BATS OF COASTAL SOUTHWESTERN TASMANIA

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(with two tables and one text-figure)

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https://doi.org/10.26749/rstpp.130.1.1 ISSN 0080-4703. Faculty of Resource Science and Management, Southern Cross University, PO Box 157, Lismore, NSW, Australia 2480 (MS); Trinity Inlet Management Program, PO Box 6896, Cairns, Qld, Australia 4870 (KK). A survey of bats was undertaken in coastal southwestern Tasmania from Bond Bay north to Pilot Bay at Macquarie Harbour entrance. Survey sites were located within wet scrub and buttongrass moor vegetation communities, predominantly along watercourses or on ecotones with beaches or marsupial lawns. Of the eight species of bats so far known from Tasmania, only *Falsistrellus tasmaniensis* was not recorded in the present survey. A total of 53 individuals were captured in 111 mistnet hours from 22 survey sites sampled, including five species not previously recorded from southwestern Tasmania-*Nyctophilus timoriensis, Chalinolobus gouldii,* C. *morio, Vespadelus darlingtoni* and *V vulturnus.* The most widespread and frequently trapped species was *N. geojfroyi.* Species captured infrequently were *V regulus* and *N. timoriensis* (two sites) and *V vulturnus* (one site). **Key Words: bats, mistnet, southwestern Tasmania.**

INTRODUCTION

Little survey work has been conducted on bats in southwestern Tasmania, with the majority of survey effort confined to the vicinity of Melaleuca airstrip adjacent to Melaleuca Inlet (e.g. Schulz & Menkhorst cited in Taylor *et al.* 1987, Taylor & Comfort 1993, Department of Parks, Wildlife & Heritage records). This paper reports the results of a survey of bats of coastal southwestern Tasmania, from Bond Bay north to Macquarie Heads, which was conducted during February and early March 1993. Prior to the present survey, only three of the eight recognised bat species occurring in Tasmania had been recorded in the southwestern region — the lesser long-eared bat *Nyctophilus geoffroyi,* King River bat *Vespadelus regulus* and the Tasmanian pipistrelle *Falsistrellus tasmaniensis* (Taylor *et al.* 1987, Rounsevell *et al.* 1991, Watts 1993); the last was not found in the present study.

METHODS

The survey of bats or coastal southwestern Tasmania was undertaken as part of a general fauna survey conducted while traversing the coast on foot from Bond Bay north to Macquarie Heads between 9 February and 11 March 1993 (Schulz & Kristensen 1993a, b, Kristensen and Schulz 1994).

Twenty-two survey sites were sampled (fig. 1), from Bond Bay in the south to Pilot Bay at Macquarie Harbour entrance in the north. All sites were sampled on only a single night. Survey sites were either deliberately selected as being suitable for trapping bats, due to the presence of suspected "flyways" along creeks (Taylor & O'Neill 1985), or were set at sites where we were forced to camp for the night.

Survey sites occurred within two principal vegetation communities which, following the classification of Kirkpatrick & Dickinson (1984), were wet scrub (91%), and buttongrass moor (9%). The majority of sites were located over watercourses up to 150 m from the shoreline within wet scrub (50%) or in ecotones with beaches (23%) or marsupial lawns (9%) immediately adjacent to the shoreline (table 1). All sites were located at altitudes of less than 10 m above sea level.

Three techniques were employed to survey the bat fauna of coastal southwestern Tasmania.

