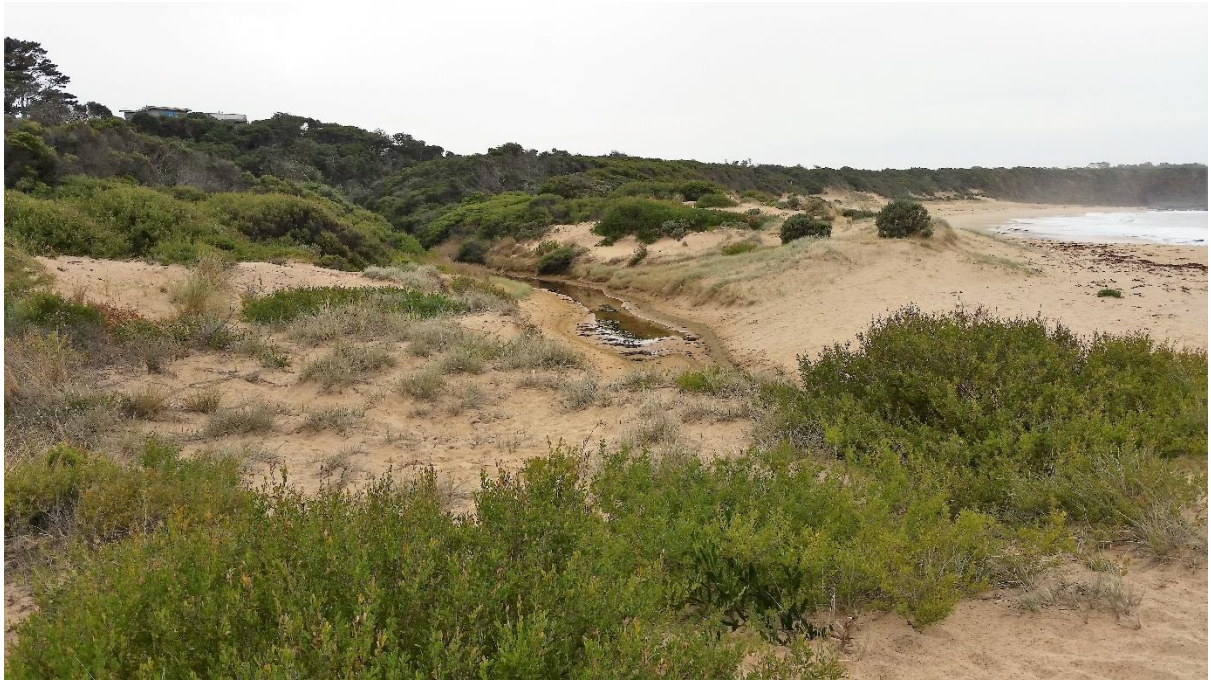
A survey of the vertebrate fauna of Undertow Bay foreshore, Cape Paterson, April 2018.



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1. Summary

A survey of the vertebrate fauna of the Undertow Bay foreshore near Cape Paterson, South Gippsland was conducted in mid-April, 2018. Fifty-five vertebrate species were recorded comprising fifteen mammals, 35 birds, three reptiles and two amphibians. The native Swamp Rat was recorded in significant numbers. The usual burrows and runway systems constructed by this species were found in all parts of the study area. The introduced House Mouse and Black Rat were recorded in large numbers. The threatened Lewin's Rail and the uncommon Pink Robin were recorded by surveillance camera in dense Melaleuca vegetation along Pea Creek. The threatened Hooded Plover was recorded during a preliminary visit in November 2017. Four species of insectivorous bats were recorded for the first time in this part of Victoria. The Weasel Skink was recorded for only the second time in the Wonthaggi/Bunurong district. Numerous species were detected by surveillance camera, including a Common Wombat with pouched young, confirming breeding for this species.

2. Introduction

A survey of the vertebrate fauna of the Undertow Bay foreshore, Cape Paterson, South Gippsland, Victoria was conducted over six days from 8 April 2018 to 13 April 2018. A preliminary visit was also made to the study site on 11 November 2017.

The purpose of the survey was to determine which species of mammals, birds, reptiles and amphibians currently inhabit the area.

