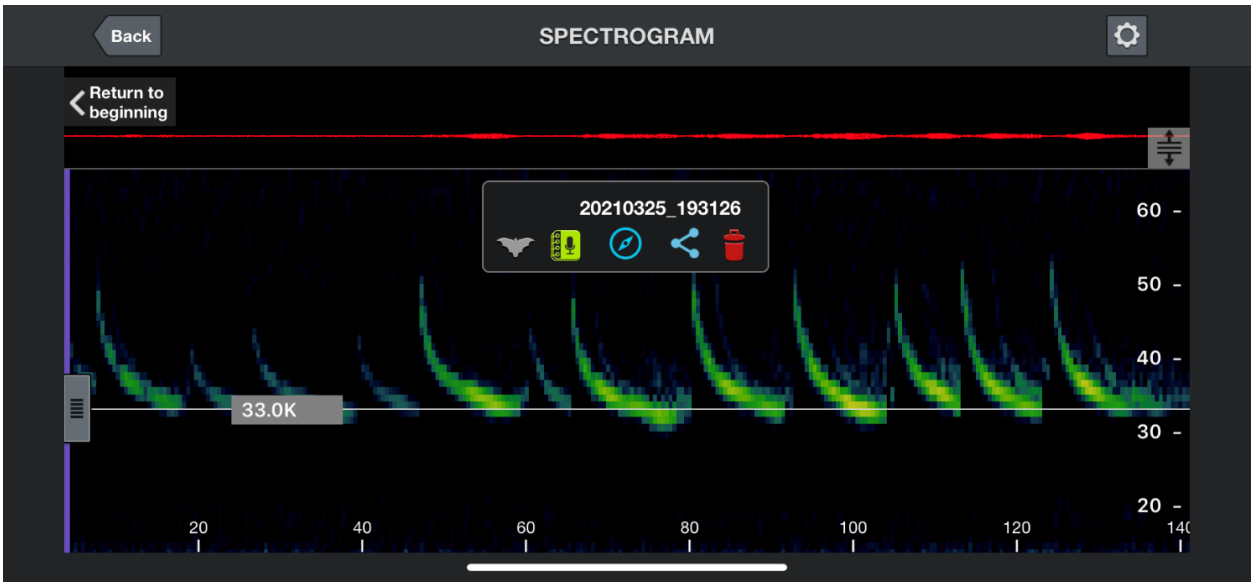


Identification Forearm 53.2mm; Weight 25.4g. This bat is distinguished by its relatively large size, simple ear structure and its broad snout.

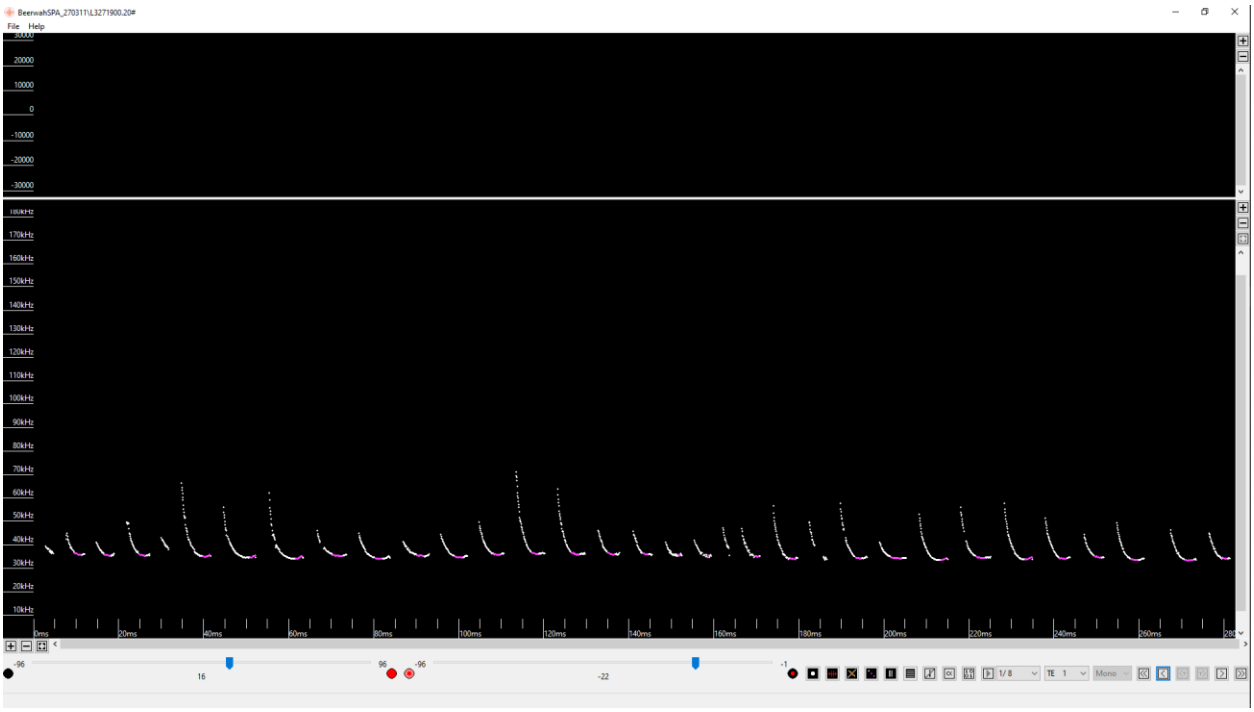
Echolocation Call The call of this bat is difficult to differentiate from that of the *S. orion* the two of which are often classified as Q35 bats.

Distribution and habitat: *S. rueppellii* is potentially found in all habitats on the Sunshine Coast from sea-level to the highest mountains and including rainforests, wet and dry sclerophyll forests and woodland and cleared paddocks with remnant trees where they forage in the gaps around tree crowns. Q35 bats are detected right across the Sunshine Coast area, in all habitats from the coastal plain to the hinterland but they are always one of the scarcest bats at any site.

Ecology This species roosts in tree hollows and rood spaces in abandoned buildings. This species is known to eat other microbat species, but mainly feeds on flying beetles.



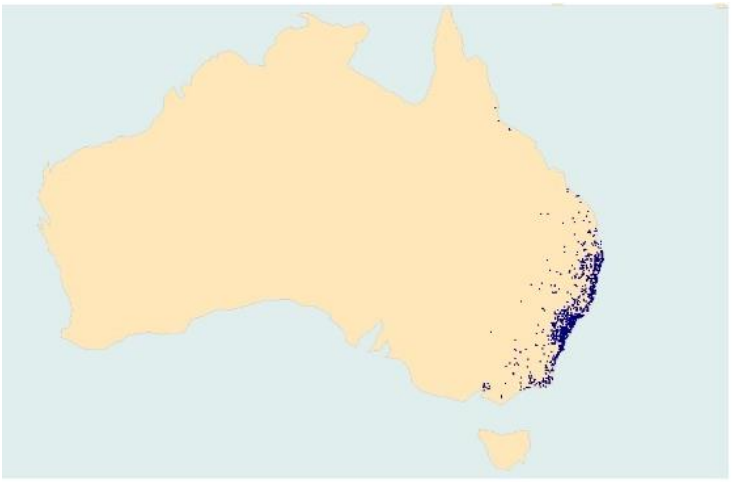
EchoMeter Touch screen shot, full spectrum, compressed mode.



Anabat SD2 recording, zero-crossings rendered in F7 scale, AnalookW in compressed mode.

Eastern broad-nosed bat *Scotorepens orion* (F. Vespertilionidae)

Superseded names: *Nycticeius orion*

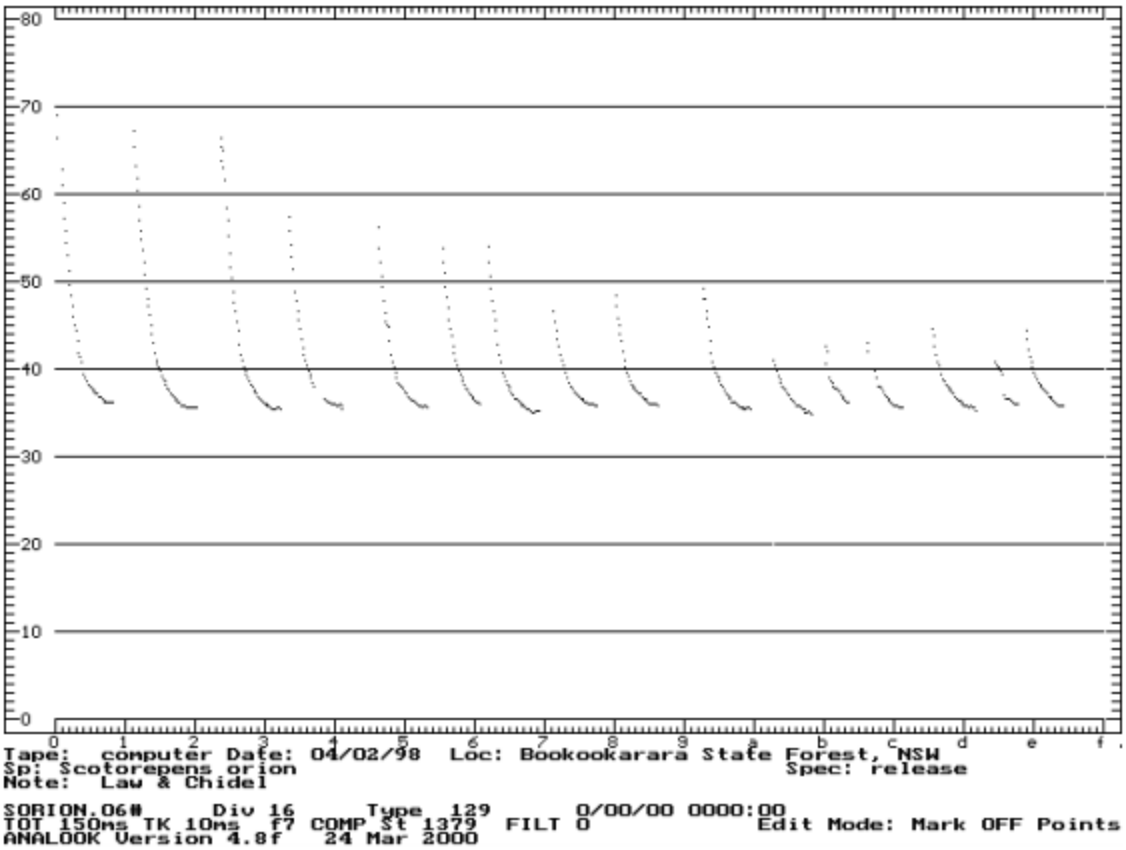


Identification Forearm 35.1, Weight 9.3g.

Echolocation Call Calls of this species is difficult to differentiate from those of *S. rueppellii* above.

Distribution and habitat: Q35 bats are detected right across the Sunshine Coast area, in all habitats from the coastal plain to the hinterland but they are always one of the scarcest bats at any site.