(1) *Monofilament mistnetting.* At all 22 sites, between one and four monofilament mistnets of three lengths, 5.5 m, 12.9 m and 18.5 m, were set as single nets angled across watercourses or gaps in dense vegetation. In more open areas, double and triple nets were set in Y-shaped and Z-shaped patterns, as described in Helman & Churchill (1986). Nets were set for a minimum period of one hour after dusk. Taylor & O'Neill (1988) found that bats in all habitats sampled in Tasmania

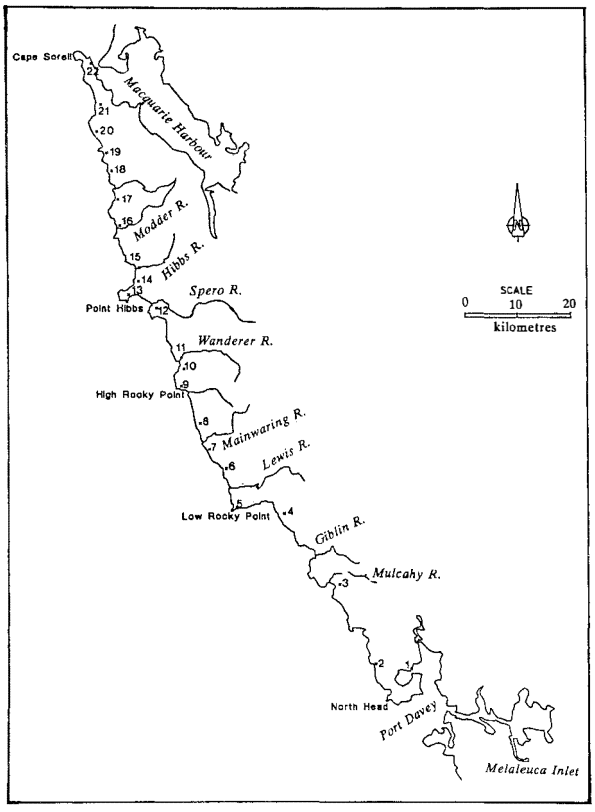

FIG. 1 — Survey sites for bat survey of coastal southwestern Tasmania. Numbers correspond with listing in table 1.

TABLE 1
Survey sites, dates of field work, broad vegetation types, trapping effort and numbers of species of bats recorded

Site no.	Locality	Grid ref.	Date	Habitat*	Trap effort†	Species recorded
1	Bond Bay beach	43°15'S, 145°54'E	9.2.93	Wet scrub/beach	4.5	1
2	Paradise Lagoon	43°15'S, 145°49'E	10.2.93	Wet scrub/creek	6.0	0
3	Alec Rivulet, Mulcahy Bay	43°07'S, 145°43'E	12.2.93	Wet scrub/creek	1.0	0
4	Unmarrah Creek mouth	43°01'S, 145°38'E	14.2.93	Wet scrub/marsupial lawn	2.25	1
5	Low Rocky Point	42°59'S, 145°29'E	16.2.93	Buttongrass moor	1.25	0
6	Sassy Creek mouth	42°55'S, 145°29'E	17.2.93	Wet scrub/creek	12.0	4
7	Stinky Creek mouth	42°53'S, 145°27'E	18.2.93	Wet scrub/marsupial lawn	10.0	4
8	Reuben Creek	42°49'S, 145°25'E	19.2.93	Wet scrub/creek	4.0	1
9	Minder Cove	42°46'S, 145°23'E	20.2.93	Wet scrub/beach	4.0	1
10	South of Hartwell Cove	42°44'S, 145°23'E	21.2.93	Wet scrub/beach	2.0	1
11	Wanderer River mouth	42°43'S, 145°23'E	22.2.93	Wet scrub/beach	4.0	1
12	Spero River mouth	42°38'S, 145°20'E	27.2.93	Wet scrub/river	9.0	2
13	Whitehorses Beach	42°37'S, 145°18'E	28.2.93	Buttongrass moor/beach	4.0	1
14	Evans Creek mouth	42°36'S, 145°18'E	1.3.93	Wet scrub/creek	4.0	3
15	Hibbs Lagoon mouth	42°34'S, 145°18'E	2.3.93	Wet scrub/creek	6.0	0
16	Modder River mouth	42°30'S, 145°15'E	3.3.93	Wet scrub/river	5.0	2
17	Birthday Creek mouth	42°27'S, 145°15'E	4.3.93	Wet scrub/creek	3.0	2
18	North of Birthday Bay	42°25'S, 145°14'E	5.3.93	Wet scrub/creek	7.5	0
19	South of Gotge Point	42°22'S, 145°13'E	6.3.93	Wet scrub	5.0	0
20	South of Sloop Point	42°20'S, 145°12'E	7.3.93	Wet scrub	7.5	0
21	South of The Grandfathers	42°16'S, 145°13'E	8.3.93	Wet scrub/creek	4.0	1
22	Pilot Bay	42°12'S, 145°12'E	10.3.93	Wet scrub	5.0	3