The study site is situated approximately 110 kilometres SSE of the Melbourne CBD near the coastal town of Cape Paterson (Fig. 1.). The area is covered by Natmap, 1:100,000, Sheet No. 8020 (Wonthaggi). The MGAs for the central point of the area are 800E, 186N. The site covers approximately six hectares and is managed by Bass Coast Council.

Ecological Vegetation Classes include Coastal Headland Scrub, Coastal Dune Grassland Mosaic and Sand Heathland/Wet Heath Mosaic. A small ephemeral stream, known as Pea Creek flows through the study site.

The survey was commissioned by the Cape Paterson Residents and Ratepayers Association Inc. and was conducted by Peter Homan Fauna Consultancy.

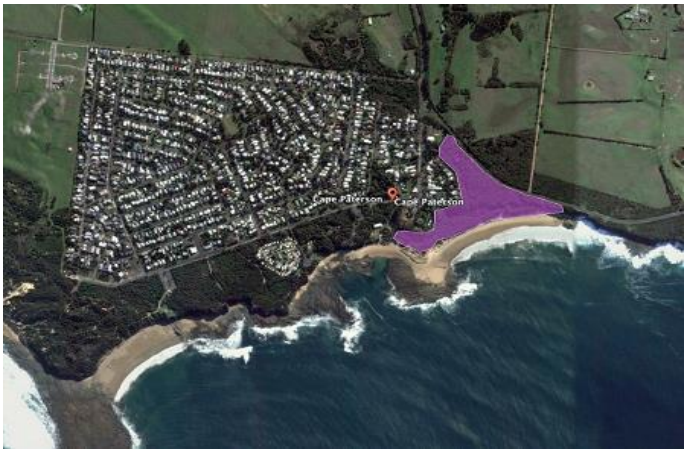

Fig. 1. Location of study site near Cape Paterson.

3. Methods

Survey techniques included Elliott trapping, Type A (Elliott Scientific Equipment, Upwey, Victoria), herpetofauna funnel trapping (Ecosystematica Environmental Consultants, WA), harp trapping (Faunatech, Bairnsdale, Victoria), remote surveillance cameras (Scoutguard, Models KG-680V & SG-990V, China), bat detector (Anabat Express, Titley Scientific, USA), spotlighting on foot (Klarus FH-10 Hunting Torch), active herpetofauna searching (log, rock and debris turning: scanning possible basking sites with binoculars), bird count and general observation.

A grid of 20 Elliott traps was established in Sand Heathland/Wet Heath Mosaic east of Pea Creek. Trap-lines and traps were ten metres apart. An additional 10 Elliott traps was set in dense vegetation along Pea Creek. Baits consisted of a mixture of smooth peanut butter, quick oats and golden syrup. Elliott traps were closed during the day.

One line of 20 reptile/amphibian funnel traps was set in the Sand Heathland/Wet Heath Mosaic area. Funnel traps were set in pairs, three to four metres apart, each side of a 30cm high aluminium flywire drift fence that stretched for 36 metres. Funnel traps were left open for night-time and day-time sampling.

A harp trap was set along a walking track that passed through the study site. A bat detector was set in another location overlooking a steep slope above Pea Creek.

Six remote surveillance cameras were set in the Sand Heathland/Wet Heath Mosaic east of Pea Creek. A further four cameras were set in the headwaters of Pea Creek, opposite the nearby sports complex. Cameras were set for 20 second videos (every two seconds) over a 24 hour cycle.

Overall, 230 trap-nights were completed. These consisted of 120 Elliott trap-nights, 60 funnel trap-nights, 2 harp trap-nights, 2 bat detector-nights and 46 surveillance camera-nights.

4. Results

Fifty-five vertebrate species were recorded during the study.

