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Cercartetus lepidus (Diprotodontia: Burramyidae)

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Abstract: *Cercartetus lepidus* (Thomas, 1888) is a burramyid commonly called the little pygmy-possum. It is 1 of 4 species in the genus *Cercartetus*, which together with *Burramys parvus* form the marsupial family Burramyidae. This Lilliputian possum has a disjunct distribution, occurring on mainland Australia, Kangaroo Island, and in Tasmania. Mallee and heath communities are occupied in Victoria and South Australia, but in Tasmania it is found mainly in dry and wet sclerophyll forests. It is known from at least 18 fossil sites and the distribution of these reveal a significant contraction in geographic range since the late Pleistocene. Currently, this species is not listed as threatened in any state jurisdictions in Australia, but monitoring is required in order to more accurately define its conservation status. DOI: 10.1644/842.1.

Key words: Australia, burramyid, hibernator, little pygmy-possum, pygmy-possum, Tasmania, Victoria mallee

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Cercartetus lepidus (Thomas, 1888)
Little Pygmy-possum

Dromicia lepida Thomas, 1888:142. Type locality "Tasmania."

E[*udromicia*] (*Dromiciola*) *lepida*: Matschie, 1916:260. Name combination.

Eudromicia lepida Iredale and Troughton, 1934:23. Type locality "Tasmania."

Cercartetus lepidus: Wakefield, 1963:99. First use of current name combination.

CONTEXT AND CONTENT. Order Diprotodontia, suborder Phalangiformes, superfamily Phalangeroidea, family Burramyidae (Kirsch 1968). No subspecies for *Cercartetus lepidus* are currently recognized.

NOMENCLATURAL NOTES. In reexamining museum material of so-called "young" *Dromicia nana* (= *Cercartetus nanus*), Thomas (1888) recognized unique cranial and dental characters, which led him to erect a new species with the name *Dromicia lepida* (= *C. lepidus*). The holotype of *C. lepidus* (an adult female with 4 hairless pouch young from Tasmania collected by Ronald Gunn) is held in the British Museum [Natural History], London (BMNH 1852.1.15.11).

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Fig. 1.—An adult *Cercartetus lepidus* from Tasmania. Used with permission of the photographer David Watts.

Cercartetus lepidus has sometimes been placed in *Eudromicia*, a genus name originally proposed by Mjöberg (1916) to accommodate his new species *E. macrura* (= *C. caudatus*) from New Guinea. Matschie (1916) preferred to delineate each of the pygmy-possums in separate monotypic genera and on the basis of pelage, ear shape, tail shape, and molar number and size placed *D. lepida* in a separate subgenus *Dromiciola* (also favored by Turnbull and Schram [1973]). A taxonomic decision by Iredale and Troughton (1934) maintained that *Dromicia lepida* belonged in *Eudromicia* (supported by Tate [1945]). All this was cast aside when Wakefield (1963) advanced *Cercartetus* for all pygmy-possum species known at that time; *Burramys parvus* was thought to be extinct and not yet recognized as a pygmy-possum.

It has occasionally been presumed that *Cercaertus* (Burmeister, 1837) was a misspelling or synonym of *Cercartetus* (e.g., Guiler 1960; Hickman and Hickman 1960; Simpson 1945). However, *Cercaertus* is a junior synonym of *Trichosurus* and not of *Cercartetus* (Harris 2006; Wakefield 1963).

Cercartetus is a reference to the prehensile tail (from the Greek *kerkos* meaning tail) and *lepidus* is derived from the Greek word for scale, referring to the minute scales on the distal part of the tail (Flannery 1994; Strahan 1981).

Vernacular names used include possum mouse, dormouse possum, lesser pygmy possum, Tasmanian dormouse phalanger, Trasmanian pigmy-possum, and lesser dormouse-opossum (Hickman and Hickman 1960; Ogilby 1892; Skemp 1950; Strahan 1981) and there are a few names recorded that were used by the Tasmanian Aboriginals (Plomley 1976).