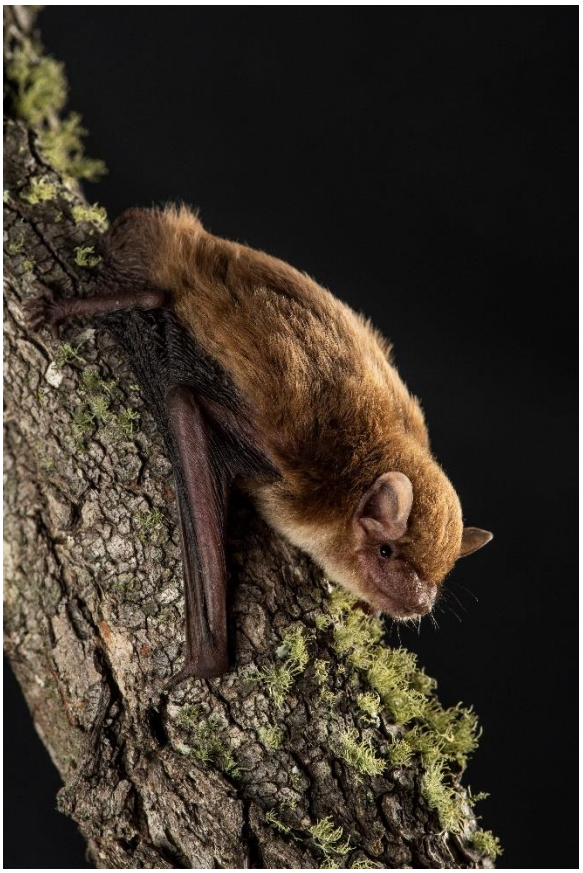
Ecology This species roosts in tree hollows and building. Nothing is known of diet or foraging.



Zero-crossing call sequence reproduced from Reinhold *et al.* (2001). Echolocation calls of this species are difficult to differentiate from *S. rueppellii* above.

Parnaby's broad-nosed bat *Scotorepens sp. (Parnaby)* (F. Vespertilionidae)

Superseded names: None

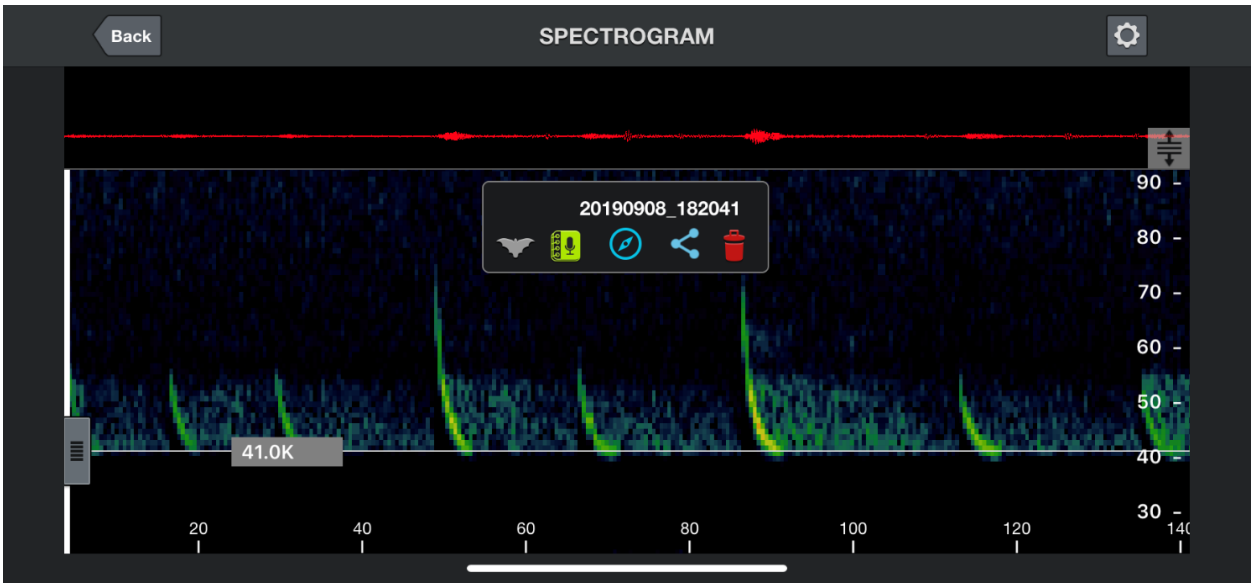


Identification Forearm 32.8mm, Weight 7.4g. This species is difficult to distinguish from other members of the genus.

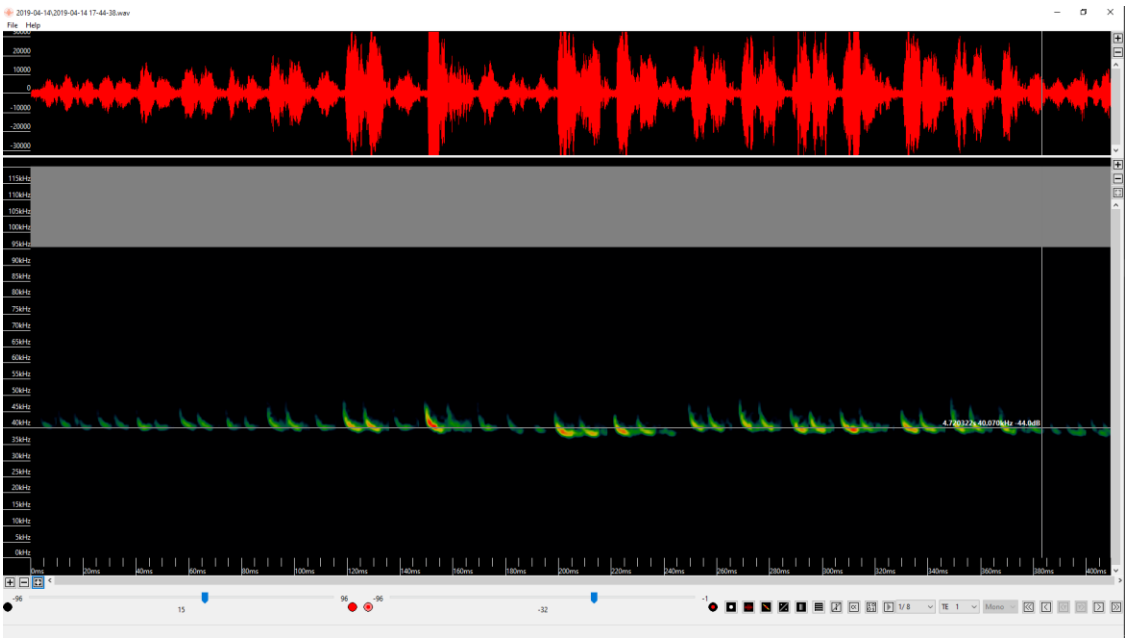
Echolocation Call The call of this species is difficult to distinguish from that of *C. nigrogriseus* below and together these are usually called Q40 bats in bat detector surveys.

Distribution and habitat: This species is a moderately common bat on the Sunshine Coast being found in open sclerophyll forests and clearings with remnant trees. It has a fast, direct flight and forages within the open spaces between tree canopies.

Ecology This species roosts in tree hollows and buildings, and forms a large colony in the disused Dularcha Railway tunnel near Landsborough. Its diet is unknown but very likely consists of flying insects.



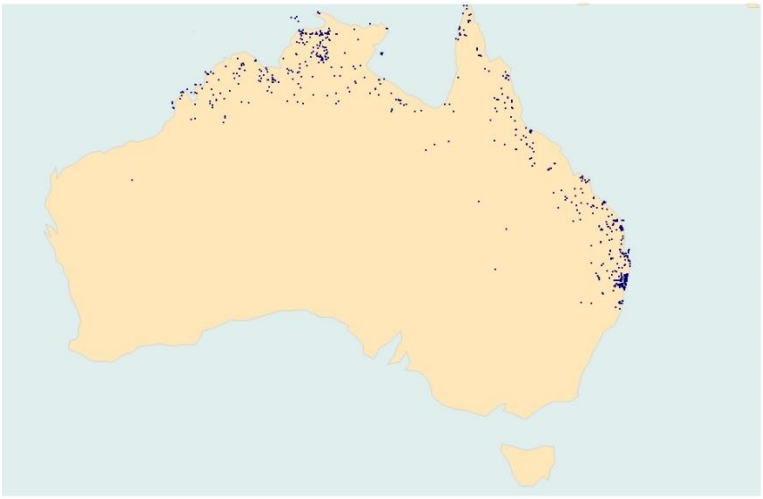
EchoMeter Touch screen shot, full spectrum, compressed mode. Characteristic feature: usually steep and conspicuously up-sweeping tail at about 40kHz. There is no reliable method for distinguishing this species from *C. nigrogriseus*.



Anabat Swift recording, full spectrum rendered in Kaleidoscope Lite. Compressed view. Note well up-sweeping tails in this sequence.

Hoary wattled bat *Chalinolobus nigrogriseus* (F. Vespertilionidae)

Superseded names: no recent alternative names



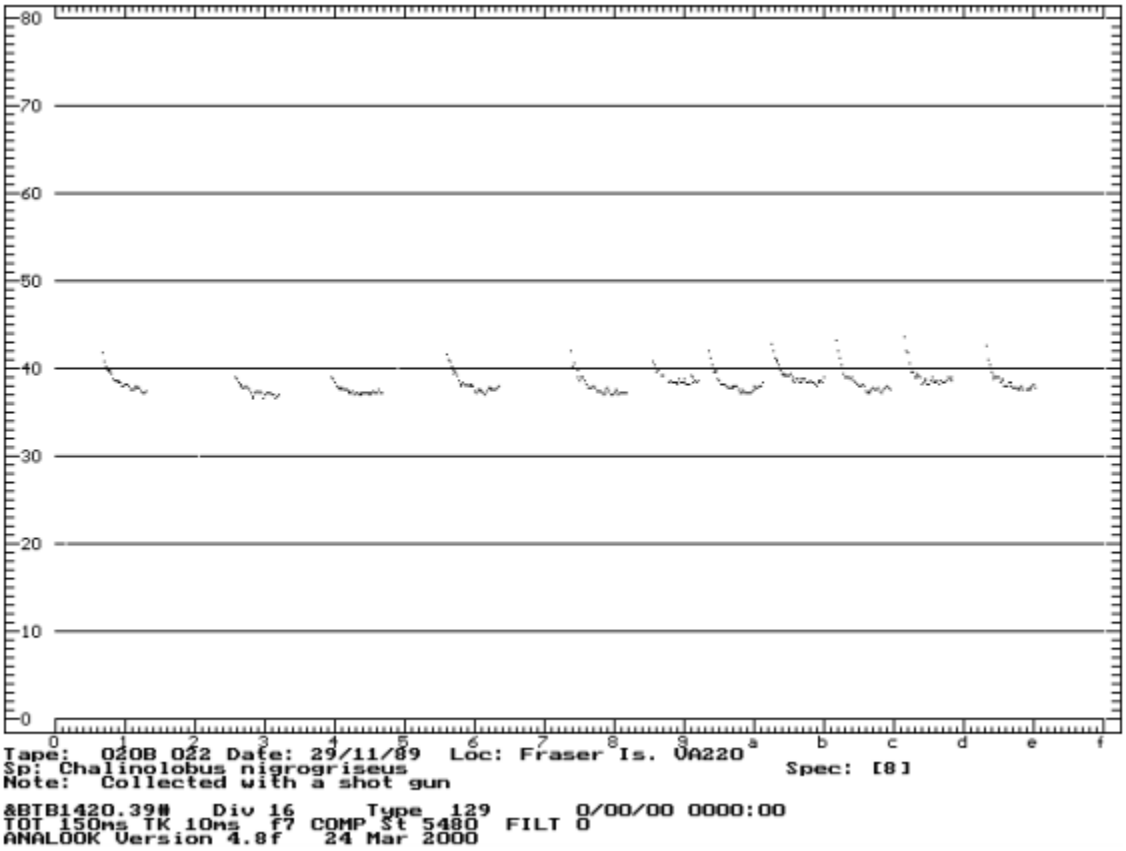
Identification Forearm 34.2mm, Weight 6g. This bat is easily recognized in the hand. It possesses the high domed head and poorly developed versions of the fleshy lobes of C. *gouldii*, and its fur has white tips which give it a frosted appearance.