4.1 Mammals

These included fifteen mammals, of which thirteen were native species and two were introduced (Table 1.). One species was monotreme, four were marsupial and ten were eutherian. Significant numbers of Swamp Rat *Rattus lutreolus* were captured in Elliott traps (Fig. 2). The usual burrows and runways constructed by this common native rodent were found in all parts of the study area. Large numbers of the introduced House Mouse *Mus musculus* were also captured in Elliott traps. Large numbers of the introduced Black Rat *Rattus rattus* were detected by surveillance cameras. Short-beaked Echidna *Tachyglossus aculeatus*, Common Wombat *Vombatus ursinus*, Black Wallaby *Wallabia bicolor*, Common Brushtail Possum *Trichosurus vulpecula*, Common Ringtail Possum *Pseudocheirus peregrinus*, House Mouse and Swamp Rat were also detected by surveillance camera. A Common Wombat with pouched young was recorded by surveillance camera, confirming breeding for this species. Several active Common Wombat burrows were also found. Little Forest Bat *Vespadelus vulturnus* and Lesser Long-eared Bat *Nyctophilus geoffroyi* were captured in a harp trap. The White-striped Freetail Bat *Tadarida australis* was heard at night during spotlighting. A bat detector recorded Little Forest Bat, Large Forest Bat *Vespadelus darlingtoni*, Gould's Wattled Bat *Chalinolobus gouldii*, Chocolate Wattled Bat *Chalinolobus morio* and Southern Freetail Bat *Mormopterus planiceps*. Common Brushtail Possum and Common Ringtail Possum and were seen during spotlighting.

Taxonomy and common and scientific names follow Menkhorst and Knight (2011).

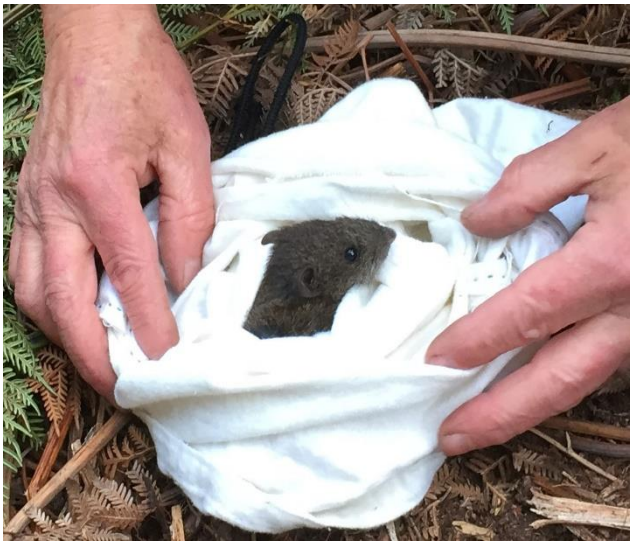

Fig. 2. Swamp Rat.

4.2 Birds

Thirty-five species of birds were recorded (Table 2.). Thirty-three species were native and two were introduced. Three threatened species were recorded (DSE 2013; DELWP 2018):

1. Hooded Plover *Thinornis rubricollis*. Two seen during preliminary visit, November, 2017.
2. Lewin's Rail *Lewinia pectoralis*. At least one individual recorded by surveillance camera during main study period.
3. White-throated Needletail *Hirundapus caudacutus.* A large flock was seen over the study site on one occasion during the main study period.

One Southern Boobook *Ninox novaeseelandiae* was found dead during the preliminary visit in November 2017. A Brown Goshawk *Accipiter fasciatus* was seen to take unidentified prey from the ground amongst dense vegetation during the main study period. Other notable species recorded included Pink Robin *Petroica rodinogaster*, Eastern Yellow Robin *Eopsaltria australis*, Common Bronzewing *Phaps chalcoptera*, Yellow-faced Honeyeater *Lichenostomus chrysops* (Fig. 3), Spotted Pardalote *Pardalotus punctatus* (Fig. 4), Bassian Thrush *Zoothera lunulata*, Eastern Spinebill *Acanthorhynchus tenuirostris*, White-naped Honeyeater *Melithreptus lunatus*, White-eared Honeyeater *Lichenostomus leucotis*, Crescent Honeyeater *Phylidonyris pyrrhopterus*, Grey Fantail *Rhipidura albiscapa*, Silvereye *Zosterops lateralis* Grey Shrike-thrush *Colluricincla harmonica* and Red-browed Finch *Neochmia temporalis*.

Taxonomy and common and scientific names follow Christidis and Boles (2008).

Fig. 3. Yellow-faced Honeyeater

Fig. 4. Spotted Pardalote

4.3 Reptiles

Three species of reptiles, all skinks, were recorded (Table 3.). The Southern Grass Skink *Pseudemoia entrecasteauxii,* Weasel Skink *Saproscincus mustelinus* (Fig. 5) and Metallic Skink *Niveoscincus metallicus* were captured in funnel traps. Several Metallic Skinks were also seen basking on logs.

Taxonomy and common and scientific names follow the Victorian Biodiversity Atlas.