DIAGNOSIS

Cercartetus lepidus (Fig. 1) is distinguished from other pygmy-possums by its size, coloration, tail length, and dentition. Specifically, it differs from *C. concinnus* (Harris 2009) by having gray rather than white belly fur, and from *C. nanus* (Harris 2008) by its smaller size and the presence of a 4th molar (Fig. 2). *C. caudatus* has a much longer tail, and *B. parvus* has a very large 3rd premolar that is grooved and serrated. Generally about the size of a small mouse, it is distinguished from murids by the presence of an opposable, clawless hallux, syndactylous digits on the hind feet, and diprotodont lower incisors. It also has a long, slender, prehensile tail. Weighing around 7–10 g, *C. lepidus* is the smallest of all possums.

GENERAL CHARACTERS

Cercartetus lepidus has a conical head with snort muzzle, long whiskers, large, dark, forward-directed eyes, and large, thin, almost naked ears that can be expanded or furled depending on activity and ambient temperature. The tail is

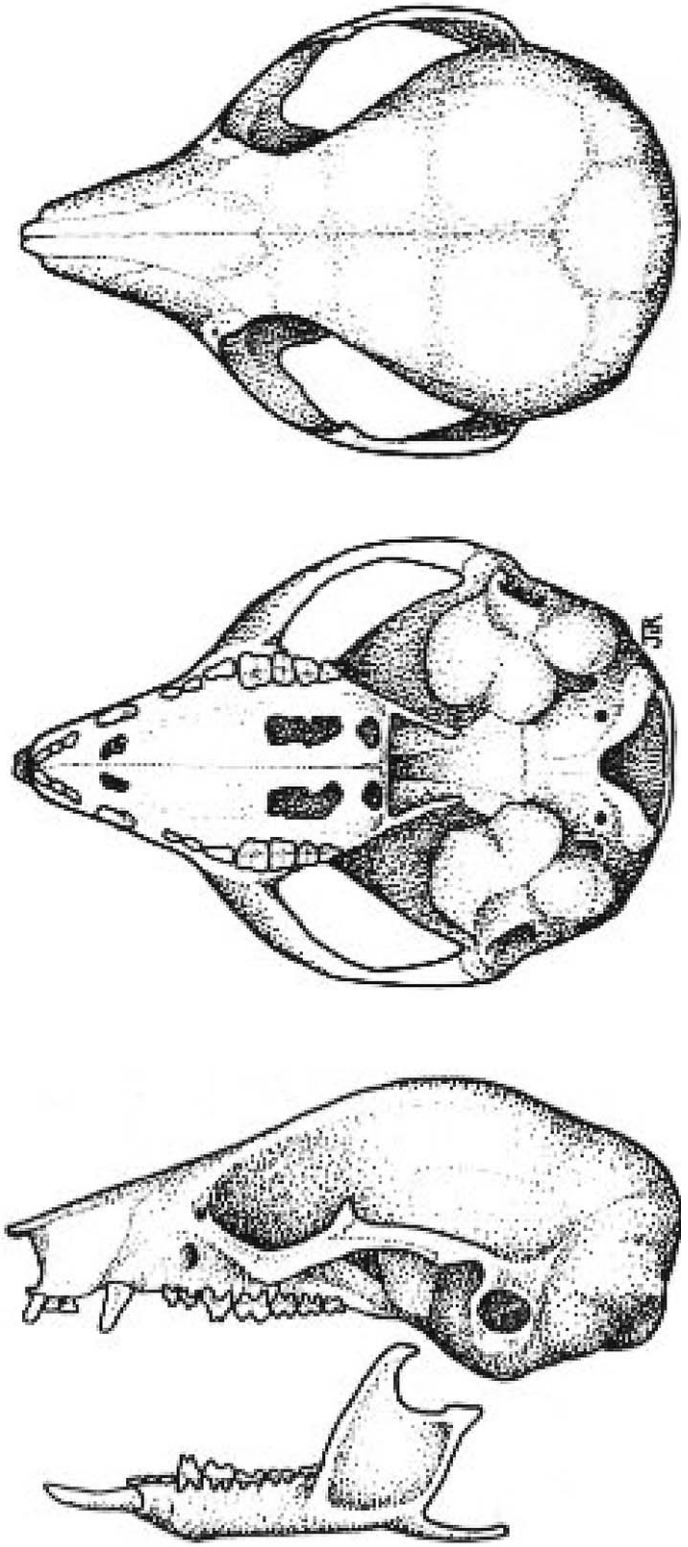

Fig. 2.—Dorsal, ventral, and lateral views of skull and lateral view of mandible of a male *Cercartetus lepidus* from Golden Valley (near Deloraine), Tasmania (Queen Victoria Museum and Art Gallery number 1980/1/76). Collected by P. Wright in November 1979. Greatest length of skull is 19.6 mm. Used with permission of the illustrator Judy Rainbird.