* Broad vegetation types (after Kirkpatrick & Dickinson 1984)/position of mistnet (over watercourses or marsupial lawn/beach ecotones).
† Trap effort measured in mistnet hours.

concentrated their foraging activities to an initial period of three hours after dark. In order to obtain a measure of relative net success for each species, the number of mistnet hours sampled at a particular site represented the number of nets set, irrespective of net length for the sample period. Mistnets were constantly monitored to retrieve bats before they chewed their way through the net and escaped.

(2) *Triplining.* This technique was only used at a single site in buttongrass moor at Low Rocky Point. Fine nylon fishing line (0.25 mm diameter) was stretched tightly about 20–30 mm above a still water surface. Bats coming in to drink hit such lines, and some are flipped into the water, forcing them to swim to the bank where they can be caught (Helman & Churchill 1986). As with mistnets, triplining requires a person to be constantly monitoring the lines in order to stop bats from reaching the bank and escaping.

(3) *Search of sea caves.* All sea caves, overhangs along watercourses and crevices in rock faces encountered were searched for roosting bats.

Mistnetting was conducted on 22 nights of the 32-day survey. Climatic conditions ranged from calm weather to wind speeds of less than 20 knots, no rain to showers and squalls, and no moon to full moon. On the remaining nine nights, survey work was not conducted, due to adverse climatic conditions with wind speeds of over 20 knots and/or constant rain, or to forced camp sites in situations where it was not feasible to erect nets, because of the nature of the terrain, the lateness of arrival or the physical condition of the authors.

RESULTS

Seven of the eight species of bats known from Tasmania were recorded in this survey. In a total of 111 mistnet hours at 22 survey sites, 53 individuals (all species combined) or 0.48 bats/mistnet hour were captured. The greatest number of species recorded from a single site was four species (two occasions) and no bats were recorded from seven sites (table 1). Trapping results for bats recorded during the survey are given in table 2. No bats were caught using the triplining technique.

Nyctophilus geoffroyi was the most commonly trapped (20 individuals) and widespread species (nine sites), with a capture rate of 1.8 individuals/ten mistnet hours. Other species recorded in more than five survey sites were *Chalinolobus morio* (nine individuals trapped at seven sites) and *C. gouldii* (11 individuals trapped at four sites). One species, *Vespadelus vulturnus,* was trapped as a single individual from one site. Two species were recorded from only two survey sites, *N. timoriensis* and *V. regulus.*

All seven species were recorded from wet scrub, while only one, *N. geoffroyi,* was trapped in buttongrass moor. Six species (*C. gouldii, C. morio, N. geoffroyi, N. timoriensis, V. regulus* and *V. darlingtoni*) were captured in mistnets set over watercourses fringed by wet scrub. Four species (*C. gouldii, C. morio, N. geoffroyi* and *V. darlingtoni*) were trapped on the ecotone of wet scrub and shoreline, and four (*C. morio, N. geoffroyi, N. timoriensis* and *V. darlingtoni*) on the ecotone of wet scrub and marsupial lawns immediately adjacent to the shoreline. *V. vulturnus* was only captured in a mistnet angled across a four-wheel drive track behind Pilot Bay at Macquarie Harbour entrance.

No bats were located in sea caves or overhangs along watercourses, although several sea caves which could potentially provide suitable roost sites were located between the Mainwaring River and Endeavour Bay. The only roosting bat encountered was a single *N. geoffroyi* located 4 m above the ground in a tangle of bark and sticks accumulated in the fork of a *Eucalyptus nitida,* north of Christmas Cove (42°42'S, 145°23'E).