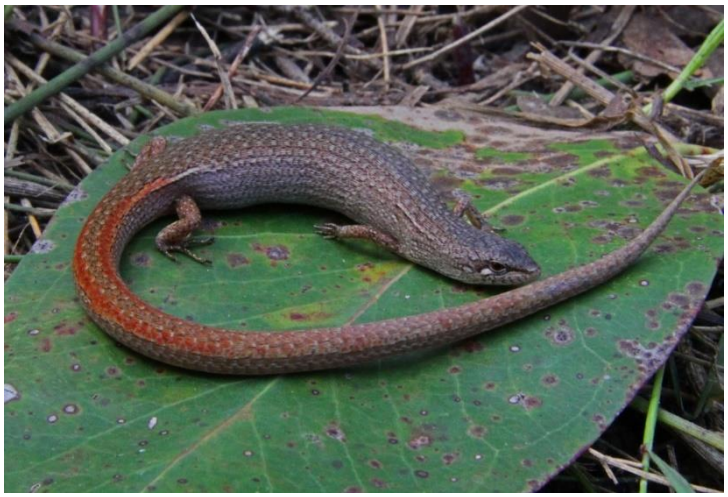

Fig. 5. Weasel Skink.

4.4 Amphibians

Two species of amphibians were recorded (Table 4.). One species was a hylid (tree) frog and one was a myobatrachid frog. Several Southern Bullfrog (also called Pobblebonk Frog) *Limnodynastes dumerilli* (Fig. 6) were captured in funnel traps. Southern Brown Tree Frog *Litoria ewingii* was heard several times, especially near Pea Creek.

Taxonomy and common and scientific names follow the Victorian Biodiversity Atlas.

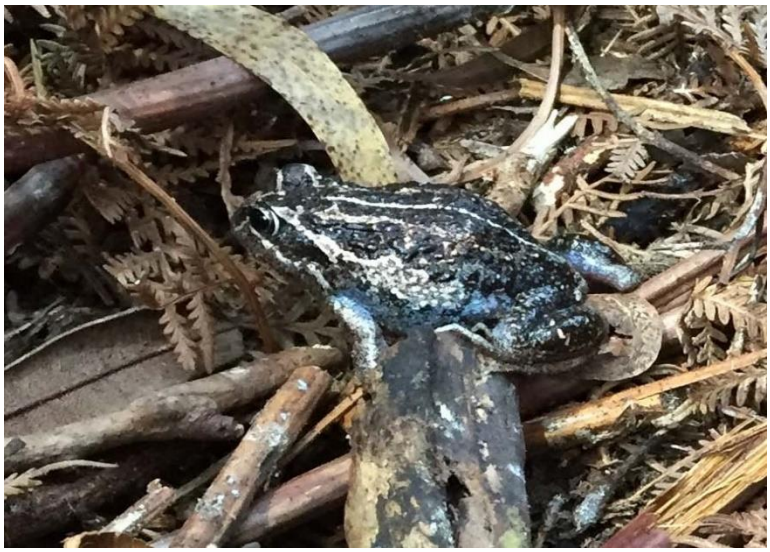

Fig. 6. Southern Bullfrog or Pobblebonk Frog.

Table 1. List of mammals and number recorded. E indicates estimated number; * indicates introduced species.

Common Name	Scientific Name	Number
Short-beaked Echidna	*Tachyglossus aculeatus*	1
Common Wombat	*Vombatus ursinus*	2
Common Brushtail Possum	*Trichosurus vulpecula*	3
Common Ringtail Possum	*Pseudocheirus peregrinus*	7
Black Wallaby	*Wallabia bicolor*	3
White-striped Freetail Bat	*Tadarida australis*	3
Southern Freetail Bat	*Mormopterus planiceps*	1
Gould's Wattled Bat	*Chalinolobus gouldii*	1
Chocolate Wattled Bat	*Chalinolobus morio*	1
Large Forest Bat	*Vespadelus darlingtoni*	1
Little Forest Bat	*Vespadelus vulturnus*	10
Lesser Long-eared Bat	*Nyctophilus geoffroyi*	3
House Mouse	*Mus musculus* *	30E
Swamp Rat	*Rattus lutreolus*	30E
Black Rat	*Rattus rattus* *	30E

Table 2. List of birds and number recorded. E = estimated number; * indicates introduced species; **T** indicates threatened species.