Fig. 3.—*Cercartetus lepidus* in a typical hibernating posture. Note the folded ears, also the spiraled tail and curled paws. The incrassated tail base is clearly visible. Used with permission of the photographer David Watts.

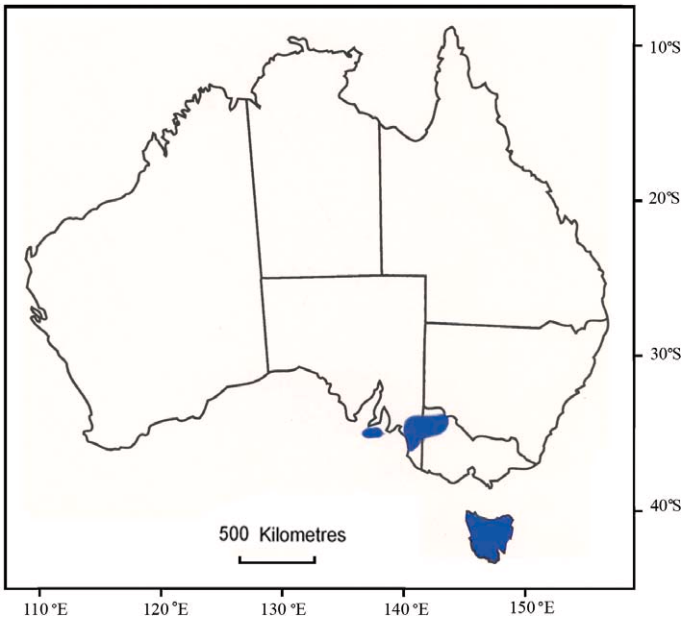

Fig. 4.—Geographic distribution of *Cercartetus lepidus*. Adapted from Van Dyck and Strahan (2008).

cylindrical, except for the base, which may be thickened with a caudal fat store (Fig. 3). The fur is thick at the tail base and becomes gradually sparser toward the tip. Burramyids usually have a dark ring around each of the eyes, but in *C. lepidus* the ring is inconspicuous and vaguely defined. The general color of the dorsal pelage is pale fawn with the underparts light gray, although there may been some color variations, particularly in Tasmanian specimens (Guiler 1960; Nowak and Paradiso 1983; Watts 2002). Most of the fur is dense and very soft, reaching to 7 mm in length, with guard hairs up to 9 mm (Green 1973; Lyne and McMahon 1951). Long whiskers extend from either side of the snout. No significant dimorphism in size between the sexes is apparent. Standard external measurements of adults (lengths in mm ± *SD*) from 26 males and 13 females, respectively, were: body mass (8.4 ± 0.7 g; 9.0 ± 1.2 g); head and body (70.4 ± 4.0; 71.3 ± 4.0); tail (64.2 ± 3.7; 67.8 ± 3.8); hind foot (10.2 ± 0.2; 10.2 ± 0.3—Ward 1992). See Aitken (1974) and Flannery (1994) for additional measurements.