Echolocation Call The call of this species is difficult to distinguish from that of *S. sp (Parnaby)* above, and together these are usually called Q40 bats in bat detector surveys.

Distribution and habitat: Due to its ambiguous call (i.e. not able to be reliably differentiated from *Scotorepens sp* (Parnaby), the species is poorly known on the Sunshine Coast, where it is close to its southern range. There is a suggestion that in south-east Qld it is most common in coastal woodland and adjacent heath environments, but this has not been rigorously tested. In the tropics it seems to prefer woodland and forest environments with an uncluttered understory, and the same may apply in SEQ.

Given its tropical distribution it is likely that it's confined to coastal areas on the Sunshine Coast.

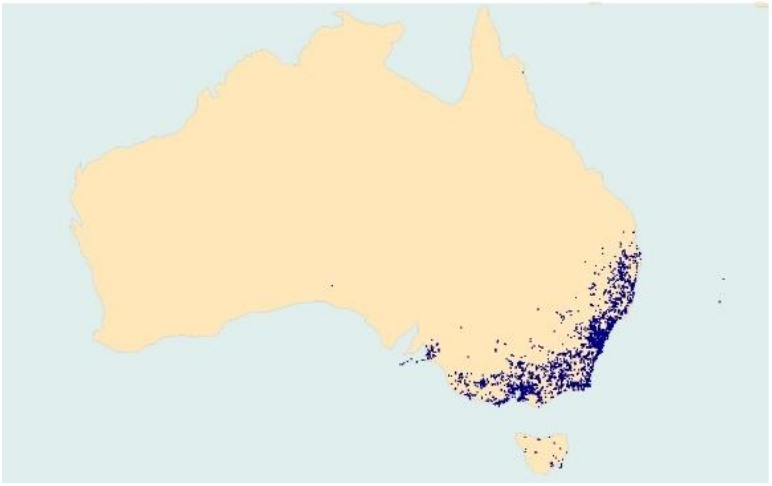
Ecology The species roosts in tree hollows in Eucalypts. The diet consists of a broad range of invertebrates which they capture on the wing. These bats are fast and manoeuvrable in flight.



Zero-crossing call sequence reproduced from Reinhold *et al.* (2001). Characteristic feature: there is no reliable method for distinguishing this species from *S*. sp (Parnaby).

Large forest bat *Vespadelus darlingtoni* (F. Vespertilionidae)

Superseded names: *Eptesicus saggitula, E. darlingtoni*



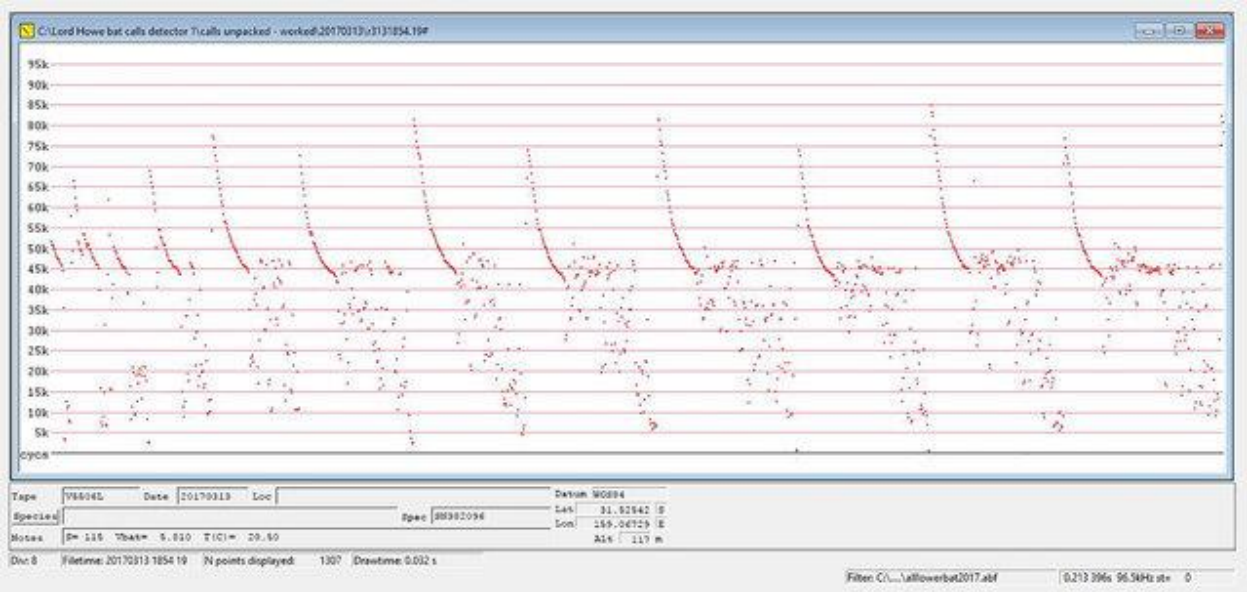
Identification Forearm 35.1mm, Weight 7.7g. The long fur and large size of this species distinguish it from other members of it genus, which as a whole are best identified from other microbats by the lack of any distinguishing features (i.e. simple ears, no nose leaf complex, muzzle not swollen, short toes).

Echolocation Call The call of this species is a typical reverse "j" shape call at around 42-45kHz. The call doesn't have a down-sweeping tail, unlike the similar *M. orianae* but caution should be applied to identifying bats as this species unless very good sequences are achieved.

Distribution and habitat: This is a cool adapted species of the Great Dividing Range, which barely makes it into the Sunshine Coast area, if at all. It is reasonably well-known further south in the Scenic Rim and Border Ranges of Queensland and further south including Tasmania, but only one Sunshine Coast record exists in the Atlas of Living Australia database, that being at Maroochydore. This seems unlikely, given the species

southern distribution and preference for cool climates, however its presence in the high elevation forests of the Conondale and Blackall Ranges is possible.

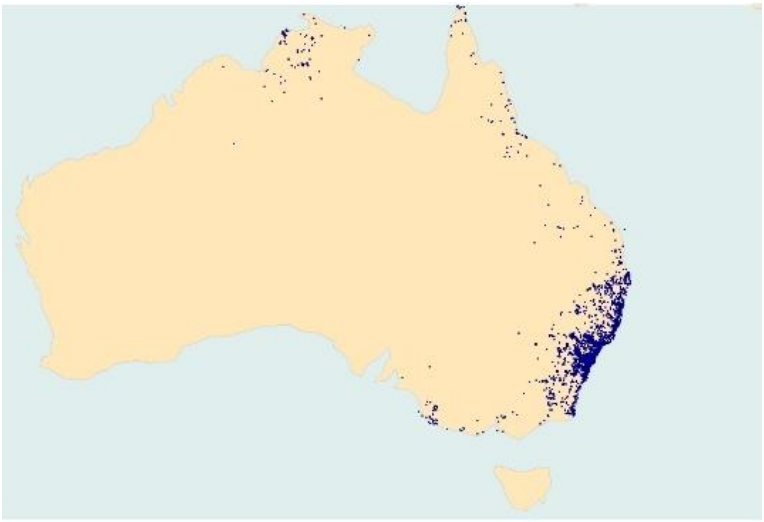
Ecology This species roosts in hollows in Eucalypts, especially living smooth barked species, and occasionally buildings. The diet includes moths, beetles and other flying insects.



Zero-crossings call of *Vespadelus darlingtoni* from Lord Howe Island Source: https://www.researchgate.net/publication/321779117_The_Australian_Museum_Lord_Howe_Island_Expedition_2017-birds_and_mammals/figures?lo=1

Large bent-winged bat *Miniopterus orianae* (F. Miniopteridae)

Superseded names: *Miniopterus schriebersi*

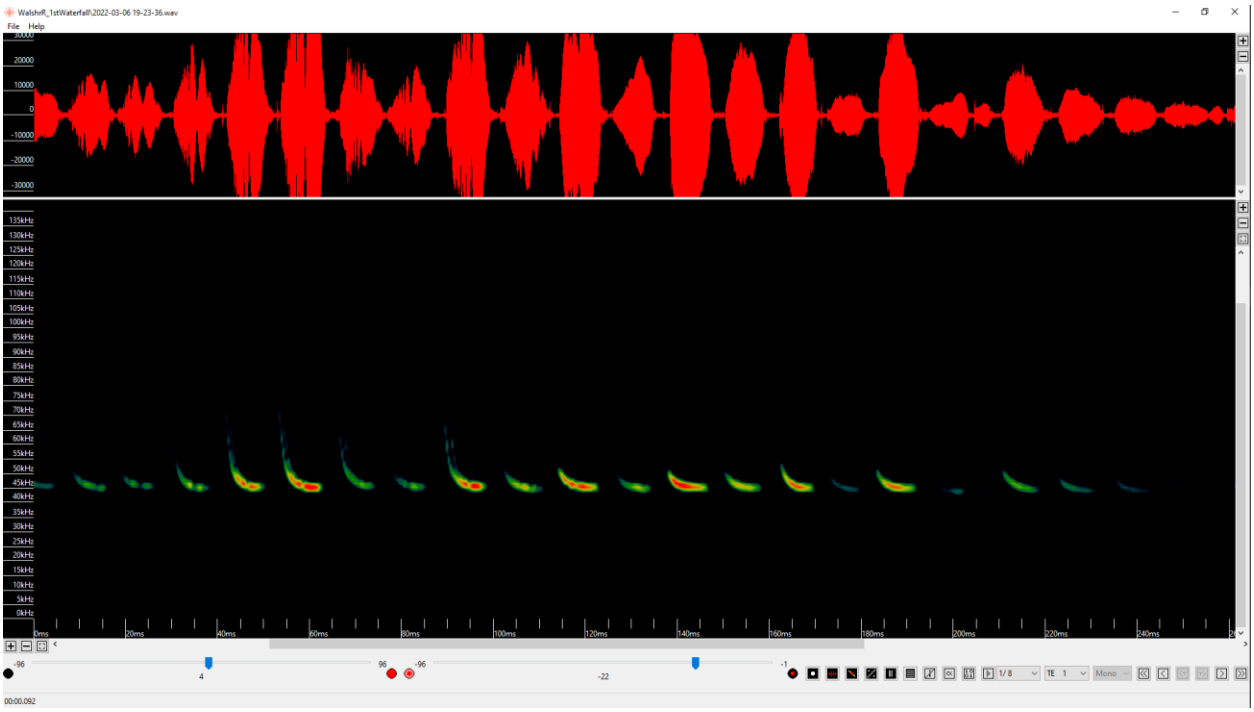


Identification Forearm 47.9mm. 14.1g. Like the little bentwing (below) this species can be distinguished by its dome-shaped head and the fact that the terminal phalanx of the third finger is more than 3 times the length of the 2nd phalanx (which gives the wing the characteristic bent appearance).

Echolocation Call This is the only species in the Sunshine Coast area with a down-sweeping call and a characteristic frequency of around 45kHz. It also has the characteristic feeding buzz of all *Miniopterus*, which drops suddenly in frequency from the attack phase pulses (see *M. australis* below).