DISCUSSION

The seven species recorded in the survey area represent 88% of the known bat species of Tasmania. This compares with 50% found by Taylor *et al.* (1985) in the Upper Henty River region of western Tasmania and 12% found by Green (1979) in the Sumac Forest and Dempster Plains in northwestern Tasmania. All species of bats recorded from the Upper Henty River region and from the Sumac Forest and Dempster Plains were found in the present study area.

Prior to the present survey, only three species of bats had been recorded from southwestern Tasmania (Taylor *et al.* 1987, Rounsevell *et al.* 1991, Taylor & Comfort 1993). The most frequently recorded species was *N. geoffroyi.* This bat was found roosting on occasions in the bushwalkers' huts at Melaleuca (M. Schulz, pers. obs.) and for periods of time in the Willson's house a Melaleuca (P. & B. Willson, pers. comm.). It was also captured in mistnets set around D. King's garden at Melaleuca (M. Schulz & K. Menkhorst, unpubl. rec.). No individuals of this species were caught in harp traps or recorded by an ultrasonic bat detector at Melaleuca and Claytons by Taylor & Comfort (1993). Away from Melaleuca, *N. geoffroyi* has been caught in monofilament mistnets at Schooner Cove, Cox Bight, Louisa Bay and Louisa River (M. Schulz & K. Menkhorst unpubl. rec., Taylor *et al.* 1987).

Two other bat species previously recorded from southwestern Tasmania appear to be restricted in distribution within this region. *V. regulus*, captured only once in the present survey, had been recorded by M. Schulz and K. Menkhorst (cited in Taylor *et al.* 1987) and Taylor & Comfort (1993) at Melaleuca. (The latter authors did not trap this species at the site but obtained a bat recording that "most closely resembled" it.)

The Tasmanian pipistrelle *Falsistrellus tasmaniensis,* previously recorded from the New Harbour area on the south coast (Taylor *et al.* 1987, Rounsevell *et al.* 1991), was not located this time, possibly because all trapping was confined to wet scrub and buttongrass moor vegetation communities rather than taller forest communities.

The present study, together with previous records, has shown that all eight species of bats recorded for Tasmania occur in southwestern Tasmania. Rounsevell *et al.* (1991) suggested that *C. morio, N. geoffroyi V. darlingtoni* and *V. regulus* are probably distributed throughout most of the state while *C. gouldii, F. tasmaniensis, N. timoriensis* and *V. vulturnus* may be limited within the perhumid cold climatic zone (after Gentilli 1972). The present survey showed *C. gouldii* to be widely distributed in this climatic zone and *N. timoriensis* to be patchily distributed; no information was available for *F. tasmaniensis. V. vulturnus,* on the other hand, was only recorded in the humid warm zone (Gentilli 1972) at Macquarie Harbour entrance and may possibly be absent from the perhumid climatic zone of southwestern Tasmania.

Five of the species now recorded (*C. gouldii, C. morio, N. timoriensis, V. darlingtoni* and *V. vulturnus*) had not been located previously in southwestern Tasmania (Taylor *et al.* 1987, Rounsevell *et al.* 1991). The first two were widespread, being recorded at four and seven sites respectively. *V. darlingtoni* was recorded from three sites, *N. timoriensis* from two sites and *V. vulturnus* from a single site (table 2). The location of five additional bat species was attributed to the survey effort undertaken in this study and sampling of areas not previously surveyed. In the most comprehensive survey previously undertaken in the region (Taylor & Comfort 1993) at Melaleuca, a total survey effort of five harp trap nights, two nights of mistnetting and four nights of 45-minute sampling, using a Anabat II (Titley Electronics) bat detector, yielded no bat captures and only two bat passes recorded with the detector. The present survey sampled 22 sites with a total of 111 mistnet hours, averaging 5.1 mistnet hours/site. This effort resulted in recording bats (one species or more) at 68% of sites, with three or more species recorded in 18% of sites sampled.