DISTRIBUTION

Cercartetus lepidus has a disjunct distribution (Fig. 4), occurring on mainland Australia (i.e., in South Australia and Victoria) and on the offshore island state of Tasmania (Green 1979; Harris 2005; Menkhorst 1995; Munks et al. 2004). *C. lepidus* was thought to be confined to Tasmania and extinct on the mainland until 1964, when a live specimen was found on Kangaroo Island, South Australia (Aitken 1967, 1974). However, it was suggested that this animal had been inadvertently transported to Kangaroo Island (Wakefield 1970). Subsequently, the occurrence of extant *C. lepidus* outside Tasmania was verified by the discovery of populations on mainland South Australia (Aitken 1977; Barritt 1978) and in western Victoria (Conole 1996; Dixon 1978). It has been predicted that *C. lepidus* could occur in southwestern New South Wales (Dickman et al. 1993), although this has not been verified. The distribution of *C. lepidus* spans the climatic range from a maximum annual rainfall of about 1,200 mm in western Tasmania to a minimum of 300 mm in the Victorian mallee.

FOSSIL RECORD

In Tasmania, *Cercartetus lepidus* has been recorded from 9 fossil sites (Cave Bay Cave, Beeton Rockshelter, Nunamira Cave, Bone Cave, Pseudocheirus Cave, March Fly Pot, Warreen, Newdegate Cave, and Kutikina Cave). The oldest of these is Warreen where an age of 34,790 ± 510 to 15,960 ± 310 years has been established (Harris and Garvey 2006). The oldest fossil bones of *C. lepidus* known from mainland Australia are from Cathedral Cave in the Naracoorte Caves National Park World Heritage Site in South Australia. A recently published age for this deposit is 528,000 ± 41,000 years (*C. lepidus* in Unit 4 of Prideaux et al. [2007]). Other fossil sites for this species in South Australia include Seton Rock Shelter (Kangaroo Island), Victoria Fossil Cave, Wet Cave, and Robertson Cave (Hope et al. 1977; Reed and Bourne 2000). Several fossil sites in New South Wales and eastern Victoria are extralimital to its recorded modern distribution and include Broom Cave (Lundelius 1983; Ride 1960; Turnbull and Schram 1973),

Nettle Cave (Morris et al. 1997), Pyramids Cave (Gill 1965; Wakefield 1960, 1963, 1967, 1972), and New Guinea II Cave (Ossa et al. 1995). These indicate a substantial contraction of geographic range since the late Pleistocene.

FORM AND FUNCTION

Dental formula is i 3/1, c 1/0, p 3/4, m 4/4, total 40 (Fig. 2; Green and Rainbird 1983). Statistical data for skull and tooth measurements of *Cercartetus lepidus* also are available (Aitken 1967, 1974, 1977; Thomas 1888; Turnbull and Schram 1973). Brain mass is recorded as 0.376 g (Haight and Nelson 1987).

The female's pouch is well developed and typical of diprotodont marsupials (type 5—Russell 1982). It opens anteriorly and contains 4 teats (Green 1973; Ward 1992). The reproductive system has been examined histologically (Smith 1984; Ward 1990). Females lack a posterior vaginal sinus, and in 1 specimen examined the urethra was 1.8 mm long and the urogenital sinus was 6.4 mm long. In males, the penis is bifid with the left fork slightly larger than the right (Turner and McKay 1989). The testes are ellipsoidal, the scrotum is not pendulous (Smith 1984), and the tunica vaginalis is described as deeply pigmented (Tyndale-Biscoe and Renfree 1987) or black (Smith 1984). The rete testis has been described as similar to that of other species of *Cercartetus* and there are reportedly 15–21 tubuli recti (Woolley and Vanderveen 2002). The prostate is "carrot-shaped" (Smith 1984; Ward 1990). Spermatozoan structure is similar to that of other burramyids and *Trichosurus* in terms of sperm head shape, internal proportions, and the presence of a midpiece fiber network (Harding 1987).