Distribution and habitat The large bent-wing bat occurs in a range of habitats including rainforest, dry and wet eucalypt forests and grasslands and paddocks, and urban areas. In forested environments it forages above the canopy. On the Sunshine Coast, this species is found in coastal areas and the hinterland in multiple vegetation communities. Known roosting sites include abandoned mine shafts on the Blackall Range and Conondale Range It feeds around street lights and lights at sports fields.

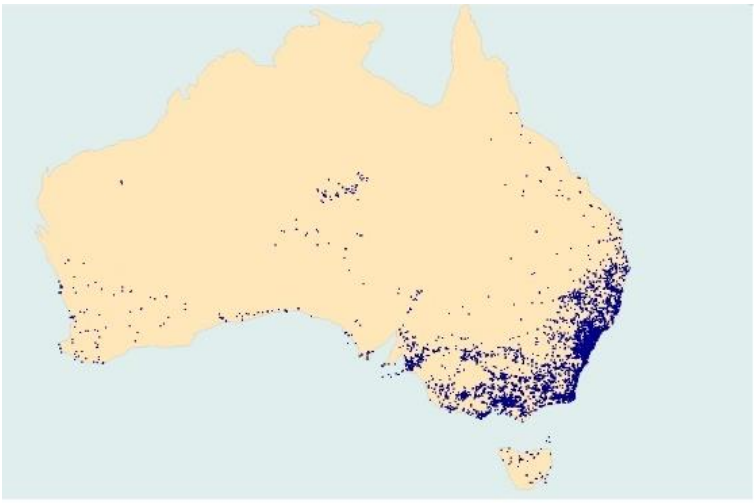
Ecology This species uses caves, tunnels and mine shafts as roost sites, and has been known to travel up to 65km from these roosts to their foraging grounds. A key limit to populations of the species is the available of substantial caves to act as humid maternity caves, where young bats are pupped. The species feeds on moths and other flying invertebrates.



Anabat Swift recording, full spectrum rendered in Kaleidoscope Lite. Compressed view. Characteristic feature: The only bat known from the Sunshine Coast area which calls at 45kHz. Lacks an up-sweeping tail, usually a down-sweeping tail obvious (if not in this sequence).

Chocolate wattled bat *Chalinolobus morio* (F. Vespertilionidae)

Superseded names: no recent alternative names



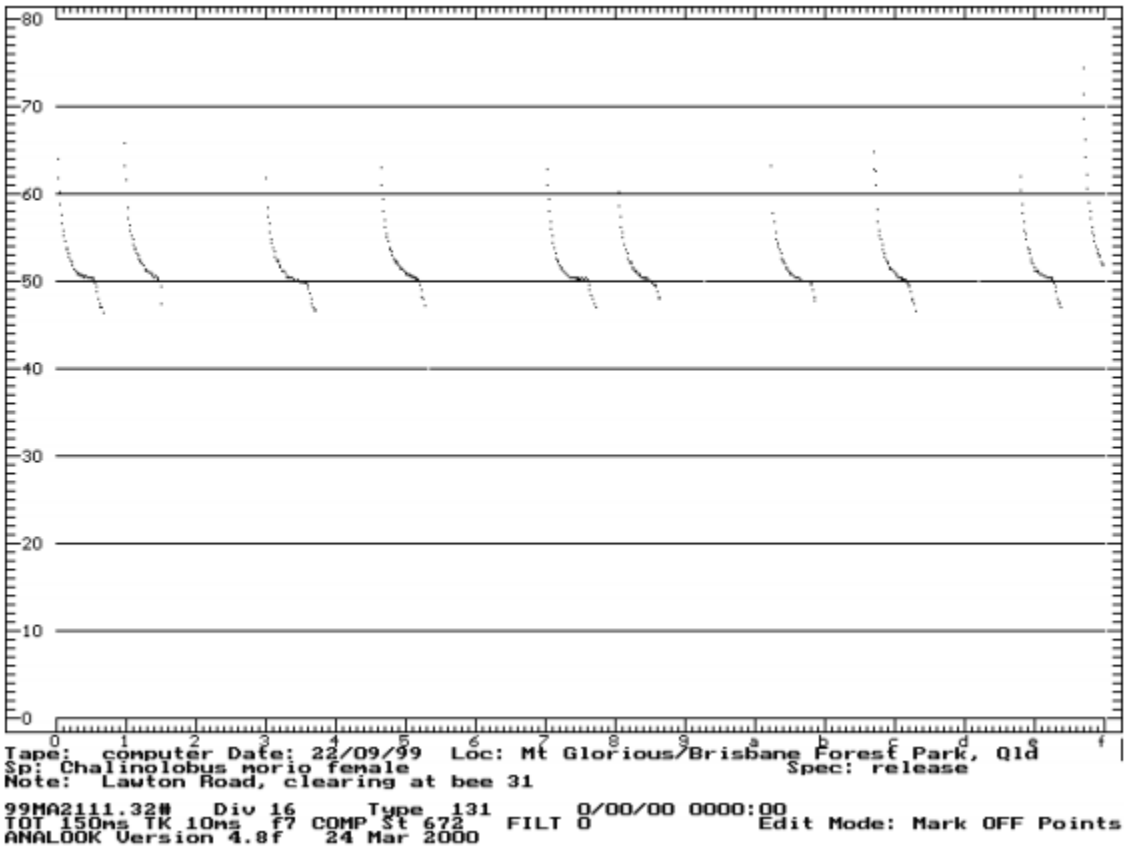
Identification Forearm 38.9mm; Weight 8.9g. This bat is distinguished by domed crown, small lobe at corner of mouth and prominent lobe on lower lip, and uniform chocolate-coloured fur.

Echolocation Call The call of this species overlaps with *Vespadelus troughtoni* and low frequency *V. pumilus* and, but in good quality sequences can be differentiated by its down-sweeping tail.

Distribution and habitat This is a bat of continuous forests and woodlands including rainforests, wet and dry sclerophyll forests and shrublands. It is a very manoeuvrable flight which it uses to hunt in the layer between the canopy and shrub layer. *C. morio* is rarely detected on the Sunshine Coast.

Ecology This species roosts in tree hollows and buildings, and is also known to roost in caves and culverts where tree hollows are in short supply. In south-east Queensland this is

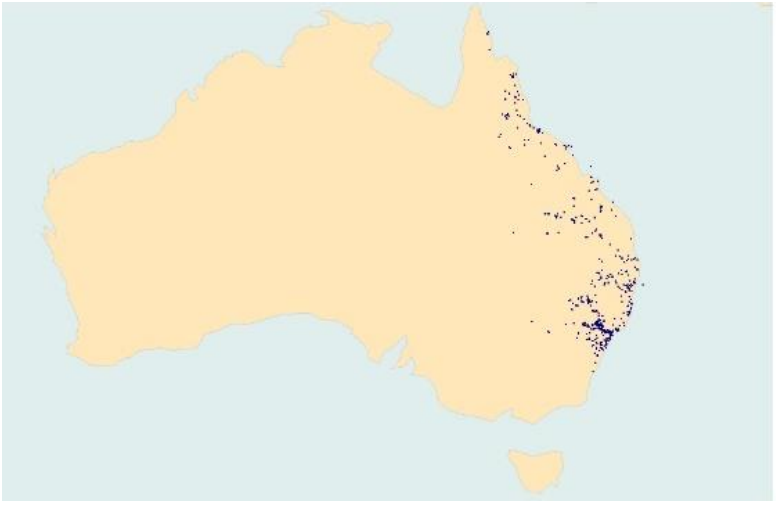
a cool adapted species which undergoes local migrations from its summer mountaintop habitat to winter lowland habitats. The diet includes whatever flying insects are available.



Zero-crossing call sequence reproduced from Reinhold *et al.* (2001). Characteristic feature: curved, down-sweeping tail at 50kHz.

Eastern cave bat *Vespadelus troughtoni* (F. Vespertilionidae)

Superseded names: *Eptesicus troughtoni*

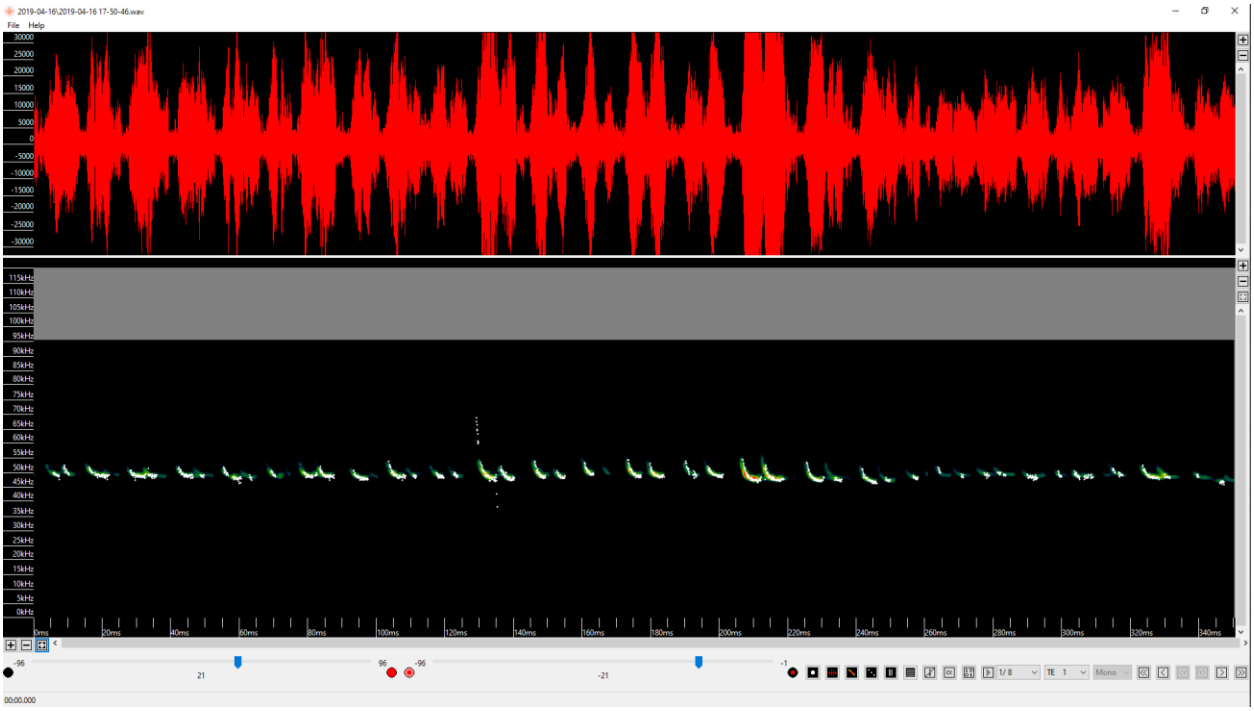


Identification Forearm 34.6mm; Weight 5.4g. This bat is difficult to tell apart from *V. pumilus* without detailed body measurements. It tends to occupy different habitat to that species (see below), which may assist identification.

Echolocation Call The call of this species overlaps in shape and frequency with its close relative *V. pumilus*. If calls have a characteristic frequency of below 50kHz they can be attributed to *V. troughtoni*. If between 50 and 54kHz and have an upturned tail, they can only be attributed to *Vespadelus* sp.

Distribution and habitat As its common name reflects, this species depends on rocky roosting area as a key habitat resource. In the Sunshine Coast these bats are therefore patchy, and most commonly encountered within the dry sclerophyll forests within several kms of rhyolitic plugs, such as the Glasshouse Mountains and Mt Cooroy and Pomona, or where rocky environments provide cracks and crevices for daytime shelter.