Bat species diversity is generally considered to be low in western Tasmania (Taylor & O'Neill 1985, Taylor *et al.* 1987, Taylor & Comfort 1993). Taylor *et al.* (1987) attributed this to the cold climatic conditions and high rainfall of the region in comparison with eastern Tasmania. The present survey has demonstrated that bat species diversity overall in coastal southwestern Tasmania is comparable

TABLE 2
Summary of trapping results in the survey of bats in coastal southwestern Tasmania

Species	Total trapped	Vegetation community*		Sites recorded†
		Wet scrub	Buttongrass moor	
Nyctophilus geoffroyi	20	+	+	7,8,10,12,13,14,17,21,22
Chalinolobus gouldii	11	+	–	6,11,14,16
C. morio	9	+	–	1,4,7,12,14,16,22
Vespadelus regulus	5	+	–	6,17
N. timoriensis	4	+	–	6,7
V. darlingtoni	3	+	–	6,7,9
V. vulturnus	1	+	–	22

* After Kirkpatrick & Dickinson (1984).

† Site numbers used are those identified in table 1.

with that of eastern Tasmania. In forested sites in eastern Tasmania, trapping records indicate that it is not uncommon for seven or eight species to occur sympatrically (Taylor *et al.* 1987). During the present survey, in a single night of mistnetting at each of four sites, three or four species were recorded. Since the use of mistnets is generally considered to be less effective than harp traps (e.g. Richards 1992), and all net sites during the present survey were located in scrub rather than forested situations, a survey of coastal forests in western Tasmania deploying harp traps and ultrasonic bat detectors could reveal a similar bat species diversity, with the possible absence of *V. vulturnus*, to that in many forested situations in eastern Tasmania.

The density of bats present in coastal southwestern Tasmania appears to be lower than in eastern Tasmania, although no data was collected to quantify this. Taylor & Comfort (1993), using an Anabat II detector, demonstrated a marked difference in bat passes, with 80 times greater number of passes in dry forest in eastern Tasmania compared with around Melaleuca Inlet. However, the bat fauna present at Melaleuca appears depauperate and is unlikely to be representative of southwestern Tasmania as a whole. For example, in over 50 monofilament mistnet hours in late 1992 and early 1993, M. Schulz and K. Menkhorst (unpubl. rec.) recorded only 12 *N. geoffroyi* and three *V. regulus*. These results are low compared with many sites sampled in a single night during the present survey. At some locations during the survey, such as south of Hartwell Cove and at the Wanderer River mouth, large numbers of bats were observed foraging over the shoreline and adjacent vegetation. Both these sites were close to rainforest and E. *nitida* wet forest vegetation communities (Kirkpatrick & Dickinson 1984). Fishermen reported on some summer nights having large numbers of bats flying around boats anchored close inshore at The Pophole, south of Low Rocky Point (C. Wessing, pers. comm.) where *E. nitida* wet forest immediately flanks the shoreline in this area.

In a total of 544 bats trapped at nine sites in eastern, western and northwestern Tasmania, Taylor *et al.* (1987) found the following relative proportions of each species: *V. regulus* 35%, *C. morio* 20%, *V. darlingtoni* 12%, *V. vulturnus* 11%, *N. geoffroyi* 10%, *F. tasmaniensis* 7%, *N. timoriensis* 3% and *C. gouldii* 2%. In the present survey, the relative proportions of trapped species was: *N. geoffroyi* 38%, *C. gouldii* 21%, *C morio* 17%,*V. regulus* 9%, *N. timoriensis* 8%, *V. darlingtoni* 5% and *V. vulturnus* 2%. Thus, of the three most frequently captured species in southwestern Tasmania, only one (*C. morio*) rated in the top three bat species trapped by Taylor *et al.* (1987). The species recorded least frequently by Taylor *et al.* (1987), *C. gouldii*, was the second most commonly trapped species in the present study, while species of the genus *Vespadelus*, comprising only 16% of all bats caught, accounted for 58% in the earlier survey. The differing results may be due to a combination of factors, including different vegetation communities and climatic zones sampled, and differences in trapping techniques (e.g. harp traps [Taylor] v. mistnets [present study]).