The ability of *C. lepidus* to become dormant or torpid has been frequently observed (Fig. 3; Barritt 1978; Geiser 1987; Green 1979, 1993; Hickman and Hickman 1960; Skemp 1950). The longest period of dormancy recorded is 6 days and animals may become dormant at any time of the year (Geiser 1987; Hickman and Hickman 1960). It has been suggested that *C. lepidus* should be considered a true hibernator (Geiser 1985), and although this may well be justified, torpor is not as prolonged or deep as that in *C. nanus* (see Harris 2008), and arousal rates (0.03°C/min) may be slower (about 20 min to normothermia) in the smaller *C. lepidus* (Green 1973; Hickman and Hickman 1960; Wallis 1979). In one study, body temperature of dormant *C. lepidus* was within 1°C of ambient temperature, that is, body temperature was recorded as 15°C; however, body temperature was not measured below an ambient temperature of 15°C. Torpor is entered at ambient temperatures as low as 2°C (Hickman and Hickman 1960) and 5.9°C (Geiser 1987). During torpor, oxygen consumption (a measure of metabolic rate) is only 1% of that of a nontorpid individual (Geiser 1987).

ONTOGENY AND REPRODUCTION

In South Australia and Victoria, births may occur throughout the year or mainly from late winter to spring (Coventry and Dixon 1984; Ward 1992) and in Tasmania only from spring to summer (Andrews 1990; Green 1973, 1979; Watts 2002). It has been suggested that differences between these regions may relate to differences in seasonal food availability (Carthew and Cadzow 2008). Maximum litter size is 4 and potential yearly fecundity is 8 (Bennett et al. 1989; Coventry and Dixon 1984; Ward 1992). After approximately 42 days the young are ejected from the pouch and may either be left in the nest while the mother forages, or travel clinging to her fur (see photograph in Green [1993]). Young become independent at about 90 days (Green 1979; Menkhorst 1995; Watts 2002).

In the past, it has been implied that *Cercartetus lepidus* may exhibit embryonic diapause (Renfree 1993; Ward 1990), based on anecdotal observations of diapause in *C. concinnus* (Bowley 1939; Casanova 1958; Hartman 1940). However, in *C. concinnus* continued growth of blastocysts during lactation suggests that diapause does not occur (Clark 1967) or that it is characterized by a slowing growth of blastocysts rather than a total cessation (Tyndale-Biscoe 1973). Hence, diapause probably does not occur in *C. lepidus* (Jackson 2003) or in other burramyids.

ECOLOGY

Population characteristics.—Very little research has been undertaken on free-ranging populations of *Cercartetus lepidus* (Duncan and Taylor 2001; Ward 1992). Because *C. lepidus* is diminutive, secretive, and difficult to detect, many records are from accidental discovery rather than systematic survey (Green 1979). Spotlighting is occasionally successful for detection of this species (Andrews 1967) but pitfall trapping is regarded as more effective (Barritt 1978; Cockburn et al. 1979; Conole 1996; Coventry and Dixon 1984; Duncan and Taylor 2001).

Space use.—On Kangaroo Island, *Cercartetus lepidus* occurs in dry sclerophyll forest, and on mainland South Australia and western Victoria, in mallee and heathland vegetation, which may have a sparse canopy of *Eucalyptus baxteri*, *E. costata*, or *E. leptophylla*, and in tall shrubland of *Acacia*, *Banksia*, *Callitris*, *Hakea*, *Leptospermum*, or *Melaleuca* (Aitken 1977; Bennett et al. 1989; Menkhorst 1995). In Tasmania, this species favors dry forests and heathlands, and to a lesser extent wet sclerophyll forest, but not rainforest (Green 1993; Wall 1985), or terrestrial alpine or treeless subalpine habitats (Kirkpatrick et al. 1993).