Common Name	Scientific Name	Number
Chestnut Teal	*Anas castanea*	2
Spotted Dove	*Streptopelia chinensis* *	3
Common Bronzewing	*Phaps chalcoptera*	1
White-throated Needletail	*Hirundapus caudacutus,* **T**	60E
White-faced Heron	*Egretta novaehollandiae*	1
Australian White Ibis	*Threskiornis molucca*	1
Brown Goshawk	*Accipiter fasciatus*	1
Lewin's Rail	*Lewinia pectoralis*, **T**	1
Hooded Plover	*Thinornis rubricollis*, **T**	2
Crimson Rosella	*Platycercus elegans*	1
Southern Boobook	*Ninox novaeseelandiae*	1
Laughing Kookaburra	*Dacelo novaeguineae*	2
Superb Fairy-wren	*Malurus cyaneus*	8E
White-browed Scrubwren	*Sericornis frontalis*	12E
Brown Thornbill	*Acanthiza pusilla*	10E
Spotted Pardalote	*Pardalotus punctatus*	2
Eastern Spinebill	*Acanthorhynchus tenuirostris*	2
Yellow-faced Honeyeater	*Lichenostomus chrysops*	6E

White-eared Honeyeater	*Nesoptilotis leucotis*	1
Little Wattlebird	*Anthochaera chrysoptera*	2
Red Wattlebird	*Anthochaera carunculata*	10E
Crescent Honeyeater	*Phylidonyris pyrrhopterus*	3
New Holland Honeyeater	*Phylidonyris novaehollandiae*	5
White-naped Honeyeater	*Melithreptus lunatus*	6E
Grey Shrike-thrush	*Colluricincla harmonica*	2
Grey Butcherbird	*Cracticus torquatus*	3
Australian Magpie	*Cracticus tibicen*	2
Grey Fantail	*Rhipidura albiscapa*	6E
Pink Robin	*Petroica rodinogaster*	1
Eastern Yellow Robin	*Eopsaltria australis*	10E
Silvereye	*Zosterops lateralis*	20E
Welcome Swallow	*Hirundo neoxena*	2
Bassian Thrush	*Zoothera lunulata*	1
Common Blackbird	*Turdus merula* *	6E
Red-browed Finch	*Neochmia temporalis*	1

Table 3. List of reptiles and number recorded.

Common Name	**Scientific Name**	**Number**
Metallic Skink	*Niveoscincus metallicus*	5
Southern Grass Skink	*Pseudemoia entrecasteauxii*	2
Weasel Skink	*Saproscincus mustelinus*	1

Table 4. List of amphibians and number recorded. E = estimated number.

Common Name	**Scientific Name**	**Number**
Southern Brown Tree Frog	*Litoria ewingi*	8E
Southern Bullfrog	*Limnodynastes dumerilli*	7

5. Discussion.

A number of surveys of vertebrate fauna have been conducted since 1999 in South Gippsland especially in the general Wonthaggi district and coastal areas between Harmer's Haven and Inverloch in areas managed by Parks Victoria (Homan 1999, 2002, 2003a, 2003b, 2006, 2007, 2008, 2010; Parks Victoria 2006; FNCV unpub.data; RMIT unpub.data). These studies have produced records of a wide range of taxa including several rare and threatened species, including Swamp Antechinus *Antechinus minimus*, Growling Grass Frog *Litoria raniformis,* Southern Toadlet *Pseudophryne semimarmorata*, Swamp Skink *Lissolepis coventryi* and Lewin's Rail (DSE 2013; DELWP 2018).

Lewin's Rail is a secretive, ground-dwelling, marshland bird that is seldom seen by investigators (Menkhorst *et al.* 2017). The species inhabits dense cover amongst reeds, saltmarsh and tussocks of coastal and near coastal wetlands where it forages for invertebrates in shallow water or on exposed mud and bare ground (Menkhorst *et al*. 2017). Little is known about the movements of Lewin's Rail and records of the species are rare and opportunistic. Consequently, in Victoria, Lewin's Rail is listed as threatened under the *Flora and Fauna Guarantee Act 1988* (DELWP 2018). One other coastal record exists for this rare bird in the Bunurong district. During a survey of vertebrate fauna at Harmers Haven in 2003, one Lewin's Rail was captured in a cage trap that was set in reeds beside Coal Creek, approximately four kilometres west of Undertow Bay (Homan 2003b). That capture was the first record for the species along this part of the Victorian coast. At least two other records of Lewin's Rail exist for areas closer to Wonthaggi (G. Glare pers. comm.). The new record of this threatened species at Undertow Bay during the current survey is especially noteworthy and shows the importance of preserving even relatively small areas of wildlife habitat. The Melaleuca vegetation along Pea Creek, upstream of the small foot bridge and opposite the sporting complex, appears to be ideal habitat for Lewin's Rail and may well support other rare and secretive taxa. The lower sections of Pea Creek, below the waterfall, would almost certainly support similar species.