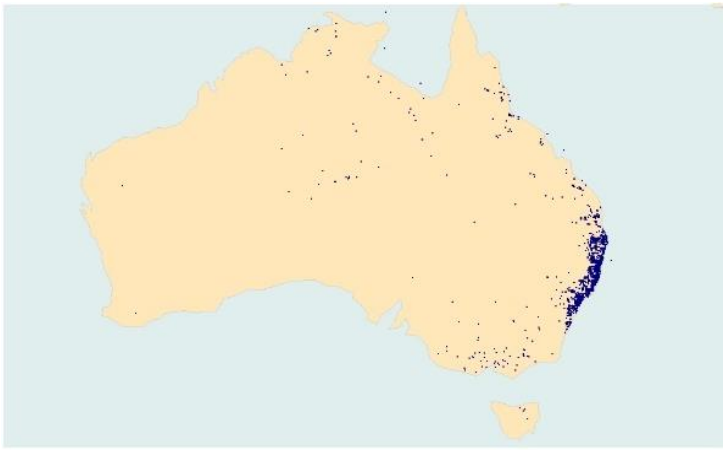
Ecology This species roosts in rock fissures and caves, and is sometimes found beneath rocks where they are sitting on flat bedrock. During the night, these bats rest in large aggregations of several hundred individuals in aeolian potholes in the ceilings of exposed overhangs on the Glasshouse Mountains. Occasionally a lone individual can be found in these aeolian erosion features during the day.



Anabat Swift recording, full spectrum rendered in Kaleidoscope Lite. Compressed view. Characteristic feature: curved, up-sweeping tail between 48-54kHz. If between 51 and 54kHz, can't be distinguished from *V. pumilus* and should be identified as *Vespadelus* sp.

Eastern forest bat *Vespadelus pumilus* (F. Vespertilionidae)

Superseded names: *Eptesicus pumilus*

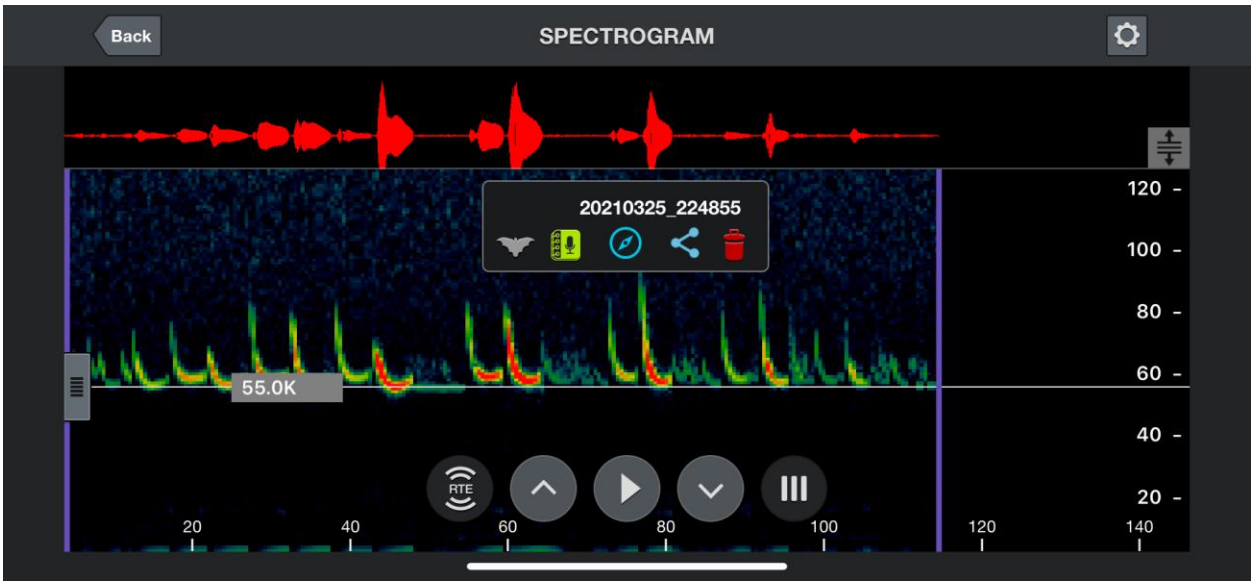


Identification Forearm 30.9mm; Weight 4.4g. This bat is difficult to tell apart from *V. troughtoni* without detailed body measurements. It tends to occupy different habitat to that species (see below), which may assist identification.

Echolocation Call The call of this species overlaps in shape and frequency with its close relative *V. troughtoni*. If calls have an upwards inflected tail, and characteristic frequency of above 54kHz they can be attributed to *V. pumilus*. If between 50 and 54kHz and with an upturned tail, they can only be attributed to *Vespadelus* sp.

Distribution and habitat This is one of the most commonly encountered species in forests on the Sunshine Coast. It is found in coastal and hinterland sites in vine forests and wet sclerophyll forest, and drier forest types with scrubby gullies. It forages beneath the canopy of these sometimes very cluttered forests.

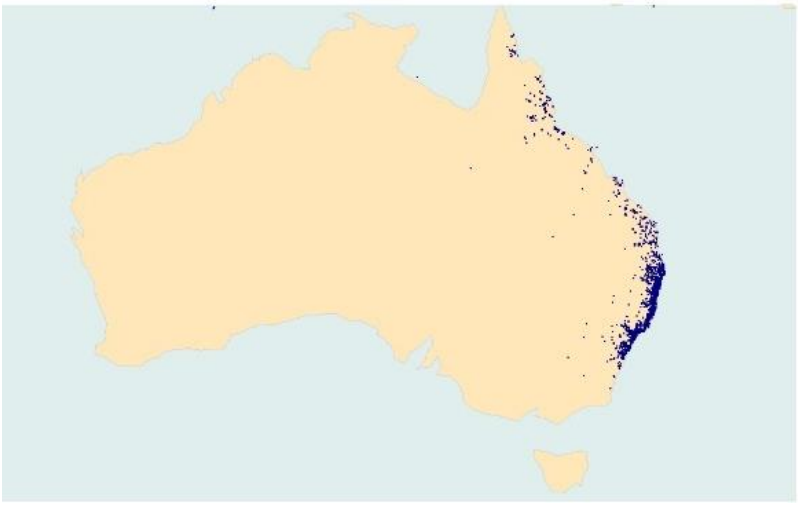
Ecology This species roosts in tree hollows of a range of sizes from large trees with cavities in the trunk, to small diameter saplings and twiggy branches. It eats small flying insects.



EchoMeter Touch screen shot, full spectrum, compressed mode. Characteristic feature: curved, up-sweeping tail between 50-57kHz. If between 51 and 54kHz, can't be distinguished from *V. troughtoni* and should be identified as *Vespadelus* sp.

Little bent-winged bat *Miniopterus australis* (F. Miniopteridae)

Superseded names: no recent alternative names

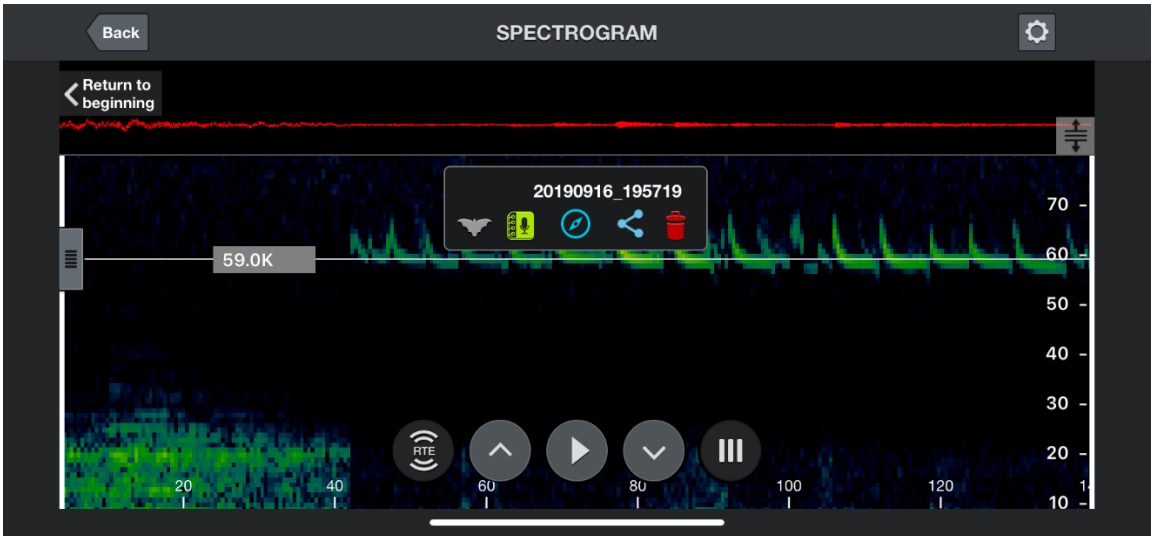


Identification Forearm 39.3mm; Weight 6.7g. Like its larger relative *M. orianae*, this species can be positively identified in the hand by the extra-long terminal joint on the third figure, which is more than 3 times the length of the second joint of that finger.

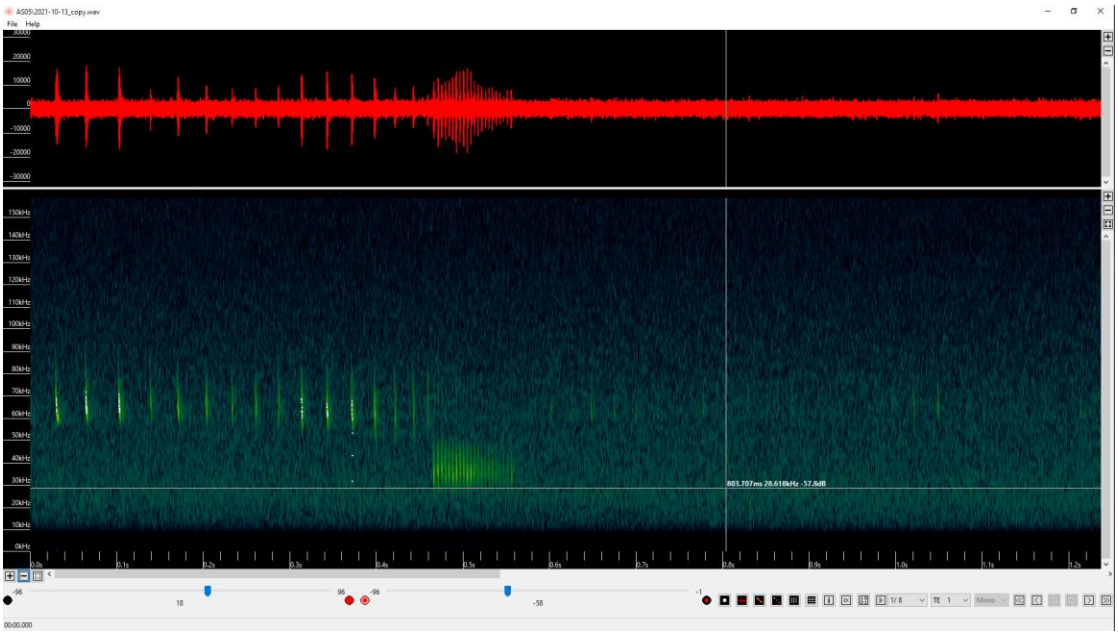
Echolocation Call Curved. Down-sweeping tail. Characteristic frequency around 60kHz.

Distribution and habitat This is the most abundant microbat on the Sunshine Coast and is present in a broad range of habitats from mountain vine forests to coastal woodlands. It is a swift and manoeuvrable flier which forages beneath the forest canopy and along tracks.