Cercartetus lepidus may build a dome-shaped nest of bark fibers well secluded in a tree cavity, stump, hollow log, or similar retreat (Duncan and Taylor 2001; Green 1993; Hickman and Hickman 1960; Slater 1992; Wakefield 1963).

They also have been recorded squatting in an old nest of the New Holland honeyeater (*Phylidonyris novaehollandiae*) situated about 1 m above the ground in dense tea-tree scrub (Green 1979).

Recorded movements by individuals are up to 280 m between recaptures in different trapping seasons (Duncan and Taylor 2001; Ward 1992). There is no quantitative information on the size of the home range in this species. However, it is possible that they have a drifting home range (Ward 1992). It is thought that they track available flowering resources in the landscape, switching from one species to another as they come into flower.

Diet.—In captivity, *Cercartetus lepidus* has been recorded eating insects, spiders, small lizards, candied honey, and apple (Green 1979; Hickman and Hickman 1960; Skemp 1950). If overfed with sweet foods captive animals may become extremely fat (Geiser 1987; Green 1979). Analysis of feces and gut samples from wild-caught animals have shown that insects as well as nectar and pollen from *Banksia ornata*, *B. marginata*, *Eucalyptus*, *Leptospermum coriaceum*, and *Astroloma conostephioides* are important dietary components (Cadzow and Carthew 2004; Ward 1992).

Diseases and parasites.—Various fleas, mites, and ticks have been recorded as parasitic on *Cercartetus lepidus*, including *Acanthopsylla rothschildi*, *A. scintilla*, *Andreacarus radfordi*, *Choristopsylla ochi*, and *Ixodes tasmani* (Domrow 1987; Dunnet and Mardon 1974; Green 1979; Green and Munday 1971; Holland 1971).

Interspecific interactions.—*Cercartetus lepidus* is sympatric with *C. concinnus* on Kangaroo Island and through some of their ranges in the mallee region of southeastern Australia (e.g., Big Desert Wilderness in Victoria and Mt. Scott Conservation Park in South Australia—Bennett et al. 1989; Cadzow and Carthew 2004). In some parts of Tasmania, *C. lepidus* is sympatric with *C. nanus* (Duncan and Taylor 2001; Green 1979; Munks et al. 2004). However, *C. lepidus* is reported to occur over a much greater range in Tasmania than *C. nanus* and is more frequently encountered (Andrews 1990; Munks et al. 2004). The basis for the coexistence of these morphologically similar species is not clear; it could be related to dietary differences (Bennett et al. 1989; Cadzow and Carthew 2004), partition in the use of vertical space (Munks et al. 2004), or other factors.

Known predators include the laughing kookaburra (*Dacelo novaeguineae*—Green et al. 1988), masked owl (*Tyto novaehollandiae*—Mooney 1992, 1993), cat (*Felis catus*—Skemp 1950), Tasmanian devil (*Sarcophilus harrisii*), spotted-tailed quoll (*Dasyurus maculatus*), eastern quoll (*D. viverrinus*—Mumbray 1992; Wallis et al. 1977) and tiger snake (*Notechis scutatus*—Fearn and Spencer 1995). In Tasmania, southern boobook (*Ninox novaeseelandiae*) and copperhead snake (*Astrelaps superbus*) also are suggested to include *C. lepidus* in their diet (Green 1979).

Miscellaneous.—The species has reportedly been kept in captivity (Aitken 1967; Geiser 1987; George 1990; Green 1979, 1993; Hickman and Hickman 1960), but scant information is available on its maintenance and husbandry (Jackson 2003). Daily food consumption of active animals in captivity is approximately 7% of body weight (Hickman and Hickman 1960).