The remoteness of the southwestern region and surveying on foot greatly restricted techniques available for sampling the bat fauna. The harp trap (Tuttle 1974, Tidemano & Woodside 1978), which has been widely and successfully used for capturing all Tasmanian bat species (Taylor *et al.* 1987, O'Neill & Taylor 1989), is a large, bulky, heavy piece of equipment, totally unsuitable for carrying through the dense trackless vegetation of southwestern Tasmania. Deployed around melaleuca Inlet, such traps have met with only limited success (Department of Parks, Wildlife & Heritage records, Taylor & Comfort 1993). For example, Taylor & Comfort (1993) trapped no bats in five harp traps nights around D. King's garden and mine workings in this area. In the present survey, these traps were not used, due to the dense nature of the vegetation, the necessity of restricting the weight of backpacks for the 32-day walking survey and the difficulty of carrying such traps across ten rivers where all gear had to be floated. Techniques were limited to mistnetting and triplining. As a result, the survey depended on mistnetting as the prime technique, although not carrying mistnet poles but using "bush poles" of reasonably straight, dead branches, driftwood or dead sapling trunks.

Mistnets have a number of drawbacks and consequently are rarely used as the prime survey method in general fauna surveys where remoteness and vehicle access is not a problem (e.g. Richards 1992, Schulz & de Oliviera, pers. obs.). Some of the drawbacks of mistnets are listed below.

(1) Mistnets bias against species which are slow flying and have sufficient manoeuvrability to avoid them, or species that have high-frequency echolocation calls that enable them to detect knots and shelf strings in mistnets. These problems were partially overcome by deploying ultrafine monofilament mistnets, less likely to be detected. To maximise the possibility of catching slow-flying manoeuvrable species, such as *Nyctophilus*, nets were set in puzzle formations or slanted across openings, in an effort to trick the bats.

(2) Mistnets have to be constantly monitored, and it is difficult to survey a number of sites concurrently. In the present survey, mistnets were always erected within easy walking distance from the campsite. This was both to conserve torch batteries, of which we had only a limited supply, and to allow for regular checking of nets while undertaking other duties such as erecting the camp, cooking dinner, repairing equipment and writing-up the day's notes. No attempt was made to sample more than one site per night, for the reasons outlined previously and because the authors had been walking all day with heavy backpacks, often over difficult terrain (Kristensen & Schulz 1994) and frequently did not have the energy to constant monitor distant sites.

(3) Monofilament mistnets are generally regarded as expendable survey items, due to their fragile nature (e.g. Helman & Churchill 1986). In the present survey, the nets used became progressively more full of holes, due to wind catching the nets and wrapping them around vegetation, and on occasions flocks of ducks flew into and sometimes through the nets, resulting in gaping holes. By the end of the survey, most nets were more holes than useful net and were difficult to deploy successfully.

Despite the limitations of using mistnets as the primary bat survey technique, the results demonstrated that monofilament mistnets are a useful bat survey tool, where terrain and remoteness restrict other techniques.

Another widely used bat survey tool, the ultrasonic bat detector, was not used in the present survey. Detection of ultrasonic calls requires the careful use of delicate electronic equipment (de Oliviera *et al.* 1994) not resistant to water. It was considered impractical to carry a bat detector, cassette recorder, cassette tapes and a large supply of batteries, and the equipment might well have failed in wet weather or during river crossings and/or accidental submersion of backpacks in the sea. The only localities in coastal south-

western Tasmania where ultrasonic bat detectors have been used are at Melaleuca and Claytons on the southern shore of Bathurst Harbour (Taylor & Comfort 1993). However, in future surveys of western Tasmania, it is recommended that a waterproofed bat detector also be deployed as, at a number of sites, bats were observed lying around but none were caught in the nets.