Ecology This species eats beetles, moths, flies and spiders and other invertebrates. This species is believed to roost in caves, tunnels and culverts however its commonness and widespread distribution on the Sunshine Coast suggest that it also uses tree hollows and possibly buildings.



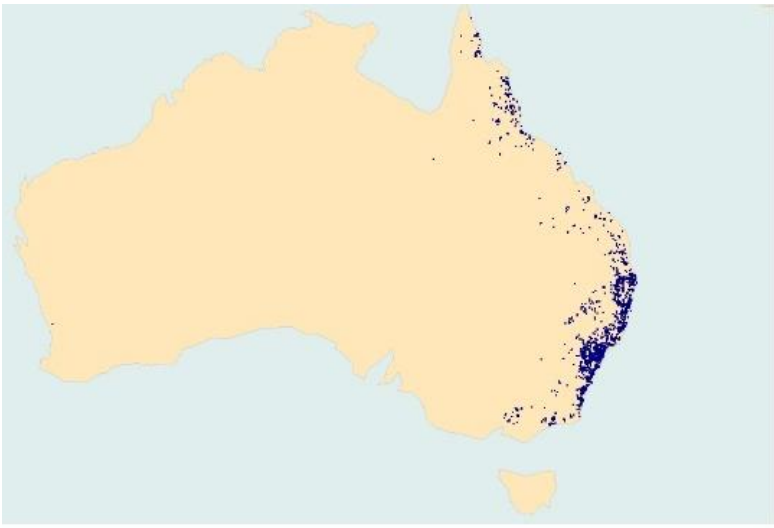
EchoMeter Touch screen shot, full spectrum, compressed mode. Characteristic feature: curved with a down-sweeping tail. Highest call frequency of any curve-shaped call in Australia, at around 57-62kHz.



Anabat Swift recording, full spectrum rendered in Kaleidoscope Lite. Compressed view. Note distinctive *Miniopterus* feeding buzz here. Thees calls appear near vertical as an artefact of the zoom.

Eastern horseshoe bat *Rhinolophus megaphyllus* (F. Rhinolophidae)

Superseded names: no recent alternative names

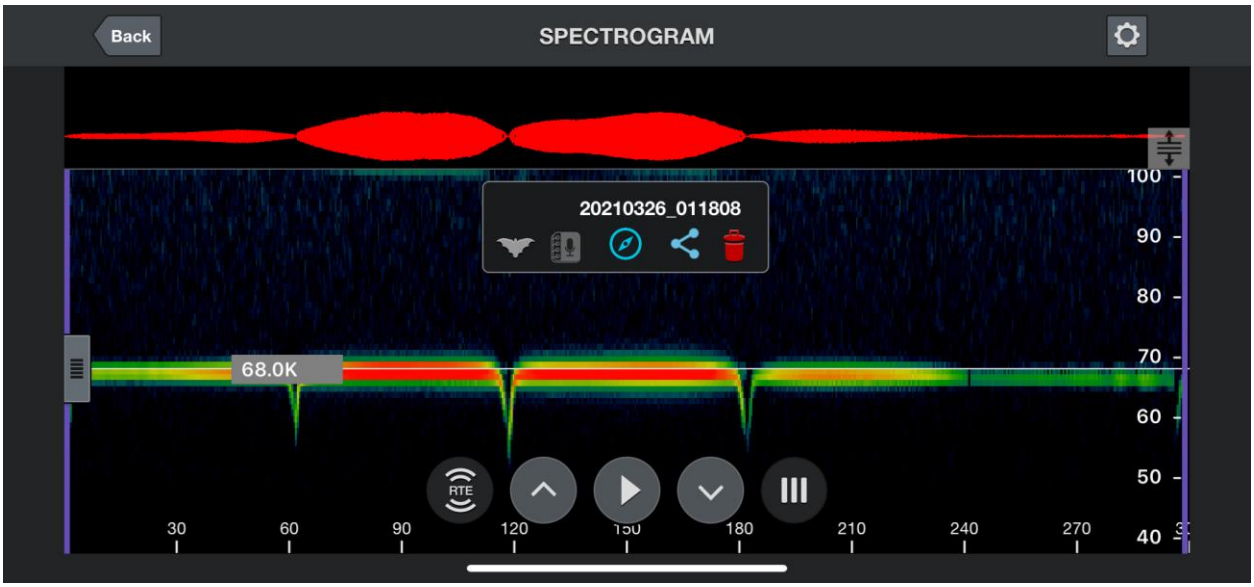


Identification Forearm 46.6mm; Weight 8.4g. This is visually a very distinctive bat. It is the only local microbat that roosts suspended by its feet from a ceiling or overhang. The horseshoe-shaped nose-leaf also identifies this species in south-east Queensland.

Echolocation Call Even the most fragmented of calls of this species are identifiable and cannot be confused with that of any other bat. It is a constant frequency call at around 70kHz.

Distribution and habitat: These bats are adapted to fly and hunt in cluttered environments including rainforests, wet and dry sclerophyll forests. These habitats are widespread on the coast and hinterland of the Sunshine Coast, but R. megaphyllus is only found where roost sites occur nearby.

Ecology This species roosts in caves, abandoned mines and tunnels, cavities in strangler figs, undercut creek banks and rarely buildings. They use have favoured perches where they rest during the night in buildings (especially shower cubicles) and insubstantial caves and overhangs. Horseshoe bats eat a variety of flying and non-flying invertebrates which they pursue on the wing or from perches, and glean from surfaces.



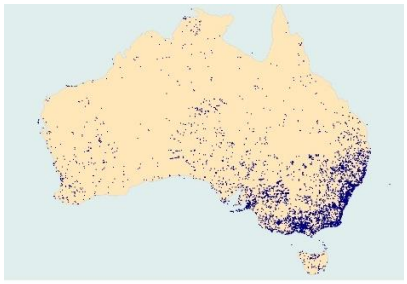
EchoMeter Touch screen shot, full spectrum, compressed mode. Easily recognized by constant frequency at around 70kHz.

Long-eared bats *Nyctophilus bifax, N. geoffroyi, N. gouldi* (F. Vespertilionidae)

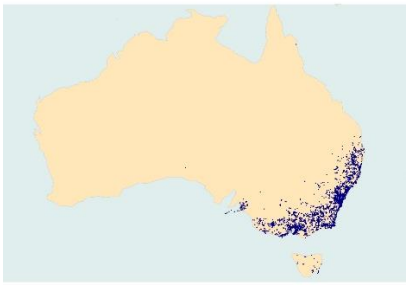
Superseded names: no recent alternative names

N. bifax

N. geoffroyi



N. gouldi



N. bifax

N. geoffroyi

N. gouldi

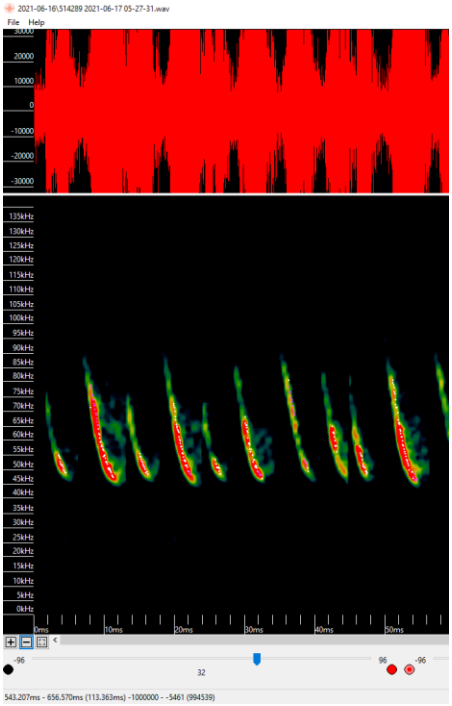
Identification *Nyctophilus* are distinguished by their long ears, which are joined over the top of the head, and their rudimentary nose leaf. The three *Nyctophilus* species found on the Sunshine Coast can be distinguished in the hand by coat colour, ear length (very difficult to measure on live bats) and by the shape of their nose-leaf (see above). *N. bifax:* low, broad muzzle ridge with no dividing groove, tan coloured fur, slightly paler on belly. *N. geoffroyi:* high muzzle ridge with central groove forming a distinct y-shaped groove, tan- to grey coloured fur markedly paler on belly. *N. gouldi* moderate muzzle ridge with central groove but no or indistinct y-shaped groove, grey or khaki-coloured fur, slightly paler on belly.

Echolocation Call *Nyctophilus* have a characteristic call consisting of a series of near vertical pulses, with pulse intervals usually of >95ms. They can be confused with *M. macropus*, which normally has calls more closely spaced (<75ms) and near vertical pulses of varying slope compared to *Nyctophilus*. There is no known method for distinguishing the calls of these three closely related species. Typically they can only be listed as *Nyctophilus* sp. from bat detector surveys.

Distribution and habitat *Nyctophilus* sp. can be found right across the Sunshine Coast area. *N. bifax* and *N. gouldi* are bats of moist, cluttered forests including rainforests and wet sclerophyll forests, vine thickets in gullies of open forests and in and around *Allocasuarina* groves. *N. geoffroyi* is a less well-known species here, but is presumed to occupy drier habitats than the previous two. All are slow flying flutterers, which search thick vegetation for flying and stationary prey.

Ecology *Nyctophilus* commonly roost in relatively exposed positions in houses, where they tuck themselves into the corners of walls and ceilings in small groups. They also use the corners where joists meet floors in high set houses. Attention is often drawn to their presence by the scats (similar to mouse scats) which accumulate beneath their daytime roost. They also frequently roost inside the bags placed over banana bunches to protect them from fruit bats and fruit-eating birds. Natural roost sites include tree hollows,

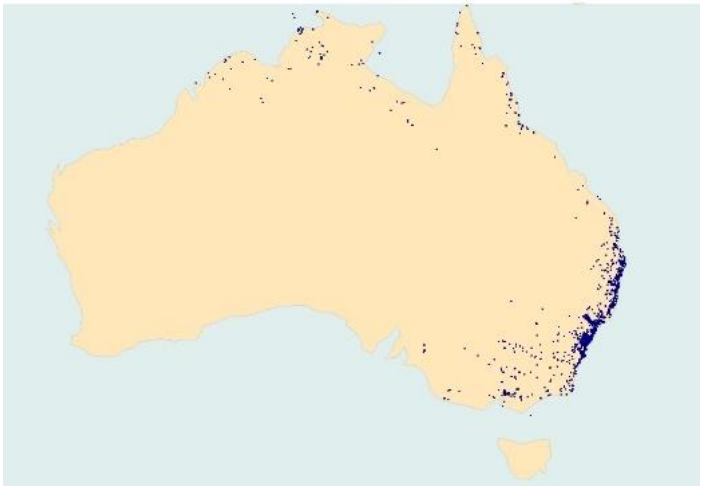
sheltered locations within epiphytes, and under peeling bark. Long-eared bats feed on the ground as well aerially and are sometime caught in pitfall buckets or are observed launching from the ground on tracks in forest on the Sunshine Coast. These bats use passive hearing and sight to target and capture active prey more so than any other microbat.



Anabat Swift recording, full spectrum rendered in Kaleidoscope Lite. Compressed view. Characteristic feature: Calls are steep linear calls, with consistent slope, usually spaced >95ms apart. Can not be distinguished and should be referred to as *Nyctophilus* sp. These are soft calls which often produce short sequences.