BEHAVIOR

Mostly nocturnal and arboreal, *Cercartetus lepidus* lives in the forest understory and among the shrubs, tea-tree, and heath, shunning the higher branches of trees where it would be vulnerable to attack by owls (Green 1993; Hickman and Hickman 1960; Watts 2002). When fully awake these animals are very alert and active and efficient climbers (Andrews 1990; Green 1973). The social organization of *C. lepidus* is not well understood, but burramyids appear to forage solitarily and have undefended ranges (style D—Jarman and Kruuk 1996). Hence, the nest is usually occupied by 1 animal (Slater 1992), but occasionally a pair or a female with young will be found together in the same nest (Green 1979, 1993). During dormancy, *C. lepidus* assumes a typical hibernating posture. It curls into a ball, the eyes closed, the ears folded and bent downward, and the tail coiled in a flat spiral (Fig. 3; Hickman and Hickman 1960).

Antipredator behavior in burramyids is thought to include anachoresis (avoidance by concealment in a retreat, such as a burrow, that precludes an attack), specific activity patterns (such as adjustment of foraging activity to minimize predation risk), vigilance (a general wariness), withdrawal (retreat to hollow or mother's pouch when alarmed), retaliation (biting or intimidatory displays including hissing), and flight (fleeing from the predator—Coulson 1996).

Its disposition is usually mild, but some individuals will bite if handled (Green 1973, 1993). If alarmed or threatened it may make a hissing noise, but to my knowledge recordings of the vocalizations of *C. lepidus* are not available. In eating, it secures prey with its forepaws and tears away edible portions with its teeth (Hickman and Hickman 1960). Extensive self-grooming may be undertaken after feeding mainly using the claws and with the aid of saliva (Hickman and Hickman 1960). This action is particularly important in transferring pollen, an important protein source, from the fur to the mouth (Turner and McKay 1989). In relation to flower visitation and pollen transport, *C. lepidus* has been implicated as a possible pollinator of various proteaceous and myrtaceous species (Fig. 5; Turner 1982).

GENETICS

Cercartetus lepidus has XY/XX sex determination and a diploid number (2n) of 14 chromosomes (McKay 1984; Sharman 1961). DNA studies conducted on *Cercartetus* to date suggested a sister relationship between *C. lepidus* and *C.*

Fig. 5.—*Cercartetus lepidus* is a nondestructive visitor to a range of flowering plants and may play an important role in pollination. Used with permission of the photographer David Watts.

nanus, although bootstrap support for this was only moderate (Osborne and Christidis 2002). A high level of DNA sequence divergence (ca. 7%) was recorded between the specimens of *C. lepidus* examined from mainland Australia and Tasmania, and this provides some evidence to support possible recognition of them as separate subspecies or perhaps even full species (Osborne and Christidis 2002).

CONSERVATION

The species is rated as "Least Concern" on the 2009 International Union for Conservation of Nature and Natural Resources Red List of Threatened Species (International Union for Conservation of Nature and Natural Resources 2007), and is not listed as a threatened species federally within Australia or in state-based legislation in South Australia, Tasmania, or Victoria. However, informal assessments have been made that it is uncommon in wet and dry eucalypt forest in Tasmania, rare on Kangaroo Island, and uncommon in mallee shrubland and semiarid heath in South Australia and Victoria (Menkhorst and Knight 2001). Further comment on conservation status or abundance in specific areas can be found in the literature (Bennett et al. 1989; Carthew and Cadzow 2008; Conole 1996; Green 1967; Menkhorst 1995; Stewart et al. 1998; Wakefield 1963). *Cercartetus lepidus* has suffered habitat loss from land clearance for agriculture and forestry (Green 1979; Hocking and Driessen 1996; Woinarski 1989) and may be threatened by inappropriate fire regimes (Bennett et al. 1989; Menkhorst 1995; Tulloch 2004). Potentially, it is a threatened species (Flannery 1994; Smith and Gilfedder 1993; Watts 2002) and for that reason requires monitoring in Tasmania (Bryant 1994) as well as other parts of its range on mainland Australia.

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