The absence of bats in sea caves scattered along the coast, particularly in the High Rocky Point area, was not a surprise. No cave-dwelling bats have been reported in Tasmania (Taylor *et al.* 1987, Rounsevell *et al.* 1991, Watts 1993). Hall (1981) indicated that cave-dwelling species are generally less numerous in mainland Australia than forest roosting species and decrease in numbers with increasing latitude.

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REFERENCES

De Oliviera, M.C., Corben, C. & Hogan. L.D., 1994: Ultrasonic detection of micro-bats in southeastern Queensland. Department of Primary Industries Forest Service, Fauna Conservation and Ecology Section, Brisbane. Internal report.

Gentilli, J., 1972: *AUSTRALIAN CLIMATIC PATTERNS*. Nelson, Melbourne.

Green, R.H., 1979: A survey of the vertebrate fauna of the Sumac Forest and the Dempster Plains, north-west Tasmania. *Rec. Queen Vic. Mus.* 65:1-9.

Hall,L.S., 1981: The biogeography of Australian bats. *In* Keast, K.(Ed.): *ECOLOGICAL BIOGEOGRAPHY OF AUSTRALIA*. Dr W. Junk, The Hague: 1557- 1583.

Helman, P. & Churchill, S., 1986: Bat capture techniques and their use in surveys. *Macroderma* 2: 32-53.

Kirkpatrick, J.B. & Dickinson, K.J.M., 1984: *TASMANIAN VEGETATION MAP*. Tasmanian Forestry Commission, Hobart.

Kristensen, K. & Schulz, M. 1994: The wild, wild west. *Austr. Geogr.* 35: 25-26.

O'Neill, M.G. & Taylor, R.J., 1989: Feeding ecology of Tasmanian bat assemblages. *Aust. J. Ecol.* 14: 19-31.

Richards, C.C., 1992: *Fauna survey. Wingham Management Area, Port Macquarie region. For. Resour. Ser.* 22, For. Commn NSW, Sydney.

Rounsevell, D.E., Taylor, R.J. & Hocking, G.J., 1991: Distribution records of native terrestrial mammals in Tasmania. *Wildl. Res.* 18: 699-717.

Schulz, M. & Kristensen, K., 1993a: A survey of the shorebirds of western Tasmania. Part Two. North Head. Port Davey entrance to Macquarie Heads. *The Stilt* 23: 26-29.

Schulz, M. & Kristensen, K., 1993b: Coastal fauna survey of western Tasmania, with comments on management. Internal Report. World Heritage Area, Dept Parks, Wildl. Heritage, Hobart.

Taylor, R.J. & Comfort, M.D., 1993: Small terrestrial mammals and bats of Melaleuca and Claytons. southwestern Tasmania. *Pap. Proc. R. Soc. Tasm.* 127: 33-37.

Taylor, R.J. & O'Neill, M.G., 1985: Composition of the bat (Chiroptera: Vespertilionidae) communities in Tasmanian forests. *Aust. Mamm.* 9: 125- 130.

Taylor, R.J. & O'Neill, M.G., 1988: Summer activity patterns of insectivorous bats and their prey in Tasmania. *Aust. Wildl. Res.* 15: 533-539.

Taylor, R.J., O'Neill, M.G. & Reardon, T., 1987: Tasmanian bats: Identification, distribution, and natural history. *Pap. Proc. R. Soc. Tasm.* 121:109-119.

Taylor, R.J., Bryant, S.L., Pemberton, D. & Norton, T.W., 1985: Mammals of the Upper Henty Region, western Tasmania. *Pap. Proc. R. Soc. Tasm.* 119: 7-14.

Tidemann, C.R. & Woodside. D.P., 1978: A collapsible bat-trap and a comparison of results obtained with the trap and mist-nets. *Aust. Wildl. Res.* 5: 355-362.

Tuttle, M.D., 1974: An improved trap for bats. *J. Mammal.* 55: 474-477.

Watts, D., 1993: *TASMANIAN MAMMALS, A FIELD GUIDE*. Rev. ed. Focal Printing, Hobart.

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