Lage-footed myotis *Myotis macropus* (F. Vespertilionidae)

Superseded names: *Myotis adversus*



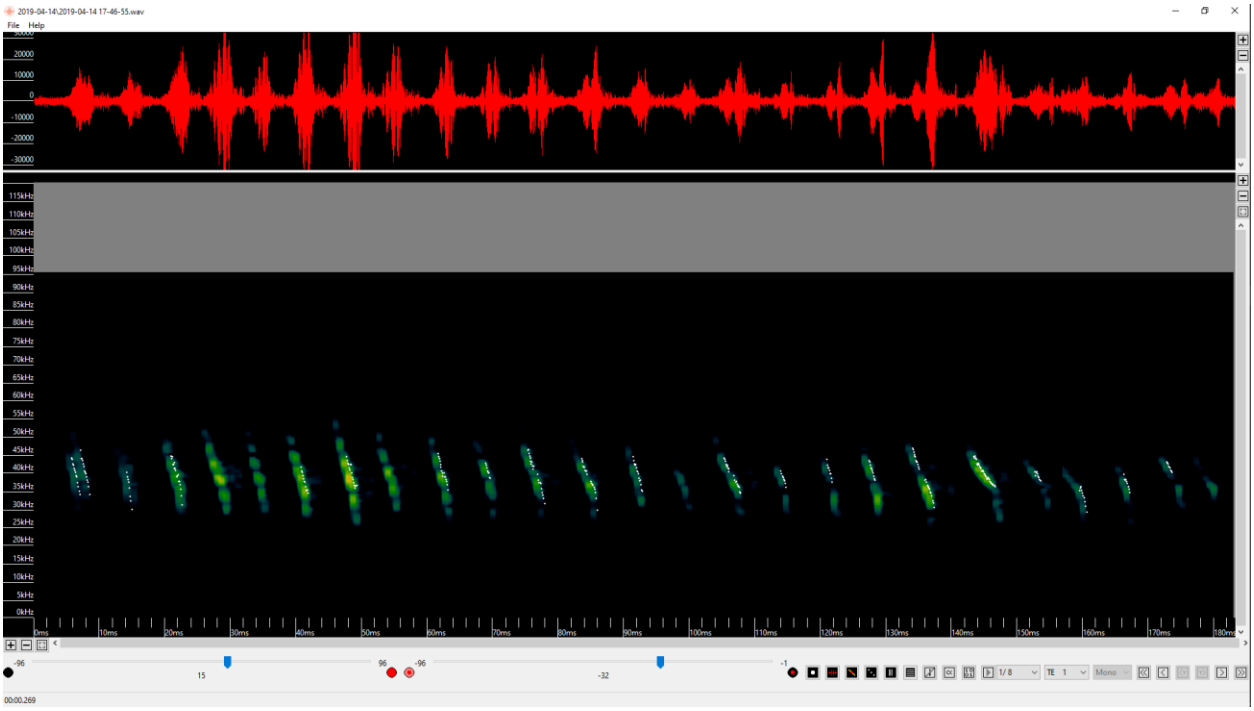
Identification Forearm 38.4mm; Weight 8.3g. This species can be distinguished in the hand by its proportionally larger toes than any other microbat. Its foraging behaviour also sets it apart from all other species.

Echolocation Call The call of this species consists of a series of near vertical pulses, with pulse interval typically <75ms apart. Pulses within a call sequence have variable slope, and when viewed in compressed mode this feature becomes obvious.

Distribution and habitat This species forages over calm water bodies including ponds, lakes, creeks and rivers. It is potentially found over any calm water on the Sunshine Coast area. This species has disappeared from sites on the Sunshine Coast following development which has resulted in widespread land clearing, despite the persistence of aquatic habitats.

Ecology This species uses it's oversized feet to rake the water's surface for aquatic insects, crustaceans and small fish. They also consume flying insects from just above the surface and less commonly adjacent to the water. These bats roost in rock overhangs over water,

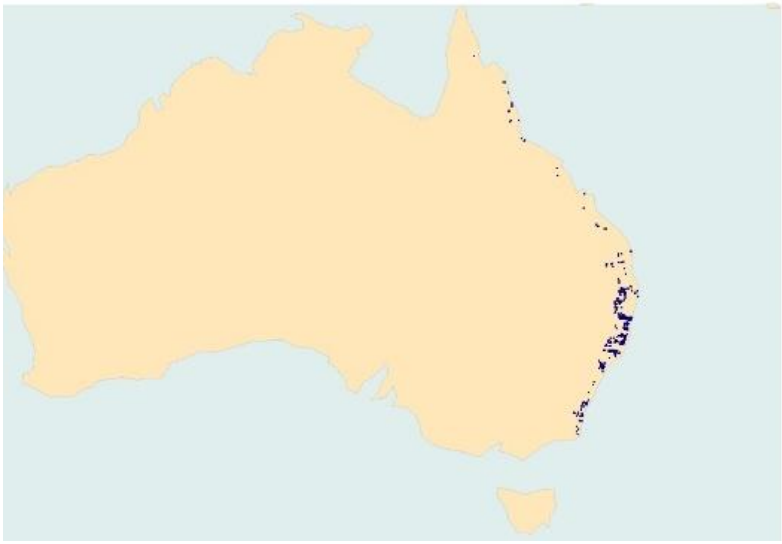
and within caves and culverts over or close to water. In sites not directly over water, they use cracks and crevices, or fairy martin nests within these sites.



Anabat Swift recording, full spectrum rendered in Kaleidoscope Lite. Compressed view. Characteristic feature: Calls are steep linear calls, with changeable slope between pulses, usually spaced <75ms apart. These are loud calls which often produce long call sequences. Typically only collected at or near open water.

Golden tipped bat *Phoniscus papuensis* (F. Vespertilionidae)

Superseded names: *Kerivoula papuensis*

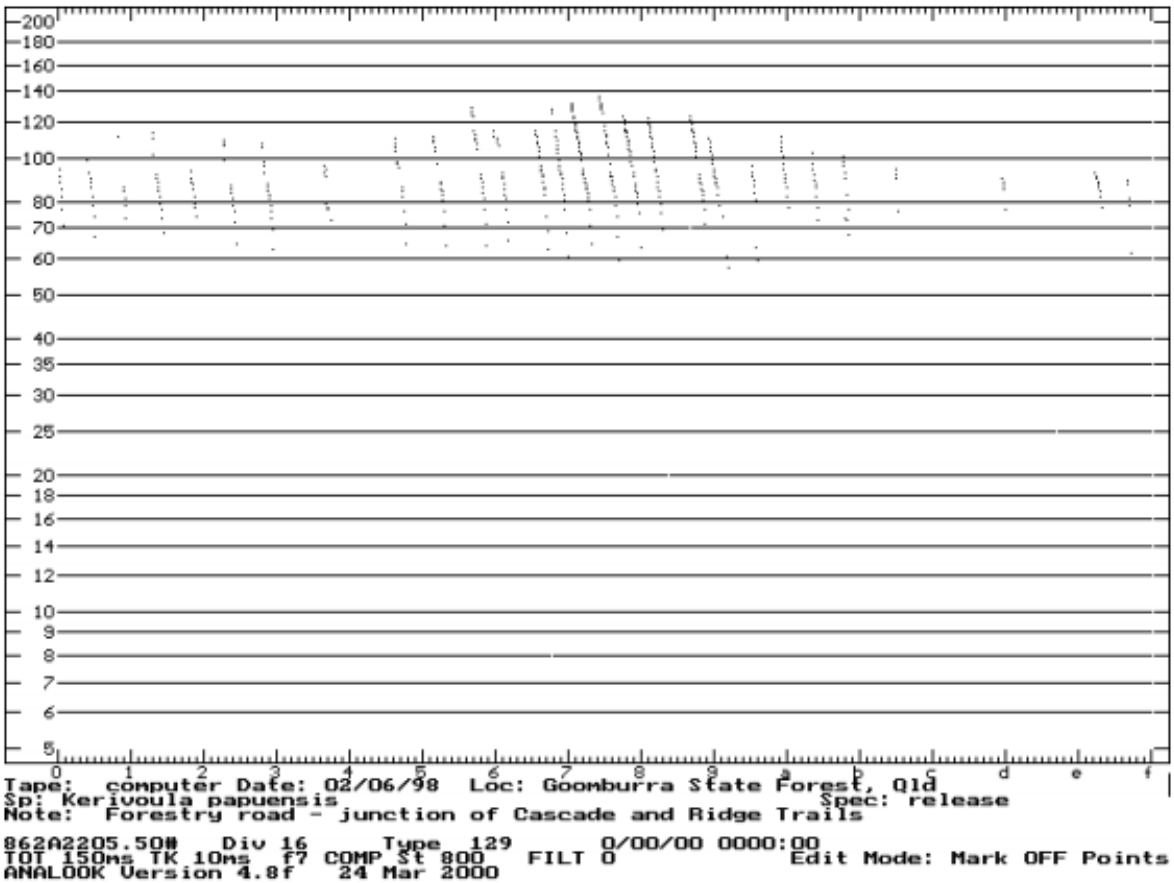


Identification Forearm 36.7mm; Weight 6.9g. This bat is easily identified in the hand by it's long, golden-tipped fur which gives it its common name.

Echolocation Call This bat has the highest frequency and softest echolocation call of any bat in Australia. It has near vertical pulses similar to *Nyctophilus* and *Myotis* but starting at a much higher frequency than either of those genera.

Distribution and habitat This bat appears to be a creature of wet sclerophyll forests and rainforest margins, although they are also found in coastal woodland and Allocasuarina forests. It is poorly documented on the Sunshine Coast.

Ecology *Phoniscus* roost in the abandoned nests of yellow-throated scrub wrens and brown gerygones, in epiphytes and tree hollows. This species is one of the most specialized of the microbats, feeding almost exclusively on orb-weaving spiders. Its broad band frequency call allows it to finely observe its prey and its web. It has well-developed, forward pointing incisors which allow it to snatch these arachnids from their webs. Anecdotal observations suggest that populations of this bat rise and fall in synch with populations of the orb-spider community. During drought conditions these spiders become scarce and observations of *Phoniscus* become rare.



Zero-crossing call sequence reproduced from Reinhold *et al.* (2001). Echolocation calls of this species are extremely soft and rarely recorded. Bat needs to be <1m from recorder. They have a similar form to *Nyctophilus* and *Myotis* species, but are a higher frequency.

Some habitats of bats of the Sunshine Coast

Microbats occur in all habitats on the Sunshine Coast and south-east Queensland, ranging from urban areas, farmland and other human created open areas, heathland, mangroves and various woodland and all open and closed forest types. The following section includes photographs of some sites encompassing this diversity of habitats and lists the bat community detected at each.

Coastal heathland, Mooloolah River National Park, Sippy Downs. *A. australis*, *C. gouldi*, *C. nigrogriseus/S. sp (Parnaby)?*, *O. lumsdenae*, *M. orianae*, *O. ridei and S. flaviventris.*

Coastal dry sclerophyll forest, Roy's Rd, Beerwah. *A. australis, C. gouldi, C. nigrogriseus/S. sp(Parnaby)*, *M. australis, M. orianae, Nyctophilus* sp, *O. ridei, O. lumsdenae, S. rueppellii, S. flaviventris*

Grassy Eucalypt forest adjacent to Mt Beerwah, Glass House Mtns. *A. australis, C. gouldii, M. australis, O. lumsdenae, S. sp (Parnaby), R. megaphyllus, S. flaviventris, V. pumilus, V, troughtoni.*

Open pasture in a mosaic of wet sclerophyll forest. *A. australis, O. ridei, O. lumsdenae, Scotorepens sp. (Parnaby), S. rueppellii, V. pumilus.*

Simple notophyll vine forest, Mary Cairncross Scenic Reserve, Maleny. *M. australis*, *N. gouldi*, *N. bifax*, *R. megaphyllus* and *V. pumilus*. *A. australis, C. gouldii, O. lumsdenae,* and *O. ridei* forage around the edges and over the top of the canopy of this forest and can sometime be recorded on detectors placed within the forest.