The Pink Robin is an uncommon species that usually inhabits deep, dark mountain forests of Victoria and far south-eastern New South Wales (Menkhorst *et al*. 2017). The species is more common and widespread in Tasmania and some Bass Strait islands. During autumn and winter Pink Robins, especially females and immature birds, disperse widely and can be found in many unexpected places, including coastal scrub (Menkhorst *et al*. 2017). Despite that the species has not been previously recorded along any part of the coast between Cape Paterson and Inverloch (Victorian Biodiversity Atlas). However, two records exist for Pink Robin from a site near Harmer's Haven from May 2000 (Victorian Biodiversity Atlas). Therefore the recording of an adult female Pink Robin by surveillance camera amongst Melaleuca scrub near Pea Creek during the current survey is especially noteworthy.

The Bush Rat *Rattus fuscipes* is probably the most common native, eutherian mammal in south-eastern Australia (Menkhorst 1995). The species is widespread and inhabits many vegetation communities wherever deep soils provide the opportunity to dig burrows. In the Wonthaggi/Bunurong district Bush Rats are most common in the Wonthaggi Heathland Nature Conservation Reserve. The species was also found at several sites within the Harmer's Haven Flora and Fauna Reserve during a survey of vertebrate fauna in 2003 (Homan 2003b). However, the species was found to be absent from all study sites within the Bunurong Coastal Park during a similar

study in 2002 (Homan 2002). When the Bush Rat disappears from any given area, for whatever reason, the introduced Black Rat *Rattus rattus* often invades the area and occupies a similar niche to the native rodent. The Black Rat and the Bush Rat have similar diets and foraging habits, but there is no evidence that Black Rats actually displace Bush Rats. The nearest coastal records of Bush Rat are from a gully at the end of Wilson's Road, approximately two kilometres south-west of Undertow Bay (Homan 2003b). For some unknown reason the habitat at the Undertow Bay study site appears to no longer suit the native Bush Rat. The introduced Black Rat is now well established in this area with a significant and permanent population.

The Swamp Rat is found over a wide area of southern and coastal Victoria (Victorian Biodiversity Atlas). The species inhabits heathlands, native grasslands, coastal scrubs and roadside verges invaded by introduced weeds (Menkhorst 1995). During surveys of vertebrate fauna along the Bunurong coast and Harmer's Haven, Swamp Rats were recorded in numerous locations (Homan 2002, 2003b). During the current survey, Swamp Rat was found to be very abundant and was the only small, terrestrial native mammal recorded throughout the study site. Indeed, the typical burrows and runway systems constructed by this species were found in all vegetation communities, including swathes behind sand-dunes and along the "estuary" section of Pea Creek. Captured Swamp Rats were weighed and their sex determined. Each individual was found to be in excellent condition and included adults and sub-adults, confirming breeding at the study site. The Swamp Rat was recorded at a very high capture rate of 19% indicating that the Undertow Bay study site provides ideal habitat for this species. Capture rates have been much lower at other nearby survey sites. At the Bunurong Coastal Reserve, the capture rate for Swamp Rat was 3.7% (Homan 2002); at Harmer's Haven Flora and Fauna Reserve the capture rate was 2.1% (Homan 2003b); and at Wonthaggi Heathlands was 3.3% in September 2017 (RMIT unpub.data). Fortunately the native Swamp Rat and the introduced Black Rat have very different diets and foraging habits and are able to persist together in suitable habitat.

In recent years major changes in technology have seen a significant shift in survey methods to detect the presence of terrestrial mammals of all sizes, arboreal mammals and many reptiles. Developments in devices to detect the presence of insectivorous bats have advanced greatly over recent years. The use of surveillance cameras (also called camera traps) is now widespread amongst investigators and is often the first technique of choice used in surveys of terrestrial mammals and, in more recent times, surveys of reptiles and secretive birds (Meek and Fleming 2014; Welbourne *et al*. 2015).

During the current survey at Undertow Bay foreshore surveillance cameras were set at two locations within the study site, including along sections of Pea Creek as well as amongst the fairly large area of Sand Heathland/Wet Heath Mosaic. This EVC was chosen as the best possible location to record Swamp Antechinus within the study site. Indeed, one Swamp Antechinus was previously recorded in a section of the Bunurong Coastal Reserve, several hundred metres east of Undertow Bay (Homan 2002). Unfortunately no evidence of Swamp Antechinus was found during the current study; however, it is possible that individuals of this species may occupy the study site from time to time. Wherever Antechinus persist the introduced House Mouse cannot compete. The large population of House Mice in the study area suggests that currently Swamp Antechinus is most certainly absent. Indeed, the capture rate for House Mouse during the current survey was a high 17.5%. Many House Mice were also recorded by surveillance camera.

Seven species of insectivorous bats were recorded during the study. Four of these, Gould's Wattled Bat, White-striped Freetail Bat, Large Forest Bat and Southern Freetail Bat, have never previously been recorded along this part of the Victorian coast. All seven species recorded are widespread and

common throughout most of Victoria (Churchill 2008); however, bat field studies are fairly specialised and few experienced investigators have conducted insectivorous bat surveys in the Wonthaggi/Bunurong district.

The Weasel Skink is a common lizard found over a wide area of south-eastern Australia (Wilson and Swan 2013). The species is often recorded during reptile trapping surveys and is commonly found under logs, rocks and human debris. However, despite considerable survey effort over the last 20 years in the Wonthaggi/Bunurong district, the capture of one individual during the current survey represents only the second available record for this species in this part of Victoria. The first record of Weasel Skink was at the Wonthaggi Heathlands in October 2013 (RMIT unpub.data). The Metallic Skink and Southern Grass Skink, both captured in funnel traps during the current survey, have been recorded numerous times in all other local conservation reserves and on private properties.

A number of other species may almost certainly occupy or visit the Undertow Bay area. The threatened Swamp Skink has been recorded from two sites near Harmer's Haven and from one site along the Bunurong coast (Homan 2002; 2003b). The species is often seen basking on fallen Melaleuca logs and trunks. The area with suitable habitat around the headwaters of Pea Creek was searched extensively during the current survey, however, no Swamp Skinks were seen. Several other species of skinks and two species of snakes are very likely to be present. Other mammals are likely to be present or visit the area. Indeed, local residents adjacent to the study site report sightings of Koala *Phascolarctos cinereus* as recently as December, 2017 and Lowland Copperhead *Austrelaps australis* in 2017 (N. Duncan pers. obs.). Several species of amphibians may also be present, including the threatened Southern Toadlet, which breeds in autumn in damp sites that may flood after rain (Hero *et al.* 1991). The Southern Toadlet has been recorded at one other local site in the Wonthaggi Heathlands with very similar habitat to that along Pea Creek (Homan 2003a). Several migratory woodland birds would be expected to occupy the area during early spring each year (Pizzey and Knight 2012). A range of these birds, migrating to south-east Australia to breed, have been recorded regularly in the Wonthaggi/Bunurong district especially at the Wonthaggi Heathlands (G. Glare, T. Allen, J. & A. Whitelaw, C. Boase pers. obs.)

6. Acknowledgements.

The survey was conducted under the terms of Research Permit no. 10007833 issued by the Department of Environment, Land, Water and Planning and approval no. 21.15 of the Wildlife and Small Institutions Animal Ethics Committee of the Department of Economic Development, Jobs, Transport and Resources (DEDJT&R). Biometrics were conducted under the terms of Scientific Procedures Fieldwork Licence no. 20013 issued by DEDJT&R. Maryrose Morgan of Carlton provided field assistance. Barry James, Peter Muskens and Melynda Dawson of Cape Paterson Residents and Ratepayers Association Inc. also provided much appreciated assistance. The study was funded by the Wettenhall Environment Trust and Bass Coast Council for the Cape Paterson Residents and Ratepayers Association Inc.

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