Coastal wet sclerophyll forest, Dularcha NP, Landsborough. *M. australis*, *Nyctophilus sp, Scotorepens sp (Parnaby), S. rueppellii, V. pumilus, R. megaphyllus (*if close to caves or large strangler fig trees*).*

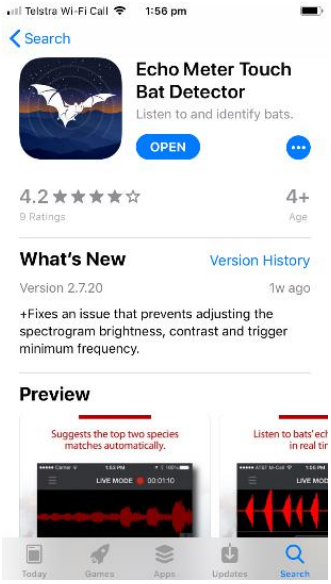
Open water bodies in forested environments, including rivers and creeks, and ponds are used as foraging areas by *M. adversus, O. ridei, S. sp (Parnaby), M. adversus, C. gouldii.*. Nearly all other bat species drink from calm water bodies and can be detected in these environments.

Urban landscape in a mosaic of regrowth Eucalypt forest, Carnarvon Crt, Beerwah. *A. australis, C. gouldii, C. nigrogriseus/Scotorepens sp(Parnaby), M. orianae, O. lumsdenae, O. ridei, S. flaviventrus, V. troughtoni.*

An illustrated guide to using the Echometer Touch bat detector

The following guide provides step by step instructions for using the Echometer Touch bat detector to detect and identify microbats. These detectors can be used for either active (i.e. hand-held) or passive (set and forget) bat detecting. Bat activity is highest in warm, calm evenings, in the hour or so immediately after dark, and near ponded or calm freshwater, where they drink. Tracks through dense forest form flyways for bats and can concentrate their movements. To fully sample the bat community in your area of interest, it is best to use your detector in as many different environments as possible and over multiple nights.

1. Install EchoMeter Touch Bat Detector app by Wildlife Acoustics Inc from The Apple app store or Google Play to your device.



2. Once installed open the app. You will be prompted to insert the ultrasonic module. If your phone has a protective case, you may need to use a dock extender and if you have an Android phone you may need to use the adapter.

3. The app opens in '**Live Mode**' where the sound images will move from right to left across the screen. Tap the button with the three vertical bars to shift between '**real time**' and '**compressed**'. Compressed mode simply removes the gaps between the calls.

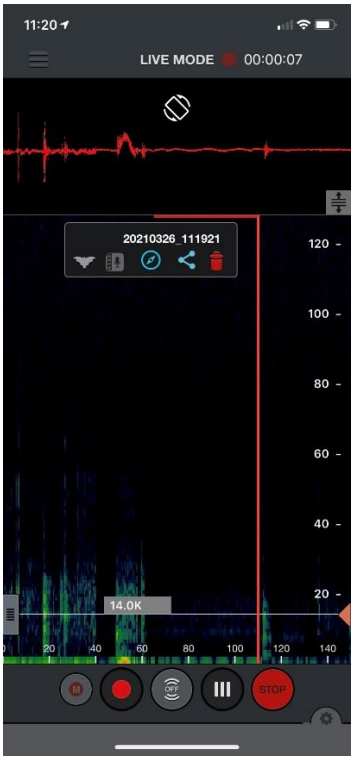
4. To hear microbat calls, tap the centre button to shift between **HET** (heterodyne) and **RTE** (Real-time Expansion) conversion modes. You may also need to adjust the volume of your phone.

5. Tap the cogwheel in the bottom right-hand corner to access the brightness and contrast settings. Also change the trigger minimum frequency to 12kHz to reduce the number of false triggers caused by insects. On the main screen an orange triangle will indicate the minimum trigger frequency.

6. Tap the menu button (three horizontal bars in the top left hand corner) to access the menu, select '**Advanced Settings**' and turn '**Real-Time Auto ID**' off. This function only works in Nth America and Europe. If you need to restore default settings just tap '**Information**' in the menu screen and then the '**Restore Defaults**' button.

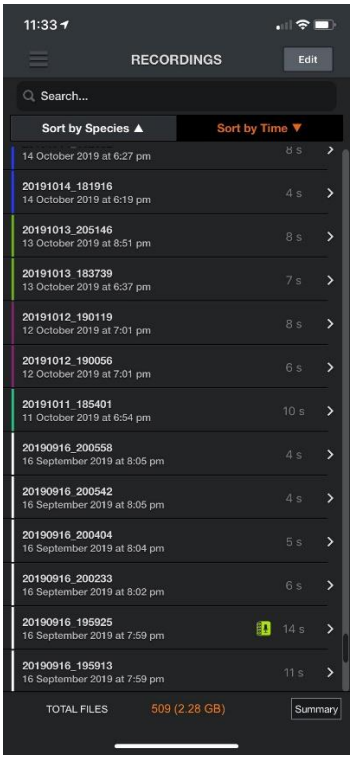
7. Return to '**Live**' mode through the menu and tap the record button (red dot) at the bottom of the main screen. A timer and a red blinking dot will appear beside the words '**Live Mode**' at the top of the main screen. Once the record mode is activated any microbat-like ultrasonic sounds will be automatically recorded. For static recording (i.e., leaving your phone out for 2 hours to overnight) reduce volume to zero, disable mobile/Bluetooth and Wi-Fi (use aeroplane setting) and lock the screen to maximise battery life. Seal the phone in a zip lock bag for weatherproofing.

8. To end the recording tap the '**Record**' button again.



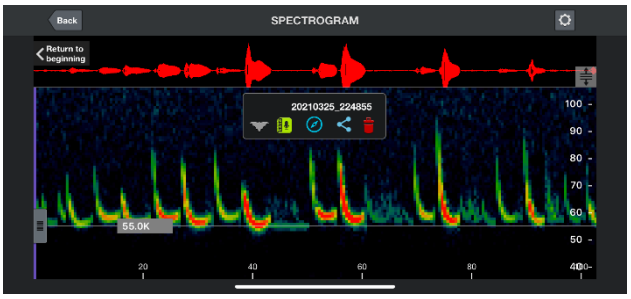
9. To review your recordings, tap the menu button and then the '**Recordings'** button to see all the recordings saved on your phone. Each different date should be colour coded.

10. From here you can view, edit and delete your recordings.

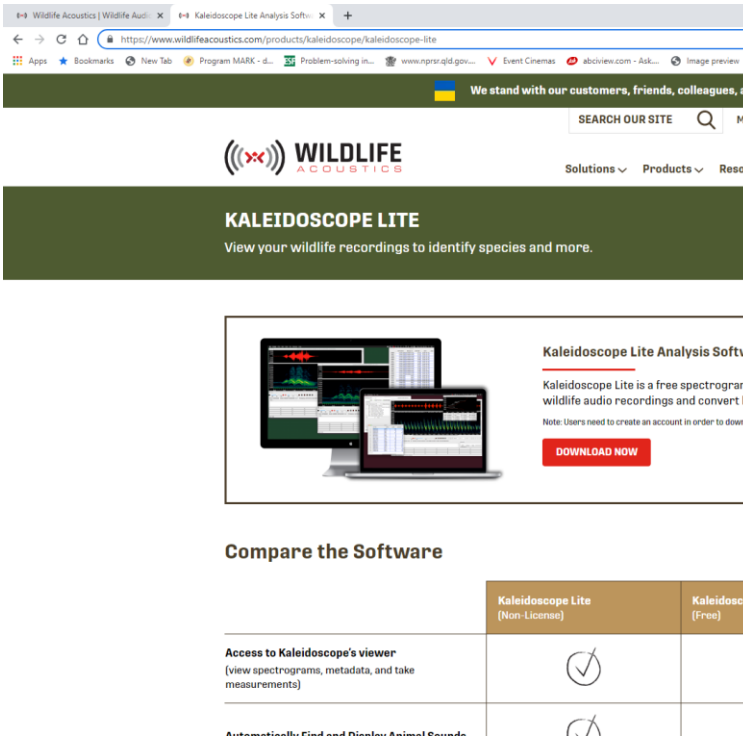


11. To see more of a call, try turning your phone on to its side to view it in landscape mode.

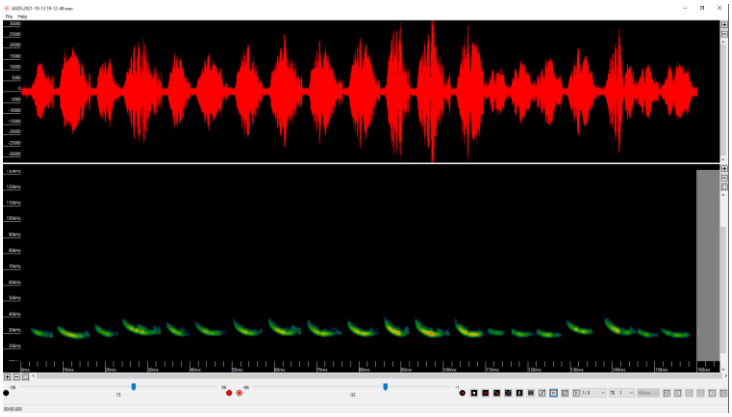
12. Recorded calls can also be downloaded to a compatible laptop or external hard drive for storage and viewing on a larger screen.



13. Download calls from your phone folder to a folder on your computer
14. Download your call visualiser of choice. The free-to-download *Kaleidoscope Lite* is your best free option if using EchoMeter Touch (https://www.wildlifeacoustics.com/products/kaleidoscope/kaleidoscope-lite).



15. Once downloaded and installed, open Kaleidoscope and use the File > Open menu (top right) to select and view a WAV file.
16. Choose the best settings to view your calls (I suggest full spectrum setting).
17. Play around with the settings and view the Kaleidoscope online tutorials.
18. Use the arrow buttons to move (bottom right) to move back and forth between call and folders.



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Other information resources

Aust Bat Society (https://www.ausbats.org.au/) A source of all sorts of information on Australian bats including distribution and conservation status).

How to report a suspect case of WNS Jun 2016.docx
https://www.wildlifehealthaustralia.com.au/Portals/0/Documents/ProgramProjects/How_to_report_a_suspect_case_of_WNS.pdf

Software resources

AnabatInsight free download for analysis and visualisation of files recorded on 2nd generation Anabat detectors (i.e. Express, Swift, Scout, Walkabout) only. You need to purchase a licensed version of AnabatInsight if you wish to work with files recorded on non-Anabat bat dtectors, including EchoMeter Touch devices. https://www.titley-scientific.com/au/anabat-insight.html

AnalookW free download for visualization and analysis of zero-crossing files. This is legacy software created to support st generation Anabat , there is no reason to be using zero-crossings sound files when using EchoMeter Touch. https://users.lmi.net/corben/Beta/

Kaleidoscope Lite file conversion and visualization. This is the free software of choice when working with EchoMeter Touch recordings.
https://www.wildlifeacoustics.com/products/kaleidoscope/kaleidoscope-lite